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Mollusca Gastropoda: New deep-water turrid gastropods (Conoidea) from eastern Indonesia

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ABSTRACT

Nineteen new species are described from the bathyal zone of the Arafura Sea at depths between 146 and 1084 m. The genus *Lusitanops* is recorded for the first time from the Indo-Pacific and *Clinura vitrea* sp. nov. is the first Recent representative of this hitherto Cenozoic fossil genus. Based on shell and radula morphology, the classification of *Heteroturris* in the Clathurellinae is confirmed. Including new species described here, there are now 92 turrid species recorded from Indonesia at depths greater than 200 m.

RÉSUMÉ

Mollusca Gastropoda : Nouveaux Turridae bathyaux (Conoidea) de l'est de l'Indonésie.

Dix-neuf espèces nouvelles de Turridae *sensu lato* (= Turridae *s. s.* + Conidae) sont décrites de la mer d'Arafura, à des profondeurs comprises entre 146 et 1084 m. Le genre *Lusitanops* est signalé pour la première fois de l'Indo-Pacifique, et *Clinura vitrea* sp. nov. représente la première occurrence dans les faunes modernes de ce genre, jusqu'ici connu comme fossile du Cénozoïque. L'attribution du genre *Heteroturris* à la sous-famille Clathurellinae est confirmée par la morphologie de sa radula. Certaines espèces nouvelles atteignent de grandes dimensions (par exemple *Comitas rex* sp. nov., 87 mm et *Nihonia maxima* sp. nov., 128 mm), ce qui suggère que la faune bathyale de Turridae d'Indonésie (92 espèces actuellement recensées à des profondeurs supérieures à 200 m) est encore loin d'être inventoriée de façon satisfaisante.

INTRODUCTION

Conoidea, or Turridae *sensu lato* as they used to be known, represent a significant component of deep-water gastropod assemblages worldwide. Because of the sheer size of the family, and also because many species are extremely scarce, Indo-Pacific turrids are poorly known. Despite the rich harvest of turrids obtained there by the landmark "*Siboga*" expedition one hundred years ago, the fauna of Indonesian waters is no exception.

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SCHEPMAN (1913) recorded 52 species, most of them new, from water depths exceeding 200 m in the Indonesian archipelago. The KARUBAR expedition, which worked in eastern Indonesia during October and November 1991, obtained a very rich material of Conoidea, comprising over 100 species. Work on this collection is in progress and the results will greatly extend our knowledge of the deep-water Indonesian fauna. The purpose of the present paper, which is a preliminary report on this turrid fauna, is to record and describe some of the more spectacular new species collected during the expedition. Twenty new species are described from 19 deeper-water stations, at depths between 146 and 1084 m. They belong to 15 genera.

Type material is housed in Muséum national d'Histoire naturelle, Paris (MNHN) and Pusat Penelitian dan Pengembangan Oseanologi LIPI, Jakarta (POLIPI).

SYSTEMATIC ACCOUNT

Superfamily CONOIDEA Fleming, 1822

Family TURRIDAE H. & A. Adams, 1853

Subfamily TURRINAE H. & A. Adams, 1853

Genus *GEMMULA* Weinkauff, 1875

TYPE SPECIES: *Pleurotoma gemmata* Reeve, 1843 (= *Gemmula hindsiana* Berry, 1958) [Non *Pleurotoma gemmata* Conrad, 1835].

Gemmula closterion sp. nov.

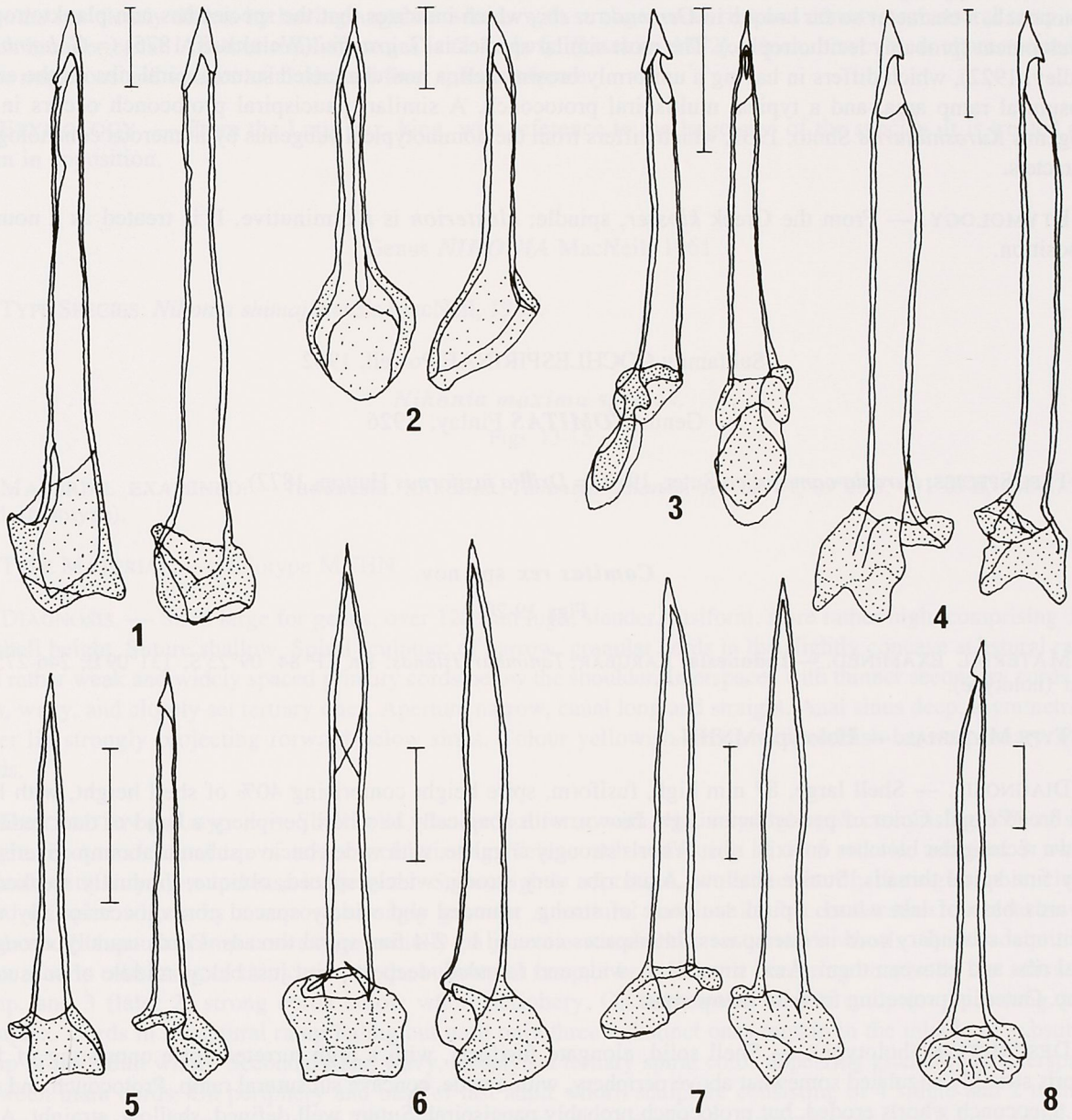
Figs 11-12, 16

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn DW 61, 09°05'S, 132°44'E, 235-236 m, 1 dd (paratype MNHN). — Stn CP 67, 08°58'S, 132°06'E, 146-233 m, 1 lv (holotype), 2 dd (paratypes MNHN and POLIPI). — Stn CP 79, 09°16'S, 131°22'E, 239-250 m, 2 lv (paratypes MNHN and POLIPI).

TYPE MATERIAL. — Holotype and 3 paratypes MNHN, 2 paratypes POLIPI.

DIAGNOSIS. — Shell small, up to 22 mm high, very narrow, spire height about 40% of shell height, periostracum rather thick, light-brown. Protoconch non-planktotrophic, of 1.5 whorls, smooth except for a few arcuate axial ribs near transition to teleoconch. Teleoconch whorls with strong bicarinate subsutural fold, narrow and concave subsutural ramp, and prominent peripheral keel with rounded gemmae. Suture deeply channeled. Base with three very strong spiral cords separated by wide and usually smooth interspaces. Canal long and straight. Anal sinus deep, wide, U-shaped.

DESCRIPTION (holotype). — Shell, slender, very narrow (diameter/height 0.27), spire height comprising 40% of shell height. Color white under rather thick light-brown periostracum. Protoconch consisting of 1.5 smooth whorls, diameter is 0.85 mm, with 5 narrow arcuate axial ribs near transition to teleoconch. Teleoconch consisting of 8.75 whorls with a narrow, concave subsutural ramp, a strong, gemmate peripheral keel and another strong cord between keel and abapical suture. Keel bearing 16 rounded and slightly longitudinally elongate gemmae on last two whorls, bordered by 2 narrow cords on either side. Subsutural fold strong, bicarinate, with 1 wavy cord running along its edge and 1 more prominent, weakly granulate cord below it. Suture deeply channeled and covered by edge of subsutural fold. Base with 3 very strong cords separated by wide smooth interspaces, 3 weaker and rather widely spaced cords near base of canal, which is covered by 15 weak cords. Aperture small, ovate, inner lip with straight columellar side covered by white callus. Outer lip chipped, but growth lines define rather deep and broad, U-shaped, peripheral anal sinus.



FIGS 1-8. — Radulae. **1**, *Borsonia jaya*, paratype. — **2**, *Heteroturris gemmuloides*, paratype. — **3**, *Gymnobela ioessa*, paratype. — **4**, *Gymnobela muricata*, paratype. — **5**, *Gymnobela mitrodeta*, holotype. — **6**, *Gymnobela baruna*, holotype. — **7**, *Clinura vitrea*, holotype. — **8**, *Xanthodaphne cladara*, paratype. Scale bar 50 µm.

Dimensions: height 18.0 mm, last whorl height 10.8 mm, aperture height 8.2 mm, shell diameter 4.8 mm. Largest paratype 22.2 x 5.7 mm. Diameter/height ratio of intact shells 0.26-0.30, mean 0.28.

Paratypes very similar to holotype, differing only in details of spiral sculpture. Subsutural fold on last whorl occasionally with 1 additional thin thread in its lower part, cords below keel may number up to 4, and two paratypes have a thin cord in 1 interspace between main cords on shell base. Also, in some paratypes, the subsutural ramp may have numerous, rather strong, oblique growth lines.

REMARKS. — *Gemmula closterion* is one of the smallest species in the genus. I cannot ascertain that the specimens examined are adult, but this is likely since shells from 3 different stations are of about the same size.

Even if the type specimens are subadult, the species is nevertheless easily recognizable by its paucispiral protoconch, a character so far unique in *Gemmula s. str.*, which indicates that the species has non-planktotrophic development (probably lecithotrophic). The most similar species is *G. graeffei* (Weinkauff, 1875) (= *G. hombroni* Hedley, 1922), which differs in having a uniformly brown shell, a non-channeled suture, spiral ribs on the entire subsutural ramp area, and a typical multispiral protoconch. A similar, paucispiral protoconch occurs in the subgenus *Kuroshioturris* Shuto, 1961, which differs from the nominotypical subgenus by numerous conchological characters.

ETYMOLOGY. — From the Greek *kloster*, spindle; *klosterion* is a diminutive. It is treated as a noun in apposition.

Subfamily COCHLESPIRINAE Powell, 1942

Genus *COMITAS* Finlay, 1926

TYPE SPECIES: *Surcula oamarutica* Suter, 1917 (= *Drillia fusiformis* Hutton, 1877).

Comitas rex sp. nov.

Figs 19-20

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 84, 09°23'S, 131°09'E, 246-275 m, 1 dd (holotype).

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell large, 87 mm high, fusiform, spire height comprising 40% of shell height, with long and broad canal. Color of periostracum light brown, with abapically to whorl periphery a band of dark reddish-brown rectangular blotches on axial ribs. Whorls strongly angulate, with wide concave subsutural ramp covered by very fine spiral threads. Suture shallow. Axial ribs very strong, widely spaced, oblique, gradually weakening towards base of last whorl. Spiral sculpture of strong, rounded and widely spaced cords, occasionally with additional secondary cord in interspaces. Interspaces covered by 2-4 fine spiral threads. Cords equally strong on axial ribs and between them. Anal sinus deep, wide and rounded, deepest point just below middle of subsutural ramp. Outer lip projecting forward below sinus.

DESCRIPTION (holotype). — Shell solid, elongate fusiform, with a high turreted spire consisting of 13.5 whorls strongly angulated somewhat above periphery, with a wide, concave subsutural ramp. Protoconch and first 2-3 teleoconch whorls eroded, but protoconch probably paucispiral. Suture well defined, shallow, straight. Axial ribs very strong, rather sharp, widely spaced, opisthocline, produced adapically without forming a knob, entirely traversing spire whorls, gradually weakening abapically, abruptly stopping on shell base; 10 on penultimate whorl and 8 on last whorl. Subsutural ramp covered by very fine and closely set spiral threads. Spiral cords below ramp coarse, rounded, equally strong on axial ribs and between them; interspaces broader than cord, with 2-4 coarse threads and occasionally an additional secondary cord. Base almost flat, smoothly continuous with canal. Canal long, proportionally very broad, and slightly curved adaxially. Inner lip of aperture weakly and rather evenly concave, with thin, longitudinally rugose callus. Outer lip projecting moderately forward below sinus. Anal sinus deep, wide and rounded, deepest point just below middle of subsutural ramp. Shell covered by thin, firmly attached light brown periostracum, with abapically to whorl periphery a reddish-brown band forming distinctly darker rectangular blotches on axial ribs, most clearly visible on wet shell.

Dimensions: height 87.1 mm, last whorl height 52.3 mm, aperture height 42.7 mm, diameter 27.5 mm.

REMARKS. — The sculpture and general colour pattern resemble those of *C. ilariae* Bozzetti, 1991, but *Comitas rex* clearly differs by having angulate whorls with stronger axial ribs and concave subsutural ramp, and much broader canal. Another similar species is *C. kaderlyi* (Lischke, 1872), which, however, is characterized by more numerous and weaker axial ribs and finer spiral sculpture.

ETYMOLOGY. — From the Latin *rex*, king, with reference to the large size of the species. It is treated as a noun in apposition.

Genus *NIHONIA* MacNeil, 1961

TYPE SPECIES: *Nihonia shimajiriensis* MacNeil, 1961.

Nihonia maxima sp. nov.

Figs 13-15

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 84, 09°23'S, 131°09'E, 246-275 m, 1 dd (holotype).

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell large for genus, over 120 mm high, slender, fusiform, spire rather high, comprising 35% of shell height. Suture shallow. Spiral sculpture of narrow, granular cords in the slightly concave substural ramp, and rather weak and widely spaced primary cords below the shoulder. Interspaces with thinner secondary cords and thin, wavy, and closely set tertiary ones. Aperture narrow, canal long and straight. Anal sinus deep, asymmetrical, outer lip strongly projecting forward below sinus. Colour yellowish-white, with reddish-brown primary spiral cords.

DESCRIPTION (holotype). — Shell solid, slender, fusiform, with relatively high spire comprising 35% of shell height. Protoconch and tip of teleoconch missing. Teleoconch consisting of 10.5 whorls, adapical 3 whorls styloid, with very slow increase in diameter. Suture tightly adpressed, sometimes hardly distinguishable, clearly lined on spire whorls by a narrow, strongly granular subsutural cord, which becomes rather obsolete on last 2 whorls. Subsutural ramp concave, especially on juvenile whorls, less so on adult whorls. Spiral sculpture of spire whorls consisting of thin cords on the subsutural ramp, a broader cord bordering abapically the subsutural ramp, and 3 (later 2) strong cords below whorl periphery. On subsequent whorls sculpture becoming more complex. Cords in subsutural ramp fading out until only three indistinct ones remain in the middle of subsutural ramp of last adult whorl. Secondary and wavy, closely set tertiary spiral cords appearing gradually in interspaces between main cords. On periphery and base of last adult whorl, sculpture consisting of 4 single and 2 twinned flattened, rather weak primary cords. No axial sculpture except numerous strong incremental lines intersecting spiral cords, spiral cords sometimes interrupted at intersections, especially on canal. Aperture rather narrow, ovate, smoothly continuous with long, straight canal. Inner lip covered by thin callus. Outer lip thin, strongly projecting forward below anal sinus. Sinus deep, asymmetrical, deepest part in abapical half of subsutural ramp. Colour yellowish-white, with reddish-brown primary spiral cords.

Dimensions: height 128.2 mm, last whorl height 83.8 mm, aperture height 71.2 mm, diameter 32.1 mm.

REMARKS. — In whorl profile and type of sculpture, *Nihonia maxima* is most similar to the type species of the genus, *N. shimajiriensis*, from the Pliocene of Okinawa. However, *N. shimajiriensis* is much smaller (the incomplete holotype is 26 mm high at about 9 whorls, including 1.5 whorls of the protoconch, but the last whorl is partly broken), lacks the styloid apical whorls with slowly increasing diameter present in *N. maxima*, and has strongly angulate whorls bearing more pronounced cords. *N. maxima* can be easily distinguished from the two

common Recent species of the genus, *N. australis* (Roissy, 1805) and *N. mirabilis* (Sowerby, 1914), by its complex and much weaker spiral sculpture.

ETYMOLOGY. — From the Latin *maximus*, largest, with reference to the very large adult size.

Genus *CLAVOSURCULA* Schepman, 1913

TYPE SPECIES: *Clavosurcula sibogae* Schepman, 1913.

Clavosurcula schepmani sp. nov.

Figs 17-18

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn CC 21, 05°14'S, 133°00'E, 688-694 m, 1 lv (holotype).

Tanimbar Islands: stn CP 69, 08°42'S, 131°53'E, 356-368 m, 1 dd (paratype).

TYPE MATERIAL. — Holotype and paratype MNHN.

DIAGNOSIS. — Shell biconical with cyrtoconoid spire. Protoconch of 1.5 smooth light-brown whorls, indicating non-planktotrophic development. First teleoconch whorls angulate, with subsutural row of tubercles, and strong, oblique, axial knobs at periphery. Last whorls with abapical portion of suture at level of undulating peripheral keel, leaving only subsutural ramp exposed. Base of last whorl with broad flattened spiral cords separated by narrow grooves.

DESCRIPTION (holotype). — Shell thin, biconical, spire cyrtoconoid. Protoconch light brown, teleoconch white. Protoconch of 1.5 evenly convex whorls, diameter 850 µm. Teleoconch of 7.3 rapidly expanding whorls. First 3 teleoconch whorls with broad, smooth, concave ramp with a subsutural row of pointed tubercles, and strong peripheral keel overhanging abapical part of whorl, sculptured by broad, opisthocline axial ribs, forming pointed knobs on periphery, and extending to abapical suture, crossed by rather indistinct, narrow, spiral cords. After third whorl, exposed whorl height abapically of peripheral keel becomes covered by successive whorl, gradually leaving only concave ramp exposed. On subadult and adult whorls, subsutural row of tubercles coalesced to a wavy subsutural fold, and adapical margin of peripheral keel forming spirally striated suprasutural undulating fold, suture impressed, undulating. Subsutural ramp broad, rather flat, with weak indistinct spiral cords, on penultimate whorl sculptured in median area by two more distinct cords. Base of last whorl sculptured by 35 rather strong, wide, flattened cords separated by narrow interspaces, interspaces broader on canal. Base slightly convex, smoothly connecting to a long and straight canal. Aperture narrow, subrectangular. Inner lip covered by very thin callus. Anal sinus deep, with rounded outline, deepest point above middle of subsutural ramp. Outer lip chipped but, judging from growth lines, greatly projecting forward below sinus.

Dimensions: height 25.5 mm, diameter 12.2 mm, last whorl height 20.0 mm, aperture height 17.9 mm.

REMARKS. — The paratype measures 36.0 x 16.0 mm for 8.5 whorls. The early whorls are decorticated, but probably only part of the protoconch is missing. Spire whorls have the same sculpture as on the holotype. In the last two whorls there is a distinct spiral striation between abapical edge of sinus zone and peripheral keel, which is straight, not undulating.

Clavosurcula schepmani is very similar to the type and only species of the genus, *C. sibogae*, from the Flores Sea in 794 m. The latter species is, however, larger (38 mm at 8 whorls; SHUTO's [1970] measurements of the holotype are erroneous), broader, and without peripheral knobs and subsutural tubercles, even on first teleoconch whorls.

ETYMOLOGY. — The species is named in honor of M. M. SCHEPMAN for his pioneering work on the deep-sea turrids of the "*Siboga*" expedition.

Family CONIDAE Fleming, 1822

Subfamily CLATHURELLINAE H. & A. Adams, 1858

Genus ***BORSONIA*** Bellardi, 1839

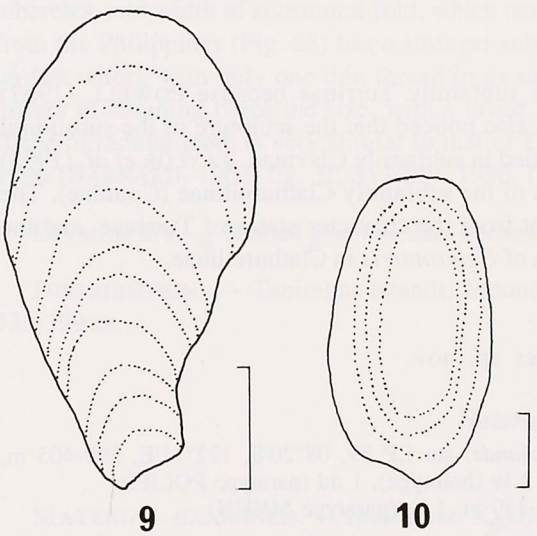
TYPE SPECIES: *Borsonia prima* Bellardi, 1839.

Borsonia jaya sp. nov.

Figs 1, 9, 39-44

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 72, 08°36'S, 131°33'E, 676-699 m, 1 lv, 1 dd (paratypes MNHN). — Stn CP 87, 08°47'S, 130°49'E, 1017-1024 m, 2 lv (paratypes MNHN), 3 dd (2 paratypes MNHN and 1 paratype POLIPI). — Stn CP 89, 08°39'S, 131°08'E, 1058-1084 m, 4 lv (holotype and 1 paratype MNHN, 2 paratypes POLIPI), 2 dd (paratypes MNHN). — Stn CP 91, 08°44'S, 131°05'E, 884-891 m, 1 lv (paratype POLIPI), 1 dd (paratype MNHN).

TYPE MATERIAL. — Holotype and 10 paratypes MNHN, 4 paratypes POLIPI.



FIGS 9-10. — Opercula.
9, *Borsonia jaya*, paratype. Scale bar 0.5 mm. — **10**, *Heteroturris gemmuloides*, paratype. Scale bar 0.25 mm.

DIAGNOSIS. — Shell fusiform, solid, up to 70 mm high, with high spire, periphery angulate, subsutural ramp concave in abapical part and devoid of axial sculpture. Axial ribs oblique, narrow, short, weakening abapically, restricted to periphery on last adult whorl. Spiral cords rather strong and closely set, narrower on ramp, covering the whole shell surface. Aperture pyriform with moderately long canal, inner lip with low pleat in adapical part of columellar edge. Anal sinus broad, moderately deep. Shell chalky, covered with dark-brownish grey periostracum, aperture of adult, live collected specimens light orange inside. Operculum small, pyriform, with terminal nucleus. Radular teeth large, straight, with short rounded basal part.

DESCRIPTION (holotype). — Shell slender, fusiform, solid, with high spire forming 41.5% of shell height. Protoconch and early teleoconch whorls corroded. Remaining part of teleoconch consisting of 8 convex whorls, angulate at periphery, suture shallow, slightly channeled. Subsutural ramp weakly convex adapically, concave abapically. Axial ribs short, opisthocline, narrow, separated by interspaces wider than ribs, abapically extending from angulation to suture, evanescent on outer base; 16 ribs on penultimate whorl, 18 on last whorl, where their vertical extension is restricted to periphery. Spiral cords rather strong, flattened, sometimes with a narrower cord between primary ones, narrower on subsutural ramp. Interspaces between cords narrow, not exceeding half of cord width, except on canal and adjacent portion of base, where interspaces exceed cord width. Last whorl moderately convex, base smoothly continuous with rather long and straight canal. Aperture broad, pyriform, evenly curved inner lip with broad callus and low pleat in adapical part of columellar edge. Outer lip evenly curved, projecting forward below anal sinus. Sinus moderately deep, as broad as subsutural ramp, deepest point in the middle of ramp. Shell chalky, covered with dark-brownish grey periostracum, aperture light orange inside.

Dimensions: height 60.9 mm, last whorl height 35.6 mm, aperture height 28.7 mm, diameter 19.8 mm.

Radula of a paratype (stn CP 87, height 35.5 mm) with large, straight, narrow teeth with rounded basal part, length 490 µm. Operculum small, pyriform, with slightly curved axis and terminal nucleus.

REMARKS. — The paratypes are 35.5 to 70.5 mm high, with some variation in proportions of the last whorl (*e.g.* Figs 41-42). Younger specimens (Fig. 43) have a relatively broader body whorl with axial ribs proportionally higher, extending to shell base. In such small specimens the aperture is greyish-white inside. The importance of columellar pleat may vary slightly, it is present in all but one specimen. Axial ribs on last whorl number 17-19.

Borsonia jaya is very similar to *B. epigona* Martens, 1901 from west of Sumatra, 646-676 m, but the latter is much smaller (up to 28 mm high), with distinctly angulate shell base, straight axial ribs, very prominent columellar pleat, and, judging from the original illustration, without spiral sculpture in the subsutural ramp. *B. jaya* also shows some similarity to the type-species of *Buridrillia* Olsson, 1942, *Clathrodrillia (Buridrillia) panarica* Olsson, 1942 from the Pliocene of Central America. However, it has been recently shown (EMERSON & MCLEAN, 1992) that *Buridrillia* has radular teeth of modified wishbone type and therefore belongs to the subfamily Crassispirinae.

ETYMOLOGY. — From the Indonesian *jaya*, meaning large, beautiful.

Genus ***HETEROTURRIS*** Powell, 1967

TYPE SPECIES: *Heteroturris sola* Powell, 1967.

REMARKS. — *Heteroturris* was originally described in the subfamily Turrinae because POWELL (1967) considered it closely allied to *Lophiotoma* Casey, 1904. POWELL also noticed that the sculpture of the subsutural ramp resembles that of *Microdrillia* Casey, 1903, which he classified in subfamily Clavinae. TAYLOR *et al.* (1993) have included *Microdrillia* in the "tomopleurid" group of genera of the subfamily Clathurellinae (Conidae). The style and position of anal sinus in *Heteroturris* is rather different from the character states of Turrinae, and the radular morphology of *H. gemmuloides* confirms the classification of *Heteroturris* in Clathurellinae.

Heteroturris gemmuloides sp. nov.

Figs 2, 10, 21-23

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 59, 08°20'S, 132°11'E, 399-405 m, 1 lv (paratype MNHN). — Stn CP 69, 08°42'S, 131°53'E, 356-368 m, 1 lv (holotype), 1 dd (paratype POLIPI).
Philippines. MUSORSTOM 2: stn CP 75, 13°51'N, 120°30'E, 300-330 m, 1 lv (paratype MNHN).

TYPE MATERIAL. — Holotype and 2 paratypes MNHN, 1 paratype POLIPI.

DIAGNOSIS. — Shell large for the genus, height up to 40 mm, solid, narrowly fusiform, with high spire and long canal. Whorls with rather prominent bicarinate subsutural fold, concave subsutural ramp, and prominent, tuberculate, peripheral keel. Subsutural ramp bearing numerous, regular, curved folds formed by thickened scars of anal sinus. Abapically of keel, spiral cords strong and widely spaced, sometimes with a thinner cord in interspaces, two on exposed part of spire whorls, over 20 on base and canal of last whorl. Anal sinus deep, U-shaped, with parallel sides. Shell chalky white under rather thick light-brown periostracum. Operculum small, vestigial, with large central nucleus. Radula long, with more than 50 transverse rows. Radular teeth small, inflated at the base, with proximal opening.

DESCRIPTION (holotype). — Shell solid, narrowly fusiform, with tall spire comprising 40% of total shell height. Protoconch and apical teleoconch whorls eroded. Remaining part of teleoconch consisting of 10.5 angulate

whorls. Subsutural ramp wide, concave with rather massive, broad, flat-topped, bicarinate subsutural fold and 2 weak spiral threads in the middle, ramp bearing numerous, regular, curved folds formed by thickened scars of anal sinus. On last whorl, cords of subsutural fold becoming strongly and irregularly granulate, and appearing like a spirally twisted rope, due to intersection with growth lines. Peripheral keel moderately prominent, bearing numerous rounded tubercles truncated adapically at edge of ramp, 24 tubercles on penultimate whorl, 27 on last whorl. Spiral sculpture consisting of one abapical cord bordering suture, and one additional strong cord (missing on apical whorls) below peripheral keel. On last whorl, periphery with 4 widely interspaced strong cords, additional thinner cords appearing in between. Base and canal covered by ca. 26 cords, sometimes with thinner cord in interspaces; adapical basal cords of almost same strength as those at periphery, but prominence of cords gradually decreases towards tip of canal, where cords are obsolete. Axial sculpture consisting of strong incremental lines, intersection with spiral cords granular. Aperture rather narrow, ovate, gradually continued by long and straight canal. Inner lip covered by thick callus, parietal wall weakly and evenly curved. Anal sinus deep, U-shaped, with parallel sides, occupying entire width between subsutural fold and peripheral keel. Colour chalky white under thick light-brown periostracum.

Dimensions: height 40.5 mm, last whorl height 24.4 mm, aperture height 21.1 mm, diameter 11.8 mm.

Operculum (of paratype) small, 1.05 x 0.6 mm, vestigial, very thin, with large central nucleus. Radula long, narrow, with over 50 transverse rows. Radular teeth rather small, mean length 270 µm (in specimen 38.5 mm high), short, base strongly inflated, with proximal opening.

REMARKS. — Paratypes are smaller than holotype: 38.5 x 11.3 mm and 33.0 x 9.7 mm. Specimens from Indonesia are very similar to the holotype, except for minor variation in the strength and number of peripheral tubercles, and width of subsutural fold, which may be slightly concave between two marginal cords. The specimen from the Philippines (Fig. 23) has a stronger subsutural fold, and a slightly narrower subsutural ramp, especially on last whorl, with only one thin thread in its middle. *Heteroturris gemmuloides* is very similar to *H. sola*, but differs in attaining twice the size, with a broad, bicarinate subsutural fold, and a nodulose peripheral keel. The shape of radular teeth is very similar to that of *Typhlomangelia polythele* Barnard, 1963 and *T. adenica* Sysoev, 1996 (BARNARD, 1963, fig. 3f; SYSOEV, 1996, fig. 4).

ETYMOLOGY. — Named *gemmuloides* because of its superficial resemblance to species of *Gemmula*.

DISTRIBUTION. — Tanimbar Islands, Indonesia, and southwest of Luzon Island, Philippines, taken alive at 330-399 m.

Heteroturris serta sp. nov.

Fig. 28

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn DW 28, 05°31'S, 132°54'E, 448-467 m, 1 dd (holotype).

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell solid, small, less than 10 mm high, narrowly fusiform, with high spire and long canal. Protoconch with 3.25 whorls, initial 1.5 whorls smooth, subsequent whorls sculptured by strong, closely spaced axial ribs. Suture channeled. Whorls with very strong, smooth, rounded peripheral keel and thick subsutural fold, crenulated adapically. Subsutural ramp narrow, concave, with one spiral cord in the middle, and regular arcuate folds formed by thickened scars of anal sinus. Spiral cords very strong and widely spaced. Last whorl with three cords on shell base below keel. Anal sinus broad and shallow. Colour light yellowish.

DESCRIPTION. — Shell solid, thick-walled, small, narrowly fusiform with tall spire comprising 37% of shell height. Protoconch multispiral, consisting of 3.25 whorls; first 1.5 whorls smooth, subsequent whorls covered with numerous arcuate axial ribs, which gradually become stronger towards abrupt protoconch/teleoconch

discontinuity. Teleoconch consisting of 6.25 whorls. Spiral sculpture on spire whorls consisting of a thick, overhanging subsutural fold with flattened and steeply descending surface, a strong, smooth peripheral keel, and another cord bordering abapical suture (on last 2 spire whorls only). Axial sculpture consisting of strong incremental folds that do not extend over main spiral cords. Subsutural fold consisting of a strong, smooth spiral cord abapically and a much weaker crenulated adapical cord, separated by area covered by oblique incremental wrinkles. Subsutural ramp rather narrow, concave, covered by distinct, crisp, arcuate incremental folds formed by scars of anal sinus, and on last 3 whorls bearing a narrow cord running in the middle of ramp and forming tubercles at intersection with axial folds. Periphery and base of last whorl with 4 strong cords with wide interspaces, followed by 13 gradually weakening cords on canal. Canal long and straight. Aperture rather narrow, pyriform, with a strong lira inside. Inner lip covered by thick callus, parietal side evenly curved. Outer lip chipped, but growth lines indicating broad and shallow anal sinus. Colour yellowish-white, with a very thin periostracum.

Dimensions: height 9.5 mm, last whorl height 6.0 mm, aperture height 4.8 mm, diameter 3.4 mm.

REMARKS. — *Heteroturris serta* differs from *H. sola* in having a solid and broad subsutural fold, stronger spiral sculpture, and a protoconch with fewer whorls. It also differs from *H. gemmuloides* in its stronger spiral sculpture and smooth peripheral keel. The holotype of *H. serta* may not be fully adult, but it is well preserved and the species should be easily recognizable, either as a juvenile with protoconch or as a mature specimen with adult sculpture.

ETYMOLOGY. — From the Latin *sertus*, plaited, with reference to the very regular incremental sculpture.

Subfamily RAPHITOMINAE Bellardi, 1875

Genus ***CRYPTODAPHNE*** Powell, 1942

TYPE SPECIES: *Cryptodaphne pseudodrillia* Powell, 1942.

Cryptodaphne rugosa sp. nov.

Figs 24-27

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn DW 13, 05°26'S, 132°38'E, 417-425 m, 1 dd (holotype). — Stn DW 24, 05°32'S, 132°51'E, 230-243 m, 1 dd (paratype POLIPI).
Tanimbar Islands: stn DW 44, 07°52'S, 132°48'E, 291-295 m, 2 lv (paratypes MNHN).

TYPE MATERIAL. — Holotype and 2 paratypes MNHN, 1 paratype POLIPI.

DIAGNOSIS. — Shell rather small, up to 13 mm high, thin, teleoconch shell surface finely granulate. Protoconch multispiral, consisting of ca. 3 diagonally cancellated whorls. Teleoconch whorls with deep, slightly channeled suture, and very broad, slightly concave subsutural ramp, occupying most of height on spire whorls. Strong spiral keel adjacent to abapical suture in early whorls and well below periphery in penultimate whorl. Last whorl with 10 fine spiral cords and numerous closely set sigmoid incremental lines in subsutural ramp, and several strong and narrow cords below keel, thin secondary and tertiary cords in interspaces. Siphonal canal short and curved. Anal sinus moderately deep, asymmetrical, with deepest point in lower half of ramp. Colour of protoconch light brown, teleoconch off-white.

DESCRIPTION (holotype). — Shell rather small, thin but solid, narrowly biconical, with tall spire comprising 40% of shell height. Protoconch multispiral, protoconch I and initial part of protoconch II missing, remaining part consisting of about 2 whorls with diagonally cancellated sculpture, diameter 650 µm. Protoconch/teleoconch boundary sharp, with deeply opisthocyrt protoconch outer lip. Teleoconch consisting of 6.75 whorls separated by deep, slightly channeled suture, shell surface minutely granular. Most of whorl height occupied by very broad,

slightly concave subsutural ramp. Primary sculpture consisting of spiral cords, only the strongest adapical one exposed on early whorls, forming a suprasutural keel; penultimate whorl with one additional strong cord exposed below keel; last whorl with 8 strong, widely spaced primary cords exposed on base below peripheral keel, 1-3 thinner secondary cords in interspaces; 9 weaker cords on canal. Subsutural ramp smooth on early whorls, on later whorls bearing narrow spiral cords, 8 on penultimate, 10 on last whorls, the second from adapical margin and the most abapical ones strongest. Axial sculpture of numerous, narrow sigmoid folds formed by thickened incremental lines. Axial folds and spiral cords forming reticulate pattern in ramp, small nodules at points of intersection. Canal rather short and curved. Aperture oval, columella thick, forming a distinct angle with parietal part of inner lip. Anal sinus asymmetrical, moderately deep, steeply descending adapically, deepest point rounded in abapical half of ramp. Protoconch light brown, teleoconch off-white.

Dimensions: height 11.8 mm, diameter 4.8 mm, body whorl height 7.0 mm, aperture height 5.2 mm.

REMARKS. — In the paratypes (dimensions 12.8 x 5.1 mm, 9.3 x 3.7 mm, and 7.7 x 3.5 mm), the strength and relative position of the main spiral keel vary a little, as do also the concavity of the subsutural ramp and the number of cords on the ramp and in interspaces of primary spirals. One paratype has a protoconch of about 3 whorls with etched surface, but even in that specimen the earliest part is dissolved.

Cryptodaphne rugosa resembles *C. affinis* (Schepman, 1913), but can be easily distinguished by its proportionally larger body whorl, differently shaped anal sinus, and details of sculpture. In fact, it is much more similar to the fossil type-species than to any of the Recent species assigned to the genus (POWELL, 1966; SHUTO, 1971). The New Zealand type species *C. pseudodrillia* was originally recorded from the Lower Miocene (POWELL, 1942) and later (POWELL, 1966) the Upper Oligocene, but BEU & MAXWELL (1990) list it in the Early Miocene faunal assemblage. *C. rugosa* is almost twice the size of the holotype of *C. pseudodrillia* and differs mainly in the shape of the anal sinus, in *C. pseudodrillia* "descending almost vertically and then abruptly produced forward" (POWELL, 1942: 165), as well in the twisted canal, absence of "close-spaced spiral threads" covering the entire shell surface, and presence of minute granulation.

The diagonally cancellate protoconch sculpture clearly indicates a position in Raphitominae, however *C. rugosa* possesses features more frequently encountered in Clathurellinae, such as the closely spaced axial folds, formed by thickened growth lines, well developed over the entire subsutural ramp, and the presence of minute granulation on the shell surface.

ETYMOLOGY. — *Rugosus*, Latin adjective meaning rough, with reference to granular microsculpture.

Genus ***GYMNOBELA*** Verrill, 1884

TYPE SPECIES: *Gymnobela engonia* Verrill, 1884.

Gymnobela ioessa sp. nov.

Figs 3, 29-33

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 54, 08°21'S, 131°43'E, 836-869 m, 5 lv (holotype and 3 paratypes MNHN, 1 paratype POLIPI), 5 dd (3 paratypes MNHN and 2 paratypes POLIPI).

TYPE MATERIAL. — Holotype lv and 6 paratypes MNHN, 3 paratypes POLIPI.

DIAGNOSIS. — Shell exceeding 45 mm in height, fusiform, solid, with high spire and short canal. Whorls angulate below periphery, angulation obsolete on last adult whorl. Subsutural ramp broad, moderately to weakly concave, without axial sculpture and with fainter spiral cords, sometimes with thickened scars of anal sinus adapically. Axial ribs oblique, rather short, reaching abapical suture, only occupying periphery on adult whorls, obsolete on last whorl of large adults. Spiral cords flat, separated by narrow interspaces and, sometimes, additional

narrower cords. Anal sinus broad, moderately deep, somewhat angulate. Colour reddish-violet, with lighter subsutural band, aperture brown inside. Radular teeth straight, narrow, barbed, with narrow trilobate basal part.

DESCRIPTION (holotype). — Shell fusiform, thin but solid, with tall spire comprising 41.5% of shell height. Protoconch and outer layers of apical teleoconch whorls dissolved, only traces of brown protoconch columella remaining. Teleoconch consisting of 10 whorls, suture shallow, slightly channeled. Apical whorls angulate at periphery, angulation weaker and situated a little below periphery in subadult whorls, last whorl rather evenly rounded. Whorl profile concave above angulation, slightly convex below it. Axial sculpture consisting of ribs that extend abapically from whorl angulation to outer base, oblique, weakening abapically, 14 on penultimate whorl, obsolete on last whorl. Spiral sculpture consisting of narrow grooves delimiting low, flat spiral bands, grooves weaker on subsutural ramp, deeper below periphery. Base evenly convex, smoothly continuous with rather short, straight, moderately broad canal. Aperture broad, oval, parietal side weakly concave, separated by obtuse angle from straight columella. Inner lip a thin, broad callus, outer lip evenly curved. Anal sinus moderately deep, broad, slightly angulate, deepest point just below middle of subsutural ramp. Colour dull reddish-violet, with a lighter band subsuturally in part of ramp, aperture and columella orange brown. Periostracum very thin, transparent.

Dimensions: height 46.3 mm, last whorl height 27.1 mm, aperture height 21.2 mm, diameter 16.0 mm.

Last 1-1.5 protoconch whorls preserved on 2 paratypes, brown, with sculpture of spiral cords interrupted by close set, curved axial riblets. Radular teeth of 34.2 mm high paratype straight, narrow, barbed, with narrow trilobate basal part, mean length 170 µm (Fig. 3). No operculum.

REMARKS. — The paratypes are smaller than the holotype (largest 45.5 x 16.3 mm). In smaller specimens, the axial ribs number 14 or 15 on the last whorl and do not extend onto shell base. The adapical part of the subsutural ramp may bear numerous, regular, thickened scars of the anal sinus.

Gymnobela ioessa resembles *G. muricata*, occurring sympatrically, but differs in having a more slender, reddish-violet shell, higher axial ribs reaching suture abapically, and smaller radular teeth with narrow, trilobate basal part. *G. ioessa* also attains a smaller size.

G. ioessa and *G. muricata* form a distinct group within the genus, which combines characters of two different subfamilies of Conidae. The general shell outline and colouration, and the character of anal sinus are similar to those of Clathurellinae (*e.g.*, *Borsonia* and *Typhlosyrinx* Thiele, 1925), whereas the protoconch sculpture and the structure of radular teeth indicate a position in the Raphitominae. These species, however, can be placed in *Gymnobela* taken in a broad sense, as is frequently adopted in the current literature.

ETYMOLOGY. — From the Greek *ioeis* (feminine *ioessa*), meaning violet or dark brown, based on the ground colour of the shell.

Gymnobela muricata sp. nov.

Figs 4, 34-38

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 54, 08°21'S, 131°43'E, 836-869 m, 3 lv (2 paratypes MNHN, 1 paratype POLIPI), 2 dd (holotype and paratype MNHN). — Stn CP 73, 08°29'S, 131°33'E, 840-855 m, 1 lv (paratype POLIPI). — Stn CP 91, 08°44'S, 131°05'E, 884-891 m, 1 dd (paratypes MNHN).

TYPE MATERIAL. — Holotype (dd) and 4 paratypes MNHN, 2 paratypes POLIPI.

DIAGNOSIS. — Fully adult shell very large, up to 70 mm high, broad, solid, with high, regularly conical spire, short, broad siphonal canal. Whorls angulate just below middle of whorl, angulation obsolete in last adult whorls. Subsutural ramp wide, weakly concave, without axial sculpture. Axial ribs oblique, short, not reaching abapical suture, only occupying periphery in last whorls, obsolete on last whorl of large adults. Spiral grooves narrow, delimiting flat, unevenly broad cords, weaker on ramp than on periphery and base. Anal sinus broad, moderately deep, somewhat angulate. Colour white to light-brown. Radular teeth straight, long, weakly barbed, with bifurcate basal part.

DESCRIPTION (holotype). — Shell broadly fusiform, thin but solid, with tall spire comprising 39% of total shell height. Protoconch and apical whorls dissolved. Teleoconch consisting of 10 whorls, suture shallow. Earliest teleoconch whorls angulate just below middle of whorl, angulation weaker on subsequent whorls, last whorl almost evenly rounded. Whorl profile weakly concave above angulation, almost flat below. Axial ribs very short, oblique, extending abapically from whorl angulation on earliest teleoconch whorls, forming rounded knobs just below periphery on subadult whorls (18 ribs on penultimate whorl), obsolete on last adult whorl. Spiral sculpture consisting of narrow, shallow, unevenly spaced grooves separating low, flat cords. Cords weaker but more regular on subsutural ramp, stronger but uneven below whorl angulation. Last whorl rather inflated, with evenly convex base, clearly separated from short, very broad, slightly twisted siphonal canal. Aperture broad, oval. Inner lip covered by thin, broad, longitudinally wrinkled callus, concave parietal and columellar sides forming obtuse angle. Outer lip evenly convex. Anal sinus moderately deep, broad, slightly angulate, deepest point in abapical part of subsutural ramp. Colour chalky light yellowish brown.

Dimensions: height 69.1 mm, last whorl height 42.4 mm, aperture height 33.3 mm, diameter 25.7 mm.

Radular teeth of 33.3 mm high paratype weakly barbed with strong basal spur and bifurcate basal part, mean length 275 µm (Fig. 4). No operculum.

REMARKS. — The paratypes are smaller than the holotype (the largest is 52.1 x 20.6 mm). Small specimens are dull greyish-white, with a very thin transparent periostracum, and proportionally longer and narrower canal. The protoconch is dissolved in all specimens, but there are traces of a brown layer, suggesting that the protoconch was of the planktotrophic type.

For differences with *G. ioessa*, see that species.

ETYMOLOGY. — From the Latin *muricatus* (adj.), meaning pointed or spiny like a murex, with reference to the high spire and short, knob-like axial ribs.

Gymnobela mitrodeta sp. nov.

Figs 5, 45-46

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn CP 12, 05°23'S, 132°37'E, 413-436 m, 1 lv (holotype).

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell of medium size, 24 mm high, thin but solid, buccinoid. Protoconch multispiral, small, with 2+ diagonally cancellated whorls. Teleoconch whorls angulate at periphery, suture deep, slightly channeled. Subsutural ramp occupying about half of exposed whorl height between subsutural row of blunt tubercles and crowned periphery, ramp concave on both sides of convex median part. Spiral sculpture of fine cords in ramp, stronger but narrow cords at periphery and broad rounded cords abapically, secondary and tertiary cords in interspaces. Axial ribs oblique, numerous, very short on last whorls. Canal moderately long, slightly curved and obliquely truncated. Anal sinus asymmetrical, with apex in lower half of subsutural ramp. Protoconch brown, teleoconch white, with two light reddish-brown bands at periphery and on canal. Radular teeth small with well-developed basal part.

DESCRIPTION (holotype). — Shell thin but solid, buccinoid, with angulated shoulder at whorl periphery. Protoconch I and initial part of protoconch II missing, remaining part consisting of about 2 whorls with diagonally cancellated sculpture, diameter 550 µm. Protoconch/teleoconch boundary sharp. Teleoconch consisting of 7.8 convex, strongly angulated whorls, suture deep, narrowly channeled by subsutural ridge. Subsutural ramp occupying about half of spire whorls, concave on early whorls, but becomes progressively convex in the middle part on three last whorls; smooth on first 2 whorls, on subsequent whorls sculptured by spiral cords, very weak below subsutural ridge, increasing in strength on abapical half of subsutural ramp, and becoming very narrow near

shoulder. Below shoulder, spiral sculpture of strong, rounded and widely spaced primary cords, 2 on spire whorls, 4 on periphery of last adult whorl, interspaces with densely packed thinner secondary and tertiary cords. Spiral cords weaker on base and siphonal canal. Axial sculpture consisting of strong ribs, which are interrupted by ramp, and form blunt, elongated tubercules on subsutural ridge and at periphery. On early whorls, ribs almost straight, extending over all exposed part of whorl below periphery, on two last whorls ribs more numerous (28 on penultimate, 34 on last whorl), oblique, very short, occupying only periphery. Base moderately constricted to a rather short, slightly twisted, and obliquely truncated canal. Aperture oval, siphonal canal poorly demarcated. Inner lip covered by thin and glossy callus, parietal area weakly convex, columellar area almost straight. Anal sinus strongly asymmetrical, deepest part in abapical half of subsutural ramp, abapical edge almost horizontal, outer lip strongly projecting forward below sinus. Protoconch brown, teleoconch ground color white, with two pale reddish-brown bands, one encircling peripheral angulation on last two whorls, the other obliquely encircling canal.

Dimensions: height 24.2 mm, diameter 11.2 mm, last whorl height 16.3 mm, aperture height 13.4 mm.

Radular teeth small, 130 µm long, with well-developed basal part, subquadrate in front view (Fig. 5).

REMARKS. — *Gymnobela mitrodeta* can be easily distinguished from other species of the genus by its complex spiral sculpture, short and numerous axial ribs, tuberculated subsutural fold, strongly asymmetrical anal sinus, and peculiar color pattern.

ETYMOLOGY. — From the Greek *mitrodetos* (adjective), crowned by a turban, with reference to the orange spiral band encircling the periphery of subadult and adult whorls.

Gymnobela micraulax sp. nov.

Figs 47-48

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 91, 08°44'S, 131°05'E, 884-891 m, 2 lv (holotype and paratype).

TYPE MATERIAL. — Holotype and paratype MNHN.

DIAGNOSIS. — Shell of medium size, up to 27 mm, thin, semi-transparent, narrow, with high spire. Teleoconch whorls angulate at periphery or above it, with steep, smooth subsutural ramp. Suture shallow. Spiral sculpture of narrow grooves. Axial ribs strong, oblique, vanishing rapidly below periphery before abapical suture. Canal moderately long, inner lip without callus. Outer lip strongly projecting below deep anal sinus. Colour light-brown.

DESCRIPTION (holotype). — Shell fusiform, thin, semi-transparent, narrow, with high spire forming about 40% of total height. Protoconch corroded apically, remaining 2 whorls sculpture etched, but traces of oblique reticulation present. Teleoconch consisting of 8.5 shouldered whorls, whorl angulation above periphery, suture shallow, slightly adpressed, steeply descending subsutural ramp almost flat adapically and concave near whorl angulation. Axial sculpture of strong, broad and opisthocline ribs, forming axially elongated nodule below shoulder, vanishing abapically before reaching suture. 14 axial ribs on penultimate whorl, 13 on last whorl. Incremental lines forming raised wrinkles in adapical part of subsutural ramp. Spiral sculpture consisting of narrow, rather evenly spaced grooves, 9 on exposed part of penultimate whorl, 35 on last whorl, more crowded on canal. Base weakly convex, smoothly connected to moderately long, obliquely truncated canal. Aperture narrow, poorly demarcated from canal, inner lip weakly and evenly concave, without a callus, outer lip thin, fragile, strongly projecting forward below anal sinus. Anal sinus deep, deepest point just below suture. Colour of protoconch with traces of brown, teleoconch glassy light-brown.

Dimensions: shell height 26.6 mm, diameter 8.1 mm, body whorl height 15.8 mm, aperture height 12.8 mm.

REMARKS. — The paratype measures 22.0 x 7.1 mm and has 7.5 teleoconch whorls (protoconch corroded, surface etched). Whorl angulation is approximately at periphery, which also results in a slightly broader subsutural ramp. It also differs slightly from the holotype in the ribs being slightly more axially elongated.

Gymnobela micraulax can be easily distinguished from other Indo-Pacific species of *Gymnobela* by its high spire and sculpture of narrow grooves.

ETYMOLOGY. — *Micraulax*, Greek (adj.) meaning with small furrows, with reference to the spiral sculpture.

Gymnobela baruna sp. nov.

Figs 6, 49-50

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn CC 21, 05°14'S, 133°00'E, 688-694 m, 1 lv (holotype), 1 dd (paratype).

TYPE MATERIAL. — Holotype and paratype MNHN.

DIAGNOSIS. — Shell thin, up to 36 mm high, with high spire occupying 45% of shell height. Protoconch multispiral, with diagonally cancellated sculpture. First teleoconch whorls with angular periphery, weakly concave anal sinus occupying ca. 60% of subsural ramp, periphery with very short oblique axial ribs, last whorls almost evenly convex. Spiral sculpture of fine spiral cords and strongly sigmoid incremental lines, intersection irregularly reticulate. Colour white, adapical half of last whorls with very pale yellowish-white band.

DESCRIPTION (holotype). — Shell consisting of 1+ protoconch and 9.5 teleoconch whorls, slender, thin but rather solid, high, fusiform, tall spire occupying 45% of shell height, suture rather deep, slightly channeled. Tip of protoconch dissolved, remaining whorl surface etched but remnants of sculpture typical of multispiral larval shell with diagonally cancellated sculpture, indicating planktotrophic development. First 6 teleoconch whorls distinctly shouldered, weakly concave sinus zone occupying about 60% of broad subsutural ramp, whorl profile almost flat above and below strong peripheral angulation. Subsequent whorls almost evenly convex, subsutural ramp flat with poorly defined abapical border. Axial sculpture consisting of strongly sigmoid incremental lines, forming raised opisthocyrt riblets in sinus zone, and strongly prosocline threads below sinus; very short, broad, opisthocline ribs on periphery of spire whorls, ca. 15 per whorl, vanishing on 6th and subsequent whorls. Spiral sculpture consisting of cords, weakly defined and widely spaced in sinus zone, sharply defined, thin, rounded and closely spaced on rest of the whorl, a few stronger below periphery. Intersection of incremental lines and spiral cords rather regularly reticulate on spire whorls, more irregularly so on last whorl, due to unevenness of lines and cords. Aperture rather broad, oval, widely open siphonal canal not distinctly set off. Inner lip with thin, polished callus extending over convex parietal and concave columellar areas. Outer lip chipped, anal sinus (from shape of growth) rather deep, its deepest point in middle of subsutural ramp. Colour chalky white, adapical half of last whorls with very pale yellowish-white band.

Dimensions: height 36.2 mm, diameter 12.8 mm, last whorl height 21.3 mm, aperture height 16.7 mm.

Radular teeth (Fig. 6) straight, unbarbed, basal part subquadrate in frontal view, length 250 µm.

REMARKS. — The paratype (21.6 x 8.5 mm at 2+ protoconch and 7.5 teleoconch whorls) is a damaged and slightly eroded shell. Whorl profile and sculpture correspond to the characters of holotype at comparable size, but whorl angulation is more pronounced than on corresponding (7th) whorl of the holotype; also, spiral cords and growth lines are slightly coarser.

Gymnobela baruna is rather different from most other representatives of the genus. The general shell outline, the absence of prominent axial sculpture and fine spiral cords are more characteristic of *Xanthodaphne*. However, the high spire and clearly defined broad subsutural ramp, delimited by the whorl angulation in early whorls, are features that do not fit that genus. *G. baruna* is most similar to the species illustrated by MATSUMOTO (1979, pl. 17, fig. 3) as *Daphnella proxima* Kuroda. The latter, however, is a manuscript name and a *nomen nudum* [ICZN Art. 13a(i)].

ETYMOLOGY. — From the name of the Indonesian research vessel *"Baruna Jaya 1"* which collected the material. *Baruna* is used as a noun in apposition.

Genus *MIOAWATERIA* Vella, 1954

TYPE SPECIES: *Awateria personata* Powell, 1954.

Mioawateria asarotum sp. nov.

Fig. 55

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn DW 13, 05°26'S, 132°38'E, 417-425 m, 1 dd (holotype).

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell small, about 7 mm high, short, wide, solid, with few rapidly expanding whorls. Protoconch multispiral with diagonally cancellated sculpture. Teleoconch whorls angulate. Last whorl almost as high as wide, completely covered by sculpture of low, wide cords, intersecting numerous, stronger but narrower axial ribs, intersection forming axially elongated nodules. Aperture broad. Canal very short and poorly differentiated from aperture. Anal sinus broad and shallow.

DESCRIPTION. — Shell small, solid, broadly biconical, with low spire and very large, inflated last whorl, occupying 74% of total shell height. Protoconch consisting of 2+ convex whorls, protoconch I and probably about 0.5 whorl of protoconch II missing, sculpture of opisthocyrt, opisthocline axial riblets, forming diagonal cancellation with oblique threads in abapical two-thirds. Axial riblets nearly orthocline near clearly defined protoconch/teleoconch discontinuity. Teleoconch consisting of 3.8 rapidly expanding whorls, with sharp angulation above periphery, subsutural ramp weakly concave. On first teleoconch whorl, two spiral cords and a third, poorly defined one on shoulder, intersecting thinner axial riblets, intersection forming axially elongate nodules. On 2nd and third whorls, an additional spiral cord exposed above suture, shoulder cord more distinct, intersecting axial riblets of similar strength, intersection forming rounded beads. On last whorl, 19 spiral cords and 35 ribs; subsutural cord indistinct on broad subsutural fold, peripheral cords broad, low, separated by narrow groove, cords on base and canal higher and separated by interspaces occupying equal width; axial ribs sharp, stronger than cords, forming raised, prosocline, sigmoid wrinkles in subsutural zone, rather orthocline and extending over whole whorl height below angulation, forming checkerboard pattern with spiral grooves. Aperture broad, parietal wall convex with rather thin callus, columella almost straight with thicker callus. Canal short and broad. Outer lip broken, but growth lines indicating very shallow sinus, with deepest point at whorl angulation. Protoconch brown, teleoconch beige-white.

Dimensions: height 6.9 mm, diameter 4.8 mm, last whorl height 5.1 mm, aperture height 3.9 mm.

REMARKS. — *Mioawateria asarotum* is similar to the type species, *M. personata*, but differs in having much lower spire and inflated body whorl. In shell outline, it is similar to *M. rhomboidea* (Thiele, 1925) from West Africa, but differs in its smaller shell with curved axial ribs and very wide spiral cords. *M. extensaeformis* (Schepman, 1913), which is rather common in the Indo-Pacific bathyal, has a narrower shell and much weaker spiral sculpture.

ETYMOLOGY. — Latin *asarotum* (noun in apposition), a floor laid in mosaic, with reference to the elongated squares formed by intersection of axial and spiral sculpture.

Genus *CLINURA* Bellardi, 1875

TYPE SPECIES: *Murex (Pleurotoma) calliope* Brocchi, 1814 (Neotype figured by ROSSI RONCHETTI, 1955, fig. 163).

Clinura vitrea sp. nov.

Figs 7, 54

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 91, 08°44'S, 131°05'E, 884-891 m, 1 lv (holotype).

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell of medium size, 21 mm high, thin, porcellaneous, with high pagodiform spire. Teleoconch whorls very convex, with keeled periphery. Axial ribs numerous, very short, restricted to whorl periphery, forming narrow oblique knobs on keel. Spiral sculpture of strong cords below periphery, interspaces rather wide. Last whorl attenuated towards moderately long, straight canal. Subsutural ramp broad, almost devoid of sculpture, sinus rounded, deepest point in middle of ramp. Radular teeth short, straight, with bilobate basal part.

DESCRIPTION (holotype). — Shell thin, porcellaneous, broadly fusiform, consisting of 8.5+ very convex teleoconch whorls (protoconch and apical teleoconch whorls dissolved) with high pagodiform spire occupying 42% of total shell height. Suture impressed, periphery angulate, subsutural ramp broad, convex, whorl profile concave abapically of slightly overhanging peripheral keel, base regularly convex. Outer shell layer etched on spire whorls, details of sculpture preserved on last two whorls only. Axial sculpture consisting of numerous (28 on penultimate and last whorls), short, opisthocline riblets, forming oblique nodules on peripheral keel and extending to abapical concavity only; incremental lines very distinct in ramp, occasionally thickened as opisthocyrt wrinkles. Spiral sculpture in subsutural ramp consisting of 6-8 poorly defined cords, on and below peripheral keel consisting of strong, sharply defined cords, interspaces broader than cords, 2 stronger cords just above suture in exposed part of spire whorls. Base convex, canal distinctly set off, long, straight, narrow. Aperture ovate, inner lip a thin glaze over weakly convex parietal area and almost straight columella. Outer lip chipped, based from incremental lines anal sinus occupies whole ramp, rounded, deepest point on abapical side of middle part of ramp. Colour porcellaneous white, etched shell surface and interspaces between cords opaque, chalky white, ramp and cords vitreous.

Dimensions: height 21.3 mm, diameter 10.5 mm, last whorl height 13.4 mm, aperture height 11.1 mm.

Radular teeth 250 µm long, straight, short, with a bilobed and turned out basal part (Fig. 7).

REMARKS. — Until now the genus *Clinura* was known only from Oligocene to Pliocene deposits in Europe, Indonesia and New Zealand (POWELL, 1966), and *C. vitrea* is the first Recent record. Regrettably, however, the protoconch of the new species is unknown, and this makes the generic placement only provisional. It is similar to the type species from the Pliocene of Italy. Characters shared by fossil species of *Clinura* and *C. vitrea* are the fusiform-biconic shell profile with a pagodiform spire, narrow canal, crenulate peripheral keel, and strong spiral sculpture below whorl periphery. In *C. calliope* the anal sinus is rather shallow and has the apex in the upper part of subsutural ramp but the form and position of anal sinus vary rather greatly within the genus (see BEETS, 1942) and in some species are similar to those of *C. vitrea.*

ETYMOLOGY. — Latin *vitreus* (adjective), like glass, with reference to both the fragility of the shell and the semi-transparent appearance.

Genus ***VEPRECULA*** Melvill, 1917

TYPE SPECIES: *Clathurella sykesi* Melvill & Standen, 1903.

Veprecula bandensis sp. nov.

Fig. 53

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn CC 21, 05°14'S, 133°00'E, 688-694 m, 1 lv (holotype).

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell large for genus, 21 mm high, very thin and fragile, slender, with high spire. Protoconch multispiral with oblique axial ribs. Teleoconch whorls weakly angulate at shoulder, narrow, weakly concave subsutural ramp with regular fold-like scars of anal sinus. Sculpture finely reticulate, of numerous thin axial riblets and thin strong spiral cords, interspaces spirally elongate. Canal moderately long, slightly twisted and obliquely truncated. Anal sinus deep, deepest point in adapical part of ramp. Colour white.

DESCRIPTION. — Shell very thin and fragile, slender, fusiform, with high spire comprising 37% of total shell height. Protoconch I and tip of multispiral protoconch II dissolved, only last whorl remaining, convex, sculptured by strong, coarse, prosocline axial ribs; protoconch / teleoconch discontinuity sharp. Teleoconch consisting of 7.0 whorls, suture tightly impressed, whorls weakly angulate at shoulder, evenly convex below shoulder. Subsutural ramp narrow, weakly concave, without spiral sculpture, with numerous regular, raised, opisthocyrt wrinkles corresponding to scars of anal sinus. Sides finely reticulately sculptured by numerous (42 on last whorl), prosocyrt, sharply defined, narrow axial riblets overriden by almost equally strong but narrower spiral cords, interspaces spirally very elongate, intersection of cords and riblets spirally elongate; 3 spiral cords on first teleoconch whorl, additional cords added at shoulder and between cords, reaching 20 on penultimate whorl, 35 on periphery and base of last whorl, plus 13, slightly stronger, on canal. Base evenly connected to moderately long, twisted, and obliquely truncated canal. Aperture pyriform. Inner lip strongly concave on abapical part of parietal side, covered by thin, translucent, axially wrinkled callus. Outer lip damaged, anal sinus (based on incremental scars) deep, deepest point in adapical part of ramp. Colour of protoconch deep brown, of teleoconch semi-transparent white with thin, tightly adhering beige periostracum.

Dimensions: height 21.1 mm, diameter 7.7 mm, last whorl height 13.2 mm, aperture height 10.2 mm.

REMARKS. — *Veprecula bandensis* can be included in *Veprecula* on the basis of shell outline, reticulate sculpture, and characteristic sculpture of protoconch. It is most similar to the type species, *V. sykesi*, but differs in having a much larger shell with lower spire, fainter sculpture, twisted canal, and poorly prominent intersection of axial and spiral sculpture. Other known species of the genus have a much stronger sculpture, consisting of widely spaced ribs and cords.

The new species is also similar to *Daphnella thia* Melvill & Standen, 1903 (the original figure of that species is rather inadequate, but it was recently illustrated by BOSCH *et al.*, 1995: 167) in shell outline and sculpture, but differs in having more curved ribs, a well differentiated subsutural ramp, and different protoconch sculpture.

ETYMOLOGY. — *Bandensis*, an adjective based on the stem Banda (Sea), the type locality.

Genus ***XANTHODAPHNE*** Powell, 1942

TYPE SPECIES: *Pleurotoma (Thesbia) membranacea* Watson, 1886.

Xanthodaphne cladara sp. nov.

Figs 8, 51-52

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn CC 21, 05°14'S, 133°00'E, 688-694 m, 2 lv (holotype and paratype).

TYPE MATERIAL. — Holotype and paratype MNHN.

DIAGNOSIS. — Shell large for genus, about 32 mm high, buccinoid, very thin, fragile, light-brown. Protoconch brown, of about 3 diagonally cancellated whorls. Teleoconch spiral sculpture of very fine cords, appearing on third whorl and becoming stronger towards last whorl. Subsutural zone of first whorls with regular,

opisthocyrt folds formed by thickened growth lines, becoming obsolete on last whorls. Canal rather long, columella slightly twisted.

DESCRIPTION (holotype). — Shell buccinoid, very thin, fragile, consisting of 2.1+ protoconch and 6 teleoconch whorls. Tip of protoconch broken, probably consisting of protoconch I and less than 0.5 whorl of protoconch II. Remaining whorls forming a rather low spire, diameter 1.05 mm, sculptured over abapical two-thirds by oblique reticulation, and opisthocyrt riblets on adapical third. Protoconch/teleoconch boundary sharp. Teleoconch whorls very convex, with rather deep, impressed suture, slightly concave subsutural ramp defined only on first 4 whorls, last two whorls very regularly convex. Sculpture fine and delicate, consisting of sigmoid incremental lines, obsolete in last 2 whorls, strong in first 4 whorls, forming raised opisthocyrt wrinkles in subsutural zone, and low, indistinct, prosocyrt lines below shoulder; numerous, fine, flattened spiral cords, interspaces narrow, indistinct on first two whorls, stronger on subsequent whorls, also present in subsutural zone. Last adult whorl strongly convex, with weak incremental lines and thin, but strong spiral cords, 4 or 5 per mm on periphery, a little more crowded on base, more spaced on canal. Canal rather long, broad, straight. Aperture broad, columella slightly twisted, without inner lip callus. Based on growth lines, anal sinus broad, very shallow. Colour light-brown, protoconch brown.

Dimensions: height 31.7 mm, diameter 13.8 mm, last whorl height 22.3 mm, aperture height 17.1 mm.

REMARKS. — The paratype (30.4 x 12.4 mm at 6 teleoconch whorls) has a less inflated last whorl: diameter/height 0.41 vs. 0.435 in the holotype. Such a difference could possibly represent sexual dimorphism. Growth lines on the last whorl are more distinctly sigmoid than in the holotype, due to more prosocyrt profile on periphery. Radular teeth 280 µm, straight, with short but strongly expanded basal part (Fig. 8).

Xanthodaphne cladara is similar to *X. subrosea* (Barnard, 1963) from off Cape Point, South Africa, 2524-2780 m, but differs in having a more slender shell, with more slowly expanding whorls, a smaller protoconch (diameter 1.45 mm in *subrosea*), and fainter spiral sculpture.

ETYMOLOGY. — From the Greek *kladaros* (adj.; feminine *kladara*), easily broken, with reference to the fragility of the shell.

Genus *LUSITANOPS* Nordsieck, 1968

TYPE SPECIES: *Pleurotomella lusitanica* Sykes, 1906.

Lusitanops dictyota sp. nov.

Fig. 56

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Tanimbar Islands*: stn CP 38, 07°40'S, 132°27'E, 620-666 m, 1 lv (holotype).

New Caledonia. BIOCAL: stn. CP 60, 24°01'S, 167°08'E, 1480-1530 m, 1 lv.

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell large for genus, about 17 mm high, thin, light-brown. Protoconch of 3+ diagonally cancellated brown whorls. Teleoconch sculpture of thin spiral cords covering the entire shell surface, and numerous, regularly and closely set incremental riblets, intersection finely reticulate. Aperture broad. No anal sinus. No radula, no operculum.

DESCRIPTION (holotype). — Shell buccinoid, thin, consisting of 3 + protoconch and 4.3 teleoconch whorls. Tip of protoconch (probably only protoconch I) damaged, remaining whorls convex, diameter 1.05 mm, sculptured on abapical two-thirds by opisthocyrt riblets intersected by equally strong oblique cords, on adapical third by much

fainter spiral threads in axial interspaces. Protoconch/teleoconch boundary sharp. Teleoconch whorls evenly convex, suture impressed, rather deep. Spiral sculpture consisting of fine, flattened cords, occasionally in last 2 whorls with thinner additional cord in interspaces, interspaces equal to or narrower than cord width, 17 on penultimate whorl, about 75 on last whorl. Axial sculpture consisting of numerous, evenly spaced, orthocline, thickened incremental lines, interspaces narrow. On first half teleoconch whorl, spiral cords stronger than incremental ribs; on subsequent 2 whorls, cords and ribs of equal strength, cords a little rugose at intersection with ribs, producing a finely reticulate sculpture; on last 2 whorls, spiral cords stronger than incremental riblets. Base regularly convex, connected rather abruptly to rather short, straight canal. Aperture broad, columellar and parietal areas of inner lip forming an obtuse angle, callus very narrow, outer lip partly broken, but apparently regularly convex. No distinct anal sinus. Colour light-brown, protoconch brown. No operculum. No radula.

Dimensions: height 16.9 mm, diameter 9.4 mm, last whorl height 13.2 mm, aperture height 10.4 mm.

REMARKS. — *Lusitanops dictyota* is similar to *L. cingulata* Bouchet & Warén, 1980 from the upper abyssal of the North-Eastern Atlantic, but differs in having a much larger shell with fainter and closely set spiral cords. This is the first record of *Lusitanops* outside the North-Eastern Atlantic.

The specimen from New Caledonia is very similar to the holotype, except for being much smaller (8.6 x 5.2 mm at 3+ adult whorls), with slightly broader last whorl. Its protoconch consists of 2.5 remaining whorls, upper ca. 1.25 whorls missing.

ETYMOLOGY. — From the Greek *dictyotos* (adj.), reticulate, with reference to the sculpture of the teleoconch.

DISTRIBUTION. — Tanimbar Islands, Indonesia, and southward of New Caledonia, taken alive at 620-1530 m.

CONOIDEA incertae sedis

Genus ***THELECYTHARELLA*** Shuto, 1969

TYPE SPECIES: *Agladrillia oyamai* Shuto, 1965.

Among existing genera of Conoidea, the new species described below conforms rather well with *Metaclathurella* Shuto, 1983 [type species: *Austropusilla (Metaclathurella) crokerensis* Shuto, 1983], originally classified by Shuto as a subgenus of *Austropusilla* Laseron, 1954. KILBURN (1995) has synonymized *Metaclathurella* and *Lioglyphostomella* Shuto, 1970 with *Thelycytharella* [*sic*!], and stated that *Austropusilla* is not related. This synonymization seems reasonable, with *Metaclathurella* only characterized by a complete absence of axial sculpture. Within this complex, *T. vitrea* (Reeve, 1845) and *T. kecil* sp. nov., form a distinct group characterized by a very small (5.5 mm high) pupoid shell without axial sculpture, and further research may prove that they belong to a separate genus.

The taxonomic position of *Thelecytharella* is unclear. It was originally placed in the subfamily Mangeliinae, an opinion followed by KILBURN (1995), without an indication of reasons for such placement. However, conchological characters alone are insufficient to allocate it to a subfamily, and even to a family. Examination of anatomy is badly needed, but the present material is represented by a single empty shell.

Thelecytharella kecil sp. nov.

Fig. 58

MATERIAL EXAMINED. — **Indonesia**. KARUBAR, *Kai Islands*: stn DW 28, 05°31'S, 132°54'E, 448-467 m, 1 dd (holotype).

TYPE MATERIAL. — Holotype MNHN.

DIAGNOSIS. — Shell small, 5.5 mm, but solid, subcylindrical, few-whorled, white. Protoconch multispiral, smooth. Teleoconch whorls very weakly but evenly convex, covered by strong spiral cords, 5 on first whorl, 22 on last whorl. Aperture narrow, canal very short. Anal sinus moderately deep, rounded, directed somewhat adapically.

DESCRIPTION (holotype). — Shell very solid, subcylindrical, consisting of 2+ protoconch and 3.1 teleoconch whorls. Tip of protoconch dissolved, plugged by secondary callus, remaining whorls smooth, polished, with strongly opisthocyrt incremental lines and strong basal keel partly covered by successive whorl; protoconch diameter 850 µm, *i.e.* half diameter of first teleoconch whorl. Protoconch/teleoconch boundary sharp. Teleoconch whorls rapidly growing but slowly expanding, weakly and evenly convex, suture shallow. Sculpture primarily spiral, consisting of strong rounded cords, 5, 7 and 22 on first to third whorls respectively, two adapical cords more widely spaced at level of sinus. Very fine spiral microsculpture in interspaces between cords. No axial sculpture other than fine, sigmoid incremental lines. Aperture ovate, narrow, siphonal canal very short, indistinctly set off. Inner lip evenly curved, covered by thick callus with free edge. Outer lip with thin edge but strengthened behind by low varix, deep stromboid notch at base of siphonal canal. Anal sinus moderately deep, semi-enclosed, directed slightly adapically. Colour white.

Dimensions: height 5.5 mm, diameter 1.6 mm, last whorl height 3.4 mm, aperture height 2.4 mm.

REMARKS. — In shell shape, the new species is very similar to *T. vitrea* from the Philippines (lectotype figured by KILBURN, 1995, fig. 12), but clearly differs in having strong spiral sculpture.

ETYMOLOGY. — From the Indonesian *kecil* (adj.), small, with reference to the small adult size. It is used here as an invariable noun in apposition.

Genus *ALICEIA* Dautzenberg & Fischer, 1897

TYPE SPECIES: *Aliceia aenigmatica* Dautzenberg & Fischer, 1897.

REMARKS. — The taxonomic position of *Aliceia* is rather enigmatic, and the species described below offers no help. The anal sinus of the type species is shallow, whereas in *A. simplicissima* (Thiele, 1925) it is deep, rather narrow, and distinctly peripheral. Such style of anal sinus suggests that the genus may belong to the family Turridae, subfamily Turrinae, or to the bathytomine group of Clathurellinae (Conidae). At the same time, the protoconch is more similar to some genera of the subfamily Raphitominae (Conidae), *e.g.*, *Pleurotomoides* Bronn, 1831 and *Famelica* Bouchet & Warén, 1980. In shell outline, sinus character, and the absence of sculpture, *A. simplicissima* resembles the turrine genus *Lucerapex* Iredale, 1936. However, *Lucerapex* has a paucispiral globular smooth protoconch and nodules or scales on the peripheral keel.

Aliceia presently includes three species: the North Atlantic *A. aenigmatica*, the Indo-West Pacific *A. simplicissima*, and the Hawaiian species figured by KAY (1979: 364, fig. 115 N) as "*Thatcheriasyrinx* sp." and suggested by BOUCHET & WARÉN (1980) to be also a member of *Aliceia*. This genus thus appears to have a world-wide distribution. Whereas *A. aenigmatica* and "*Thatcheriasyrinx* sp." are very similar to each other in shell outline, and possess a broad and shallow anal sinus, a false umbilicus, and semi-tubular processes on the periphery, *A. simplicissima* differs in having a slender shell lacking sculpture, with a rather deep and narrow anal sinus. Nevertheless, the thin small shell without spiral cords or axial ribs, the more or less peripheral position of the sinus, and the peculiar protoconch with axial pillars below peripheral keel are characters shared by all three species, and it seems reasonable to include the species of THIELE in *Aliceia*, at least until more material, with soft parts, comes to hand.

Aliceia simplicissima (Thiele, 1925)

Fig. 57

Pleurotoma (Gemmula?) simplicissima Thiele, 1925: 175 (209), pl. 23 (35), fig. 3-3a.

MATERIAL EXAMINED. — **Indonesia**. *"Valdivia"* : stn 199, 0°15,5'N, 98°04'E, 470 m: 1 dd 4.8 x 2.0 mm.
KARUBAR, *Tanimbar Islands*: stn CP 69, 08°42'S, 131°53'E, 356-369 m, 1 dd 5.75 x 2.2 mm
Zanzibar. *"Valdivia"*: stn 245, 05°27.9'S, 39°18.8'E, 463 m: 1 dd 3.8 x 1.75 mm.

TYPE MATERIAL. — The shell collected by the *"Valdivia"* at the station 245 is here designated as the lectotype. The other shell is a paralectotype. Both are deposited at the Zoologisches Museum, Berlin, no registration number.

DESCRIPTION (KARUBAR specimen). — Shell slender, thin, semi-transparent, consisting of 3+ protoconch and 4.7 teleoconch whorls, suture impressed, deep. Tip of protoconch (probably protoconch I and less than 0.5 whorl of protoconch II) broken, remaining whorls smooth above periphery, sculptured by short straight axial ribs below periphery, indistinct near protoconch/teleoconch boundary. Teleoconch whorls obtusely angulate at periphery, angulation stronger towards adult whorls, periphery occupied by anal sinus forming a band with sharply defined edges. Incremental lines thin, indistinct, strongly prosocyrt above and below periphery, strongly opisthocyrt in sinus zone. No spiral sculpture. Aperture broadly subtriangular, canal moderately long and straight. Shell colour translucent white, with one light-brown spiral band at base of exposed whorl height, encircling base of last whorl, and a second narrower band encircling base of canal.

REMARKS. — None of the shells of the Zoologisches Museum, Berlin, corresponds to measurements given by THIELE (5 x 1.8 mm), but the shell from Zanzibar (apparently figured by THIELE) is better preserved and is for this reason designated as lectotype. It has 3.5 teleoconch and 3+ protoconch whorls.

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APPENDIX

Check-list of deep-water turrid gastropods from Indonesia

To estimate the richness of the turrid fauna of Indonesian waters, and to provide a basis for further research, it seems useful to give here a check-list of deep-water turrid gastropods presently known from Indonesia. This list includes species recorded at depths greater than 200 m, in the area within the political borders of Indonesia. A total of 92 species are listed.

The taxonomic position of species has been re-evaluated, when possible, but brief descriptions and poor illustrations of some species allow to allocate them only tentatively to genera, awaiting the examination of respective type material.

Species	Locality and depth	References
TURRIDAE/TURRINAE		
Gemmula hombroni Hedley, 1922	Throughout Indonesia, 34-522 m	SCHEPMAN, 1913
Gemmula kieneri (Doumet, 1840)	Throughout Indonesia, 69-462 m	SCHEPMAN, 1913
Gemmula congener (Smith, 1894)	Bali Sea, SW Halmahera I., 330-397 m	SCHEPMAN, 1913
Gemmula praesignis (Smith, 1895)	Flores and Halmahera Seas, 411-794 m	SCHEPMAN, 1913
Gemmula sibogae (Schepman, 1913)	W Sumatra, Halmahera I., 362-660 m	SCHEPMAN, 1913
Gemmula gemmulina (Martens, 1902)	NE & W Sumatra, Sulawesi, Maluku Is, Kalimantan, 68-750 m	THIELE, 1925; POWELL, 1964

Species	Locality and depth	References
Gemmula sibukoensis Powell, 1964	Kalimantan, Sulawesi, Maluku Is, 476-885 m	POWELL, 1964
Gemmula closterion Sysoev, 1997	Arafura Sea, 146-250 m	Present paper
Gemmula (Ptychosyrinx) truncata (Schepman, 1913)	Banda Sea, 2798 m	SCHEPMAN, 1913
Gemmula (Ptychosyrinx) teschi Powell, 1964	Kalimantan, Sulawesi, Maluku Is, 635-1022 m	POWELL, 1964
Gemmula (Pinguigemmula) thielei (Finlay, 1930)	W Sumatra, 614 m	THIELE, 1925
Gemmula (Unedogemmula) unedo (Kiener, 1839-40)	Maluku Is, 503 m	POWELL, 1964
Lucerapex molengraaffi (Tesch, 1915)	Kalimantan, Sulawesi, 558-1022 m	POWELL, 1964
Lucerapex schepmani Shuto, 1970	Ceram Sea, 835 m	SHUTO, 1970b
COCHLESPIRINAE		
Comitas pagodaeformis (Schepman, 1913)	Halmahera Sea, E Banda Sea, 397-411 m	SCHEPMAN, 1913
Comitas melvilli (Schepman, 1913)	E Banda Sea, 560-918 m	SCHEPMAN, 1913
Comitas obtusigemmata (Schepman, 1913)	Makassar Strait, Halmahera and Arafura Seas, 472-2029 m	SCHEPMAN, 1913
Comitas undosa (Schepman, 1913)	Flores Sea, Molucca Passage, 794-796 m	SCHEPMAN, 1913; POWELL, 1969
Comitas erica (Thiele, 1925)	NE Sumatra, 750 m	THIELE, 1925
Comitas obliquicosta (Martens, 1901)	W Sumatra, 1143 m	THIELE, 1925
Comitas chuni (Martens, 1902)	W Sumatra, 1143 m	THIELE, 1925
Comitas suratensis (Thiele, 1925)	NW Sumatra, 1024 m	THIELE, 1925
Comitas paupera (Watson, 1881)	Arafura Sea, 1463 m	POWELL, 1969
Comitas galatheae Powell, 1969	Arafura Sea, 352 m	POWELL, 1969
Comitas eurina (Smith, 1899)	Kalimantan, 1626 m	POWELL, 1969
Comitas thisbe diomedea Powell, 1969	Sulawesi, 987-1022 m	POWELL, 1969
Comitas rex Sysoev, 1997	Arafura Sea, 246-275 m	Present paper
Nihonia maxima Sysoev, 1997	Arafura Sea, 246-275 m	Present paper
Cochlespira pulchella (Schepman, 1913)	Halmahera Sea, 411-472 m	SCHEPMAN, 1913
Leucosyrinx (Sibogasyrinx) pyramidalis (Schepman, 1913)	Timor Sea, 918 m	SCHEPMAN, 1913
Shutonia variabilis (Schepman, 1913)	Ceram Sea, 835 m	SCHEPMAN, 1913
Clavosurcula sibogae Schepman, 1913	Flores Sea, 794 m	SCHEPMAN, 1913
Clavosurcula schepmani Sysoev, 1997	Banda and Arafura Seas, 356-694 m	Present paper
Apiotoma tibiaformis sibukoensis Powell, 1969	Kalimantan, 635 m	POWELL, 1969
Marshallena philippinarum (Watson, 1882)	NE Sumatra, Flores Sea, 750-794 m	SCHEPMAN, 1913, POWELL, 1969
Marshallena nierstraszi (Schepman, 1913)	Arafura Sea, 1788 m	SCHEPMAN, 1913
Marshallena diomedea Powell, 1969	Kalimantan, 558-567 m	POWELL, 1969
CLAVATULINAE		
Makiyamaia sibogae Shuto, 1970	Ceram Sea, 835 m	SHUTO, 1970b
CRASSISPIRINAE		
Inquisitor subangusta (Schepman, 1913)	Halmahera Sea, 411 m	SCHEPMAN, 1913; SHUTO, 1970a
Inquisitor? radula (Hinds, 1843)	Java, S Celebes Sea, W New Guinea, E Banda Sea, 14-275 m	SCHEPMAN, 1913

Species	Locality and depth	References
"Drillia" audax Melvill & Standen, 1903	Savu Sea, 247 m	SCHEPMAN, 1913
Paradrillia celebensis (Schepman, 1913)	Makassar Strait, 1301 m	SCHEPMAN, 1913; SHUTO, 1970a
"Crassispira" aequatorialis Thiele, 1925	NE Sumatra, 750 m	THIELE, 1925
CONIDAE/CLATHURELLINAE		
Bathytoma atractoides (Watson, 1881)	W Sumatra, Timor Sea, 918-1143 m	SCHEPMAN, 1913; THIELE, 1925
Borsonia smithi Schepman, 1913	Savu Sea, 959 m	SCHEPMAN, 1913
Borsonia symbiotes (Wood-Mason & Alcock, 1891)	W Sumatra, Flores Sea, 794-1143 m	SCHEPMAN, 1913; THIELE, 1925
Borsonia timorensis (Schepman, 1913)	Timor Sea, 918 m	SCHEPMAN, 1913
Borsonia epigona Martens, 1901	W Sumatra, 614-677 m	THIELE, 1925
Borsonia jaya Sysoev, 1997	Arafura Sea, 676-1084 m	Present paper
Maoritomella batjanensis (Schepman, 1913)	Halmahera I., 397 m	SCHEPMAN, 1913; SHUTO, 1970a
Typhlosyrinx supracostata (Schepman, 1913)	Flores Sea, Kalimantan, Molucca Passage, 759-921 m	SCHEPMAN, 1913; SHUTO, 1970b; POWELL, 1969
Glyphostoma cara (Thiele, 1925)	NE Sumatra, 750 m	THIELE, 1925
Heteroturris gemmuloides Sysoev, 1997	Arafura Sea, 356-405 m	Present paper
Heteroturris serta Sysoev, 1997	Banda Sea, 448-467 m	Present paper
MANGELIINAE		
Benthomangelia trophonoidea (Schepman, 1913)	NE Sumatra, Flores and Ceram Seas, 660-903 m	SCHEPMAN, 1913; THIELE, 1925
Benthomangelia gracilispira (Powell, 1969)	Kalimantan, 558 m	POWELL, 1969
Anticlinura biconica (Schepman, 1913)	Banda Sea, 462 m	SCHEPMAN, 1913; SHUTO, 1970a
"Mangelia terpnisma" abyssicola Schepman, 1913	Makassar Strait, 1301 m	SCHEPMAN, 1913
Guraleus? verhoeffeni (Martens, 1904)	W Sumatra, 470 m	THIELE, 1925
Guraleus halmahericus (Schepman, 1913)	Halmahera I., 472 m	SCHEPMAN, 1913; SHUTO, 1970b
Guraleus (Euguraleus) savuensis (Schepman, 1913)	Savu Sea, 247 m	SCHEPMAN, 1913; SHUTO, 1970b
Stellatoma rufostrigata (Schepman, 1913)	Halmahera Sea, 411 m	SCHEPMAN, 1913; SHUTO, 1970b
Heterocithara sibogae Shuto, 1970	Halmahera I., 472 m	SHUTO, 1970b
RAPHITOMINAE		
Neopleurotomoides rufoapicatus (Schepman, 1913)	Ceram Sea, 835 m	SCHEPMAN, 1913; SHUTO, 1971
Isodaphne perfragilis (Schepman, 1913)	Makassar Strait, Ceram Sea, 835-2029 m	SCHEPMAN,1913; SHUTO, 1971
Pagodidaphne gradata (Schepman, 1913)	Halmahera Sea, 411 m	SCHEPMAN, 1913
Pagodidaphne schepmani (Thiele, 1925)	NE Sumatra, 750 m	THIELE, 1925
Cryptodaphne affinis (Schepman, 1913)	Ceram Sea, 835 m	SCHEPMAN, 1913
Cryptodaphne abbreviata (Schepman, 1913)	Ceram Sea, 835 m	SCHEPMAN, 1913
Cryptodaphne (Acamptodaphne) biconica (Schepman, 1913)	E Halmahera Sea, 469 m	SCHEPMAN, 1913; SHUTO, 1971

Species	Locality and depth	References
Cryptodaphne rugosa Sysoev, 1997	Banda and Arafura Seas, 230-425 m	Present paper
Gymnobela pulchra (Schepman, 1913)	Banda Sea, 462 m	SCHEPMAN, 1913
Gymnobela ceramensis (Schepman, 1913)	Ceram Sea, 835 m	SCHEPMAN, 1913
Gymnobela dubia (Schepman, 1913)	Ceram Sea, 835 m	SCHEPMAN, 1913
Gymnobela ioessa Sysoev, 1997	Arafura Sea, 836-869 m	Present paper
Gymnobela muricata Sysoev, 1997	Arafura Sea, 836-891 m	Present paper
Gymnobela mitrodeta Sysoev, 1997	Banda Sea, 413-436 m	Present paper
Gymnobela micraulax Sysoev, 1997	Arafura Sea, 884-891 m	Present paper
Gymnobela baruna Sysoev, 1997	Banda Sea, 688-694 m	Present paper
Mioawateria extensaeformis (Schepman, 1913)	W Sumatra, Banda Sea, 462-750 m	SCHEPMAN, 1913; THIELE, 1925
Mioawateria asarotum Sysoev, 1997	Arafura Sea, 884-891 m	Present paper
Clinura vitrea Sysoev, 1997	Banda Sea, 417-425 m	Present paper
Veprecula bandensis Sysoev, 1997	Banda Sea, 688-694 m	Present paper
Pleurotomella clathurellaeformis (Schepman, 1913)	Ceram Sea, 835 m	SCHEPMAN, 1913
Pleurotomella siberutensis (Thiele, 1925)	NE Sumatra, 750 m	THIELE, 1925
Eubela equatorialis Thiele, 1925	NE Sumatra, 750 m	THIELE, 1925
Xanthodaphne pyriformis (Schepman, 1913)	Ceram Sea, 835 m	SCHEPMAN, 1913
Xanthodaphne cladara Sysoev, 1997	Banda Sea, 688-694 m	Present paper
Lusitanops dictyota Sysoev, 1997	Arafura Sea, 620-666 m	Present paper
Spergo sibogae Schepman, 1913	E Banda Sea, 560 m	SCHEPMAN, 1913
INCERTAE SEDIS		
Aliceia simplicissima Thiele, 1925	W Sumatra, Arafura Sea, 356-470 m	THIELE, 1925; Present paper
Thelecytharella kecil Sysoev, 1997	Banda Sea, 448-467 m	Present paper

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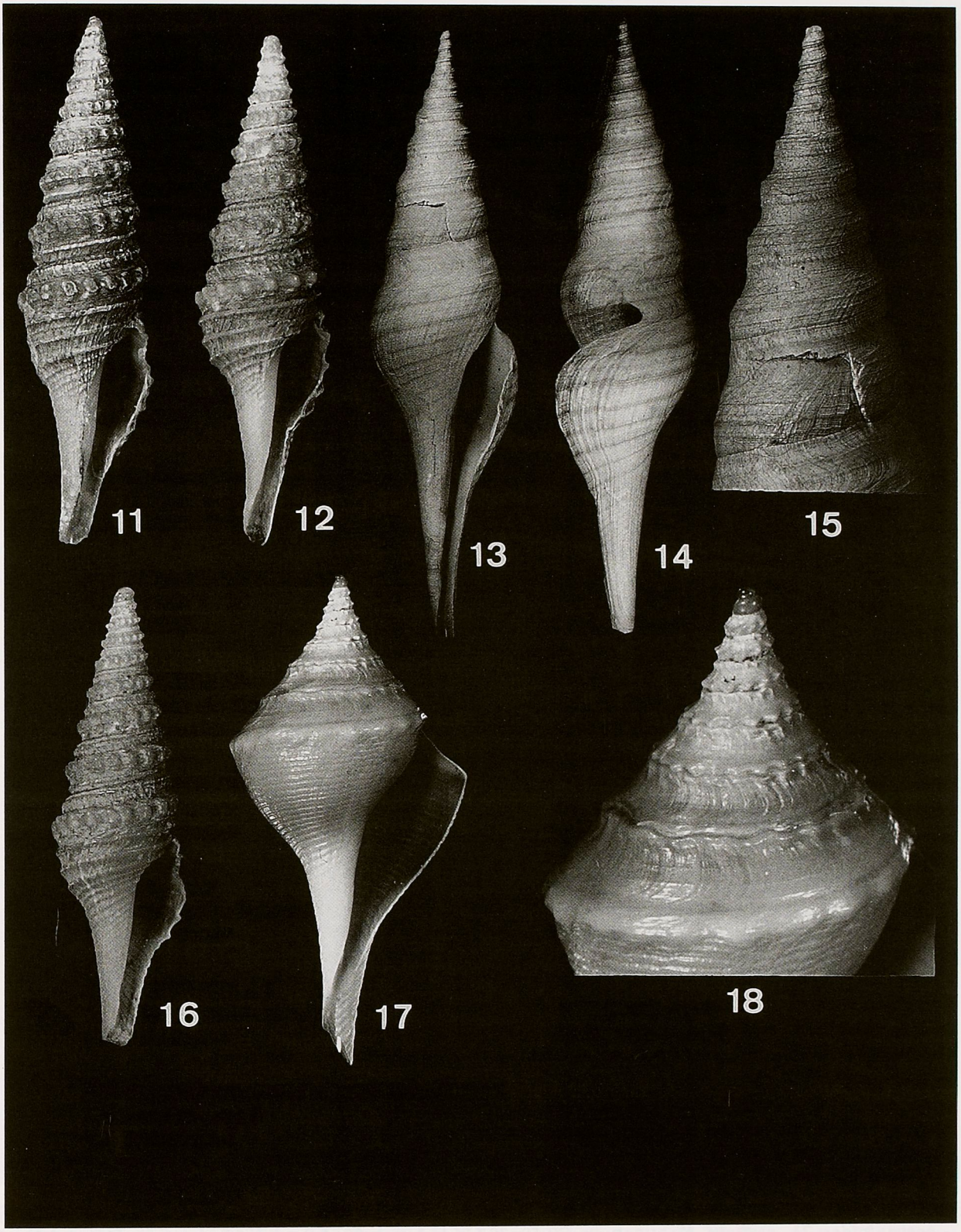
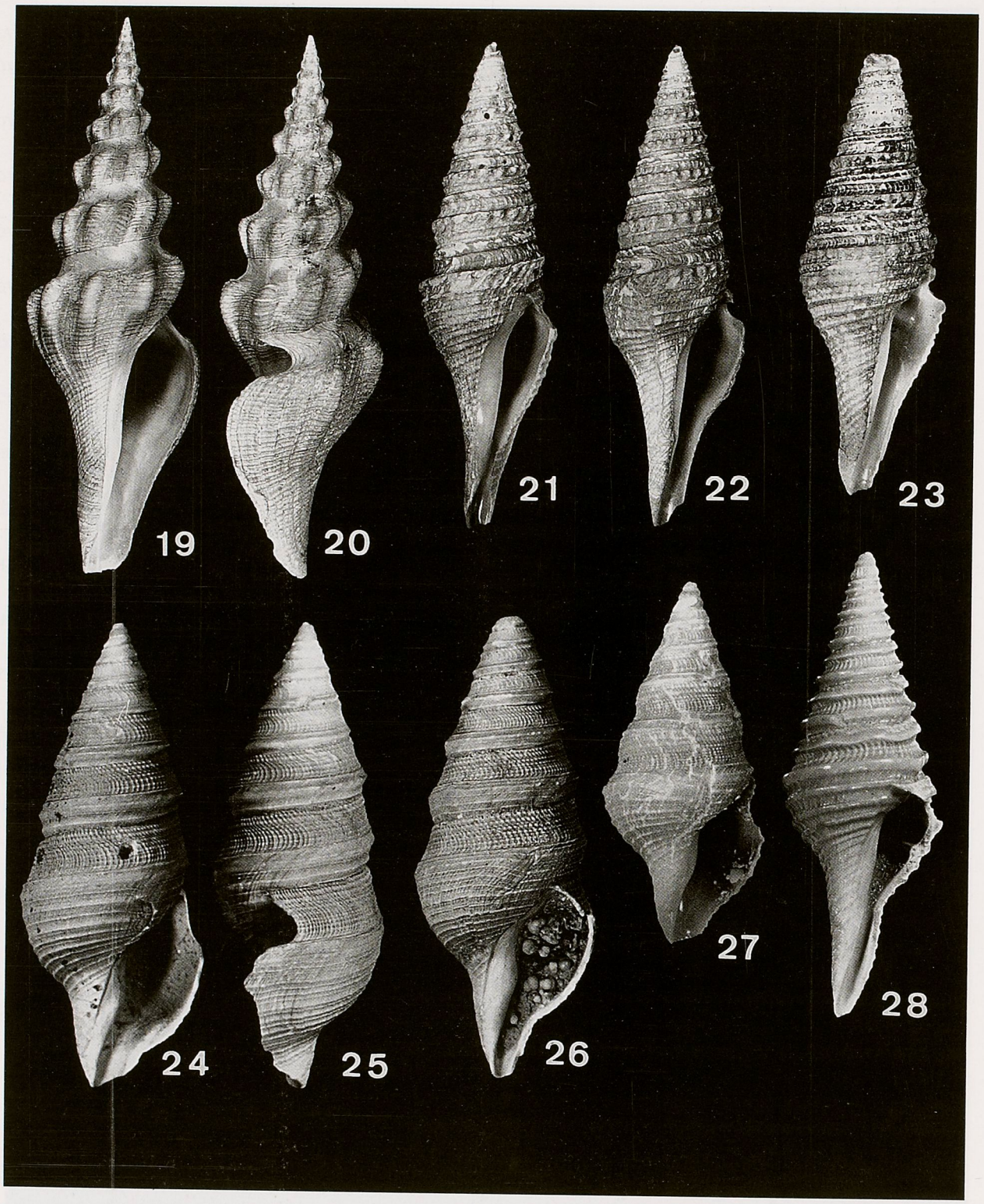
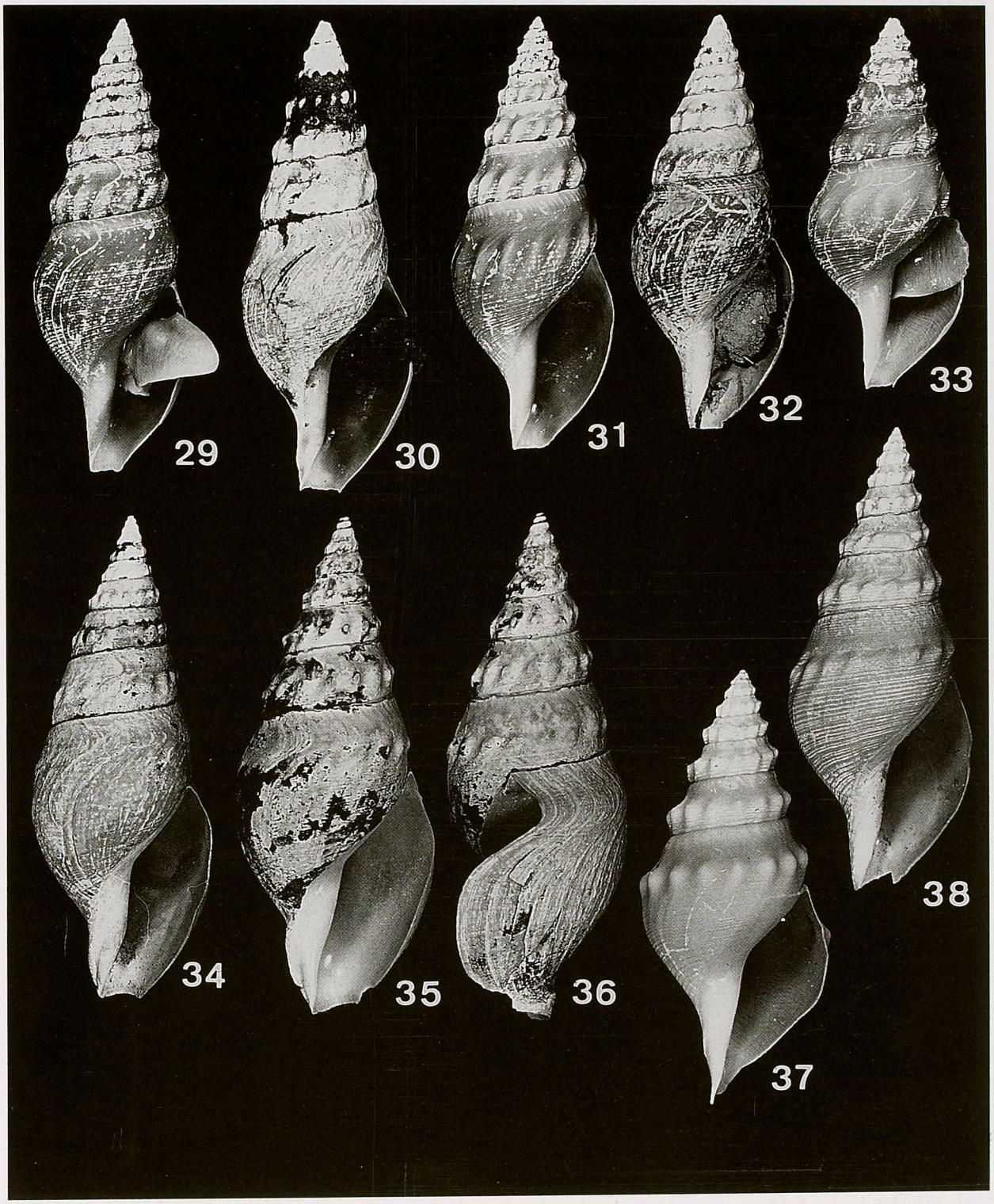


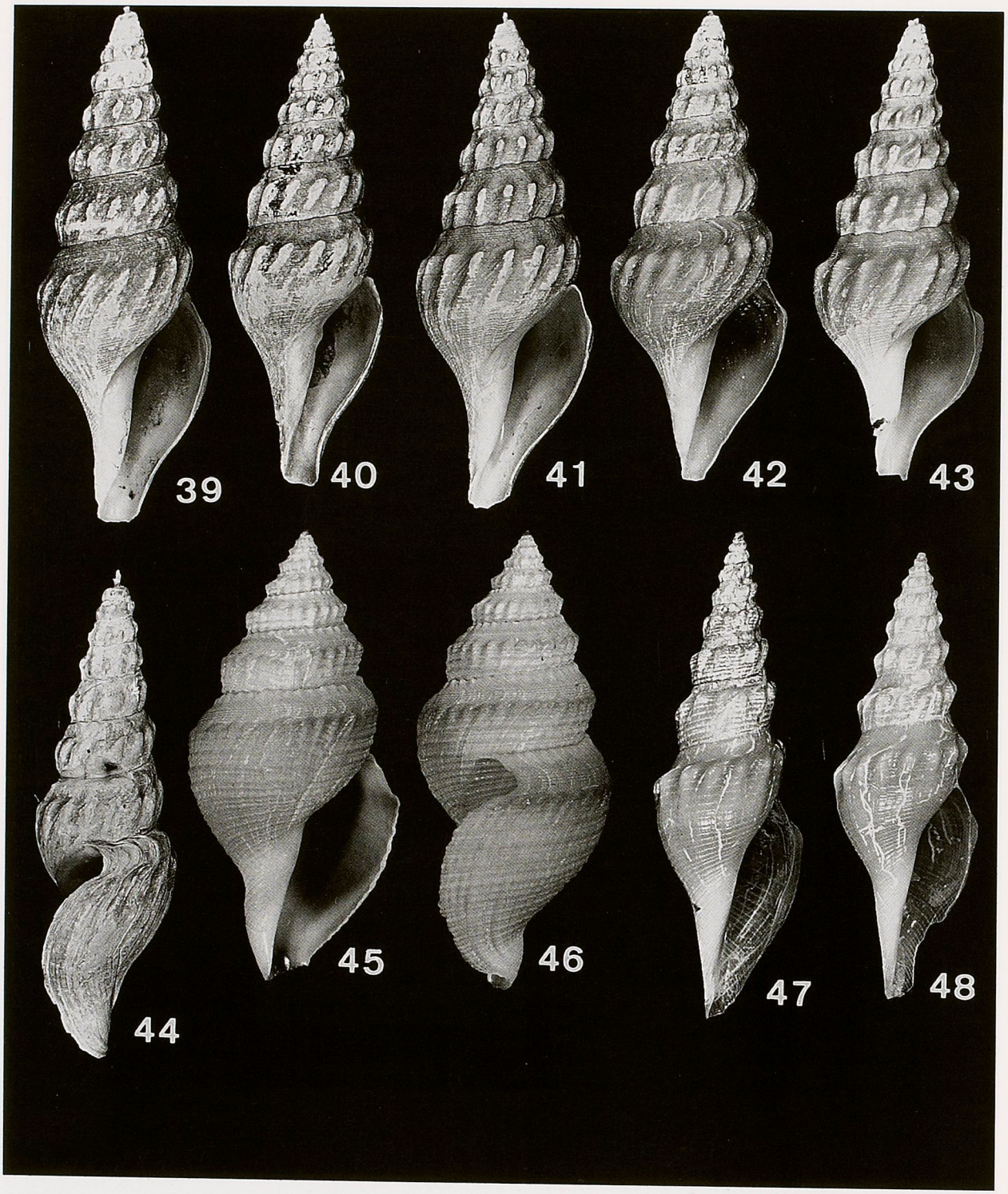
FIGS 11-18. — Genera *Gemmula*, *Nihonia*, and *Clavosurcula*. **11-12, 16**, *Gemmula closterion*: **11**, paratype, KARUBAR stn CP 79, 22.1 x 5.8 mm; **12**, holotype; **16**, paratype, KARUBAR stn CP 67, 14.9 x 4.3 mm. — **13-15**, *Nihonia maxima*, holotype. — **17-18**, *Clavosurcula schepmani*, holotype.



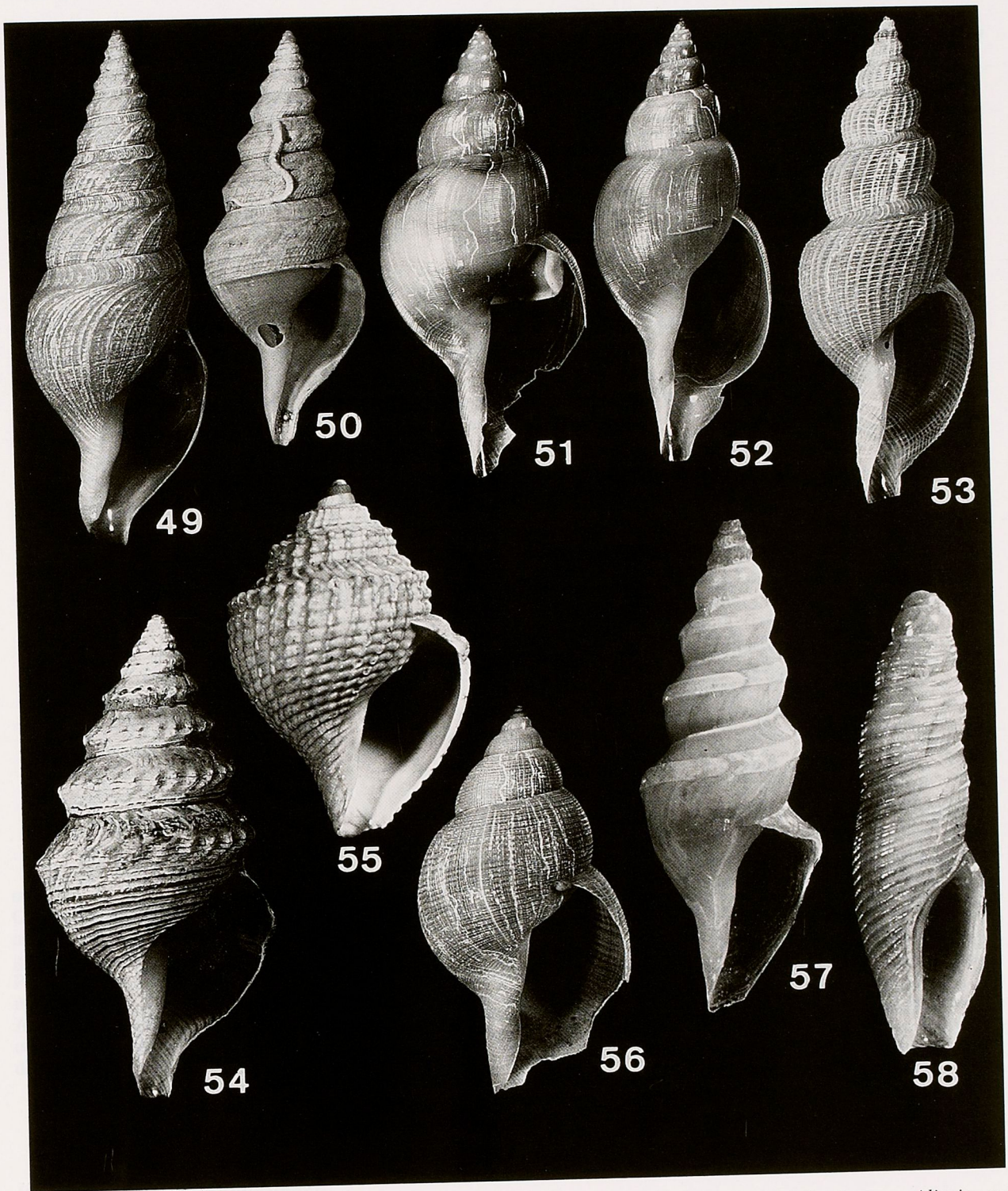
FIGS 19-28. — Genera *Comitas*, *Heteroturris*, and *Cryptodaphne*. **19-20**, *Comitas rex*, holotype. — **21-23**, *Heteroturris gemmuloides*: **21**, paratype, KARUBAR stn CP 59, 38.5 x 11.1 mm; **22**, holotype; **23**, paratype, MUSORSTOM 2 stn CP 75, 27.8 x 9.1 mm. — **24-27**, *Cryptodaphne rugosa*: **24-25**, holotype; **26**, paratype, KARUBAR stn DW 24, 12.8 x 5.1 mm; **27**, paratype, KARUBAR stn DW 44, 7.7 x 3.4 mm. — **28**, *Heteroturris serta*, holotype.



FIGS 29-38. — Genus *Gymnobela*. **29-33**, *G. ioessa*: **29**, holotype; **30-33**, paratypes, KARUBAR stn CP 54, 46.6 x 16.4, 37.2 x 13.9, 35.9 x 14.2, and 30.3 x 12.9 mm, respectively. — **34-38**, *G. muricata*: **34**, holotype; **35-36**, paratype, KARUBAR stn CP 73, 52.1 x 20.6 mm; **37-38**, paratypes, KARUBAR stn CP 54, 29.4 x 12.8 and 43.3 x 17.5 mm, respectively.



FIGS 39-48. — Genera *Borsonia* and *Gymnobela*. **39-44**, *Borsonia jaya*: **39**, holotype; **40**, paratype, KARUBAR stn CP 91, 61.5 x 20.4 mm; **41**, paratype, KARUBAR stn CP 87, 58.0 x 20.8 mm; **42**, paratype, KARUBAR stn CP 72, 51.9 x 19.6 mm; **43**, paratype, KARUBAR stn CP 87, 43.8 x 16.0 mm; **44**, paratype, KARUBAR stn CP 89, 70.5 x 22.2 mm. — **45-46**, *Gymnobela mitrodeta*, holotype. — **47-48**, *Gymnobela micraulax*, holotype.



FIGS 49-58. — Genera *Gymnobela*, *Xanthodaphne*, *Veprecula*, *Clinura*, *Mioawateria*, *Lusitanops*, *Aliceia*, and *Thelecytharella*. **49-50**, *Gymnobela baruna*, holotype and paratype, respectively. — **51-52**, *Xanthodaphne cladara*, holotype and paratype, respectively. — **53**, *Veprecula bandensis*, holotype. — **54**, *Clinura vitrea*, holotype. — **55**, *Mioawateria asarotum*, holotype. — **56**, *Lusitanops dictyota*, holotype. — **57**, *Aliceia simplicissima* KARUBAR stn CP 69, 5.75 x 2.2 mm. — **58**, *Thelecytharella kecil*, holotype.