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Revision of the genus *Turris* Batsch, 1789 (Gastropoda: Conoidea: Turridae) with the description of six new species

RICHARD N. KILBURN[1], ALEXANDER E. FEDOSOV[2] & BALDOMERO M. OLIVERA[3]

[1] *Natal Museum, Private Bag 9070, Pietermaritzburg 3201, South Africa (dickkilburn@sai.co.za).*
[2] *A.N. Severtzov Institute of Ecology and Evolution, Russian Academy of Sciences, Leninski Prospect 33, Moscow 119071, Russia. (FedosovAlexander@gmail.com).*
[3] *Department of Biology, University of Utah, 257 South 1400 East, Salt Lake City, Utah 84112, U.S.A. (olivera@biology.utah.edu).*

Abstract

The taxonomy of the genus *Turris* Batsch, 1789, type genus of the family Turridae, widespread in shallow-water habitats of tropic Indo-Pacific, is revised. A total of 31 species of *Turris*, are here recognized as valid. New species described: *Turris chaldaea*, *Turris clausifossata*, *Turris guidopoppei*, *Turris intercancellata*, *Turris kantori*, *T. kathiewayae*. Homonym renamed: *Turris bipartita nom. nov.* for *Pleurotoma variegata* Kiener, 1839 (*non* Philippi, 1836). New synonymies: *Turris ankaramanyensis* Bozzetti, 2006 = *Turris tanyspira* Kilburn, 1975; *Turris imperfecti*, *T. nobilis*, *T. pulchra and T. tornatum* Röding, 1798, and *Turris assyria* Olivera, Seronay & Fedosov, 2010 = *T. babylonia*; *Turris dollyae* Olivera, 2000 = *Pleurotoma crispa* Lamarck, 1816; Turris *totiphyllis* Olivera, 2000 = *Turris hidalgoi* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000**;** *Turris kilburni* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000 = *Turris pagasa* Olivera, 2000; *Turris (Annulaturris) munizi* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000 = *Gemmula lululimi* Olivera, 2000. Revised status: *Turris intricata* Powell, 1964, *Pleurotoma variegata* Kiener, 1839 (*non* Philippi, 1836) and *Pleurotoma yeddoensis* Jousseaume, 1883, are regarded as full species (not subspecies of *Turris crispa)*. Neotype designated: For *Pleurotoma garnonsii* Reeve, 1843, to distinguish it from *Turris garnonsii* of recent authors, type locality emended to Zanzibar. New combination: *Turris orthopleura* Kilburn, 1983, is transferred to genus *Makiyamaia*, family Clavatulidae.

Key words: Taxonomy, *Turris*, Indo-West Pacific, new species, new synonymies, new combinations.

Introduction

The family Turridae *s.l.* comprises one of the largest groups of marine gastropods and a major component of the Indo-Pacific molluscan fauna. According to the highly conservative estimate of Tucker (2004), the Turridae *s.l.* (excluding the Coninae) consists of about 2990 species, quantitatively prominent in species lists of many local faunas. Wide distributions and species richness in Turridae are accompanied by high morphological heterogeneity that makes the family extremely problematic for taxonomists. Originally described by exclusion, Turridae in traditional understanding obviously comprises a combined group of separate, independently evolved clades, and cannot be considered as a monophyletic taxon (Bouchet, et al, 2011; Puillandre, et al, 2011). Another practical problem in turrid taxonomy is that the last, and probably the only, comprehensive revision of generic-level taxa was undertaken by Powell in 1966, and since that time many genera have been extended to incorporate subsequently described species. As a result, many—if not most—of turrid genera, require revision, with redefinition of their boundaries and ordering of the synonymy.

The genus *Turris* Batsch, 1789, type genus of the family Turridae, is one of the most easily recognized of Indo-Pacific turrid genera. The type species of the genus, *Turris babylonia*, was described by Linnaeus in 1758 under the original combination *Murex babylonius*. The only recent monograph was written by Powell (1964), which summarized data on the distribution of previously-known *Turris* species and included some information on type specimens. Powell recognised 9 species-level taxa (proposing for one of them four distinct forms treated as subspecies). Subsequently, in 1966 Powell established the distinct subgenus *Annulaturris* (type species *Pleurotoma amicta* Smith, 1877) within the genus *Turris*, with two species included. Some later authors considered

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Annulaturris to be a full genus—we will refer to these taxa as *Turris s.l.*, here including *Turris s.s.* and *Annulaturris*. Recently, based on molecular data and radular morphology of nine Philippine species of the genus, Fedosov and coauthors (2011) found them to indeed form two separate clades, of which one includes the type species, *T. babylonia*, while the second includes, among others, *T. annulata* Members of different clades can also be distinguished by radular morphology, which being in agreement with molecular data, however, appears not enough informative to differentiate species within each clade. The main shortcoming of the study, conducted by Fedosov and coauthors, was very restricted dataset, which included Philippine specimens only and had missing some crucial species of the genus *Turris*, known from other localities, like *T. ruthae* Kilburn, 1983, *T. ambages* Barnard, 1958, *T. faleiroi* Kilburn, 1998. We believe that inclusion of these in analysis may result in further rearrangement of clades within the genus *Turris*, suggesting its further taxonomic alterations. Since currently there is no published complementary phylogeny, that could underlie robust supraspecific taxonomy of the genus *Turris*, at this point authors will follow traditional views on the taxonomy of the genus.

Since the publication of Powell's monograph about 14 species have been added, although several of these are clearly synonymous. 2000 formed a peak in the description of *Turris* diversity—in this year two papers dedicated to the description of new Philippine species were published simultaneously (June, 2000). These papers, under the authorship of Olivera and of Vera-Peláez, Vega-Luz, & Lozano-Francisco respectively, contributed a total of 10 new names in the genus *Turris*, although some of these were synonymous with each other. These simultaneously-published names, some based on the same species, create a tangled nomenclatural problem that we have attempted to resolve.

The authors of the present paper have attempted to provide a taxonomic revision of the genus *Turris*, with the aim of finalizing the valid names, and helping to stabilise the nomenclature of this genus. Since it was shown (Fedosov, et al, 2011), that radular morphology remains generally constant in both *Turris s.s.* and *Annulaturris* clades, in the present paper we do not consider radular characters.

Materials and Methods

The material studied here was mostly previously deposited in institutional repositories. Additionally conchological material was obtained from private collection of the third author and the collection of Conchology Inc. A huge collection of material from the barcoded collections of recent expeditions conducted by the Museum National d'Histoire Naturelle, was kindly loaned by scientific stuff of MNHN. Descriptions and measurements are based on shells oriented in the traditional way, spire up with the aperture facing the viewer (front view) and turned 90°CCW (side view).

Abbreviations:

a/l = ratio of aperture length and total length (measured along main shell axis)
b/l = ratio of breadth and total length
ca = "*circa*" (approximately)
colln= collection
f. = *fide* (according to)
loc. = locality
t/s = transverse section.

AF = Alexander Fedosov
BO = Baldomero Olivera
RK = Richard Kilburn

Abbreviations of museums and depositories:
MCZ = Museum of Camparative Zoology, Harvard University, Cambridge, MA, U.S.A
FMNH = Field Museum, Chicago, IL, U.S.A.
IPEE = A.N. Severtzov Institute of Ecology and Evolution, Moscow, Russia
LSUK = Linnean Society, London, UK

MHNG = Museum d'Histoire Naturelle, Geneva, Switzerland
MNCN = Museo Nacional de Ciencias Naturales, Madrid, Spain.
MNHN = Museum National d'Histoire Naturelle, Paris, France
MZBI = Museo de Zoologia, Bologna, Italy
NHMUK = The Natural History Museum, London, UK
NMPG = Museum der Natur, Gotha, Germany.
NMSA = Natal Museum, Pietermaritzburg, South Africa
NMWC = National Museum of Wales, Cardiff, UK
NSMT = National Science Museum, Tokyo, Japan
PBRC = Philippine Biodiversity Resources Centre, Quezon City, Philippines
PNM = Philippine National Museum, Manila, Philippines
SAMC = South African Museum (Iziko), Cape Town, South Africa
URM = University of Rostock Museum, Germany
USNM = National Museum of Natural History, Washington DC, USA
UZIU = Universitets Zoologiska Institut, Uppsala, Sweden
ZMUC = Zoological Museum, Copenhagen, Danmark

Taxonomy

Family TURRIDAE H. & A. Adams, 1853

Turris Batsch, 1789

Type species (s.d. Dubois & Bour 2010): *Murex babylonius*, 1758.
Synonym: *Annulaturris* Powell, 1966. Type species (o.d.): *Pleurotoma amicta* E. A. Smith, 1877.

DESCRIPTION: Shell medium to large (adult length 40–185 mm), fusiform with high spire and long, unnotched siphonal canal; anal sinus a deep slot situated on a ridge immediately above the peripheral keel; sculpture of spiral cords or ridges, sinus cord often crenulated. Usually with brown spots or stripes. Protoconch usually minute and papilliform, of 2–5 whorls, smooth, later whorls usually axially ribbed; in some species large and bulbous, of 1.5–2.0 smooth whorls. Operculum ungulate, typical of Turrinae.

Radula of duplex marginal teeth, varying considerably in shape, sometimes with a quadrate central tooth bearing a small to large median cusp.

Turris is a tropical Indo-West Pacific group with only one temperate water species (the South African *Turris faleiroi* Kilburn, 1998). No species of *Turris* occur in the Atlantic Ocean or Mediterranean Sea.

The genus *Turris* was distinguished by Powell (1964, 1966) from the very similar genus *Lophiotoma* Casey, 1904, on the basis of the anal sinus being situated on a "special" spiral cord, not on the peripheral cord as in the latter. This convention is followed here, although this difference hinges solely on the relative strength of the two cords, a character not always clearly defined. We follow Li & Li (2007) in leaving the status of *Annulaturris* in abeyance, pending more extensive radula studies.

Nomena dubia:

The following name is unidentifiable and must be regarded as a *nomen dubium*:

Pleurotoma gracillima Weinkauff, 1875: 26, pl. 5, figs 4–5. Type loc.: unknown. [= *Turris crispa* f. Powell (1964), but type figure too small for certainty].

Note on nomenclature (first reviser principle):

A problem is presented in the case of certain species of *Turris*, whose names were proposed simultaneously by Vera-Peláez, Vega-Luz & Lozano-Francisco, and by Baldomero Olivera, in June, 2000. (Although Olivera's paper was dated "December, 1999", an e-mail message from the former editor-in-chief, Dr Lourdes J. Cruz, dated 3rd May 2001, states that publication was delayed, resulting in an actual publication date of June, 2000.)

As the most balanced solution we have invoked the "First Reviser" rule (ICZN Article 24.2), and propose the following synonymy (senior synonyms in bold):

***Turris hidalgoi* Vera-Peláez, Vega-Luz & Lozano-Francisco** = synonym *Turris totiphyllis* Olivera

***Turris pagasa* Olivera** = synonym *Turris kilburni* Vera-Peláez, Vega-Luz & Lozano-Francisco

Turris babylonia (Linné, 1758)

Plate 1, figs A–K

Murex babylonius Linné, 1758: 753 (cited references include Rumphius 1705: 96, pl. 29, fig. L); Hanley 1855: 299; Gmelin 1791: 3541, sp. 52; Dodge 1957: 144; Wallin 1994: 74. Type loc.: "in O. Asiae" [= Amboina [Ambon Is, Indonesia] *f.* Rumphius 1705].

Pleurotoma babylonia; Montfort 1810: 534, fig. 134; Lamarck 1816: p. 8, pl. 439, figs 1a–b; Kiener 1839: 4, pl. 1, fig. 1 (not 2); Reeve 1843: pl. 1, sp. 5; Weinkauff 1875: 10, pl. 1, figs 4–5.

Turris babylonia; Powell 1964: 327 (references), pl. 181, figs 3-4 only; ?Powell 1966: text-fig. C40 (radula, after Thiele 1929: 361), pl. 6, fig. 17; Olivera 2000: 302 (in part), pl. 1, fig. 6 (only), pl. 4 (lower row only); Hasegawa *et al.* 2000: 631, pl. 314, fig. 59; Robin 2008: pl. 448, fig. 3.

Turris imperfecti Röding, 1798: 123, sp. 1590 (cites *Murex babylonus* [*sic*] Gmelin, 1791, species 52, var.). Type loc.: not given. New synonym.

Turris nobilis Röding, 1798: 123, sp. 1588 (cites *Murex babylonus* [*sic*] Gmelin, 1791, species 52, var.). Type loc.: not given. New synonym.

Turris pulchra Röding, 1798: 123, sp. 1589 (cites *Murex babylonus* [*sic*] Gmelin, 1791, species 52). Type loc.: not given. New synonym.

Turris tornatum Röding, 1798: 124, sp. 1605 (cites *Murex babylonus* [*sic*] Gmelin, 1791, species 52, and Favanne (1780): pl. 33, fig. C. 6). Type loc.: not given. New synonym.

Turris assyria Olivera, Seronay & Fedosov, 2010: 50, fig. 1b, 2 c–e and bottom row, fig. 3 (holotype), figs 4–5, table 1. Type loc. Danajon Bank, east of Cebu, Philippines, 10–16 fath. [18–29 m], on sandy rubble. New synonym.

DESCRIPTION: Narrowly to biconically fusiform (b/l 0.24–0.29, a/l 0.41–0.44), whorls slightly pagodiform, with long to moderately long, slightly to distinctly recurved siphonal canal; suture shallow. Outer lip in side view almost straight, without a stromboid notch; anal sinus moderately deep, narrowly linear, expanding slightly at lip. Sculpture of strong slightly angular spiral cords, 4 main cords on penultimate whorl, each interval usually with 1–2 spiral threads and very fine collabral threads; cords not bearing fine secondary threads; whorls angular, with a massive, somewhat keeled peripheral cord. Subsutural cord broad and low, with a median ridge, a weak one at suture and sometimes an anterior one; sulcus concave, as wide as subsutural cord. Sinus cord narrow, flat to slopingly angular; base of each spire whorl with a single main cord; base of last whorl with 7–10 strong, angular ridges alternating with up to 4 weaker ones, becoming uniformly fine towards anterior end.

Porcellaneous white, main spiral cords with rounded or rectangular spots, usually black, subsutural region and mid last whorl or intervals between cords sometimes with a reddish-brown suffusion.

Protoconch papilliform, of *ca* 2.5 whorls, smooth except for a slight basal keel on last whorl.

Maximum length 97.5 mm.

DISTRIBUTION: Indonesia and Philippines south to Queensland and New Caledonia; low-tide fringe to *ca* 50 m, coral sand and marine grass.

TYPES: *M. babylonius*: lectotype, here designated, in LSUK ("properly documented" with "549", the number of its entry in the *Systema Naturae*, written on its inner lip); it was designated by Dodge (1957) as "the holotype" = lectotype under ICZN article 74.5. Dance (1967: 8) observes that "the majority of such markings seem to be in the handwriting of Linnaeus." The lectotype is accompanied by a specimen of the species here described as *Turris chaldaea*, which being unmarked can be presumed to have been added subsequently and has no type status. Two possible paralectotypes are in UZIU (Wallin 1994). At least one other paralectotype may be in MZBI (Rumphius collection). In Rumphius (1705: pl. 29, fig. L) there is an illustration of recognisable specimen of *Turris babylonia*, as here interpreted, from Amboina [= Ambon, Maluku]. That is here accepted as its type locality. The following names are synonymised with *M. babylonius*, the lectotype of that being here designated as their respective neotypes: *Turris imperfecti*, *Turris nobilis*, *Turris pulchra*, and *Turris tornatum* Röding, 1798.

T. assyria: holotype (PBRC), paratypes 1–23 PBRC, MNHN, FMNH, Olivera colln.

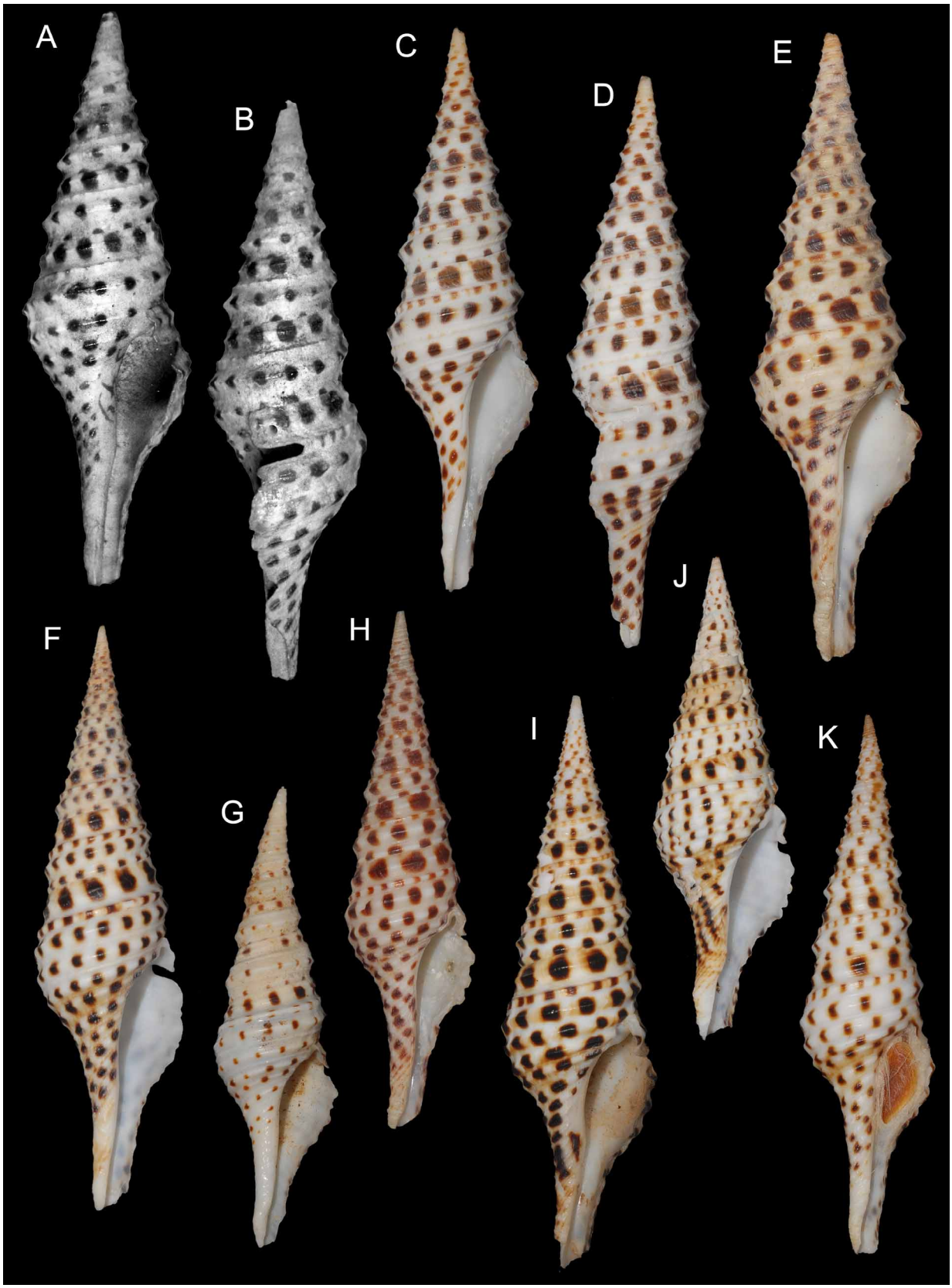

PLATE 1. *Turris babylonia* (Linné, 1758): A, **B**—Lectotype of *Murex babylonius*, LSUK. *"In O. Asiae"*, 48.4 x 13.8 mm; **C**, **D**—Off Lady Musgrave Is., Queensland, trawled 80–100 m, BO colln, 62.5 x 16.8 mm; **E**—Moluccas, BO colln, 67.5 x 17.7 mm; **F**—Marau Sound, Quadalcanal, Solomon Islands, BO colln, 75.8 x 19.6 mm; **G**—Sulu Sea, Philippines, BO colln, 67.8 x 17.7 mm; H—Cebu, Philippines, BO colln, 69.1 x 17.0 mm; **I**—Olango Is., Philippines, 44–73 m, BO colln, 78.9 x 21.3 mm; **J**—same data, BO colln, 62.4 x 17.4 mm; **K**—same data, BO colln, 71.1 x 17.6 mm.

OTHER MATERIAL EXAMINED (see Olivera *et al.* 2010): INDONESIA: Moluccas [Maluku] (NMSA J4468: H. Becker colln),

REMARKS: This well-known species was redefined by Olivera *et al* (2010) although erroneously regarded as an unnamed species, which was redescribed as *Turris assyria*. As an actual lectotype of *Murex babylonius* is known, we do not repeat the half dozen references given by Linnaeus (1758), except for Rumphius, who gave the first probable type locality for *T. babylonia*. These references were briefly discussed by Dodge (1957).

Turris ambages **Barnard, 1958**

Plate 2, figs A–D

Turris ambages Barnard, 1958: 148, fig. 231; Powell 1964: 337; Barnard 1969: 604, figs 3a, b; Kensley 1973: 202, fig. 798; Kilburn 1983: 556, figs 2 (protoconch), 19–20 (holotype), 21. Type locality (designated Kilburn 1983): off O'Neil [Neill or Cunge] Peak, Zululand, 90 fath. [165 m].

DESCRIPTION: Shell medium-sized, b/l 0.29–0.31, a/l 0.30–0.45, suture relatively shallow, whorls gently convex, last whorl with a basal angle, subsutural cord low, usually shallowly bifid, weakly crenulate or finely pliculate, slightly weaker than sinus cord, sulcus deeply and narrowly channelled; sinus cord on shoulder, bearing a series of low, lunulate crenules or nodules (when fresh each with an oblique basal "tail"); anterior to sinus cord is a prominent, rounded peripheral cord, with sloping sides, and a weaker basal cord. Base of last whorl with well-spaced spiral cords and ridges, upper ones often coarsely nodose, becoming progressively weaker anteriorly, intermediary lirae few or absent. Anal sinus openly U-shaped and relatively shallow.

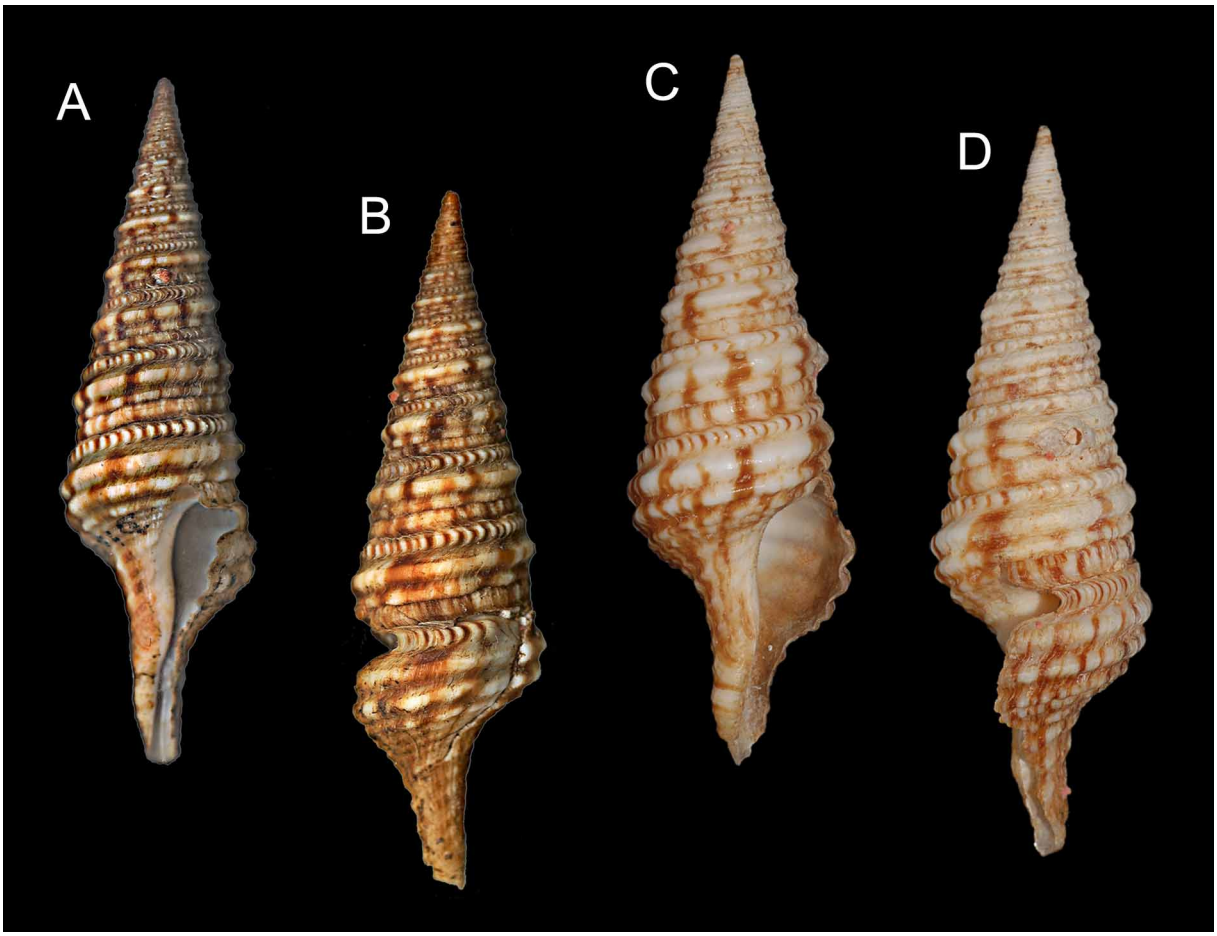

PLATE 2. ***Turris ambages*** **Barnard, 1958**: **A**, **B**—S-E of Illovo, southern Natal, 90 m, NMSA D4090, 43.6 x 12.2 mm; **C**, **D**—off Phumula, southern Natal, 44 m, NMSA W7420, 51.2 x 16.5 mm.

Yellowish-white, with irregular axial streaks and blotches of brownish-orange, particularly between the crenules.

Protoconch papilliform, of *ca* 2.5 whorls, the initial one blunt and relatively large; smooth with arcuate axial riblets near termination; diameter *ca* 1.25 mm.

Attains 50 mm.

DISTRIBUTION: Continental shelf and upper slope of KwaZulu-Natal and southern Mozambique, from Quissico south as far as the Natal/Transkei border, in about 38–165 metres, in sand pockets on low profile sandstone reefs.\

TYPES: Holotype SAMC A8685.

OTHER MATERIAL EXAMINED (all NMSA, dredged RK *et al.*, unless indicated otherwise): ZULULAND: S.E. of Durnford Point, 95 m, sponge rubble (E8611, E8434) and 100 m, mud and sponge rubble (E8634). S.E. of Cape Vidal, 110 m, sponge rubble (E4924). NATAL NORTH COAST: off Tongaat Bluff, 85 m, coarse sand (E9871). NATAL SOUTH COAST: off Umlaas Canal, 128 m (B6310, B7938), and 135 m (B7939); dredged A. Connell; N.E.. of Green Point, 75 m, coarse sand and rubble (D3978), S.E. of Green Point, 100 m, fine sand and rubble (D3981); between Green Point and Widenham, 70 m, coarse sand and sponge (D3524); off Phumula, southern Natal, 44 m (NMSA W7420); off Scottburgh, 100 m, (B3478: dredged A. Connell); off Park Rynie, 100 m, coral rubble (W400). TRANSKEI: beach drift between Mzamba and Mtentu Rivers, don. J. Stannard (E6014).

REMARKS: This uncommon south-east African endemic somewhat resembles *T. ruthae* and *T. brevicanalis* in its more or less crenulated sinus cord. *T. ambages* and *T. ruthae* are compared below. *T. brevicanalis* has more evenly convex whorls with more numerous, less close-set spiral ridges, of which the peripheral one is relatively weaker than in *T. ambages*.

Turris amicta **(E. A. Smith, 1877)**

Plate 3, figs A–D

Pleurotoma amicta E. A. Smith, 1877: 488. Type loc.: "Sandwich Islands" [erroneous, emended to Bombay, N. W. India, by Powell (1966)].
Surcula cingulifera var. *amicta*; Melvill 1917: 162.
Turris amicta; Powell 1964: 334, pl. 254, figs 7–8.
Turris (*Annulaturris*) *amicta*; Powell 1966: text-fig. C42 (radula), pl. 6, fig. 18.

DESCRIPTION: Shell fusiform with acuminate, orthoconoid spire but with relatively short base, b/l 0.30–0.36, a/l 0.37–0.42;, siphonal canal short, slightly flexed to right; inner lip sigmoid, thickly calloused, in gerontic individuals developing a wide fasciole with a large false umbilicus; whorls rather flat-sided, suture deep, sometimes channelled. Outer lip convex in side view, anal sinus rather shallow, narrowly V-shaped.

Sculpture of rather uniform spiral cords; subsutural cord not projecting, bearing 2–3 spiral threads. Sulcus very narrow and moderately deep, often slightly recessed under sinus cord. Sinus cord bearing 1–2 ridges (flattening out towards lip). Basal part of spire whorls with 3–4 main cords, slightly angular with widely sloping sides, to rounded, the upper one forming the barely projecting periphery; often a weaker ridge in intervals. Base of last whorl with about 10–14 main cords, intervals between cords with 1–3 intermediary threads, rostrum with an additional 10–12 fine, close threads. Collabral threads relatively strong in interstices, periostracum sometimes giving them a lamellar appearance.

Uniform white, with a persistent yellowish-olive periostracum.

Protoconch unknown.

Maximum length 65 mm.

DISTRIBUTION: Gulf of Aden and Pakistan, south to India and Sri Lanka (Powell, 1964), north to Chennai, shallowly subtidal in marine grassflats.

TYPES: Three syntypes NHMUK 1872.10.21.20 and 1964.2.29.

OTHER MATERIAL EXAMINED: INDIA: off Koswari Is, Tuticorin area, in 2–3 m (NMSA L5413, L8000: RK); Bombay (ANSP 292066: Townsend; A. W. B. Powell); Cuffparade, Colaba, Bombay (ANSP 317212: F. B. Steiner). PAKISTAN: Karachi (ANSP 99310)

REMARKS: An uncommon species in modern collections, but is probably overlooked in the field, perhaps on account of its drab appearance. It is most similar to *Turris kathiewayae* n. sp. in shell characters; that species, however, lacks the persistent periostracum, and has a longer, straighter siphonal canal and steep-sided spiral cords. Bombay specimens appear to be much smaller (e.g. 38.5 mm) than those from the east coast of India.

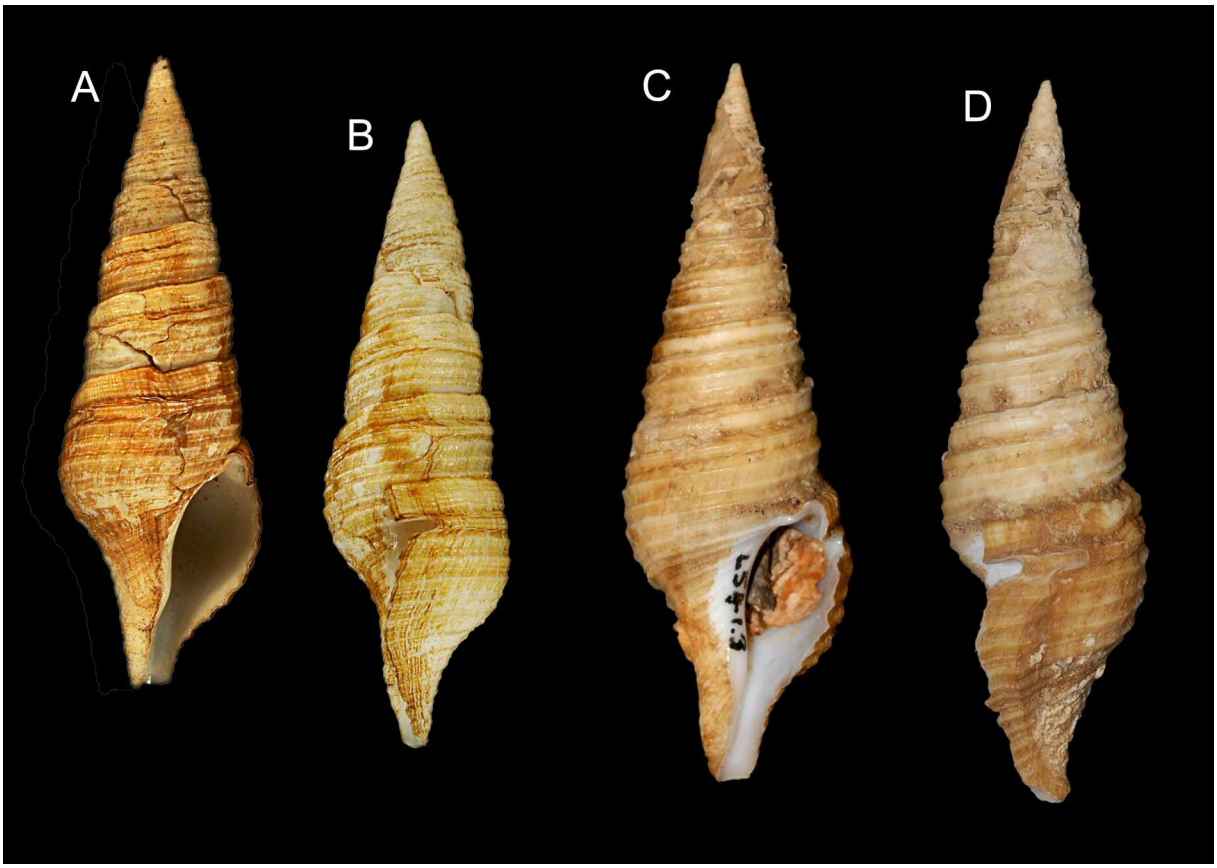

PLATE 3. *Turris amicta* (E. A. Smith, 1877): A, **B**—Syntype of *Pleurotoma amicta*, H. Cuming "Sandwich Islands", NHMUK 1964229, 49.5 x 16.1 mm; **C**, **D**—off Koswari, Is., S-E India, 2–3 m, NMSA L5413, RK, 62.6 x 18.1 mm.

Turris annulata (Reeve, 1843)

Plate 4, figs A–J

Pleurotoma annulata Reeve, 1843: pl. 5, sp. 35. Type loc.: unknown.
Turris annulata (in part); Powell 1964: 333, pl. 254, figs 5–6 (copy of type figures of *P. fagina*), not pl. 181, fig. 19 [= *T. kathiewayae* sp. nov.].
Turris (*Annulaturris*) *annulata*; Powell 1966: 51; Horikoshi 1989: 32, fig. 1.
Annulaturris annulata; Dharma 2005: pl. 41, fig. 11.
Pleurotoma fagina Adams & Reeve, 1850: 40, pl. 9, figs 2a–b. Type loc.: China Sea.
Turris (*Tomopleura*) *fagina*; Melvill 1917: 146.
Turris fagina; Oostingh 1938: 27 (Pliocene of Java); Yen 1942: 238, pl. 25, fig. 184.
Pleurotoma (Pleurotoma) fabagina [*sic*] Weinkauff, 1877: 4.

DESCRIPTION: Shell fusiform with an acuminate, orthoconoid spire; spire angle 20–25º; b/l 0.23–0.29, a/l 0.41–0.45; base of last whorl somewhat constricted, siphonal canal slightly bent to right, longer than rest of aperture, narrow in young examples, in old individuals broad with a strong fasciole and deep false umbilicus; suture fairly shallow but sharply incised. Anal sinus relatively shallow, linguiform, margins with a slight flange.

Early whorls with three spiral cords, increasing to a total of 4 main cords on later whorls. Subsutural cord low and rounded, bearing an angular median ridge and a more or less weaker thread on either side. Sulcus a deep, narrow furrow, slightly recessed under sinus cord complex, edged anteriorly by an angular thread. Sinus cord at periphery, slightly projecting (sometimes beyond peripheral cord), weakly flat-topped with sloping sides, the posterior side slightly

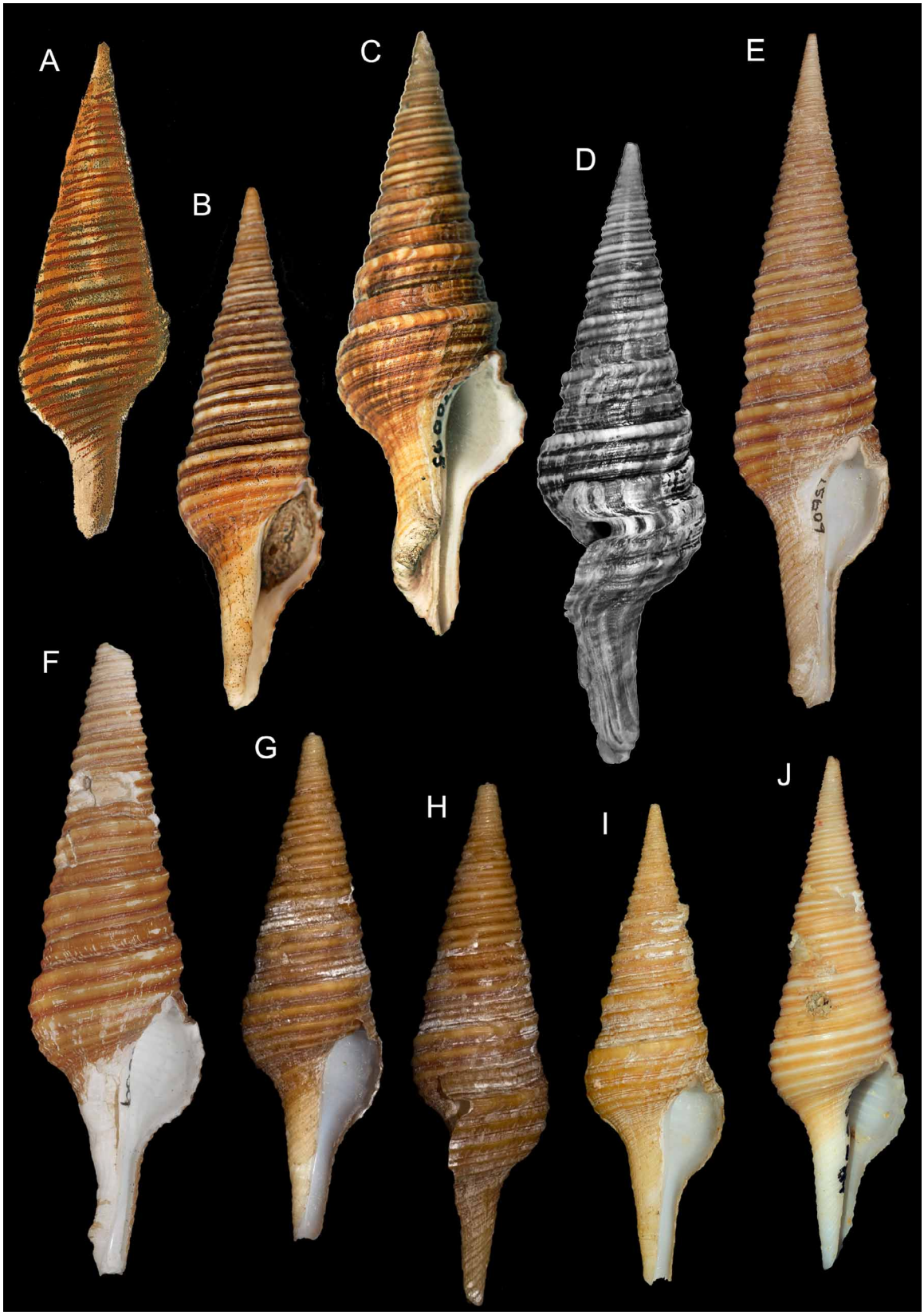

PLATE 4. *Turris annulata* (Reeve, 1843): A—Type fig. of *Pleurotoma annulata*, after Reeve, 1843: pl. 5, sp. 35; **B**—loc. unknown, NMWC 1955.158.00902, ex MacAndrew, 49.8 x 14.2 mm, specimen mistakenly regarded as the lost holotype by Powell (1964); **C**, **D**—Holotype of *Pleurotoma fagina* Adams & Reeve, 1850 (= neotype of *Turris annulata*), China Sea, NHMUK 1970095, 73.8 x 27.2 mm; **E**, **F**—Racha Isl., Phuket, W. Thailand, 20 m,, NMSA L5609: **E**—80.5 x 18.5 mm; **F**—64.1 x 17.6 mm; **G**–**I**—south of Dwarka, Gujarat, India, 60–65 m, MCZH 362501; **J—**Phuket, W. Thailand, ANSP 286281, 60.5 x 16.4 mm.

tabulate. Base of later spire whorls with two close-set spiral cords with sloping sides, whose edges each bear a thin spiral thread, upper cord nearly as strong as sinus cord, the intervals containing a few fine to strong spiral threads. Upper base of last whorl with three angular spiral cords, followed by weaker but uneven ridges, and groups of intermediary threads, those on rostrum alternately weaker and stronger. Collabral threads coarse but not pliculate, somewhat cancellating the finer threads.

Protoconch unknown.

Reddish-brown with main cords and rostrum paler; periostracum dull medium brown, smooth, covering cords when fresh.

Attains 96.4 mm in length.

DISTRIBUTION: Gulf of Oman and west coast of India to west coast of Thailand and Indonesia, in 10–84 m.

TYPES: *P. annulata*: types lost (see discussion below). *P. fagina*: holotype NHMUK 1970095, dimensions 73.8 x 27.2 mm: this is here designated as the neotype of *P. annulata*.

OTHER MATERIAL EXAMINED: ARABIAN GULF: Henjam Is., Iran (26º39'N; 55º52'E), 46 fath. [84 m], sand (NHMUK: Sykes colln). WEST THAILAND: Ko Racha Yai, south of Phuket Is. (7º36'N; 98º22'E), *ca* 20 m (NMSA L5609: S. Patamakanthin); Phuket Is., 3 mi NE. of Lighthouse Is., 80 ft [24 m] (ANSP 286281: International Indian Ocean Expedition). INDONESIA: Sunda Strait (105°40'E; 6°5.5'S), 52 m, juvenile (ZMUC, Mortensen). INDIA: 10 mi W, of Cochin, Kerala, 10–15 fath. [18–27 m] (ANSP 303824: R. Robertson); S. of Dwarka, Gujarat, 60–65 m (MCZH 362501).

OTHER RECORDS: Bintan Is., Sumatra (Dharma 2005)

REMARKS: Subsequent authors have synonymised *Turris fagina* with *Turris annulata*, and the dorsal view of Reeve's figure of the latter does appear to agree with that of the holotype of *T. fagina*. Possible confusion has been caused by Powell's suggestion that the missing type of *T. annulata* is "almost certainly" an unlocalised shell in the MacAndrew collection in NMWC (1955.158.00902). But there is no documented link between it and the Stainforth collection (where the holotype was held); furthermore, it shows a paler sinus cord than illustrated in Reeve's figure, and has a last whorl that is not strongly concave below the suture; furthermore it bears an operculum, rarely preserved in Reeve's era.

Turris annulata appears to vary somewhat in proportions. The more typical Thai population appears to comprise markedly narrower individuals than that represented by the holotype of *P. fagina*; in this the area between the suture and the shoulder varies from flat to distinctly concave. A sample from Phuket (ANSP 286281) at first sight appeared to be somewhat intermediate between *T. annulata* and *T. kathiewayae*. However closer examination showed that bleaching and wear had produced a *kathiewayae*-like appearance, and sculptural details are those of *T. annulata*.

It may be noted that the term "China Seas", as used by Adams & Reeve, frequently included the seas of the Indo-Malaysian archipelago.

***Turris bipartita* nom. nov.**

Plate 5, figs A–J

Pleurotoma variegata Kiener, 1839 (*non* Philippi, 1836): 14, pl. 9, fig. 1. Type loc.: l'Océan Indien".
Turris variegata; Gravely 1942: 73; Pinn 1990: 111, fig. 204; Kilburn 2002: 12.
Turris crispa variegata; Powell 1964: 332, pl. 254, fig. 2.
?Pleurotoma indica Deshayes, 1833 (*non Turris indica* Röding, 1798): 421, pl. 2, figs 9–10; Kiener 1839: 16, pl. 11, fig. 1. Type loc.: "Ceylan" [Sri Lanka].

DESCRIPTION: Shell fusiform, b/l 0.26–0.33, a/l 0.41–0.45, siphonal canal long and narrow to fairly broad and moderately short, recurved, adults with a fasciole and false umbilicus. Suture shallow; outer lip moderately convex in side view, its edge weakly crenate, anal sinus rather shallow, linear to linguiform.

Subsutural cord low and somewhat sloping, bearing 2–3 thin, angular ridges, their intervals pliculated by collabral threads. Sulcus relatively shallow and sloping, containing 2–3 spiral threads. Sinus cord flat-topped to shallowly bifid. Peripheral cord typically angular, projecting slightly to strongly beyond sinus cord. Base of spire whorls with 2–3 weak, angular main cords and 1–2 weaker spiral threads filling each interval. Base of last whorl with 17–24 low, angular spiral lirae with rather numerous intermediary threads, cancellated by collabral threads. Collabral threads dense, mainly in interstices.

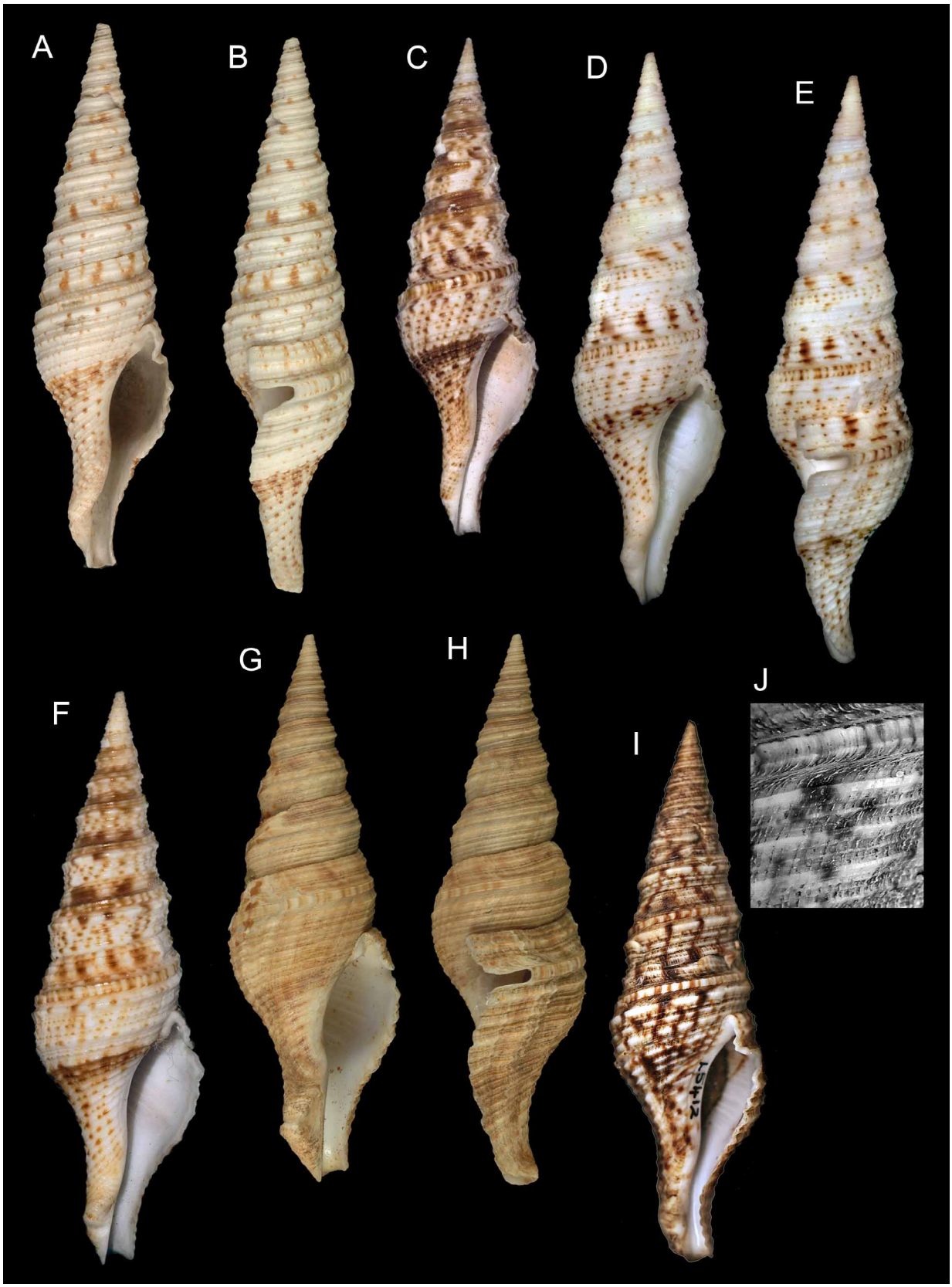

PLATE 5. ***Turris bipartita*** **nom. nov.**: **A**, **B**—Syntype of *Pleurotoma variegata* Kiener, 1839 (*non* Philippi, 1836), Indian Ocean, MNHN, 84.6 x 22.1 mm; **C**—Madras, India, BO colln, 64.1 x 18.5 mm; **D**, **E**—Madras, India, BO colln, 74.0 x 20.5 mm; **F**—Madras, India, BO colln, 68.0 x 20.2 mm; **G**, **H**—Holotype of *Pleurotoma indica* Deshayes, 1833 (*non Turris indica* Röding, 1798): MNHN, "Ceylan" (Sri Lanka), MNHN, 76.8 x 23.3 mm; **I**, **J**—Off Koswari Is., Tuticorin area, SE India, 2–3 m, NMSA L5412, RK, 66.3 x 18.9 mm.

Protoconch small and paucispiral. evidently of about 2.0 whorls, the last half-whorl axially ribbed, with the beginnings of a subsutural cord, breadth *ca* 0.90 mm.

Cream-colour with brownish flames or small blotches on subsutural cord and around upper part of base of last whorl (often forming a strong band), elsewhere sometimes with irregular oblique axial brown bands, which form spots on the ridges; occasionally uniform light brown or white with faint markings.

Maximum length 85.0 mm.

DISTRIBUTION: South-eastern India (Chennai southwards) and probably Sri Lanka, sand and marine grass in 2–16 m.

TYPES: *P. variegata*: syntype in MNHN. *P. indica*: syntype in MNHN (although labelled "holotype", Deshayes implied that he had a number of specimens).

PUBLISHED RECORDS: Chennai (Madras) (Powell (1964), Gravely (1942)); Tuticorin, 9 fath. [16 m] (Powell 1964); Pondicherry (Pinn 1990).

MATERIAL EXAMINED: INDIA: off Koswari Is., Tuticorin area, 2–3 m (NMSA L5412: RK); Chennai (Madras) (B0 colln: L. Strange, also NMSA J4911: T. Honker).

REMARKS: Little material of this species has been examined. Typical examples (Pl. 5, figs A–F) are available from Chennai (Madras), and one from Pondicherry is illustrated by Pinn (1990). The form common in the Tuticorin area of the Gulf of Mannar (Pl.5, figs I–J) differs somewhat in its proportions, being broader with a shorter, wider siphonal canal (often forming a strong fasciole in adults) and its spiral sculpture is coarser; this material agrees better with the MNHN specimen (Pl. 5, figs G–H) labelled as the holotype of *P. indica*. The latter is for the present regarded as a *species dubium*.

Powell's statement that *T. variegata* is "probably restricted to the **west** coast of India" is a *laps. cal.*: The species is reliably reported only from the **east** coast.

ETYMOLOGY: *bi* (two) + *partita* (divided), alluding to the two strongly variegated zones on the last whorl.

Turris brevicanalis **(Kuroda & Oyama in Kuroda *et al*. 1971)**

Plate 6, figs A–H

Annulaturris brevicanalis Kuroda & Oyama in Kuroda *et al*., 1971: 224, pl. 57, fig. 5. Type loc.: Sagami Bay, Japan.
Turris (Annulaturris) brevicanalis; Hasegawa *et al.* 2000: 633, pl. 315, fig. 65.
Turris brevicanalis; Higo *et al*. 2001: 101 (fig. of holotype).
Turris (Annulaturris) brevicanalis; Higo *et al.* 1999: 304;
Not: *Annulaturris brevicanalis;* Vera-Peláez *et al.* 2000: pl. 7, fig. 4.

DESCRIPTION: Shell thick, fusiform, b/l 0.27–0.38, a/l 0.37–0.40, whorls gently convex, siphonal canal distinctly recurved, usually equal in length to rest of aperture, sometimes shorter; columella callus thick, with distinct edge, fasciole sometimes with a slight false umbilicus. Outer lip convex, drawn in at base of siphonal canal, but not forming a distinct stromboid notch, edge of lip crenate; anal sinus moderately shallow, linguiform, with a raised border.

Spiral cords slightly angularly rounded, but crests flattened, sometimes steep-sided, except on base; suture forming a deep but narrow notch. First whorl with two granulate spiral ridges, following whorls with 3 thin spiral ridges per whorl, with a 4th one developing above suture. Subsutural cord bearing three spiral ridges, the median one strong, the others weak, crossed by dense axial lamellae, crenulating sulcus, which is deep and narrow. Sinus cord projecting, forming a narrowly tabulate shoulder, more or less wider than sulcus, shallowly bifid, feebly crenulate. flanked by fine, converging, oblique lamellae; base of whorl with 3 slightly angularly rounded spiral cords, plus several spiral threads above suture, the peripheral cord not protruding beyond sinus cord or only slightly so; intervals are filled with dense spiral threads. Upper part of base with 5–6 weakly convex spiral cords, rostrum with 12–16 fine, dense, rough threads. Collabral threads weak to strong, crispate, forming thin lamellae in intervals, coarsest below suture and on rostrum.

PLATE 6. ***Turris brevicanalis***, Kuroda, Oyama, 1971; **A**, **B**—holotype, Tanabe Bay, Japan, NSMT-MoR-06103, 69.5 x 24.3 mm; **C**, **D**—Tanabe Bay, Japan, ANSP, 85.2 x 24.3 mm; **E, F—**Jogashima Is, Sagami Bay, Japan, NSMT-MoR 77202, 70.0 x 19.2 mm; **G**, **H**—Off Wakayama Prefecture, Japan, NSMT-Mo 77201: Sakurai colln 74.2 x 20.3 mm.

Colour dull white, spiral cords with rounded reddish-brown spots or short bars, becoming paler behind lip and on base.

Protoconch bluntly conical, of slightly over 3 convex whorls, with feeble axial ribs, except on last whorl which bears 10 relatively strong, opisthocyrt axial ribs; breadth 1.03 mm.

Dimensions (largest examples seen): 89.4 x 25.4 mm; 86.6 x 24.4 mm; 85.2 x 24.3 mm.

TYPES: *A. brevicanalis*: holotype NSMT–MoR 06103 in Showa Memorial Institute (f. Kikuchi *et al*. 1997: 25).

OTHER MATERIAL EXAMINED: JAPAN: off Jyogashima Is., Kanagawa Prefecture, Honshu (NSMT-Mo 77202: Sakurai colln); Sagami, Kanagawa Prefecture (NSMT-MoR 18913: Showa Memorial Institute); off Kii, Wakayama Prefecture, (NSMT-Mo 77199: Kawamura colln); off Wakayama Prefecture (NMST-Mo 77201: Sakurai colln); Tanabe Bay, off Sakaihama in Minabe-cho, Tanabe-gun, Wakayama Prefecture (ANSP 420818: Hideo Katori); off Hota, Kyonan-machi, Chiba Prefecture, 30 fath.[55 m] (NSMT-Mo 77203: T. Inaba).

REMARKS: A variable species, with a siphonal canal that is short to moderately long, and spiral cords that may be low with shallow intervals or moderately strong with crisp intervals. Collabral threads may be low or sharply defined.

Turris brevicanalis is very similar to *T. pagasa*, but grows larger, with a distinctly thicker subsutural cord, and relatively wider sinus cord, and usually shows a series of fine spiral threads immediately above the suture on the last whorl; *T. brevicanalis* lacks the pale band anterior to the sinus cord that is distinctive of *T. pagasa*.

***Turris chaldaea* sp. nov.**

Plate 7, figs A–H

?Turris babylonica[sic] Röding, 1798: 123 (cites Gmelin 1791: sp. 52 and Chemnitz 1780: pl. 143, figs 1331–2).
?Turris gothica Röding, 1798: 124 (cites *Murex babylonus* [*sic*] Gmelin, 1791: sp. 52, based on Chemnitz 1780: pl. 143, figs 1331–2). Type loc.: not given.
?Turris rustica Röding, 1798: 124, sp. 1597 (cites *Murex babylonus* [*sic*] Gmelin, 1791, species 52). Type loc.: not given.
?Turris pyramidalis Röding, 1798: 124, sp. 1598 (cites *Murex babylonus* [*sic*] Gmelin, 1791, species 52). Type loc.: not given
?Turris vitrea Röding, 1798: 124, sp. 1599 (cites *Murex babylonus* [*sic*] Gmelin, 1791, species 52). Type loc.: not given.
?Pleurotome [sic] *marmorata* Link, 1807: 119 (cites *M. babylonicus* Gmelin, 1791: 3544). Type loc.: not given.
Pleurotoma babylonia (non Linnaeus, 1758*)*; Reeve 1843: pl. 1, sp. 5
Turris babylonia (*non* Linnaeus, 1758); Powell 1964: 327(in part) (references), pl. 181, figs 1-2 only; Olivera, Seronay & Fedosov 2000: 50, figs 1a, 2a, b, fig. 6; Olivera & Sysoev 2008: pl. 680, figs 6–8; Dharma 2005: pl. 41, fig. 12.
Turris hidalgoi (*non* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000); Robin 2008: pl. 448, fig. 8.

DESCRIPTION: Shape biconic-fusiform, b/l 0.26–0.31, a/l 0.40–0.43, spire angle 29º–32º, whorls moderately convex with peripheral cord forming a slight angle at or below midwhorl; aperture slightly deltoid in shape, siphonal canal more or less equal to aperture, rostrum slightly recurved, with a narrow but distinct fasciole, sometimes with a very slight false umbilicus. Outer lip in side view convex (slightly opisthocline), with a distinct stromboid notch, edge of lip fluted; siphonal canal moderately shallow, linear, expanding at edge.

Surface smooth and glossy, spiral cords low, in t/s weakly and gradually rounded to broadly and weakly angular, intervals shallow; suture shallow. Subsutural cord strongly impressed, weakly rounded, with a very slight median ridge; sinus cord narrow, medially sunken. Peripheral cord weakly projecting, very slightly angular, base of whorl with a similar but weaker and narrower cord, bordered above and below by a fine intermediary thread. Upper part of base with three low, weakly defined cords, with a finer intermediary between each pair; rostrum with 5–6 fine ridges. becoming obsolete towards termination. Early whorls with the subsutural cord distinctly bifid, peripheral cord angular.

Porcellaneous white to pale brown, main spiral cords with conspicuous rounded or rectangular black or brownish-black spots with white intervals, subsutural region and a broad interrupted band around upper part of base with a dark to reddish-brown suffusion, intervals between cords sometimes similar ly brown; aperture and inner lip white.

Attains *ca* 95.5 mm in length.

DISTRIBUTION: Japan to Philippines and Solomon Islands, west to Admiralty Is. (Olivera *et al*. 2000, as *T. babylonia*).

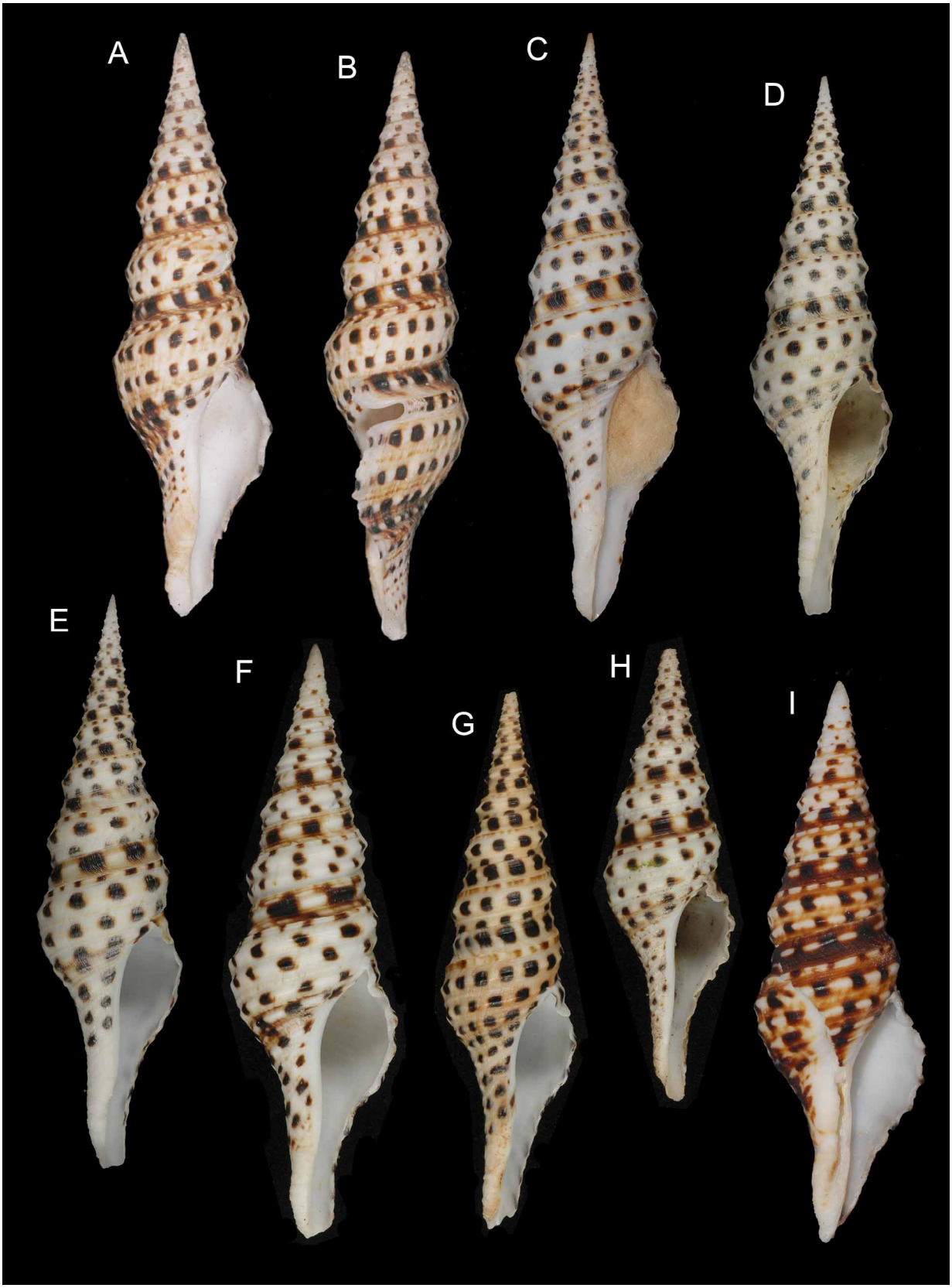

PLATE 7. *Turris chaldaea* nsp.: A, **B**—Holotype, Davao Gulf, Samal Is., Philippines, MNHN 24944, 95.5 x 25.9 mm; **C**—Paratype 1, Davao Gulf, Samal Is., Philippines, NHMUK 20110208, 94.0 x 25.5 mm; **D**—Paratype 2, Davao Gulf, Samal Is., Philippines, ANSP 426053, 86 x 22.6 mm; **E**—Paratype 3, Davao Gulf, Samal Is., Philippines, MNHN 24435, 93 x 23.4 mm; **F**—Misamis Is. Northern Mindanao, Philippines, BO colln, 95.2 x 26.2 mm; **G**—Fitzroy Is., Queensland, Australia, BO colln, 80.2 x 20 mm; **H**—Marau Sound, Guadalcanal, Solomon Islands, BO colln, 70. x 20.2 mm; **I**—Aliguay Is, N. Mindanao, Philippines, trawled, 30–70 fath, BO colln, 81.7 x 24.0 mm.

TYPE LOCALITY: Davao Gulf, Mindanao, PHILIPPINES

TYPES: Holotype (Pl. 7, figs A–B) 7.07ºN, 125.71ºE, Samal Is, Davao Gulf, **PHILIPPINES**, dived, purchased from dealer, August, 2010; dimensions 95.5 x 25.9 mm, MNHN 24944. Paratype 1 (Pl. 7, fig. C), same locality, 94.0 x 25.5 mm, (NHMUK 20110208); Paratype 2 (Pl. 7, fig. D), same locality, 86 x 22.6 mm (ANSP 426053); Paratype 3 (Pl. 7, fig. E), same locality, 93 x 23.4 mm (MNHN 24435)

Turris gothica, *T. rustica*, *T. pyramidalis*, *T. vitrea*: originally Chemnitz collection and NMPG (Bolten colln), are now apparently lost; the same Chemnitz reference, showing an unidentifiable shell, is given to all. *P. marmorata*: syntypes possibly in URM and Chemnitz colln, but now probably lost.

REMARKS: Powell (1964) pointed out the existence of a shorter, broader form of *Turris babylonia*—which he incorrectly regarded as typical—and a slender one (which he equated with *Pleurotoma raffrayi* Tapparone-Canefri, 1878, but see *Turris undosa*). However, the lectotype of *Murex babylonius* is in fact a narrowly fusiform shell, with a spire angle of 22º–25º and a longer, straighter siphonal canal. *Turris chaldaea*, apart from its different proportions, has a relatively shorter siphonal canal, with a distinct stromboid notch and a dark zone below the suture, not seen in *T. babylonia*. Olivera *et al.* (2010) demonstrated the two to be distinct species, but erred in identifying the broader, more biconic specimens as the true *Turris babylonia*.

The name *Turris gothica* Röding, 1798, is probably the earliest applicable to the present species, but not only has this name never been used subsequently, but its identity is dependent on Chemnitz's figures, which lack sufficient details for certainty.

ETYMOLOGY: *chaldaeus*, resembling the script of the people inhabiting the area of Babylon (Chaldaean), Latin adjective.

Turris clausifossata **sp. nov.**

Plate 8, figs A–E

?*Turris undosa (non* Lamarck, 1816); Wilson 1994: 194, pl. 38, fig. 15.

DESCRIPTION: Shell thick, fusiform, base somewhat contracted, b/l *ca* 0.35, a/l 0.38, whorls gently and evenly convex, suture shallow, but sharply incised ; siphonal canal rather straight, short, about half rest of aperture, columella callus fairly thick, with a slight parietal nodule, fasciole weak, with a narrow false umbilicus. Outer lip opisthoclinely convex, drawn in at base of siphonal canal, edge crenate, stromboid notch distinct; anal sinus moderately shallow, linguiform, with a raised border.

Spiral cords low but angular, their crests slightly posteriorv to median. Early whorls with three subequal spiral cords, from about the 11th whorl, the subsutural one separating as the subsutural cord. Subsutural cord declivously angular with two spiral ridges, the posterior the weaker; sulcus very shallow, narrower than subsutural cord, anal cord very narrow, rather tabulate, shallowly bifid, flanked by converging, oblique lamellae; base of whorl with 3 spiral cords, median one weak, peripheral one the strongest; these cords equal to their intervals or narrower. Upper part of base with 4 main spiral cords, with some weaker intermediaries; rostrum with about 12 fine, well-spaced spiral threads. Collabral threads distinct, interstitial.

Colour dull, pale brown, spiral cords with rounded reddish-brown spots, obliguely aligned on later whorls, forming continuous stripes on early ones' aperture and columella callus white.

Protoconch somewhat mamillate, of about 2 whorls, 2nd whorl with dense, arcuate riblets, width 0.79 mm

DISTRIBUTION: Known only from the type locality, on the coast of western India.

TYPE LOCALITY: 3 miles South of Dwarka, Gujarat, INDIA

TYPES: Holotype (Fig. 8 A, B), , 3 mi. S. of Dwarka, Gujarat, INDIA, *Anton Brun* Stn 216A, 21°49'N, 68°55'E, 27.5–28.5 fath. [50–52 m], 58.1 x 20.2 mm, MCZ N362501. Paratype 1, juvenile 58.1 x 20.2 mm, same data; Paratype 2, juvenile 49.5 x 15.3 mm, same data.

REMARKS: Although only one adult and two juveniles are known, they are sufficient to demonstrate the uniqueness of the species. Although superficially similar to *Turris nadaensis*, the spiral furrows between the cords are much shallower than in this or any other species, the anal cord being scarcely higher than the adjacent surface. *Turris tanyspira* is perhaps the most similar species to *clausifossata*, but the latter differs in the much wider and shallower intercostal furrow anterior to the anal cord, which is furthermore narrower, lower and non-shouldered, and is crossed by stronger growth-plicules.

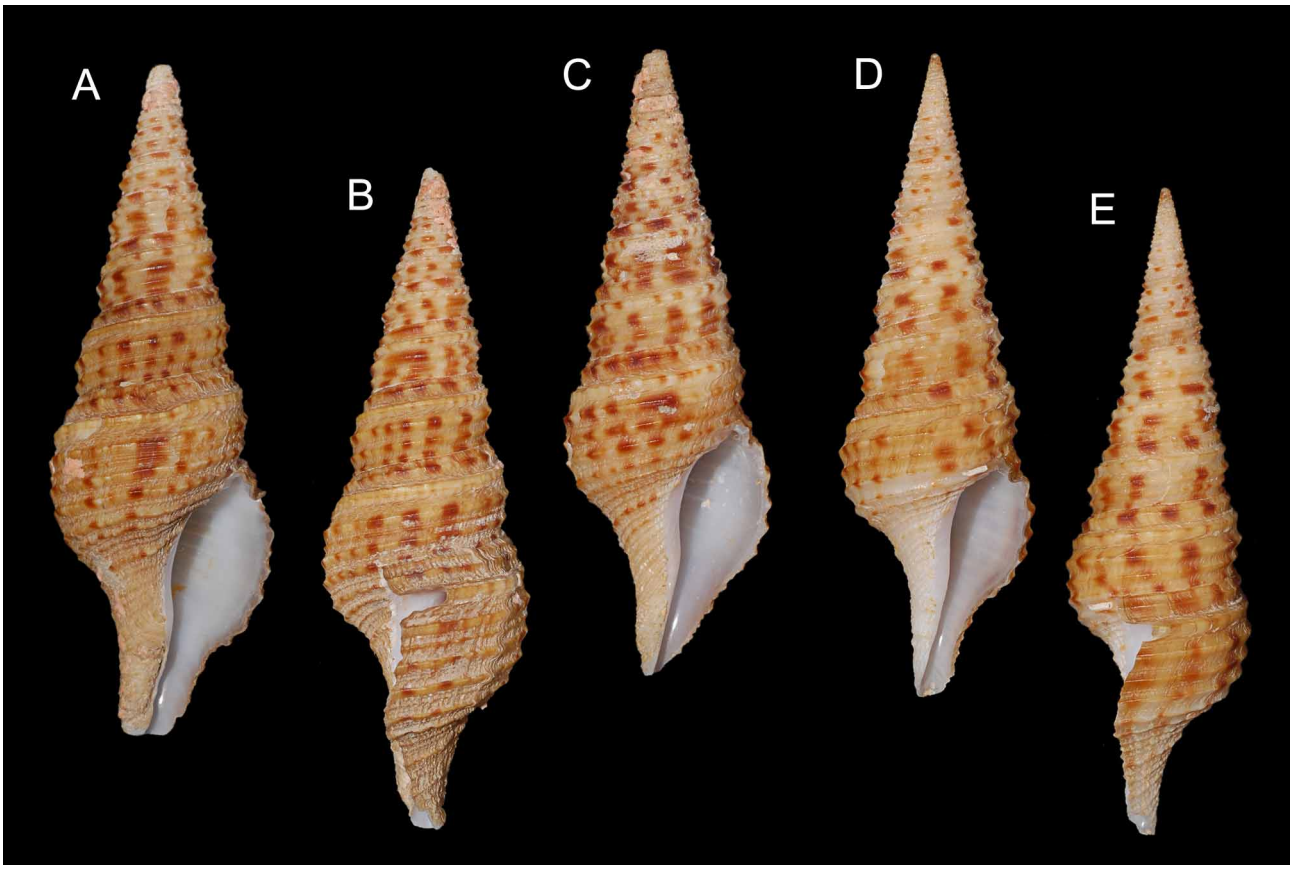

PLATE 8. *Turris clausifossata* nsp.: 3 mi. S. of Dwarka, Gujarat, India, *Anton Brun* Stn 216A, 50–52 m, Cambridge University N362501: **A**, **B**—holotype, 58.1 x 20.2 mm; **C** –juvenile paratype, 52.2 x 17.0 mm; **D**, **E**—juvenile paratype, 49.5 x 15.3 mm.

ETYMOLOGY: *clausus* (filled) + *fossata* (grooves), Latin, alluding to the apparently "filled-in" spiral grooves.

Turris condei Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000

Plate 9, figs A–F

Turris condei Vera-Peláez, Vega-Luz, & Lozano-Francisco, 2000: 8, pl. 1, fig. 6 (protoconch), pl. 2, fig. 15 (anal sinus), pl. 18, figs 1–8 (type loc. Laing Is., Hansa Bay, Papua New Guinea).

DESCRIPTION (based on Mozambique examples): Shell as in *Turris hidalgoi*, but siphonal rostrum broader in adults, sinus cord is more shallowly bifid and is shouldered above, intervals between upper spiral cords with 2–3 fine spiral threads, crossed by fine axial threads.

Greyish-white, intervals between spiral cords brownish-white, spiral cords dotted with dark brown, larger on peripheral cord; subsutural region with rectangles of dark brown (the thin subsutural cord darker), separated by equal-sized rectangles of white; base of last whorl with a broad transverse blotch of dark brown, crossed by white-flecked spiral threads, each side of the blotch rendered serrated by spots on the adjacent ridges.

TYPES: *T. condei:* Holotype MNCN 15.05/39976; paratype No. 4 NMSA L5620, 10 other paratypes in private collections.

DISTRIBUTION: Northern Mozambique to Solomon Islands and Papua New Guinea, in 3–80 m, sand, stones and dead coral (Vera-Peláez, *et al.* 2000).

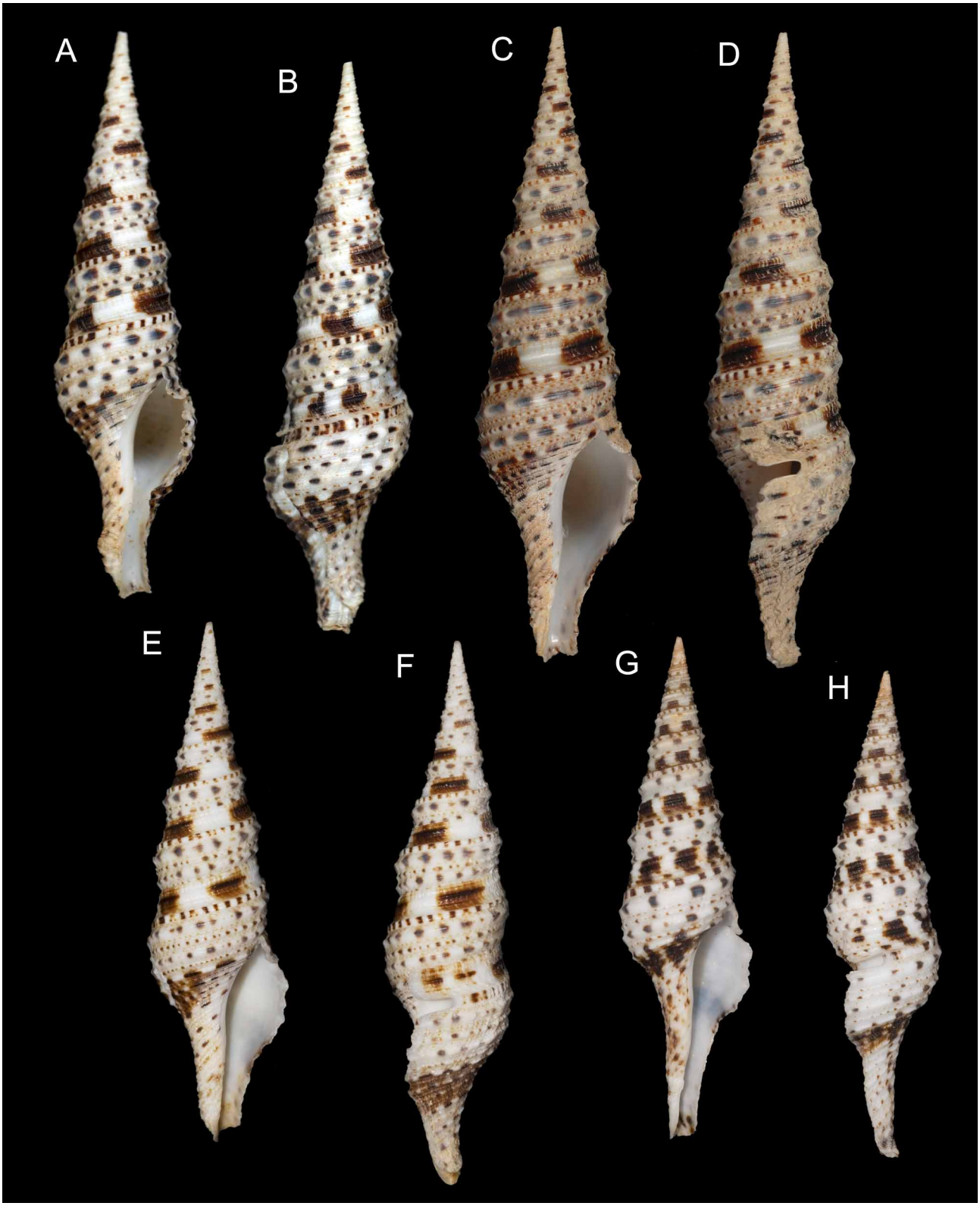

PLATE 9. *Turris condei* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000: A, **B**—Holotype, Laing Is., Papua New Guinea, MNCN 15.05/39976, 72.8 x 18.9 mm; **C**, **D**—15°31.1'S, 167°15.7'E, Vanuatu, MNHN, 76.1 x 19.7 mm; **E**, **F**—Nacala Bay, Mozambique, BO colln, 77.1 x 21.2 mm; **G**, **H**—Nacala Bay, Mozambique, BO colln, 62.6 x 16.3 mm.

OTHER MATERIAL EXAMINED: NORTHERN MOZAMBIQUE: Nacala Bay, 12 m, and 5–8 m (BO colln). SOLOMON IS.: Guadalcanal Is., Honiara (NMSA L5620: J. Conde); NEW CALEDONIA: 20°46.5'S, 167°06.2'E, 25–45m (MNHN); 20°55.5'S, 167°04.2'E, 10–30m (MNHN); VANUATU: Expedition "SANTO", Stn. DR9; 15°57.69'S, 167°22.96'E, 12 m (MNHN); Stn. FB80: 15°55.08'S, 167°16.04'E, 2–45 m (MNHN).

REMARKS: Essentially very similar to *T. hidalgoi*, but colour pattern over most of surface flecked, instead of strongly spotted and blotched; the broad dark blotch on the base of that species bears scattered spots (not spiral lines of flecks as in *T. condei)*; the intervals between the spiral cords are glossier in *hidalgoi* and more pliculate, rather than dull and obliquely microcancellate.

Turris crispa (Lamarck, 1816)

Plate 10, figs A–M

Pleurotoma crispa Lamarck, 1816: 8, pl. 439, fig. 4; Lamarck 1822: 95; Weinkauff 1875: 9, pl. 1, figs 1–2. Type loc.: not given.
Turris crispa; Hedley 1922: 215; Hasegawa *et al.* 2000: 631, pl. 314, fig. 61.
Turris crispa crispa; Powell 1964: 330, pl. 181, figs 9–12; Powell 1966: text-fig. C41 (radula); Cernohorsky 1972: 182, pl. 53, fig. 2; Kira 1972: 100, pl. 36, fig. 5; Ladd 1982: 63, pl. 19, figs 6–7; Wilson 1994: 194, pl. 38, figs 5 a–b, 10 a–b.
Turris crispa; Vera-Peláez *et al.* 2000: pl. 3, figs 7–9 (protoconch), pl. 7, figs 11–13; Li & Li 2007: 64, pl. 1, figs 2–3.
Turris dollyae Olivera, 2000: 298, pl. 1, specimen 2, pls 2, 6; Olivera, Sysoev, 2008: pl. 681, fig. 1; Dharma 2005: pl. 41, fig. 9. Type loc.: Tabaco Bay, Albay, Philippines, 50–100 m. **Syn. Nov.**

DESCRIPTION: Shell very elongate and acuminately fusiform (b/l 0.22–0.23, a/l 0.42–0.50 (see below for Australian examples), spire angle *ca* 20–22º), siphonal canal very long and straight, sometimes forming a slight fasciole with a slit-like false umbilicus; whorls gently and more or less evenly rounded, with peripheral cord barely or not projecting. Anal sinus deep and linear, widening at the opening.

Surface dull and roughened by lamellate collabral threads, which may form scales in the interstices; main spiral cords (particularly the peripheral one) with microscopic spiral threads. Early whorls with three equal cords, the median one granulose. Subsutural cord narrow, bearing a strong, broadly angular ridge and 1–2 thinner ridges above or two subequal ridges. Sulcus moderately wide, flatly concave with gently sloping sides, bearing 3–4 low threads. Sinus cord moderately raised, top concave to shallowly bifid, sloping, often with lunulate growth lines. Base of spire whorls with 3 angular cords, the upper one strongest (peripheral), the anterior pair equal to one another. Base of last whorl with *ca* 21 ridges, upper 3 angular and wide-set, those on rostrum even and relatively close; wider intervals with 2–4 fine intermediary threads. Finer threads rendered scaly by collabral threads, particularly in subsutural area.

White to brownish-white, spiral ridges with brown or black axial bars or lines, often more or less aligned to form wavy axial lines, particularly in juveniles.

Maximum length 123 mm.

Protoconch cyrtoconoid, of 3.0–3.5 whorls, smooth initially, with opisthocyrt riblets on last whorl, base *ca* 0.80 mm wide, termination concave; colour deep brown (partly after Vera-Peláez *et al.* 2000).

DISTRIBUTION: Southern Natal and Western Australia north through the Indian Ocean to west coast of Thailand and Malasia, and through the Western Pacific to China, Japan and Fiji, and south to New Caledonia; lives in clean or muddy sand, sometimes amongst marine grass, intertidal to 60 m.

TYPES: *P. crispa*: holotype MHNG 1097/68 (with Lamarck's label); annotated "Oc. indien". *T. dollyae*: holotype PNM, paratypes in NHMUK, AMNH and USNM; paratype 13 NMSA L5589.

OTHER MATERIAL EXAMINED: VIETNAM: off Nha Trang, N. Thach (NMSA L8198). PHILIPPINES: Aliguay Is., Mindanao, 25–40 m, BO colln; Sogod, 250 m, Aliguay Is, Mindanao, 80–150 m, and Olango Is., 10–25 m (Guido Poppe colln); Bogo, Cebu (NMSA L5589: BO, paratype 3 of *Turris dollyae*); Sogod, Cebu (BO colln); Matanos, Samal Is., Davao Gulf, Mindanao, 80–130 fath. [146–238 m] (NMSA L8202: BO). THAILAND: Phromthep Cape, Phuket Is., *ca* 15 m (NMSA L8107: S. Patamakanthan). AUSTRALIA: Port Hedland, N.W. Australia (NMSA J5069: Rinkens); off Cape Moreton, trawled in "deep water" (NMSA: J5870: A. & B. Boorman). NORTHERN MOZAMBIQUE: Conducia Bay, W. of Choca, littoral (NMSA: H2443: K. Grosch). "Southern Mozambique" (BO colln). MADAGASCAR: 15°01.8'S, 46°58.6E, 57-69m (MNHN); SOUTH AFRICA: S. E. of Kosi Bay, northern Zululand, 50 m, fine sand (NMSA D9674: RK *et al,*); off Hully Point, northern Zululand, 60 m, shell rubble (NMSA D6707: RK *et al*); N.E. of Leven Point, northern Zululand, 42–50 m, sand with pennatulids (NMSA E4433: RK *at al.*); off Phumula, southern Natal, 36 m, living in sand on low profile reef, unusually dark specimen (NMSA W7498: M. Wallace); NEW CALEDONIA: 22°58'S, 166°56'E, 26m, MNHN; 22°50'S, 166°51'E, 32m, MNHN; 20°09'S, 163°53'E, 23m, MNHN; CORAL SEA: 19°01'S, 158°32'E, 58m, MNHN.

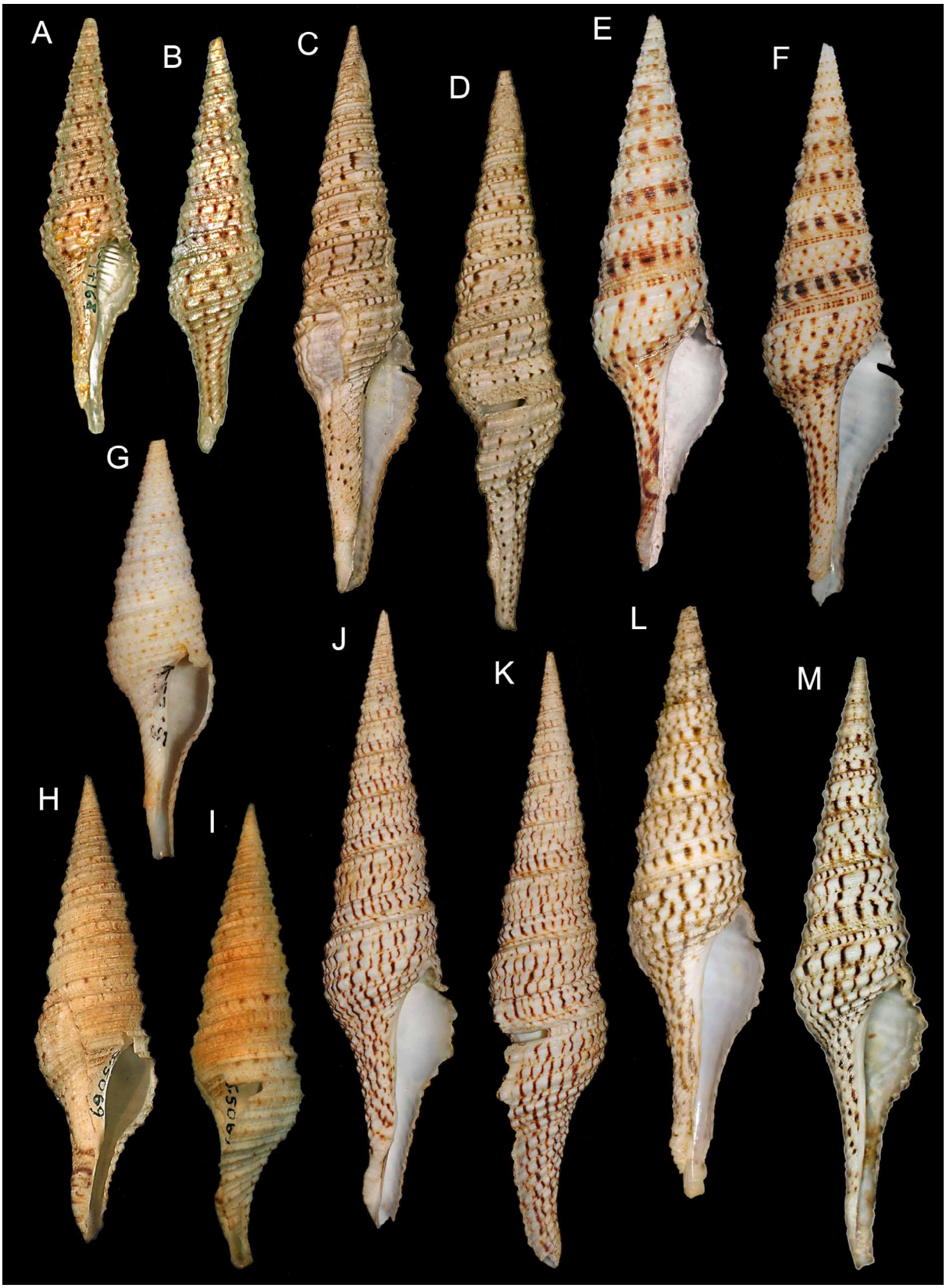

PLATE 10. *Turris crispa* (Lamark, 1816): A, **B**—Holotype of *Pleurotoma crispa*, locality unknown, MHNG, 1097/68, 55.5 x 13.0 mm; **C**, **D**—off Nha Trang, Vietnam, NMSA L8198, N. Thach, 110.7 x 24.5 mm; **E**—Southern Mozambique, 120 m, BO colln, 91.0 x 23.0 mm,; **F**—93.1 x 23.9 mm, Southern Mozambique, 40–50 m, BO colln. **G**—36.3 x 9.3 mm, Noumea, New Caledonia, NMSA K5775; **H,** I—Cape Moreton, Queensland, deep water, NMSA J5870, 54.7 x 14.2 mm; **J**, **K**—Holotype of *Turris dollyae* Olivera, 2000, Tabaco Bay, Luzon, Philippines, PNMM-40066, 119.0 x 25.6 mm; **L**—Sogod, Cebu, Philippines, BO colln, 85.7 x 20.3mm; **M**—Aliguay, Zamboanga, Philippines, 24–50 m, BO colln, 77.1 x 17.2 mm.

REMARKS: Powell (1964) treated the widely-distributed *Turris crispa* (Lamarck, 1816) as a polytypic species. No statement was offered in explanation of this action, other than the apparent allopatry and similarity of the four taxa there referred. The only shared character of possible significance is the presence of relatively strong collabral threads, although these occur also in species such as *Turris amicta* (E. A. Smith, 1877). Even if treated as a synapomorphy this sculpture cannot be used as a species-level character, as several of the so-called subspecies are parapatric/partially sympatric. Thus *Turris crispa crispa* and *T. crispa yeddoensis* (Jousseaume, 1883) are sympatric in parts of southern Japan and reportedly (Vera-Peláez *et al.* 2000) in the Philippines. At least one other member of the species-complex, *Turris grandis* (Gray in Griffith & Pidgeon, 1833), is sympatric with *T. crispa* in Vietnam and the Philippines. Consequently, it is preferable to regard each of these taxa as a full species. *Turris dollyae* Olivera, 2000, is indistinguishable from *T. crispa* (paratypes compared with photographs of the holotype of the latter and with specimens).

Most available Australian specimens (Pl. 10, figs H–I) lack precise data, but appear to indicate distinct regional variation; they are all very small (largest measured 54.1 mm) and very pale (yellowish-white or "biscuit-colour" with small and faint brownish marks). They also differ in proportions (e.g. b/l 0.25–0.27, a/l 0.40–0.42) and shorter siphonal canal (equal in length to length of rest of aperture, instead of distinctly longer than it as in typical *T. crispa*). Such a specimen is illustrated by Wilson (1994: pl. 38, figs 5 a–b); however, his pl. 39, figs 10 a–b appears to show a typical specimen, so obviously much more Australian material is needed.

Turris cristata Vera-Peláez, Vega-Luz, & Lozano-Francisco, 2000

Plate 11, figs A–F

Turris cristata Vera-Peláez, Vega-Luz, & Lozano-Francisco, 2000: 3, pl. 1, fig. 1 (protoconch), pl. 2, fig. 1 (anal sinus), pl. 4, figs 1–3, 7–12; Olivera, Sysoev, 2008: pl. 681, fig. 5; Robin 2008: pl. 448, fig. 5. Type loc.: Olango Is., Camotes Sea, Philippines.

Turris undosa (*non* Lamarck, 1816); Powell 1964: 334, pl. 181, fig. 20; pl. 258 (distribution) [not pl. 254, figs 9–10 which do appear to show *T. undosa*]; Azuma 1973: fig. 8 (radula); Springsteen & Leobrera 1986: 265, pl. 76, fig. 4; Higo, Callomon & Goto 1999: 303; Olivera 2000: 309, pl. 1, specimen 12, pl. 8; Hasegawa *et al.* 2000: 631, pl. 314, fig. 53.

?*Pleurotoma undosa*; Reeve 1843: pl. 3, sp. 18.

Not *Turris undosa*; Wilson 1994: 194, pl. 38, fig. 15.

DESCRIPTION: Shell angularly fusiform, with high, subulate, orthoconoid spire and conspicuously contracted, concave-sided base, b/l 0.22–0.25, a/l 0.32–0.36. Early whorls flat, later ones concave. Outer lip strongly convex, edge fluted, anal sinus fairly shallow, linguiform.

Sculptured by a very thick, prominent, rounded subsutural cord, bearing 3-4 thin ridges, delimited by a very narrow notch-like sulcus; sulcus slightly recessed under sinus cord, from which there projects a posteriorly-directed, minute, delicate, obliquely striate flange. Sinus cord varying from relatively high and somewhat angular to low and flat-topped. Base of spire whorls with two narrow cords with widely sloping sides (and a few fine intermediary threads); the lower cord may project to form the periphery, but may be overlapped by the suture, so that the peripheral angle lies on the upper last whorl. Upper base of last whorl with 2 narrow sharp cords, followed by 7–9 thin, low threads, separated by wide intervals bearing an occasional intermediary thread, rostrum with 5 even-sized threads. Collabral threads weak on spire whorls, except on subsutural cord, where they render intervals between the spiral threads pitted, strong and dense on base of last whorl (rendering interstices cancellated).

White with wavy, oblique axial flames (sometimes broken into blotches) of orange- or reddish-brown, base of last whorl and inner lip (often also outer lip) usually violet, main ridges on base of last whorl with brown flecks.

Maximum length 83 mm.

Protoconch conical, of 2.75–3 whorls, first 1.5 smooth, rest with opisthocline axial riblets; brown.

DISTRIBUTION: S. E. India to Japan and south to Western Australia and New Caledonia (MNHN); in *ca* 10–150 m, in sand or mud.

TYPES: *T. cristata*: Holotype MNCN 15.05/32710, paratypes in MNCN and author's collections; paratype 10 NMSA L5622 ex J. Conde.

OTHER MATERIAL EXAMINED: JAPAN: off Kii, 60–90 m (NMSA J3687: S. Akita). PHILIPPINES: Aliguay Is., Mindanao, 80–150 m., trawled, and Olango, 20–25 m (both G. Poppe colln); Balicasag Is., Bohol,

70–100 fath. [129–183 m] and Mindoro Is. (BO colln); Panglao, Bohol Is. (NMSA J3953: F. J. Springsteen) and 250–350 m (paratype, NMSA L5622: J. Conde); off Punta Engano, Mactan Is., 80 fath. [146 m]; Balut Is., Mindanao (NMSA L1851: D. Steinke). NEW GUINEA (ANSP 249709); NEW CALEDONIA: 20°47.7'S, 167°09.35'E, 5–30 m, MNHN; 22°59'S, 166°58'E, 24 m, MNHN.

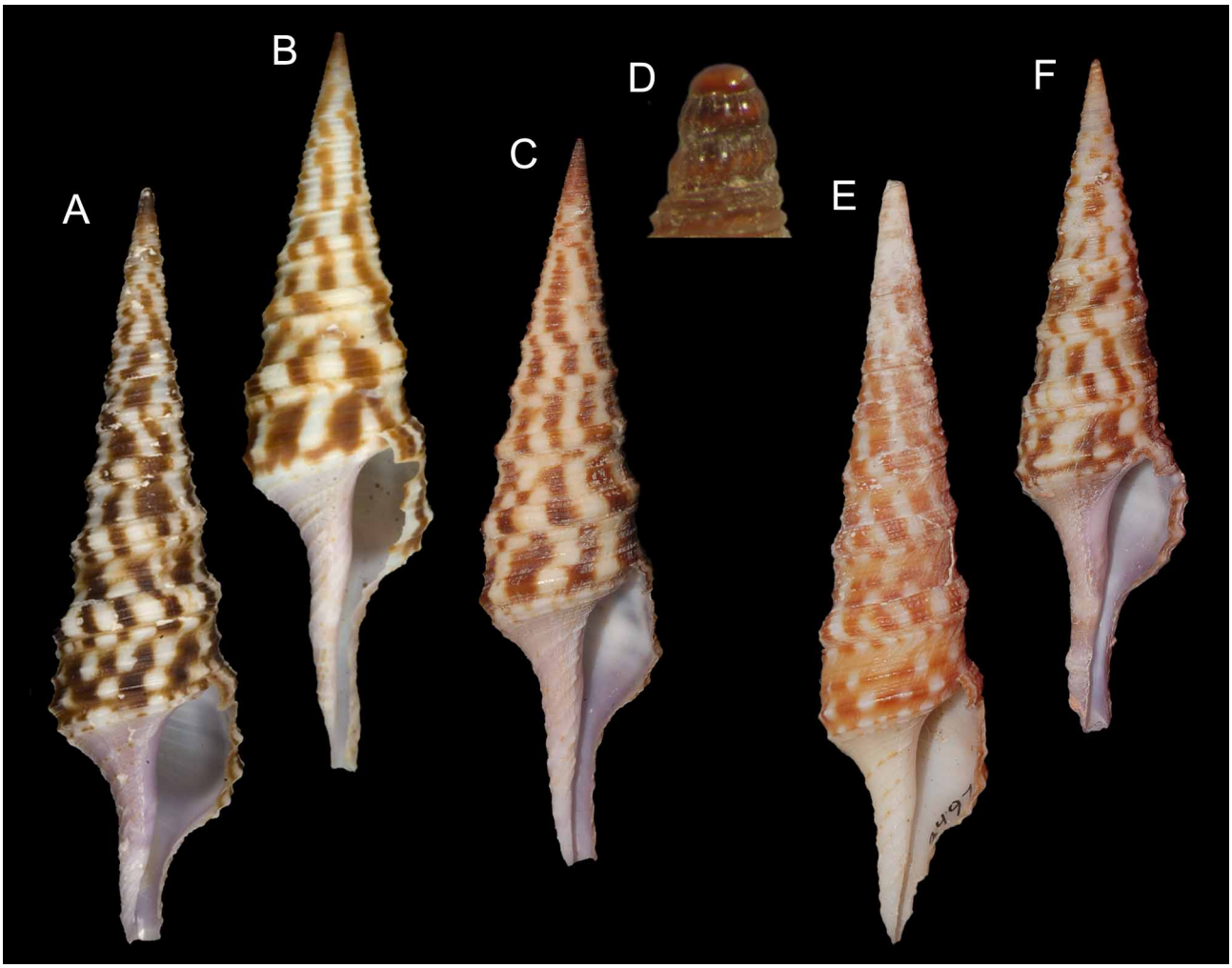

PLATE 11. *Turris cristata* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000: **A**—Holotype, Olango Is, Philippines, MNCN-32710, 59.7 x 15.7 mm; **B**—Paratype 1, Panglao Is., Philippines, MNCN, 58.2 x 15.4 mm; **C**, **D**—Mindoro Is., Philippines, BO colln, 57.4 x 15.0 mm; **E**—New Guinea, ANSP 249709, 60.5 x 13.7 mm; **F**—Japan, ANSP 420685, 55.1 x 14.5 mm.

REMARKS: Although there is some variation in detail of spiral sculpture, *T. cristata* is always recognisable by its massive subsutural cord and strongly contracted base. Although once commonly misidentified as *Pleurotoma undosa* Lamarck, 1816, the holotype of that lacks the characteristic subsutural cord.

Turris cryptorrhaphe (Sowerby, 1825)

Plate 12, figs A–E

Pleurotoma cryptorrhaphe G. B. Sowerby, I, 1825: 58; Gray & Sowerby I 1839: 120, pl. 34, fig. 8; Reeve 1843: pl. 234, fig. 16 ("15" on plate); Reeve 1843, pl. 1, sp. 7; Weinkauff 1875: 20, pl. 4, figs 4–7. Type loc.: not given.

Turris cryptorrhaphe; Powell, 1964: 335 (refs), pl. 181, figs 14–15; Cernohorsky 1972: 183, pl. 53, fig. 3; Olivera 2000: 308, pl. 1, specimen 13, pl. 7; Vera-Peláez *et al.* 2000: pl. 1, fig. 4 (protoconch), pl. 6, figs 6–7; Higo *et al.* 2001: pl. 101, fig. G3529 (holotype); Olivera & Sysoev 2008: pl. 681, figs 8–9; Robin 2008: pl. 448, fig. 6..

Murex bicarinatus Wood, 1828: 15. Type loc.: unknown.

Pleurotoma woodii Kiener, 1839: 12, pl. 7, fig. 1 (*n. nov.* for *P. bicarinata*). Type loc.: unknown.

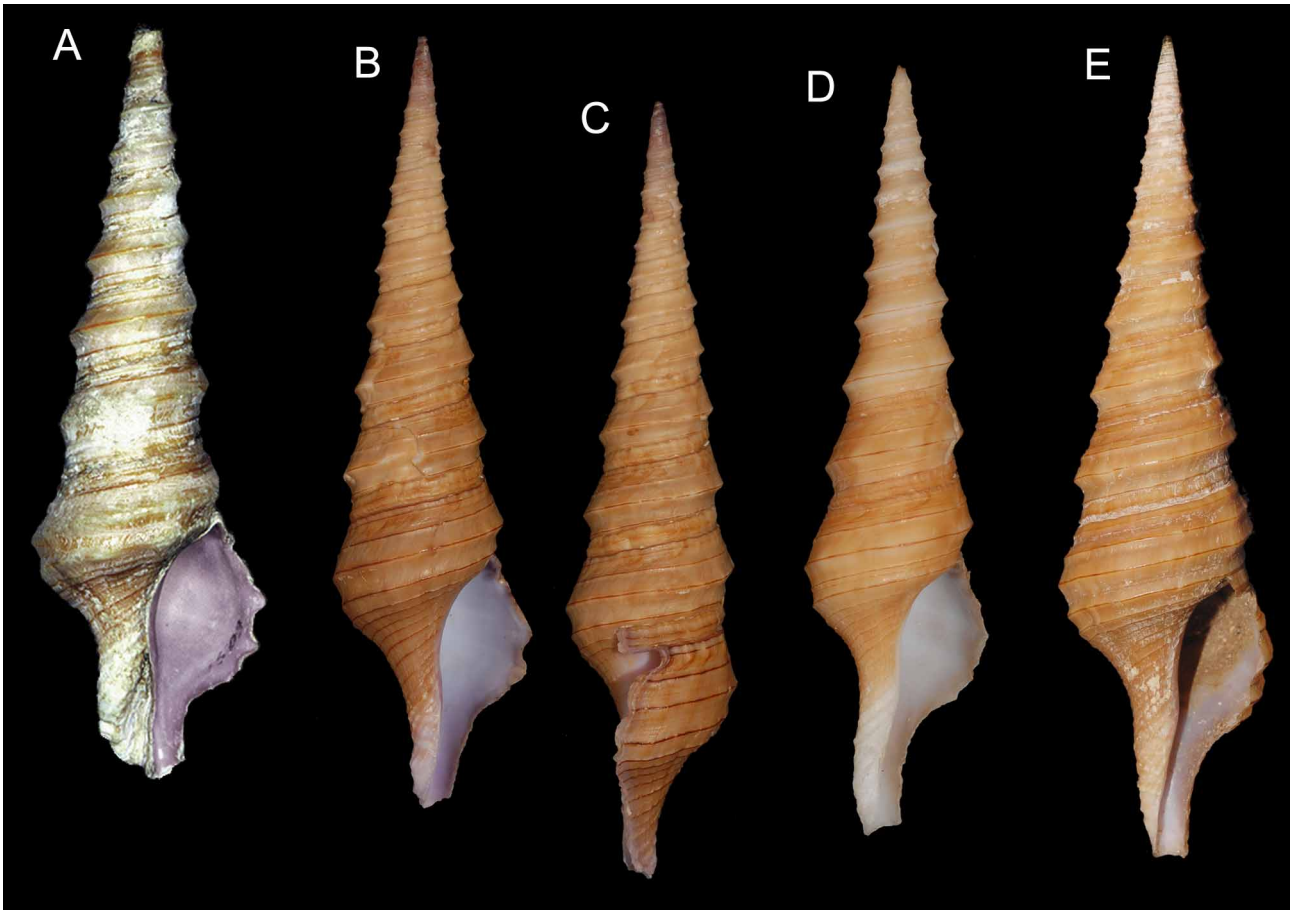

PLATE 12. *Turris cryptorrhaphe* (Sowerby, 1825): **A**—Holotype of *Pleurotoma cryptorrhaphe*, locality unknown, NHMUK 1963470, 67.5 x 21.1 mm; **B**, **C**—Cagayan, Philippines, BO colln, 72.1 x 17.7 mm; **D**—Bohol, Philippines, BO colln, 61.7 x 14.5 mm; **E**—Olango Is., Cebu, Philippines, BO colln, 67.4 x 17.6 mm.

DESCRIPTION: Shell narrow (b/l 0.25–0.26) with high spire (a/l 0.31–0.33), narrowly acuminate, whorls angular (almost pagodiform), base of last whorl contracted, siphonal canal relatively short and recurved, with a prominent fasciole, often bearing a narrow false umbilicus. Base of each whorl with a double keel, separated by a concavity, the upper the stronger. Upper part of whorls with a weak subsutural cord, bordered anteriorly by a deep, narrow sulcus; sinus ridge narrow and low, often indistinct, except for lunulate growth lines. Base of last whorl with *ca* 17–20 ridges, above alternately weaker and stronger, on rostrum strong and transversely notched.

Dull yellowish- or reddish-brown to dark brown, except for a fine spiral line of darker brown on each cord and main ridge; rostrum white or violet, aperture violet-tinged.

Protoconch small, subcylindrical, of *ca* 2 whorls, with axial riblets, breadth *ca* 0.65 mm.

Attains 78 mm.

DISTRIBUTION: Indonesia and Philippines to Papua New Guinea, east to Marshall Islands and Fiji; 4–60 m, in sand under rocks.

TYPES: *P. cryptorrhaphe*: holotype NHMUK 1963470, ex Stainforth collection, dimensions 67.5 x 21.1 mm. *M. bicarinatus* (*woodii*): location of type unknown.

OTHER MATERIAL EXAMINED: PHILIPPINES: Olango Is., Cebu (B0 colln); Balut Is., Mindanao (NMSA L1972: B0), between Olango, Cebu and Bohol Islands, 20–60 m (NMSA L8203: BO); Palawan, tangle nets (NMSA J3213: F. J. Springsteen); Panglao, Bohol, tangle nets (NMSA K2452: F. J. Springsteen); Bohol and Cagayan (G. Poppe colln); NEW CALEDONIA: 20°50.4’S, 165°22.8’E, 20 m, MNHN; 20°41.4’S, 164°14.8’E, 20–30 m, MNHN; 20°52.4’S, 167°08.5’E, 4 m, MNHN.

REMARKS: The protoconch is more frequently retained than in most *Turris* species, at least in immature individuals, possibly indicative of a burrowing habit.

***Turris faleiroi* Kilburn, 1998**
Plate 13, figs A–D

Turris faleiroi Kilburn, 1998: 159, figs 8–9. Type loc.: off Algoa Bay, 100 m.

DESCRIPTION (modified after Kilburn 1998): Spire very high and base relatively short (a/l 0.34–0.36, b/l 0.30–0.31), spire orthoconoid with flattened whorls and shallow suture. Anal sinus shallow, asymmetrically and openly U-shaped.

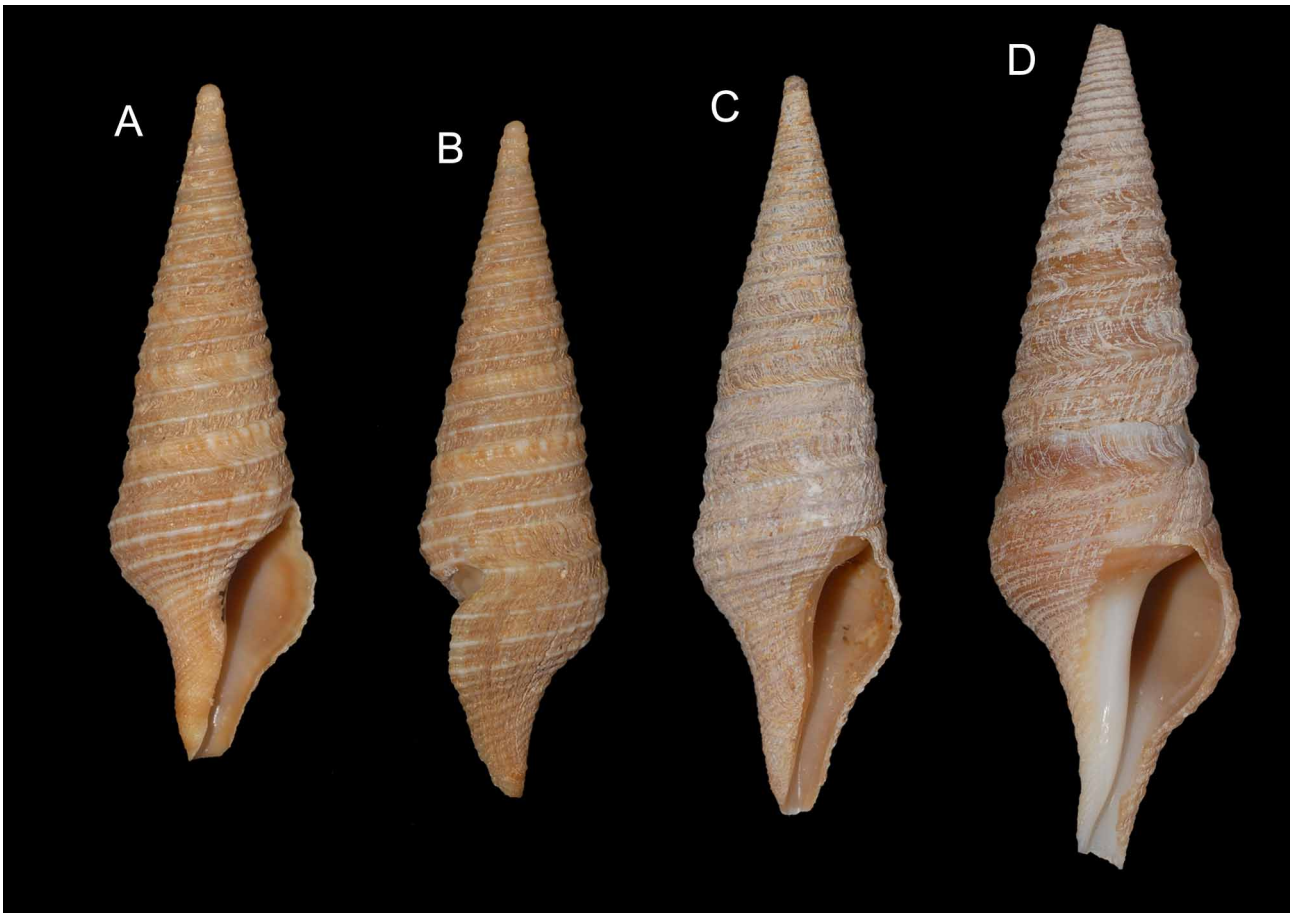

PLATE 13. *Turris faleiroi* Kilburn, 1998: **A**, **B**—Holotype, off Algoa Bay, South Africa, 100 m, NMSA V6145, 40.3 x 12.0 mm; **C**, **D—**off Algoa Bay, South Africa, 100 m, NMSA V2588; **C**—44.7 x 12.4 mm; **D**—59.7 x 12.7 mm.

Subsutural cord low, broad, rather ill-defined, bearing 3–4 spiral threads and microscopic spiral striae that are crenulated by axial sculpture. Sulcus shallow. Sinus cord thin, weakly and irregularly crenulated. Peripheral region of base with 3 slightly stronger, subequal spiral cords, interval between each pair with one intermediary ridge, flanked by several weaker threads; two of these cords visible on spire whorls (making a total of 4 cords per whorl, although the anteriormost may be hidden in suture). First teleoconch whorl with 4 thin lirae. Anterior end of last whorl with 20–25 lirae, those on rostrum close and even, those above stronger and more widely-spaced, their intervals with fine spiral striae. Fine, sharp, crispate collabral threads overall, crenulating the main spirals.

Pale brown, with lighter main spirals, bearing an occasional slightly darker reddish-brown fleck, protoconch light brown. Traces of a dull, pale brown periostracum retained interstitially.

Protoconch papillose, relatively large and blunt, of *ca* 1.8 whorls, smooth except for the last half-whorl which bears 8–16 arcuate axial ribs plus a spiral thread developing above suture near termination of protoconch; breadth of last whorl 1.60–1.75 mm.

Maximum length 43.5 mm.

DISTRIBUTION: Known only from the type locality, on the eastern fringe of the Agulhas Bank, South Africa.

TYPES: Holotype NMSA V6145; paratype 1 NMSA V6146, juvenile; paratypes 2–3 in private hands.

REMARKS: This species has the southernmost distribution of all *Turris* spp, and is the only member of the genus to occur on the Agulhas Bank, south of South Africa, although it is evidently very localised in range. Its relatively large, papillose protoconch appears unique in the genus, but is characteristic of many Agulhas Bank molluscs. This probably reflects a Pleistocene origin, when during periods of maximum regression, those species with planktotrophic development, whose range had become progressively restricted to the edge of the present continental shelf, would have been threatened with extinction, as a consequence of their larvae being ultimately swept east into the South Indian Ocean by the reflexed Agulhas current, or ultimately by the West Wind drift.
The types, most of which were taken alive, were all collected in crayfish (rock lobster) pots, suggesting that the species is an opportunistic scavenger.

***Turris garnonsii* (Reeve, 1843)**
Plate 14, figs A–I

Pleurotoma garnonsii Reeve, 1843: pl. 1, sp. 4; Weinkauff 1875: 12, pl. 2, figs 1–2 (not 3–4). Type loc.: Zebu [= Cebu] Is., Philippines [erroneous, neotype loc. here designated: Zanzibar] .
Turris garnonsii; Powell 1964: 329 (references), pl. 181, figs 7–8 [not 18, see next], pl. 254; Kilburn 1983: 553; Drivas & Jay 1986: 28, textfig. left-hand shell only.
Pleurotoma babilonia[sic] var.; Kiener 1839: 4, pl. 1, fig. 2.

DESCRIPTION: Shell resembling *Turris babylonia* (restricted sense) in shape (b/l 0.24–0.31, a/l 0.38–0.46), but with dense, somewhat lamellar collabral riblets overall (instead of weak threads), giving the surface a duller, rougher appearance, and less angulate whorls; spiral cords more angulate than in *babylonia*. Subsutural cord low, feeble to distinct, with a median ridge and a weaker one on either side; sulcus shallow and ill-defined, with three spiral threads. Sinus cord low, flat, usually shallowly bifid; base of each spire whorl with two narrow ridges, of equal strength; base of last whorl with 16–20 ridges. First teleoconch whorl with four spiral ridges, the 2nd from base strongest.

Vividly patterned, ivory-white with large brown spots (often square or rectangular) below suture and a more or less broken band of this colour around upper part of base of last whorl, spiral cords and main ridges with brown dots.

Protoconch bluntly conical of 2.5 whorls, last with fine, opisthocline axial riblets and a thin spiral thread at suture, white, width *ca* 0.84 mm.

Attains 74 mm (Powell, 1964).

DISTRIBUTION: Indian Ocean, from Zululand and East Africa to the Red Sea (Sharabati, 1984), east to the Andaman and Réunion Islands, in clean or muddy sand, often among rocks or coral, intertidal to 80 m.

TYPES: Holotype originally in the Stainforth collection, which was dispersed by sale. Although Powell (1964: fig. 1) illustrated a specimen in the NHMUK as the supposed holotype, this cannot now be located (pers. comm. Kathie Way) and is presumed to be lost. Moreover Powell's photograph of it is not easy to reconcile with even Reeve's crude illustrations (pl. 14, fig. A) in shape.

Neotype designation: Since Weinkauff (1875), *Turris garnonsii* has been confused with a different species (see *Turris guidopoppei* below) from the Philippines. That species is moderately abundant in the vicinity of Cebu (the spurious type locality of *Pleurotoma garnonsii*, a species unfamiliar to modern Philippine collectors). In view of this confusion, we designate a neotype from the locality from which *T. garnonsii* specimens are most commonly represented, namely Zanzibar (also a known source of dealer's specimens in the 19th century). The neotype (pl. 14, figs B–C) from Fumba, Zanzibar, living on "weedy sandflats", and collected by R. C. Wood, has been deposited in the NHMUK 20110294.

OTHER MATERIAL EXAMINED: ANDAMAN ISLANDS: Port Blair area (NMSA F4925: Mrs and Miss E. M. Man). TANZANIA: W. of Stone Town, Zanzibar, 30–60 ft [9–19 m] (NMSA L7993: H. Conley). MAURITIUS (NMSA L8200): off Ile aux Bénitiers, lagoon, 1.5 m at LST, fine sand between coral heads (NMSA K8807: R. K., D. Herbert). RÉUNION IS.: 20°52'S, 55°38'E, 110 m and 21°00'S, 55°15'E, 58–70 m (MNHN, juvs). NORTHERN MOZAMBIQUE: Quirimba Island, S.W. sandflats, at LST (NMSA J8623: RK); S.W. Conducia Bay, muddy sand with rocks, LST (NMSA H2459: K. Grosch); Conducia Bay, sandy area with rocks, above *Thalassodendron* bed, about 0.3 m above LST (NMSA H2458: K. Grosch); Quissimajul Bay and F. Velosa, Nacala Bay, 2–3 m, mud, sand, algae, BO colln, ex C.P. Fernandes. MADAGASCAR: BO colln, ex F. Lorenz.

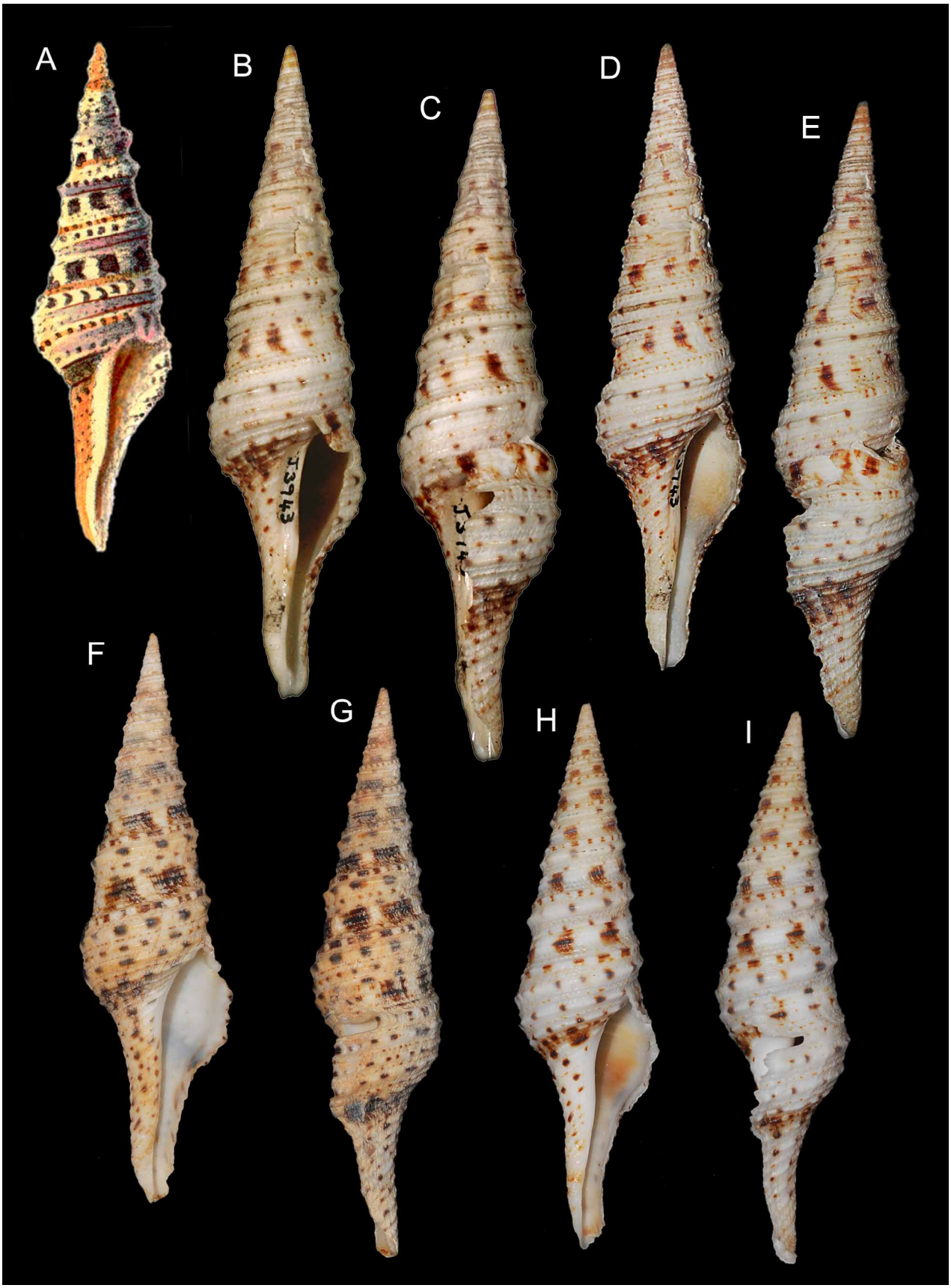

PLATE 14. *Turris garnonsii* (Reeve, 1843): A—Type figure of *Pleurotoma garnonsii*, after Reeve, 1843: pl. 1, figs 4a-b, Zebu [Cebu] Is., Philippines [erroneous]; **B**, **C**—Neotype of *Pleurotoma garnonsii*, Fumba, Zanzibar, on weedy sandflats, NHMUK 20110294, 67.5 x 17.1 mm; **D**, **E**—Zanzibar, Tanzania, NMSA, 67.6 x 16.6 mm; **F**, **G**—Madagascar, BO colln, 65.9 x 17.5 mm; **H**, **I**—Nacala Bay, Northern Mozambique, 2–3 m, BO colln, 59.2 x 15.7 mm.

***Turris grandis* (Gray in Griffiths & Pidgeon, 1833)**
Plate 15, figs A–E

Pleurotoma grandis Gray in Griffiths & Pidgeon, 1833: 599, pl. 23, fig. 1; Reeve 1843: pl. 2, sp. 13; Weinkauff 1875: 10, pl. 1, fig. 3. Type loc.: not given.
Turris grandis; Vera-Peláez, Vega-Luz & Lozano-Francisco 2000: 2, pl. 3, figs 4–6 (protoconch), pl. 7, figs 8–10; Li & Li 2007: 64, pl. 1, fig. 1; Olivera, Sysoev, 2008: pl. 682, figs 3–4.
Pleurotoma crispa (*non* Lamarck, 1822); Kiener 1839: 8, pl. 2, fig. 1.
Turris crispa (*non* Lamarck, 1822); Olivera 2000: 297, pl. 1, spec. 1 a–b, pls 2, 6.

DESCRIPTION: Shell very large and acuminately fusiform (b/l 0.19–0.24, a/l 0.44–0.48), siphonal canal very long (usually more than half total length of aperture), straight or bent slightly to the right. Anal sinus deep and linear, widening at the opening.

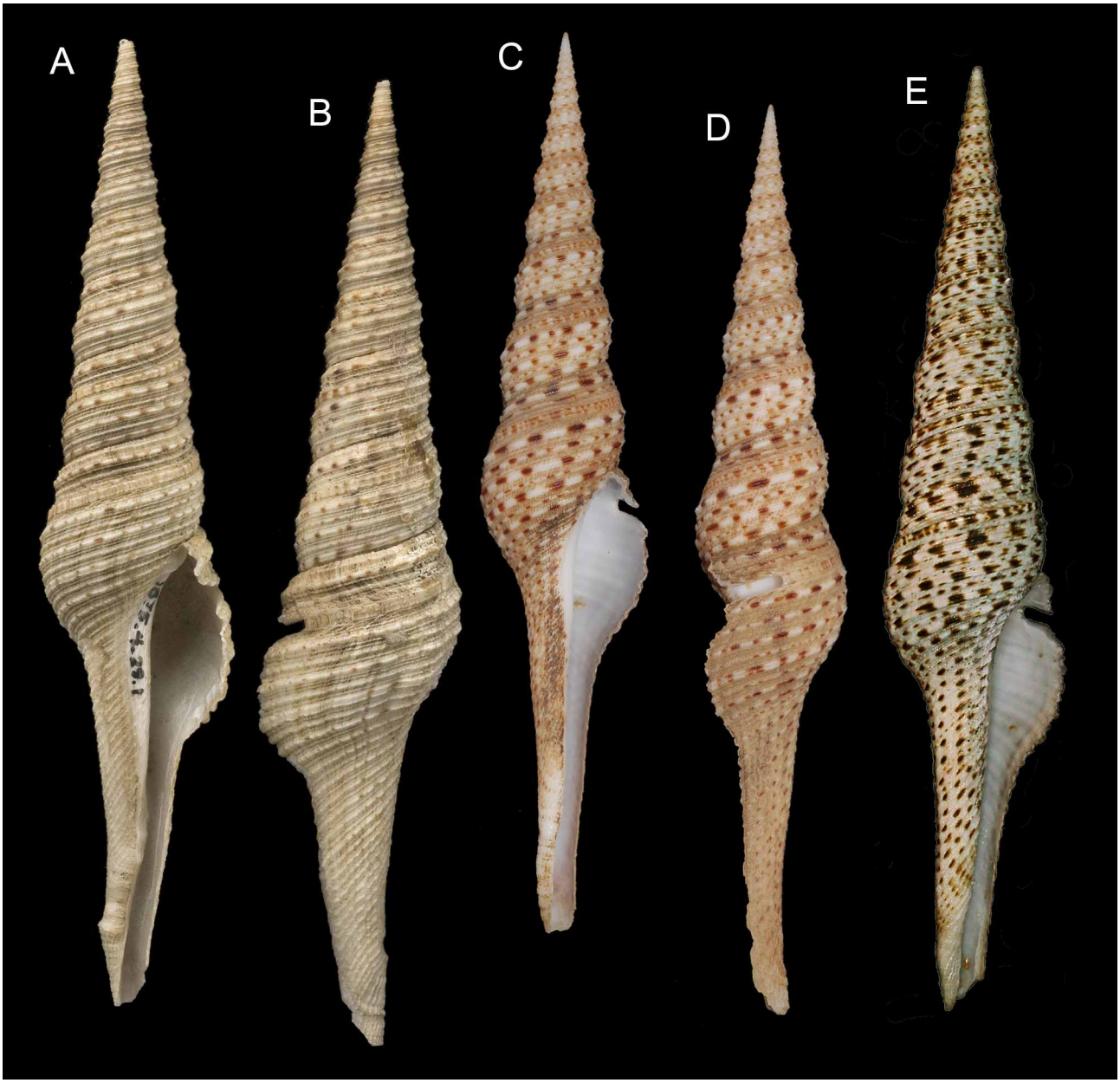

PLATE 15. *Turris grandis* (Gray, 1833): A, **B**—Holotype of *Pleurotoma grandis*, locality unknown; NHMUK 1875.4.29.1, 137.5 x 29.2 mm; **C**, **D**—Sogod, Cebu, Philippines, BO colln, 130.3 x 25.9 mm, **E**—Vietnam, NMSA L8204, N. Thach, 112.1 x 21.1 mm.

Early whorls with three ridges, the median one granular. On later whorls, subsutural cord bears an angular ridge, with a weaker one on either side. Sulcus equal in width to cord, shallow and gradually sloping with a median spiral ridge, and weak threads on either side. Sinus cord low, slightly concavely tabulate. Base of spire whorls with 4–5 angular cords, the uppermost projecting slightly as the peripheral cord, their intervals relatively sharply incised and wider than cords (or equal to them), with irregular intermediary threads. Base of last whorl with *ca* 32 spiral ridges, upper ones with 1–2 intermediary threads, ridges on rostrum finer and equal in strength. Collabral threads somewhat lamellar, particularly subsuturally.

Off-white with small reddish or purplish-brown spots and dots, mostly spirally elongated and rarely extending across intervals, occasionally obsolete.

Protoconch cyrtoconoid, of about 2.3 whorls, first 1.5 whorls smooth, last one with arcuate axial ribs, colour white (after Vera-Peláez *et al*. 2000).

Very large, attaining at least 185 mm.

DISTRIBUTION: Philippines and Indonesia to Vietnam and China (Hainan, Guangdong and Beibu Gulf, *fide* Li & Li 2007), 61–150 m, in sandy mud.

TYPES: *P. grandis*: holotype NHMUK 1875.4.29.1 (pl. 15, figs A–B), dimensions 137.5 x 29.2 mm.

OTHER MATERIAL EXAMINED: VIETNAM: off Nha Trang, 10–25 m (NMSA L8204: N. Thach). PHILIPPINES: Olango Is., fishermen, Guido Poppe colln; between Sogod and Bogo, N. Cebu, trawled (BO colln).

REMARKS: Although Hedley (1922) and Powell (1964) regarded *Pleurotoma grandis* as a synonym of *P. crispa*, Vera-Peláez *et al.* (2000) reaffirmed its distinctness from that species, as did Olivera (2000, as *T. crispa crispa*). *Turris grandis* differs from *T. crispa* in its larger maximum size (it is the largest member of the genus), proportionally narrower siphonal canal, colour pattern of spots rather than axial bars, less lamellar collabral threads, more numerous spiral ridges (i.e. 4–5 basal cords on later spire whorls, instead of only 3) and a protoconch of 2.0–2.3 whorls, against 3.0–3.5 whorls (with a smaller nucleus) in *T. crispa*.

Turris guidopoppei **sp. nov.**

Plate 16, figs A–G

Pleurotoma garnonsi [sic]; Weinkauff 1875: 12, pl. 2, figs 3–4.

Turris garnonsii (*non* Reeve, 1843); Powell 1964: 329, pl. 181, fig. 18 (as "slender form"); Vera-Peláez, Vega-Luz & Lozano-Francisco 2000: 10, pl. 8, figs 9–11; Olivera 2000: pl. 1, fig. 8; Olivera & Sysoev 2008: pl. 681, figs 6–7; Robin 2008: pl. 448, fig. 7.

DESCRIPTION: Shell very narrowly fusiform, b/l 0.20–0.22; a/l 0.44–0.48; siphonal canal very long, slender and slightly recurved terminally; suture shallow, whorls convex anteriorly, subsutural region shallowly-concave; outer lip moderately convex, anal sinus deep, linguiform, parallel-sided; interior of aperture with 13–14 spiral ridges.

Subsutural region without a distinct cord, but with a complex of ridges, consisting of two pliculate threads at suture, followed by a very thin, but stronger dark ridge. Sulcus ill-defined and sloping, containing 2–3 crenulated spiral threads. Sinus cord low, distinctly bifid, posterior margin slightly tabulate. Base of spire whorls with three main spiral cords, the upper (peripheral) cord prominent and angular, situated at mid-whorl, lower two narrower and weaker, each interval with a fine thread. Upper base of last whorl with 7–9 widely-spaced angular cords, each interval with a fine thread; rostrum with *ca* 10 fine, rough, subequal ridges. Relatively weak collabral threads are visible mainly in intervals, rendering interstitial threads crenulated.

White with orange-brown squares or rectangles in subsutural area and a similarly coloured zone at parietal region, main cords and some of the finer ones spotted or flecked with dark brown.

Attains 89.6 mm.

Protoconch narrow, slightly cyrtoconoid, of *ca* 5 smooth whorls (Vera- Peláez *et al*. 2000).

DISTRIBUTION: Philippines, in 20–60 m to New Caledonia.

TYPE LOCALITY: Olango Is., Cebu, Philippines.

TYPES: Holotype (Pl. 16, Figs. A-B) Olango Is., Cebu, PHILIPPINES, 24–40 fath. [44–73 m], by hookah, MNHN 24945, dimensions 94.0 x 19.6 mm,; Paratype 1 (Pl. 16, Fig. C), Bohol Is, PHILIPPINES; 77.8 x 15.7 (MNHN 24436); Paratype 2—same locality, 65.5 x 14.7, (ANSP 426054); Paratype 3, between Olango Is and Bohol Is, PHILIPPINES, dived 20–50 m (NMSA L8199: BO); Paratypes 4–5, same locality, 20–50 m (NHMUK 20119300: BO).

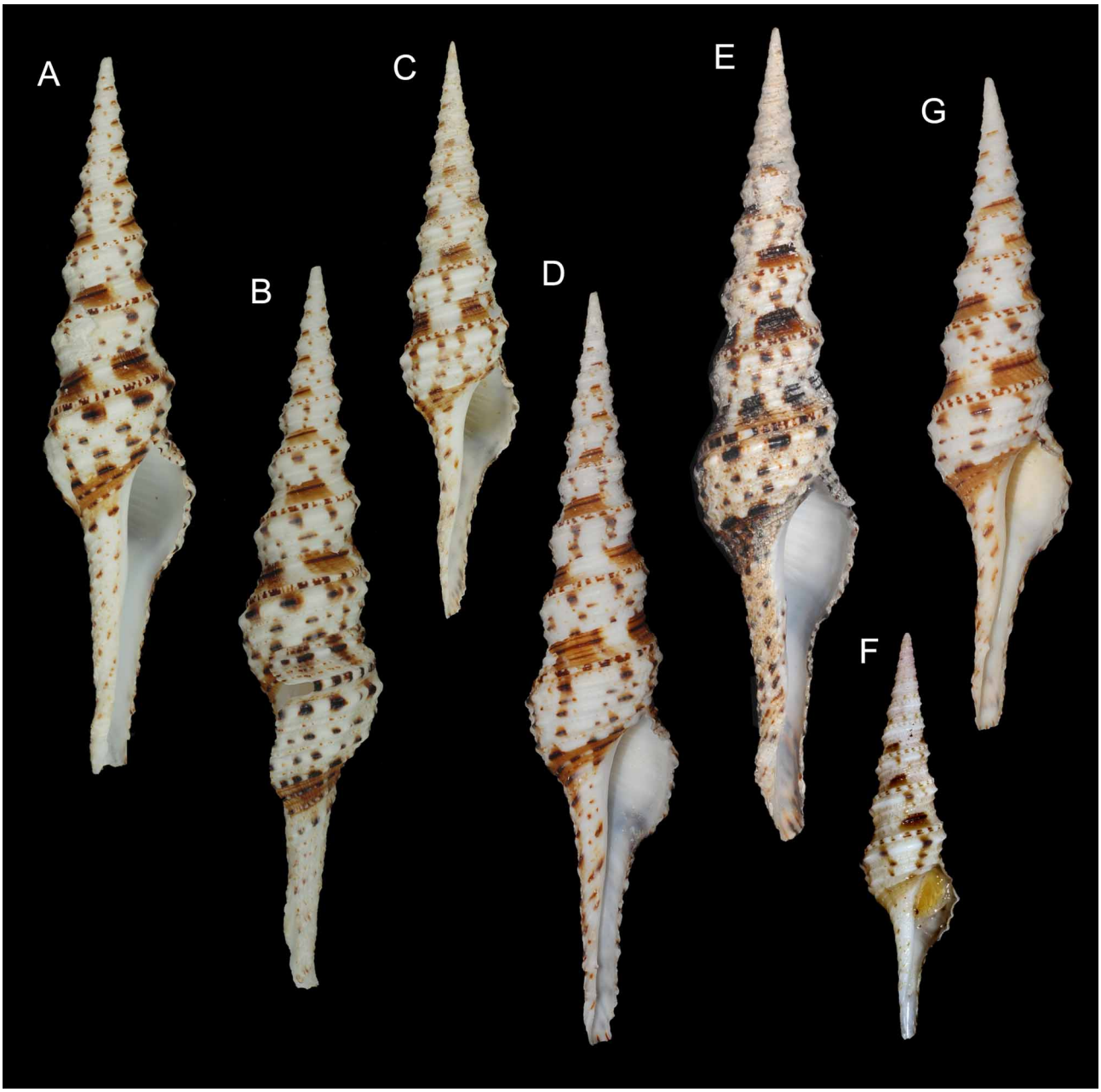

PLATE 16. *Turris guidopoppei* nsp.: A, **B**—Holotype, Olango Is., Cebu, Philippines, 44–73 m, 92.6 x 19.4 mm, MNHN 24945; **C**—Paratype 1, Olango Is., Cebu, Philippines, 25-40 m, 77.8 x 15.7 mm, MNHN 24436; **D**—Oslob, Southern Cebu, Philippines, BO colln, 89.5 x 19 mm; **E**—Olango Is, Cebu, Philippines, 20–25 m; BO colln, 115 x 23.6 mm; **F**—Sogod, Cebu, Philippines, BO colln, 30.8 x 7.7 mm; **G** –Aliguay Is, Mindanao, Philippines, 80-150 m, BO colln, 67.5 x 15.2 mm.

OTHER MATERIAL EXAMINED: PHILIPPINES: 13°55'N, 120°22'E, 20-21m (MNHN); NEW CALEDONIA: 20°40.4'S, 164°14.9'E, 26-40m (MNHN);

REMARKS: In shape, this species superficially resembles a miniature *Fusinus* (family Fasciolariidae). In colouration it resembles *Turris garnonsii* (pl. 14, figs A–I), but its shell is much more slender (breadth/length about 0.19–0.22, against 0.25–0.27) and more fusiform with a longer siphonal canal (about twice the aperture length, but subequal to it in *garnonsii)*, and a very strongly undulating profile; its peripheral cord is situated at mid-whorl, while in *T. garnonsii* it is positioned below the mid-whorl.

ETYMOLOGY: Named in honour of Mr Guido Poppe, who generously provided hospitality and support in the Philippines, during preparation of this manuscript.

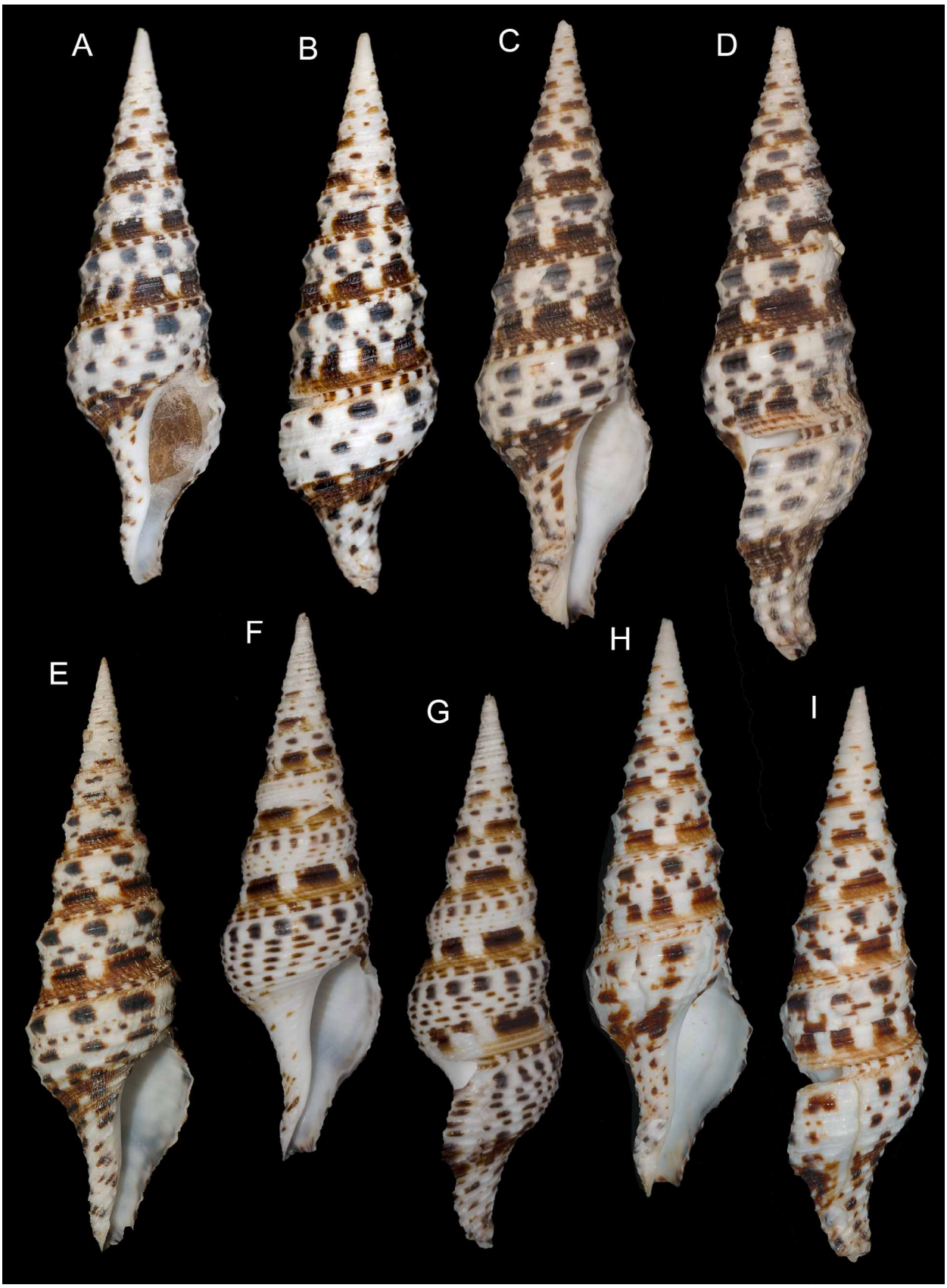

PLATE 17. *Turris hidalgoi* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000: **A**, **B**—Holotype, Olango Is., Cebu, Philippines, MNCN-15.05/32709, 65.8 x 19.2 mm; **C**, **D**—Philippines, BO colln, 87.0 x 25.0 mm; **E—**Philippines, exact locality unknown, BO colln, 72.3 x 21. mm; **F, G**—Aliguay Is., Mindanao, Philippines, BO colln, 61.7 x 18.7 mm; **H**, **I** –. Holotype of *Turris totiphyllis* Olivera, 2000: Olango Is., Cebu, Philippines, PNMM-40068, 75.7 x 22.3 mm.

***Turris hidalgoi* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000**
Plate 17, figs A–I

Turris hidalgoi Vera-Peláez, Vega-Luz, & Lozano-Francisco, 2000: 4, pl. 1, fig. 5 (protoconch). pl. 2, fig. 4 (anal sinus), pl. 5, figs 4–12. Type loc.: Olango Is., Camotes Sea, Philippines.
Turris totiphyllis Olivera, 2000: 306, pl. 1, specimen 15, pl. 7; Olivera & Sysoev 2008: pl. 682, figs 5–6. Type loc.: between Olango Is., Cebu and Bohol areas of central Philippines, 20–60 m. **Syn. Nov.**
Turris cf. T. totiphyllis; Olivera, Sysoev, 2008: pl. 682, fig. 7.
Turris totiphylisorum [*sic*]; Dharma 2005: pl. 41, fig. 10.

DESCRIPTION: Fusiform (b/l 0.27–0.30, a/l 0.37–0.46) with acuminate, orthoconoid spire and narrow, tapering base, siphonal canal subequal in length to rest of aperture, which is narrowly elliptical; fasciole weak, false umbilicus very narrow or absent, tip of canal obliquely truncate to strongly rounded, sometimes shallowly notched in young examples. Edge of outer lip crenulated, interior with thin spiral ridges; anal sinus fairly shallow, forming a linear notch.

Early whorls flattened, with 3 subequal, granulose ridges. Later teleoconch whorls with a weak median angle, formed by peripheral cord; suture a shallow notch; subsutural cord weak and impressed, with a low, median angular ridge and 1–3 thin threads on either side; sulcus a shallow, slight concavity. Sinus cord low, stepped and concave-topped, with a ridge on either side of crest in adult; peripheral cord forming a prominent angle, with sloping sides; base of spire whorls with 2 weakly angular ridges, the sutural one the stronger. Base of last whorl with 18–23 spiral ridges, upper ones strongest but most of varying strength. Interstices and subsutural region with minute, crinkly, flattened collabral lamellae.

Ground colour white, vividly marked below suture with reddish-brown rectangles, and stained with reddish-brown around upper part of base; main cords with spots or bars of dark brown, strongest on peripheral cord; sinus cord with paired spots of reddish-brown.

Protoconch (after Vera-Peláez *et al*. 2000): bluntly cyrtoconoid, of about 3.5 whorls, the first very small, lip sinusigerous; smooth, developing axial riblets on 3rd and 4th whorl.

Attains 93.9 mm.

DISTRIBUTION: Philippines, in 10–250 m, on mud.

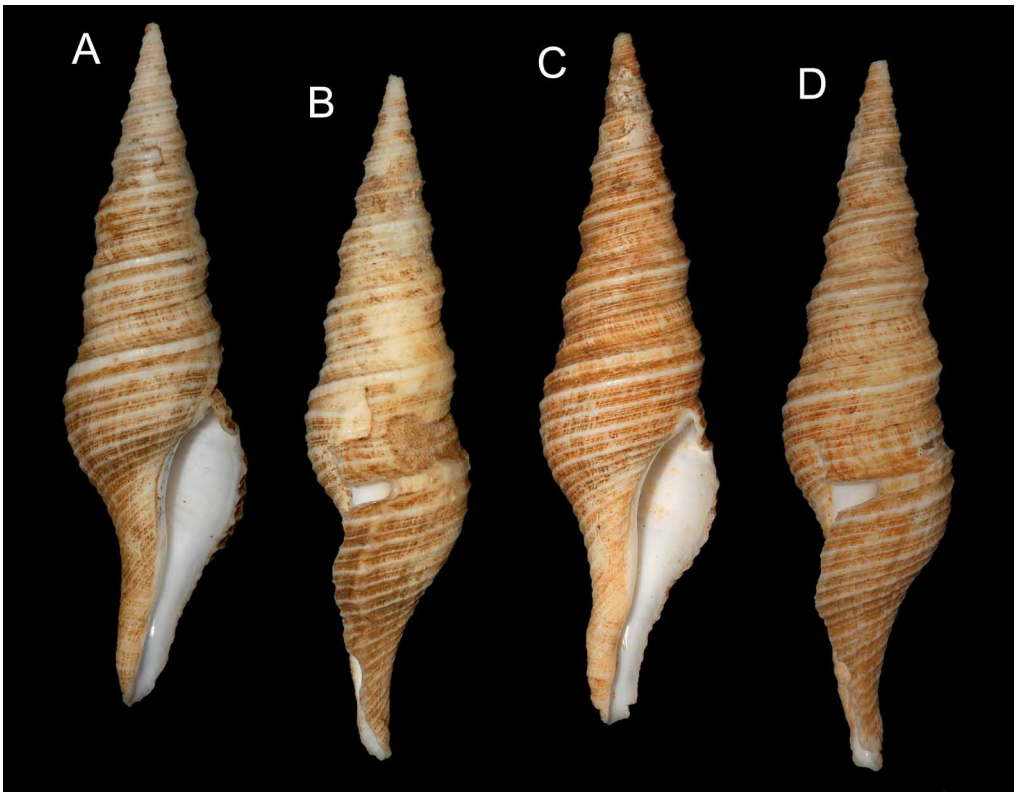

PLATE 18. *Turris intercancellata* nsp.: A, **B**—Holotype, NHMUK 2011029, off Kerala, West of Cape Comorin, India, 300–400 m, 82.0 x 21.3 mm; **C**, **D**—Paratype 1, same data, NMSA L7998, 78.9 x 19.9 mm.

TYPES: *T. hidalgoi*: Holotype MNCN 15-05/32.709 (pl. 17, figs A–B), paratypes in private hands (paratype 5 in J. Conde colln has been examined). *T. totiphyllis*: Holotype (pl. 17, figs H–I) in PNM, paratypes in NHMUK, USNM and private hands.

OTHER MATERIAL EXAMINED: PHILIPPINES: Mindanao, Zamboanga, 10–25 m, Aliguay is., Mindanao, 80–150 m, trawled (G. Poppe colln); Matanos, Samal Is. Davao Gulf, Mindanao, 80–130 fath. [146–238] (NMSA: BO); between Olango Is., Cebu and southern Bohol, 20–60 m (paratype 1, *T. totiphyllis*); Balicasag, Bohol, 50–150 m (paratype 2, *T. totiphyllis);* Olango Is, Cebu (paratype 7, *T. totiphyllis*) (BO colln); Panglao, Bohol, 250 m (NMSA L8201: J. Conde).

REMARKS: Characterised mainly by its coarse pattern of more or less large, staggered, dark brown transverse spots on a white ground.

The differences between *T. hidalgoi* and *T. spectabilis* are not always sharply defined, but may be summarised as follows (Table 1)

TABLE 1. Some conchological differences between *T. hidalgoi* and *T. spectabilis*,

	T. hidalgoi	***T. spectabilis***
Subsutural cord	distinct, bearing a strong median ridge;	weak or absent, with 2–4 thin ridges (sometimes a slightly stronger median ridge)
	covered by alternate large dark brown and white rectangles	light reddish brown with small dark brown and white rectangles at suture
Sinus cord:	relatively wide, and flat or concave topped, bearing two spiral ridges.	of two thin threads, occasionally granular.

***Turris intercancellata* sp. nov.**
Plate 18, figs A–D

DESCRIPTION: Shell fusiform (b/l 0.26–0.28, a/l 0.43–0.45), with long, tapering siphonal canal, inclined to the left, with a slight fasciole. Interior of aperture with 11–14 spiral ridges. Anal sinus relatively shallow, parallel-sided; outer lip in side-view rounded and opisthocline, stromboid notch ill-defined.

Suture shallow, subsutural region relatively wide, subsutural cord very low to flattened and ill-defined, bearing 3 moderately angular ridges, the sutural one weakest, anterior one strongest. Sulcus ill-defined, very shallowly and slopingly concave, containing 2–3 spiral threads. Sinus cord strongest and forming a very slight shoulder, although not peripheral, wide and slightly concave-topped, crenulated on early whorls. Base of spire whorls bearing 3–4 unequal narrow spiral cords, all asymmetrically angular, uppermost cord strongest, forming periphery; intervals 2–3 times width of cords and filled with 3–5 thin but well-developed spiral threads. Base of last whorl with 16–18 angular, well-spaced spiral ridges, with a weaker one in each interval, plus 8–16 (sometimes weak) threads on rostrum. Collabral threads strong and dense, rendering intermediary sculpture more or less cancellate, coarser ones pliculate, those immediately below sinus cord very strongly, almost spirally inclined.

White, main cords occasionally with inconspicuous, pale brown flecks. When fresh with traces of dull olive-brown periostracum in interstices.

Protoconch missing in all types.

Dimensions: 82.1 x 22.4 mm (holotype); largest paratype 91.4 x 23.8 mm.

TYPE LOCALITY: West of Cape Comorin, Kerala, S. W. India, 300–400 m.

TYPES: Holotype (Pl. 18, figs A–B) NHMUK 20110299, off Kerala, West of Cape Comorin, India, 300–400 m, 82.0 x 21.3 mm; paratypes NMSA L7998, same data as holotype.

REMARKS: *Turris intercancellata* differs from other members of the *Turris crispa* complex in all or most of the following characters: siphonal canal shorter and broader (resembling *T. bipartita* in this character), collabral sculpture strong but simple, instead of lamellar and crinkled, rendering the cord intervals more or less obliquely cancellate; subsutural cord barely developed; main cords lack secondary spiral threads; cords on base of spire

whorls relatively weak and widely-spaced; colour pattern absent or consisting of faint dots. In general sculpture this species resembles the form of *T. bipartita* described as *Pleurotoma indica* Deshayes, 1833, but the latter (pl. 5, figs G–J) differs markedly in proportions and has a pronounced fasciole, which is absent in *T. intercancellata*.

A large quantity of specimens of this species was found in a box in a dealer's warehouse in Tuticorin; according to the dealer, this sample was trawled west of Cape Comorin.

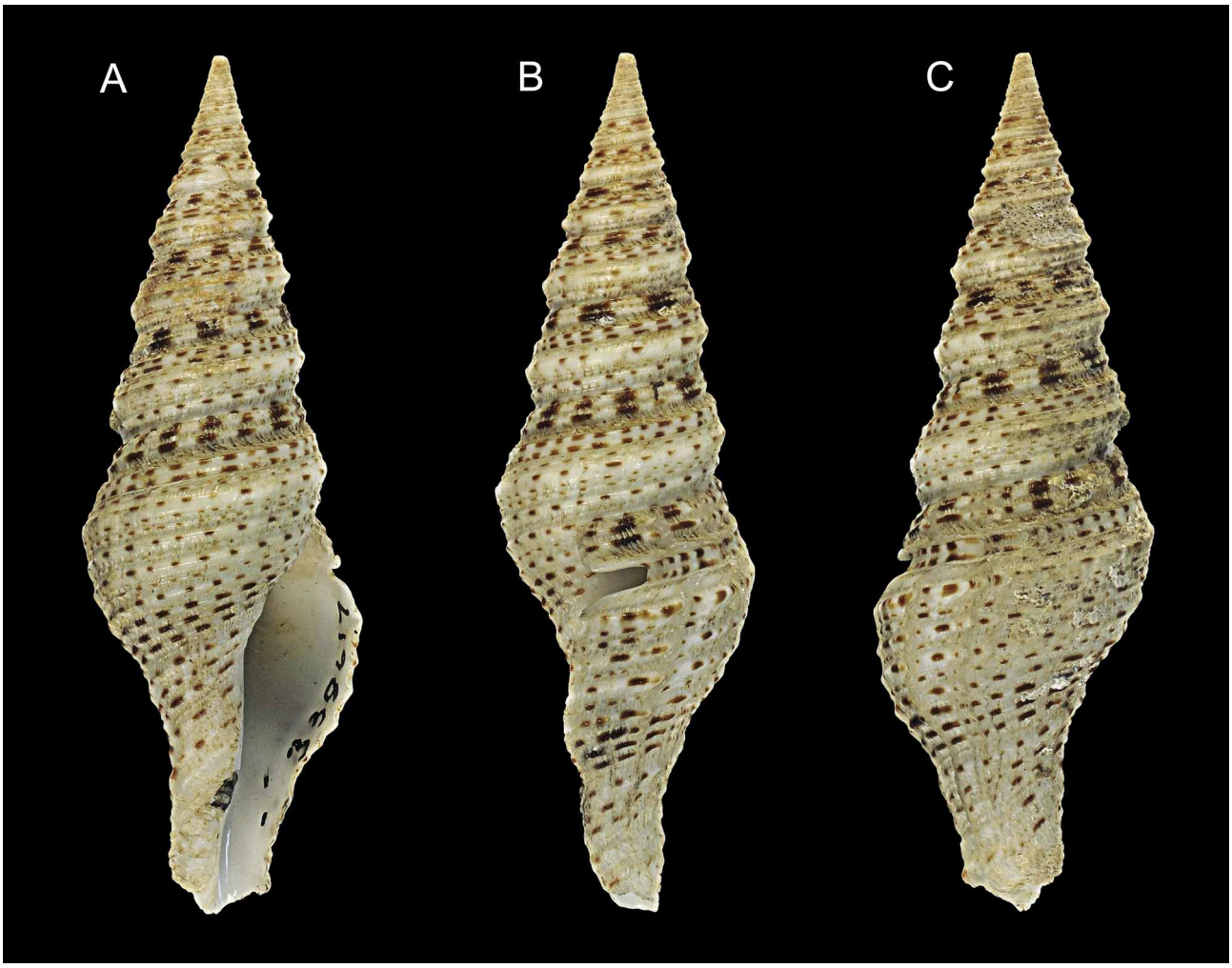

PLATE 19. *Turris intricata* Powell, 1964: **A–C**—Holotype, entrance to Honolulu Harbour, Oahu, Hawaii, USNM 338617, 43.3 x 14.2 mm.

Turris intricata Powell, 1964
Plate19, figs A–C

Turris crispa intricata Powell, 1964: 332, pl. 254, fig. 4; Kay 1979: 341, fig. 113K. Type loc.: entrance to Honolulu Harbour, Oahu Island, Hawaii, 12 fath. [22 m].
Turris sp aff *intricata* Severns, 2011: pl. 174, fig. 5.

DESCRIPTION (based on holotype): Shell biconic-fusiform, b/l 0.33, a/l 0.44 (spire *ca* 1.2 times length of aperture), siphonal canal relatively short and slightly recurved, end obliquely truncate; spire whorls angular at lower third; anal sinus moderately deep, a parallel-sided slot, edge raised into a flange.

Suture shallow; subsutural cord depressed, bearing two spiral ridges, sulcus about half width of cord, shallowly concave, with a few weak spiral threads, overridden by oblique lamellae. Sinus cord low, declivous, concave-topped, flanked on either side by a smooth, rounded ridge. Peripheral cord roundly declivous, smooth, nearly as wide as sinus cord. Lower part of spire whorl with two cords (the 2nd partly visible above suture, intervals with 1–2 fine threads. Base of last whorl with 16 narrow spiral cords, upper intervals with a single intermediary thread,

cords on rostrum angular and cut into lamellae. Early whorls with 3 subequal spiral cords. Collabral threads relatively strong and lamellate, mostly interstitial.

Off-white, spiral ridges flecked with brown dots and dashes, not connected axially; subsutural cord and a zone around upper base more strongly patterned than elsewhere.

Attains 43.8 mm.

DISTRIBUTION: Endemic to Hawaii, in 18–37 m.

TYPES: Holotype USNM 338617.

REMARKS: This species differs markedly from *Turris crispa* in proportions.

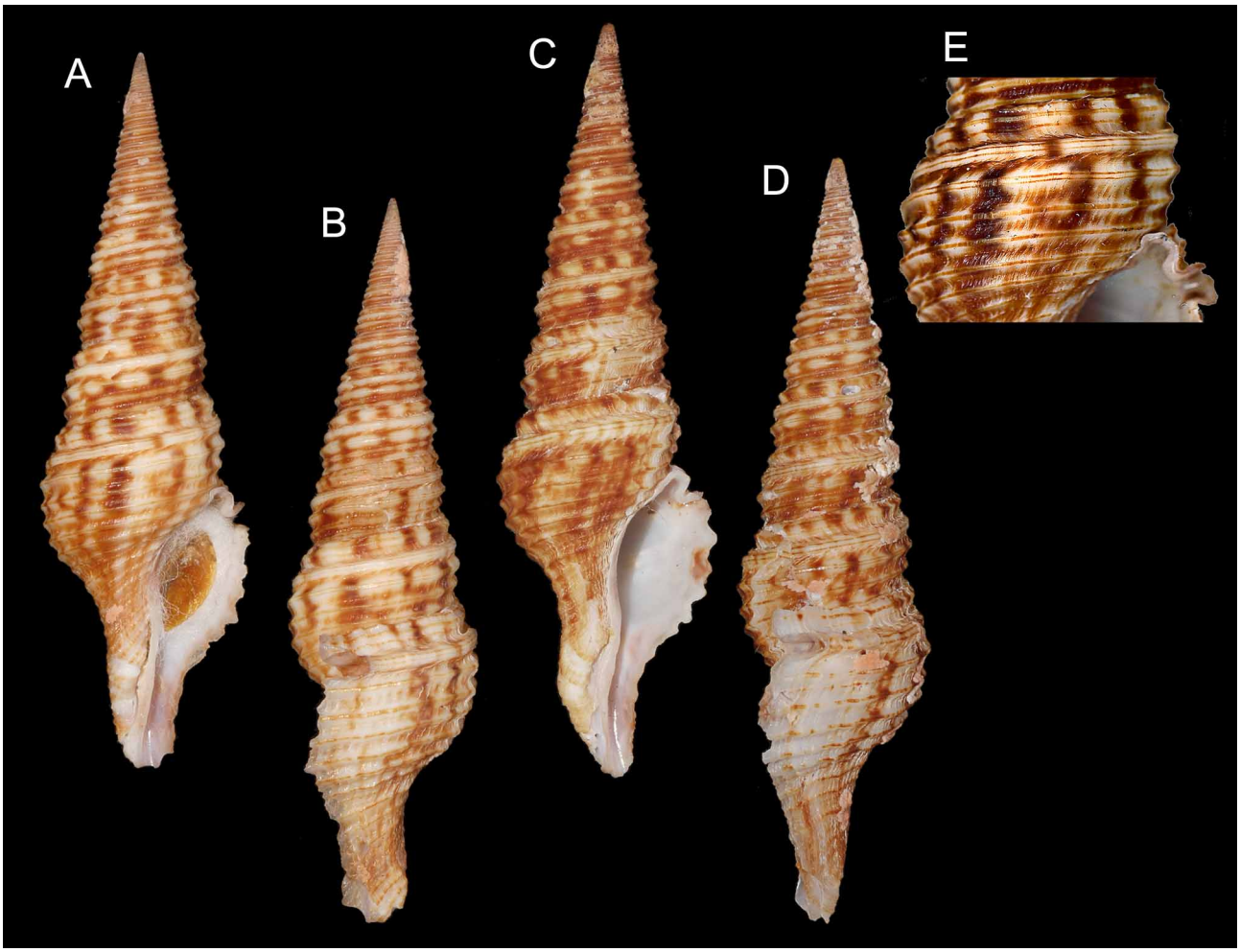

PLATE 20. *Turris kantori* nsp.: A, **B**—Holotype, NHMUK 20110301, off Pangandaran, central Java, Indonesia, 15–20 m, RK, 51.2 x 14.9 mm; **C**–**E**—Paratype, same data, NMSA L2827, 55.6 x 15.1 mm.

***Turris kantori* sp. nov.**
Plate 20, figs A–E

DESCRIPTION: Shell with spire angle 20–21º; b/l 0.29, a/l 0.37–0.42, with an acuminate, orthoconoid spire; base of last whorl constricted, siphonal canal moderately short, tapering and recurved, in adult with distinct fasciole and false umbilicus; suture deep; teleoconch whorls *ca* 14 in number. Anal sinus relatively shallow, parallel-sided, with a raised rim.

Subsutural cord angular, relatively narrow, with a median ridge and a weaker thread on either side; sulcus a deep, narrow furrow, slightly recessed under sinus cord complex. Sinus cord angular except for a flat or concave crest formed by a double ridge, sides steeply sloping. Peripheral cord slightly projecting, somewhat flat-topped but with sloping sides; base of whorl with two similar but slightly weaker cords, intermediary threads fine and few,

sometimes absent. Base of last whorl with *ca* 14 ridges, those above strongest and with an occasional intermediary, those anteriorly finer and even. Collabral threads lamellate, forming small scales along lower edge of sulcus.

Colour pale brownish-yellow, with irregular, oblique flames of brown, paler behind lip, spiral ridges that surmount cords are lined with brown, interior of siphonal canal violet-tinged. Periostracum a persistent glaze, dull or reddish-brown. Attains 55.8 mm.

Protoconch somewhat worn, conical, of about 3 whorls, with axial riblets on last whorl, breadth *ca* 0.80 mm.

DISTRIBUTION: Gulf of Manaar (S. E. India) to southern coast of Java, in 15–20 m.

TYPES: Holotype (Pl. 20, figs A–B) off Pangandaran (Teluk Citanduy), south coast of central Java, INDONESIA, 7º43'S; 108º42'E, in 15–20 m; collected RK, 51.2 x 14.9 mm, NHMUK 20110301. Paratype 1 (Pl. 20. figs C–E), same data, 55.8 x 16.4 mm, NMSA L8437/T2655.

OTHER MATERIAL EXAMINED: INDIA: Tuticorin, Gulf of Manaar, 8º47'N; 78º08'E, (NMSA L5459), one worn shell, RK.

REMARKS: *Turris kantori* is distinguished from *T. annulata* by its angular, sloping-sided, flat-topped spiral cords, whose crests bear a twin (or single), brown ridge (absent in *T. annulata*), in the sinus cord being weaker than the succeeding one (peripheral in *annulata*) and the base of the later spire whorls bearing an extra cord (i.e. there are five main cords on the penultimate whorl in *kantori*, four in *annulata*). The anal sinus is deeper and more parallel-sided in *T. kantori* and bordered by a prominently raised flange, weak in *T. annulata*. Finally, the suture is shallower in *T. annulata*, which also lacks the oblique stripes of *kantori*. There is also a superficial resemblance to *Turris omnipurpurata* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000, which also possesses brown-lined cords. However that species differs from *T. kantori* not only in its narrower form, very shallow suture and lilac ground colour, but also in its subsutural and sinus cords bearing only a single, rather than a double, brown line.

Although the types were probably collected alive from fishing nets, the soft parts have decomposed to sediment. A worn shell found in a fishing village midden in the Tuticorin area (see above) indicates the possible extent of its distribution. This is not unexpected, as the fauna of the south (Indian Ocean) coast of Java and Sumatra has a significant number of species in common with southeastern India, as a consequence of predominant ocean current systems.

ETYMOLOGY: named in honour of Dr Yuri Kantor of IPEE, for his help and friendship.

***Turris kathiewayae* sp. nov.**

Plate 21, figs A–G

Turris annulata (non Reeve, 1843); (in part) Powell 1964: 333, pl. 181, fig. 19; Olivera 2000: 310, pl. 1, specimen 9, pl. 10 (left); ?Kosuge 1988: 101, pl. 41, fig. 2; Li & Li 2007: 65, pl. 1, fig. 4; Olivera & Sysoev 2008: pl. 680, fig. 10; Robin 2008: pl. 448, fig. 1.

Annulaturris annulata; Vera-Peláez *et al.* 2000: pl. 2, fig. 9 (anal sinus), pl. 3, fig. 1 (protoconch), pl. 7, figs 5–7.

Turris (Annulaturris) annulata; Hasegawa *et al.* 2000: 633, pl. 315, fig. 66.

DESCRIPTION: Spire angle 25–28º, b/l 0.27-0.30, a/l 0.41–0.49, with an acuminate, orthoconoid spire, siphonal canal straight, moderately thick but tapering, is approximately equal to the aperture; whorls with periphery more or less median, suture channelled; teleoconch whorls *ca* 16 (apex more or less worn in all seen). Anal sinus shallow, tongue-shaped, parallel-sided, bordered by a raised flange; interior of aperture with 4–7 well-spaced spiral ridges. Sculptured by strong spiral cords with narrow intervals, containing collabral threads. Subsutural cord well-defined, consisting of two irregularly and weakly crenulate ridges, the posterior one slightly weaker but forming a flange bordering suture, sometimes a third ridge above sulcus. Sulcus deep and narrow. Sinus cord peripheral, slopingly flat-topped and concave to very shallowly bifid, often no wider than other cords, irregularly crenulated by shallow lunulate grooves. Base of spire whorls with two main cords, each unequally and deeply bifid, forming a thin accessory cord on its anterior margin; a 3rd main cord sometimes just visible above suture; intervals between main cords deep, much narrower than cords. Base of last whorl with 18–20 strong, irregularly nodose spiral cords, posteriorly with some interstitial ridges, a variable development of microscopic threads in intervals and on sides of cords; ridges on rostrum finer, closer and more even, becoming obsolete near end, rendered rugose by collabral threads. Collabral threads thin but strong, forming oblique lamellae in sulcus. Traces of pale periostracum in interstices between spiral cords.

White with some light brown blotches or flecks, particularly below suture, or pale buff with white cords, anal cord sometimes marked with arcuate brown lines (creating a gemmulate appearance); rostrum and aperture white. Protoconch (photomicrograph courtesy of B. Olivera) bluntly conical, *ca* 3 whorls, the last with arcuate, suture-to-suture axial riblets; breadth *ca* 0.76 mm.

Attains 61 mm.

DISTRIBUTION: Philippines to southern Japan, China, Tonga and New Caledonia, 25–320 m.

TYPE LOCALITY: Aliguay Is., Zamboanga, Northern Mindanao, PHILIPPINES

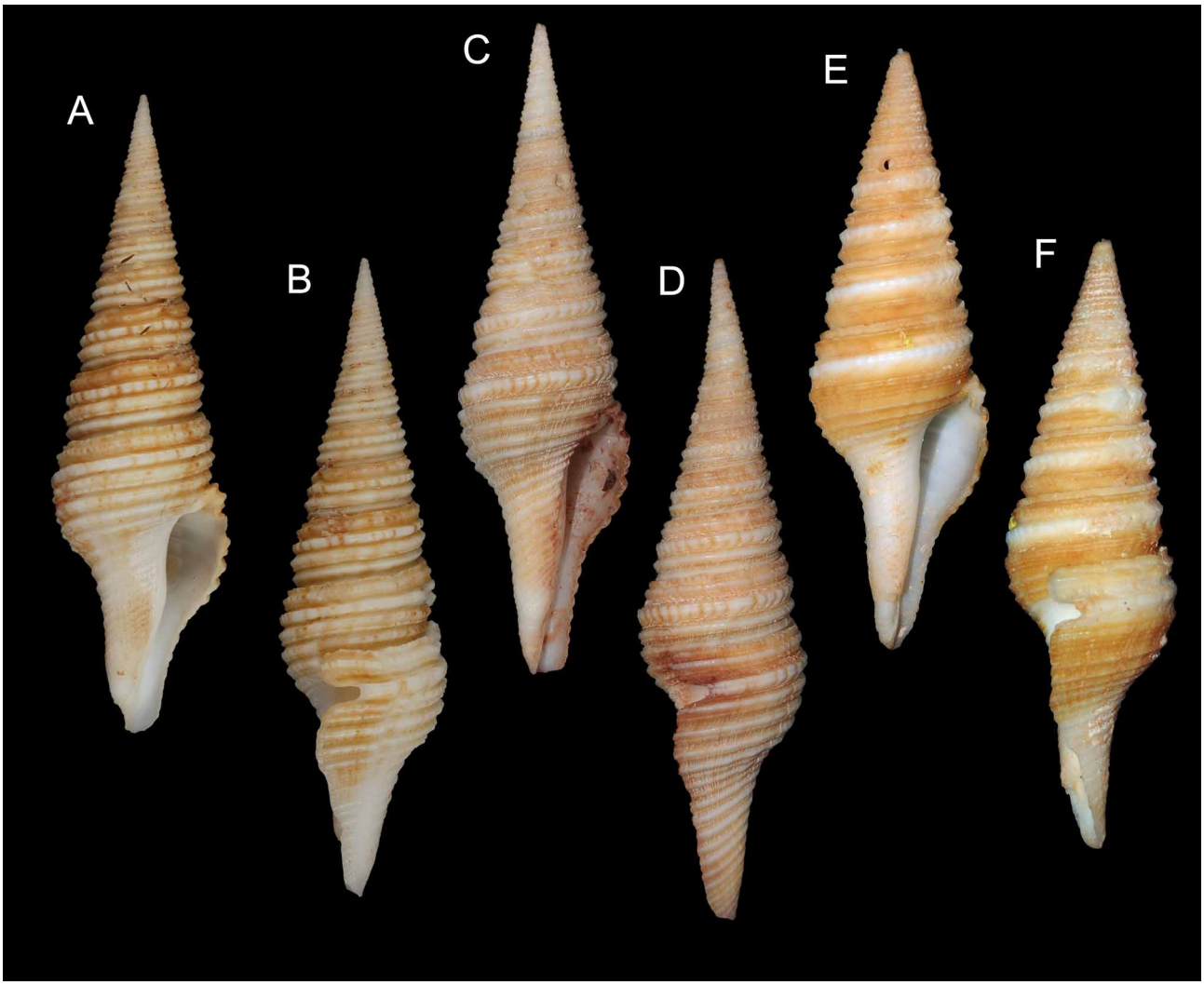

PLATE 21. *Turris kathiewayae* nsp.: A, **B**—Holotype, 51.1 x 14.0 mm, Aliguay Is., Mindanao, Philippines, MNHN 24946; **C**, **D**—Paratype 1, 55.0 x 16.3 mm, Aliguay Is, Mindanao, Philippines, 44–73 m, ANSP 426055; **E**, **F**—55.0 x 16.3mm, New Caledonia, 350–450 m, BO colln;

TYPES: Holotype (Pl. 21, Figs. A-B), Aliguay Is. (8º45'N; 123º14'E), Zamboanga Province, Northern Mindanao, **PHILIPPINES,** 25–40 m, MNHN 24946, dimensions 59.0 x 16.8 mm; Paratype 1 (Pl. 21, Figs. C-D) same locality, 25–40 fath. [44–73 m], 55.0 x 16.3 mm (ANSP 426055); Paratype 2, TERRASSES, Stn. DW3120 (22°44'S, 167°12'E), 320 m, **NEW CALEDONIA**, 53.7 x 15.4 mm (IM-2009-13559); Paratypes 3-9, Aliguay Is., off Dapitan, Zamboanga Province, Philippines, 46–73 m (2 paratypes NHMUK 20110302, 4 paratypes NMSA L8206/T2588). **JAPAN:** Off Tosa, 100 fath. [183 m], NMSA J3682/T2589, 2 paratypes, don. M. Azuma; off Okino-Tori Island, Japan (20º25'N; 136º00'E), trawled (NMSA L8305/T2587: Shingo Habu).

OTHER MATERIAL EXAMINED: PHILIPPINES: off Bohol Is., Philippines (9º50'N; 124º10'E) (NMSA K2117: R. Martin). NEW CALEDONIA: 20°54.15'S, 167°01.7'E, 120–250 m (MNHN); Noumea, 350–450 m (BO colln); TONGA: 21°17'S, 175°00'E, 350–355 m (MNHN), 18°37'S, 174°03'E, 320-360 m (MNHN)

REMARKS: Although this taxon has been regarded as merely a "white deep-water form" of *T. annulata* (Reeve, 1843), the two may be distinguished as follows:

Turris annulata: Suture shallow; spiral cords low and roundly angular, with narrow, very shallow intervals; subsutural cord very low, with 3–4 low, wide-set ridges; sinus cord not crenulated. Colour uniform reddish-brown with a persistent brown periostracum overall.

Turris kathiewayae: Suture shallowly channelled; spiral cords high, with deep, relatively wide intervals, most main cords compound (with 1–2 weaker ridges cut off on the anterior face); subsutural cord prominent, bearing 2–3 strong ridges; sinus cord usually irregularly crenulated by very shallow lunulate grooves. Colour off-white, to pale brown with diffuse pale brown marks, crests of ridges with brown spiral lines; periostracum interstitial.

A specimen from Noumea differs from all others seen in colouration, which is light brown with a white sinus cord; there are also minor sculptural differences. The significance of these differences is unknown.

ETYMOLOGY: Named in honour of Ms Kathie Way of the NHMUK, for her valuable assistance and advice.

Turris nadaensis Azuma, 1973

Plate 22, figs A–I

Turris nadaensis Azuma, 1973: 33, figs 6–7 (radula); Higo, Callomon & Goto 1999: 303; Olivera 2000: 309, pl, 1, specimen 10, pl. 8; Hasegawa *et al.* 2000: 633, pl., 315, fig. 64; Olivera & Sysoev 2008: pl. 681, figs 2–4; Robin 2008: pl. 449, fig. 2. Type loc.: off Nada, Kii Peninsula, Japan, 20–30 fath. [37–55 m].

Turris undosa (*non* Lamarck, 1816); Robin 2008: pl. 449, fig. 2.

?Turris undosa; Vera-Peláez *et al.* (2000): pl. 1, fig. 2 (protoconch), pl. 4, figs 4–6.

DESCRIPTION: Shell very variable in proportions and in length of siphonal canal, b/l 0.27–0.32, a/l 0.28–0.42. Suture shallow. Sculptured by sharp spiral cords, with rather wide intervals, bearing fine collabral threads.

Subsutural cord low (in fact distinctly impressed), bearing a sharp median ridge with a weak one on either side. Sulcus moderately deep, and recessed under sinus cord, bordered by delicate, oblique scales (instead of a thin lamellate flange as in *T. undosa*). Sinus cord angular and shouldered (i.e. sloping) towards lip becoming flattened and with two thin ridges. Peripheral cord angular and moderately prominent, separated from sinus cord by a delicate, minute interstitial flange bearing oblique scales. Base of spire whorls with two angular ridges with widely sloping sides, intervals sometimes one or more spiral threads. Base of last whorl with a total of 17–20 spiral ridges, the upper 5–6 the strongest, becoming gradually weaker anteriorly (with a few finer intermediary threads), 5–6 uniformly fine ones on base of rostrum.

White or brownish-white, with oblique axial stripes, breaking into spots on base of last whorl, crests of main ridges often with a thin brown line; inner lip and base of last whorl tinged with violet.

Protoconch small, conical, *ca* 2.5 whorls, all except 1st with arcuate axial riblets.

Attains 87.5 mm.

DISTRIBUTION: Southern Japan and Vietnam to the Philippines, Thailand and Solomon Islands, 10–150 m, sand.

TYPES: *T. nadaensis*: Holotype in private collection of late Masao Azuma, no. 16151, present location not traced.

OTHER MATERIAL EXAMINED: JAPAN: Tanabe Bay, Honshu, Japan (ANSP 421607 and 420647). VIETNAM: off Nha Trang, 70 m, sand (NMSA L7994: N. Thach). THAILAND: Racha Is., Phuket area, 20 m (NMSA: S. Patamakanthin); S.W. of Phuket, *ca* 100–120 m, trawled (NMSA L3588: S. Patamakanthin). PHILIPPINES: Balut Is., tangle net in *ca* 150 m; Masbate Is., 10–20 m, and Aliguay Is, Mindanao, trawled in 80–150 m (Guido Poppe colln); Matanos, Samal Is. Davao Gulf; Olango and Palawan Is. (BO colln); Panglao, Bohol, 73–110 m (NMSA L1855: D. Steinke); West Samar (NMSA G6252: F. J. Dayrit); Palawan, tangle net (NMSA J3949: F. J. Springsteen); SOLOMON IS: 9°50.4'S, 160°53.2'E, 82-83m (MNHN)

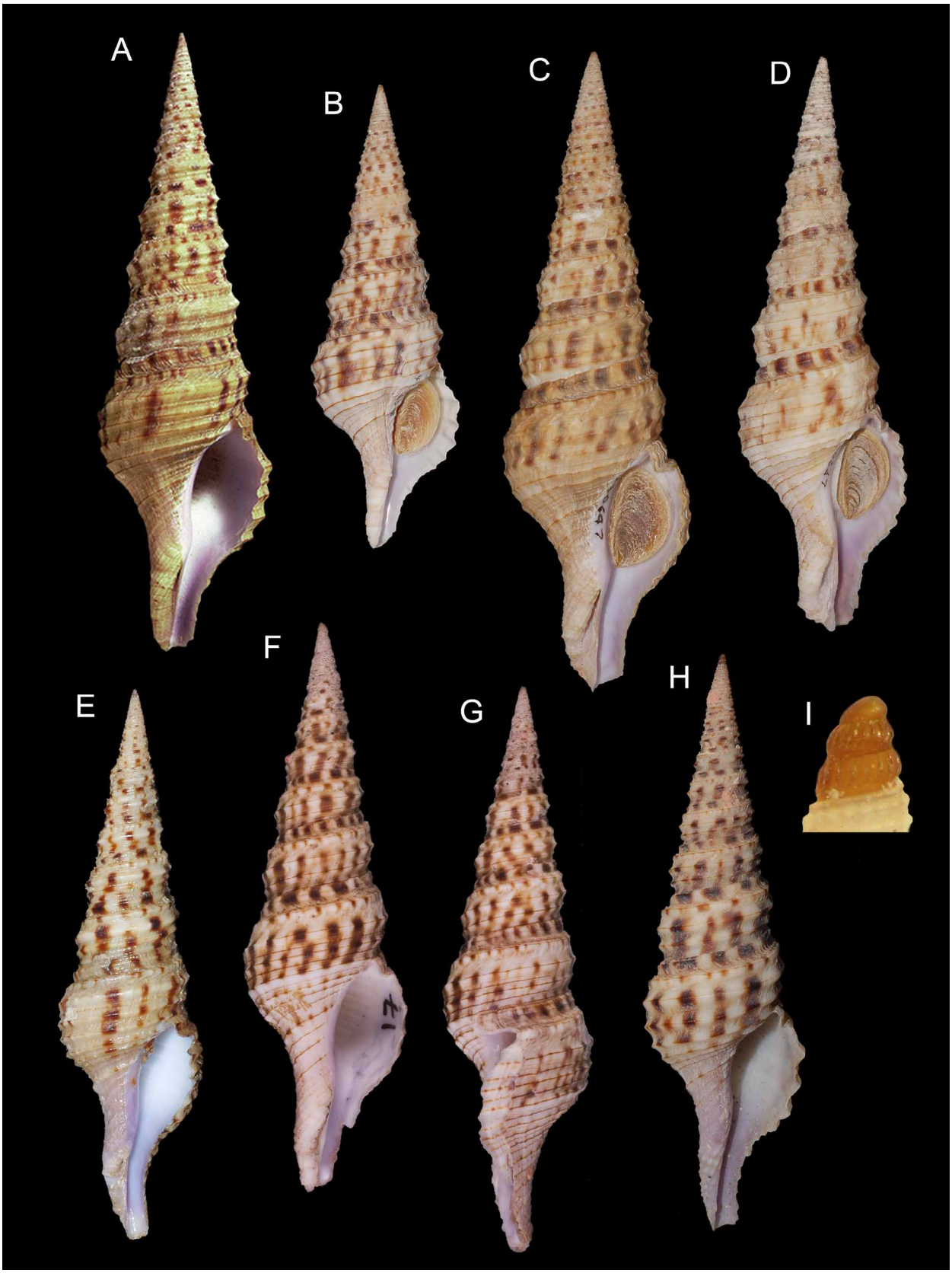

PLATE 22. ***Turris nadaensis*** **Azuma, 1973**: **A**—Holotype, off Nada, Kii Peninsula, Japan, 45–65 m, in late Masao Azuma colln (not traced), 83.2 x 22.5 mm; **B**—Tanabe Bay, Honshu, Japan, ANSP 421607, 62.1 x 20.3 mm; **C, D**—Tanabe Bay, Honshu, Japan, ANSP 420647: **C**—87.4 x 26.6 mm; **D**—86.1 x 25.7 mm; **E**—Olango Is., Philippines, BO colln, 67.5 x 18.0 mm,; **F**, **G**—off Nha Trang, Vietnam, 20–70 m, NMSA L7994, 86.6 x 24.7 mm; **H, I**—Palawan Is., Philippines, BO colln, 65.2 x 18.6 mm.

REMARKS: *Turris nadaensis* is often confused with *T. cristata*, but is easily distinguished by its weak subsutural cord, much more uniform spirals and non-contracted base. Olivera (2000) discussed variation in *T. undosa* (as *T. nadaensis*) and noted the occurrence of a form with a stronger, sharper peripheral cord, rendering the whorls more angular; this form would appear to be typical *undata*. However, available material of *T. nadaensis* appears to show variation that is not easy to interpret. Variability in length of siphonal canal and in its degree of tapering is obvious, as is colour of base (vivid violet to pinkish-white). But size also varies: adult Philippine examples are usually 67.0 to 76.0 mm in length, Vietnamese specimens are particularly large (to 87.5 mm) but Thai adults may not exceed 46 mm. One Vietnamese specimen (NMSA L7994) has a particularly short, recurved siphonal canal. Variation in angularity of spiral cords may be visually exaggerated by a distinct spiral line on their crests.

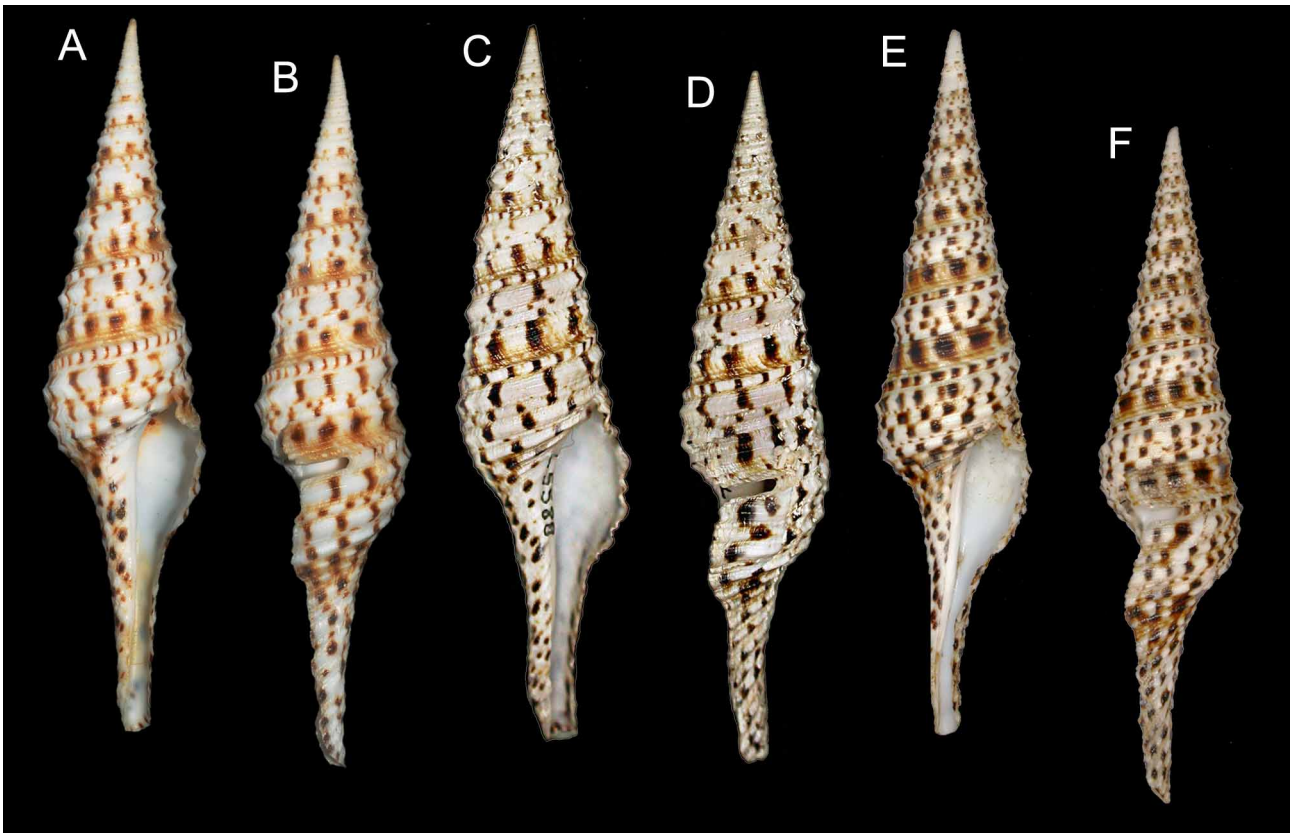

PLATE 23. *Turris normandavidsoni* Olivera, 2000: A, **B**—Holotype, Sogod, Cebu, Philippines, 50-100 m, PNMM-40067, 66.3 x 15.2 mm; **C**, **D**—Paratype, Sogod, Cebu, Philippines, 50-100 m, NMSA L5588, 67.2 x 15.3 mm,; **E**, **F**—Nha Trang, Vietnam, NMSA L8204, N. Thach, 89.2 x 20.6 mm.

Turris normandavidsoni Olivera, 2000
Plate 23, figs A–F

Turris normandavidsoni Olivera, 2000: 300, pl. 1, specimen 3, pl. 3; Li & Li 2007: 67, pl. 1, fig. 5; Olivera & Sysoev 2008: pl. 682, figs 1–2. Type loc.: Sogod, Cebu, Philippines, 50–100 m.
Turris crispa (*non* Lamarck, 1816); Robin 2008: pl. 448, fig. 4.

DESCRIPTION: Shell thin, narrowly fusiform, b/l 0.21–0.25, spire subulate and orthoconoid, siphonal canal long and narrow (a/l 0.44–0.50), slightly twisted, sometimes sloping dorsally Outer lip opisthocline in side view, edge fluted; anal sinus moderately deep to deep, linear. Suture indistinct.

Somewhat resembling *Turris crispa*, but sinus cord adapically tabulate (terraced) and angular, and sulcus relatively wide and shallowly concave, with 4–6 fine spiral threads; subsutural cord replaced by two fine ridges; anterior cords on spire whorls consisting of a strong, angular peripheral cord and 1–2 basal cords, plus fine spiral

threads on and between main cords; base of last whorl with 17–19 spiral cords and weaker intermediaries, those on rostrum fine. Collabral threads fine, cancellating the finer spiral threads.

Colour pattern generally of axial bars or axially oblong spots of dark to blackish-brown, those on subsutural cord generally large, conspicuous and slightly diffuse; area of sulcus and a zone on last whorl level with parietal region often tinged with pale brown.

Attains 99.3 mm in length, but more often 60–70 mm.

DISTRIBUTION: Philippines, Vietnam and southern China to New Guinea and Fiji, 20–150 m, in muddy sand.

TYPES: Holotype in PNM (40067). Paratypes in NHMUK and USNM; paratype 8, NMSA L5588: BO,

OTHER MATERIAL EXAMINED: VIETNAM: Nha Trang, 20–60 m (NMSA L2804: N. Thach). PHILIPPINES: between Sogod and Bogo, off N. Cebu (BO colln); off Balicasag Is., 80–120 m, tangle nets, Nucnucan Is., Bohol, 10–25 m and Palawan Is., 25 m (G. Poppe colln); Matanos, Samal Is, Davao Gulf, Mindanao, 80–100 fath. [146–183 m) (BO colln); Calituben, Bohol, *ca* 30 m (BO colln).

REMARKS: This taxon is superficially intermediate between the larger *T. crispa* and *T. babylonia*. It has the slender proportions of *T. crispa*, but differs in details such as the broader, more strongly patterned subsutural cord. From *Turris babylonia*, *T. normandavidsoni* differs in its much less angular peripheral cord.

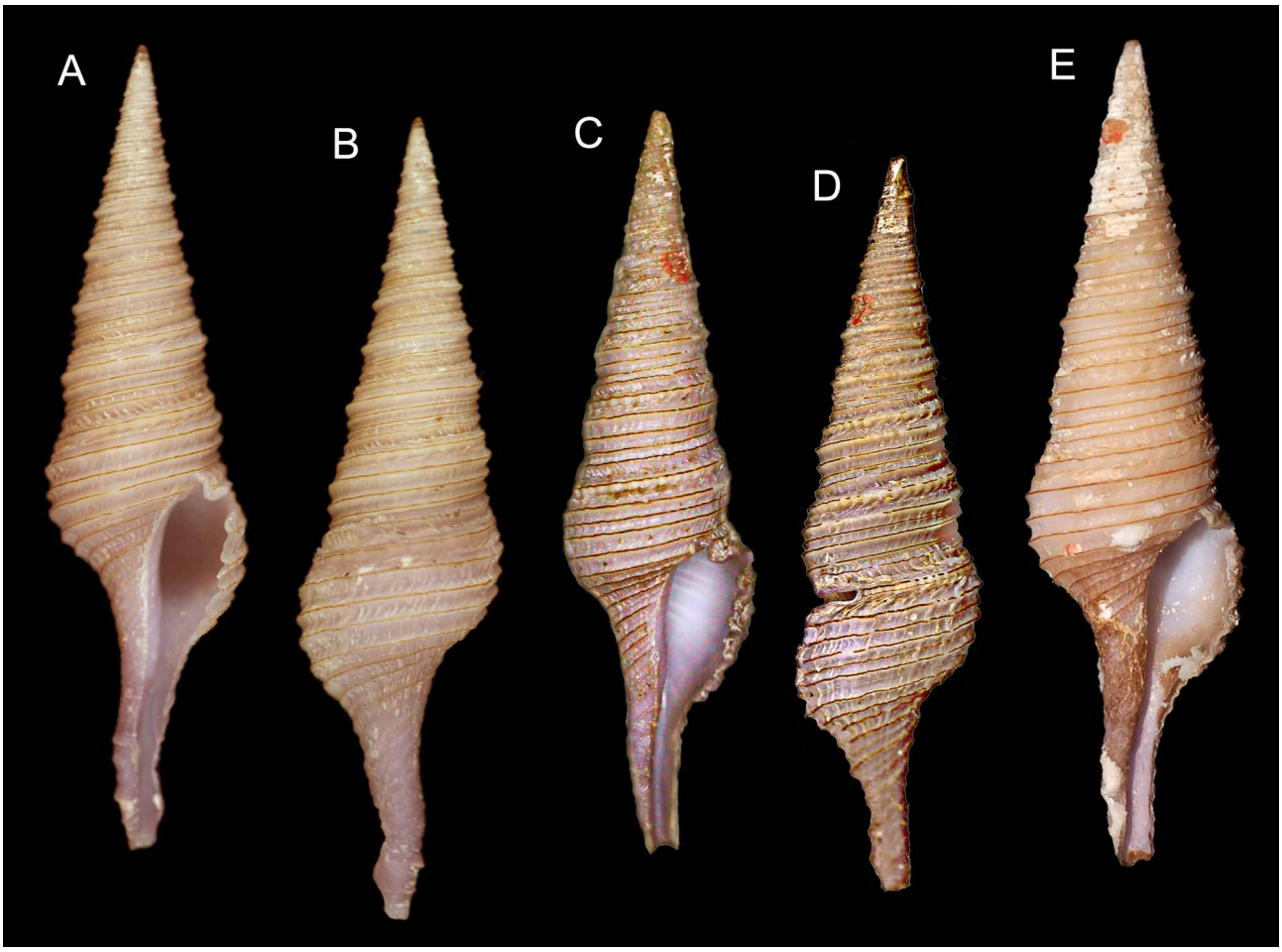

PLATE 24. *Turris omnipurpurata* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000: **A**, **B**—Holotype, Balicasag Is., Bohol, Philippines, MNCN-39978, 47.3 x 12.3 mm; **C**, **D**—Paratype 1, Balicasag Is., Bohol, Philippines, 49.4 x 14.1 mm, J. Conde colln; **E**—Balicasag Is., Bohol, Philippines, BO colln, 48.5 x 12.7 mm.

Turris omnipurpurata Vera-Peláez, Vega-Luz, & Lozano-Francisco, 2000

Plate 24, figs A–E

Turris omnipurpurata Vera-Peláez, Vega-Luz, & Lozano-Francisco, 2000: 6, pl. 1, fig. 3 (protoconch), pl. 2, fig. 3 (anal sinus), pl. 6, figs 1–5. Type loc.: Balicasag Is., Bohol Sea, Philippines;

DESCRIPTION: Shell narrowly fusiform (b/l 0.26–0.29, a/l 0.46–0.49), with subulate, orthoconoid spire; siphonal canal long (longer than rest of aperture), narrow, slightly recurved, whorls weakly convex, suture very shallow; anal sinus moderately deep, narrow, parallel-sided.

Sculptured by narrow, angular spiral cords, without intermediary threads. Subsutural cord low, bearing a simple angular cord; sulcus deep, anteriorly forming a notch-like recess, bordered by a thin crenulated flange. Sinus cord angular on spire whorls, flattening behind lip, followed anteriorly by a relatively wide interval, containing a thin, wavy intermediary thread, base of spire whorls with 4 spiral cords, the upper one peripheral. Base with *ca* 8 angular spiral cords, becoming progressively weaker anteriorly, plus 9 coarse, more rounded ones on rostrum. Collabral threads coarse and lamellose, particularly on later part of last whorl.

Pale violet, crest of spiral cords with a reddish-brown line, protoconch and inner lip also violet.

Protoconch conical, of *ca* 3 whorls, last one with opisthocline axial riblets. Attains 49.4 mm.

DISTRIBUTION: Bohol Sea, Philippines, in *ca* 250–300 m.

TYPES: Holotype MNCN 15.05/39978 (pl. 25, figs C–D), paratypes in private hands.

OTHER MATERIAL EXAMINED: PHILIPPINES: Balicasag Is., Bohol (BO colln, and paratype 1 in Javier Conde de Saro colln),

REMARKS: The narrowly fusiform shape and violaceous colouration, with a single brown line on the crest of the cords, are characteristic of this rare species.

Turris pagasa **Olivera, 2000**

Plate 25, figs A–I

Turris pagasa Olivera, 2000: 304, pl. 1, specimen 4, pl. 5; Olivera & Sysoev 2008: pl. 679, fig. 1 a, b. Type locality: Pamilacan Is., Bohol, Philippines, 100–150 m.

Turris kilburni Vera-Peláez, Vega-Luz, & Lozano-Francisco, 2000: 7, pl. 1, fig. 8, pl. 2, fig. 2, pl. 6, figs 8–12; Robin 2008: p. 2008, fig. 14. Type loc.: Balicasag Is., near Panglao, Bohol Sea, Philippines. **Syn. nov.**

DESCRIPTION: Shell relatively thick, narrowly fusiform (b/l 0.25–0.30), with subulate, orthoconoid spire (a/l 0.42–0.48), siphonal canal relatively long (equal to rest of aperture) and recurved, in large examples with a fasciole and false umbilicus. Edge of outer lip fluted, lip in side view evenly convex; anal sinus fairly shallow, narrowly V-shaped or linear and slot-like, interior of outer lip with 6–9 spiral ridges in adult.

Whorls moderately convex, initially with 3 spiral ridges, the median one gemmulate; suture narrow but deep. In adults, subsutural cord relatively low, comprising an angular, ledge-like main ridge, but with age developing feeble, converging lamellae on either side. Sulcus approximately as wide as subsutural cord, moderately deep and steep-sided, but filled with scale-like collabral threads. Sinus cord low but forming a slight shoulder, as narrow as other cords, sometimes distinctly undulating—almost gemmulate - in lateral as well as apical view; crest of sinus cord, typically bearing 2 thin spiral threads. Characteristically the interspace on either side of sinus cord is 2–3 times its width. Base of spire whorls with 2–3 ridges, the uppermost peripheral, equal in width to their intervals, which bear collabral threads and occasionally faint spiral threads. Base of last whorl with 19–22 spiral ridges, upper ones widely-spaced, with a weaker spiral thread in each interval, ridges finer and closer on rostrum. All whorls with strong, lamellar collabral threads interstitially.

Ground colour white, usually tinged with pale fawn on lower part of spire whorls; spiral ridges patterned with dark reddish-brown quadrangular dots and spots, subsutural cord with dark brown blotches, interval between sinus cord and peripheral cord white (and wider than others).

Protoconch conical, of 2.8–3.3 whorls, nucleus small, smooth, other whorls with opisthocline axial riblets; maximum breadth *ca* 0.75 mm.

Attains 98 mm.

DISTRIBUTION: Central and southern Philippines to Japan and New Caledonia; 10–55 m [18–101 m] also recorded from 80–300 m.

TYPES: *T. pagasa*: Holotype (pl. 26, figs A–B) and two paratypes in Olivera colln, holotype to be deposited in PNM. *T. kilburni*: Holotype MNCN 15.05/39977 (pl. 26, figs H–I), paratypes in private hands.

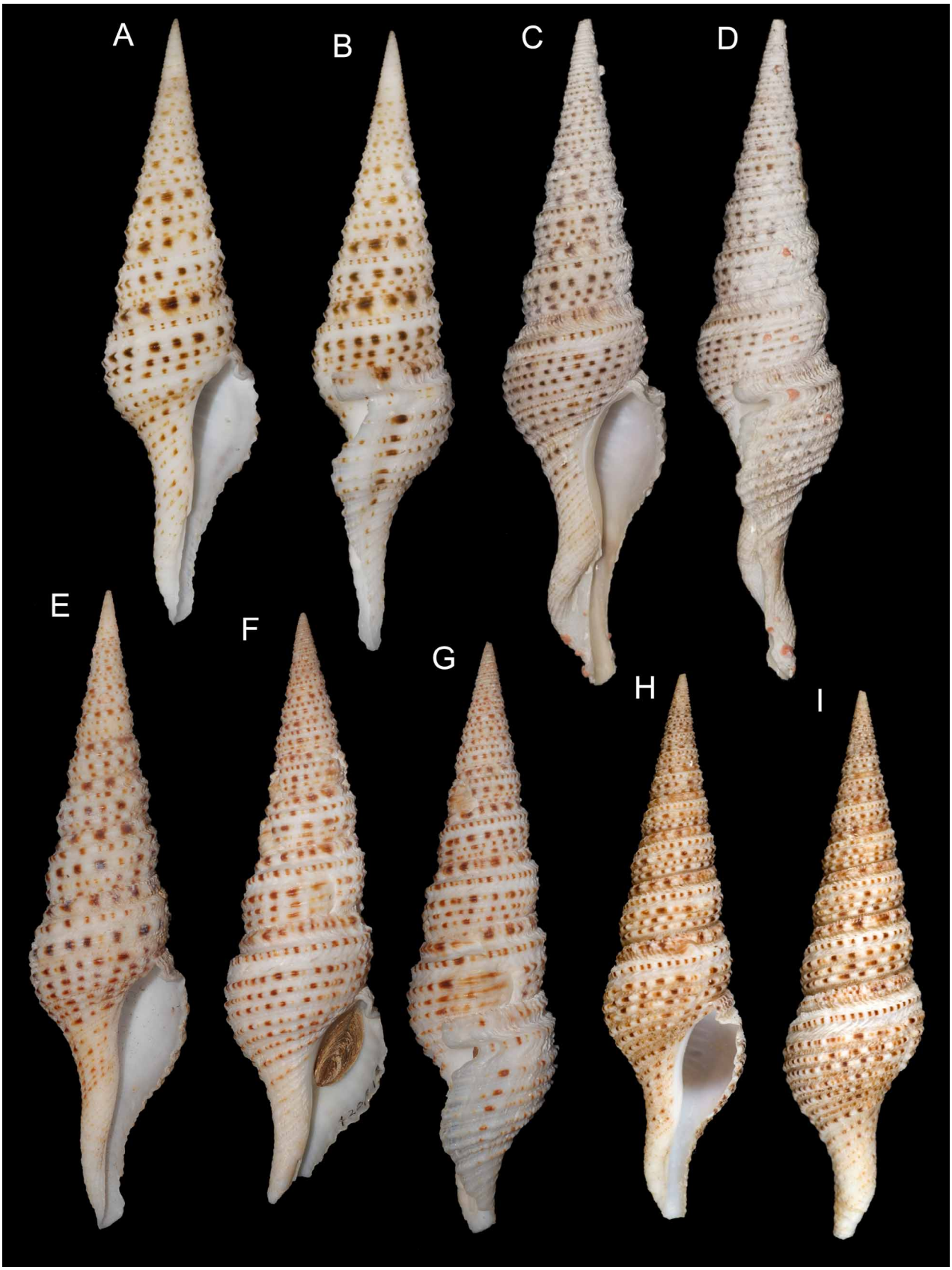

PLATE 25. *Turris pagasa* Olivera, 2000: A, **B**—Holotype, Pamilacan Is., Philippines, PNMM, 63.3 x 16.1 mm; **C**, **D**—Paratype 2, Bogo, Cebu Is., Philippines, BO colln, 97.9 x 23.9 mm; **E**—Pamilacan Is., Philippines, BO colln, 85.6 x 21.6 mm; **F**, **G** –Tanabe Bay, Japan, ANSP 86.8 x 23.1 mm; **H**, **I**—Holotype of *Turris kilburni* Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000: Balicasag Is., Philippines, MNCN-15.05/39977, 78.6 x 21.2 mm.

OTHER MATERIAL EXAMINED: PHILIPPINES: Masbate Is., 10–20 m; Zamboanga, Laminusa Is., from fishermen; Balut Is., tangle nets in *ca* 150 m (all G. Poppe colln); Aliguay Is., Zamboanga, 25–40 fath. [46–73 m] NMSA: BO); Pamilcan Is, Bohol, 100–150 m (holotype *T. pagasa*); Pamilacan Is, Bohol, 80–120 fath. [146–220 m]; off Dipolog, northern Mindanao, 80–150 m (Paratype 1, *T. pagasa*), Bogo Is., 50–100 m (Paratype 2, *T. pagasa*); Olango Is. and Leyte (all BO colln). NEW CALEDONIA: 19°05'S, 163°29'E, 230-240 m, MNHN; 22°42'S, 167°10'E, 315 m, MNHN; 24°45'S, 168°09'E, 230 m, MNHN.

REMARKS: *Turris pagasa* is characterised by its relatively low spiral cords with regular (usually small) brown spots overall, except for a relatively wide white or pale buff zone on either side of sinus cord (the anterior one typically the wider), and by all cords (including the unusually narrow sinus cord) being weakly crenulated. In life, the colour pattern is muted by a persistent, mainly interstitial, dull olive-brown periostracum (although this is usually cleaned off by the collector). The siphonal canal in adults is often longer and more strongly recurved than in other *Turris* species, and the shell thicker.

Turris ruthae **Kilburn, 1983**

Plate 26, figs A–C

Turris ruthae Kilburn, 1983: 558, figs 1 (protoconch), 12 (radula), 22–23. Type loc.: off Port Grosvenor, Transkei, South Africa, 80 m, on a bottom of calcareous nodules and lithothamnion sheets.

DESCRIPTION: Medium-sized, b/l 0.32–0.33; aperture much shorter than spire (a/l 0.37–0.39), spire somewhat cyrtoconoid (initially orthoconoid), suture shallow, not channelled, whorls with projecting, rounded peripheral angle; anal sinus deep with slightly constricted opening.

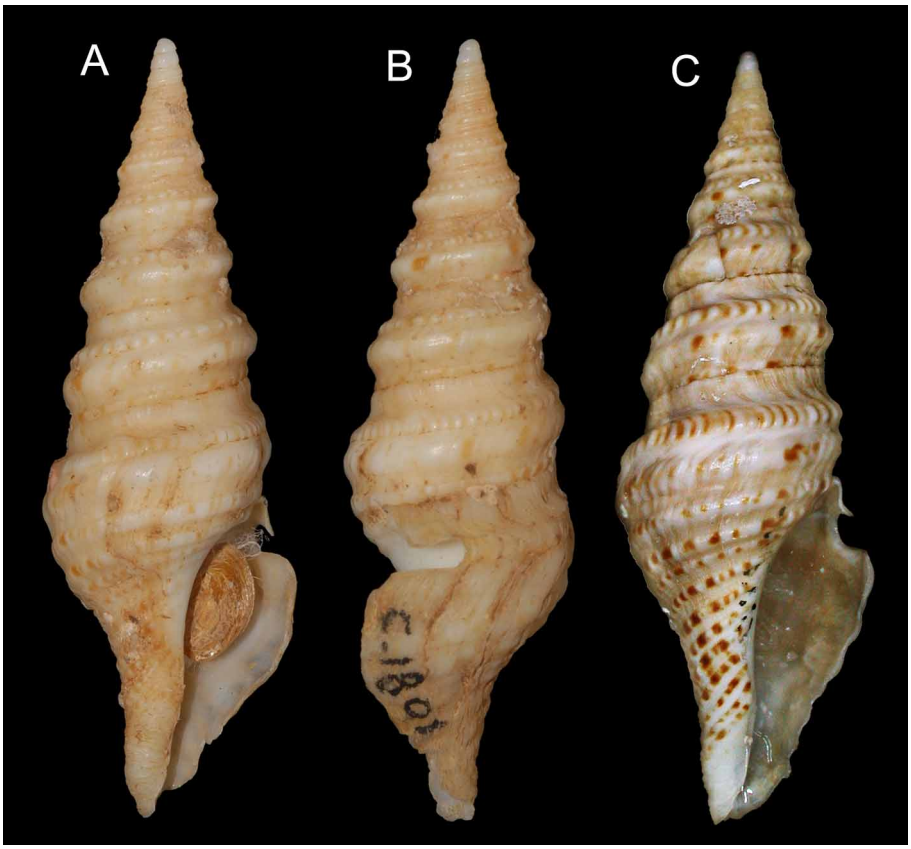

PLATE 26. *Turris ruthae* Kilburn, 1983: **A**, **B**—Holotype, 80 m, off Port Grosvenor, Transkei, South Africa, NMSA C1801, 44.6 x 14.4 mm; **C**—Off East London, 100 m, coarse sand, NMSA B8110, 47.7 x 15.6 mm

Spiral cords rounded, without sharp edges. Subsutural cord ill-defined (forming a weak ridge on early whorls), sulcus broad and gently concave, sinus cord with low, lunulate crenules; base of each whorl with a single rounded cord, showing at periphery of last whorl; base of last whorl with 3 rounded, weakly nodose cords, weakening anteriorly, subequal in width to their intervals; rest of base and rostrum with 10–12 anteriorly weakening spiral ridges, obsolete on base, sometimes with irregular intermediary threads. Spiral cords incised by growth lines, of which intermittent ones form weak, rounded nodules. Microscopic spiral threads overall, most distinct below suture.

Protoconch blunt (protoconch I fairly large), of 2 whorls, maximum diameter 1.4–1.6 mm, smooth, with terminal growth lines only.

Cream-colour, sometimes with diffuse brown spots, periostracum not obvious.

Attains 45 mm.

DISTRIBUTION: South-east Africa, on outer continental shelf and upper slope of southern Natal and Transkei, from Scottburgh to near East London, 70–150 m, mainly on coarse sand and sponge bottoms.

TYPES: Holotype NMSA C1801, paratypes in NMSA, SAMC, NHMUK, USNM, ANSP.

OTHER MATERIAL EXAMINED (all NMSA, dredged RK *et al.*, paratype data cited by Kilburn (1983) not repeated here): NATAL: S.E. of Illovo Beach, 90 m, fine sand (D4090); off Park Rynie, 96 m, live sponges (B8560); off Kwanyana River, 100 m, sponge rubble (C5316); off Port Edward, 120–128 m, live sponges (D1378), TRANSKEI: between Mtamvuna and Mzamba Rivers, 100 m, large living sponges, rubble (C5400); off Mzamba River, 100 m, sponge rubble (C5261); off Mpahlana River, 100 m, sponge rubble (C5232); off Mncwasa Point, 74 m, sand and rubble (C2204); off Whale Rock, 72–78 m, loose rocks, sand, shell debris (C3130); off Whale Rock, 90 m, sponge rubble, coarse sand, some rocks (C9474). EASTERN CAPE: off Nahoon, 85 m, medium sand, broken shell (C8254); off Kidd's Beach, 90 m, coarse sand, sponge (B8250); off East London, 90 m, coarse sand (B7996); do, coarse sand, sponges, gorgonians, living (B7817).

REMARKS: *Turris ruthae* somewhat resembles *T. ambages*, but has much more angular whorls, a less abbreviated base, more rounded spiral cords with wider intervals, a wide, evenly concave (instead of narrowly channelled) sulcus, and a less distinctly differentiated subsutural cord; the protoconch, too, differs in size and in other respects.

The shape of the marginal teeth of the radula is unique within *Turris* (see Kilburn (1983)), and may indicate the species to belong to a distinct genus.

Turris spectabilis **(Reeve, 1843)**

Plate 27, figs A–F

Pleurotoma spectabilis Reeve, 1843: pl. 1, sp. 6; Weinkauff 1875: 22, pl. 4, fig. 9. Type loc.: Ticao Is., Philippines.

Turris spectabilis; Hedley 1922: 217; Powell 1964: 336, pl. 181, figs 16, 17; Habe 1970: 121, pl. 38, fig. 21; Cernohorsky 1972: 182, pl. 53, fig. 1; Drivas & Jay 1986: 28, text fig.; Wilson 1994: 194, pl. 38, fig. 11; Hasegawa *et al.* 2000: 631, pl. 314, fig. 60; Olivera & Sysoev 2008: pl. 682, fig. 8; Robin 2008: pl. 449, fig. 1.

DESCRIPTION: Shell somewhat pyramidal-fusiform (b/l 0.26–0.31, a/l 0.34–0.39) on account of its shorter base and siphonal canal; the canal is recurved to the right. Whorls strongly convex, with periphery median. Outer lip in side view strongly convex, opisthocline above; anal sinus shallow, linear.

Sculpture: subsutural area concave, without a distinct strong cord (but 1–3 fairly weak to very weak ridges in subsutural area) nor a sulcus. Sinus cord narrow, depressed and ledge-like in adult (thin and granular in juveniles); periphery with a prominent, sloping angle, formed by the bluntly angular peripheral cord (and a weaker one immediately above it); base of spire whorls with 1-3 ridges, and some thin ridges. Base of last whorl with 10–12 spiral ridges, those above widely-spaced and obtusely angled, those on end of rostrum thin and closer. Interstitial sculpture of oblique striae, visible mainly on base of whorls and on rostrum.

Yellowish-white, vividly stained below the suture (particularly on early whorls) with a band of reddish-or orange-brown (occasionally dark brown) and usually with a similar zone around upper part of base; main cords with conspicuous spots or bars of dark brown, strongest on peripheral cord; sinus cord and basal cords vividly spotted with dark brown and white.

Attains 80 mm.

DISTRIBUTION: Zululand and Gulf of Aden eastwards through Indonesia and the Philippines to Melanesia (Marshall Islands), Queensland, Japan and Kiribati, New Caledonia and French Polynesia in clean sand, often under rocks or coral, 4–120 m.

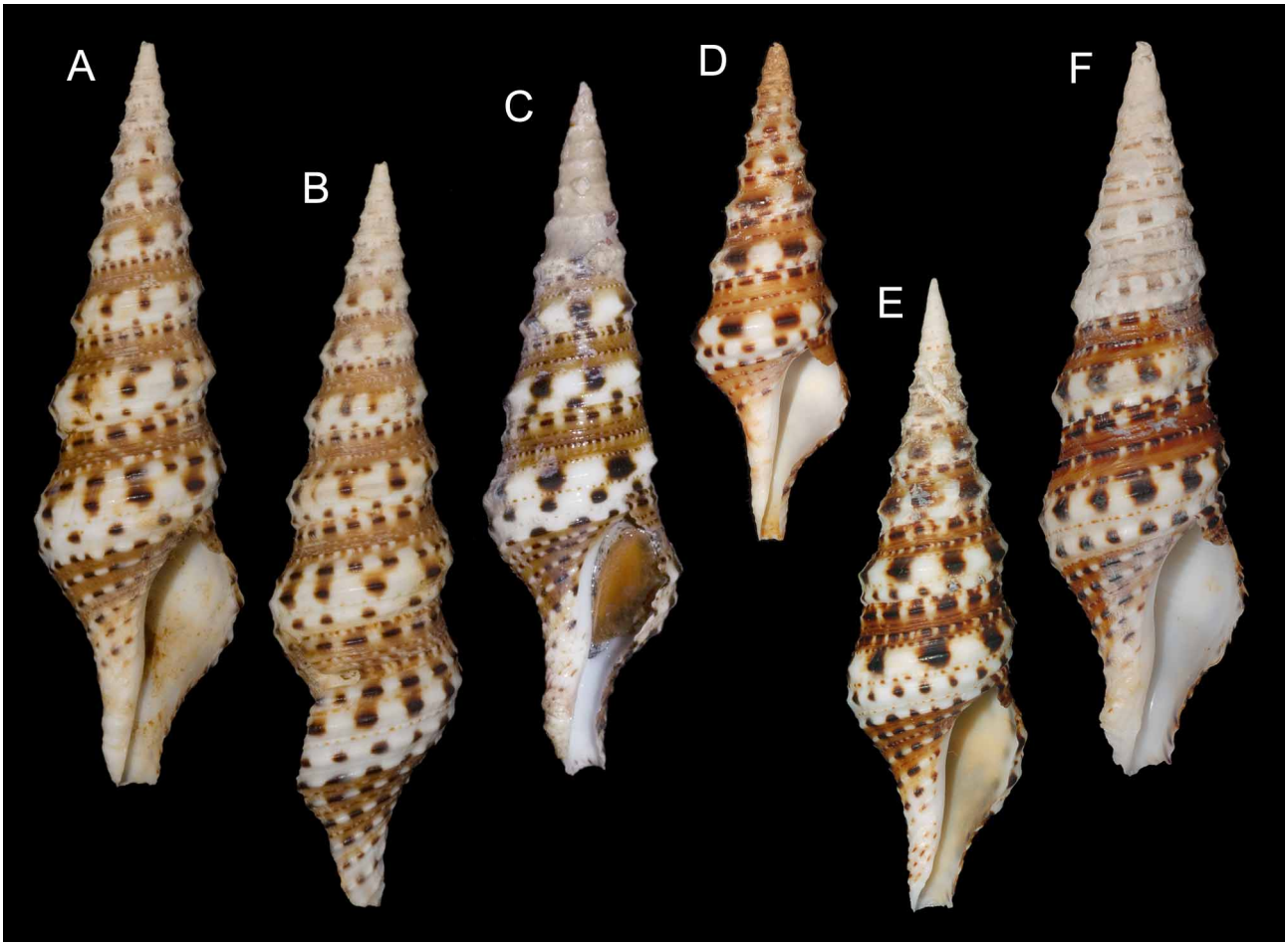

PLATE 27. *Turris spectabilis* (Reeve, 1843): A, B—Bohol, Philippines, BO colln, 77.0 x 21.9 mm; **C**—Olango Is., Philippines, BO colln, 72.2 x 20.4 mm; **D**—Queensland, Australia, BO colln, 45.8 x 14.9 mm; **E**—Northern Mozambique, 3-4 m, BO colln, 58.4 x 16.9 mm. **F**—Northern Mozambique, 5 m, BO colln, 67.4 x 19.3mm.

TYPES: Holotype originally in Stainforth colln, now evidently lost (Powell 1964).

OTHER MATERIAL EXAMINED: JAPAN: off Kii, 90 m (NMSA J3691: M. Azuma). PHILIPPINES: Olango Is., 15 m, and 20–25 m (G. Poppe colln); same data, 24–40 fath. [44–73 m] (BO colln); between Bohol, Olango and Cebu Islands, 20–60 m; Bogo, northern Cebu, deep water (BO colln); Panglao, Bohol (NM L1856: D. Steinke); off Punta Engano, Mactan Is. (NMSA K2438: F. J. Springsteen). MARQUESAS IS.: Nuku Hiva (BO colln, dived H, Morrison). QUEENSLAND: Townsville (BO colln, ex K. & G. Rowse). THAILAND: Ko Aen Village, Talang, Phuket, 10–20 m, fishing nets (NMSA L5196: RK); Pattam, Saibury district, 10–15 m, nets (NMSA L5113: S. Patamakanthan). MOZAMBIQUE: Quissimajul Bay, 3–4 m, mud, sand and algae (BO colln, ex C. P. Fernandes); N. of Beira, 18–37 m (NMSA G3267: B. Lafferty). SOUTH AFRICA: Leadsman Shoal, northern Zululand, 7–11 m, under stone ledge, half buried on sand (NMSA E2502: D. Herbert, dived); same locality, 8–11 m (NMSA E6511: D. Herbert, dived); NEW CALEDONIA: 20°49.5’S, 165°19.6’E, 10 m, MNHN; 20°40.4’S, 165°114.9’E, 26-40 m, MNHN; FRENCH POLYNESIA: 23°48.5’S, 147°53.5’E, 120-150 m, MNHN.

REMARKS: The shorter siphonal canal, lack of a differentiated subsutural cord or sulcus, and the combination of vivid reddish- or orange-brown zones and dark brown spots distinguish *T. spectabilis* from *T. garnonsii* and *T. babylonia*.

PLATE 28. ***Turris tanyspira*** **Kilburn, 1975**: **A**, **B**—holotype, N. of Beira, Mozambique, 20–35 m, NMSA G2710, 49.0 x 15.6 mm; **C**, **D**—off Phumula, southern Natal, South Africa, 44 m, NMSA L7419, 78.2 x 23.1 mm. **E**, **F** - 69.3 x 20.6mm, 60–100m, Ankaramany, Madagascar, NMSA; **G**, **H**—Holotype of *Turris ankaramaniensis*, Bozzetti, 2008, 72.9 x 20.3mm, 60–100 m, Ankaramany, Madagascar, MNHN.

Turris tanyspira Kilburn, 1975
Plate 28, figs A–H

Turris tanyspira Kilburn, 1975: 603, fig. 15. Type loc.: N. of Beira, central Moçambique, 10–20 fath. [18–37 m].
Turris ankaramanyensis Bozzetti, 2006: 8, textfigs; Robin 2008: pl. 448, fig. 1. Type loc.: Ankaramany, 100 km north of Tolagnaro, S.E Madagascar, 60–100 m. **New synonym.**

DESCRIPTION: Shell with b/l 0.30–0.31, a/l 0.36–0.38; siphonal canal short, narrow and oblique; fasciole strong to weak, large examples with a narrow false umbilicus; interior of aperture usually with thin spiral ridges. Suture narrowly channelled, becoming less so in large individuals; whorls weakly convex.

Sculptured by angular spiral cords, with intervals which are equal to them or wider, and are crossed by relatively coarse collabral threads (plicules); initially cords are very feebly granular. Subsutural cord relatively low and bearing an angular median ridge with a weaker one on either side. Sulcus a very deep and narrow furrow, not distinctly recessed under sinus cord, in fresh shells containing slightly lamellar collabral threads. Sinus cord surmounted by two thin ridges and forming a slight shoulder in immature shells (but not adults). Peripheral cord angular and moderately prominent, bearing 1–3 ridges, interval between this and sinus cord with 2–3 fine spiral threads. Base of spire whorls with 2–3 subequal, angular ridges with widely sloping sides, their intervals sometimes with a few spiral threads and fine axial threads. Base of last whorl with 18–28 ridges, the upper 5–6 the strongest, becoming gradually weaker anteriorly (with a few finer intermediary threads), *ca* 11 uniformly fine ones on base of rostrum.

White to brownish-white, with oblique axial stripes of dark brown, sinus cord pale, with a few widely-spaced brown spots and often two thin brown spiral lines; inner lip and aperture white, sometimes tinged with violet. Periostracum a translucent light brown covering, giving live shells a pale khaki hue.
Protoconch apparently very small (breadth *ca* 1.1 mm; perhaps 1.3 whorls, but limit not clear).
Maximum length 81.0 mm (Bozzetti 2006).

DISTRIBUTION: Southeast Africa, from southern Mozambique to the Natal/Transkei border, and southern Madagascar; low reefs in about 30–50 m.

TYPES: *T. tanyspira:* holotype NMSA G2710. *T. ankaramanyensis*: holotype in MNHN, two paratypes in colln Bozzetti.

OTHER MATERIAL EXAMINED: SOUTH AFRICA: off Phumula, southern Natal, (30°38.28'S, 30°32.92'E), 44 m, living in sand (NMSA L7419: M. Wallace); same locality, 36 m, on low profile off-shore reef (NMSA W2725: M. Wallace and V. Fraser). MOZAMBIQUE: N. of Beira, 18–37 m (NMSA G2710/T7855: holotype); Lacerda Lighthouse, 40 km N. of Maputo, 20–30 m, on steep slope (NMSA L4641: J. Rosado). SE MADAGASCAR: Ankaramany, (NMSA L7996: L. Bozzetti).

REMARKS: Similar to *T. nadaensis*, but with a deeper suture, blunter spiral cords, and the sulcus is deeper, not distinctly recessed and lacks scales. The holotype of *T. tanyspira* (pl. 29, figs A–B) is a small individual with blotches rather than stripes, and hence appears to differ widely from the Madagascar form described as *T. ankaramanyensis* (pl. 29, figs G–H). However, specimens subsequently collected off southern Natal and Mozambique agree closely with an example of the latter, kindly presented by Luigi Bozzetti.

Turris undosa (Lamarck, 1816)
Plate 29, figs A–F

Pleurotoma undosa Lamarck, 1816: 8, pl. 439, fig. 5; Lamarck 1822: 95; Kiener 1839: 13, pl. 3, fig. 2; Weinkauff 1875: 18, pl. 3, figs 7–8. Type loc. "Oc. indien" by Lamarck
Turris undosa; Li & Li 2007: 67, pl. 1, fig. 6,
Turris cf. T. undosa; Olivera & Sysoev 2008: pl. 682, fig. 9.
?Pleurotoma raffrayi Tapparone-Canefri, 1878: 246, pl. 6, fig. 1. Type loc.: Port Dorey, Papua New Guinea.

DESCRIPTION: Spire high and orthoconoid, base relatively short and contracted, b/l 0.27–0.32, a/l 0.33–0.41; whorls rendered angular by a submedian peripheral keel. Suture very shallow. Outer lip strongly convex, straightening on siphonal canal. Anal sinus somewhat shallowly linguiform, widening only at lip, directed slightly

anteriorly; edge of outer lip with fluted crenations; siphonal canal spout-like, usually with a narrow false umbilicus. Subsutural cord depressed, weakly convex, slightly undulating towards lip, bearing 2–3 fine spiral ridges; sulcus narrow and shallow (but deeper than suture). Sinus cord much narrower than peripheral cord, ledge-like, with a low median ridge; peripheral cord much stronger and more angular than others; last whorl with 4 spiral cords; base of spire whorls with 1–2 thin, widely spaced spiral ridges. First few whorls evidently with 3 weak spiral cords. Base of last whorl with 12–17 irregular, granular cords, upper ones strongest, with wide intervals, each interval with a thin ridge, those on fasciole (9–10) finer and denser. Interstices with oblique collabral threads, outer lip preceded by coarse, crenulated growth lines.

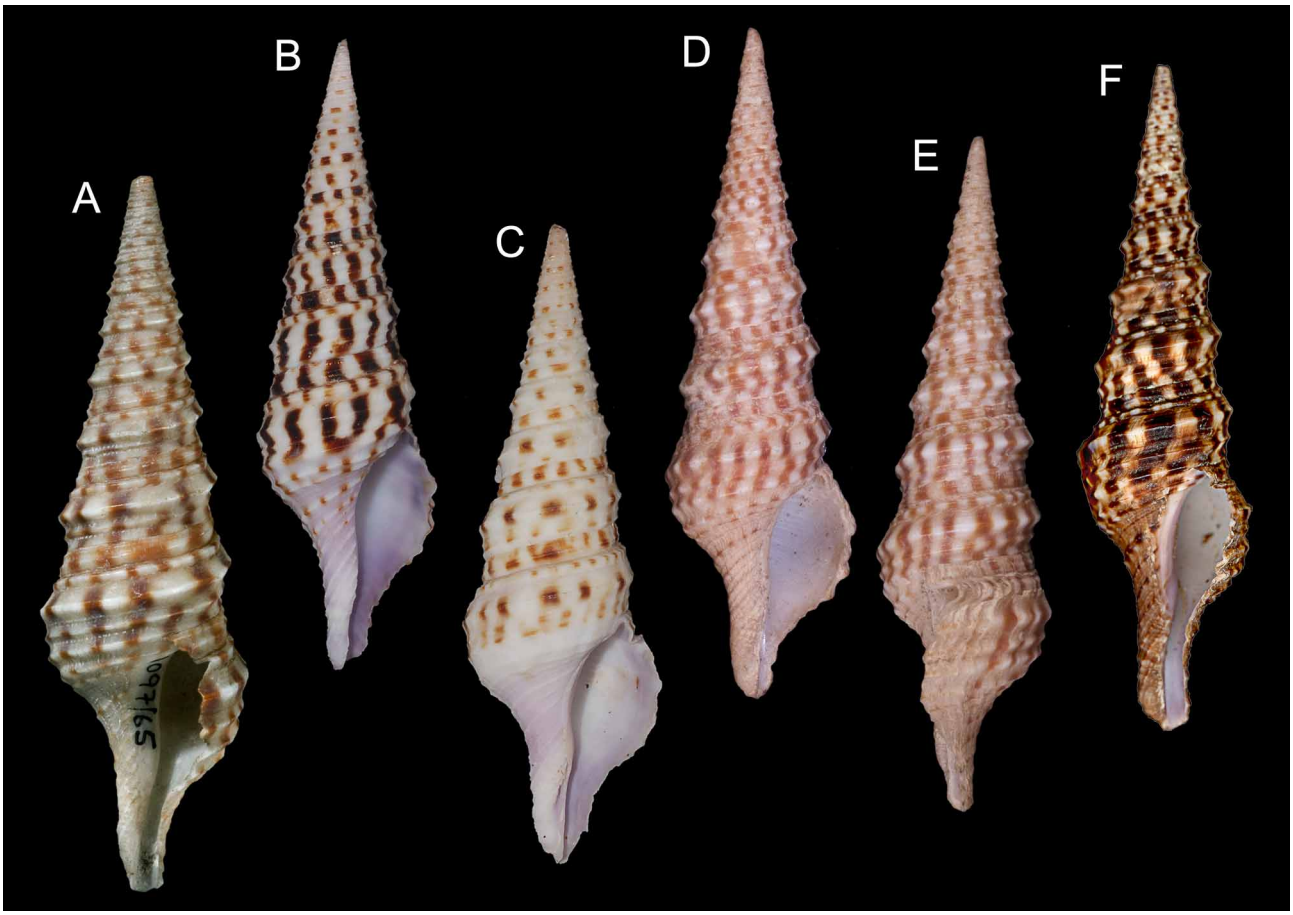

PLATE 29. *Turris undosa* (Lamark, 1816): A—Syntype of *Pleurotoma undosa*, MHNG 1097/65, "Oc. indien", 63.4 x 18.5 mm; **B—**Olango Is, Philippines, BO colln, 57.1 x 16.5 mm; **C—**Palawan Is, Philippines, BO colln, 64.3 x 20.4 mm,; **D, E**—Moluccas, 74.6 x 20.1 mm, NMSA; **F** – Moluccas, ZMUC, 74.7 x 21.7 mm.

When fresh, cream-coloured, apex and back of outer lip tinged with brown, with opisthocline stripes or bands of dark brown, breaking into rows of dots on base; sinus cord with short bars of dark brown, which become arcuate towards sinus; base, aperture and columella tinged with lilac.

Attains 74.6 mm.

Protoconch small (breadth *ca* 1.60–*ca* 1.90 mm), olive-brown, damaged in all seen.

TYPES: *P. undosa*: Holotype (labelled by Lamarck) MHNG 1097/65, annotated "Oc. indien". *P. raffrayi*: types lost (originally in Raffray collection but now not amongst his material in MNHN).

DISTRIBUTION: Indonesia and Philippines, north to the Beibu Gulf in China (Li & Li, 2007).

OTHER MATERIAL EXAMINED: PHILIPPINES: Off Panglao Is, gill nets in 200–400 fath. [366–732 m] (NMSA: BO colln, ex Q. Hora); Olango Is.(?), Cebu, 20–40 fath. [44–73 m], and Palawan Is. (NMSA: BO); Masbate Is. (ISNB: Dautzenberg colln, ex Bulow). INDONESIA: Moluccas [Maluku] (ZMUC).

REMARKS: The identity of the specimen figured by Kiener as *P. undosa* was queried by Deshayes (1843: 625), but its characters, although somewhat crudely drawn, do agree with that species. Not common in early collections (old shells usually pale brownish, striped with reddish brown, lilac tinge absent).

Pleurotoma raffrayi, judging by the type figure (dorsal view only), closely resembles *T. undosa* in sculpture of spire whorls, but the dorsum of the last whorl exhibits 8 or 9 similar-sized spiral cords, against 4–5 stronger, main ones with weaker ridges on the base.

The species illustrated by Wilson 1994 (194, pl. 38, fig. 15) as *Turris undosa*, is not that species, but shows greater resemblance to *Turris clausifossata*,

Turris venusta (Reeve, 1843)
Plate 30, figs A–B

Pleurotoma venusta Reeve, 1843: pl. 9, sp. 79. Type loc.: Siquijor Island, Central Visayas, Philippines.

DESCRIPTION (based on holotype): Shell fusiform, b/l 0.34, a/l 0.48; last whorl more strongly convex than preceding ones, suture shallow, siphonal canal long, narrow, tapering with acute end; anal sinus apparently widely V-shaped [but damaged].

Subsutural cord weak, with a blunt median ridge and a weak one on either side; sulcus shallow, subequal in width to subsutural cord, containing 2 spiral threads. Sinus cord narrow, low and flat; base of penultimate whorl with 4 cords, subequal to their intervals, the 1st cord peripheral, the lowest one weak; no intermediary threads, last whorl with 24 cords. Collabral threads weak, except on rostrum, where they are coarse.
Yellowish-white with blackish-brown spots, mostly staggered, subsutural cord with a series of large spots.
Protoconch unknown.

PLATE 30. *Turris venusta* (Reeve, 1843): A, B—Holotype of *Pleurotoma venusta*, Siquijor Is, Philippines, NHMUK 1970096, 54.6 x 18.4 mm.

Measurements; 54.6 x 18.4 mm.
DISTRIBUTION: Philippines (known only from the unconfirmed type locality).
TYPES: Holotype NHMUK 1970096.

REMARKS: This enigmatic species, sometimes wrongly synonymised with *T. babylonia*, remains known only from the holotype. The type locality is unconfirmed, despite the large quantity of *Turris* material that has become available from the Philippines over the past few decades. *Turris venusta* closely resembles *T. babylonia*, but differs from it in shape and in the stronger, closer spiral cords and very strong peripheral cord.

Turris yeddoensis (Jousseaume, 1883)

Plate 31, figs A–E

Pleurotoma yeddoensis Jousseaume, 1883: 196, pl. 10, fig. 7. Type loc.: Yedo [= Tokyo, Japan].
Turris crispa yeddoensis; Powell 1964: 331, pl. 181, fig. 13; pl. 254, fig. 3, pl. 255 (protoconch); Higo, Callomon & Goto 1999: 303; Olivera 2000: 304, pl. 5, two on left.
Turris crispa form *yeddoensis*; Oyama 1966: 17; Hasegawa *et al.* 2000: 631, pl. 314, fig. 62.
Turris yeddoensis; Vera-Peláez *et al.* 2000: pl. 6, figs 13–14; Olivera 2000: pl. 1, fig. 4.

DESCRIPTION: Shell fusiform, with b/l 0.24–0.25, a/l 0.39–0.47. Fasciole sometimes strong; anal sinus deep and narrowly linear.

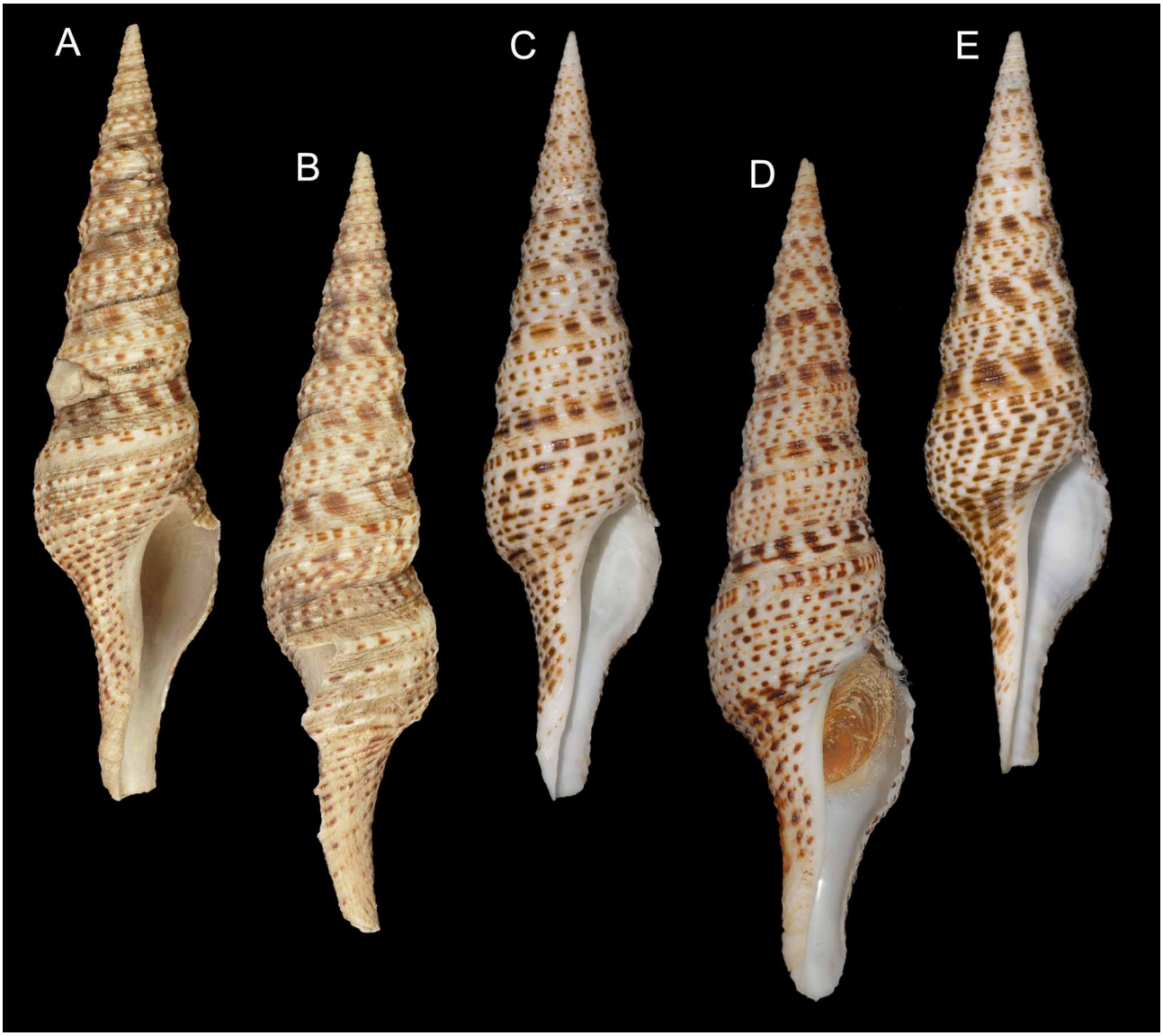

PLATE 31. *Turris yeddoensis* (Jousseaume, 1883): A, **B**—Syntype of *Pleurotoma yeddoensis*, Yedo, Japan, MNHN, 85.8 x 20.8 mm; **C**—Sakai, Wakayama prefecture, Japan, 55 m, BO colln.; **D**—Sakai, Wakayama prefecture, Japan, 55 m, BO colln.; **E**—Nada, Japan, 55–91 m, BO colln.

Spiral cords relatively low, uniform and close. Subsutural cord not raised, comprising 2–3 equal spiral lirae, sometimes with a few intermediary threads; sulcus very shallow, as wide as sinus cord, roughened by 3–5 scaly spiral threads. Peripheral cord slightly angular but barely stronger than the others; sinus cord flat-topped (slightly concave), as strong as peripheral cord or stronger; base of penultimate whorl with 3–6 weakly angular, ridges, subequal or not, and with an occasional intermediary. Base of last whorl with 22–25 ridges, with an occasional intermediary thread, main ridges becoming progressively weaker anteriorly, fine near end of rostrum.

Pale brownish to cream, spiral ridges with numerous small dark brown to black dots and dashes.

Protoconch (after Powell 1964) of 2 whorls, domed, smooth, edge of lip concave.

Attains 86 mm in length.

TYPES: Two syntypes (figured type of 85.8 x 20.8 mm and a juvenile), in MNHN.

DISTRIBUTION: Reportedly endemic to southern Japan and adjacent islands, 20–90 m on sand, but also recorded from Marinduque, Philippines, by Vera-Peláez *et al.* (2000).

OTHER MATERIAL EXAMINED: JAPAN: Nada, and Nada-Cho, Wakayama Prefecture, 30–50 fath. [55–91 m]; Sakai, Minabe, Wakayama Pref., 30 fath. [55 m]. off Tosa, 30–50 fath. [55–91m], ex Masao Azuma (all BO colln); Kusui, Nada-cho, Wakayama Pref., 60–90 m (NMSA G967: S. Akita); off Kii, 30–50 m (NMSA J3685) and Kusui, Nada-Cho, Wakayama Pref., 55–90 m (NMSA G967), both ex M. Azuma).

REMARKS: Differing from *Turris crispa* in the finer, markedly more even spiral ridges and weaker peripheral cord, anterior ridges more numerous and more weakly angulate, colour pattern finer but denser, of brown dots and dashes, in young examples not forming wavy axial lines as in *T. crispa*.

Although it is possible that *yeddoensis* evolved as a peripheral isolate of *Turris crispa*, it evidently cannot be treated as a subspecies of that, as there is some indication that they are partially sympatric. Thus, according to Higo *et al.* (1999) the range of *crispa s.s.* extends as far north as the Amami Islands, yet conversely Powell (1964) cites a record of *yeddoensis* from further south in Okinawa. Even wider sympatry is suggested by the Philippine specimen illustrated by Vera-Peláez *et al* (2000). Hasegawa *et al.* (2000) cite *yeddoensis* as a "forma" of *T. crispa*.

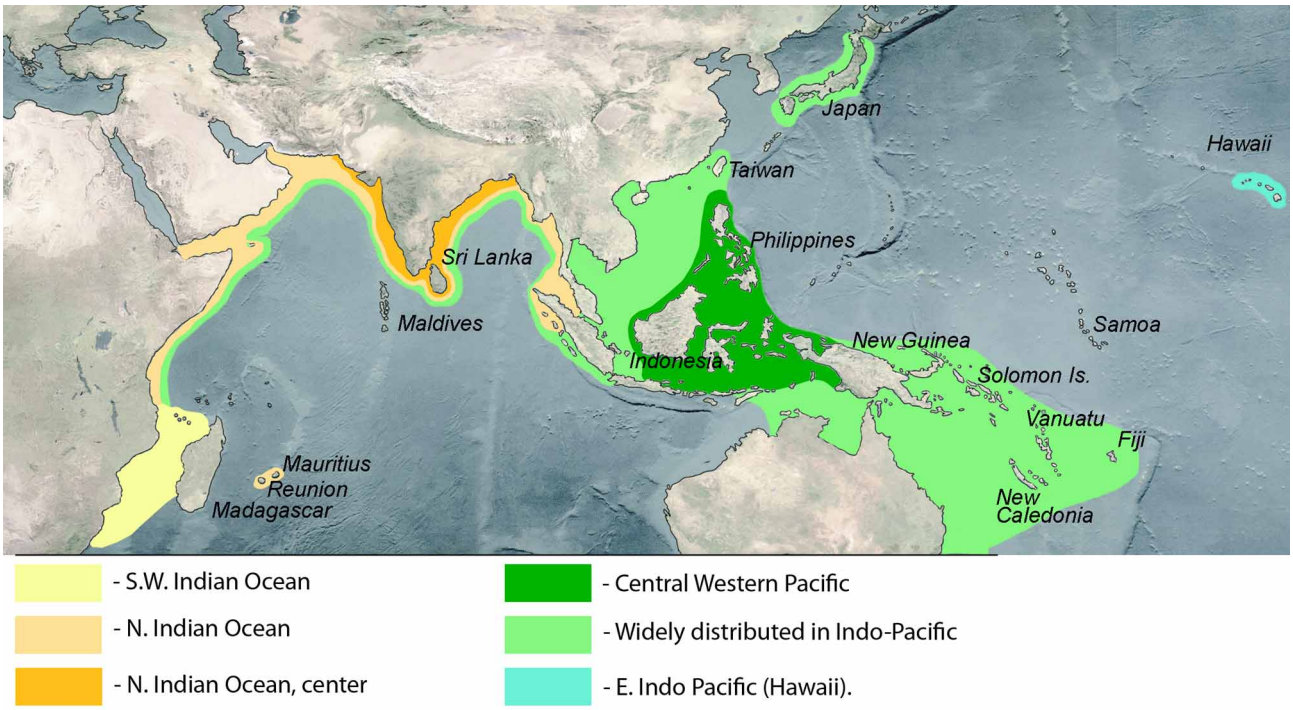

PLATE. 32. Approximate distribution of the faunal elements of the genus *Turris* in Indo-Pacific and Eastern Pacific.

SYNOPSIS OF INDO-PACIFIC *TURRIS* SPP HERE RECOGNISED.

Names in bold are regarded as valid species. Names based solely on Chemnitz figures are omitted.

ambages Barnard, 1958, *Turris*
amicta E. A. Smith, 1877, *Pleurotoma*

ankaramanyensis Bozzetti, 2008, *Turris* [= *TANYSPIRA*]
annulata Reeve, 1843, *Pleurotoma*
assyria Olivera, Seronay, Fedosov, 2010, *Turris* [= *BABYLONIA*]
babylonia Linné, 1758, *Murex*
bicarinatus W. Wood, 1828, *Murex* [= *CRYPTORRHAPHE*]
bipartita* [herein]**, ***Turris
brevicanalis Kuroda & Oyama in Kuroda *et al.*, 1971, *Annuloturris*
chaldaea, *Turris* [herein]
clausifossata, *Turris* [herein]
condei Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000, *Turris*
crispa Lamarck, 1816, *Pleurotoma*
cristata Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000, *Turris*.
cryptorrhaphe G. B. Sowerby, I, 1825, *Pleurotoma*
dollyae Olivera, 2000, Turris = *CRISPA*
fagina A. Adams & Reeve, 1850, *Pleurotoma* = *ANNULATA*
faleiroi Kilburn, 1998, *Turris*
garnonsii Reeve, 1843. *Pleurotoma*
gracillima Weinkauff & Kobelt, 1875, *Pleurotoma* [? = *CRISPA*, f. Powell, 1964, 1966]
guidopoppei* [herein]**, ***Turris
grandis Gray, 1833, *Pleurotoma*
hidalgoi Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000, *Turris*
indica Deshayes, 1833, *Pleurotoma* (*non Turris indica* Röding, 1798) = BIPARTITA
intercancellata* [herein], *Turris
intricata Powell, 1964, *Turris crispa* subsp. [FULL SPECIES]
kantori* [herein], *Turris
kathiewayae* [herein], *Turris
kilburni Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000, *Turris* = *PAGASA*
nadaensis Azuma, 1973, *Turris*
normandavidsoni Olivera, 2000, *Turris*
omnipurpurata Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000, *Turris*
***pagasa* Olivera, 2000,** *Turris*
raffrayi Tapparone-Canefri, 1878, *Pleurotoma* [? = *UNDOSA*]
ruthae Kilburn, 1983, *Turris*
spectabilis Reeve, 1843, *Pleurotoma*
tanyspira Kilburn, 1975, *Turris*.
totiphyllis Olivera, 2000, *Turris* = *HIDALGOI*
undosa Lamarck, 1816, *Pleurotoma*.
variegata Kiener, 1839 (*non* Philippi, 1836), *Pleurotoma* = *BIPARTITA* [herein]
venusta Reeve, 1843, *Pleurotoma*
woodii Kiener, 1839, *Pleurotoma* [cited *P. bicarinatus* Wood, 1828] = *CRYPTORRHAPHE*
yeddoensis Jousseaume, 1883, *Pleurotoma*

Turris spp: Distribution of faunal elements (Fig. 32).

The **approximate** distributions of Recent *Turris* spp may be summarised as follows:

S.W. Indian Ocean.
Continental shelf of S.E. Africa: *T. ambages*, *T. ruthae*, *T. faleiroi*, and to S. Madagascar, *T. tanyspira*.

N. Indian Ocean.
Indian Subcontinent: *T. amicta*, *T. intercancellata*, *T. bipartita*, *T. clausifossata*. East Africa, *T. garnonsii*. East to Indonesia: *T. annulata*, *T. kantori*.

Central Western Pacific.

W Pacific Arc: Indonesia and Philippines to southern Japan: *T. babylonia, T. brevicanalis, T. chaldaea, T. guidopoppei, T. kathiewayae, T. nadaensis, T. grandis, T. undosa, T. omnipurpurata, T. pagasa, T. yeddoensis, T. venusta*.

Widely distributed in Indo-Pacific.

T. hidalgoi, T. crispa, T. cristata, T. cryptorrhaphe, T. spectabilis, T. condei, T. normandavidsoni.

Eastern Indo-Pacific (Hawaii).

T. intricata.

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REFERENCES

Adams, A. & Reeve, L. (1850) *Mollusca. Part 2. In* Adams, A. (ed.), *The zoology of the voyage of the H. M. S. Samarang*; under the command of Captain Sir Edward Belcher, C. B., F. R. A. S., F. G. S., during the years 1843–1846. London: Reeve & Benham. pp 25–41, pls 10–17.

Azuma, M. (1973) Three new gastropods from off Kii Peninsula and Tosa Bay with a record of a rare carditid bivalve. *Venus*, 32(1), 33–38, textfigs 1–8.

Barnard, K. H. (1958) Contribution to the knowledge of South African marine Mollusca. Part I. Gastropoda: Prosobranchiata: Toxoglossa. *Annals of the South African Museum*, 44(4), 73–163, figs 1–30, pl. 1.

Barnard, K. H. (1969) Contributions to the knowledge of South African marine Mollusca. Part VI. Supplement. *Annals of the South African Museum*, 47(4), 595–661, text-figs 1–30, pls 1–2.

Batsch A. J. G. C. (1789) Versuch einer Anleitung, zur Kenntniß und Geschichte der Thiere und Mineralien, für akademische Vorlesungen entworfen, und mit den nöthigsten Abbildungen versehen. Zweyter Theil. Besondre Geschichte der Insekten, Gewürme und Mineralien. Akademische Buchhandlung, Jena

Bouchet, P., Kantor, Y. I., Sysoev, A. V. & Puillandre, N. (2011) A new operational classification of the Conoidea (Gastropoda). *Journal of Molluscan Studies*, 77, 273-308.

Bozzetti, L. (2006) *Turris ankaramanyensis* (Gastropoda: Hypsogastropoda: Turridae) nuova specie dal Madagascar meridionale. *Malacologia* (*Monstra Mondiale-Cupra Marittima*), 52, 8–9.

Cernohorsky, W. O. (1972) *Marine Shells of the Pacific*. Vol. II. Sydney: Pacific Publications. 411 pp., 68 pls

Chemnitz, J. H. (1780) *Neues systematisch Conchylien-Cabinet, geordnet und beschrieben von ... mit lebendigen Farben erleuchtet*. Nürnberg: G. N. Raspe. 4, 1–344, pls 122–159.

Dance, S.P. **(**1967) Report on the Linnaean shell collection. *Proc. Linn. Soc. Lond*. 178(1), 1-24.

Deshayes, G. P. (1832–1833) Voyage aux Indes-Orientales, pendant les annees 1825–1829. Zoologie.Mollusques. *In* Belanger, C. (Ed.) *Voyage aux Indes-Orientales, par le Nord de l'Europe,les Provinces du Caucase, la Georgie, l'Armenie et la Perse, Suivi de Details Topographiques,Statistiques et Autres sur le Pegou, les Iles de Java, de Maurice et de Bourbon, sur le Cap-de-Bonne-Esperance et Saint-Helene, Pendant les Annees 1825, 1826, 1827, 1828 et 1829, Publiesous les Auspices de LL. EE. MM. les Ministres de la Marine et de l'Interieur*. Vol. 2 *Zoologie*.Arthus Bertrand, Paris, pp. 401–440.

Deshayes, G. P. (1843) In Deshayes, G. P. & Milne Edwards, H. *Histoire naturelle des animaux sans vertèbres, présentant les*

caractères généraux et particuliers de ces animaux, leur Distribution, leur Classes, leurs Familles, leurs Genres, et la Citation des Principales Especes qui s'y Rapportent;Precedee d'une Introduction Offrant la Determination des Caracteres Essentiels de l'Animal,sa Distinction du Vegetal et des Autres Corps Naturels; Enfin, l'Exposition des PrincipesFundamentaux de la Zoologie. Deuxieme Edition. *Tome Neuvieme. Histoire des Mollusques*.J.-B. Bailliere, Paris, 728 pp

Dharma, B. (2005) *Recent and fossil Indonesian Shells*. ConchBooks: Hackenheim. 424pp.

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*, 113(2), 73–224.

Drivas, J. & Jay, M. (1986) Shells of Reunion. Family Turridae part II Subfamily Turrinae Swainson, 1840. *La Conchiglia*, 18(210–11), 28–29.

Dubois, A. & Bour, R. (2010) The distinction between family-series and class-series nomina in zoological nomenclature, with emphasis on the nomina created by Batsch (1788, 1789) and on the higher nomenclature of turtles. *Bonn Zoological Bulletin*, 57(2), 149–171.

Favanne, J. De & Favanne, J. G. (1780) *La Conchyliologie, ou histoire naturelle des coquilles etc*. 3 vols. Paris

Fedosov, A. E., Watkins, M., Showers Corneli, P., Heralde, F. M., Concepcion, G. P., & Olivera, B. M. (2011) Phylogeny of the Genus *Turris*: Correlating Molecular Markers with Radular Anatomy and Shell Morphology. *Molecular Phylogenetics and Evolution*, 59, 263–270.

Gmelin, J. F. (1791) *Caroli a Linné Systema naturae per regna tria naturae, Editio decima tertia, aucta reformata*. Leipzig: G. E. Deer. Tome 1, pars 6 (Vermes), 3021–3910.

Gravely, F. H. (1942) Shells and other animal remains found on the Madras Beach. II. Snails, etc (Mollusca Gastropda). *Bulletin of the Madras Government Museum*, 5 (2), 1–110.

Gray, J. E. (1834) Alphabetical list of the figures of Mollusca. *In* Griffith, E. & Pidgeon, E. (ed). *The animal kingdom arranged in conformity with its organization by the Baron Cuvier with additional descriptions of all the species hitherto named and many not before noticed. The Mollusca and Radiata*. London: Whittaker & Co. 12, viii + 601 pp.

Gray, J. E. & Sowerby, G. B (1839) Molluscous animals and their shells. *In:* Beechey, F. W. (Ed.) *The zoology of Captain Beechey's Voyage; compiled from the collections and Remarks made by Captain Beechey ... during a voyage to the Pacific and Behring's Straits performed in His Majesty's ship Blossom*. London: H. G. Bohn. pp 101–142 [pp 143–155 continued by G. B. Sowerby], pls 33–44.

Habe, T. (1970) *Shells of the Western Pacific in Color. Vol. 2*. Hoikusha, Osaka, 233 pp., 66 pls.

Hasegawa, K., Okutani, T. & Tsuchida, E. (2000) Family Turridae. Pp. 619–667, pls 308(in part)–332 (in part), 2 figs. *In* Okutani, T. (ed.). *Marine mollusks in Japan*. Tokyo: Tokai University Press. xlviii + 1172 pp, 152 pls.

Hedley, C. (1922) A revision of the Australian Turridae. *Records of the Australian Museum*, 13(6), 213–359, pls 42–56.

Henley, S. (1855) Ipsa Linnaei conchylia: The shells of Linnaeus, determined from his manuscripts and collections ; also, an exact reprint of the Vermes testacea of the 'Systema naturae' and 'Mantissa'. Williams and Norgate (London). 556pp.

Higo, S., Callomon, P. & Goto, Y. (1999) *Catalogue and bibliography of the marine shell-bearing Mollusca of Japan*. Osaka, Japan: Elle Scientific Publications. 749 pp., 5 maps.

Higo, S., Callomon, P. & Goto, Y. (2001) *Catalogue and bibliography of the marine shell-bearing Mollusca of Japan*. Type figures. Osaka, Japan: Elle Scientific Publications. 208 pp.

Hinds, R. B. (1843) On new species of *Pleurotoma*, *Clavatula*, and *Mangelia*. *Proceedings of the Zoological Society of London*, 1843, 36–46.

Horikoshi, M. (1989) *Sea Shells of the World. The Shapes & Patterns Designed by Nature - from the Ninomya collection*. Chiba: Natural History Museum and Institute. 86 pp, 48 pls.

Jousseaume, F. P. (1883) Descriptions d'espècies et genres nouveaux de Mollusques. *Bulletin de la Société Zoologique de France*, 8, 186–204.

Kensley, B. (1973) *Sea-shells of southern Africa. Gastropods*. Cape Town: Maskew Miller Ltd. 225 pp., 910 figs.

Kiener, L. C. (1839) Genre Pleurotome (*Pleurotoma*, Lam.). *Spécies général et iconographie des coquilles vivantes comprenant la collection du Muséum d'Histoire naturelle de Paris, collection Lamarck, celle du Prince Masséna et les découverts récente des voyageurs*. Paris: Rousseau. 84 pp., 27 pls.

Kikuchi, N., Ohara, K., Otani, Y. & Katori, H. (1997) *Catalogue of the shellfish type specimens described by the late Dr Tokubei Kuroda except in the possession of Nishinomiya City*. Nishinomiya City. 61 pp.

Kilburn, R. N. (1975) Taxonomic Remarks on South African marine Mollusca (5): including descriptions of new taxa of Rissoidae, Cerithidae, Tonnidae, Cassidae, Buccinidae, Fasciolariidae, Turbinellidae, Turridae, Architectonicidae, Epitoniidae, Limidae and Thraciidae. *Annals of the Natal Museum*, 22(2), 577–622, figs 1–25.

Kilburn, R. N. (1983) Turridae (Mollusca:Gastropoda) of southern Africa and Mozambique. Part 1. Subfamily Turrinae. *Annals of the Natal Museum*, 25(2), 549–585, figs 1–58.

Kilburn, R. N. (1998) Description of four new neogastropods of superfamilies Muricoidea and Conoidea from South Africa. *Apex*, 13(4), 155–160.

Kilburn, R. N. (2002) Biogeography of Indian marine molluscs. *In* Hylleberg, J. (ed.) Zoogeography and inventory of marine molluscs encountered in southern India. *Phuket Marine Biological Centre Special Publication* 26, 5–17.

Kira, T. (1972) *Shells of the Western Pacific in color, third edition*. Osaka, Japan: Hoikusha. [vii] + 224 pp., 72 pls

Kosuge, S. (1988) Report on the family Turridae collected along the north-western coast of Australia (Gastropoda) (2). *Bulletin of the Institute of Malacology Tokyo*, 2, 101–107, pl. 41.

Kuroda, T., Habe, T. & Oyama, K. (1971) *The sea shells of Sagami Bay.* Tokyo: Maruzen. xix + 741 pp [in Japanese], 121 pls, 489 pp [in English], index 51 pp, 1 map.

Ladd, H. S. (1982) Cenozoic fossil mollusks from western Pacific Islands; Gastropods (Eulimidae and Volutidae through Terebridae). *United States Geological Survey Professional Paper*, 1171, 1–100, pls.1–41.

Lamarck, J. B. P. A. de. (1816) Liste des objets représentés dans les planches de cette livraison. *Tableau encyclopédique et méthodique des trois règnes de la nature. Mollusques et polypes divers*. Paris: Veuve Agasse, Imprimeur. livr. 83, 1–16 pp. et livr. 84, pls. 391–488.

Lamarck, J. B. P. A. de. (1822) *Histoire Naturelle des Animaux sans Vertèbres. Précédée 'une Introduction offrant la détermination des charactères essentiels de l'Animal, sa distinction du végétal et des autres corps naturels, enfin l'exposition des principes fondamentaux de la Zoologie*. Paris: Guiraudet. **7**, 711 pp.

Li, Baoquan & Li, Xinzheng (2007) An account of the Genus *Turris* species (Mollusca: Gastropoda: Turridae) from the East and South China Seas. *Zootaxa*, 1397, 63–68.

Link, H. F. (1807) *Beschreibung der Naturalien-Sammlung der Universität zu Rostock. Mollusca*. Rostock: Adlers Erben. Part 2, 82–100; Part 3, 101–160; Part 4, 6–23.

Linnaeus, C. (1758) *Caroli a Linnaei ….. systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Tomus I, Editio Decima, Reformata, Tomus I. Regnum Animalia.* Stockholm: L. Salvii.

Melvill, J. C. (1917) A revision of the Turridae (Pleurotomidae) occurring in the Persian Gulf, Gulf of Oman, and north Arabian Sea, as evidenced mostly through the results of dredgings carried out by Mr. F. W. Townsend, 1893–1914. *Proceedings of the Malacological Society of London*, 12, 140–201, pls 8–10.

Montfort, Denys de (1810) *Conchyliologie systématique, et classification méthodique des coquilles; offerant leurs figures, leur arrangement générique, leurs descriptions caractéristiques, leurs noms; ainsi que leur synonymie en plushieurs langues. 2. Coquilles univalves, non cloisonnées*. Paris: F. Schoell. 676 pp.

Olivera, B. M. (2000 [“1999”]) The subfamily Turrinae in the Philippines: The genus *Turris* (Röding, 1798). *Philippine Journal of Science*, 128(4), 295–318.

Olivera, B. M., Seronay, R., & Fedosov, A. (2010) *Turris babylonia*; re-evaluation of a species complex and description of *Turris assyria*, new species. *Philippine Science Letter*, 3(1), 46–58.

Olivera, B. M. & Sysoev, A. V. (2008) Turridae. *In* Guido Poppe. *Philippine Marine Molluscs*. Hackenheim: Klaus & Christina Groh. Vol. II: pp 764–788, pls 677–688,

Oostingh, C. H. (1938) Die Mollusken des Pliocäns von Süd-Bantam in Java. I. Abschnitt (Gastropoda I). *De Ingenieur in Nederlandsch-Indië, IV. Mijnbouw en Geologie. ("De Mijningenieur")*, 5(2/3), 17–46, pls 1–4.

Oyama, K. (1966) On living Japanese Turridae (1). *Venus*, 25(1), 1–20.

Pinn, F. (1990) *Sea Snails of Pondicherry.* Nehru Science Centre: Pondicherry, 116 pp.

Powell, A. W. B. (1964) The family Turridae in the Indo-Pacific. Part 1. The subfamily Turrinae. *Indo-Pacific Mollusca*, 1(5), 227–346, pls 172–262.

Powell, A. W. B. (1966) The molluscan families Speightiidae and Turridae an evaluation of the valid taxa, both Recent and fossil, with lists of characteristic species. *Bulletin of the Auckland Institute and Museum*, 5, 1–184.

Puillandre, N., Kantor, Y.I., Sysoev, A.V., Couloux, A., Meyer, C., Rawlings, T., Todd, J.A. & Bouchet, P. (2011) The dragon tamed? A molecular phylogeny of the Conoidea (Gastropoda). *Journal of Molluscan Studies*, 77, 259-272

Reeve, L. A. (1843–46) Monograph of the Genus *Pleurotoma. Conchologia Iconica, or Illustrations of the shells of molluscous animals*. London: Reeve Brothers. Vol. 1: pls 1–18, species 1–155 (1843.]; pl. 19, species 156–165 (1844); pls 20–33, species 166–305 (1845.); pls 34–40, species 306–369 + index and errata (1846).

Robin, A. (2008) *Encyclopedia of Marine Gastropods.* ConchBooks: Hackenheim. 480pp.

Röding, P. F. (1798) *Museum Boltenianum sive catalogus cimeliorum e tribus regnis naturae quae olim collegerat Joa. Fried Bolten, M.D.p. d., per XL. annus Proto physicus Hamburgensis. Pars Secunda continens conchylia sive testacea univalvia, bivalvia & multivalvia*. Hamburg: Johan. Christi. Trapii. 199 pp.

Rumphius, G. E. (1705) *D'Amboinsche Rariteitkamer, behelzende eene Beschryvinge van allerhande zoo weeke als harde Schaalvisschen, te weeten raare Krabben, Kreeften, en diergelyke Zeedieren, als mede allerhande Hoorntjes en Schulpen, die men in d'Amboinische Zee vindt* ... Amsterdam: Francois Halma. pp xxix + 340, index 43 pp, pls 1–60.

Sharabati, D. (1984) Red Sea Shells. London: K. P. I. Ltd. 128pp.

Severns, M. (2011). *Shells of the Hawaiian Islands*. *The Sea Shells*. ConchBooks: Hackenheim. 462 pp.

Smith, E. A. (1877) Diagnoses of new species of Pleurotomidae in the British Museum. *Annals and Magazine of Natural History.* [series 4], 19, 488–501.

Sowerby, G. B. Ist (1825) *A catalogue of the shells contained in the collection of the late Earl of Tankerville, arranged according to the Lamarckian conchological system; together with an appendix, containing descriptions of many new species*. London: E. J. Stirling. vii + 92 pp., appendix i–xxxiv, 9 unnumbered pls.

Springsteen, F. J. & Leobrera, F. M. (1986) *Shells of the Philippines*. Manila: Carfel Seashell Museum. 377 pp, 27 figs, 100 pls.

Tapparone-Canefri, C. (1878) Catalogue des coquilles rapportées de la Nouvelle-Guinée par M. Raffray. *Bulletin de la Société Zoologique de France*, 3, 244–277, pl. 6.

Thiele, J. (1929) *Handbuch der Systematischen Weichtierkunde*. *Vol. 1*. Gustave Fischer, Jena, 376 pp.

Tucker, J. K. (2004) Catalog of Recent and fossil turrids (Mollusca, Gastropoda). *Zootaxa*, 682, 1–1295.

Vera-Peláez, J. L., Vega-Luz, R. & Lozano-Francisco, M. C. (2000) Five new species of the genus *Turris* Röding, 1798 of the Philippines and one new species of the Southern Indo-Pacific. *Malakos*, 2, 1–29, pls 1–8.

Wallin, L. (1994) *Catalogue of type specimens. 4. Linnaean specimens*. Uppsala: Uppsala Zological Museum. Revised edition. 128 pp.

Weinkauff, H. C. (1875) Ueber eine kritische Gruppe des Genus *Pleurotoma* Lam. *Sensu stricto*. *Jahrbucher der Deutschen Malakozoologischen Gesellschaft*, 2, 283–292, pl. 9.

Weinkauff, H. C. (1877a) Catalog der Arten des Genus *Pleurotoma s. st. Jahrbucher der Deutschen Malakozoologischen Gesellschaft*, 4, 1–10.

Wilson, B. R. (1994) *Australian Marine Shells. Prosobranch Gastropods. part 2 (Neogastropods)*. Vol. 2. Kallaroo: Odyssey Publishing. 408 pp.

Wood, W. (1828) *Supplement to the Index Testaceologicus; or a catalogue of shells, British and Foreign. Illustrated with 480 figures*. London: Richard Taylor for W. Wood, London. vi + 59 pp, 8 pls.

Yen, Teng-Chien (1942) A review of Chinese gastropods in the British Museum. *Proceedings of the Malacological Society of London*, 24, 170–289, pls 11–28.

APPENDIX

Gemmula Weinkauff, 1875

Type species (s.d. Cossmann, 1896) *Pleurotoma gemmata* Reeve, 1843 = Gemmula hindsiana Berry, 1958, Gulf of Magdalena, California.

Gemmula lululimi Olivera, 2000

Plate 33, figs A–D

Gemmula lululimi Olivera, 2000: 313, pls 9–10; Sysoev 2008: pl. 678, figs 4–5a-b. Type loc.: Balut Is., Philippines, 100–150 m.

Turris (Annulaturris) munizi Vera-Peláez, Vega-Luz & Lozano-Francisco, 2000: 10: pl. 1, fig. 9, pl. 2, fig. 7, pl. 7, figs 1–3 (as *Annulaturris munizi*); Robin 2008: pl. 448, fig. 15. Type loc.: Balut Is., Mindanao Sea, Philippines, *ca* 30 m, coralline bottom. **Syn. Nov.**

Description: Shell fusiform (b/l 0.29–0.38), with short, straight siphonal canal (a/l 0.39–0.46), last whorl with rounded periphery, spire straight-sided to slightly cyrtoconoid, whorls convex, without peripheral angle, suture somewhat deep but narrow; outer lip evenly convex, with 6–9 strong spiral threads inside, anal sinus relatively shallow, slightly V-shaped.

Sculptured by well-defined, but rather low and narrow spiral cords, their intervals with thin intermediary threads roughened by crinkled collabral threads. Subsutural cord relatively low, bearing an angular thread, with a weaker one on either side; sulcus very narrow and deep. Sinus cord above median, nearly as prominent as peripheral cord, declivously flattened, bearing 2 spiral threads, strongly crenulate but not gemmulate. Base of penultimate whorl with 2–3 anterior cords, the peripheral cord not particularly prominent, the 3rd cord sometimes weak. Base of last whorl with very approximately 15–25, some weaker and paler, with finer threads in intervals, fine to obsolete on tip of rostrum. Collabral threads distinct, rendering basal cords somewhat granular.

White to pale brown with main spiral ridges orange-brown; protoconch white.

Protoconch (f. Vera-Peláez *et al.* 2000) papilliform, *ca* 3.5 convex whorls, with arcuate, opisthocline axial riblets, suture covered by a thin, white ridge.

Attains 90.5 mm in length.

DISTRIBUTION: SW Japan to Southern Philippines and Papua New Guinea, depth reportedly 30 m to *ca* 360 m.

TYPES: *G. lululimi*: Holotype and one juvenile paratype presently in BO colln. *T. munizi*: Holotype in Vera-Lozano colln.

OTHER MATERIAL EXAMINED: JAPAN: off Cape Shiona, Wakayama Prefecture, 150–200 m (Shingo Habu colln, ex Akira Inada); off Irino, Kochi Prefecture, 120–130 m (Shingo Habu colln). PHILIPPINES: Oslob, S. Cebu, 360 m, and Aliguay Is., from fishermen (G. Poppe colln); Aliguay Is., Zamboanga, 24–40 fath. [44–73 m] (BO colln); PAPUA NEW GUINEA: BIOPAPUA Expedition, Stn. DW3770 (MNHN—IM-2009-17042).

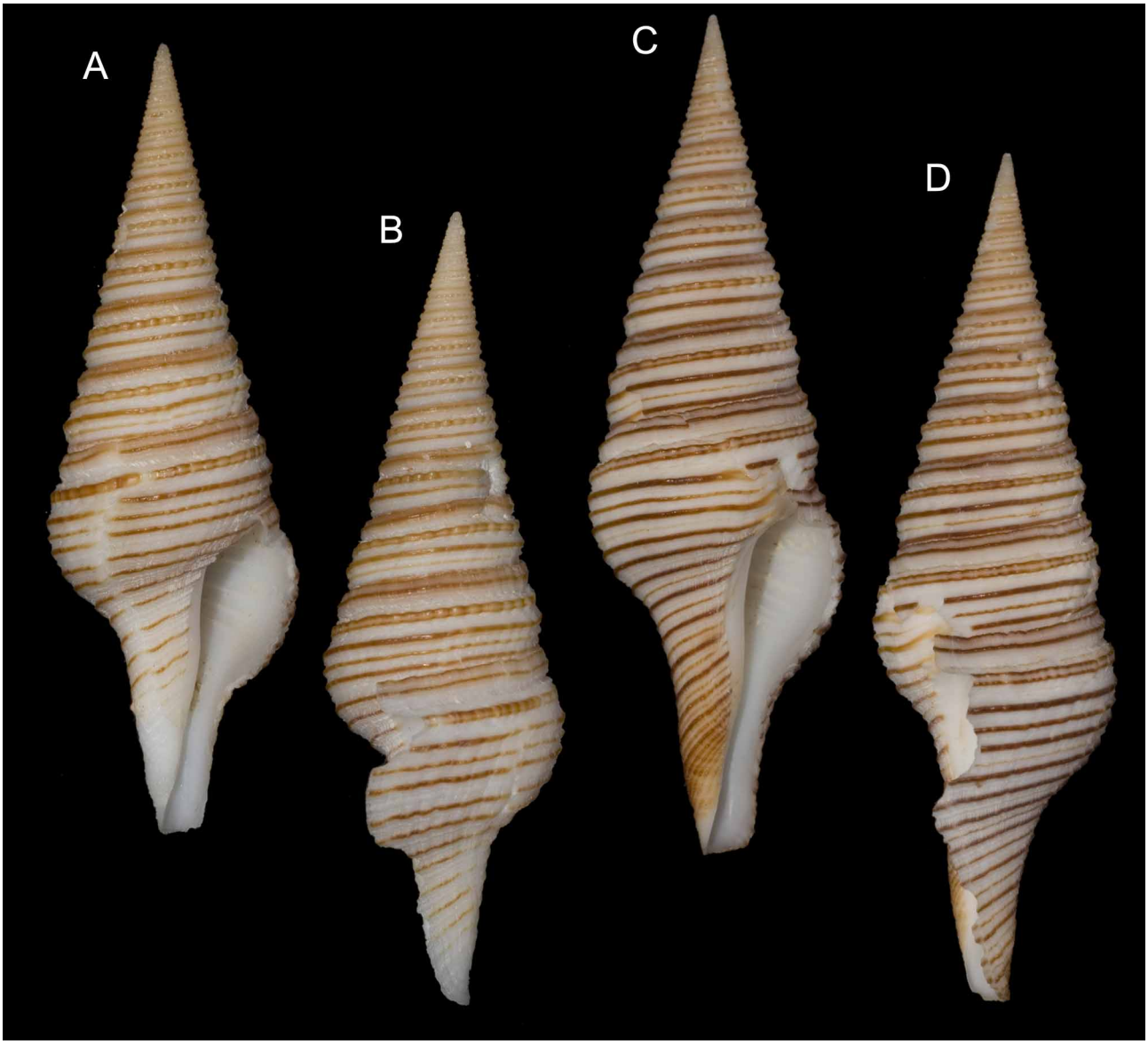

PLATE 33. *Gemmula lululimi* Olivera, 2000: A, **B**—Holotype of *Gemmula lululimi*, Balut Is., Mindanao, Philippines, PNMM, 55.7 x 17.7 mm; **C**, **D**—Paratype 1, Pamilacan Is., Philippines, BO colln, 67.2 x 23.3 mm.

REMARKS: Superficially, this species appears to be intermediate in characters between *Gemmula* and *Turris*, but has a sinus cord that is low and non-peripheral, and distinctly crenulate, not truly gemmulate as in the former. *G. lululimi* appears to be characterised by the brown ridges on a white ground, its short siphonal canal and the strongly crenulated sinus cord.

Makiyamaia MacNeil, 1961

Type species (o.d.) *Pleurotoma coreanica* Adams & Reeve, 1850, Recent of Japan and Korea.

The following species, described as *Turris orthopleura* Kilburn, 1983, was originally known only from specimens that have since proved to be juveniles. The adults now available are clearly not referable to *Turris*, but to genus *Makiyamaia*, family Clavatulidae (Bouchet, et al, 2011; Puillandre, et al, 2011).

This genus, reported previously only from Japan, Korea and China, appears also to be represented in South Africa by *Pleurotoma gravis* Hinds, 1843, of the Agulhas Bank, and probably *Surcula scalaria* Barnard, 1958, from off Cape Point in 480–800 fath**.** [878–1463 m]. Another South African species proves to be *Turris orthopleura*, which is here redescribed, based on fully adult specimens.

***Makiyamaia orthopleura* (Kilburn, 1983), new combination**
Plate 34. figs A–C

Turris orthopleura Kilburn, 1983: 560, figs 3 (protoconch), 24–26. Type loc.: Off Mbashe River, Transkei, South Africa, 100 m., sponges, marine growths, sand.

REDESCRIPTION: Shell pyramidal-fusiform, b/l 0.28-0.30, with very high, acuminately orthoconoid spire (a/l 0.35-0.38), contracted base and narrowly elliptical aperture; rostrum tapering, terminally rounded, not indented, fasciole present but only weakly swollen; false umbilicus absent. Inner lip with a smooth, glossy callus, its edge adnate; outer lip thin, anal sinus shallowly U-shaped, [edge of lip damaged anteriorly].

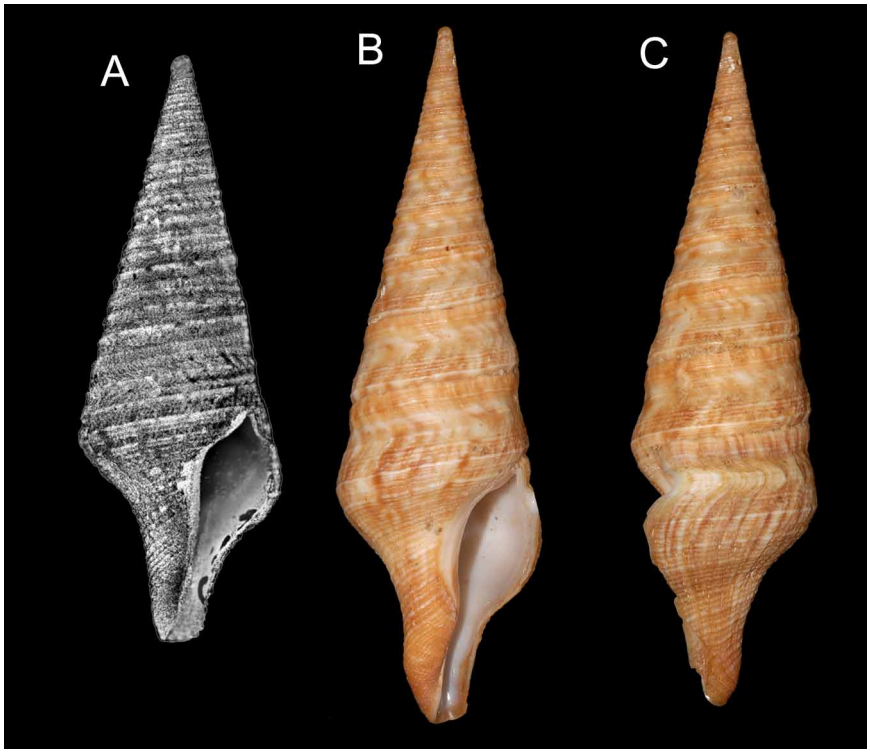

PLATE 34. *Makiyamaia orthopleura (*Kilburn, 1983): A—Holotype of *Turris orthopleura*, off Mbashe River, Transkei, 100 m, South Africa, NMSA 2834, 29.0 x 10.0 mm; **B**, **C**—off Mbotyi, Transkei, South Africa, 90 m, NMSA W2834, 50.8 x 15.0 mm.

Sculpture: Early whorls with 5–6 narrow, more or less equal, spiral ridges, on 4th-5th whorls becoming more widely spaced, sometimes with additional ridges interpolated. By the 8th whorl a shallow concavity has developed at or slightly above midwhorl; by the last (12th) whorl subsutural region has become tumid and bears about 5–6 fine spiral threads; lower half-whorl with 3 whitish spiral threads, with denser, finer threads interpolated. Base of last whorl with numerous (approximately 37) very fine and closely-set spiral threads. Collabral striae ("growth lines") coarse, rendering the finer spirals slightly granulose, becoming very coarse on later part of last whorl.

Tinged with pale brown, with slightly darker brown, sinuous, collabral strigations; lower part of each whorl with 1– 2, fine, whitish, spiral threads; base of last whorl reddish-brown, darkest anteriorly, apex also darker; interior of aperture and columella callus tinged with pinkish or violaceous.

Protoconch slightly swollen, of *ca* 2.0 whorls, first whorl bulbous, initially tilted, somewhat naticoid, of about 1 whorl, 2nd whorl with opisthocline axial ribs, termination concave (not sinusigerous); breadth 1.30–1.50 mm. Dimensions of adult specimens: 51.0 x 15.2 mm, 50.3 x 14.2 mm.

DISTRIBUTION: Apparently endemic to outer shelf and upper slope of S. E. Africa, from southern Natal (Park Rynie) to Transkei (off Qolora), 84–130 m, on sand and sponge.

ADDITIONAL RECORDS: off Mbotyi, Transkei (pl. 33, figs B–C), in 90 m, coral rubble, dredged W. Immelmann (NMSA W7421),

TYPES: Holotype NMSA W2834, 7 immature paratypes in NMSA.

REMARKS: The protoconch is indicative of a limited range endemic.