

# New Diplommatinidae from Sarawak, Malaysia (Borneo), of the genera *Opisthostoma* W.T. & H.F. Blandford, 1860 and *Plectostoma* H. Adams, 1865 (Gastropoda: Architaenioglossa: Diplommatinidae)

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## Abstract

Six new species of the genera *Opisthostoma* W.T. & H.F. Blandford, 1860 and *Plectostoma* H. Adams, 1865 (Architaenioglossa, Diplommatinidae) are described from Sarawak (Malaysia), on the island of Borneo.

**Key words.** Mollusca, Cyclophoroidea, taxonomy, new species.

**ZooBank registration.** urn:lsid:zoobank.org:pub:C3B AFFDA-2047-4437-BB19-6354C8DD5487

## Introduction

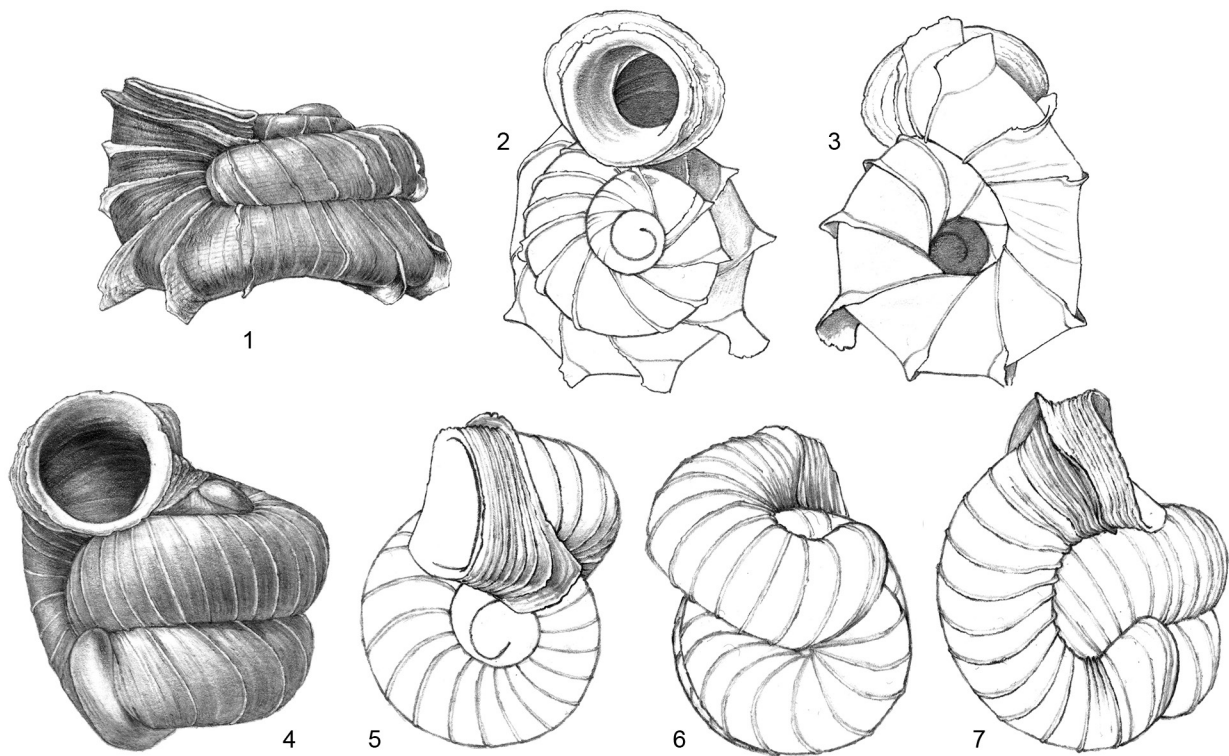
Bornean species of the genera *Opisthostoma* W.T. & H.F. Blandford, 1860 and *Plectostoma* H. Adams, 1865 have been revised by Vermeulen (1991, 1994), with all species placed in *Opisthostoma*, whereas Liew et al. (2014) segregated the two genera. Liew et al. (2014) retained species 1–23 of Vermeulen (1994) within the narrower delimitation of *Opisthostoma*; all other taxa were transferred to *Plectostoma*. After the reviews of Vermeulen (1991, 1994), additional new species of *Plectostoma* and *Opisthostoma* from Borneo have

been described by Marzuki et al. (2021), Vermeulen & Liew (2022), and Vermeulen & Khalik (2022).

In the present paper, six new species are described from four limestone areas in Sarawak (East Malaysia): Niah National Park (Miri Division), Bukit Betok along the Baram River (Miri Division), upper Kakus River limestone scarps in the upper Tatau river valley (Bintulu Division, Sibul Division), and Bukit Sarang in the lower Tatau river valley (Bintulu Division). All species except *Opisthostoma tortuosum* spec. nov. are considered endemic to one of these areas; *O. tortuosum* has been found in two widely distant areas.

## Materials and Methods

The materials studied derives from the private collection of the first author (JJV in the lists of examined material below), of the second author (ME), and of the public collection BORNEENSIS, Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah (BOR/MOL). The holotypes are stored in the Zoological Museum (MZU.MOL) of the Universiti Malaysia Sarawak (UNIMAS). The descriptions follow the format and terminology of Vermeulen & Liew (2022). The illustrations are drawn by the first author, with the aid of a Wild M8 stereo microscope with a camera lucida device. He retains the copyright of the illustrations. For the nomenclature and numbering of the limestone hills given as “my-karst xxx” in Materials examined, we follow Liew et al. (2021). Localities given in Materials examined are not always literal transcriptions of label information.



**Figures 1–7.** New species of *Opisthostoma* from Sarawak, Malaysia. 1–3. *O. planum* spec. nov., holotype (MZU.MOL.22.33), (1) frontal view; (2) apical view; (3) umbilical view. 4–7. *O. tortuosum* spec. nov., holotype (MZU.MOL.22.34), (4) frontal view; (5) apical view; (6) umbilical view; (7) left lateral view.

## Systematics

### Family Diplommatinidae L. Pfeiffer, 1857

#### Genus *Opisthostoma* W.T. & H.F. Blandford, 1860

**Type species.** *Opisthostoma nilgircum* W. T. Blandford & H. F. Blandford, 1860

#### *Opisthostoma planum* spec. nov.

Figures 1–3

**ZooBank registration.** urn:lsid:zoobank.org:act:B2D6F974-7C1F-4802-B6FF-B602BAFFC630

**Materials examined.** Holotype MZU.MOL.22.33, Malaysia, Sarawak, Miri Division, Niah National Park, Gunung Subis (my-karst 457), W part, along the path to top of Bukit Kasut, leg. JJV for DANIDA, 2003. Paratypes as holotype, JJV 10255/74 shells; paratypes ME 9922/35 shells; ME 10612/3 shells).

**Diagnosis.** *Opisthostoma planum* spec. nov. strongly resembles *O. trapezium* Van Benthem Jutting, 1952 (Peninsular Malaysia, Perak; see Van Benthem Jutting 1952: 38, fig. 19; Foon et al., 2017: 38, fig. 14C) in the depressed spire with a rather flat top area, combined with a short tuba with an approximately upwards-facing aperture (aperture

approximately in a plane perpendicular to the coiling axis of the spire), and distinct radial ribs with wide projections on the tuba. The new species differs by the upper margin of the aperture which distinctly protrudes beyond the plane perpendicular to the coiling axis of the last whorl of the spire and through the apex, by the more widely spaced radial ribs and by the more distinctly depressed-cylindrical spire. The depressed spire with a rather flat top area of *O. planum*, combined with a short tuba and the approximately upwards facing aperture, also resembles *O. devogelii* Vermeulen, 1991 (Sarawak, Kuching Division). *Opisthostoma planum* spec. nov. differs by the last part of the last whorl of the spire, which is narrowly rounded at the periphery, and only slightly rounded above and below (vs evenly rounded from suture to umbilicus), and by the widely spaced (vs densely placed), distinct radial ribs with wide projections where they cross the periphery. Among Bornean *Opisthostoma*, *O. planum* spec. nov. also shares the conspicuous radial ribs with *O. delopterum* Vermeulen, 1994 (Indonesia, Kalimantan Selatan) which, however, has a much less depressed spire.

**Description.** Shell minute, white. Spire depressed-cylindrical, with last whorl widest in frontal view. Apex slightly oblique, slightly elevated. Whorls convex, rounded, last whorl towards constriction narrowly rounded at periphery, slightly rounded above and below. Constriction

inside with two teeth: one oblique, distinct, high, short, infra-columellaris, one longitudinal, low parietalis of variable length. Tuba attached to spire, approximately circular in section, curved over approximately  $\frac{1}{4}$  whorl or slightly more, lower surface somewhat abruptly narrowed towards constriction, rounded. Radial ribs on spire widely spaced (2–4 ribs/0.5 mm), although in some shells patches with more densely placed radial ribs occur, ribs near apex not sinuous, those towards constriction increasingly sinuous at periphery and there with a shallowly concave projection abrading to a moderately sinuous scar; radial ribs on tuba widely spaced (2–5 ribs/0.5 mm halfway), below moderately sinuous and with a shallowly concave projection, abrading to a moderately sinuous scar. Spiral striation inconspicuous to distinct, fine to rather coarse. Aperture tilted 70–90° relative to coiling axis of spire, with upper margin approximately level with apex of spire, or slightly overtopping apex, broadly ovate to obtusely triangular, teeth absent. Peristome double; inner peristome hardly to moderately protruding from outer peristome, slightly thickened, and spreading; outer peristome (distinctly) projecting beyond inner and slightly concave, but gradually narrowing towards the side touching the spire and there approximately absent. Umbilicus open, wide.

**Dimensions.** Height of spire without tuba 0.75–0.85 mm; width 0.90–0.95 mm; ratio height/width 0.79–0.94; width including tuba 1.30–1.40 mm; umbilicus 0.25–0.30 mm wide; number of whorls  $3\frac{1}{8}$ – $3\frac{1}{4}$ , excluding tuba; height of aperture 0.35–0.40 mm; width 0.38–0.42 mm.

**Distribution and ecology.** Niah National Park, W-side. Primary forest on rocky hillslope, on limestone bedrock. Possibly endemic to the type locality (site-endemic; see Vermeulen & Whitten 1999: 14).

**Etymology.** From Latin *planus* = flat, referring to the flat apex.

***Opisthostoma tortuosum* spec. nov.**

Figures 4–7

**ZooBank registration.** urn:lsid:zoobank.org:act:89B2F4A7-A2B1-48AC-BD2E-FCCA05EDB431

**Materials examined.** Holotype MZU.MOL.22.34, Malaysia, Sarawak, Miri Division, Niah National Park, Gunung Subis (my-karst 457), W part, along path to top of Bukit Kasut, leg. JJV for DANIDA, 2003. Paratypes as holotype, JJV 10267/74 shells). Paratypes ME 2722/207 shells; BORMOL 6217/7 shells, Bukit Betok (my-karst 507 to 510), limestone quarry approximately 2.5 miles NE of Long Lama (ME 6217/7 shells).

**Diagnosis.** Strongly resembles *O. holzmarki* Thompson, 1978, from the same limestone area, in the compact, seemingly distorted shell shape and the outer peristome which (partly) extends over the top area of the spire. It differs by the absence of a deep longitudinal furrow in the palatal wall of the tuba adjacent to the constriction, and by the

outer peristome which covers only a part of the apical area of the spire, leaving the apex itself visible.

**Description.** Shell minute, white. Spire cylindrical, slightly narrowed towards the base in frontal view. Apex distinctly oblique, slightly elevated. Whorls convex, approximately evenly rounded. Constriction sharply incised on palatal and basal side, without teeth. Tuba attached to spire, approximately circular in section, curved over approximately  $\frac{1}{2}$  whorl, lower surface slightly narrowed towards constriction, rounded, close to constriction with a rounded, transverse bulge on palatal side which is most prominent and sharply outlined close to suture. Radial ribs on spire moderately spaced (6–9 ribs/0.5 mm), not sinuous, low and thin; radial ribs on tuba moderately spaced (5–8 ribs/0.5 mm halfway), not sinuous below. Spiral striation present, inconspicuous and fine, or absent. Aperture tilted 70–90° relative to coiling axis of spire, with upper margin widely overtopping apex of spire, approximately circular to broadly ovate, teeth absent. Peristome double; inner peristome moderately to widely protruding from outer peristome, attached to spire on one side, slightly thickened and spreading; outer peristome somewhat projecting beyond inner peristome, along lower edge of aperture gradually narrowing towards the side touching the spire, along the upper edge of aperture widening to a wing which covers part of apical area of shell, but not apex. Umbilicus closed.

**Dimensions.** Height of spire without tuba 0.65–0.70 mm; width 0.75–0.80 mm; ratio height/width 0.81–0.93; height including tuba 0.95–1.05 mm; width 0.85–0.90 mm; umbilicus 0.03–0.05 mm wide; number of whorls approximately 3, excluding tuba; height of aperture 0.25–0.35 mm; width 0.28–0.32 mm.

**Distribution and ecology.** Niah National Park, W side, and Long Lama. Primary forest on rocky hillslopes, on limestone bedrock. Possibly a local-endemic (see Vermeulen & Whitten 1999: 14).

**Etymology.** From Latin *tortuosus* = twisted.

**Notes.** The number of whorls of the spire is difficult to estimate because of the oblique position of the apex. Contrary to the Niah shells, the Long Lama shells all have a fine spiral striation. Otherwise, the two populations appear identical. As said, *O. tortuosum* spec. nov. strongly resembles *O. holzmarki*. Examination of substantial series of shells of both species confirms their status as distinct species.

**Genus *Plectostoma* H. Adams, 1865**

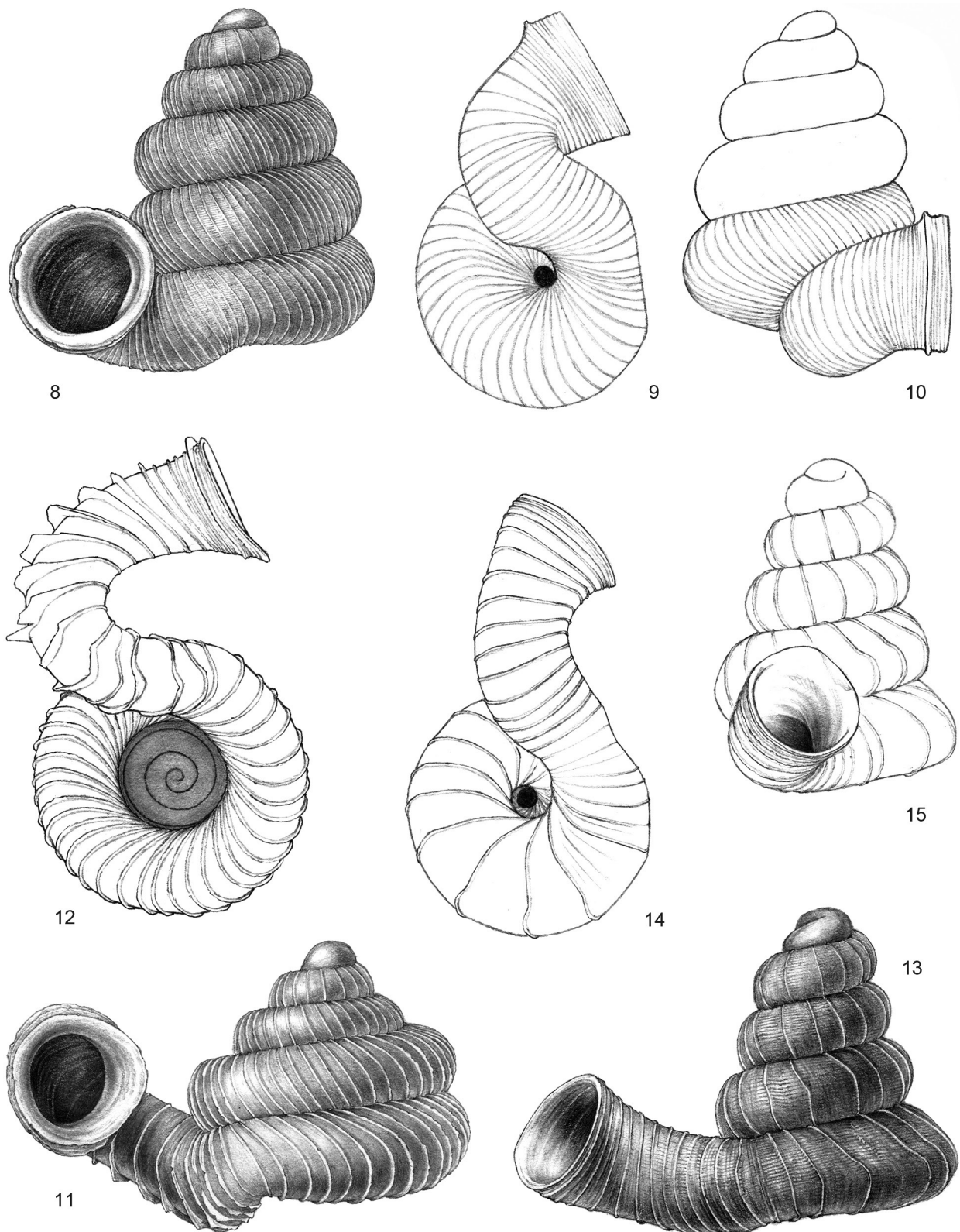
**Type species.** *Plectostoma decrespignyi* H. Adams, 1865.

***Plectostoma crobilos* spec. nov.**

Figures 8–10

**ZooBank registration.** urn:lsid:zoobank.org:act:F80066BB-2A2F-4735-AB6E-A6B9ACBBC560

**Materials examined.** Holotype MZU.MOL.22.35, Malay-



**Figures 8–15.** New species of *Plectostoma* from Sarawak, Malaysia. **8–10.** *P. crobylos* spec. nov., holotype (MZU.MOL.22.35), (8) frontal view; (9) umbilical view; (10) left lateral view. **11, 12.** *P. hyron* spec. nov., holotype (MZU.MOL.22.36), (11) frontal view; (12) umbilical view. **13–15.** *P. orthosalpinx* spec. nov., holotype (MZU.MOL.22.37), (13) frontal view; (14) umbilical view; (15) left lateral view.

sia, Sarawak, Bintulu and Sibul Divisions, upper Tatau river valley, upper Kakus river limestone scarps (my-karst 435 to 447), leg. K.F. Leong, 2005. Paratypes as holotype, JJV 12836/2 shells + 2 defective shells.

**Diagnosis.** Resembles *Plectostoma aethoderma* (Vermeulen, 1994) (Sarawak, Kuching Division) in the very short tuba and the densely ribbed spire; it differs by the distinctly shorter spire (1.55–1.75 mm, vs 2.0–3.1 mm) with fewer whorls (5–5½ whorls, vs 6½–6¾ whorls), and by the somewhat less densely placed radial ribs (8–10 ribs/0.5 mm on the penultimate whorl, vs 12–20 ribs/0.5 mm).

**Description.** Shell minute, orange. Spire conical with slightly to moderately convex sides. Apex only slightly oblique. Whorls convex, approximately evenly rounded. Constriction inside without teeth. Tuba short, detached from spire, approximately circular in section, curved over approximately ¼ whorl, lower surface rather abruptly narrowed towards constriction, rounded. Radial ribs on spire rather densely placed (8–10 ribs/0.5 mm on penultimate whorl), not sinuous, low and thin, radial ribs on tuba approximately similar. Spiral striation dense, fine. Aperture tilted up to 10° relative to coiling axis of spire, with upper margin well below apex of spire, approximately circular. Peristome double; inner peristome slightly protruding from outer peristome, not attached to spire, thickened, and spreading; outer peristome slightly projecting beyond inner on side opposite to spire, gradually narrowing towards the side facing the spire and there virtually absent. Umbilicus open, narrow.

**Dimensions.** Height of spire without tuba 1.55–1.75 mm; width 1.05–1.20 mm; ratio height/width 1.46–1.48; width including tuba 1.80–1.95 mm; umbilicus 0.13–0.18 mm wide; number of whorls 5–5½, excluding tuba; height of aperture 0.55–0.60 mm; width 0.50–0.60 mm.

**Distribution and ecology.** Upper Kakus river limestone range. Primary forest on limestone bedrock. Possibly endemic to the type locality (site-endemic; see Vermeulen & Whitten 1999: 14).

**Etymology.** From Ancient Greek *κράβυλος* = a hairdo consisting of a twisted roll of hair. The noun is used in apposition.

***Plectostoma hyron* spec. nov.**

Figures 11, 12

**ZooBank registration.** urn:lsid:zoobank.org:act:88793FE8-413B-4F3C-BFE9-70DC5ECF8DB6

**Materials examined.** Holotype MZU.MOL.22.36, Malaysia, Sarawak, Bintulu Division, lower Tatau river valley, Bukit Sarang (my-karst 434), NW side, leg. JJV for Grand Perfect Sdn Bhd, 2005. Paratypes as holotype, JJV 12827/532 shells.

**Diagnosis.** Among Bornean *Plectostoma* without longitudinal palatal lamella in the constriction (see Vermeulen, 1994: 82, couplet 30 of the key), it resembles sympatric *P.*

*tuba* (Vermeulen, 1994) in having a long tuba which is distant from the spire. *Plectostoma hyron* spec. nov. differs by the wider conical spire (ratio height/width spire 0.81–1.21, vs 1.55–1.70), by the wide umbilicus (0.40–0.60 mm wide, vs 0.30–0.40 mm), and by the straight (not sinuous) radial ribs.

**Description.** Shell minute to very small, white. Spire depressed conical with slightly to distinctly convex sides. Apex slightly to moderately oblique. Whorls convex, approximately evenly rounded. Constriction inside with a single tooth: a small, knob-shaped infracolumellaris. Tuba very long, detached from spire, approximately circular in section, curved over approximately ½ whorl, lower surface rather abruptly narrowed towards constriction, rounded or slightly flattened. Radial ribs on spire rather densely placed (7–10 ribs/0.5 mm on penultimate whorl), not sinuous, rather low and thin, radial ribs on tuba moderately spaced to rather densely placed (3–8 ribs/0.5 mm), below slightly to moderately sinuous and often slightly widened, abraded to a slightly to moderately sinuous scar. Spiral striation dense, fine. Aperture tilted up to 45° relative to coiling axis of spire, with upper margin well below to well above apex of spire, approximately circular. Peristome double; inner peristome slightly to moderately protruding from outer, not attached to spire, slightly thickened and spreading; outer peristome slightly projecting beyond inner peristome on the side opposite the spire, along the lower edge gradually narrowing towards the side facing the spire and there virtually absent, along the upper edge often with a rounded, slightly widened part before narrowing towards the side facing the spire. Umbilicus open, very wide.

**Dimensions.** Height of spire without tuba 1.05–1.45 mm; width 1.15–1.35 mm; ratio height/width 0.81–1.21; height including tuba 1.30–1.55, width 1.80–2.30 mm; umbilicus 0.40–0.60 mm wide; number of whorls 4½–5½, excluding tuba; height of aperture 0.45–0.50 mm; width 0.40–0.50 mm.

**Distribution and ecology.** Bukit Sarang. Primary forest on limestone bedrock. Probably endemic to the type locality (site-endemic; see Vermeulen & Whitten 1999: 14).

**Etymology.** From Ancient Greek *ὑρον* = a beehive in a Cretensian dialect, referring to the shape of the spire. The noun is used in apposition.

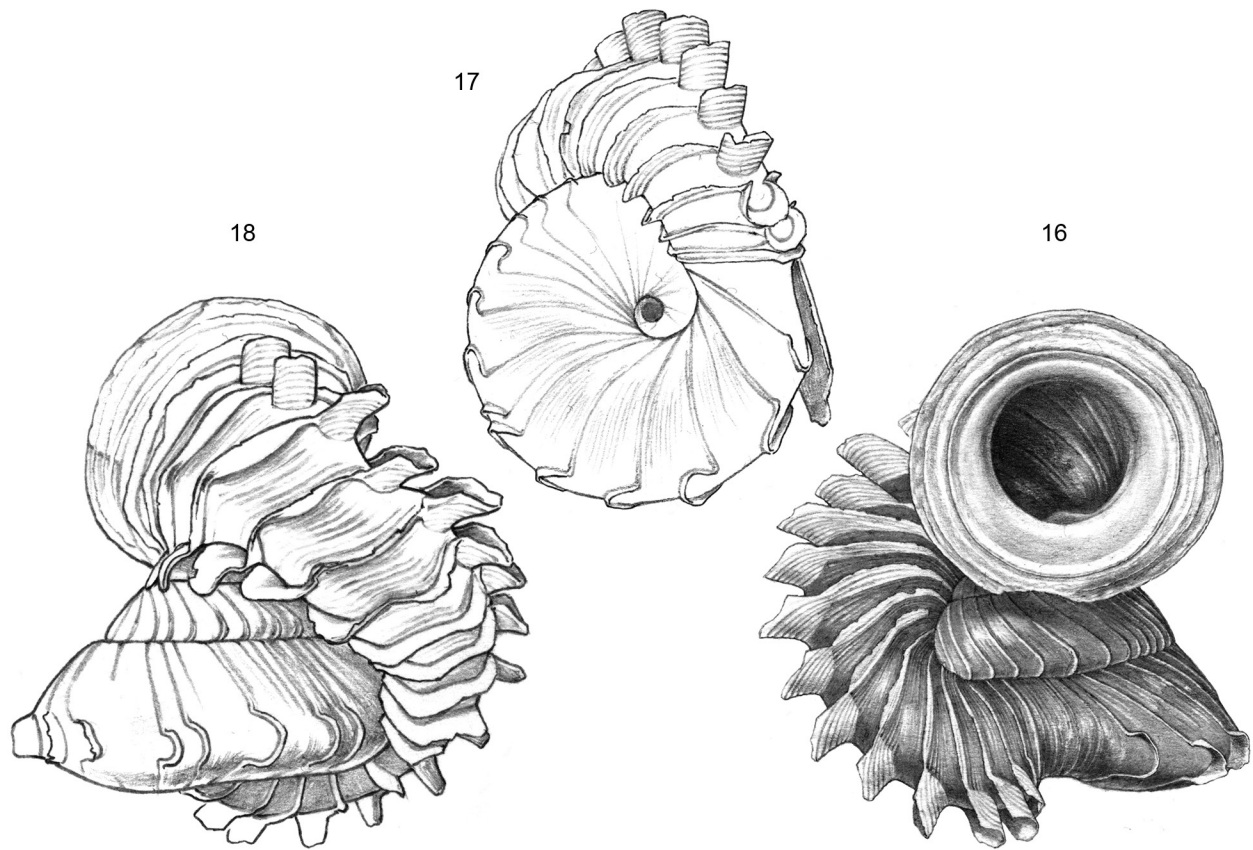
***Plectostoma orthosalpinx* spec. nov.**

Figures 13–15

**ZooBank registration.** urn:lsid:zoobank.org:act:848F50AC-9F95-4F17-80A0-0E270ADD5898

**Materials examined.** Holotype MZU.MOL.22.37, Malaysia, Sarawak, Bintulu and Sibul Divisions, upper Tatau river valley, upper Kakus river limestone scarps (my-karst 435 to 447), leg. K.F. Leong, 2005. Paratype as holotype, JJV 12835/1 shell.

**Diagnosis.** Uniquely identified among Bornean *Plectostoma* by the long, only slightly and widely curved tuba



**Figures 16–18.** *Plectostoma xyster* spec. nov., holotype (MZU.MOL.22.38), (16) frontal view; (17) umbilical view; (18) back view.

with the aperture distant from the spire. In this character it resembles *P. urunense* Vermeulen & Liew, 2022 (Sabah, Sapulut area), which has a much shorter tuba. Apart from the slightly curved tuba, it resembles *P. pyrgiscus* (Vermeulen, 1994) (Sarawak, Kuching Division) in the thin, widely spaced radial ribs; it differs by the less elevated, smaller spire (spire height 1.35–1.40 mm, vs approximately 1.8 mm). It also resembles *P. margarethanae* Marzuki et al., 2021 (Sarawak, Kuching Division) but differs by the narrowly angular periphery of the last whorl.

**Description.** Shell minute to very small, reddish. Spire conical with flat to slightly concave sides. Apex hardly oblique. Whorls convex, approximately evenly rounded, last whorl towards constriction narrowly rounded at the periphery, slightly rounded above and below. Constriction inside with a single (?) tooth: a short transverse palatalis (otherwise not checked). Tuba long, detached from spire, approximately circular in section, curved over approximately  $\frac{1}{4}$  whorl or slightly less, slightly and rather gradually narrowed towards the constriction, rounded below. Radial ribs on the spire widely spaced (2–5 ribs/0.5 mm on penultimate whorl), on first whorls not sinuous, on last whorl slightly sinuous at periphery, low and thin, radial ribs on tuba widely spaced (2–3 ribs/0.5 mm), below slightly sinuous. Spiral striation dense, rather fine.

Aperture tilted approximately  $30^\circ$  relative to coiling axis of spire, with upper margin well below apex of spire, approximately circular. Peristome inconspicuously double; inner peristome moderately protruding from outer, not attached to spire, slightly thickened and spreading; outer peristome not projecting beyond the inner peristome and hardly more distinct than nearby radial ribs. Umbilicus open, rather wide.

**Dimensions.** Height of spire without tuba 1.35–1.40 mm; width 0.85–1.00 mm; ratio height/width 1.35–1.65; width including tuba 1.70–1.90 mm; umbilicus approximately 0.15 mm wide; number of whorls  $4\frac{5}{8}$ – $4\frac{3}{4}$ , excluding tuba; height and width of aperture 0.45–0.50 mm.

**Distribution and ecology.** Upper Kakus river limestone range. Primary forest on limestone bedrock. Probably site-endemic (see Vermeulen & Whitten 1999: 14).

**Etymology.** From Ancient Greek *ὀρθός* = straight and *σάλπιγξ* = trumpet, referring to the shape of the tuba.

#### *Plectostoma xyster* spec. nov.

Figures 16–18

**ZooBank registration.** urn:lsid:zoobank.org:act:A22 EFDD4-6A86-4B83-9A2D-5BA46859A073

**Materials examined.** Holotype MZU.MOL.22.38, Malaysia, Sarawak, Miri Division, Niah National Park, Gunung

Subis (my-karst 457), W part, along the path to the top of Bukit Kasut, leg. JJV for DANIDA, 2003. Paratypes as holotype, JJV 10264/9 shells + 2 defective shells.

**Diagnosis.** Uniquely identified among Bornean *Plectostoma* by the elevated growth lines on the projections of the radial ribs on the tuba. Apart from its unique character, it particularly resembles sympatric *P. stellasubis* (Vermeulen, 1994), which differs by the approximately equally wide outer peristome all around the aperture, without a deep sinus on the side closest to the spire. It also resembles sympatric *P. grandispinosum* (Godwin-Austen, 1889), which is larger (height of spire 1.9–2.2 mm, vs 1.00–1.15 mm).

**Description.** Shell minute, pale corneous to white. Spire slightly depressed-conical, with flat sides. Apex moderately oblique. Whorls. Top whorls convex, rounded, grading to an almost flat last part of penultimate whorl, last whorl obtusely angular at periphery, almost flat above, slightly rounded below. Constriction inside with three teeth: one small, knob-shaped infracolumellaris; one longitudinal, small, short, low parietalis; one similar palatalis. Tuba attached to spire, obtusely triangular in section, curved over approximately  $\frac{3}{4}$  whorl, close to constriction with a narrow, slightly inflated part particularly on basal side before rather abruptly narrowing towards constriction, basal side otherwise narrowly rounded. Radial ribs on spire rather widely spaced (5–8 ribs/0.5 mm on last part of penultimate whorl), low, thin, ribs close to apex not sinuous, all others deeply sinuous at periphery and there slightly higher; radial ribs on tuba widely spaced (approximately 2 ribs/0.5 mm halfway), high, thin, below deeply sinuous and with a deeply concave projection, abrading to a deeply sinuous scar; radial ribs on tuba, including projections, with thin, rounded-crested riblets following growth lines, these ribs continue on adjacent shell surface. Spiral striation absent. Aperture tilted 20–30° relative to coiling axis of spire, with upper margin widely overtopping apex, approximately circular, teeth absent. Peristome double; inner peristome hardly protruding from outer peristome, hardly thickened, and distinctly spreading; outer peristome widely projecting beyond the inner all around the aperture, slightly narrower along lower edge. Umbilicus open, rather narrow.

**Dimensions.** Height of spire without tuba 1.00–1.15 mm; width 1.20–1.35 mm; ratio height/width 0.83–0.96; height including tuba 1.80–1.90; width 1.70–1.80 mm; umbilicus 0.28–0.30 mm wide; number of whorls approximately  $4\frac{1}{2}$ , excluding tuba (difficult to measure because of oblique apex); height of aperture 0.55–0.60 mm; width 0.50–0.55 mm.

**Distribution and ecology.** Niah National Park, W side. Primary forest on rocky hillslope, on limestone bedrock. Probably endemic to the type locality (site-endemic; see Vermeulen & Whitten 1999: 14).

**Etymology.** From Ancient Greek *ξυστήρ* = a rasp, referring to the ribbed projections on the tuba; the noun used in apposition.

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