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Notes on the non-marine molluscs of the island of Borneo 6. The genus Opisthostoma (Gastropoda Prosobranchia: Diplommatinidae), part 2.

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The species of the genus *Opisthostoma* (Diplommatinidae) occurring on Borneo are revised. In total, 67 species and 6 subspecies are included; 36 species and 4 subspecies are new. Contrary to the opinion, expressed in Vermeulen (1991), that *Plectostoma* should be regarded as a genus, it is now argued that it is best included in *Opisthostoma*. A new key to all the species is presented, but the descriptions of the species treated in Vermeulen (1991) are not repeated. All species except *O. javanicum* are endemic to Borneo. In its present circumscription, the genus *Opisthostoma* is presumably monophyletic on account of a unique character: the inverted last half whorl of the shell.

Key words: Gastropoda, Prosobranchia, Diplommatinidae, *Opisthostoma*, taxonomy, Malaysia, Indonesia, Borneo.

In Vermeulen (1991) characters were listed distinguishing *Plectostoma* H. Adams, 1865, from the genus *Opisthostoma* W.T. & H. Blanford, 1860 (both Diplommatinidae). Although the polythetic nature of the diagnostic set of characters for *Plectostoma* was admitted, as well as the existence of a few intermediate species, it was argued that the two taxa are best kept separate on generic level. At present, with ample material of about 40 more undescribed species and subspecies available of both groups, it becomes obvious that the overall similarity in the shape of the shell is striking, and that the only character that can be used as demarcation between the groups is a difference in the shape of the spire. The set of characters considered diagnostic for *Plectostoma* by Vermeulen (1991) can now be commented upon:

– a. "Top whorls usually not or only slightly oblique". A distinctly oblique apex occurs in about 1/3 of the species pertaining to *Plectostoma* on the basis of the presence of two or three of the characters mentioned under b, c, and d;

– b. "Whorls 4 or more". *O. stellasubis*, *O. goniostoma* and *O. pumilio*, all *Plectostoma* on account of other features (all three on account of their size, the first two also on account of the shape of the spire, the presence of projections on the radial ribs) have 3 5/8-4 whorls;

– c. "Top whorls and body whorls together forming a conical body". As said above, this character more or less holds, although *O. subconicum* of *Opisthostoma*, as well as *O. goniostoma*, *O. pumilio*, *O. crassum*, *O. dancei dispersum* of *Plectostoma* are, or may be, of intermediate shape;

– d. "Shell [meant is the spire] higher than 1.3 mm". *O. wallacei* and its subspecies, *O. crassum*, and *O. dancei dispersum*, all *Plectostoma*, are, or may be, less than 1.3 mm high.

The demarcation between the two groups is more diffuse than previously assumed. Therefore, contrary to the opinion expressed in 1991, it is now concluded that *Plectostoma* should be included in *Opisthostoma* as a subgenus.

Other generic names have been proposed for small groups of species: *Geothauma* Crosse, 1892, for species with long projections on the radial ribs, and *Gyrostropha* Ancey,

1887, for a few species with a spire with a rounded top and an almost vertical aperture. As Smith (1893b) already pointed out, applying these characters to divide the genus leads to groups of which the constituent species can be suspected to be of different phylogenetic affinity. This justifies synonymisation with *Opisthostoma*.

The monotypic genus *Laotia* Saurin, 1953, much resembles *Opisthostoma* in the shape of the shell. According to the description, the operculum has a spiral crest on its outer surface. This has never been observed in *Opisthostoma*, but frequently occurs in the genus *Cyclotus* Swainson, 1840 (Cyclophoridae). The illustrations accompanying the original description of *Laotia* suggest the presence of a constriction immediately behind the outer peristome, as in the Philippine genus *Helicomorpha* Von Moellend., 1890. At least one species included in the latter genus, however, has an operculum with a small, centrally placed tube on the outer surface (*H. quadrasi* Von Moellend., 1893), a character also occurring in *Alyceus* subg. *Stomacosmethis* Bollinger, 1918 (Cyclophoridae). *Laotia* probably has more characters in common with the family Cyclophoridae than it has with Diplommatinidae, and it cannot be synonymized with *Opisthostoma*.

In the present circumscription the genus *Opisthostoma* is presumably monophyletic on account of a unique character: the inverted tuba. So far 67 species have been found on Borneo; the genus thus beats *Diplommatina* as the largest. Thirty-six species of *Opisthostoma* are described as new in this paper. For a general survey of the genus the fairly complete checklist of Van Benthem Jutting (1952) was used.

A consequence of the above mentioned decisions is that the present revision of *Opisthostoma* includes the revision of Vermeulen, 1991. The descriptions of the species treated there are not repeated in the present revision; they are now listed among the fully treated species in the order in which they appear in the key. For such species only new information is given. Because no key can absorb such a high percentage of new species without having to be altered fundamentally, a new key is given including all species.

References to material present in the collection of the present author are abbreviated as V, followed by a collection number. The holotype specimens indicated in this collection will be deposited in the Nationaal Natuurhistorisch Museum (RMNH). If available, paratypes from the type locality will be distributed to other institutes. Eventually all other material will also be deposited at RMNH.

A few other abbreviations are used in the geographical references in the text, mainly derived from the Indonesian language: B. = batu (rock); Bt. = bukit (hill); G. = gunung (mountain); Kpg. = kampong (village); P. = Pulau (island).

After each reference to material seen by the author the number of specimens is given after a slash: /.

The drawings were made by the author, with a Wild M8 stereo microscope with camera lucida device.

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SYSTEMATIC PART

Genus *Opisthostoma* W.T. & H. Blanford, 1860.

Genus *Opisthostoma* W.T. & H. Blanford, 1860: J. Asiatic Soc. Bengal 29: 121 (not seen). Type species: *O. nilgiricum* W.T. & H. Blanford (India).

Genus *Plectostoma* H. Adams, 1865: 177. Type species: *Opisthostoma decrespignyi* H. Adams (Borneo).

Genus *Gyrostropha* Ancey, 1887: 275. Syntype species: *Opisthostoma paulucciae* Crosse & Nevill, *O. perakense* Godwin Austen & Nevill (both W. Malaysia).

Genus *Geothauma* Crosse, 1892: 282. Type species: *Opisthostoma grandispinosum* Godwin Austen (Borneo).

Shell white, corneous or orange (dark reddish brown in few species), opaque to translucent when fresh, dextral but seemingly sinistral because of the inverted last 1/4-1/2 whorl. Whorls 3-7 1/2 (inverted portion not counted). Top whorls oblique or not, smooth. All other whorls with radial ribs, usually crossed by a fine spiral striation. Next whorls together forming the usually conical to cylindrical main portion of the shell (here called: the *spire*). Approximately 1/4 - 1/2 whorl previous to the aperture a constriction is present, the narrowest part of which is usually provided inside with a transversal lamella on the palatal side, and often with one or a few more longitudinal or transversal lamellae. In the part immediately beyond the constriction (in the direction of the aperture) more longitudinal or transverse teeth may be present. The whorl beyond the constriction (here called: the *tuba*) is sinistral, growing upwards along the spire, ending in the aperture at the left side of the spire when the shell is observed in front (assuming it is dextral, see fig. 1b). Aperture circular to angular, sometimes with teeth. Peristome usually double (the radial rib or ribs forming the outer peristome hardly to distinctly thicker as, and distinctly wider than the previous ones), sometimes simple (the radial rib closest to the peristome equally thin as, and not or only slightly wider than the previous ones), outer peristome often flaring. Operculum with a corneous inner layer and a calcareous outer, about circular, multispiral. Shell 0.5 - 3.5 mm high.

Ecology. — 1. Species of the subgenus *Opisthostoma* are very difficult to find in the field. Nevertheless, they often appear present in large numbers when soil samples are sorted out. Saul (1967) has observed living animals of what she identified as *O. hailei* (= *O. brachyacrum lambii*) near Keningau, Sabah, on damp leaves, twigs and debris in rock crevices. The present author has observed living animals of *O. javanicum* and *O. subconicum* in SE. Kalimantan, in a mixture of decaying organic debris and small limestone particles at the foot of limestone cliffs. The shells are usually covered with very fine soil particles, in particular close to the radial ribs. This hidden way of living, together with their extremely small size, may account for the fact that they are easily overlooked in the field.

2. Most larger Bornean species of the subgenus *Plectostoma* live on limestone outcrops covered with fine moss and algae, in primary forest, slightly disturbed primary forest or mature secondary forest (observed have been *O. transequatorialis*, *O. lissopleuron lis-*

sopleuron, *O. hosei*, as well as the species mentioned in note 3). Berry (1962, 1964) has observed living *O. retrovertens* Tomlin, 1938, from W. Malaysia. He found that this species feeds on the moss and the algae growing on the limestone surface. Breeding is seasonal and follows the monsoon. After hatching, the juveniles grow remarkably fast, producing on average one radial rib and the portion of the spire preceding the rib, each night. Thus the animals reach maturity in about four months. The life span of an individual is unknown, although specimens have been kept alive for 12 months under laboratory conditions. Berry (1964) also gives an extensive description of the genital system of the species.

3. Living specimens of a number of species of the subgenus *Plectostoma*, particularly those with distinct radial ribs or with long projections on the radial ribs, are extremely conspicuous: they resemble small tufts of pure white cottonwool, often with glistening droplets of dew, against a background of dark green or brown, moss-covered limestone rock (*O. mirabile*, *O. everetti*, and *O. grandispinosum* observed). Living specimens of *O. stellasubis*, with projections only on the tuba, are less conspicuous; they resemble minute, white fans on the limestone surface.

4. Many species of the genus *Opisthostoma* suffer from predation and, possibly, parasites. Traces of various nature have been found on the shells:

– a. Etched patches and holes in the shell wall. Traces of burglary are most frequently found as transverse slits on the palatal and basal wall following the constriction. Shells thus perforated often have the inside of the constriction heavily etched as well: the diagnostically important teeth in the constriction may have disappeared entirely. Similar slits are often found along the sutures between the tuba and the spire. Larger holes may occur anywhere on the shell, but particularly in the thin wall between the first part of the tuba and the spire. Apparently a predator enters the shell through the tuba, finds its passage blocked by the operculum and then enters the spire through the above mentioned wall;

– b. In the umbilicus of fresh specimens of various species (*O. otostoma*, *O. everetti*, *O. wallacei*) a transparent, chitinous, ellipsoid capsule has been found, usually with a long slit on the visible end. The capsule is attached to the shell wall by a few fine threads. No traces of life of any kind have been found in these capsules; their origin is fully unknown.

Distribution. — India, Vietnam, Cambodia, W. Malaysia, Borneo, Sumatra, Java, Celebes (see also Van Benthem Jutting, 1952).

Notes. — 1. Compared to Vermeulen (1991) the terminology used to describe the shells has been altered in some aspects because of the inclusion of numerous species with a more complicated structure. All special terminology used in this paper is listed below:

– a. *Constriction*: a narrow part present at approximately 1/4 to 1/2 whorl previous to the aperture;

– b. *Spire*: the part of the shell consisting of the whorls between the apex and the constriction. The shape of the spire should be estimated while observing the shell in front view (see fig. 1b);

– c. *Tuba*: the portion of the shell between the constriction and the aperture;

– d. All information given on a parietal tooth in the constriction refers to the *longitudinal* parietalis.

2. Measurements of shells have been taken as indicated in figs. 1a, 1b. It should also be noted that:

– a. The tuba is not included in the whorl count;

– b. All measurements exclude protrusions on the radial ribs. The outer peristome is excepted from this rule, it is included in the total width of the shell;

– c. The size of the aperture is measured along its inside, contrary to Vermeulen (1991), where it is measured along the outside.

3. In order to properly observe the diagnostically important teeth in the constriction it is absolutely necessary to make a hole in the shell wall, or to break off the tuba. To ascertain the presence of the longitudinal palatalis, which is diagnostically important, it is often sufficient to immerse the shells in petrol, or to moisten the shell with a droplet of it. The teeth can than be seen through the temporarily transparant shell. A note of warning should be added here: in some species, or incidental specimens of a few other species, the longitudinal palatalis may have shifted in the direction of the parietal side, and thus be partly or entirely hidden under the suture.

Key to the Bornean species of *Opisthostoma*

(check a large series of shells wherever possible. Various taxa will key out more than once because of the variability of many characters)

1 a - Spire with 3-3 7/8 whorl. *Either* spire along its right side with the penultimate whorl slightly to distinctly wider than the ultimate if the shell is observed in front view (spire cylindrical), *or* aperture with one or more teeth, *or* both characters mentioned present (subg. *Opisthostoma*) 2

b - *Either* spire with 4-7 1/2 whorls; *or* spire with 3 5/8-4 whorls, but then spire along its right side with the penultimate whorl slightly to distinctly narrower than the ultimate if the shell is observed in front view (spire conical), and aperture without teeth (subg. *Plectostoma*) 30

2 a - Tuba partly or entirely distant from the spire 3

b - Tuba touching the spire over its entire length 8

3 a - Tuba entirely distant from the spire. Outer peristome widely distant from the spire 4

b - Tuba partly distiant from the spire, about half-way leaving a small gap between the tuba and the spire. Outer peristome (almost) touching the spire 6

4 a - Radial ribs very closely placed: 20-26 ribs/0.5 mm on the penultimate whorl of the spire, 16-22 ribs/0.5 mm half-way the tuba ..... *O. dihelicton* (1)

b - Radial ribs rather closely placed to rather widely spaced: 4-8 ribs/0.5 mm on the penultimate whorl, 3-7 ribs/0.5 mm half-way the tuba 5

5 a - Umbilicus 0.05-0.10 mm across. Spire on its right side with the penultimate whorl distinctly wider than the ultimate, if the shell is observed in front view ..... *O. asyndeton* (2)

b - Umbilicus 0.15-0.20 mm across. Spire on its right side with the penultimate whorl not or slightly wider than the ultimate, if the shell is observed in front view ..... *O. telestoma* (3)

6 a - Spire along its right side with the penultimate whorl obtusely angular if the shell is observed in front view. Tuba obtusely angular below ..... *O. crassicolle* (4)

b - Penultimate whorl of the spire rounded. Tuba rounded below 7

7 a - Inner peristome widely projecting beyond the outer, forming a downwards curved tube of up to 2/3 of the length of the tuba ..... *O. acolaston* (5)

b - Inner peristome protruding from the outer, but not forming a downwards curved tube ..... *O. semisolutum* (6)

8 a - (2) Tuba with a longitudinal or semi-circular furrow close to the constriction 9
b - Tuba without a furrow close to the constriction 11
9 a - Outer peristome widely expanding on the right side of the aperture, and covering the entire top part of the spire. Tuba with a straight, longitudinal furrow ending at the constriction ..... *O. holzmarki* (7)
b - Outer peristome at most somewhat widened on the (upper) right side of the aperture, not covering the top part of the spire. Tuba with a semi-circular furrow, opening to the right if the shell is observed in front view 10
10 a - Swelling in the tuba, close to the constriction, without radial ribs, bordered by a depression on both sides; a semi-circular furrow present on the swelling itself ..... *O. sulcatum* (8)
b - Swelling in the tuba, close to the constriction, with radial ribs, bordered by a semi-circular furrow ..... *O. rotundum* (9)
11 a - (8) Aperture in front view with one or two teeth visible 12
b - Aperture in front view without teeth visible 15
12 a - Radial ribs on the lower side of the tuba with a shallow to rather deep, semi-circular loop; these loops are most distinct about half-way the tuba 13
b - Radial ribs on the lower side of the tuba without a loop 14
13 a - Upper margin of the aperture distinctly above the level of the apex (see fig. 1c). Aperture in front view with a single tooth visible along its lower side ..... *O. auriforme* (10)
b - Upper margin of the aperture slightly below the level of the apex (see fig. 1d). Aperture in front view with two teeth visible: an inconspicuous tooth along its lower side and a more distinct along its upper side ..... *O. subconicum* (11)
14 a - The continuation of the parietalis into the tuba ending close to the lower margin of the aperture, hence distinctly visible when the aperture is observed in front view ..... *O. hailei* (12)
b - The continuation of the parietalis into the tuba ending well away from the lower margin of the aperture, hence hardly visible (often as a slight swelling only) when the aperture is observed in front view ..... *O. cryptodon* (13)
15 a - (11) Constriction and/or the adjacent part of the tuba with 1-3 longitudinal teeth in parietal, angular and palatal position 16
b - Constriction as well as the adjacent part of the tuba without longitudinal teeth in parietal, angular and palatal position 24
16 a - Constriction with 2-3 longitudinal teeth in a parietal, angular and palatal position 17
b - Constriction without longitudinal teeth, or with 1 longitudinal tooth in a parietal, angular or palatal position 20
17 a - All longitudinal teeth in the constriction short, ending well before the sharp inner curve of the tuba ..... *O. brachyacrum lambii* (17.2)
b - One longitudinal tooth in the constriction much longer than the other, continuing up to, or slightly beyond the sharp inner curve of the tuba 18
18 a - Spire 0.7-0.9 mm high and wide. Total width of shell 1.0-1.4 mm ..... *O. brachyacrum lambii* (17.2)
b - Spire 0.9-1.2 mm high, 0.9-1.1 mm wide. Total width of shell 1.3-1.7 mm 19
19 a - Aperture not or hardly tilted with regard to the coiling axis. Inner peristome with its upper margin widely below the level of the apex (see fig. 1d). Inner peristome on the right side of the aperture spreading either over the periphery, or

the lower half of the widest whorl of the spire ..... *O. gibbosum* (14)

b - Aperture tilted 15-60° with regard to the coiling axis. Inner peristome with its upper margin slightly above (see fig. 1c) to slightly below the level of the apex. Inner peristome on the right side of the aperture spreading over the upper half of the widest whorl of the spire, often also over the whorl above the widest .... *O. simile* (15)

20 a - (16) Inner curve of the tuba with a longitudinal tooth (the continuation of the parietalis in the constriction); or a longitudinal tooth present almost reaching the inner curve of the tuba 21

b - Inner curve of the tuba without a longitudinal tooth; longitudinal tooth ending well before the inner curve of the tuba 22

21 a - Parietalis high and distinct in the inner curve of the tuba, absent or low and inconspicuous at the level of the constriction .... *O. brachyacrum tatauense* (17.3)

b - Parietalis about equally high over its entire length, or highest and most distinct at the level of the constriction and lower and less distinct in the tuba (for Sabah specimens keying out here: see the notes under *O. brachyacrum lambii*) .... *O. brachyacrum brachyacrum* (17.1)

22 a - Longitudinal tooth in the constriction in a palatal position (in some shells it may take an almost angular position, but it is always inclined slightly towards the palatal side at one end, usually the end directed towards the aperture) .... *O. tridens* (16)

b - Longitudinal tooth in the constriction in a parietal position (in some shells it may take an almost angular position, but it is always inclined towards the parietal side at the end directed towards the spire) 23

23 a - Spire with 4-9(-10) radial ribs/0.5 mm on the penultimate whorl. Tuba half-way with 3-6(-7) radial ribs/0.5 mm. Umbilicus 0.05-0.25 mm wide .... *O. brachyacrum brachyacrum* (17.1)

b - Spire with 6-26 radial ribs/0.5 mm on the penultimate whorl. Tuba half-way with 5-20 radial ribs/0.5 mm. Umbilicus closed or open, up to 0.15 mm wide (for E. Sarawak and Sabah specimens keying out in this couplet: see also the notes under *O. brachyacrum brachyacrum* and *O. brachyacrum lambii*) .... *O. brachyacrum lambii* (17.2)

24 a - (15) Portion of the spire ending on the constriction with 8-15 radial ribs/0.5 mm 25

b - Portion of the spire ending on the constriction with 2-6 radial ribs/0.5 mm 26

25 a - Spire 0.7-1.0 mm high. Aperture tilted up to 45° with regard to the coiling axis of the spire ..... *O. brachyacrum lambii* (17.2)

b - Spire 0.5-0.7 mm high. Aperture tilted 70-90° with regard to the coiling axis of the spire ..... *O. devogelii* (18)

26 a - Upper margin of the peristome distinctly above the level of the apex (see fig. 1c) ..... *O. planiapex* (19)

b - Upper margin of the peristome at most very slightly above the level of the apex, usually slightly to distinctly below the level of the apex (see fig. 1d) 27

27 a - Spire on its right side with the penultimate whorl distinctly wider than the ultimate, if the shell is observed in front view (spire obliquely cylindrical) .... *O. lechria* (20)

b - Spire on its right side with the penultimate whorl not or slightly wider than the ultimate, if the shell is observed in front view (spire cylindrical, not or hardly

oblique) 28
28 a - Radial ribs on the tuba as well as on the last whorl of the spire distinctly winged ..... *O. delopterum* (21)
b - Radial ribs on the tuba as well as on the last whorl of the spire not winged 29
29 a - Peristome usually attached to both the widest whorl of the spire and the whorl above the widest, or peristome attached to the widest whorl of the spire only, but then it is usually very close to the whorl above the widest; rarely a distinct gap is present between the peristome and the whorl above the widest *O. ballorum* (22)
b - Peristome usually attached to the widest whorl of the spire only; usually a distinct gap is present between the peristome and the whorl above the widest; rarely the peristome is very close to the whorl above the widest or touching it ..... *O. javanicum* (23)
30 a - (1) Constriction with a longitudinal palatalis (check carefully, it may be partly hidden below the suture) 31
b - Constriction without a longitudinal palatalis 63
31 a - Radial ribs half-way the tuba and on its lower surface either with a deep, semi-circular loop, or with a deeply trough-shaped projection, abrading to a scar with a deep, semi-circular loop 32
b - Radial ribs half-way the tuba and on its lower surface either not sinuous, or sinuous, or with a shallow loop, or with a shallowly concave projection, abrading to a sinuous or shallowly looped scar 39
32 a - Constriction without a columellaris 33
b - Constriction with a columellaris 35
33 a - Umbilicus 0.10-0.20 mm wide. Spire 1.1-2.0 mm high. Shell 1.3-2.4 mm wide. Radial ribs on the spire (those on the last whorl excepted) usually without a projection, slightly sinuous ..... *O. wallacei wallacei* (62.1)
b - *Either* umbilicus 0.30-0.40 mm wide, *or* umbilicus 0.10-0.30 mm wide, but then spire 2.0-2.4 mm high, and shell 2.7-2.8 mm wide, and radial ribs on the spire (those on the last whorl excepted) with a projection, abrading to a shallowly to deeply looped scar 34
34 a - Constriction with a distinct parietalis. Those radial ribs that are close to the tuba with a double-channeled projection with both channels about equally deep or with the lower deepest, abrading to a scar with a double deep loop when the shell is observed in front view. Umbilicus 0.10-0.30 mm wide *O. anisopterum* (24)
b - Constriction without a parietalis, at most with a very slight swelling. Those radial ribs that are close to the tuba with a double-channeled projection with the upper channel much deeper than the lower, abrading to a distinctly sinuous scar or one with a single deep loop when the shell is observed in front view. Umbilicus 0.30-0.40 mm wide ..... *O. dormani* (25)
35 a - (32) Outer peristome along the upper side of the aperture with a very large, widely projecting wing which abruptly narrows at its right side. Inner peristome distinctly protruding from the outer ..... *O. mirabile* (26)
b - Outer peristome along the upper side of the aperture not or slightly widened, or with a only slightly projecting, widely rounded wing which gradually narrows at its right side. Inner peristome not protruding from the outer, or slightly to moderately so 36
36 a - Radial ribs on the last half-whorl of the spire with a projection half-way, often abraded to a scar with an irregularly eroded crest 37

b - Radial ribs on the last half-whorl of the spire without a projection half way, and without an eroded crest 38

37 a - Outer peristome distinctly spreading beyond the inner all around, only slightly narrowed but not absent along the right side of the aperture. Spire with convex whorls; last whorl rounded or slightly angular at the periphery *O. fraternum* (27)

b - Outer peristome spreading beyond the inner but gradually narrowed towards, and absent to narrow along the right side of the aperture. Spire with moderately convex whorls; last whorl (slightly) angular at the periphery *O. concinnum* (28)

38 a - *Either* constriction with a ridge-shaped transverse basalis, *or* constriction with a knob-shaped basalis, but then outer peristome distinctly spreading beyond the inner ..... *O. lissopleuron lissopleuron* (42.1)

b - Constriction with a distinctly knob-shaped transverse basalis. Outer peristome somewhat spreading beyond the inner or not, sometimes slightly widened along the upper side of the aperture ..... *O. lissopleuron bigibbum* (42.2)

39 a - (31) Constriction without a longitudinal parietalis 40

b - Constriction with a longitudinal parietalis 43

40 a - Outer peristome along the upper side of the aperture with a distinct, but small wing which often has a somewhat concave right margin. Spire with 3-4 radial ribs/0.5 mm on the penultimate whorl ..... *O. otostoma* (29)

b - Outer peristome along the upper side of the aperture *either* not widened or only slightly so, without a true wing, *or* with an inconspicuous wing, but then spire with 5-10 radial ribs/0.5 mm on the penultimate whorl 41

41 a - Radial ribs close to the tuba with a double-channeled projection with the upper channel much deeper than the lower, abrading to a distinctly sinuous scar or one with a deep loop when the shell is observed in front view ..... *O. dormani* (25)

b - Radial ribs close to the tuba not or hardly sinuous 42

42 a - Umbilicus 0.30-0.40 mm across. Spire 1.7-2.1 mm high, with 4-6 radial ribs/0.5 mm on the penultimate whorl ..... *O. obliquedentatum* (30)

b - Umbilicus 0.20-0.25 mm across. Spire 2.2-2.5 mm high, with 5-10 radial ribs/0.5 mm on the penultimate whorl ..... *O. inornatum* (31)

43 a - (39) Constriction without a columellaris, or with a very slight swelling only 44

b - Constriction with a distinct columellaris 47

44 a - Umbilicus 0.30-0.40 mm across ..... *O. obliquedentatum* (30)

b - Umbilicus 0.10-0.25 mm across 45

45 a - Spire 2.2-2.5 mm high. Number of whorls 6 1/8-6 7/8 .... *O. inornatum* (31)

b - Spire 1.1-2.1 mm high. Number of whorls 4 1/4-5 7/8 46

46 a - Outer peristome with a distinct, obtuse (rounded but not widely so) wing along the upper side of the aperture, and usually with a similar but less conspicuous wing along the lower side. Inner peristome slightly protruding from the outer ..... *O. dipterum* (32)

b - Outer peristome not widened along the upper and the upper side of the aperture, or only slightly so, with a well-rounded edge. Inner peristome moderately to distinctly protruding from the outer (rarely only slightly protruding) ..... *O. wallacei wallacei* (62.1)

47 a - (43) Radial ribs on the spire straight or very slightly sinuous only. Constriction without a basalis 48

b - *Either* radial ribs on the spire distinctly sinuous, *or* constriction with a basalis in the shape of a knob or transverse ridge (in the latter case often fused to the

columellaris with the demarcation visible as a shallow depression), *or* both characters mentioned present 54

48 a - *Either* inner peristome moderately protruding from the outer, *or* sides of spire convex, *or* both characters present 49

b - Inner peristome usually at most slightly protruding from the outer. Sides of spire flat to concave, rarely very slightly convex 52

49 a - Umbilicus 0.30-0.40 mm across. Inner peristome usually slightly protruding from the outer ..... *O. obliquedentatum* (30)

b - Umbilicus 0.15-0.30 mm across, if umbilicus 0.20-0.30 mm across, then inner peristome usually moderately protruding from the outer 50

50 a - Umbilicus 0.15-0.20 mm across. Inner peristome slightly protruding from the outer ..... *O. baritense* (33)

b - Umbilicus 0.20-0.30 mm across. Inner peristome usually moderately protruding from the outer 51

51 a - Peristome almost touching the spire or at most somewhat distant from it ..... *O. brevituba* (34)

b - Peristome (widely) distant from the spire, rarely only slightly distant from it ..... *O. depauperatum* (35)

52 a - (48) Constriction with a long, inconspicuous parietalis starting about half-way the longitudinal palatalis and obliquely crossing the suture while continuing into the tuba, widely beyond the longitudinal palatalis ..... *O. obliquedentatum* (30)

b - Constriction with a short, inconspicuous or distinct parietalis which does not cross the suture (although sometimes closely approaching or reaching it) and does not continue into the tuba, beyond the longitudinal palatalis 53

53 a - Radial ribs on the spire not sinuous, or rarely slightly sinuous. Columellaris abruptly ending towards the basal side of the constriction *O. decrespignyi* (36)

b - Radial ribs on the spire slightly sinuous, or rarely not sinuous. Columellaris gradually thinning out towards the basal side of the constriction ..... *O. transequatorialis* (40)

54 a - (47) Shell without any spiral striation (check fresh specimens at 50x magnification) 55

b - Spiral striation present on at least part of the shell, although sometimes inconspicuous 56

55 a - Spire 2.4-3.5 mm high. Outer peristome with a distinct, widely rounded to obtuse wing along the upper side of the aperture ..... *O. pulchellum* (37)

b - Spire 1.7-2.1 mm high. *Either* peristome simple, *or* peristome double, the outer at most slightly spreading beyond the inner ..... *O. obliquedentatum* (30)

56 a - Outer peristome along the upper side of the aperture with a (moderately) distinct edge, with a small, obtuse (rounded but not widely so) projection, or with an obtuse wing; in the latter case inner peristome with or without a few protruding lamellae on its outer surface 57

b - Outer peristome along the upper side of the aperture not widened, slightly widened or with a widely rounded wing. Inner peristome without protruding lamellae on its outer surface 59

57 a - Outer peristome along the left side of the aperture with an inconspicuous to distinct edge or a small projection ..... *O. bihamulatum* (38)

b - Outer peristome along the left side of the aperture well rounded 58

58 a - Umbilicus 0.15-0.20 mm wide. Constriction without a basalis. Inner peristome

slightly protruding from the outer, without lamellae on its outer surface, or with very inconspicuous ones which do not protrude ..... *O. dipterum* (32)

b - Umbilicus 0.25-0.40 mm wide. Constriction with a knob- to ridge-shaped transverse basalis. Inner peristome moderately protruding from the outer, often with a few protruding lamellae on its outer surface ..... *O. simplex* (39)

59 a - Constriction with a long, inconspicuous parietalis starting about half-way the longitudinal palatalis and obliquely crossing the suture while continuing into the tuba, widely beyond the longitudinal palatalis ..... *O. obliquedentatum* (30)

b - Constriction with a short, distinct parietalis which does not cross the suture (although sometimes closely approaching or reaching it) and which does not continue into the tuba, beyond the longitudinal palatalis 60

60 a - Constriction without a basalis; columellaris gradually thinning towards the basal side of the constriction ..... *O. transequatorialis* (40)

b - Constriction with a basalis in the shape of a knob or transverse ridge, the latter often fused to the columellaris with the demarcation visible as a shallow depression 61

61 a - Most radial ribs on the spire with a shallowly concave projection (check fresh specimens) ..... *O. jucundum* (41)

b - Radial ribs without a projection (sometimes a few radial ribs protected by the aperture may have a small projection) 62

62 a - Either constriction with a ridge-shaped transverse basalis, or constriction with a knob-shaped basalis, but then outer peristome distinctly spreading beyond the inner ..... *O. lissopleuron lissopleuron* (42.1)

b - Constriction with a distinctly knob-shaped transverse basalis. Outer peristome somewhat spreading beyond the inner or not, sometimes slightly widened along the upper side of the aperture ..... *O. lissopleuron bigibbum* (42.2)

63 (30)a- Radial ribs half-way the tuba and on its lower surface either with a deep, semi-circular loop, or with a deeply trough-shaped projection, abrading to a scar with a deep, semi-circular loop 64

b - Radial ribs half-way the tuba and on its lower surface either not sinuous, or sinuous, or with a shallow loop, or with a shallowly concave projection, abrading to a sinuous or shallowly looped scar 77

64 a - Radial ribs on the spire all distinct, not sinuous, or very slightly so on the lower half of the penultimate whorl; but those on the last whorl with a deep loop on the periphery when the shell is observed in front view ..... *O. picsingense* (43)

b - Radial ribs on the spire *either* absent on the last whorl of the spire, *or* present all over the spire, slightly sinuous half-way, or distinctly sinuous, or with a shallowly concave to almost tubular projection, abrading to a scar with a single or double, shallow or deep loop 65

65 a - Peristome double. Outer peristome along the upper side of the aperture with a single, widely projecting, large, obtuse to widely rounded wing 66

b - Peristome simple; or peristome double, but then outer peristome *either* with two distinct wings separated by a deep sinus, *or* along the upper side of the aperture without a true wing (though sometimes widened) 67

66 a - Wing of the outer peristome with the margins strongly curved backwards. Umbilicus 0.40-0.55 mm across ..... *O. perspectivum* (44)

b - Wing of the outer peristome with the margins not curved backwards. Umbilicus 0.15-0.30 mm across ..... *O. heteropleuron* (45)

67 a - Spiral striation absent (check fresh specimens at 50 x magnification) 68
b - Spiral striation present 72
68 a - Upper margin of the aperture widely above the level of the apex (see fig. 1c) 69
b - Upper margin of the aperture below the level of the apex (see fig. 1d), or at most slightly above it 70
69 a - Peristome touching the spire. Outer peristome on the side touching the spire with a deep sinus flanked at both sides by a distinct, widely rounded wing .... *O. stellasubis* (46)
b - Peristome distant from the spire. Outer peristome hardly to moderately spreading beyond the inner all around, or sometimes gradually narrowed towards, and absent along the side of the aperture which is closest to the spire, without wings ..... *O. grandispinosum* (47)
70 a - Last whorl rounded or at most slightly angular at the periphery, rounded above and below ..... *O. dormani* (25)
b - Last whorl of the spire distinctly but obtusely angular at the periphery, flat or only slightly convex above, slightly convex below 71
71 a - Spire with 4 1/4-5 1/4 whorls. Constriction without a columellaris *O. hosei* (48)
b - Spire with 5 5/8-6 3/8 whorls. Constriction with a distinct columellaris .... *O. cookei* (49)
72 - (67) Spire with 4 7/8-5 3/8 whorl 73
b - Spire with 5 3/8-7 1/8 whorl 75
73 a - Radial ribs on the tuba below with a long projection ..... *O. everetti* (50)
b - Radial ribs on the tuba below without a projection, or with a very short projection only 74
74 a - Total width of the shell 2.6-3.1 mm ..... *O. cyrtopleuron* (59)
b - Total width of the shell 1.3-2.4 mm ..... *O. wallacei wallacei* (62.1)
75 a - Projection on the radial ribs of the spire (the last whorl excepted) situated on the lower half of the whorls, close to the suture. Umbilicus 0.15-0.20 mm wide ..... *O. stenotoreton* (51)
b - Projection on the radial ribs of the spire (the last whorl excepted) situated about half-way the height of the whorls. Umbilicus 0.25-0.40 mm wide 76
76 a - Radial ribs on the last half-whorl of the spire with a projection *O. dormani* (25)
b - Radial ribs on the last half-whorl of the spire without a projection .... *O. cyrtopleuron* (59)
77 a - (63) Upper margin of the aperture *either* level with the apex of the spire or overtopping it (see fig. 1c), *or* slightly below the level of the apex (see fig. 1d), but then aperture circular to elliptic 78
b - Upper margin of the aperture *either* widely below the level of the apex; *or* slightly below the level of the apex, but then aperture subrectangular with the upper and lower edge grooved 80
78 a - Outer peristome along the lower left side of the aperture with a distinct, rounded wing; and along the upper right side with a similar, less conspicuous wing. Tuba touching the spire over its entire length. Spiral striation present ..... *O. shelfordi* (52)
b - Outer peristome only slightly spreading beyond the inner, but gradually narrowed towards, and absent along the right or lower side of the aperture; without any wings. Tuba partially or entirely free from the spire. Spiral striation absent 79

79 a - Umbilicus 0.15-0.20 mm across. Tuba partially free from the spire, usually touching it again near the apex. Spire with slightly convex sides *O. lituus* (53)
b - Umbilicus 0.30-0.40 mm across. Tuba entirely free from the spire, rarely close to it again near the apex. Spire with flat to slightly concave sides *O. tuba* (54)
80 a - (77) Lower edge of the aperture obtusely angular to deeply grooved 81
b - Lower edge of the aperture narrowly to widely rounded 83
81 a - Spire with flat or slightly convex sides. Spire 1.8-2.2 mm high *O. austeni* (55)
b - Spire with distinctly convex sides. Spire 1.3-1.8 mm high 82
82 a - Spire 1.7-1.8 mm high, 1.5-1.6 mm wide. Shell 2.5-2.7 mm wide. Radial ribs on the tuba with numerous, much finer radial riblets in between *O. goniostoma* (56)
b - Spire 1.3-1.7 mm high, 1.1-1.2 mm wide. Shell 1.8-2.1 mm wide. Radial ribs on the tuba without finer riblets in between ..... *O. pumilio* (57)
83 a - (80) Spiral striation present (check fresh specimens at 50 x magnification), though sometimes inconspicuous and/or present on part of the shell only 84
b - Spiral striation entirely absent 94
84 a - Umbilicus 0.25-0.40 mm across 85
b - Umbilicus 0.10-0.25 mm across 88
85 a - Radial ribs on the last whorl of the spire not sinuous 86
b - Radial ribs on the last whorl of the spire slightly to distinctly sinuous, the radial ribs close to the tuba sometimes excepted 87
86 a - Umbilicus 0.10-0.25 mm across. Peristome simple: the radial rib closest to the peristome (the outer peristome) not or only slightly wider than the previous ones. Inner peristome not drawn out on the right side of the aperture ..... *O. dancei dancei* (64.1)
b - Umbilicus 0.25-0.35 mm across. Peristome double: outer peristome distinctly wider than the closest radial ribs. Inner peristome usually somewhat drawn out on the right side of the aperture ..... *O. wilfordi* (58)
87 a - Radial ribs on the spire usually without a projection, (slightly) sinuous, those on the last whorl always without a projection. Inner peristome slightly to distinctly protruding from the outer ..... *O. cyrtopleuron* (59)
b - Most radial ribs on the spire, those on the last whorl included, with a shallowly concave to deeply trough-shaped projection half-way, abrading to a scar with a shallow to deep, semi-circular loop. Inner peristome usually not or hardly protruding from the outer ..... *O. dormani* (25)
88 a - (84) Peristome simple: the radial rib closest to the peristome (the outer peristome) not or only slightly wider than the previous ones 89
b - Peristome double: outer peristome distinctly wider than the closest radial ribs 90
89 a - Radial ribs on the tuba widely spaced (1-2 ribs/0.5 mm half-way). Height and width aperture 0.4 mm ..... *O. pyrgiscus* (60)
b - Radial ribs on the tuba (moderately) spaced (3-4 ribs/0.5 mm half-way). Height aperture 0.6-0.7 mm; width 0.5-0.7 mm ..... *O. dancei dancei* (64.1)
90 a - Radial ribs on the spire, excluding the ultimate whorl, not sinuous, or at most very slightly sinuous near the lower suture of the penultimate whorl. Peristome on its right side (almost) touching the spire 91
b - *Either* radial ribs on the spire (slightly) sinuous about half-way, *or* radial ribs on the spire not sinuous, but then peristome distant from the spire 93
91 a - Last whorl of the spire almost sharply angular at the periphery, almost flat to

slightly concave above, almost flat below ..... *O. picsingense* (43)
b - Last whorl of the spire rounded, or sometimes slightly angular at the periphery, slightly convex above and below 92
92 a - Spire with distinctly convex sides. Radial ribs on the spire moderately spaced (5 ribs/0.5 mm on the penultimate whorl). Inner peristome not drawn out over the spire on the right side of the aperture ..... *O. crassum* (61)
b - Spire with flat to slightly convex sides. Radial ribs on the spire (rather) closely placed (8-12 ribs/0.5 mm on the penultimate whorl). Inner peristome usually drawn out over the spire on the right side of the aperture, rarely not so .... *O. wallacei teinostoma* (62.2)
93 a - (90) Spire 1.2-1.6 mm high, sides flat to slightly concave. Apex not oblique ..... *O. wallacei busanense* (62.3)
b - Spire 1.1-2.0 mm high, if 1.1-1.6 mm high sides of spire convex and/or apex oblique ..... *O. wallacei wallacei* (62.1)
94 a - (83) Umbilicus 0.05-0.25 mm across 95
b - Umbilicus 0.30-0.50 mm across 101
95 a - Radial ribs on the spire very closely placed (12-20 ribs/0.5 mm on the penultimate whorl) ..... *O. aethoderma* (63)
b - Radial ribs on the spire closely placed to widely spaced (3-10 ribs/0.5 mm on the penultimate whorl) 96
96 a - Peristome simple: the radial rib closest to the peristome (the outer peristome) not or only slightly wider than the previous ones 97
b - Peristome double: outer peristome distinctly wider than the closest radial ribs 98
97 a - Spire 1.5-2.2 mm high, with flat to convex sides. Radial ribs (moderately) spaced (3-5 ribs/0.5 mm on the penultimate whorl ..... *O. dancei dancei* (64.1)
b - Spire 1.2-1.5 mm high, with (distinctly) convex sides. Radial ribs not sinuous, on the spire rather closely placed to moderately spaced (6-9 ribs/0.5 mm on the penultimate whorl) ..... *O. dancei dispersum* (64.2)
98 a - Constriction with a very distinct, lamella-shaped parietalis which continues up to, or over half-way the tuba ..... *O. ptychodon* (65)
b - Constriction without a parietalis, or constriction with a short parietalis which does not continue into the tuba 99
99 a - Last whorl of the spire almost sharply angular at the periphery, almost flat to slightly concave above, almost flat below ..... *O. picsingense* (43)
b - Last whorl of the spire rounded at the periphery, or slightly angular, slightly convex above and below 100
100 a - Radial ribs on the spire not sinuous. Peristome touching the spire along on its right side ..... *O. wallacei teinostoma* (62.2)
b - *Either* Radial ribs on the spire (slightly) sinuous, *or* radial ribs on the spire not sinuous, but then peristome distant from the spire ... *O. wallacei wallacei* (62.1)
101 a - (93) Tuba close to the constriction distinctly bulging and then abruptly narrowed towards the constriction. The portion of the tuba between the constriction and the widest part of the tuba entirely without radial ribs .... *O. episomon* (66)
b - *Either* tuba close to the constriction gradually narrowed; *or* tuba close to the constriction abruptly narrowed, but then radial ribs present on this part of the tuba at the about same, or only slightly larger intervals as on the last whorl of the spire 102

102 a - Radial ribs close to the tuba with a shallowly concave to deeply trough-shaped projection half-way, abrading to a scar with a shallow to deep, semi-circular loop 103
b - Radial ribs close to the tuba without a projection, not or hardly sinuous 104
103 a - Spire with convex top whorls; next whorls slightly convex; last whorl obtusely angular at the periphery, flat above, slightly convex below. Radial ribs on the spire hardly visible but on the lower third of the whorls with a projection abrading to a sinuous scar ..... *O. cookei* (49)
b - Spire with all about equally convex whorls; last whorl rounded or only slightly angular at the periphery. Radial ribs on the spire distinct, half-way the whorls with a projection abrading to a scar with a shallow to deep, semi-circular loop ..... *O. dormani* (25)
104 a - Spire: height 1.9-2.5 mm; width 1.3-1.6 mm. Total width of shell 2.5-3.2 mm ..... *O. perglaber* (67)
b - Spire: height 1.4-1.7 mm; width 0.9-1.0 mm. Total width of shell 1.5-1.6 mm ..... *O. tuba* (54)

Subgenus *Opisthostoma*

Spire with 3-3 7/8 whorl. Spire along its right side with the penultimate whorl usually slightly to distinctly wider than the ultimate, sometimes about as wide as the ultimate, if the shell is observed in front view. Aperture with or without teeth.

1 - **Opisthostoma dihelicton** spec. nov.
fig. 2, 67

Material seen. — SARAWAK. 1st Div.: SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194692/10, incl. HOLOTYPE; do. 194693/10).

Spire cylindrical. Apex distinctly oblique. Whorls 3 1/2-3 5/8, convex; last whorl rounded. Constriction with a transverse palatalis, sometimes with an inconspicuous columellaris. Tuba entirely distant from the spire, gradually narrowed towards the constriction, rounded below. Radial ribs very closely placed (20-26 ribs/0.5 mm on the penultimate whorl, 16-22 ribs/0.5 mm half-way the tuba), not sinuous. Spiral striation present, inconspicuous. Umbilicus open, 0.1 mm across. Aperture tilted up to 15° with regard to the coiling axis, its upper margin slightly above to widely below the level of the apex, circular to slightly elliptic. Peristome distant from the spire, simple, somewhat spreading. Spire: height and width 0.8-0.9 mm; index 1.0-1.1. Total width 1.4-1.6 mm. Height aperture 0.35-0.45 mm; width 0.35-0.40 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone range SE. of Bau.

Notes. — 1. *O. asyndeton* as well as *O. telestoma* have much wider spaced ribs.

2. The name refers to the fact that the densely ribbed shell somewhat resembles a twice-coiled spring.

2 - **Opisthostoma asyndeton** spec. nov.
fig. 3

Material seen. — KALIMANTAN. Kalimantan Selatan: 7 km N. of Kintap (V 3673/>10, HOLOTYPE RMNH 56910); limestone escarpments along road Benualawas-Limbungan (V 2856/>10).

Spire subcylindrical, along its right side with the penultimate whorl distinctly wider than the ultimate if the shell is observed in front view. Apex slightly oblique. Whorls 3 3/8-3 5/8, convex; last whorl rounded. Constriction with a transverse palatalis, with a columellaris. Tuba entirely distant from the spire, gradually narrowed towards the constriction, rounded below. Radial ribs rather closely placed to rather widely spaced (4-8 ribs/0.5 mm on the penultimate whorl, 4-7 ribs/0.5 mm half-way the tuba), not sinuous. Spiral striation present. Umbilicus open, 0.05-0.10 mm across. Aperture tilted up to 45° with regard to the coiling axis, its upper margin widely below the level of the apex, circular to slightly angular. Peristome distant from the spire, double, outer peristome moderately spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, sometimes slightly widened along the upper side; inner peristome distinctly protruding from the outer, somewhat spreading. Spire: height 0.8-1.0 mm; width 0.6-0.8 mm; index 1.2-1.3. Total width 1.2-1.4 mm. Height aperture 0.3 mm; width 0.25-0.35 mm.

Distribution. — Borneo: Kalimantan, K. Selatan, S. and E. flanks of the Meratus Mts.

Notes. — 1. In *O. telestoma* the penultimate whorl of the spire hardly bulges to the right when the shell is observed in front view. It also has a wider umbilicus.

2. The name refers to the entirely free tuba.

3 - *Opisthostoma telestoma* Vermeulen, 1991
fig. 4, 67

For further details see Vermeulen, 1991: 143.

Notes. — Umbilicus 0.15-0.20 mm across.

4 - **Opisthostoma crassicolle** spec. nov.
fig. 5, 67

Material seen. — KALIMANTAN. Kalimantan Selatan: Beramban, approximately 13 km E. of Rantau (V 3762/>10, HOLOTYPE RMNH 56911).

Spire broadly spindle-shaped. Apex not or hardly oblique. Whorls 3 1/4-3 5/8, convex; the penultimate obtusely angular on the right side if the spire is observed in front view, the ultimate obtusely angular. Constriction with a transverse palatalis, with a columellaris. Tuba about half-way leaving a small gap between the tuba and the spire, slightly bulging close to the constriction and then rather abruptly narrowed towards it, obtusely angular below. Radial ribs moderately spaced (4-6 ribs/0.5 mm on the penultimate whorl; 4-5 ribs/0.5 mm half-way the tuba), not or hardly sinuous. Spiral striation present, fine. Umbilicus open but often partly covered by the tuba, 0.1 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin widely above the level of the apex, circular to elliptic. Peristome touching the spire, double, outer peristome widely spreading beyond the inner, but gradually narrowed towards, and sometimes almost absent along the right side of the aperture; inner peristome distinctly protruding from the outer, little spreading, its outer surface and the upper surface of the outer peristome with closely placed, slightly irregular lamellae. Spire: height 1.0-1.1 mm; width 1.0 mm; index 1.0-1.1. Total width 1.2 mm. Height aperture 0.4-0.5 mm; width 0.35-0.40 mm.

Distribution. — Borneo: Kalimantan, K. Selatan, W. flanks of the Meratus Mts.

Notes. — 1. *O. acolaston* and *O. semisolutum* have a spire with rounded whorls as well as a tuba which is rounded below.

2. The name refers to the thick outer peristome.

5 - **Opisthostoma acolaston** spec. nov.
fig. 6, 67

Material seen. — KALIMANTAN. Kalimantan Selatan: Nateh near Batu Tangga, approximately 18 km E. of Barabai (V 4358/>10, HOLOTYPE RMNH 56912).

Spire cylindrical. Apex slightly oblique. Whorls 3 1/2-3 7/8, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba about half-way leaving a small gap between the tuba and the spire, with a slight, vertical depression at about 0.2 mm from the constriction and a swelling in between, rounded below. Radial ribs not sinuous, on the spire moderately spaced (4-6 ribs/0.5 mm on the penultimate whorl); those on the tuba slightly wider spaced (4 ribs/0.5 mm half-way the tuba). Spiral striation, or very fine. Umbilicus up to 0.1 mm across, but often entirely covered by the tuba. Aperture tilted up to 90° with regard to the coiling axis (facing downwards), its upper margin usually widely below the level of the apex, circular to slightly angular. Peristome double, outer peristome touching the spire, moderately spreading beyond the inner, but gradually widened towards the right side of the aperture and often partly covering the apex, inner peristome widely projecting beyond the outer, forming a downwards curved tube of up to 2/3 of the length of the tuba, somewhat spreading, its outer surface with rather closely placed to moderately spaced radial ribs. Spire: height 0.8-1.0 mm; width 0.8-0.9 mm; index 1.0-1.3. Total width about 1 mm. Height and width aperture 0.35-0.40 mm.

Distribution. — Borneo: Kalimantan, K. Selatan, W. flank of the Meratus Mts.

Notes. — 1. Well characterized by the distinctly elongated, curved inner peristome. The name refers to the distorted aspect of the shell.

2. Except for its inner peristome, the sympatrical *O. semisolutum* differs in the absence of a furrow and a swelling on the proximal part of the tuba, and having a wider umbilicus, as well as in the outer peristome not covering the apex.

6 - **Opisthostoma semisolutum** spec. nov.
fig. 7, 67

Material seen. — KALIMANTAN. Kalimantan Selatan: Nateh near Batu Tangga, approximately 18 km E. of Barabai (V 3016/>10, HOLOTYPE RMNH 56913).

Spire cylindrical. Apex (slightly) oblique. Whorls 3 1/4-3 1/2, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba about half-way leaving a small gap between the tuba and the spire, gradually narrowed towards the constriction, rounded below. Radial ribs moderately spaced (4-6 ribs/0.5 mm on the penultimate whorl as well as half-way the tuba), not sinuous. Spiral striation present, fine. Umbilicus open, 0.1 mm across. Aperture tilted up to 60° with regard to the coiling axis, its upper margin usually widely above the level of the apex, somewhat elliptic. Peristome touching the spire, double, outer peristome spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture; inner peristome distinctly protruding from the outer, somewhat spreading. Spire: height 0.8-0.9 mm;

width 0.7-0.8 mm; index 1.1-1.3. Total width 1.1-1.2 mm. Height aperture 0.25-0.35 mm; width 0.35-0.40 mm.

Distribution. — Borneo: Kalimantan, K. Selatan, W. flanks of the Meratus Mts.

Notes. — 1. Similar in some aspects to *O. acolaston*; see the note under that species.

2. The name refers to the partially free tuba.

7 - *Opisthostoma holzmarki* Thompson, 1978
fig. 67

Material seen. — SARAWAK. 4th Div.: G. Subis (Batu Niah) (leg. Holzmark, UF 24836/1, HOLOTYPE; do. 24837/2; leg. Raven, R/2; V 1515/10).

For further details see Vermeulen, 1991: 143.

8 - **Opisthostoma sulcatum** spec. nov.
fig. 8, 67

Material seen. — SARAWAK. 1st Div.: SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194694/>10, incl. HOLOTYPE; do. 194720/>10; do. 194936/1).

Spire cylindrical. Apex distinctly oblique. Whorls 3 1/8-3 3/8, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba touching the spire over its entire length, close to the constriction with a distinct swelling without radial ribs, bordered by a depression on both sides; the swelling with a deep semi-circular furrow opening to the right side if the shell is observed in front view; tuba rounded below. Radial ribs not sinuous, on the spire moderately spaced (4-6 ribs/0.5 mm on the penultimate whorl), those on the tuba often slightly wider spaced (4 ribs/0.5 mm half-way the tuba). Spiral striation present. Umbilicus usually entirely covered by the tuba. Aperture hardly tilted with regard to the coiling axis, its upper margin usually slightly above the level of the apex, circular to slightly elliptic. Peristome double, outer peristome spreading beyond the inner, but rather abruptly narrowed towards, and absent along the (lower) right side of the aperture, widened along the upper (right) side, and, slightly less so, along the lower side; inner peristome distinctly protruding from the outer, somewhat spreading. Spire: height 0.9-1.0 mm, width 0.7-0.9 mm; index 1.1-1.3. Total width 1.1-1.3 mm. Height aperture 0.3-0.4 mm; width 0.35-0.40 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone range SE. of Bau.

Notes. — 1. Characterized by the swelling in the tuba, with a semi-circular furrow on top of it. The name refers to this furrow. *O. shelfordi* has a similar swelling, including the furrow. It differs in having a conical spire.

9 - **Opisthostoma rotundum** spec. nov.
fig. 9, 67

Material seen. — SARAWAK. 1st Div.: G. Braang, NW. foot, 22 miles S. of Kuching (leg. Bong, UF 194706/1; do. 194707/9, incl. HOLOTYPE; do. 194708/10; do. 194758/2).

Spire cylindrical. Apex oblique. Whorls 3 5/8-3 7/8, convex; last whorl rounded. Constriction with a long parietalis which continues into the tuba; with a distinct, short angularis covering the suture, with a transverse palatalis, with a columellaris. Tuba touching the spire over its entire length, close to the constriction with a distinct swelling along the suture on which the radial ribs continue, bordered by a distinct, semi-circular

furrow opening to the right side if the shell is observed in front view; tuba with a slight second swelling close to the suture just beyond the first one; tuba rounded below. Radial ribs not sinuous, on the spire closely placed (7-10 ribs/0.5 mm on the penultimate whorl); those on the tuba rather closely placed (5-7 ribs/0.5 mm half-way the tuba). Spiral striation present, fine. Umbilicus open, 0.15 mm across. Aperture tilted 30-60° with regard to the coiling axis, its upper margin widely above the level of the apex, elliptic, with the continuation of the parietalis just visible along its lower side if the shell is observed in subapical view. Peristome double, outer peristome spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, slighlty widened along the upper right side and the lower side; inner peristome distinctly protruding from the outer, somewhat spreading. Spire: height 1.0-1.1 mm; width 1.0 mm; index 1.0-1.1. Total width 1.3-1.4 mm. Height aperture 0.30-0.35 mm; width 0.5 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone range S. of Kuching: upper Penrissen Valley.

Notes. — 1. In *O. sulcatum* a semi-circular furrow is present on the swollen part of the tuba itself, whereas in *O. rotundum* it is partly encircling the swelling. *O. sulcatum* also differs in the absence of radial ribs on the swollen part of the tuba.

2. The name refers to the rounded general outline of the shell.

10 - **Opisthostoma auriforme** spec. nov.
fig. 10, 67

Material seen. — KALIMANTAN. Kalimantan Selatan: Batu Tungga near Sarungga, W. of road Batulicin-Benualawas (V 3265/>10, HOLOTYPE RMNH 56914); limestone escarpments along road Benualawas-Limbungan (V 2859/5).

Spire cylindrical. Apex oblique. Whorls 3 1/4-3 3/8, convex; the penultimate obtusely angular on the right side if the shell is observed in front view, the ultimate obtusely angular. Constriction with a parietalis which continues far into the tuba; with a distinct, short angularis covering the suture, with a transverse palatalis. Tuba touching the spire over its entire length, slightly bulging and rather abruptly narrowed towards the constriction, obtusely angular below. Radial ribs on the spire moderately spaced (4-5 ribs/0.5 mm on the penultimate whorl), not sinuous; those on the tuba widely spaced (2-3 ribs/0.5 mm half-way the tuba), with a shallow, semi-circular loop below. Spiral striation present. Umbilicus open, 0.1 mm across, but often (almost) entirely covered by the tuba. Aperture tilted up to 15° with regard to the coiling axis, its upper margin widely above the level of the apex, elliptic, with the continuation of the parietalis clearly visible along its lower side if the aperture is observed in front view. Peristome double, outer peristome widely spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture; inner peristome protruding from the outer, somewhat spreading, its outer surface and the upper surface of the outer peristome with closely placed, slightly irregular lamellae. Spire: height 1.1-1.3 mm; width 1.2-1.3 mm; index 0.9-1.0. Total width 1.7-1.8 mm. Height aperture 0.4-0.6 mm; width 0.5-0.6 mm.

Distribution. — Borneo: Kalimantan, K. Selatan, karst areas E. of the Meratus Mts.

Notes. — 1. Differs from *O. subconicum*, *O. hailei* as well as *O. cryptodon* in lacking a tooth along the upper side of the aperture. The aperture somewhat resembles a human ear, hence the name.

11 - **Opisthostoma subconicum** spec. nov.
fig. 11, 67

Material seen. — KALIMANTAN. Kalimantan Selatan: limestone escarpment W. of km 6 road Benualawas-Batulicin (V 3368/>10, HOLOTYPE RMNH 56915); limestone escarpments along road Benualawas-Limbungan (V 2858/>10).

Spire conical with distinctly convex sides, or almost cylindrical. Apex slightly oblique. Whorls 3 3/8-3 5/8, convex; the penultimate rounded or slightly angular on the right side if the spire is observed in front view, the ultimate obtusely angular. Constriction with a thick parietalis which continues far into the tuba; with a transverse palatalis, with a columellaris. Tuba touching the spire over its entire length, gladually narrowed towards the constriction, obtusely to almost sharply angular below. Radial ribs on the spire rather closely placed to moderately spaced (5-8 ribs/0.5 mm on the penultimate whorl), not sinuous; those on the tuba (rather) closely placed (6-10 ribs/0.5 mm half-way the tuba), with a shallow to rather deep, semi-circular loop below. Spiral striation present. Umbilicus open, 0.20-0.25 mm across. Aperture tilted up to 45° with regard to the coiling axis, its upper margin slightly below the level of the apex, subtriangular with rounded edges, with the continuation of the parietalis just visible along its lower side if the aperture is observed in front view, with a distinct tooth along the upper side. Peristome double, outer peristome widely spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture; inner peristome protruding from the outer, little spreading, its outer surface and the upper surface of the outer peristome with closely placed, slightly irregular lamellae. Spire: height 1.1-1.5 mm; width 1.1-1.2 mm; index 1.0-1.3. Total width 1.8-2.0 mm. Height aperture 0.4-0.5 mm; width 0.5-0.6 mm.

Distribution. — Borneo: Kalimantan, K. Selatan, karst areas E. of the Meratus Mts.

Notes. — 1. Differs from *O. hailei* as well as *O. cryptodon* in having a more conical rather than a cylindrical spire (hence the name), as well as in having loops in the radial ribs on the lower surface of the tuba. These loops are most distinct about half-way the tuba.

12 - *Opisthostoma hailei* Solem, 1964
fig. 12, 69

Material seen. — SABAH. Sandakan Zone: Batu Putih near road Lahad Datu-Sandakan, near Kinabatangan R. (V 1475/>10); Batu Laab near road Lahad Datu-Sandakan, near Kinabatangan R. (leg. Wilford, UF 194855/7; do. 194873/>10); limestone hill 7 miles E. of Lamag, 3 miles NNW. of Laab, near road Lahad Datu-Sandakan, near Kinabatangan R. (leg. Wilford, UF 194872/9); Bt. Gomantong, 30 km S. of Sandakan (leg. Wilford, UF 194868/>10; do. 194869/1; do. 194871/3; V 1591/4); Batu Tumanggong Besar, 1 mile downstream Sukau, along Kinabatangan R. (leg. Wilford, UF 194870/2).

For further details see Vermeulen, 1991: 147.

Notes. — With more material available, this species appears to be more variable than previously assumed: specimens having a spire with slightly less angular whorls than the specimen depicted in Vermeulen (1991) do occur.

13 - *Opisthostoma cryptodon* Vermeulen, 1991
fig. 13, 69

Material seen. — SARAWAK. 1st Div.: G. Pangga 3 km ENE. of Bau (V 2141/9); small gorge 1 mile S. of Bau (leg. Wilford, UF 194865/>10); hill S. of Bau goldmine, 2.1 km S. of Bau (leg. Auffenberg, UF 18361/7; do.

183887/>10); G. Doya 2 miles SE. of Bau (leg. Wilford, UF 59105/>10; do. 194867/>10); G. Kapur 6 km SE. of Bau (V 2224/>10; leg. De Vogel, V 2632/>10); Kpg. Beratok along road Kuching-Serian (V 2579/7); mile 21 road Kuching-Serian, Bt. Akut (leg. Wilford, UF 194737/8); G. Gayu 23 miles S. of Kuching (leg. Wilford, UF 194866/1); 7.5 km WNW. of Kpg. Piching, near Serian (V 1926/8); G. Selabor, W. of Kpg. Lobang Batu, 12.5 km S. of Tebakang (leg. Wilford, UF 194856/>10; do. 194857/>10; do. 194858/8; do. 194859/>10; do. 194860/>10; do. 194861/1; do. 194862/>10; do. 194863/5; do. 194864/2; do. 194920/1; V 2098/>10, HOLOTYPE RMNH 56592).

For further details see Vermeulen, 1991: 148.

Notes. — Specimens are now available which have a distinctly more angular aperture than the type specimen, see fig. 13.

General note. — *O. tridens*, *O. gibbosum*, *O. simile*, *O. brachyacrum*, *O. ballorum* and *O. javanicum* are very similar and may sometimes cause problems with identification. Some of them together probably constitute a species complex. The presence, as well as the configuration of the teeth in the constriction provide important characters. To facilitate identification, a short diagnosis is given of *O. tridens* and two subspecies of *O. brachyacrum*, although they are fully described in Vermeulen (1991).

14 - **Opisthostoma gibbosum** spec. nov.
fig. 14, 67

Material seen. — SARAWAK. 1st Div.: G. Meruga just S. of Kpg. Braang Wah (leg. Wilford, UF 194712/>10, incl. HOLOTYPE); G. Gayu 23 miles S. of Kuching (leg. Wilford, UF 194760/3; do. 194775/1); G. Saak 1 mile W. of Begu, 24 miles S. of Kuching (leg. Wilford, UF 194774/1); limestone hill 1 mile NE. of Pankalan Ampat, 0.5 mile E. of Temerang (leg. Wilford, UF 194709/1).

Spire cylindrical. Apex distinctly oblique. Whorls 3 3/8-3 3/4, convex; last whorl rounded. Constriction with a distinct parietalis which continues to slightly beyond the sharp inner curve of the tuba; with a distinct, short angularis covering the suture, with a transverse palatalis, with a columellaris. Tuba touching the spire over its entire length, slightly to distinctly bulging and then gradually to rather abruptly narrowed towards the constriction, rounded below. Radial ribs not sinuous, on the spire densely placed (11-17 ribs/0.5 mm on the penultimate whorl); those on the tuba moderately spaced (5-6 ribs/0.5 mm half-way the tuba). Spiral striation present, fine. Umbilicus open, 0.10-0.15 mm across. Aperture not or hardly tilted with regard to the coiling axis, its upper margin widely below the level of the apex, about circular to elliptic. Peristome double, outer peristome spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture; inner peristome distinctly protruding from the outer, somewhat spreading, on the right side of the aperture spreading over the periphery or over the lower half of the widest whorl of the spire, its outer surface with closely placed, fine lamellae. Spire: height 1.0-1.2 mm; width 0.9-1.0 mm; index 1.0-1.2. Total width 1.4-1.5 mm. Height aperture 0.40 mm; width 0.40-0.45 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone range S. of Kuching: upper Penrissen Valley.

Notes. — 1. Series of the Sabah form of *O. brachyacrum lambii* which have the same configuration of teeth in the tuba are smaller (spire 0.7-0.9 mm high), and have the radial ribs on the spire wider spaced (6-12 ribs/0.5 mm on the penultimate whorl).

2. *O. simile* has the aperture attached higher on the spire.

3. In some series the tuba is distinctly swollen towards the contriction (hence the name). This character is not diagnostic; specimens in which the tuba is only slightly swollen also exist.

15 - **Opisthostoma simile** spec. nov.
fig. 15, 67

Material seen. — SARAWAK. 1st Div.: limestone hill 1 mile NE. of Pankalan Ampat, 0.5 mile E. of Temerang (leg. Wilford, UF 194709/>10); G. Lelat 1 mile SW. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194778/2, incl. HOLOTYPE); G. Mas 0.5 mile W. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194777/3).

Spire cylindrical. Apex distinctly oblique. Whorls 3 1/2-3 7/8, convex; last whorl rounded. Constriction with a distinct parietalis which continues to slightly beyond the sharp inner curve of the tuba; with a distinct, short angularis covering the suture, with a transverse palatalis, with a columellaris. Tuba touching the spire over its entire length, gradually narrowed towards the constriction (but rather abruptly narrowed on the umbilical side), rounded below. Radial ribs not sinuous, on the spire rather densely to very densely placed (7-20 ribs/0.5 mm on the penultimate whorl); those on the tuba moderately spaced to densely placed (5-14 ribs/0.5 mm half-way the tuba). Spiral striation present, fine. Umbilicus open, 0.10-0.15 mm across. Aperture tilted 15-60° with regard to the coiling axis, its upper margin slightly above to slightly below the level of the apex, about circular to elliptic. Peristome double, outer peristome spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture; inner peristome distinctly protruding from the outer, somewhat spreading, on the right side of the aperture spreading over the upper half of the widest whorl of the spire, often also over the whorl above the widest. Spire: height 0.9-1.1 mm; width 1.0-1.1 mm; index 0.9-1.1. Total width 1.3-1.6 mm. Height aperture 0.40-0.45 mm; width 0.40-0.50 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone range SE. of Kuching: near Serian.

Notes. — 1. Series of the Sabah form of *O. brachyacrum lambii* which have the same configuration of teeth in the tuba are smaller (spire 0.7-0.9 mm high). The differences with *O. gibbosum* are given under that species.

2. The name refers to the similarity between this species and *O. brachyacrum lambii*.

16 - *Opisthostoma tridens* Vermeulen, 1991
fig. 69

Material seen. — SARAWAK. 1st Div.: SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194752/>10; do. 194753/>10; do. 194754/>10); Kpg. Beratok along road Kuching-Serian (V 2024/>10, HOLOTYPE RMNH 56593); Kpg. Tiang Bekap 10 km SSW. of Kpg. Beratok (leg. Wilford, UF 194738/>10; do 194911/>10; leg. De Vogel, 2565/>10); G. Braang, NW. foot, 22 miles S. of Kuching (leg. Bong, UF 194758/>10; do. 194926/1; do. 194927/>10); G. Gayu 23 miles S. of Kuching (leg. Wilford, UF 194760/>10; do. 194929/>10; do. 194931/1); limestone hill 1 mile NE. of Pankalan Ampat, 0.5 mile E. of Temerang (leg. Wilford, UF 194759/>10); Kpg. Segur Benuk, mile 21 Penrissen Road (leg. De Vogel, V 2545/8); G. Mas 0.5 mile W. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194762/>10); G. Sibow, 0.5 mile NW. of Nyabet, 24 miles SSE. of Kuching (UF 194763/3); 7.5 km WNW. of Kpg. Piching, near Serian (V 1925/>10).

For a full description see Vermeulen, 1991: 152.

Diagnosis. — Constriction with a short longitudinal palatalis (sometimes almost in angular position), without a parietalis, without an angularis. Spire with 5-10 ribs/0.5 mm on the penultimate whorl; tuba with 4-6 ribs/0.5 mm half-way. Umbilicus 0.10 mm across.

Notes. — 1. The presence of a short to rather long longitudinal palatalis, combined with the absence of both a parietalis and an angularis is diagnostic. The species shows little variability in these characters and is usually easily to recognise, although the external shape of the shell is almost identical with *O. brachyacrum brachyacrum*, in particular with forms similar to the type of that taxon.

2. Incidentally, the longitudinal palatalis may occupy an almost angular position, although it is always slightly verging towards the palatal side on one end. Sympatric specimens of *O. brachyacrum lambii* with a comparable configuration of teeth in the constriction (because the angularis is missing and the parietalis is in an almost angular position) have the radial ribs more closely placed on the spire (9-26 ribs/0.5 mm on the penultimate whorl).

3. In some specimens of *O. brachyacrum lambii* both parietalis and angularis have moved towards the palatal wall, so that the parietalis occupies an angular position and the angularis a palatal position. Besides, sometimes an infrapalatalis is present in this species, next to a parietalis and an angularis. Therefore, to positively identify *O. tridens*, it is not sufficient to observe the presence of a palatalis through the shell wall, but the constriction has to be opened to check for the presence of more longitudinal teeth.

17.1 - *Opisthostoma brachyacrum brachyacrum* (Thompson 1978)
fig. 16, 68

Material seen. — SARAWAK. 1st Div.: G. Doya 2 miles SE. of Bau (leg. Wilford, UF 194932/>10); G. Kapur 6 km SE. of Bau (V 2230/6); G. Wah S. of Braang, 23 miles S. of Kuching (leg. Wilford, UF 194773/8). 4th Div.: G. Subis (Batu Niah) (leg. Wall, UF 194734/>10; do. 194735/>10; leg. Holzmark, UF 24873/1, HOLOTYPE; R/>10; V 1514/>10); near Bt. Kudi, Beluru area SW. of Marudi (leg. Wilford, UF 194748/4; do. 194917/6); Bt. Vrong, Beluru area SW. of Marudi (leg. Wilford, UF 194749/>10; do. 194750/>10; do. 194751/>10); G. Mulu Nat. Park, lower Tutoh Valley (leg. Wilford, UF 194742/>10; do. 194744/>10; do. 194745/>10; do. 194746/>10; do. 194747/>10); G. Mulu Nat. Park, Tutoh Valley, G. Benarat (leg. Wilford, UF 194916/>10).

For a full description see Vermeulen, 1991: 150, under *O. brachyacrum*.

Diagnosis. — Constriction with a distinct parietalis which may continue up to the sharp inner curve of the tuba and which is equally high over its entire length, or highest near the constriction, or which may be much shorter and inconspicuous, without an angularis. Spire with 4-14 ribs/0.5 mm on the penultimate whorl; tuba with 3-7 ribs/0.5 mm half-way. Umbilicus 0.05-0.25 mm wide.

Distribution. — SARAWAK. 1st Div., limestone ranges S. of Kuching, rare and on scattered localities only. 4th Div: common in limestone areas.

Notes. — 1. *O. brachyacrum* can be divided into three subspecies mainly on account of the configuration of the teeth in the constriction. Subspec. *tatauense* is well characterized by a differently shaped longitudinal parietalis. Subspec. *lambii* differs from subspec. *brachyacrum* in the presence of a short angularis, but within both subspecies specimens occur in which one or more teeth in the constriction are inconspicuous or absent. Only in the limestone ranges S. of Kuching, where subspec. *brachyacrum* and subspec. *lambii* occur together, such specimens hardly obscure the difference between them. In other limestone areas within their combined range either one, or the other subspecies is found,

or series of specimens morphologically close to one of the two subspecies. In some limestone areas they are found together with series of specimens in which the diagnostic teeth in the constriction are (partly) missing, so that the unequivocal identification of individual specimens is not always possible. These are provisionally included in the subspecies with which they occur sympatrically.

2. Specimens of subspec. *brachyacrum* from limestone ranges S. of Kuching, Sarawak, always have a distinct parietalis which continues to slightly beyond the sharp inner curve of the tuba. They have a relatively narrow umbilicus (up to 0.15 mm diam.) and on average the radial ribs on the spire are more densely arranged than in specimens from elsewhere (8-14 ribs/0.5 mm on the penultimate whorl) Sympatric specimens of subspec. *lambii* may have a shell of an identical external shape; specimens in which the short angularis is missing differ from subspec. *brachyacrum* in having a shorter, or an absent parietalis.

Specimens of subspec. *brachyacrum* from G. Subis usually have the parietalis as above. The radial ribs on the spire, however, are usually wider spaced, 4-9(-10) radial ribs/0.5 mm on the penultimate whorl, and the umbilicus is up to 0.25 mm diam. The long, distinct parietalis distinguishes these specimens from all subspec. *lambii* from the area S. of Kuching. However, subspec. *lambii* from Sabah often has an equally long parietalis. Specimens in which the angularis, typical for subspec. *lambii*, is missing cannot be distinguished from narrowly umbilicated specimens of subspec. *brachyacrum* from G. Subis.

Specimens of subspec. *brachyacrum* from the Beluru and Mulu areas differ only from those from G. Subis in having an inconspicuous, short parietalis only. Distinction from Sabah specimens of subspec. *lambii* with a similar configuration of teeth in the constriction is, again, impossible. Specimens of subspec. *lambii* from the area S. of Kuching which do not have an angularis, differ on average in having a more densely ribbed spire (6-26 radial ribs/0.5 mm on the penultimate whorl), and in always having a narrow umbilicus (up to 0.15 mm wide).

3. Specimens of subspec. *brachyacrum* with a low spire and/or a wide umbilicus often resemble *O. javanicum* from E. Sabah; they differ in always having a longitudinal parietalis, however short and inconspicuous it may be.

4. Specimens of *O. ballorum* from the Mulu area may resemble subspec. *brachyacrum*; see the notes under *O. ballorum*.

17.2 - *Opisthostoma brachyacrum lambii* (Vermeulen, 1991)
fig. 68

Opisthostoma lambii Vermeulen, 1991: 155; holotype ("Lian Cave 12 km N. of Keningau") leg. Vermeulen, RMNH 56595.

Opisthostoma tarphypleura Vermeulen, 1991: 153; holotype ("W. of Kpg. Lobang Batu, 12.5 km S. of Tebakang) leg. Vermeulen, RMNH 56594.

Material seen. — SARAWAK. 1st Div.: quarry km 31.6 road Kuching-Bau (leg. Auffenberg, UF 183983/1); G. Pangga 3 km ENE. of Bau (V 2142/>10); G. Kapur 6 km SE. of Bau (leg. Wilford, UF 194769/>10; V 2229/>10); SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194752/6; do. 194754/>10; do. 194770/7); G. Jambusan 4 km SE. of Bau (V 2177/9); mile 18.5 road Kuching-Serian (leg. Wilford, UF 194767/>10; do. 194768/>10); Kpg. Beratok along road Kuching-Serian, rock quarry along road (leg. Auffenberg, UF 184047/5); mile 21 road Kuching-Serian, Bt. Akut (leg. Wilford, UF 194736/>10); Kpg. Tiang Bekap 10 km SSW. of Kpg. Beratok (leg. De Vogel, V 2584/>10); G. Gayu 23 miles S. of Kuching (leg. Wilford, UF 194776/>10; do. 194930/1); G. Saak 1 mile W. of Begu, 24 miles S. of Kuching (leg. Wilford, UF 194761/>10);

limestone hill 1 mile NE. of Pankalan Ampat, 0.5 mile E. of Temerang (leg. Wilford, UF 194928/2); Kpg. Segur Benuk, mile 21 Penrissen Road (leg. De Vogel, V 2537/>10); G. Lelat 1 mile SW. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194778/>10); G. Mas 0.5 mile W. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194777/4); G. Selabor, W. of Kpg. Lobang Batu, 12.5 km S. of Tebakang (leg. Wilford, UF 194755/>10; do. 194771/>10; do. 194918/4; do. 194919/1; do. 194937/6; V 2097/>10, HOLOTYPE *O. tarphypleura* RMNH 56594). SABAH. Interior Zone: Lian Cave 12 km N. of Keningau (leg. Dance, UF 194765/4; do. 194766/1; V 1113/>10, HOLOTYPE *O. lambii* RMNH 56595); Batu Urun near Sepulot, from soil deposited at Tenom Agricultural Station (V 1150/>10); Batu Punggol SE. of Sepulot (leg. Dorman, UF 196626/>10; V 1890/>10); 1 km SE. of Simatuoh, 10 km ESE. of Sepulot (leg. Dorman, UF 196561/2; do. 196699/>10); 4 km N. of Simatuoh, 9 km NE. of Sepulot (leg. Dorman, UF 196727/7); 5.5 km NNE. of Simatuoh, 9 km E. of Sepulot (leg. Dorman, UF 196506/7); Pun Batu approximately 30 km W. of Sepulot (V 1288/>10).

For a full description see Vermeulen, 1991: 153 and 155, the combined descriptions of *O. lambii* and *O. tarphypleura.*

Diagnosis. — Constriction usually with a parietalis which may be short, or which may continue up to or slightly beyond the sharp inner curve of the tuba (if it continues it is equally high over its entire length, or highest near the constriction), usually with a short angularis covering the suture (sometimes in a palatal position). Spire with 6-26 ribs/0.5 mm on the penultimate whorl; tuba with 5-20 ribs/0.5 mm half-way. Umbilicus closed, or open, up to 0.15 mm wide.

Distribution. — SARAWAK. 1st Div., limestone ranges S. of Kuching, common and widespread. SABAH. Interior Zone, widespread.

Notes. — 1. This subspecies consists of two slightly different populations, which in Vermeulen (1991) were treated as separate species. Recent collecting has yielded several populations from the Sabah interior including intermediate specimens; see below. The separate status of the two can therefore not be maintained.

2. Specimens from the area S. of Kuching usually have a short parietalis next to a short angularis. Sometimes these teeth may have moved towards the palatal wall, so that the parietalis takes an angular position and the angularis a palatal position. The angularis may also be missing. Such specimens may be confused with either *O. tridens*, or with *O. brachyacrum brachyacrum*; see the notes under these taxa. The difference between specimens in which both the angularis and the parietalis are missing and *O. ballorum* are given under the latter species.

3. In a single sample from the area S. of Kuching (UF 194778) specimens occur which have, next to the angularis, a short longitudinal tooth in a infrapalatal position. The longitudinal palatalis of *O. tridens* is always positioned much higher on the palatal wall.

4. Specimens of subspec. *lambii* from most locations in Sabah differ from Sarawak specimens in having a long parietalis continuing up to the sharp inner curve of the tuba. Only incidentally specimens are found on these locations in which the angularis is absent or inconspicuous; such specimens cannot be distinguished from subspec. *brachyacrum* with a similar parietalis. In the Simatuoh area, subspec. *lambii* shows much more variability in the length and presence/absence of the parietalis and angularis. Next to subspec. *lambii*, as found elsewhere in Sabah, specimens are found with the configuration of teeth in the constriction as in Sarawak specimens of subspec. *lambii*, or as in the various forms of subspec. *brachyacrum.* Intermediates between such specimens and typical subspec. *lambii* are also found. All these specimens are included in subspec. *lambii* because they occur together with this taxon, in spite of the fact that some of them cannot be distinguished from subspec. *brachyacrum.*

17.3 - **Opisthostoma brachyacrum tatauense** subspec. nov.
fig. 17, 68

Material seen. — SARAWAK. 4th Div.: Bt. Sarang, Tatau Valley (leg. Bong, UF 194756/2; do. 194757/8; do. 194772/>10, incl. HOLOTYPE; do. 194921/1; do. 194922/>10; do. 194923/6; do. 194924/1; do. 194925/1).

As the type subspecies, but constriction usually with a parietalis which continues up to or slightly beyond the sharp inner curve of the tuba, and which is low and inconspicuous, (or even absent) at the constriction, but high and distinct half-way the tuba, without an angularis. Spire with 6 radial ribs/0.5 mm on the penultimate whorl; tuba with 5-20 ribs/0.5 mm half-way. Umbilicus closed, or open, up to 0.05 mm wide. Spire: height 0.7-0.8 mm; width 0.7 mm; index 1.0-1.2. Total width 1.0-1.1 mm. Height and width aperture 0.30 mm.

Distribution. — Sarawak. 4th Div. Tatau River basin.

Notes: — In the type subspecies the umbilicus is usually wider, being 0.05-0.25 mm across.

18 - *Opisthostoma devogelii* Vermeulen, 1991
fig. 67

Material seen. — SARAWAK. 1st Div.: Kpg. Tiang Bekap 10 km SSW. of Kpg. Beratok (leg. Wilford, UF 194934/>10; leg. De Vogel, V 2567/>10); Kpg. Segur Benuk, mile 21 Penrissen Road (leg. De Vogel, V 2547/>10, HOLOTYPE RMNH 56597); G. Lelat 1 mile SW. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194778/7); G. Mas 0.5 mile W. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194938/2).

For further details see Vermeulen, 1991: 159

19 - *Opisthostoma planiapex* Vermeulen, 1991
fig. 67

Material seen. — SARAWAK. 1st Div.: 3 km SW of Taiton goldmine, near Bau (leg. Auffenberg, UF 183923/1); G. Kapur 6 km SE. of Bau (V 2227/>10, HOLOTYPE RMNH 56591).

For further details see Vermeulen, 1991: 145

20 - *Opisthostoma lechria* Vermeulen, 1991
fig. 69

For further details see Vermeulen, 1991: 157

21 - **Opisthostoma delopterum** spec. nov.
fig. 18, 67

Material seen. — KALIMANTAN. Kalimantan Selatan: limestone escarpments along road Benualawas-Limbungan (V 2857/>10, HOLOTYPE RMNH 56916).

Spire cylindrical. Apex not or slightly oblique. Whorls 3 1/4-3 1/2, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba touching the spire over its entire length, gradually narrowed towards the constriction, rounded below. Radial ribs not sinuous, on the spire rather densely placed (7-8 ribs/0.5 mm on the penultimate whorl); on the tuba widely spaced (3 ribs/0.5 mm half-way the tuba). Spiral striation present, fine. Umbilicus open, 0.10-0.15 mm across. Aperture tilted 15-45° with regard to the

coiling axis, its upper margin slightly to widely below the level of the apex, about circular to elliptic. Peristome double, outer peristome spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture; inner peristome distinctly protruding from the outer, somewhat spreading, on the right side of the aperture either spreading over the widest whorl of the spire as well as the whorl above; or touching the widest whorl only, but then only a narrow gap present between the peristome and the whorl above the widest. Spire: height 0.8-1.0 mm; width 0.8-0.9 mm; index 1.0-1.2. Total width 1.2-1.3 mm. Height aperture 0.25-0.30 mm; width 0.35-0.40 mm.

Distribution. — Borneo: Kalimantan, K. Selatan, karst area E. of the Meratus Mts.

Notes. — 1. *O. ballorum* has the aperture similarly attached to the spire. Both *O. ballorum* and *O. javanicum* differ in having only low radial ribs on the last whorl and the tuba.

2. The name refers to the distinct radial ribs (from the Greek 'delos', meaning: distinct).

22 - *Opisthostoma ballorum* Vermeulen, 1991
fig. 68

Material seen. — SARAWAK. 1st Div.: 3 km SW of Taiton goldmine, near Bau (leg. Auffenberg, UF 183926/4); small gorge 1 mile S. of Bau (leg. Wilford, UF 194865/>10); hill S. of Bau goldmine, 2.1 km S. of Bau (leg. Auffenberg, UF 183885/1); G. Doya 2 miles SE. of Bau (leg. Wilford, UF 194764/>10); G. Kapur 6 km SE. of Bau (leg. Wilford, UF 194740/>10; do. 194913/>10; do. 194914/>10; do. 194915/>10; V 2228/>10, HOLOTYPE RMNH 56598; leg. De Vogel, V 2605/>10). 4th Div.: Bt. Gading, Baram Valley, N. of Long Lama (leg. Wilford, UF 194741/>10); G. Mulu Nat. Park, near Nat. Park entrance (leg. Ball, V 2669/>10); G. Mulu Nat. Park, lower Tutoh Valley (leg. Wilford, UF 194743/>10).

For further details see Vermeulen, 1991: 162

Notes. — 1. Specimens from the 1st. Divison of Sarawak differ from sympatric specimens of *O. brachyacrum lambii* without a longitudinal parietalis in having the radial ribs on the portion of the spire ending on the constriction much wider spaced (2-6 radial ribs/0.5 mm in *O. ballorum*; 8-15 in *O. brachyacrum lambii*).

2. Specimens of *O. ballorum* from the 4th. Division of Sarawak, excluding Batu Gading, differ from those from the 1st. Division, and from those from Batu Gading in the 4th. Division, in having the radial ribs on the penultimate whorl of the spire somewhat wider spaced: 7-12 radial ribs/0.5 mm in the 1st. Div.; 5-7 radial ribs/0.5 mm in the 4th. Div. *O. brachyacrum brachyacrum* from the 4th. Division with a relatively low spire and a narrow umbilicus is very similar to sympatric specimens of *O. ballorum*. It is possible that these specimens of *O. ballorum* represent in fact a form of *O. brachyacrum brachyacrum* lacking the longitudinal parietalis.

3. *O. javanicum* may look similar; see the notes under that species.

23 - *Opisthostoma javanicum* Van Benthem Jutting, 1932
fig. 68

Opisthostoma javanicum Van Benthem Jutting, 1932: 203; holotype ("Goenoeng Tjibodas [Estate of Tjampea] near Buitenzorg, Java") leg. Van Benthem Jutting (not seen).

Opisthostoma aspastum Van Benthem Jutting, 1951: 30; holotype ("Limestone hills near Pangkadjene, near Makassar, South Celebes") leg. Tammes-Bolt (not seen).

Opisthostoma aetheroscopa Vermeulen, 1991: 155; holotype ("Gomantong Hill 30 km S. of Sandakan") leg. Vermeulen, RMNH 56596.

Material seen. — SABAH. Sandakan Zone: Bt. Gomantong, 30 km S. of Sandakan (V 1590/6, HOLOTYPE of *O. aetheroscopa* RMNH 56596). KALIMANTAN. Kalimantan Selatan: Batu Apoh, approximately 35 km NE. of Martapura (leg. Lamb & Mackinnon, V 2466/>10; V 3336/>10); Telaga Langsat, approximately 18 km SSW. of Barabai (V 3435/>10); Bt. Pagat, limestone hill 8 km SE. of Barabai (V 3797/>10); Nateh near Batu Tangga, approximately 18 km E. of Barabai (V 3017/>10); G. Siamang near Desah Liu, 30 km E. of Tandjung (V 3097/>10); G. Buleh, 4 km E. of Muara Uja (V 3711/>10); Jaro near Muara Uja, limestone escarpment W. of the village (V 3203/>10); G. Halat, near border Kalimantan Timur along main road Banjarmasin-Balikpapan (V 2796/>10); Batu Tungga near Sarungga, W. of road Batulicin-Benualawas (V 3264/>10); limestone escarpment W. of km 6 road Benualawas-Batulicin (V 3369/>10); limestone escarpments along road Benualawas-Limbungan (V 2855/>10). Kalimantan Timur: Batu Butuk, near Muara Komang along main road Banjarmasin-Balikpapan (V 3531/>10); G. Melihat, foot of S.-facing slope, between river and main road Banjarmasin-Balikpapan (V 2948/>10); 30 km W. of Balikpapan (leg. Van Balgooij, V 2498/6). Material seen from elsewhere: Madura (leg. Whitten, V 2525/>10). Celebes: Maros Mts., Bantimurung (leg. Prud'homme van Reine, V 2756/5).

For further details see Vermeulen, 1991: 155 and 160, the combined descriptions of *O. tarphypleura* and *O. javanicum*.

Notes. — 1. Recently, populations of *O. javanicum* have been found in SE. Kalimantan containing specimens with a lower spire and a wider umbilicus than the type. They occur together with specimens similar to the type, as well as with numerous morphological intermediates (e.g in V 2948). They are not different from *O. aetheroscopa*, from Gomantong, Sabah. As a consequence, *O. aetheroscopa* and must be regarded as a synonym of *O. javanicum*.

2. *O. ballorum* differs in usually having the peristome attached to both the widest whorl of the spire and the whorl above the widest. In case the peristome does not touch the whorl above the widest, only a very narrow gap is present between them is most cases. In *O. javanicum* this gap is usually much wider.

3. Populations of *O. brachyacrum brachyacrum* from the 4th. Division of Sarawak show a variability similar to that of *O. javanicum*. Particularly specimens with a low spire and/or a wide umbilicus may resemble similar forms of *O. javanicum*. See the notes under *O. brachyacrum brachyacrum*.

Subgenus *Plectostoma*

Spire with 3 5/8-7 1/2 whorl. Spire along its right side with the penultimate whorl usually slightly to distinctly narrower than the ultimate, sometimes about as wide as the ultimate, if the shell is observed in front view. Aperture without teeth (though sometimes distinctly angular).

24 - **Opisthostoma anisopterum** spec. nov.
fig. 19, 71

Material seen. — SARAWAK. 1st Div.: G. Gayu 23 miles S. of Kuching (leg. Wilford, UF 194846/1); G. Saak 1 mile W. of Begu, 24 miles S. of Kuching (leg. Wilford, UF 194908/>10, incl. HOLOTYPE); limestone hill 1 mile NE. of Pankalan Ampat, 0.5 mile E. of Temerang (leg. Wilford, UF 194721/>10; do. 194811/8).

Spire conical with flat to concave sides. Apex not oblique. Whorls 5 1/4-5 7/8, (moderately) convex; last whorl rounded to angular. Constriction with a parietalis, a longitudinal and a transverse palatalis. Tuba gradually narrowed towards the constriction, slightly angular below. Radial ribs on the spire moderately to widely spaced (2-4 ribs/0.5 mm on the penultimate whorl), with a deeply trough-shaped projection half-

way, abrading to a shallowly to deeply looped scar, (projection of those close to the tuba double-channeled with both channels about equally deep or with the lower deepest, abrading to a scar with a double deep loop when the shell is observed in front view); those on the tuba widely spaced (1-2 ribs/0.5 mm half-way the tuba), below with an almost tubular, straight to slightly curved projection abrading to a scar with a deep, semi-circular loop. Spiral striation absent or inconspicuous, more distinct on the tuba. Umbilicus open, 0.10-0.30 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular to elliptic. Peristome double; outer peristome spreading beyond the inner, either gradually narrowed towards the right side of the aperture or not; inner peristome hardly protruding from the outer, spreading. Spire: height 2.0-2.4 mm; width 1.2-1.6 mm; index 1.5-1.8. Total width 2.7-2.8 mm. Height aperture 0.6-0.7 mm; width 0.6-0.8 mm.

Distribution. — Borneo: Sarawak, 1st Div., a limestone escarpment NE. of Pankalan Ampat.

Notes. — 1. *O. everetti* and *O. stenotoreton* do not have a longitudinal palatalis. The latter also has the projections on the radial ribs close to the tuba abrading to a scar with a single loop, not a double one.

2. The longitudinal palatalis in the constriction is sometimes difficult to observe through the shell wall: it may partly be hidden below the suture.

3. The name refers to the fact the radial ribs on the last whorl of the spire are twice looped, whereas all other ribs only have a single loop.

25 - **Opisthostoma dormani** spec. nov.
fig. 20, 70

Material seen. — SABAH. Interior Zone: 1 km SE. of Simatuoh, 10 km ESE. of Sepulot (leg. Dorman, UF 196560/>10, incl. HOLOTYPE; do. 196682/>10; do. 196685/>10; do. 196691/>10; do. 196697/>10); 5.5 km NNE. of Simatuoh, 9 km E. of Sepulot (leg. Dorman, UF 196551/>10); 2.75 km NNW. of Simatuoh, 7 km E. of Sepulot (leg Dorman, UF 196612/>10).

Spire conical with flat to concave sides. Apex not oblique. Whorls 5 3/8-7 1/8, convex; last whorl rounded or slightly angular. Constriction with or without a longitudinal palatalis, with a transverse palatalis. Tuba gradually narrowed towards the constriction, rounded to slightly angular below. Radial ribs with a shallowly concave to deeply trough-shaped projection half-way, abrading to a scar with a shallow to deep, semi-circular loop (projection of those close to the tuba double-channeled with the upper channel much deeper than the lower, abrading to a distinctly sinuous scar or one with a single deep loop when the shell is observed in front view); those on the spire moderately to widely spaced (2-5 ribs/0.5 mm on the penultimate whorl); those on the tuba widely spaced (1-2 ribs/0.5 mm half-way the tuba), below with a slightly curved projection. Spiral striation absent or inconspicuous. Umbilicus open, 0.30-0.40 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular to elliptic. Peristome simple or double; when simple spreading, often with a somewhat thickened lip inside; when double outer peristome somewhat spreading beyond the inner or not, if so gradually narrowed towards, and absent along the right side of the aperture, often somewhat widened along the upper side; inner peristome usually not or hardly protruding from the outer, spreading. Spire: height 1.9-2.6 mm; width 1.3-1.6 mm; index 1.3-1.7. Total width 2.5-2.9 mm. Height aperture 0.6-0.7 mm; width 0.6-0.8 mm.

Distribution. — Borneo: Sabah, Interior Zone, a small area E. of Sepulot.

Notes. — 1. Variable in the shallowly/deeply looped radial ribs, and in the presence/absence of both a longitudinal palatalis in the constriction as well as spiral striation. These characters occur in all possible combinations in the abundant material available. It is therefore not possible to divide this taxon any further.

2. Three samples from S. of Simatuoh (UF 196682, 196685, 196697) differ in having a simple peristome. In the last mentioned sample such specimens occur together with specimens with a double peristome. A similar variability occurs in *O. obliquedentatum*, from the same area.

3. *O. anisopterum* has a narrower umbilicus; *O. obliquedentatum* and *O. inornatum* have hardly sinuous radial ribs close to the tuba; *O. hosei* and *O. cookei* have a spire with a distinctly angular last whorl; *O. cyrtopleuron* does not have projections on the radial ribs on the spire.

4. Named after D.K. Dorman, who first collected this species.

26 - *Opisthostoma mirabile* E.A. Smith, 1893
fig. 21, 72

Opisthostoma mirabile E.A. Smith, 1893a: 346; syntypes ("Gomanton Hill, N. Borneo") leg. Everett, BMNH 92.7.20.127-128/2 & 92.7.23.25-26/2.

Material seen. — SABAH. Sandakan Zone: Bt. Gomantong, 30 km S. of Sandakan (BMNH/4, see above; leg. Saul, NMW 1968.92/5; leg. Dance, UF 194818/18; do. 194819/2; do. 194820/>10; leg. Saul, UF 194815/2; leg. Wilford, UF 59101/>10; UF 133016/2; UF 160191/4; UF 160194/4; V 1592/>10); mile 2.5 on former road Suanlamba-Gomantong (leg. Wilford, UF 194816/>10); Bt. Kuntos, near mile 6 on former road Suanlamba-Gomantong (leg. Wilford, UF 194817/>10).

Spire conical with flat to concave sides. Apex not oblique. Whorls 5 3/8-7 1/2, convex; last whorl rounded or slightly angular. Constriction with a parietalis, a longitudinal and a transverse palatalis, a columellaris which continues as a ridge-shaped transverse basalis. Tuba gradually narrowed towards the constriction, (slightly) angular below. Radial ribs with a deeply trough-shaped projection half-way, abrading to a scar with a deep, semi-circular loop (projection of those close to the tuba slightly double-channeled, abrading to a scar with a single deep loop when the shell is observed in front view); those on the spire moderately to widely spaced (2-4 ribs/0.5 mm on the penultimate whorl); those on the tuba widely spaced (2 ribs/0.5 mm half-way the tuba), below with a distinctly curved projection. Spiral striation absent. Umbilicus open, 0.20-0.30 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular to elliptic. Peristome double; outer peristome widely spreading beyond the inner but abruptly narrowed towards, and absent along the right side of the aperture, with a very large wing along the upper side; inner peristome distinctly protruding from the outer, spreading. Spire: height 1.8-3.1 mm; width 1.3-1.9 mm; index 1.4-1.6. Total width 2.6-3.9 mm. Height aperture 0.5-0.7 mm; width 0.6-0.9 mm.

Distribution. — Borneo: Sabah, Sandakan Zone, Bt. Gomantong S. of Sandakan. Also found on two locations N. of Bt. Gomantong, on limestone outcrops which cannot be located anymore, and which are probably destroyed.

Notes. — 1. Variable in the height of the spire as well as in the spacing of the ribs. The sample UF 194816, from near Suanlamba, consists of a series of rather small specimens with a wide spire with rather closely placed radial ribs. Similar specimens are incidentally found near Bt. Gomantong, among specimens more closely resembling the type.

2. Similar to *O. perspectivum* and *O. heteropleuron*; see the notes under these respective species.

27 - *Opisthostoma fraternum* E.A. Smith, 1905
fig. 22

Opisthostoma fraternum E.A. Smith, 1905b: 360; holotype ("North Borneo") BMNH 1905.3.20.3
Material seen. — SABAH. "North Borneo" (BMNH/1, see above; RMNH/5; UF 133015/4).

Spire conical with slightly convex sides. Apex slightly oblique. Whorls 5 5/8-6 1/8, convex; last whorl rounded or slightly angular. Constriction with a parietalis, a longitudinal and a transverse palatalis, a columellaris. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs widely spaced (1-2 ribs/0.5 mm on the penultimate whorl, 1 rib/0.5 mm half-way the tuba), with a deeply trough-shaped projection half-way, abrading to a scar with a deep, semi-circular loop (projection of those close to the tuba double-channeled either with both channels equally deep or with the upper channel much deeper than the lower, abrading to a scar with a single deep loop when the shell is observed in front view); those on the tuba below with a slightly curved projection. Spiral striation, inconspicuous. Umbilicus open, 0.20 mm across. Aperture hardly tilted with regard to the coiling axis, circular. Peristome distant from the spire, double; outer peristome spreading beyond the inner all around, though gradually somewhat narrowed along the right side of the aperture, somewhat widened along the upper side; inner peristome hardly protruding from the outer, spreading. Spire: height 2.1-2.4 mm; width 1.5-1.6 mm; index 1.4-1.5. Total width 2.8-3.0 mm. Height and width aperture 0.6-0.8 mm.

Distribution. — Borneo: Sabah, further details unknown.

Notes. — See note 1 under *O. concinnum*.

28 - *Opisthostoma concinnum* Fulton, 1901
fig. 23, 70

Opisthostoma concinnum Fulton, 1901: 242; holotype ("Gomanton, N. Borneo") BMNH 1901.12.13.5-8/4 & 1901.12.9.169/1.

Opisthostoma smithi Fulton, 1901: 243; holotype ("Banguey Island, Borneo") BMNH 1901.12.9.170.

Material seen. — SABAH. Kudat Zone: Pulau Banggi (BMNH/1, see above; RMNH/>10; UF 133022/3). Sandakan Zone: Batu Putih near road Lahad Datu-Sandakan, near Kinabatangan R. (V 1473/>10); Batu Laab near road Lahad Datu-Sandakan, near Kinabatangan R. (leg. Wilford, UF 194910/>10); Bt. Gomantong, 30 km S. of Sandakan (BMNH/5, see above; RMNH/2; UF 160187/2); limestone outcrop W. of Sg. Tabin, lower part, lower Segama Valley (leg. Wilford, UF 194821). Tawau Zone: G. Madai, 40 km SSW. of Lahad Datu (leg. Smits, M 14079/6; leg. Dorman, UF 196753/>10). "North Borneo" (UF 133005/2; UF 133006/2; UF 160199/9).

Spire conical with flat to concave sides. Apex not oblique. Whorls 5 1/2-6 3/8, moderately convex; last whorl (slightly) angular. Constriction with a parietalis, a longitudinal and a transverse palatalis, a columellaris, with or without a basalis that is knob-shaped or a transverse ridge. Tuba gradually narrowed towards the constriction, (slightly) angular or with a ridge below. Radial ribs on the spire rather closely placed to widely spaced (2-6 ribs/0.5 mm on the penultimate whorl), with a (shallowly) concave to deeply trough-shaped projection half-way, often abraded to a sinuous or shallowly to deeply looped scar (projection of those close to the tuba often double-channeled either with both channels equally deep or with the upper channel much deeper than the lower,

abrading to a scar with either a single or a double, deep or shallow loop when the shell is observed in front view); those on the tuba moderately to widely spaced (2-3 ribs/0.5 mm half-way the tuba), below with a deeply trough-shaped, slightly curved projection abrading to a scar with a deep, semi-circular loop. Spiral striation fine. Umbilicus open, 0.30-0.40 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular. Peristome double; outer peristome spreading beyond the inner but gradually narrowed towards, and absent to narrow along the right side of the aperture, often somewhat widened along the upper side; inner peristome hardly protruding from the outer, spreading. Spire: height 1.7-2.3 mm; width 1.3-1.5 mm; index 1.3-1.7. Total width 2.5-3.2 mm. Height and width aperture 0.6-0.7 mm.

Distribution. — Borneo: Sabah, E. part, and P. Banggi. On widely scattered localities.

Notes. — 1. Variable. Specimens from Gua Madai differ from the type of *O. concinnum* and *O. smithi*. They have slightly more convex whorls, the last is less angular, the tuba is less angular below, and the radial ribs on the last whorl abrade to a scar with a single deep loop. Specimens from Batu Laab differ in having radial ribs with a single deep loop on the spire, including the last whorl, as well as a rather narrow umbilicus.

2. All such specimens are somewhat reminiscent of *O. fraternum* as far as the mentioned characters are concerned. Yet the latter species is sufficiently characterized by its spire with convex whorls and with a more rounded last whorl, and by its continuous outer peristome.

3. *O. concinnum* may be part of the species complex *O. simplex-O. lissopleuron*; see the notes under *O. lissopleuron*.

29 - *Opisthostoma otostoma* Boettger, 1893
fig. 24, 70

Opisthostoma otostoma Boettger, 1893: 194; lectotype ("Borneo, Brunei, Labuan") leg. Staudinger, SMF 104951

Material seen. — SABAH. Interior Zone: "Brunei": small islands around Labuan (NMW/6; SMF 104951/1 see above). "North Borneo" (UF 160195/8).

Spire conical with flat sides. Apex slightly oblique. Whorls 5 1/2-6 1/8, convex; last whorl rounded. Constriction with a longitudinal and a transverse palatalis, and an inconspicuous columellaris. Tuba somewhat abruptly narrowed towards the constriction, rounded. Radial ribs moderately spaced (3-4 ribs/0.5 mm on the penultimate whorl, 3 ribs/0.5 mm half-way the tuba), on the spire slightly sinuous, those close to the tuba not sinuous; those on the tuba not or slightly sinuous below. Spiral striation present. Umbilicus open, 0.15-0.30 mm across. Aperture hardly tilted with regard to the coiling axis, circular to elliptic. Peristome double; outer peristome spreading beyond the inner but gradually narrowed towards, and absent along the right side of the aperture, with a distinct, but small wing along the upper side which often has a somewhat concave right margin; inner peristome slightly protruding from the outer, spreading. Spire: height 2.0-2.2 mm; width 1.5-1.6 mm; index 1.3-1.4. Total width 2.4-2.7 mm. Height aperture 0.6-0.7 mm; width 0.6 mm.

Distribution. — Sabah, Interior Zone, small limestone islands around Labuan. Probably extinct due to habitat destruction: the limestone has been quarried for the construction of the Labuan airfield.

30 - **Opisthostoma obliquedentatum** spec. nov.
fig. 25, 70

Material seen. — SABAH. Interior Zone: 4 km N. of Simatuoh, 9 km NE. of Sepulot (leg. Dorman, UF 196726/>10, incl. HOLOTYPE); 5.5 km NNE. of Simatuoh, 9 km E. of Sepulot (leg. Dorman, UF 196500/>10; do. 196508/>10; do. 196553/>10).

Spire conical with flat or slightly convex sides. Apex not or slightly oblique. Whorls 5 1/2-6 1/8, convex; last whorl rounded. Constriction with or without a parietalis, if present inconspicuous, starting about half-way the longitudinal palatalis and obliquely crossing the suture while continuing into the tuba beyond the longitudinal palatalis, with a longitudinal and a transverse palatalis, with or without a columellaris and a ridge-shaped transverse basalis. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs on the spire moderately spaced (4-6 ribs/0.5 mm on the penultimate whorl), sinuous or not, those close to the tuba not or hardly sinuous; those on the tuba moderately to widely spaced (2-4 ribs/0.5 mm half-way), not or hardly sinuous below. Spiral striation absent or present. Umbilicus open, 0.30-0.40 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular to elliptic, Peristome simple or double; when simple spreading, often with a somewhat thickened lip; when double outer peristome slightly spreading beyond the inner or not, if so gradually narrowed towards, and absent along the right side of the aperture, sometimes slightly widened along the upper side; inner peristome usually slightly protruding from the outer, spreading. Spire: height 1.7-2.1 mm; width 1.4-1.6 mm; index 1.3-1.5. Total width 2.4-2.7 mm. Height and width aperture 0.6-0.7 mm.

Distribution. — Borneo: Sabah, Interior Zone, a small area NE. of Sepulot.

Notes. — 1. Specimens from the sample UF 196926 (which includes the type specimen) differ from the others in having a spire with slightly convex sides, in the absence of spiral striation, as well as in having a simple peristome. A similar variabily occurs in *O. dormani*, from the same area.

2. Many specimens have a characteristic parietalis which crosses the suture with the previous whorl (hence the name) and continues into the tuba. Specimens without such a parietalis differ from *O. inornatum* in having a wider umbilicus, and from *O. otostoma* in lacking a small wing along the upper side of the aperture.

31 - **Opisthostoma inornatum** spec. nov.
fig. 26, 70

Material seen. — SABAH. Interior Zone: 1 km SE. of Simatuoh, 10 km ESE. of Sepulot (leg. Dorman, UF 196558/>10; do. 196684/>10, incl. HOLOTYPE; do. 196690/3; do. 196698/>10).

Spire conical with flat to very slightly convex sides. Apex oblique or not. Whorls 6 1/8-6 7/8, convex; last whorl rounded. Constriction with or without a parietalis, if present inconspicuous, with an often inconspicuous longitudinal palatalis, a transverse palatalis, rarely with a very inconspicuous columellaris. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs closely placed to moderately spaced (5-10 ribs/0.5 mm on the penultimate whorl, 5-8 ribs/0.5 mm half-way on the tuba), slightly sinuous or not, those close to the tuba not sinuous. Spiral striation present. Umbilicus open, 0.20-0.25 mm across. Aperture hardly tilted with regard to the coiling axis, circular. Peristome distant from the spire, double; outer peristome hardly to moderately spreading beyond the inner, but gradually narrowed towards, and narrow to

almost absent along the right side of the aperture, slightly widened or with an inconspicuous wing along the upper side, sometimes very slightly widened along the lower side; inner peristome slightly protruding from the outer, spreading. Spire: height 2.2-2.5 mm; width 1.3 mm; index 1.7-1.9. Total width 2.5 mm. Height and width aperture 0.5-0.6 mm.

Distribution. — Borneo: Sabah, Interior zone, a small area SE. of Sepulot.

Notes. — 1. Variable in a number of characters regarded as diagnostic in other species: presence/absence of a parietalis; radial ribs straight or slightly sinuous.

2. *O. baritense*, *O. brevituba*, *O. depauperatum* and *O. decrespignyi* all have a columellaris in the constriction; *O. wallacei* is smaller and has fewer whorls.

3. The name refers to the fact that this species has few outstanding features when compared to its congeners.

32 - **Opisthostoma dipterum** spec. nov.
fig. 27, 70

Material seen. — SARAWAK. 4th Div.: G. Mulu Nat. Park, lower Tutoh Valley (leg. Wilford, UF 194831/>10, incl. HOLOTYPE; do. 194847/>10).

Spire conical with flat to slightly convex sides. Apex slightly oblique or not. Whorls 5 1/8-5 7/8, convex; last whorl rounded. Constriction with a parietalis, a longitudinal and a transverse palatalis, with or without a very inconspicuous columellaris. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs moderately spaced (3-4 ribs/0.5 mm on the penultimate whorl, 3 ribs/0.5 mm half-way on the tuba), those on the spire sinuous; those on the tuba (slightly) sinuous below. Spiral striation fine. Umbilicus open, 0.15-0.20 mm across. Aperture hardly tilted with regard to the coiling axis, circular. Peristome double; outer peristome spreading beyond the inner, but rather abruptly narrowed towards, and absent along the right side of the aperture, with a distinct, obtuse (rounded but not widely so) wing along the upper side, and usually a similar but less conspicuous wing along the lower side; inner peristome slightly protruding from the outer, spreading. Spire: height 1.7-2.1 mm; width 1.2-1.4 mm; index 1.4-1.6. Total width 2.1-2.3 mm. Height aperture 0.5-0.6 mm; width 0.5 mm.

Distribution. — Borneo: Sarawak, 4th Div., G. Mulu Nat. Park.

Notes. — 1. Very similar to, and sympatric with *O. pulchellum*. It is regarded as a different species because of its consistently smaller size, the presence of spiral striation, and the absence or near absence of a columellaris in the constriction.

2. The name refers to the two small wings at opposite sides of the aperture.

33 - *Opisthostoma baritense* E.A. Smith, 1893
fig. 28

Opisthostoma baritense E.A. Smith, 1893a: 347; syntypes ("Barit Mountain, N.W. Borneo") leg. Everett, BMNH 92.4.20.131/1 & 92.4.23.27-28/2.

Material seen. — SARAWAK. 4th Div.: "Barit Mountain": G. Mulu area (BMNH/3, see above; UF 133004/1); G. Mulu Nat. Park, Melinau Valley, near N. main entrance Deer Cave (leg. Wall, UF 194833/1). "North Borneo" (RMNH/1).

Spire conical with (slightly) convex sides. Apex oblique. Whorls 5 3/4, convex; last whorl rounded. Constriction with a parietalis, a longitudinal and a transverse palatalis,

a distinct columellaris. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs rather closely placed to moderately spaced (4-8 ribs/0.5 mm on the penultimate whorl, 4-7 ribs/0.5 mm half-way on the tuba), not or hardly sinuous. Spiral striation fine. Umbilicus open, 0.15-0.20 mm across. Aperture hardly tilted with regard to the coiling axis, circular to elliptic. Peristome somewhat distant from the spire, double; outer peristome slightly spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, sometimes slightly widened along the upper side and/or along the lower side; inner peristome slightly protruding from the outer, spreading. Spire: height 2.0-2.3 mm; width 1.4-1.5 mm; index 1.3-1.5. Total width 2.2-2.4 mm. Height and width aperture 0.5-0.6 mm.

Distribution. — Borneo: Sarawak, 4th Div., G. Mulu area. Rare.

Notes. — Similar to *O. inornatum* as well as *O. brevituba*, see the notes under these respective species.

34 - **Opisthostoma brevituba** spec. nov.
fig. 29, 71

Material seen. — SABAH. Sandakan Zone: Batu Putih near road Lahad Datu-Sandakan, near Kinabatangan R. (V 1472/>10, HOLOTYPE RMNH 56929).

Spire conical with flat to convex sides. Apex slightly oblique or not. Whorls 5 1/4-6 1/4, convex; last whorl rounded. Constriction with a parietalis, a longitudinal and a transverse palatalis, a distinct columellaris. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs (moderately) spaced (4-6 ribs/0.5 mm on the penultimate whorl and half-way on the tuba), not or hardly sinuous. Spiral striation fine. Umbilicus open, 0.20-0.30 mm across. Aperture hardly tilted with regard to the coiling axis, circular to elliptic, often slightly angular. Peristome almost touching the spire or somewhat distant from it, double; outer peristome slightly spreading beyond the inner, but gradually narrowed towards, and narrow or absent along the right side of the aperture, moderately widened or with a small wing along the upper side, and somewhat less widened along the lower side; inner peristome moderately protruding from the outer, spreading. Spire: height 1.8-2.3 mm; width 1.3-1.5 mm; index 1.3-1.6. Total width 2.2-2.4 mm. Height and width aperture 0.5-0.6 mm.

Distribution. — Borneo: Sabah, Sandakan Zone, Batu Putih.

Notes. — 1. *O. inornatum*, *O. baritense*, *O. depauperatum* and *O. decrespignyi* all lack a small wing along the upper part of the peristome.
2. The name refers to the very short, sharply curved tuba.

35 - *Opisthostoma depauperatum* E.A. Smith, 1894.
fig. 30, 70

Opisthostoma depauperatum E.A. Smith, 1894: 272; syntypes ("Barit Mountain, N.W. Borneo") BMNH 93.6.7.80-84/4.

Material seen. — SARAWAK. 5th Div.: G. Budah, Medalam Valley, trib. of Limbang R. (leg. Wilford, UF 194830/6; do. 194834/>10). "Barit Mountain, N.W. Borneo" BMNH/4, see above).

Shell often redddish-brown. Spire conical with slightly convex sides, or with convex sides near the apex, slightly concave lower down. Apex slightly oblique or not. Whorls 5 3/8-6 1/4, convex; last whorl rounded. Constriction with a parietalis, a longitudinal

and a transverse palatalis, a distinct columellaris. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs (moderately) spaced (3-5 ribs/0.5 mm on the penultimate whorl, 3-4 ribs/0.5 mm half-way on the tuba), not or very slightly sinuous. Spiral striation absent or inconspicuous. Umbilicus open, 0.20-0.25 mm across. Aperture hardly tilted with regard to the coiling axis, circular, elliptic, or slightly angular. Peristome (widely) distant from the spire, rarely only slightly distant, double; outer peristome usually somewhat spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, often slightly widened along the upper side; inner peristome usually moderately protruding from the outer, rarely only slightly protruding, spreading. Spire: height 1.5-2.3 mm; width 1.2-1.5 mm; index 1.3-1.6. Total width 2.2-2.6 mm. Height and width aperture 0.5-0.6 mm.

Distribution. — Borneo: Sarawak, 5th Div.: Limbang Valley.

Notes. — 1. Variable. Specimens may have a distinctly higher spire than the depicted one, as well as less conspicuous, more densely placed ribs.

2. *O. inornatum* and *O. decrespignyi* have the inner peristome only slightly protruding from the outer; *O. baritense* and *O. brevituba* have the peristome at most slightly distant from the spire.

36 - *Opisthostoma decrespignyi* (H. Adams, 1865)
fig. 31, 70

Plectostoma decrespignyi ("DeCrespignii") H. Adams, 1865: 177; holotype ("Labuan Island, Borneo") leg. De Crespigny, (not seen).

Scoliostoma sp. De Crespigny, 1864: Nat. Hist. Review, 599 (not seen).

Opisthostoma decrespignyi ("DeCrespignii") (H. Adams, 1865) Blanford, 1867: 305.

Material seen. — "North Borneo" (RMNH/2; UF 133007/5; UF 133008/8; UF 160188/>10; UF 118762/1).

Spire conical with flat to slightly concave sides. Apex slightly oblique or not. Whorls 5 3/8-5 7/8, convex; last whorl rounded. Constriction with an inconspicuous and often somewhat irregularly shaped parietalis, a similar longitudinal palatalis, a transverse palatalis, a knob-shaped columellaris abruptly ending towards the basal side of the constriction. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs moderately spaced (4-6 ribs/0.5 mm on the penultimate whorl, 3-4 ribs/0.5 mm half-way on the tuba), not sinuous (rarely slightly so). Spiral striation fine. Umbilicus open, 0.25-0.35 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular. Peristome (somewhat) distant from the spire, double; outer peristome hardly spreading beyond the inner, but gradually narrowed towards, and absent narrow along the right side of the aperture, slightly widened along the upper side; inner peristome slightly protruding from the outer, spreading. Spire: height 1.7-1.9 mm; width 1.2-1.3 mm; index 1.4-1.6. Total width 2.2-2.3 mm. Height and width aperture 0.5-0.6 mm.

Distribution. — Borneo: Sabah, Interior Zone, small limestone islands around Labuan. Probably extinct due to habitat destruction: the limestone has been quarried for the construction of the Labuan airfield.

Notes. — Similar to *O. inornatum*, *O. transequatorialis*, and particularly to *O. wilfordi*; see the notes under these respective species.

37 - *Opisthostoma pulchellum* Godwin Austen, 1890
fig. 32, 70

Opisthostoma pulchellum Godwin Austen, 1890: 245; holotype ("Baram District, Borneo") leg. Hose, BMNH 913.03.VII.1/7.

Opisthostoma linterae Sowerby, 1896: 94; syntypes ("Sarawak") BMNH 95.12.13.4-6/7.

Material seen. — SARAWAK. 4th Div.: "Barit Mountain": G. Mulu area (NMW/6); "Brunei": G. Mulu area (UF 160196/9); G. Mulu Nat. Park, near Nat. Park entrance (leg. Dorman, UF 196387/6; leg. Ball, V 2671/>10); G. Mulu Nat. Park, lower Tutoh Valley (leg. Wilford, UF 194806/>10; do. 194807/>10; do. 194808/9; do. 194885/8; do. 194886/7; do. 194887/2); G. Mulu Nat. Park, Melinau Valley, near N. main entrance Deer Cave (leg. Wall, UF 194889/7); G. Mulu Nat. Park, Tutoh Valley, G. Benarat (leg. Dance, UF 194813/>10); G. Mulu Nat. Park, Melinau Paku R. headwaters, G. Api (leg. Wall, UF 194888/>10); G. Mulu Nat. Park, "Basecamp" (leg. Dorman, UF196381/3). "Mulu Mountains" (UF 133020/3). "Baram District, Borneo" (BMNH/7, see above). "Sarawak" (BMNH/7, see above; NMW/>10; RMNH/2; UF 133012/3; UF 133013/2; UF 160193/2). "North Borneo" (NMW/>10; UF 133017/3; UF 133019/1; UF 194940/2).

Spire conical with flat to distinctly convex sides. Apex slightly oblique or not. Whorls 5 3/4-6 7/8, convex; last whorl rounded. Constriction with a parietalis, a longitudinal and a transverse palatalis, a distinct columellaris which continues as a ridge-shaped transverse basalis or not. Tuba gradually to rather abruptly narrowed towards the constriction, rounded below. Radial ribs on the spire rather closely placed to widely spaced (1-7 ribs/0.5 mm on the penultimate whorl), sinuous, often with a shallowly concave projection half-way, abrading to a (slightly) sinuous scar, those on the tuba moderately to widely spaced (2-3 ribs/0.5 mm half-way), below with a shallowly concave projection, abrading to a not or slightly sinuous scar. Spiral striation absent. Umbilicus open, 0.15-0.25 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular. Peristome double; outer peristome (widely) spreading beyond the inner, but rather abruptly narrowed towards, and absent along the right side of the aperture, with a distinct, widely rounded to obtuse wing along the upper side, and usually a similar but less conspicuous wing along the lower side; inner peristome hardly to distinctly protruding from the outer, spreading. Spire: height 2.4-3.5 mm; width 1.6-2.2 mm; index 1.4-1.6. Total width 3.0-4.0 mm. Height and width aperture 0.7-1.0 mm.

Distribution. — Borneo: Sarawak, 4th Div., G. Mulu Nat. Park.

Notes. — 1. Shows variability in the size of the shells, the shape of the spire (its sides varying from straight to distinctly convex because of a tightly coiled last whorl), the size of the tuba (short in some specimens, long and prominent in others), and the presence or absence of a basalis.

2. Similar to *O. dipterum*, see the notes under that species.

38 - **Opisthostoma bihamulatum** spec. nov.
fig. 33, 70

Material seen. — SABAH. Tawau Zone: G. Baturong, 50 km WSW. of Lahad Datu (leg. Dorman, UF 196784/>10; do. 196793/>10; do. 196817/>10; V 1837/>10, HOLOTYPE RMNH 56917).

Spire conical with about flat sides. Apex (slightly) oblique. Whorls 5 3/8-6 3/8, convex; last whorl rounded. Constriction with a parietalis, a longitudinal and a transverse palatalis, a columellaris, a knob- to ridge-shaped transverse basalis that is sometimes fused to the columellaris. Tuba gradually narrowed towards the constriction, rounded or slightly angular below. Radial ribs moderately to widely spaced (3-6 ribs/0.5

mm on the penultimate whorl, 3-5 ribs/0.5 mm half-way the tuba), (hardly) sinuous, those close to the tuba not sinuous; those on the tuba not or slightly sinuous below. Spiral striation present, often inconspicuous. Umbilicus open, 0.15-0.25 mm across. Aperture tilted up to 30° with regard to the coiling axis, subrectangular to subtriangular. Peristome almost touching the spire or distant from it, double; outer peristome (somewhat) spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, with an inconspicuous to distinct edge or a small projection along the left side and a (moderately) distinct edge or small, obtuse (rounded but not widely so) projection along the upper side; inner peristome protruding from the outer, spreading. Spire: height 1.6-2.3 mm; width 1.2-1.5 mm; index 1.2-1.7. Total width 2.0-2.7 mm. Height and width aperture 0.5-0.6 mm.

Distribution. — Borneo: Sabah, Tawau Zone, G. Baturong.

Notes. — Well characterized by the two small projections on the outer peristome, along the left and upper side of the aperture. The name refers to this character.

39 - *Opisthostoma simplex* Fulton, 1901
fig. 34, 72

Opisthostoma simplex Fulton, 1901: 243; syntypes ("Gomanton Hill, N. Borneo") BMNH 1901.12.9.168/1 & 1901.12.13.9-12/4.

Material seen. — SABAH. Sandakan Zone: limestone hill 7 miles E. of Lamag, 3 miles NNW. of Laab, near road Lahad Datu-Sandakan, near Kinabatangan R. (leg. Wilford, UF 194804/8; do. 194805/>10); Bt. Gomantong, 30 km S. of Sandakan (BMNH/5, see above; UF 160198; leg. Wilford, UF 194798/>10; do. 194799/>10; V 1589/4). "North Borneo" (UF 133021/2).

Spire conical with slightly concave to slightly convex sides. Apex not oblique. Whorls 5 1/8-6 3/8, convex; last whorl rounded to slightly angular. Constriction with a parietalis, a longitudinal and a transverse palatalis, a columellaris which continues as a knob- to ridge-shaped transverse basalis. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs on the spire rather closely placed to moderately spaced (4-5 ribs/0.5 mm on the penultimate whorl), sinuous or not, but those close to the tuba not sinuous; those on the tuba moderately spaced (3 ribs/0.5 mm half-way), slightly sinuous below. Spiral striation present, often inconspicuous. Umbilicus open, 0.25-0.40 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular, elliptic or slightly angular. Peristome touching the spire or distant from it, double; outer peristome spreading beyond the inner, gradually to rather abruptly narrowed towards, and absent along the right side of the aperture, usually with a distinct, obtuse (rounded but not widely so) wing along the upper side, and sometimes a similar but less conspicuous wing along the lower side; inner peristome moderately protruding from the outer, often with a few protruding lamellae on its outer surface, spreading. Spire: height 1.5-2.2 mm; width 1.2-1.6 mm; index 1.2-1.5. Total width 2.0-2.5 mm. Height and width aperture 0.5-0.6 mm.

Distribution. — Borneo: Sabah, Sandakan Zone, isolated limestone hills in the Kinabatangan Valley.

Notes. — 1. Known from two populations only. The population found on a limestone scarp N. of Batu Laab shows less variability than the population at Bt. Gomantong: all specimens have the peristome adnate to the spire.

2. Part of a species complex, see note under *O. lissopleuron*.

40 - **Opisthostoma transequatorialis** spec. nov.
fig. 35, 70

Material seen. — KALIMANTAN. Kalimantan Selatan: G. Siamang near Desah Liu, 30 km E. of Tandjung (V 3096/1); G. Buleh, 4 km E. of Muara Uja (V 3699/>10, HOLOTYPE RMNH 56918); Jaro near Muara Uja, limestone escarpment W. of the village (V 3200/>10); G. Halat, near border Kalimantan Timur along main road Banjarmasin-Balikpapan (V 2795/>10); 7 km N. of Kintap (V 3681/1). Kalimantan Timur: G. Melihat, foot of S.-facing slope, between river and main road Banjarmasin-Balikpapan (V 2947/>10); 30 km W. of Balikpapan (leg. Van Balgooij, V 2506/4).

Spire conical with flat to concave sides, rarely with very slightly convex sides. Apex slightly oblique or not. Whorls 4 5/8-6 7/8, convex; last whorl rounded or slightly angular. Constriction with a sharply outlined, regularly shaped parietalis, a similar longitudinal palatalis, a transverse palatalis, a columellaris gradually thinning out towards the basal side of the constriction. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs (moderately) spaced (3-5 ribs/0.5 mm on the penultimate whorl, 3-4 ribs/0.5 mm half-way on the tuba), (slightly) sinuous (rarely not so); those on the tuba not sinuous. Spiral striation fine. Umbilicus open, 0.20-0.35 mm across. Aperture tilted up to 30° with regard to the coiling axis, circular to subrectangular. Peristome distant from the spire, double; outer peristome hardly to moderately spreading beyond the inner, but gradually narrowed towards, and absent narrow along the right side of the aperture, often slightly widened along the upper side; inner peristome slightly protruding (rarely somewhat more protruding) from the outer, spreading. Spire: height 1.5-2.3 mm; width 0.9-1.5 mm; index 1.3-1.7. Total width 1.7-3.0 mm. Height and width aperture 0.4-0.6 mm.

Distribution. — Borneo: Kalimantan, SE. and E. part.

Notes. — 1. *O. decrespignyi* usually has straight radial ribs, as well as a columellaris which abruptly ends towards the basal side of the constriction.

2. The name refers to the fact that this is the only species of subg. *Plectostoma* occurring S. of the equator.

41 - *Opisthostoma jucundum* E.A. Smith, 1893
fig. 36, 70

Opisthostoma jucundum E.A. Smith, 1893a: 347; syntypes ("Mantanani Island") leg. Everett, BMNH 92.7.20.129-130/2 & 92.7.23.31-32/2.

Material seen. — SABAH. West Coast Zone: Mantanani Islands (BMNH/4, see above; NMW/6; RMNH/2; UF 160192/2).

Spire conical with flat sides. Apex slightly oblique or not. Whorls 5 7/8-6 1/8, convex; last whorl rounded. Constriction with a parietalis, a longitudinal and a transverse palatalis, a columellaris which continues as a ridge-shaped transverse basalis. Tuba gradually narrowed towards the constriction, rounded below. Radial ribs on the spire moderately to widely spaced (3-5 ribs/0.5 mm on the penultimate whorl), sinuous with a shallowly concave projection half-way, abrading to a sinuous scar, those on the tuba widely spaced (2-3 ribs/0.5 mm half-way), below slightly sinuous and with a shallowly concave projection, abrading to a not or slightly sinuous scar. Spiral striation distinct, rather coarse. Umbilicus open, 0.30-0.35 mm across. Aperture hardly tilted with regard to the coiling axis, circular to elliptic. Peristome distant from the spire, double; outer peristome only slightly spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, sometimes slightly

widened along the upper side; inner peristome slightly protruding from the outer, spreading. Spire: height 2.0-2.3 mm; width 1.4-1.5 mm; index 1.4-1.5. Total width 2.5-2.8 mm. Height aperture 0.5-0.6 mm; width 0.6 mm.

Distribution. — Borneo: Sabah, West Coast Zone, Mantanani Islands.

42.1 - **Opisthostoma lissopleuron lissopleuron** spec. nov.
fig. 37, 72

Material seen. — SABAH. Sandakan Zone: Bt. Kolop, 4 miles WSW. of Latangan (leg. Wilford, UF 194812/5; do. 194903/>10); Batu Tumanggong Besar, 1 mile downstream Sukau, along Kinabatangan R. (leg. Wilford, UF 194800/>10; do. 194882/1; do. 194883/>10; do 194902/>10). Tawau Zone: 'Kirk's Cave', 8 km N. of Lahad Datu (leg. Smits, M 14078/4; leg. Saul, NMW 1968.92/4; do. UF 194874/3; V 1252/>10); limestone hill at km 52 road Tawau-Lahad Datu, 2 km N. of junction with road to Semporna (leg. Dorman, UF 196851/>10); Bt. Pababola, Segarong Hills 25 km ESE. of Kunak (V 1757/>10, HOLOTYPE RMNH 56919); Batu Tenggar, Segarong Hills 25 km ESE. of Kunak (V 1803/>10); small limestone outcrop 15 miles NNW. of Kalabakan (leg. Wilford, UF 194884/>10).

Spire conical with concave to slightly convex sides. Apex slightly oblique or not. Whorls 5 3/8-6 7/8, convex; last whorl rounded to slightly angular. Constriction with a parietalis, a longitudinal and a transverse palatalis, a columellaris which continues as a knob- to ridge-shaped transverse basalis. Tuba gradually narrowed towards the constriction, rounded to angular below. Radial ribs on the spire closely placed to moderately spaced (3-8 ribs/0.5 mm on the penultimate whorl), sinuous or not, those on the tuba rather closely placed to moderately spaced (3-6 ribs/0.5 mm half-way), sinuous or with a shallow to deep, semi-circular loop below, and sometimes with a short projection. Spiral striation inconspicuous to distinct. Umbilicus open, 0.35-0.55 mm across. Aperture tilted up to 45° with regard to the coiling axis, circular to elliptic. Peristome distant from the spire, double; outer peristome hardly to distinctly spreading beyond the inner, gradually narrowed towards, and absent or very narrow along the right side of the aperture, often with a widely rounded wing along the upper side of the aperture, and sometimes a similar but less conspicuous wing along the lower side; inner peristome hardly to moderately protruding from the outer, at most with inconspicuous lamellae on its outer surface, spreading. Spire: height 1.7-2.4 mm; width 1.1-1.6 mm; index 1.3-1.7. Total width 2.2-3.2 mm. Height and width aperture 0.5-0.7 mm.

Distribution. — Borneo. Sabah, E. part, on widely scattered limestone hills.

Notes. — 1. *O. l. lissopleuron* consists of a number of well isolated populations, each slightly different from the others, but each showing variability to such an extent that overlap in characters exists with other populations. The populations can be grouped as follows:

– a. Populations in the Segarong Hills (including the type specimen) have moderately to widely spaced radial ribs and medium-sized shells;

– b. Populations in the Kinabatangan Valley (near Sukau and Bt. Kolop) often have smaller shells than the type, with more densely placed, sometimes straight radial ribs. They may also have deeply looped radial ribs on the tuba. The population on Bt. Kolop has a slightly wider umbilicus. Specimens similar to the type specimen also occur. All these forms are morphologically linked by intermediates;

– c. Populations in the Segama Valley and near Kunak. These have a very wide umbilicus, and often a more or less knob-shaped basalis in the constriction (reminiscent of subspec. *bigibbum*). A population from near Kalabakan has an umbilicus of a size intermediate between this and the type.

2. Together, two populations are distinguished as a subspecies here, because it is not certain whether they should be given a taxonomic status or not. If larger series of shells are available, they can easily be distinguished; single shells, however, may fall within the variability of the type subspecies.

3. *O. simplex*, *O. lissopleuron*, and possibly *O. concinnum* show a remarkable similarity in most features. Together they may constitute a species complex. Within the complex, *O. concinnum* and *O. simplex* both have a single unique character: the first has distinct projections on the radial ribs on the spire; the second can usually be distinguished unequivocally on account of the protruding lamellae on the outer surface of the inner peristome. In one location *O. concinnum* occurs together with *O. simplex*, and in one or possibly two others with *O. lissopleuron bigibbum*. In such locations the taxa involved perfectly retain their identity: each specimen can easily be identified as belonging to one of the taxa, and no intermediates are found. It is therefore decided that at least *O. concinnum* can be regarded as a separate species; and although *O. simplex* has not (yet) been encountered together with *O. lissopleuron*, it is thought best to treat this taxon in the same way.

4. The name 'lissopleuron' refers to the lack of any projections on the radial ribs.

42.2 - **Opisthostoma lissopleuron bigibbum** subspec. nov.
fig. 38, 72

Material seen. — SABAH. Sandakan Zone: limestone escarpment along Sg. Tabin, lower Segama Valley (leg. Wilford, UF 194801/>10). Tawau Zone: G. Madai, 40 km SSW. of Lahad Datu (leg. Dorman, UF 196754/>10; V 1702/>10, HOLOTYPE RMNH 56920).

As the type subspecies, but spire with slightly concave to convex sides. Constriction with a distinctly knob-shaped basalis. Radial ribs on the spire rather closely placed to moderately spaced (3-6 ribs/0.5 mm on the penultimate whorl), slightly sinuous, but those close to the tuba often not or hardly sinuous; those on the tuba moderately to widely spaced (2-4 ribs/0.5 mm half-way). Umbilicus 0.30-0.40 mm across. Aperture tilted up to 80° with regard to the coiling axis. Peristome (widely) distant from the spire, outer peristome somewhat spreading beyond the inner or not, sometimes slightly widened along the upper side of the aperture; inner peristome hardly protruding from the outer. Spire: height 1.6-2.1 mm; width 1.2-1.4 mm; index 1.2-1.5. Total width 2.0-2.6 mm. Height and width aperture 0.5-0.7 mm.

Distribution. — Borneo. Sabah, SE. part, on two widely distant limestone hills.

Notes. — 1. Differs from lissopleuron by usually having a distinctly knob-shaped basalis. Some specimens of lissopleuron have a similar but less conspicuous basalis, but these usually have the outer peristome distinctly spreading beyond the inner. Specimens of subspec. *bigibbum* often have a longer tuba than the type subspecies.

2. *O. tuba* does not have a longitudinal palatalis in the constriction; *O. decrespignyi* does not have a basalis.

3. The name refers to the two knobs present along on the basal side of the constriction.

43 - *Opisthostoma picsingense* E.A. Smith, 1905
fig. 39

Opisthostoma picsingense E.A. Smith, 1905a: 190; holotype ("Picsing, Upper Sadong, Sarawak") leg. Beddome, BMNH 1905.2.24.16.

Material seen. — SARAWAK. 1st Div.: SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194835/>10; do. 194836/8; do. 194845/>10); Kpg. Piching, near Serian (BMNH/1, see above; NMW/7); G. Selabor, W. of Kpg. Lobang Batu, 12.5 km S. of Tebakang (leg. Wilford, UF 194837/>10; do. 194838/>10; do. 194839/>10; do. 194840/>10; do. 194841/>10; do. 194842/>10; do. 194843/>10; do. 194844/>10; V 2093/>10).

Spire conical with slightly to distinctly concave sides. Apex not oblique. Whorls 5 1/4-5 7/8; top whorls convex; next whorls slightly convex; last whorl almost sharply angular at the periphery, almost flat to slightly concave above, almost flat below. Constriction with a parietalis, a transverse palatalis. Tuba gradually narrowed towards the constriction, angular or with an almost sharp ridge below. Radial ribs on the spire (rather) closely placed (6-10 ribs/0.5 mm on the penultimate whorl), not sinuous, or very slightly so on the lower half of the penultimate whorl; but those on the last whorl closely placed to widely spaced (2-12 ribs/0.5 mm half-way), with a single deep loop on the periphery when the shell is observed in front view; those on the tuba closely placed to widely spaced (2-12 ribs/0.5 mm half-way), below with a short, shallowly concave to deeply trough-shaped projection abrading to a slightly sinuous to deeply looped scar. Spiral striation absent or inconspicuous. Umbilicus open, 0.15-0.20 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin below the level of the apex, usually elliptic. Peristome (almost) touching the spire, sometimes distant from it, double; outer peristome widely spreading beyond the inner, but narrowed towards, and absent along the right side of the aperture, along the upper side of the aperture widened or with a an obtuse (rounded but not widely so) wing which is sometimes truncated on its right side, along the left and the lower side often with a similar but less distinct wing ; inner peristome slightly to moderately protruding from the outer, spreading. Spire: height 1.8-2.5 mm; width 1.3-1.5 mm; index 1.4-1.7. Total width 2.3-3.1 mm. Height aperture 0.6-0.7 mm; width 0.7-0.8 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone ranges S. of Kuching, on widely scattered localities.

Notes. — Specimens with the aperture not touching the spire, and with a distinct wing along the upper side of the aperture (e.g. UF 194841 from the Serian area) differ from *O. heteropleuron* in having a spire with sinuous radial ribs.

44 - **Opisthostoma perspectivum** spec. nov.
fig. 40, 72

Material seen. — SABAH. Interior Zone: Batu Punggol SE. of Sepulot (leg. Dorman, UF196623/>10; V1891/>10, HOLOTYPE RMNH 56921).

Spire conical with about flat sides. Apex slightly oblique or not. Whorls 5 1/8-5 5/8, moderately convex; last whorl rounded to slightly angular. Constriction with a short, sometimes inconspicuous parietalis, a transverse palatalis, a small columellaris. Tuba gradually narrowed towards the constriction, rounded or slightly angular below. Radial ribs widely spaced (1-2 ribs/0.5 mm on the penultimate whorl and half-way on the tuba), those on the spire with a shallowly concave to deeply trough-shaped projection on the lower half of the whorls, abrading to a sinuous or deeply looped scar; but those close to the tuba with a deeply trough-shaped projection on the periphery, abrading to a scar with a single deep loop when the shell is observed in front view; those on the tuba similar but with an almost tubular, curved projection below which is swollen at the tip. Spiral striation absent, rarely inconspicuous. Umbilicus open, 0.40-0.55 mm across. Aperture

tilted up to 45° with regard to the coiling axis, its upper margin about level with the apex or widely above it, circular to elliptic. Peristome distant from the spire, double; outer peristome narrowed towards, and absent along the right and lower side of the aperture, along the upper side with a widely projecting, large, widely rounded wing which has (strongly) recurved margins, and is often truncated to its right side; inner peristome distinctly protruding from the outer, spreading. Spire: height 1.7-2.0 mm; width 1.3-1.5 mm; index 1.3-1.4. Total width 2.5-3.0 mm. Height and width aperture 0.6-0.7 mm.

Distribution. — Borneo: Sabah, Interior Zone, Batu Punggol E. of Sepulot only.

Notes. — 1. *O. heteropleuron* and *O. mirabile* have an outer peristome which is about flat along the margins; next to this the latter has a longitudinal palatalis.

2. The name refers to the wide umbilicus of this species.

45 - **Opisthostoma heteropleuron** spec. nov.
fig. 41, 71

Material seen. — SARAWAK. 1st Div.: Kpg. Beratok along road Kuching-Serian (V 2026/5); mile 21 road Kuching-Serian, Bt. Akut (possibly same locality) (leg. Wilford, UF 194779, HOLOTYPE).

Spire conical with (slightly) concave sides. Apex not oblique. Whorls 4 3/4-5, convex; last whorl obtusely angular at the periphery, slightly concave above, almost flat to slightly convex below. Constriction with a transverse palatalis. Tuba gradually narrowed towards the constriction, obtusely angular or with an obtuse ridge below. Radial ribs on the spire rather closely placed (5-6 ribs/0.5 mm on the penultimate whorl), distinctly sinuous, but those on the last whorl widely spaced (2 ribs/0.5 mm half-way), with a deeply trough-shaped projection on the periphery, abrading to a scar with a single deep loop when the shell is observed in front view; those on the tuba widely spaced (2-3 ribs/0.5 mm half-way), similar but with a long, slightly curved projection. Spiral striation present, often rather coarse. Umbilicus open, 0.15-0.30 mm across. Aperture tilted 30-45° with regard to the coiling axis, its upper margin at most about level with the apex, circular. Peristome distant from the spire, double; outer peristome widely spreading beyond the inner, but narrowed towards, and absent along the right side of the aperture, with a distinct, obtuse (rounded but not widely so) wing with a truncated or concave right margin along the upper side of the aperture, and with or without a similar but less distinct wing along the lower side; inner peristome (moderately) protruding from the outer, spreading. Spire: height 1.4-1.7 mm; width 1.0-1.1 mm; index 1.4-1.7. Total width 2.3-2.4 mm. Height and width aperture 0.6 mm.

Distribution. — Borneo: Sarawak, 1st Div., one or a few limestone hills along the road from Kuching to Serian. Close to extinction, or extinct, due to habitat destruction.

Notes. — 1. *O. everetti* and *O. stenotoreton* do not have a wing with a truncated or concave right margin along the upper side of the aperture. In *O. mirabile* this wing is larger; next to this the species has a longitudinal palatalis.

2. The name refers to the fact that the radial ribs on the last whorl of the spire as well as on the tuba have a projection, whereas the others have not.

46 - **Opisthostoma stellasubis** spec. nov.
fig. 42, 71

Material seen. — SARAWAK. 4th Div.: G. Subis (Batu Niah) (R/>10; leg. Dance, UF 194897/9; do. 194898/>10; do. 194899/>10; leg. Dorman, UF 196395/>10; V 1511/>10, HOLOTYPE RMNH 56922).

Spire conical with flat sides. Apex slightly oblique or not. Whorls 3 7/8-4 1/4; top whorls convex; last whorl obtusely angular at the periphery, only slightly convex above and below. Constriction with an inconspicuous parietalis or not, a transverse palatalis, an inconspicuous knob-shaped transverse basalis or not. Tuba abruptly narrowed towards the constriction, angular below. Radial ribs on the spire rather closely placed (5-6 ribs/0.5 mm on the penultimate whorl), distinctly sinuous on the lower half of the whorls, but those close to the tuba widely spaced (1-3 ribs/0.5 mm), hardly visible but on the periphery with a deeply trough-shaped to almost tubular, curved projection, abrading to a scar with a single deep loop when the shell is observed in front view; those on the tuba similar but with a longer projection below which is slightly swollen at the tip. Spiral striation absent. Umbilicus open, 0.40-0.45 mm across. Aperture tilted 40-50° with regard to the coiling axis, its upper margin widely above the level of the apex, circular to elliptic. Peristome touching the spire, double; outer peristome widely spreading beyond the inner but on the side which touches the spire with a deep sinus flanked at both sides by a distinct, widely rounded wing; inner peristome not or hardly protruding from the outer, spreading. Spire: height 1.4-1.7 mm; width 1.2-1.4 mm; index 1.1-1.3. Total width 2.5-2.6 mm. Height aperture 0.7 mm; width 0.5-0.6 mm.

Distribution. — Borneo: Sarawak, 4th Div., G. Subis only.

Notes. — 1. Well characterized by its low and wide spire, its very large tuba, and its deeply notched outer peristome.

2. The name 'stellasubis', 'the star of G. Subis' was thought to be an apt epitheton for this spectacular species.

47 - *Opisthostoma grandispinosum* Godwin Austen, 1889
fig. 43, 71

Opisthostoma grandispinosum Godwin Austen, 1889: 350; holotype ("Niah Hills") leg. Everett, (not seen).
Opisthostoma tiesenhauseni Gredler, 1902: 58; holotype ("Niah, Distrikt Baram") leg. Gredler (not seen).

Material seen. — SARAWAK. 4th Div.: G. Subis (Batu Niah) (UF 133010/1; leg. Dorman, UF 196435/>10; do. 196481/>10; leg. Wall, UF 59097/>10; do. 194809/>10; do. 194810/>10; V 1510/>10). "Baram, Borneo" (NMW/1). "Borneo" (NMW/3; NMW/1).

Spire conical with distinctly convex sides. Apex (slightly) oblique. Whorls 4 3/8-4 7/8; top whorls convex; last whorl obtusely angular at the periphery, slightly convex above and below. Constriction with a short and inconspicuous parietalis, a transverse palatalis, an inconspicuous columellaris. Tuba bulging and then abruptly narrowed towards the constriction, slightly angular below. Radial ribs widely spaced (1-2 ribs/0.5 mm on the penultimate whorl and half-way on the tuba), those on the spire hardly visible but on the lower half of the whorls with a deeply trough-shaped to almost tubular, slightly curved projection, abrading to a scar with a single deep loop; those on the tuba similar but more distinct, with a longer, strongly curved projection below which is swollen at the tip. Spiral striation absent. Umbilicus open, 0.35-0.50 mm across. Aperture tilted up to 20° with regard to the coiling axis, its upper margin widely above the level of the apex, elliptic. Peristome distant from the spire, double; outer peristome hardly to moderately spreading beyond the inner all around, or sometimes gradually narrowed towards, and absent along the side of the aperture which is closest to the spire; inner peristome not or hardly protruding from the outer, spreading. Spire: height 1.9-2.2 mm; width 1.7-2.0 mm; index 1.0-1.1. Total width 2.8-3.1 mm. Height aperture 1.4 mm; width 1.1 mm.

Distribution. — Borneo: Sarawak, 4th Div., G. Subis only.

Notes. — The types of *O. grandispinosum* and *O. tiesenhauseni* were not available to the author. However, from the original descriptions of the two, as well as Godwin Austen's adequate illustration of the former, it appears that they must be conspecific.

48 - *Opisthostoma hosei* Godwin Austen, 1890
fig. 44, 71

Opisthostoma hosei Godwin Austen, 1890: 246; syntypes ("Baram District, Borneo") leg. Hose, BMNH 914.03.VII.1/2.

Material seen. — SARAWAK. 4th Div.: G. Subis (Batu Niah) (NMW/4; R/>10; leg. Dorman, UF 196431/>10; leg. Wall, UF 194814/1; do. 194875/9; V 1513/>10). "Baram District, Borneo" (BMNH/2, see above).

Spire conical with about flat sides. Apex slightly oblique. Whorls 4 1/4-5 1/4; top whorls convex; last whorl obtusely angular at the periphery, flat to slightly convex above and below. Constriction with a transverse palatalis. Tuba slightly bulging and then abruptly narrowed towards the constriction, obtusely angular or with an obtuse ridge below. Radial ribs on the spire either entirely absent, or present on the top whorls only, or present on the entire spire, if present rather closely placed to moderately spaced (3-5 ribs/0.5 mm on the penultimate whorl), distinctly sinuous on the lower half of the whorls; but those close to the tuba with a single deep loop on the periphery when the shell is observed in front view; those on the tuba (moderately) spaced (2-4 ribs/0.5 mm half-way), below with a short, but deeply trough-shaped projection, abrading to a deeply looped scar. Spiral striation absent. Umbilicus open, 0.20-0.30 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin usually below the level of the apex, sometimes slightly above, about circular. Peristome widely distant from the spire, double; outer peristome somewhat spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture; inner peristome slightly protruding from the outer, widely spreading. Spire: height 1.5-2.2 mm; width 1.1-1.5 mm; index 1.2-1.6. Total width 2.2-3.1 mm. Height and width aperture 0.5-0.8 mm.

Distribution. — Borneo: Sarawak, 4th Div., G. Subis only.

Notes. — May have a distinctly higher spire than the depicted specimens.

49 - *Opisthostoma cookei* E.A. Smith, 1894
fig. 45, 71

Opisthostoma cookei E.A. Smith, 1894: 271; syntypes ("Sarawak") leg. Hose, BMNH 89.5.24.2-6/5.

Opisthostoma sarawacense Gredler, 1902: 57; paratypes ("Niah, im Distrikte von Sarawak") leg. Gredler, SMF 191644/4.

Material seen. — SARAWAK. 4th Div.: G. Subis (Batu Niah) (NMW/1; R/6; leg. Gredler, SMF 191644/4, see above; leg. Dorman, UF 196433/>10; V 1512/>10). "Sarawak" (BMNH/5, see above).

Spire conical with flat to distinctly concave sides. Apex not oblique. Whorls 5 5/8-6 3/8; top whorls convex; next whorls slightly convex; last whorl obtusely angular at the periphery, flat above, slightly convex below. Constriction with an inconspicuous parietalis, a transverse palatalis, a distinct columellaris. Tuba gradually narrowed towards the constriction, rounded, somewhat angular or with a slight, obtuse ridge below. Radial ribs on the spire (rather) closely placed (5-6 ribs/0.5 mm on the penultimate whorl), hardly visible but on the lower third of the whorls with a slight, shallowly

concave projection abrading to a sinuous scar, those close to the tuba similar but abrading to a scar with a single, shallow or deep loop when the shell is observed in front view; those on the tuba moderately to widely spaced (1-3 ribs/0.5 mm half-way), more distinct, below with a short, (deeply) trough-shaped projection abrading to a sinuous to deeply looped scar. Spiral striation absent. Umbilicus open, 0.35-0.40 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin widely below the level of the apex, circular to elliptic. Peristome widely distant from the spire, double; outer peristome hardly to moderately spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture; inner peristome slightly protruding from the outer, widely spreading. Spire: height 2.0-2.5 mm; width 1.3-1.6 mm; index 1.5-1.6. Total width 2.8-3.0 mm. Height aperture 0.7 mm; width 0.6-0.7 mm.

Distribution. — Borneo: Sarawak, 4th Div., G. Subis only.

Notes. — May have a higher spire than the depicted specimen, with distinctly concave sides.

50 - *Opisthostoma everetti* E.A. Smith, 1893
fig. 46, 71

Opisthostoma everetti E.A. Smith, 1893a: 346; syntypes ("Jambusan, N.W. Borneo") BMNH 92.7.20.125-126/2 & 92.7.23.29-30/2.

Material seen. — SARAWAK. 1st Div.: G. Pangga 3 km ENE. of Bau (V 2143/>10); G. Doya 2 miles SE. of Bau (leg. Wilford, UF 194909/1); G. Jambusan 4 km SE. of Bau (BMNH/4, see above; V 2180/>10). "North Borneo" (NMW/7; UF 133009/2). "Borneo" (UF 160189/3).

Spire conical with about flat sides. Apex not oblique. Whorls 4 7/8-5 3/8, convex; last whorl rounded. Constriction with an inconspicuous parietalis, a transverse palatalis. Tuba gradually narrowed towards the constriction, slightly angular below. Radial ribs on the spire widely spaced (2-3 ribs/0.5 mm on the penultimate whorl), with a (deeply) trough-shaped projection half-way the whorls, abrading to a (deeply) looped scar, but those on the last whorl with a double-channeled projection (the lower channel deeper than the upper) abrading to a scar with two adjacent loops when the shell is observed in front view; those on the tuba widely spaced (1-2 ribs/0.5 mm half-way), below with a long, deeply trough-shaped to almost tubular, almost straight to distinctly curved projection abrading to a deeply looped scar. Spiral striation present. Umbilicus open, 0.25-0.30 mm across. Aperture tilted 30-45° with regard to the coiling axis, its upper margin slightly below the level of the apex, sometimes slightly above it, circular. Peristome distant from the spire, double; outer peristome moderately to widely spreading beyond the inner all around, but gradually narrowed towards the right side of the aperture and sometimes (almost) absent there; inner peristome slightly to moderately protruding from the outer, (widely) spreading. Spire: height 1.8-2.2 mm; width 1.3-1.5 mm; index 1.3-1.5. Total width 2.6-3.1 mm. Height aperture 0.7-0.8 mm; width 0.7-0.9 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone ranges around Bau.

Notes. — 1. Similar to *O. anisopterum*, *O. heteropleuron* and *O. stenotoreton*; see the notes under these respective species.

2. Van Benthem Jutting (1952: 8, fig. 2) provides an illustration of some radula teeth of this species.

51 - **Opisthostoma stenotoreton** spec. nov.
fig. 47, 71

Material seen. — SARAWAK. 4th Div.: Bt. Vrong, Beluru area SW. of Marudi (leg. Wilford, UF 194904/>10; do. 194905/>10, incl. HOLOTYPE; do. 194906/>10; do. 194907/8).

Spire conical with about flat to concave sides. Apex not oblique. Whorls 5 5/8-6, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba gradually narrowed towards the constriction, slightly angular below. Radial ribs on the spire widely spaced (2 ribs/0.5 mm on the penultimate whorl), with a (deeply) trough-shaped projection on the lower half of the whorl, abrading to a (deeply) looped scar, those on the last whorl with a straight projection abrading to a scar with a single deep loop when the shell is observed in front view; those on the tuba widely spaced (1-2 ribs/0.5 mm half-way), with a longer, curved projection, otherwise similar. Spiral striation present. Umbilicus open, 0.15-0.20 mm across. Aperture tilted 30-45° with regard to the coiling axis, its upper margin below the level of the apex, circular to elliptic. Peristome distant from the spire, double; outer peristome slightly to moderately spreading beyond the inner, usually gradually narrowed towards, and narrow or absent along the right side of the aperture; inner peristome slightly protruding from the outer, (widely) spreading. Spire: height 2.1-2.5 mm; width 1.3-1.4 mm; index 1.5-1.9. Total width 2.8-3.1 mm. Height aperture 0.6-0.9 mm; width 0.7-0.8 mm.

Distribution. — Borneo: Sarawak, 4th Div., Beluru area.

Notes. — 1. *O. everetti* and *O. anisopterum* have the projections on the radial ribs close to the tuba abrading to a scar with a double loop; next to this, *O. anisopterum* has a longitudinal palatalis. Also similar to *O. heteropleuron*; see the note under that species.

2. The name refers to the narrow umbilicus.

52 - *Opisthostoma shelfordi* E.A. Smith, 1905
fig. 48, 72

Opisthostoma shelfordi E.A. Smith, 1905a: 189; holotype ("Picsing, Upper Sadong, Sarawak") BMNH 1905.2.24.17.

Material seen. — SARAWAK. Kpg. Piching (BMNH/1, see above). "Sarawak" (NMW/2).

Spire conical with flat sides. Apex not oblique. Whorls 4 3/4-5, moderately convex; last whorl rounded to slightly angular at the periphery. Constriction with a transverse palatalis (only checked through the shell wall). Tuba touching the spire over its entire length, close to the constriction with a sharply outlined, distinct swelling, on top with a deep semi-circular furrow opening to the lower side if the shell is observed in front view; tuba rounded below. Radial ribs not sinuous, on the spire rather closely placed (4-5 ribs/0.5 mm on the penultimate whorl), slightly crested towards the upper margin of the whorls and there attached to the surface of the previous whorl; those on the tuba moderately spaced (3 ribs/0.5 mm half-way), without a crest as above. Spiral striation present. Umbilicus open, 0.30 mm across. Aperture hardly tilted with regard to the coiling axis, its upper margin widely above the level of the apex, about circular or slightly angular. Peristome touching the spire, double; outer peristome spreading beyond the inner, but rather abruptly narrowed towards, and absent or narrow along the right and lower side of the aperture, with a distinct, rounded wing along the lower left side and a similar, less conspicuous wing along the upper right side; inner peristome protruding from the outer, spreading, with some spreading lamellae on its outer surface.

Spire: height 1.5-1.7 mm; width 1.1-1.3 mm; index 1.3-1.4. Total width 1.5-1.7 mm. Height and width aperture 0.5 mm.

Distribution. — Borneo: Sarawak, 1st Div., near Serian. Not found again in recent years.

53 - **Opisthostoma lituus** spec. nov.
fig. 49, 71

Material seen. — SARAWAK. 4th Div., Bt. Sarang, Tatau Valley (leg. Bong, UF 59103/>10; do. 194705/>10 incl. HOLOTYPE).

Spire conical with slightly convex sides. Apex oblique. Whorls 4 5/8-5 3/8, convex; last whorl rounded. Constriction with an inconspicuous transverse palatalis, an inconspicuous columellaris. Tuba free from the spire but usually touching it again near the apex, bulging and then abruptly narrowed towards the constriction, rounded below. Radial ribs on the spire rather closely placed to moderately spaced (3-8 ribs/0.5 mm on the penultimate whorl), often widened and flattened on the lowermost part of the whorls, with a (shallowly) concave projection on the lower half of the whorls, usually abraded to a (slightly) sinuous to shallowly looped scar, but often to a hardly sinuous scar on the last whorl; those on the tuba closely placed to moderately spaced (5-9 ribs/0.5 mm half-way), not or slightly sinuous below. Spiral striation absent. Umbilicus open, 0.15-0.20 mm across. Aperture tilted up to 60° with regard to the coiling axis, its upper margin slightly below the level of the apex to widely above it, circular to elliptic. Peristome touching the spire or slightly distant from it, double; outer peristome only slightly spreading beyond the inner, but gradually narrowed towards, and absent along the right or lower side of the aperture; inner peristome slightly protruding from the outer, moderately spreading. Spire: height 1.4-1.6 mm; width 1.0-1.2 mm; index 1.3-1.6. Total width 1.2-1.5 mm. Height aperture 0.4-0.6 mm; width 0.5 mm.

Distribution. — Borneo: Sarawak, 4th Div., Tatau Valley.

Notes. — 1. *O. tuba* has a wider umbilicus, the spire with flat to slightly concave sides and less sinuous radial ribs, as well as the tuba entirely free from the spire.

2. The name refers to the trumpet-shaped tuba.

54 - **Opisthostoma tuba** spec. nov.
fig. 50, 71

Material seen. — SARAWAK. 4th Div., Bt. Sarang, Tatau Valley (leg. Bong, UF 59099/>10; do. 194710/>10 incl. HOLOTYPE, do. 194711/>10).

Spire conical with flat to slightly concave sides. Apex oblique or not. Whorls 5-5 3/4, convex; last whorl rounded. Constriction with a transverse palatalis, sometimes an inconspicuous columellaris. Tuba free from the spire, rarely close to it again near the apex, gradually to abruptly narrowed towards the constriction, rounded below. Radial ribs on the spire moderately spaced (4 ribs/0.5 mm on the penultimate whorl), (slightly) sinuous; but those close to the tuba rather closely placed to moderately spaced (4-8 ribs/0.5 mm), not or hardly sinuous; those on the tuba closely placed to moderately spaced (6-11 ribs/0.5 mm half-way), not sinuous below. Spiral striation absent. Umbilicus open, 0.30-0.40 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin slightly below the level of the apex to widely above it, circular to elliptic. Peristome distant from the spire, double; outer peristome only slightly spreading

beyond the inner, but gradually narrowed towards, and absent along the right or lower side of the aperture; inner peristome slightly protruding from the outer, moderately spreading. Spire: height 1.4-1.7 mm; width 0.9-1.0 mm; index 1.4-1.7. Total width 1.5-1.6 mm. Height aperture 0.5-0.6 mm; width 0.5 mm.

Distribution. — Borneo: Sarawak, 4th Div., Tatau Valley.

Notes. — 1. Similar to *O. lituus*, see the note under that species.

2. As in the preceding species, the name refers to the trumpet-shaped tuba.

55 - *Opisthostoma austeni* E.A. Smith, 1894
fig. 51

Opisthostoma austeni E.A. Smith, 1894: 272; syntypes ("Rumbang, Sarawak") BMNH 93.6.7.56-57/2 & 93.6.8.14-15/2.

Opisthostoma sadongense E.A. Smith, 1905a: 189; holotype ("Picsing, Upper Sadong, Sarawak") BMNH 1905.2.24.15.

Material seen. — SARAWAK. 1st Div.: quarry km 31.6 road Kuching-Bau (leg. Auffenberg, UF 183953/>10; do. 183984/>10); G. Pangga 3 km ENE. of Bau (V 2145/>10); 3 km SW of Taiton goldmine, near Bau (leg. Auffenberg, UF 183900/9; do. 183925/>10); G. Kapur 6 km SE. of Bau (V 2226/>10); SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194780/>10; do. 194781/>10; do. 194782/>10); Lobang Angin 2 km SW. of Bau (V 2297/1); G. Jambusan 4 km SE. of Bau (V 2179/>10); Kpg. Segur Benuk, mile 21 Penrissen Road (leg. De Vogel, V 2546/3); Kpg. Piching (BMNH/1, see above); 7.5 km WNW. of Kpg. Piching, near Serian (V 3827/2). "Sarawak" (UF 133003/2). "Rumbang, Sarawak" (BMNH/4, see above); "North Borneo" (RMNH/2; UF 160184/2). "Borneo" (NMW/7). "Borneo" or "Brunei", specimens mixed with *O. otostoma* (NMW/6; UF 160195/2), see note below.

Spire conical with flat to slightly convex sides. Apex (slightly) oblique. Whorls 4 5/8-5 5/8, convex; last whorl rounded. Constriction rarely with an inconspicuous parietalis, with a transverse palatalis. Tuba touching the spire over its entire length, gradually narrowed towards the constriction, rounded below. Radial ribs on the spire rather closely placed to widely spaced (3-8 ribs/0.5 mm on the penultimate whorl), not or slightly sinuous, but those on the last whorl not sinuous; those on the tuba (widely) spaced (2-4 ribs/0.5 mm half-way), not sinuous below, often with much finer radial riblets in between. Spiral striation absent. Umbilicus open, 0.15-0.25 mm across. Aperture tilted up to 30*ff* with regard to the coiling axis, its upper margin widely below the level of the apex, subtriangular with an obtusely angular to deeply grooved lower edge, an obtusely angular upper edge, an obtusely angular to slightly rounded right edge, the left side well rounded. Peristome double; outer peristome slightly to moderately spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, slightly widened along the upper side, and sometimes along the lower; inner peristome (moderately) protruding from the outer, somewhat spreading. Spire: height 1.8-2.2 mm; width 1.3-1.5 mm; index 1.3-1.6. Total width 2.3-2.7 mm. Height aperture 0.8-0.9 mm; width 0.5-0.7 mm.

Distribution. — Sarawak, 1st div., limestone ranges S. of Kuching. Particularly common in the Bau area; elsewhere only locally.

Notes. — 1. Similar to *O. goniostoma* and *O. pumilio*; see the notes under these species.

2. Two samples, from NMW and UF (see above), are mixed with *O. otostoma*, thus suggesting Labuan as a provenance. The UF sample is even labeled "Brunei". Both samples were collected long ago, probably in the same period as when the types of both species were collected. Similar samples of these and other species have been divided in small sets and distributed over numerous collections. It is assumed that the two mixta

are sets of a single sample, and that the mixing took place long after collecting, but before the distribution of the sample. It is concluded that *O. austeni* has never been found in the Labuan area.

56 - **Opisthostoma goniostoma** spec. nov.
fig. 52, 71

Material seen. — SARAWAK. 1st Div.: SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194783/8, incl. HOLOTYPE).

Spire conical with distinctly convex sides. Apex (distinctly) oblique. Whorls 3 5/8-4, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba touching the spire over its entire length, gradually narrowed towards the constriction, rounded below. Radial ribs not sinuous, on the spire moderately spaced (4 ribs/0.5 mm on the penultimate whorl); those on the tuba moderately to widely spaced (2-3 ribs/0.5 mm half-way), with numerous, much finer radial riblets in between. Spiral striation absent. Umbilicus open, 0.15-0.20 mm across. Aperture tilted 30-45° with regard to the coiling axis, its upper margin widely to slightly below the level of the apex, subrectangular with the upper and lower edge grooved, the left and right side well rounded. Peristome double; outer peristome slightly spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, with a slight widening with an obtuse (not widely rounded) top along the upper edge of the aperture; inner peristome moderately protruding from the outer, often with fine riblets outside, spreading. Spire: height 1.7-1.8 mm; width 1.5-1.6 mm; index 1.1-1.2. Total width 2.5-2.7 mm. Height aperture 0.9 mm; width 0.7 mm.

Distribution. — Borneo: Sarawak, 1st Div., near Bau.

Notes. — 1. *O. austeni* has a spire with flat or slightly convex sides; *O. pumilio* is distinctly smaller.

2. The name refers to the angular aperture.

57 - *Opisthostoma pumilio* E.A. Smith, 1894
fig. 53, 72

Opisthostoma pumilio E.A. Smith, 1894: 273; holotype ("Rumbang, Sarawak") leg. Everett, BMNH 93.6.7.58-59/2 & 93.6.8.16-17/2.

Material seen. — SARAWAK. 1st Div.: 7.5 km WNW. of Kpg. Piching, near Serian (V 1924/>10). "Rumbang, Sarawak" (BMNH/4, see above). "North Borneo" (NMW/3; RMNH/2; UF 160197/2).

Spire conical with distinctly convex sides. Apex oblique. Whorls 3 7/8-4 5/8, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba touching the spire over its entire length, gradually narrowed towards the constriction, rounded below. Radial ribs (moderately) spaced (3-7 ribs/0.5 mm on the penultimate whorl and half-way the tuba), on the spire slightly sinuous, but those on the last whorl not or hardly sinuous; those on the tuba not sinuous below, sometimes with some much finer radial riblets in between. Spiral striation absent. Umbilicus open, 0.10-0.15 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin widely below the level of the apex, subtriangular with an obtusely angular lower edge and a slightly wider rounded upper and right edge, the left side well rounded. Peristome (almost) touching the spire, double; outer peristome slightly spreading beyond the inner, but gradually narrowed towards, and absent along the right side and often along the lower

side of the aperture, often slightly widened along the upper side; inner peristome moderately protruding from the outer, not drawn out over the spire on the right side of the aperture, sometimes slightly spreading. Spire: height 1.3-1.7 mm; width 1.1-1.2 mm; index 1.2-1.4. Total width 1.8-2.1 mm. Height aperture 0.6-0.7 mm; width 0.5 mm.

Distribution. — Borneo: Sarawak, 1st Div., Serian area.

Notes. — 1. Similar to *O. goniostoma*; see the note under this species. *O. austeni* has a larger shell, as well as a spire with at most slightly convex sides. *O. wallacei* always has the lower side of the aperture more widely rounded, and usually at least some traces of a fine spiral striation are present. Besides, specimens sympatric with *O. pumilio* always have a parietalis in the contsriction, although elsewhere incidental specimens as well as populations are found without one. If in specimens of *O. wallacei* the inner peristome touches the spire, it is usually drawn out over the spire to some extent.

2. A sample from near Kpg. Piching (V 1924) has yielded a single sinistral specimen among hundreds of dextral specimens.

58 - **Opisthostoma wilfordi** spec. nov.
fig. 54, 71

Material seen. — SARAWAK. 4th Div.: near Bt. Kudi, Beluru area SW. of Marudi (leg. Wilford, UF 194785/>10; do. 194786/>10; do. 194877/>10; do. 194878/>10; do. 194879/>10, incl. HOLOTYPE); Bt. Vrong, Beluru area SW. of Marudi (leg. Wilford, UF 194880/>10; do. 194881/>10).

Spire conical with flat to concave sides. Apex not oblique. Whorls 4 7/8-6, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba free from the spire, gradually narrowed towards the constriction, rounded below. Radial ribs on the spire rather closely placed to widely spaced (3-8 ribs/0.5 mm on the penultimate whorl), not sinuous, but widely spaced (2-3 ribs/0.5 mm) on the last whorl; those on the tuba (rather) widely spaced (3-4 ribs/0.5 mm half-way), not or hardly sinuous. Spiral striation present, often very fine. Umbilicus open, 0.25-0.35 mm across. Aperture tilted up to 45° with regard to the coiling axis, its upper margin widely below the level of the apex, circular to elliptic. Peristome double, outer peristome slightly to moderately spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, sometimes slightly widened along the upper side; inner peristome slightly to moderately protruding from the outer, moderately spreading, usually somewhat drawn out on the right side of the aperture. Spire: height 1.4-1.8 mm; width 1.0-1.2 mm; index 1.2-1.7. Total width 2.0-2.3 mm. Height aperture 0.4-0.5 mm; width 0.5 mm.

Distribution. — Borneo: Sarawak, 4th Div., Beluru area.

Notes. — 1. In many specimens the disposition of the radial ribs on the spire is rather conspicuous: much wider spaced on the last whorl than on the previous ones. Specimens with widely spaced ribs all over the spire also occur.

2. Similar to *O. cyrtopleuron*; see the notes under the latter species. *O. decrespignyi* has more teeth in the constriction.

3. Named after the geologist G.E. Wilford. While prospecting for minerals in Borneo, three decades ago, he assembled a large collection of terrestrial molluscs by taking numerous soil samples in limestone areas.

59 - **Opisthostoma cyrtopleuron** spec. nov.
fig. 55, 71

Material seen. — SARAWAK. 4th Div.: Bt. Gading, Baram Valley, N. of Long Lama (leg. Wilford, UF 194726/>10; 194727/>10); Bt. Besungai, Baram Valley, 4 miles NE. of Long Lama, 0.5 mile SW. of Bt. Gading (leg. Stevens, UF 194729/>10; do. 194730/>10; do. 194731/>10; do. 194732/>10); G. Labang Tukeng near Kejin Trib, Baram Valley, 4 miles NE. of Long Lama (leg. Stevenson, UF 194728/>10). SABAH. Interior Zone: Batu Punggol SE. of Sepulot (leg. Dorman, UF 196625/>10; V 1892/>10); Pun Batu approximately 30 km W. of Sepulot (V 1285/>10, HOLOTYPE RMNH 56923).

Spire conical with flat to concave sides. Apex slightly oblique or not. Whorls 5 1/8-6 3/4, convex; last whorl rounded to slightly angular at the periphery, slightly convex above and below. Constriction with or without a parietalis, with a transverse palatalis, with or without a columellaris. Tuba free from the spire, gradually narrowed towards the constriction, rounded below. Radial ribs on the spire rather closely placed to widely spaced (3-6 ribs/0.5 mm on the penultimate whorl), (slightly) sinuous, sometimes flattened and inconspicuous on the upper half of the whorls; those on the tuba widely spaced (2-3 ribs/0.5 mm half-way), sinuous below or not, or with a shallowly concave to deeply trough-shaped projection, abrading to a scar with a shallow to deep, semi-circular loop. Spiral striation present, sometimes fine. Umbilicus open, 0.25-0.40 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin widely below the level of the apex, circular to elliptic. Peristome double, outer peristome slightly to distinctly spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, often slightly to distinctly widened along the upper side; inner peristome slightly to distinctly protruding from the outer, (moderately) spreading. Spire: height 1.7-2.5 mm; width 1.2-1.6 mm; index 1.3-1.7. Total width 2.6-3.1 mm. Height and width aperture 0.6-0.8 mm.

Distribution. — Borneo: Sarawak, 4th Div., Baram Valley. Sabah, Interior Zone, Sepulot area.

Notes. — 1. Three distant, and on average slightly different populations are included. The populations from the Sabah interior are most similar, although some series from Batu Punggol show, to a varying degree, a number of deviant characters: a higher spire with concave sides, a projection on the radial ribs on the tuba leaving a looped scar, a more widely flaring outer peristome, as well as a distinctly protruding inner peristome. The samples from the Baram Valley, Sarawak, differ from the Sabah specimens in often having partly flattened radial ribs on the spire, and often in lacking a parietalis and a columellaris in the constriction. In some Sarawak specimens, however, these teeth are inconspicuously present; in the Sabah specimens they are often distinct, but sometimes equally inconspicuous. Altogether, no characters can be found that are sufficiently diagnostic to distinguish further taxa.

2. *O. wilfordi* is usually smaller, has straight radial ribs on the spire and has a wider umbilicus when compared to the diameter of the spire.

3. The name refers to the sinuous radial ribs.

60 - **Opisthostoma pyrgiscus** spec. nov.
fig. 56, 72

Material seen. — SARAWAK. 1st Div.: G. Selabor, W. of Kpg. Lobang Batu, 12.5 km S. of Tebakang (leg. Wilford, UF 194733/1, HOLOTYPE).

Spire conical with flat sides. Apex oblique. Whorls 6, convex; last whorl rounded. Constriction with a transverse palatalis (only observed through the shell wall). Tuba free from the spire, gradually narrowed towards the constriction, rounded below. Radial ribs on the spire rather widely spaced (4 ribs/0.5 mm on the penultimate whorl), slightly sinuous, but those close to the tuba not sinuous; those on the tuba widely space (1-2 ribs/0.5 mm half-way), not sinuous. Spiral striation distinct. Umbilicus open, 0.15 mm across. Aperture hardly tilted with regard to the coiling axis, its upper margin widely below the level of the apex, circular. Peristome simple, slightly spreading. Spire: height 1.8 mm; width 1.0 mm; index 1.8. Total width 1.9 mm. Height and width aperture 0.4 mm.

Distribution. — Borneo: Sarawak, 1st Div., Serian area.

Notes. — 1. Well characterized by its high spire with well-spaced radial ribs, combined with a simple peristome.

2. The name refers to the turreted spire of this species.

61 - **Opisthostoma crassum** spec. nov.
fig. 57, 70

Material seen. — SARAWAK. 4th Div.: G. Mulu Nat. Park, Tutoh Valley, G. Benarat (leg. Wilford, UF 194939/3, incl. HOLOTYPE).

Spire conical with distinctly convex sides, almost cylindrical. Apex oblique. Whorls 4 1/8-4 5/8, distinctly convex; last whorl rounded. Constriction with an inconspicuous parietalis, a transverse palatalis. Tuba touching the spire over its entire length, gradually narrowed towards the constriction, rounded below. Radial ribs moderately spaced (5 ribs/0.5 mm on the penultimate whorl, as well as half-way the tuba), not sinuous. Spiral striation inconspicuous, very fine. Umbilicus open, 0.10 mm across. Aperture hardly tilted with regard to the coiling axis, its upper margin widely below the level of the apex, circular to slightly angular. Peristome touching the spire, double, outer peristome slightly to moderately spreading beyond the inner, but gradually narrowed towards, and absent or narrow along the right side of the aperture, slightly widened along the upper side or not; inner peristome moderately to distinctly protruding from the outer, moderately spreading, its outer surface and the upper surface of the outer peristome with some fine riblets or lamellae. Spire: height 1.1-1.2 mm; width 0.8 mm; index 1.4-1.5. Total width 1.4-1.5 mm. Height and width aperture 0.4 mm.

Distribution. — Borneo: Sarawak, 4th Div., G. Mulu Nat. Park.

Notes. — 1. *O. wallacei teinostoma* has similar, non-sinuous radial ribs on the spire. It differs in having a spire with flat or slightly convex sides, and with less spaced radial ribs, as well as in the inner peristome which is usually drawn out over the spire on its right side.

2. The name refers to the thick-set appearance of this species.

62.1 - *Opisthostoma wallacei wallacei* (Ancey, 1887)
fig. 58

Plectostoma wallacei Ancey, 1887: 276; holotype ("Borneo") (not seen).

Opisthostoma wallacei (Ancey) E.A. Smith, 1893a: 347.

Opisthostoma beddomei E.A. Smith, 1904: 105; syntypes ("Bidi Mountains, 20 miles from Sarawak") leg. Beddome, BMNH 1904.7.5.11-12.

Material seen. — SARAWAK. 1st Div.: Busau (NMW/5); 3 km SW of Taiton goldmine, near Bau (leg. Auffenberg, UF 183902/>10; do. 183924/>10); small gorge 1 mile S. of Bau (leg. Wilford, UF 194796/>10; do. 194900/>10); hill S. of Bau goldmine, 2.1 km S. of Bau (leg. Auffenberg, UF 183854/>10; do. 183860/3; do. 183868/>10; do. 183886/>10); 1 km S. of Bau, S. edge of active gold mine (leg. Dorman, UF 196362/>10); 2-3 km SW. of Bau (leg. Dorman, UF 196263/7); G. Doya 2 miles SE. of Bau (leg. Wilford, UF 194797/>10; do. 194900/>10); G. Kapur 6 km SE. of Bau (leg. Dorman, UF 196308/>10; leg. Wilford, UF 194695/9; do. 194696/>10; do. 194784/1; do. 194876/1; V 2222/>10; V 2223/>10; V 3830/1; leg. De Vogel, V 2619/>10); Bidi Mt. (BMNH/2, see above; RMNH/1); SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194935/2); Lobang Angin 2 km SW. of Bau (V 3829/>10); Bt. Krion 2 km SW. of Bau (leg. Dorman, UF 196347/>10); Kpg. Tiang Bekap 10 km SSW. of Kpg. Beratok (leg. Wilford, UF 194822/>10; leg. De Vogel, V 2561/>10; do. 2580/>10); G. Braang, NW. foot, 22 miles S. of Kuching (leg. Wilford, UF 194697/>10; do. 194698/>10); G. Wah S. of Braang, 23 miles S. of Kuching (leg. Wilford, UF 194825/9; do. 194826/>10); G. Gayu 23 miles S. of Kuching (leg. Wilford, UF 194702/>10; do. 194703/>10; do. 194704/3; do. 194896/>10); limestone hill 1 mile NE. of Pankalan Ampat, 0.5 mile E. of Temerang (leg. Wilford, UF 194699/5; do. 194824/4); G. Saak 1 mile W. of Begu, 24 miles S. of Kuching (leg. Wilford, UF 194701/>10); Kpg. Segur Benuk, mile 21 Penrissen Road (leg. De Vogel, V 2548/2; do. 2549/>10); G. Lelat 1 mile SW. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194792/>10); G. Mas 0.5 mile W. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194827/>10; do. 194828/>10); G. Sibow, 0.5 mile NW. of Nyabet, 24 miles SSE. of Kuching (UF 194829/>10); 7.5 km WNW. of Kpg. Piching, near Serian (V 3828/>10). "North Borneo" (UF 160200/2). "Borneo" (NMW/2).

Spire conical with flat to convex (sometimes with slightly concave) sides. Apex slightly oblique or not. Whorls 4 1/4-5 5/8, convex; last whorl rounded, or sometimes slightly angular at the periphery, slightly convex above and below. Constriction with an inconspicuous to distinct parietalis, with or without a longitudinal palatalis, with a transverse palatalis. Tuba free from the spire or touching it over its entire length, gradually narrowed towards the constriction, rounded below. Radial ribs on the spire rather closely placed to widely spaced (3-7 ribs/0.5 mm on the penultimate whorl), (slightly) sinuous about half-way, but those close to the tuba (slightly) sinuous or with a single or a double, deep or shallow loop when the shell is observed in front view; those on the tuba closely placed to widely spaced (3-9 ribs/0.5 mm half-way), sinuous below or not, or with a shallow to deep, semi-circular loop, in the latter case often with a short, shallowly concave to deeply trough-shaped projection. Spiral striation present, often inconspicuous, very fine, rarely entirely absent. Umbilicus open, 0.10-0.20 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin widely below the level of the apex, slightly angular to subtriangular with a narrowly rounded lower edge and a slightly wider rounded upper and right edge, the left side well rounded. Peristome touching the spire or distant from it, double, outer peristome moderately to distinctly spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, sometimes slightly widened along the upper and the lower side; inner peristome moderately to distinctly protruding from the outer (rarely only slightly protruding), (moderately) spreading, its outer surface and the upper surface of the outer peristome usually without, but sometimes with some fine riblets or lamellae. Spire: height 1.1-2.0 mm; width 0.8-1.2 mm; index 1.3-1.6. Total width 1.3-2.4 mm. Height and width aperture 0.4-0.7 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone ranges S. of Kuching. Common around Bau, much more scattered Eastwards.

Notes. — 1. Extremely variable. The following forms can be distinguished:

– a. '*O. wallacei*': large shells. Spire often slightly convex. Radial ribs sinuous, those on the last whorl with a double, deep or shallow loop when the shell is observed in front

view; those on the tuba with a shallow to deep, semi-circular loop, often with a short projection. Occurs both in the Bau area as well as in the Penrissen Valley;

– b. '*O. beddomei*': small to large shells. Spire slightly concave to convex. Radial ribs (slightly) sinuous including those on the last whorl and those on the tuba. Occurs mainly in the Bau area; in the Penrissen Valley few populations have been found so far. These are often slightly aberrant, they are either very small, or have a spire with concave sides and a somewhat angular last whorl.

Morphological intermediates between these two occur frequently throughout the range of the subspecies.

2. Similar to *O. pumilio*, see the note under the latter species.

3. Local populations occur which obviously differ from sympatrical series of the type subspecies. Elsewhere, however, series of the type subspecies may contain morphological intermediates, often without specimens entirely similar to the local population involved being present. These local populations are listed here as subspecies:

62.2 - **Opisthostoma wallacei teinostoma** subspec. nov.
fig. 59, 71

Material seen. — SARAWAK. 1st Div.: quarry km 31.6 road Kuching-Bau (leg. Auffenberg, UF 183985/>10); G. Pangga 3 km ENE. of Bau (V 2144, HOLOTYPE RMNH 56924); G. Kapur 6 km SE. of Bau (leg. De Vogel, V 2609/>10); Lobang Angin 2 km SW. of Bau (V 2298/5); Bt. Krion 2 km SW. of Bau (leg. Dorman, UF 196345/>10); G. Jambusan 4 km SE. of Bau (V 2181/>10).

As the type subspecies but spire with flat to slightly convex sides. Apex oblique. Whorls 4 1/8-5, convex; last whorl rounded. Constriction without a parietalis, without a longitudinal palatalis. Tuba touching the spire over its entire length. Radial ribs not or hardly sinuous, without projections, on the spire (rather) closely placed (8-12 ribs/0.5 mm on the penultimate whorl); on the tuba rather closely placed (6-8 ribs/0.5 mm halfway). Aperture subtriangular with widely rounded edges. Peristome touching the spire; inner peristome usually drawn out over the spire on the right side of the aperture, rarely not so. Spire: height 1.0-1.5 mm; width 0.8-1.1 mm; index 1.2-1.5. Total width 1.3-1.8 mm. Height aperture 0.4-0.6 mm; width 0.4-0.5 mm.

Distribution. — Borneo: Sarawak, 1st Div., area around Bau.

Notes. — 1. Differs from the type subspecies in having not or hardly sinuous radial ribs. In most cases it is clearly different from the type subspecies, although a few specimens in series of the type subspecies seem to be intermediate. Such specimens have almost straight ribs, but differ in having the tuba distant from the spire, or in being distinctly larger than subspec. *teinostoma*.

2. The name refers to the peristome which usually stretches over the spire along the right side of the aperture.

62.3 - *Opisthostoma wallacei busauense* (E.A. Smith, 1893)
fig. 60

Opisthostoma busauense E.A. Smith, 1893a: 348; syntypes ("Busau, N.W. Borneo") leg. Everett, BMNH 92.7.20.123/1 & 92.7.23.21-22/2.

Material seen. — SARAWAK. 1st Div., Busau (BMNH/3, see above); Kpg. Tiang Bekap 10 km SSW. of Kpg. Beratok (leg. De Vogel, V 2559/7); limestone hill 1 mile NE. of Pankalan Ampat, 0.5 mile E. of Temerang (leg. Wilford, UF 194699/7); Kpg. Segur Benuk, mile 21 Penrissen Road (leg. De Vogel, V 2551/5); G. Mas 0.5 mile W. of Nyabet, 24 miles SSE. of Kuching (leg. Wilford, UF 194793/>10). "North Borneo" (RMNH/2).

As the type subspecies but spire with flat to slightly concave sides. Apex not oblique. Whorls 4-5, convex; last whorl rounded. Constriction with or without an inconspicuous parietalis, without a longitudinal palatalis. Tuba free from the spire or touching it over its entire length. Radial ribs on the spire rather closely placed to widely spaced (3-7 ribs/0.5 mm on the penultimate whorl), (slightly) sinuous, sometimes with a slight, shallowly concave projection half-way, but those close to the tuba not or slightly sinuous; those on the tuba closely placed to moderately spaced (4-9 ribs/0.5 mm half-way), below not or slightly sinuous, sometimes with a shallowly concave, short projection. Aperture hardly tilted with regard to the coiling axis, circular to subtriangular with widely rounded edges. Spire: height 1.2-1.6 mm; width 0.8-1.0 mm; index 1.4-1.6. Total width 1.6-1.9 mm. Height aperture 0.4-0.5 mm; width 0.5 mm.

Distribution. — Borneo: Sarawak, 1st Div., limestone ranges S. of Kuching. Most frequently found in Penrissen Valley.

Notes. — Differs from the type subspecies by its small size, the apex which is not oblique, and its spire with flat or concave sides. Specimens from the type subspecies may show one or two of these characters.

63 - **Opisthostoma aethoderma** spec. nov.
fig. 61, 72

Material seen. — SARAWAK. 1st Div.: G. Selabor, W. of Kpg. Lobang Batu, 12.5 km S. of Tebakang (leg. Wilford, UF 194722/>10; do. 194723/>10; do.194724/>10; do. 194725/>10; V 2095/>10, HOLOTYPE RMNH 56925).

Shell redddish-brown. Spire conical with convex sides. Apex (slightly) oblique. Whorls 6 1/8-6 7/8, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba free from the spire, gradually narrowed towards the constriction, rounded below. Radial ribs very closely placed (12-20 ribs/0.5 mm on the penultimate whorl and half-way on the tuba), not sinuous. Spiral striation absent. Umbilicus almost closed or open, up to 0.10 mm across. Aperture hardly tilted with regard to the coiling axis, its upper margin widely below the level of the apex, elliptic. Peristome moderately spreading, simple or double, if double only inconspicuously so because the outer and the inner peristome are entirely fused, outer peristome hardly spreading beyond the inner, absent along the right side of the aperture. Spire: height 2.0-3.1 mm; width 1.5-1.7 mm; index 1.3-1.7. Total width 2.3-2.5 mm. Height aperture 0.8-0.9 mm; width 0.7-0.8 mm.

Distribution. — Borneo: Sarawak, 1st Div., area around Serian.

Notes. — Well characterized by its very densely ribbed, reddish-brown shell (hence the name), combined with a simple peristome.

64.1 - **Opisthostoma dancei dancei** spec. nov.
fig. 62, 72

Material seen. — SARAWAK. 1st Div.: G. Selabor, W. of Kpg. Lobang Batu, 12.5 km S. of Tebakang (leg. Wilford, UF 194787/1; do. 194802/>10; do. 194803/>10; do. 194848/>10; do. 194849/>10; do. 194850/>10; do. 194851/>10; do. 194852/>10; do. 194890/>10; do. 194891/>10; do. 194892/>10; do. 194894/>10; do. 194895/>10; V 2096/>10, HOLOTYPE RMNH 56926).

Spire conical with flat to convex sides. Apex slightly to distinctly oblique. Whorls 4 3/8-6, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba touching the spire or free from it, gradually narrowed towards the constriction, rounded

below. Radial ribs (moderately) spaced (3-5 ribs/0.5 mm on the penultimate whorl, 3-4 ribs/0.5 mm half-way on the tuba), on the spire slightly sinuous or not, but those on the last whorl and on the tuba not sinuous. Spiral striation absent or inconspicuous, very fine. Umbilicus open, 0.10-0.25 mm across. Aperture tilted up to 30*ff* with regard to the coiling axis, its upper margin widely below the level of the apex, circular to elliptic, often slightly angular. Peristome simple, somewhat spreading. Spire: height 1.5-2.2 mm; width 1.1-1.4 mm; index 1.1-1.6. Total width 1.9-2.6 mm. Height aperture 0.6-0.7 mm; width 0.5-0.7 mm.

Distribution. — Borneo: Sarawak, 1st Div., area around Serian.

Notes. — 1. *O. perglaber* has a double peristome as well as a much wider umbilicus.

2. Within *O. dancei* two forms exist which mainly differ in size: a large form occurring at Lobang Batu (near Serian) only, and a small form known so far from a few widely scattered localities. Because they are otherwise almost identical, and because new material from other localities may fill up the morphological gap between them, the latter is regarded as a subspecies.

3. Named after S.P. Dance, who must have spent years picking molluscs from the soil samples gathered by G.E. Wilford.

64.2 - **Opisthostoma dancei dispersum** subspec. nov.
fig. 63, 72

Material seen. — SARAWAK. 1st Div.: mile 18.5 road Kuching-Serian (leg. Wilford, UF 194714/>10; do. 194715/>10); Kpg. Beratok along road Kuching-Serian (leg. Auffenberg, UF 184020/>10; V 2025/>10, HOLOTYPE RMNH 56927); Kpg. Beratok along road Kuching-Serian, rock quarry along road (leg. Auffenberg, UF 184006/>10; do. 184035/>10; do. 184048/>10); mile 21 road Kuching-Serian, Bt. Akut (leg. Wilford, UF 194716/>10; do. 194717/>10; do. 194718/>10). 4th Div.: G. Subis (Batu Niah) (leg. Wall, UF 194713/1); Bt. Maloi, Baram Valley, 4 miles ENE of Batu Gading (leg. Wall, UF 194719/8).

As the type subspecies but spire with (distinctly) convex sides. Whorls 4 1/4-4 7/8. Radial ribs not sinuous, on the spire rather closely placed to moderately spaced (6-9 ribs/0.5 mm on the penultimate whorl), on the tuba moderately spaced (4-5 ribs/0.5 mm half-way). Spiral striation absent. Spire: height 1.2-1.5 mm; width 0.9-1.2 mm; index 1.2-1.5. Total width 1.6-2 mm. Height and width aperture 0.4-0.5 mm.

Distribution. — Borneo: Sarawak, on widely scattered localities (the name refers to this distribution pattern).

65 - **Opisthostoma ptychodon** spec. nov.
fig. 64, 71

Material seen. — SARAWAK. 1st Div., SE. end of limestone outcrop S. of Bau (leg. Wilford, UF 194794/1; do. 194795/>10; do 194823/>10, incl. HOLOTYPE).

Spire conical with flat to slightly concave sides. Apex not oblique. Whorls 4 1/2-5 1/4, convex; last whorl slightly angular at the periphery, slightly convex above and below. Constriction with a very distinct, lamella-shaped parietalis which continues up to, or over half-way the tuba, with a transverse palatalis, with a longitudinal basalis which continues up to one third of the tuba. Tuba free from the spire, gradually narrowed towards the constriction, rounded below. Radial ribs rather closely placed to widely spaced (3-8 ribs/0.5 mm on the penultimate whorl, as well as half-way the tuba), those on the spire (slightly) sinuous, low; those on the tuba not or hardly sinuous below, much higher than those on the spire. Spiral striation absent. Umbilicus open, 0.10-0.20

mm across. Aperture hardly tilted with regard to the coiling axis, its upper margin widely below the level of the apex, circular or slightly angular. Peristome double, outer peristome distinctly spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, its margins often slightly bent backwards; inner peristome distinctly protruding from the outer, somewhat spreading, its outer surface and the upper surface of the outer peristome with numerous fine lamellae. Spire: height 1.5-1.9 mm; width 1.0-1.2 mm; index 1.4-1.6. Total width 2.2-2.4 mm. Height and width aperture 0.5-0.6 mm.

Distribution. — Borneo: Sarawak, 1st Div., Bau area.

Notes. — Well characterized by the outer peristome, densely covered with fine lamellae, as well as by the very long parietalis (hence the name).

66 - **Opisthostoma episomon** spec. nov.
fig. 65, 72

Material seen. — SARAWAK. 1st Div.: G. Selabor, W. of Kpg. Lobang Batu, 12.5 km S. of Tebakang (V 2094/>10, HOLOTYPE RMNH 56928).

Spire conical with flat sides. Apex oblique or not. Whorls 5 5/8-6, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba free from the spire, distinctly bulging and then abruptly narrowed towards the constriction, rounded below. Radial ribs (widely) spaced (2-4 ribs/0.5 mm on the penultimate whorl, 2-3 ribs/0.5 mm half-way on the tuba), those on the spire with a slight, shallowly concave projection half-way, usually abraded to a sinuous scar, but those on the last whorl (slightly) sinuous, without a projection; those on the tuba not sinuous below, without a projection; the portion of the tuba closest to the constriction without radial ribs. Spiral striation absent. Umbilicus open, 0.40-0.50 mm across. Aperture tilted 15-45° with regard to the coiling axis, its upper margin widely below the level of the apex, circular to elliptic. Peristome double; outer peristome moderately spreading beyond the inner, but gradually narrowed towards, and absent or narrow along the right side of the aperture, often slightly widened along the upper side; inner peristome distinctly protruding from the outer, moderately spreading. Spire: height 2.4-2.6 mm; width 1.7-1.9 mm; index 1.3-1.4. Total width 3.1-3.4 mm. Height aperture 0.8-0.9 mm; width 0.9-1.0 mm.

Distribution. — Borneo: Sarawak, 1st Div., area around Serian.

Notes. — 1. Well characterized by its large size, its wide umbilicus and the distinct bulge in the tuba, close to the constriction.

2. The name refers to the bulky appearance of the shell.

67 - **Opisthostoma perglaber** spec. nov.
fig. 66, 71

Material seen. — SARAWAK. 4th Div.: Bt. Sarang, Tatau Valley (leg. Bong, UF 194788/6; do.194790/7; do. 194791/3; do. 194832/>10; do. 194933/>10; do. 194853/>10, incl. HOLOTYPE; do. 194854/>10).

Spire conical with flat sides. Apex not oblique. Whorls 5 3/4-6 5/8, convex; last whorl rounded. Constriction with a transverse palatalis. Tuba free from the spire, laterally sometimes slightly to distinctly bulging and then abruptly narrowed towards the constriction, rounded below. Radial ribs on the spire closely placed to widely spaced (3-9 ribs/0.5 mm on the penultimate whorl) slightly sinuous or not, but those close to the tuba not sinuous; those on the tuba rather closely placed to widely spaced (2-7

ribs/0.5 mm half-way), not sinuous. Spiral striation absent. Umbilicus open, 0.30-0.40 mm across. Aperture tilted up to 30° with regard to the coiling axis, its upper margin widely below the level of the apex, circular to slightly angular. Peristome double, slightly to moderately spreading beyond the inner, but gradually narrowed towards, and absent along the right side of the aperture, usually widened or with a small wing along the upper side, sometimes slightly widened along the lower side; inner peristome somewhat protruding from the outer, (moderately) spreading. Spire: height 1.9-2.5 mm; width 1.3-1.6 mm; index 1.3-1.7. Total width 2.5-3.2 mm. Height and width aperture 0.7-0.8 mm.

Distribution. — Borneo: Sarawak, 4th Div., Tatau Valley.

Notes. — 1. In some samples the tuba is distinctly swollen towards the constriction; in other samples, from different localities on the same limestone hill, it is not or hardly swollen. Otherwise the two forms are not different.

2. Similar to *O. dancei dancei*, see the notes under that species. *O. cyrtopleuron* and *O. wilfordi* both differ in having spiral striation.

3. The name refers to the absence of any spiral striation on the shell.

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Plate captions:

Fig. 1. a, figure indicating how the various measurements of the shell should be taken: shell in umbilical view with 1 - line along which the diameter of the umbilicus is measured, 2 - the constriction, 3 - the number of radial ribs/0.5 mm on the last part of the spire, close to the constriction, 4 - the number of radial ribs/0.5 mm half-way the tuba; b, do.: shell in front view with 1 - height of the spire, 2 - width of the spire, 3 - total width of the shell, 4 - height and width of the aperture, 5 - line along which the convexity of the spire should be observed, 6 - the number of radial ribs/0.5 mm on the penultimate whorl of the spire; c, explanatory figures to the key: shell with the upper margin of the aperture above the level of the apex; d, do., shell with the upper margin of the aperture below the level of the apex.
Fig. 2. *Opisthostoma dihelicton* spec. nov., holotype specimen, Sarawak: near Bau (UF), front view.
Fig. 3. a, *Opisthostoma asyndeton* spec. nov., holotype specimen, Kalimantan: near Kintap (RMNH), front view; b, do., umbilical view.
Fig. 4. *Opisthostoma telestoma* Vermeulen, 1991, Sabah: P. Banggi (V), umbilical view.
Fig. 5. a, *Opisthostoma crassicolle* spec. nov., holotype specimen, Kalimantan: Beramban (RMNH), front view; b, do., lateral view.
Fig. 6. a, *Opisthostoma acolaston* spec. nov., holotype specimen, Kalimantan: Nateh (RMNH), front view; b, other shell from the same locality (V), umbilical view.
Fig. 7. a, *Opisthostoma semisolutum* spec. nov., holotype specimen, Kalimantan: Nateh (RMNH), front view; b, other shell from the same locality (V), umbilical view.
Fig. 8. a, *Opisthostoma sulcatum* spec. nov., holotype specimen, Sarawak: near Bau (UF), front view; b, other shell from the same locality, lateral view.
Fig. 9. a, *Opisthostoma rotundum* spec. nov., holotype specimen, Sarawak: G. Braang (UF), front view; b, do., oblique apical view.
Fig. 10. *Opisthostoma auriforme* spec. nov., holotype specimen, Kalimantan: Batu Tungga near Sarunnga (RMNH), front view.
Fig. 11. a, *Opisthostoma subconicum* spec. nov., holotype specimen, Kalimantan: along road Benualawas-Batulicin (RMNH), front view; b, do., umbilical view.
Fig. 12. *Opisthostoma hailei* Solem, 1964, Sabah: Batu Putih (V), shell illustrated in Vermeulen (1991: fig. 4. a), umbilical view.
Fig. 13. a, *Opisthostoma cryptodon* Vermeulen, 1991, Sarawak: G. doya (UF), front view; b, do., umbilical view.
Fig. 14. a, *Opisthostoma gibbosum* spec. nov., holotype specimen, Sarawak: G. Meruga (UF), front view; b, do., umbilical view.
Fig. 15. a, *Opisthostoma simile* spec. nov., holotype specimen, Sarawak: G. Lelat (UF), front view; b, do., umbilical view.
Fig. 16. a, b, *Opisthostoma brachyacrum brachyacrum* (Thompson 1978), Sarawak: G. Subis (UF), front view; c, other shell from the same locality, umbilical view; d, other shell from the same locality (V), same shell as depicted in Vermeulen (1991: fig. 5a), umbilical view.
Fig. 17. a, *Opisthostoma brachyacrum tatauense* subspec. nov., holotype specimen, Sarawak: Bt. Sarang (UF), front view; b, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction.
Fig. 18. a, *Opisthostoma delopterum* spec. nov., holotype specimen, Kalimantan: along road Benualawas-Limbungan (RMNH), front view; b, do., umbilical view.
Fig. 19. a, *Opisthostoma anisopterum* spec. nov., holotype specimen, Sarawak: G. Saak (UF), front view; b, do., umbilical view; c, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction; e, Sarawak: near Temerang (UF), front view.
Fig. 20. a, *Opisthostoma dormani* spec. nov., holotype specimen, Sabah: Simatuoh area (UF), front view; b, do., umbilical view; c, d, other shells from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; e, f, other shells from the same locality, lateral view with the tuba removed to show the inner surface of the constriction; g, other shell from the same locality, front view; h, do., umbilical view.
Fig. 21. a, *Opisthostoma mirabile* E.A. Smith, 1893, Sabah: Bt. Gomantong (V), front view; b, other shell from the same locality, umbilical view; c, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction; e, Sabah: near Suanlamba (UF), front view.

Fig. 22. a, *Opisthostoma fraternum* E.A. Smith, 1905, locality unknown (UF), front view; b, other shell, umbilical view; c, do., umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell, lateral view with the tuba removed to show the inner surface of the constriction; e, do., operculum.

Fig. 23. a, *Opisthostoma concinnum* Fulton, 1901, Sabah: Bt. Gomantong (RMNH), front view; b, do., umbilical view; c, Sabah: Batu Putih (V), umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction; e, Sabah: G. Madai (UF), front view.

Fig. 24. a, *Opisthostoma otostoma* Boettger, 1893, Sabah: small islands around Labuan (NMW), front view; b, do., umbilical view; c, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 25. a, *Opisthostoma obliquedentatum* spec. nov., holotype specimen, Sabah: Simatuoh area (UF), front view; b, do., umbilical view; c, other shell from the same locality, oblique front view to show the position of the teeth in the constriction; d, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; e, f, other shells from the same locality, lateral view with the tuba removed to show the inner surface of the constriction; g, other shell from the same locality, front view.

Fig. 26. a, *Opisthostoma inornatum* spec. nov., holotype specimen, Sabah: Simatuoh area (UF), front view; b, do., umbilical view; c, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 27. a, *Opisthostoma dipterum* spec. nov., holotype specimen, Sarawak: G. Mulu area (UF), front view; b, do., umbilical view; c, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 28. a, *Opisthostoma baritense* E.A. Smith, 1893, Sarawak: G. Mulu area (RMNH), front view; b, do., umbilical view; c, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction; e, do., operculum.

Fig. 29. a, *Opisthostoma brevituba* spec. nov., holotype specimen, Sabah: Batu Putih (RMNH), front view; b, do., umbilical view; c, other shell from the same locality (V), umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality (V), lateral view with the tuba removed to show the inner surface of the constriction; e, do., operculum.

Fig. 30. a, *Opisthostoma depauperatum* E.A. Smith, 1894, Sarawak: G. Budah (UF), front view; b, do., umbilical view; c, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 31. a, *Opisthostoma decrespignyi* (H. Adams, 1865), locality unknown (RMNH), front view; b, do., umbilical view; c, other shell from the same locality (UF), lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 32. a, *Opisthostoma pulchellum* Godwin Austen, 1890, Sarawak: G. Mulu area (NMW), front view; b, other shell from the same locality (V), front view; c, do., umbilical view; d, e, other shells from the same locality (UF), lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 33. a, *Opisthostoma bihamulatum* spec. nov., holotype specimen, Sabah: G. Baturong (RMNH), front view; b, do., umbilical view; c, other shell from the same locality (V), back view; d, other shell from the same locality (V), umbilical view with part of the shell removed to show the teeth in the constriction; e, other shell from the same locality (V), lateral view with the tuba removed to show the inner surface of the constriction; f, g, h, other shells from the same locality (UF), do.

Fig. 34. a, *Opisthostoma simplex* Fulton, 1901, Sabah: Bt. Gomantong (V), front view; b, do., umbilical view; c, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 35. a, *Opisthostoma transequatorialis* spec. nov., holotype specimen, Kalimantan: G. Bulch (RMNH), front view; b, other shell from the same locality (V), front view; c, other shell from the same locality (V), lateral view with the tuba removed to show the inner surface of the constriction; d, Kalimantan: G. Melihat (V), umbilical view; e, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; f, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 36. a, *Opisthostoma jucundum* E.A. Smith, 1893, Sabah: Mantanai Island (NMW), front view; b, do., umbilical view; c, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 37. a, *Opisthostoma lissopleuron lissopleuron* spec. nov., holotype specimen, Sabah: Bt. Pababola (RMNH), front view; b, do., umbilical view; c, other shell from the same locality (V), umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality (V), lateral view with the tuba removed to show the inner surface of the constriction; e, Sabah: near Lahad Datu (V), front view; f, do., umbilical view; g, h, other shells from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 38. a, *Opisthostoma lissopleuron bigibbum* subspec. nov., holotype specimen, Sabah: G. Madai (RMNH), front view; b, do., umbilical view; c, other shell from the same locality (V), front view; d, other shell from the same locality (V), umbilical view with part of the shell removed to show the teeth in the constriction; e, other shell from the same locality (V), lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 39. a, *Opisthostoma picsingense* E.A. Smith, 1905, Sarawak: G. Selabor (V), front view; b, do., umbilical view; c, Sarawak: Kpg. Piching (NMW), front view.

Fig. 40. a, *Opisthostoma perspectivum* spec. nov., holotype specimen, Sabah: Batu Punggol (RMNH), front view; b, do., apical view; c, other shell from the same locality (UF), umbilical view.

Fig. 41. a, *Opisthostoma heteropleuron* spec. nov., holotype specimen, Sarawak: Bt. Akut (UF), front view; b, do., umbilical view.

Fig. 42. a, *Opisthostoma stellasubis* spec. nov., holotype specimen, Sarawak: G. Subis (RMNH), front view; b, do., apical view.

Fig. 43. a, *Opisthostoma grandispinosum* Godwin Austen, 1889, Sarawak: G. Subis (V), front view; b, do., back view.

Fig. 44. a, *Opisthostoma hosei* Godwin Austen, 1890, Sarawak: G. Subis (V), front view; b, do., back view; c, do., umbilical view; d, other shell from the same locality (UF), front view.

Fig. 45. a, *Opisthostoma cookei* E.A. Smith, 1894, Sarawak: G. Subis (V), front view; b, do., umbilical view.

Fig. 46. a, *Opisthostoma everetti* E.A. Smith, 1893, Sarawak: G. Jambusan (V), front view; b, do., umbilical view; c, unknown locality (UF), umbilical view with part of the shell removed to show the teeth in the constriction.

Fig. 47. a, *Opisthostoma stenotoreton* spec. nov., holotype specimen, Sarawak: Bt. Vrong (UF), front view; b, do., umbilical view.

Fig. 48. *Opisthostoma shelfordi* E.A. Smith, 1905, Sarawak: Kpg. Piching (NMW), front view.

Fig. 49. a, *Opisthostoma lituus* spec. nov., holotype specimen, Sarawak: Bt. Sarang (UF), front view; b, do., lateral view; c, do., umbilical view.

Fig. 50. a, *Opisthostoma tuba* spec. nov., holotype specimen, Sarawak: Bt. Sarang (UF), front view; b, do., umbilical view; c, other shell from the same locality, front view.

Fig. 51. a, *Opisthostoma austeni* E.A. Smith, 1894, Sarawak: G. Jambusan (V), front view; b, do., umbilical view.

Fig. 52. a, *Opisthostoma goniostoma* spec. nov., holotype specimen, Sarawak: near Bau (UF), front view; b, do., umbilical view.

Fig. 53. a, *Opisthostoma pumilio* E.A. Smith, 1894, Sarawak: near Kpg. Piching (V), front view; b, do., umbilical view; c, other shell from the same locality, front view.

Fig. 54. a, *Opisthostoma wilfordi* spec. nov., holotype specimen, Sarawak, Bt. Kudi (UF), front view; b, do., umbilical view.

Fig. 55. a, *Opisthostoma cyrtopleuron* spec. nov., holotype specimen, Sabah: Pun Batu (RMNH), front view; b, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; c, do., operculum; d, Sabah: Batu Punggol (V) front view; e, do., umbilical view; e, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 56. a, *Opisthostoma pyrgiscus* spec. nov., holotype specimen, Sarawak: G. Selabor (UF), front view; b, do., umbilical view.

Fig. 57. a, *Opisthostoma crassum* spec. nov., holotype specimen, Sarawak: Mulu area (UF), front view; b, do., umbilical view.

Fig. 58. a, *Opisthostoma wallacei wallacei* (Ancey, 1887), Sarawak: G. Kapur (V), front view; b, do., umbilical view; c, other shell from the same locality, front view; d, other shell from the same locality, front view; e, do., umbilical view; f, Sarawak: Lobang Angin (V), front view; g, Sarawak: Segur Benuk (V), front view; h, Sarawak: 1 mile NE. of Pankalan Ampat (UF), front view (a-h: shells similar to the type of *O. beddomei*); i, Busau (NMW), front view; j, do., umbilical view (i, j: shell similar to the type of *O. wallacei*).

Fig. 59. a, *Opisthostoma wallacei teinostoma* subspec. nov., holotype specimen, Sarawak: G. Pangga (RMNH), front view; b, do., umbilical view.

Fig. 60. a, *Opisthostoma wallacei busauense* (E.A. Smith, 1893), Sarawak: Kpg. Segur Benuk (V), front view; b, do., umbilical view.

Fig. 61. *Opisthostoma aethoderma* spec. nov., holotype specimen, Sarawak: G. Selabor (RMNH), front view.

Fig. 62. a, *Opisthostoma dancei dancei* spec. nov., holotype specimen, Sarawak: G. Selabor (RMNH), front view; b, do., umbilical view; c, other shell from the same locality (UF), front view.

Fig. 63. *Opisthostoma dancei dispersum* subspec. nov., holotype specimen, Sarawak: Kpg. Beratok (RMNH), front view.

Fig. 64. a, *Opisthostoma ptychodon* spec. nov., holotype specimen, Sarawak: near Bau (UF), front view; b, do., umbilical view; c, other shell from the same locality, umbilical view with part of the shell removed to show the teeth in the constriction; d, other shell from the same locality, lateral view with the tuba removed to show the inner surface of the constriction.

Fig. 65. a, *Opisthostoma episomon* spec. nov., holotype specimen, Sarawak: G. Selabor (RMNH), front view; b, do., umbilical view.

Fig. 66. a, *Opisthostoma perglaber* spec. nov., holotype specimen, Sarawak: Bt. Sarang (UF), front view; b, do., umbilical view.

Fig. 67. Map of Borneo, with the distribution of: *Opisthostoma auriforme* (10), *O. subconicum* (11), *O. delopterum* (21) (black dot); *O. holzmarki* (7) (black square); *O. crassicolle* (4) (black star); *O. rotundum* (9), *O. gibbosum* (14), *O. simile* (15), *O. devogelii* (18) (black inclined square); *O. dihelicton* (1), *O. sulcatum* (8), *O. planiapex* (19) (circle); *O. acolaston* (5), *O. semisolutum* (6) (open square); *O. telestoma* (3) (open stars); the ranges are generalized: a single dot may represent a single location or a number of nearby locations.

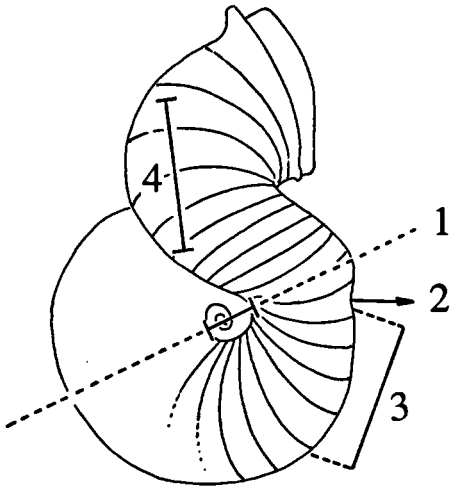
Fig. 68. Map of Borneo, with the distribution of: *Opisthostoma brachyacrum brachyacrum* (17.1) (black dots and circles); *O. brachyacrum lambii* (17.2) (black and open squares); *O. javanicum* (23) (black and open stars); *O. ballorum* (22) (black and open inclined squares); *O. brachyacrum tatauense* (17.3) (star in black dot); the open signs denote populations which are aberrant and which sometimes cause problems with identification (see the notes under the respective species); an open sign half overlapping a similar closed sign indicates that aberrant specimens occur among typical specimens. The ranges are generalized: a single dot may represent a single location or a number of nearby locations.

Fig. 69. Map of Borneo, with the distribution of: *Opisthostoma hailei* (20) (black dots); *O. cryptodon* (13), *O. tridens* (16) (black square); *O. lechria* (20) (open star); the ranges are generalized: a single dot may represent a single location or a number of nearby locations.

Fig. 70. Map of Borneo, with the distribution of: *Opisthostoma concinnum* (28) (black dots); *O. otostoma* (29), *O. decrespignyi* (36) (black square); *O. dormani* (25), *O. obliquedentatum* (30), *O. inornatum* (31) (black star); *O. dipterum* (32), *O. pulchellum* (37), *O. crassum* (61) (black inclined square); *O. depauperatum* (35) (circle); *O. bihamulatum* (38) (open square); *O. transequatorialis* (40) (open stars); *O. jucundum* (41) (open inclined square); the ranges are generalized: a single dot may represent a single location or a number of nearby locations.

Fig. 71. Map of Borneo, with the distribution of: *Opisthostoma stellasubis* (46), *O. grandispinosum* (47), *O. hosei* (48), *O. cookei* (49) (black dot); *O. cyrtopleuron* (59) (black squares); *O. heteropleuron* (45) (black star); *O. everetti* (50), *O. goniostoma* (56), *O. wallacei teinostoma* (62.2), *O. ptychodon* (65) (black inclined square); *O. stenotoreton* (51), *O. wilfordi* (58) (circle); *O. lituus* (53), *O. tuba* (54), *O. perglaber* (67) (open square); *O. brevituba* (34) (open star); *O. anisopterum* (24) (open inclined square); the ranges are generalized: a single dot may represent a single location or a number of nearby locations.

Fig. 72. Map of Borneo, with the distribution of: *Opisthostoma dancei dispersum* (64.2) (black dots); *O. perspectivum* (44) (black square); *O. simplex* (39) (black stars); *O. lissopleuron bigibbum* (42.2) (black inclined squares); *O. pyrgiscus* (60), *O. aethoderma* (63), *O. dancei dancei* (64.1), *O. episomon* (66), (circle); *O. mirabile* (26) (open square); *O. shelfordi* (52), *O. pumilio* (57) (open star); *O. lissopleuron lissopleuron* (42.1) (open inclined squares); the ranges are generalized: a single dot may represent a single location or a number of nearby locations.



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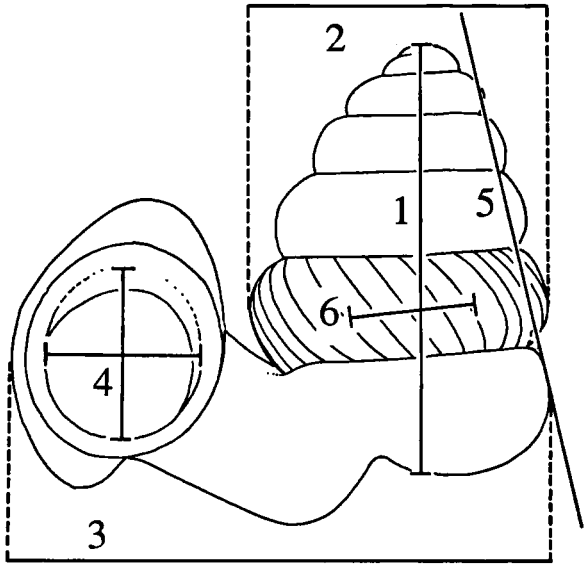

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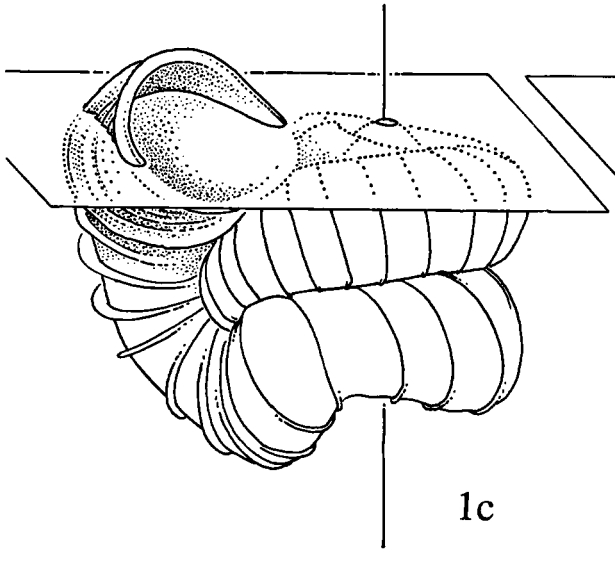

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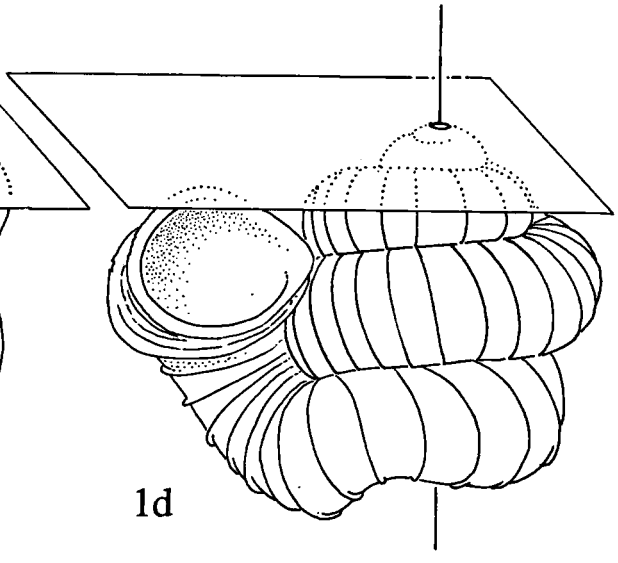

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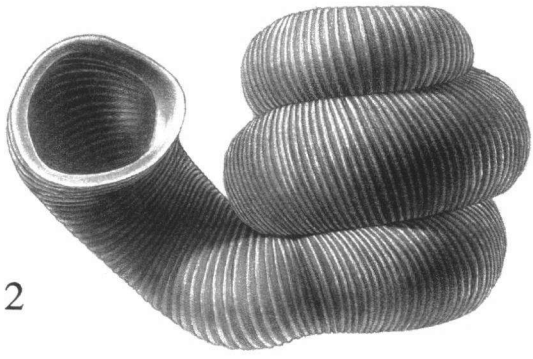

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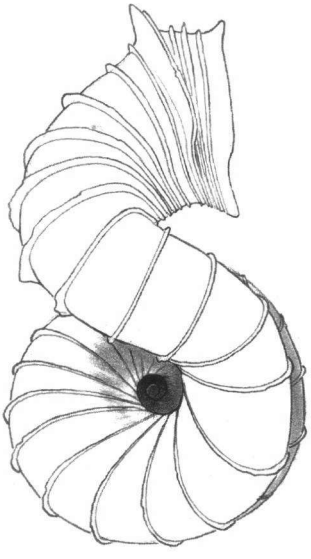

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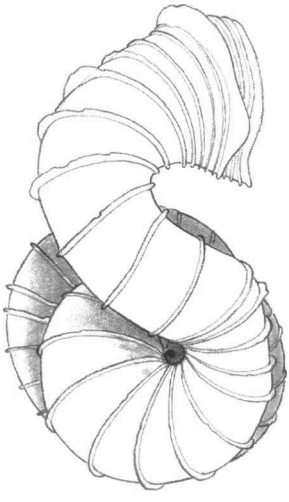

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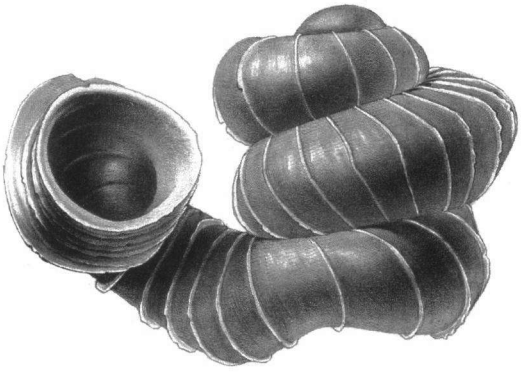

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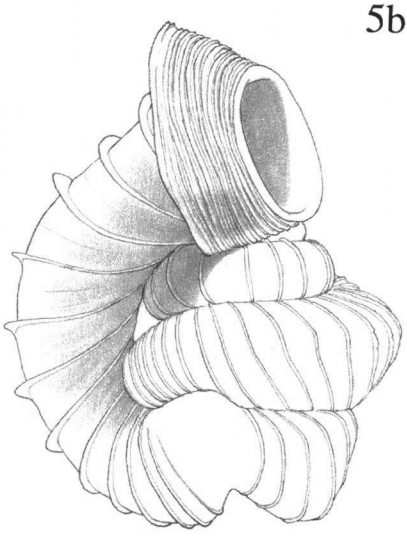

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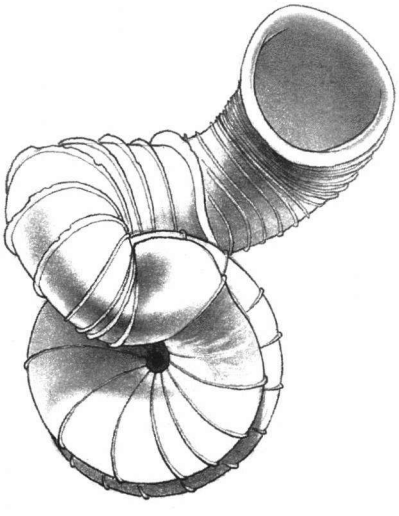

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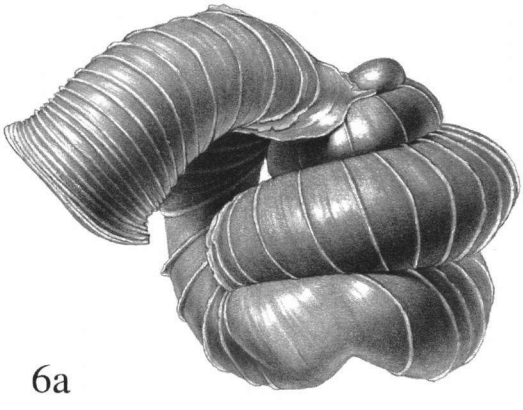

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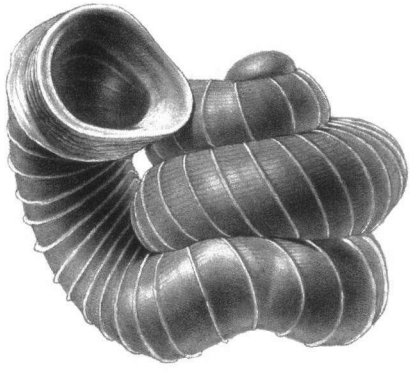

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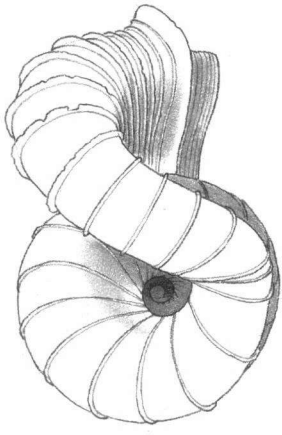

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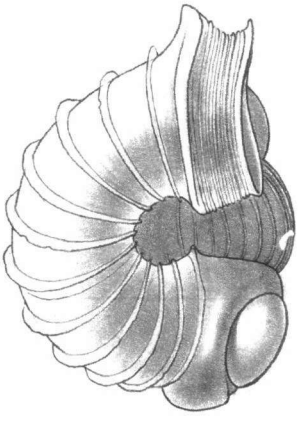

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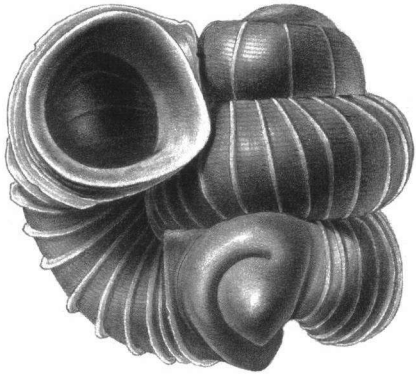

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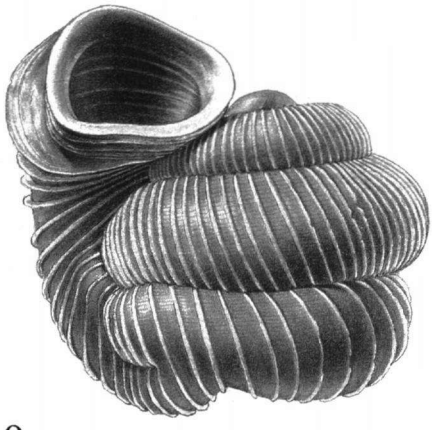

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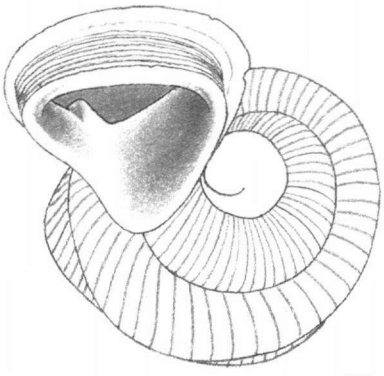

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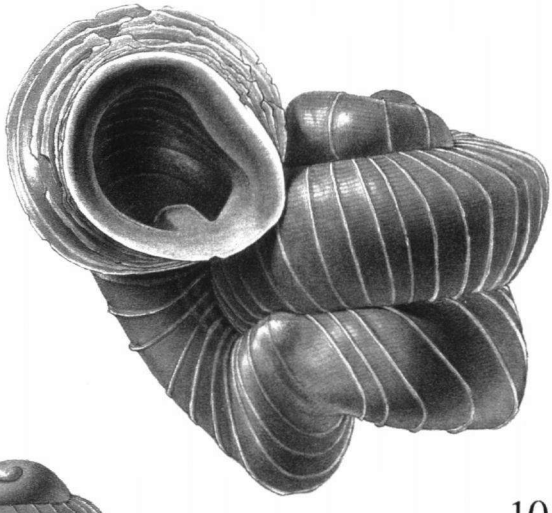

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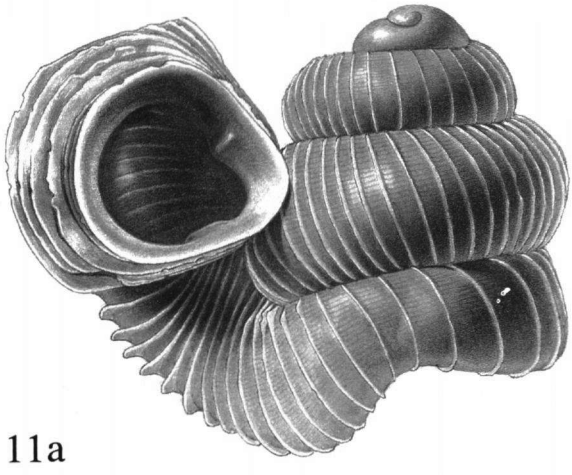

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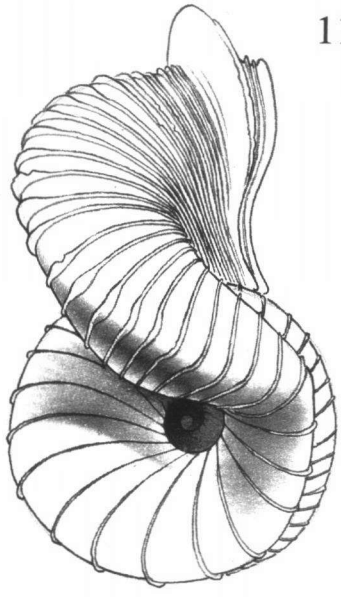

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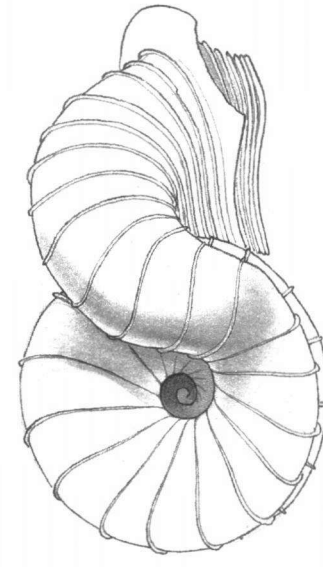

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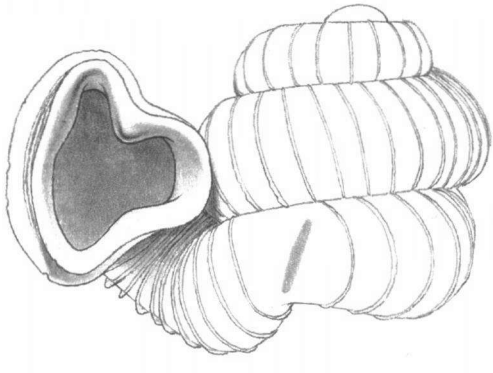

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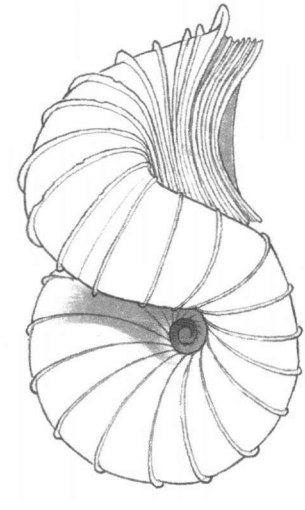

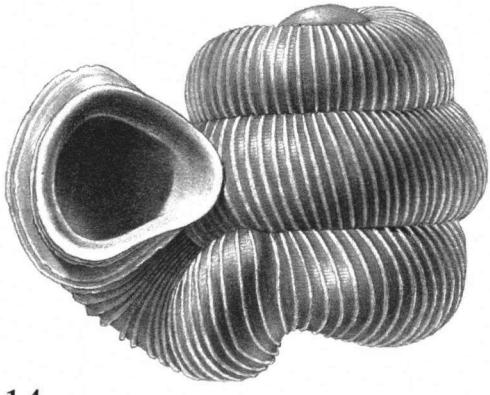

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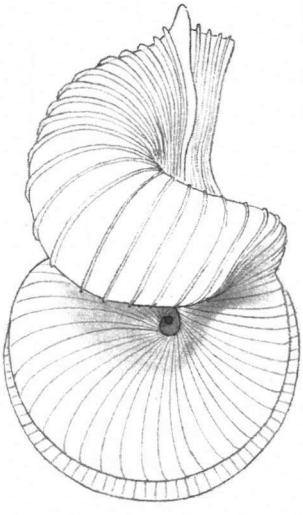

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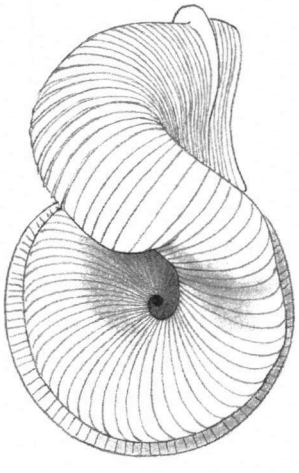

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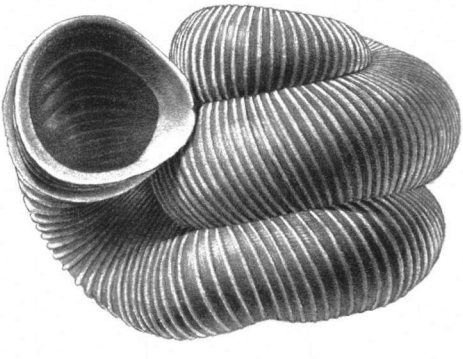

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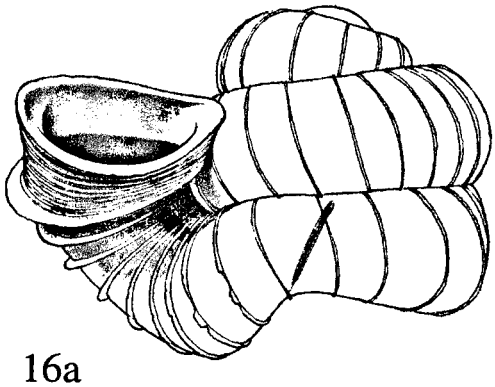

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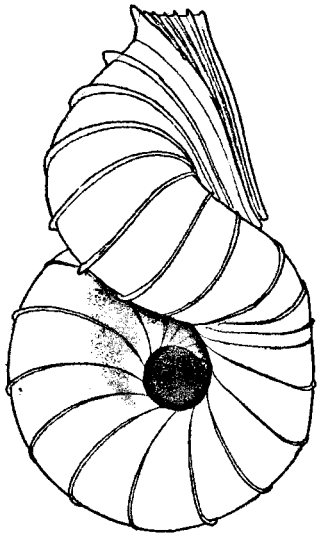

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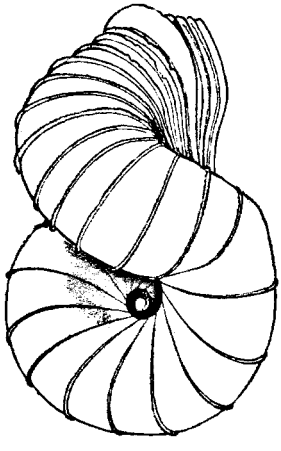

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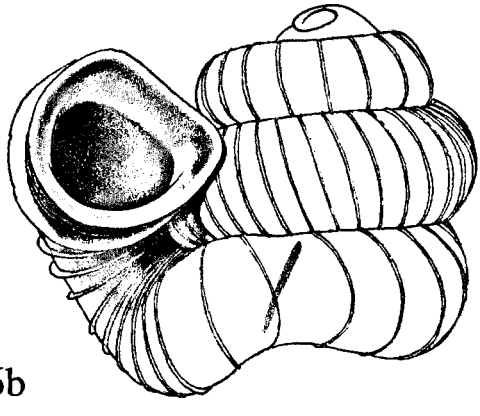

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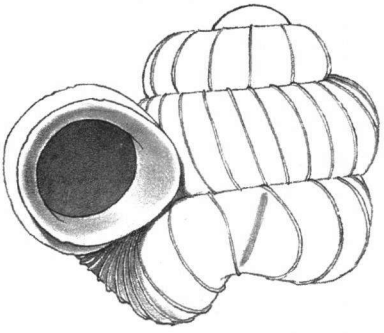

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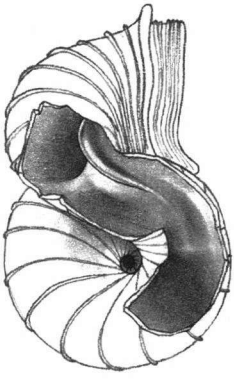

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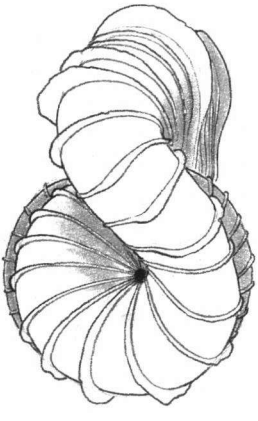

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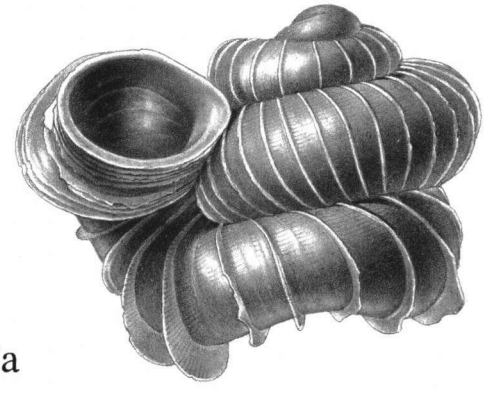

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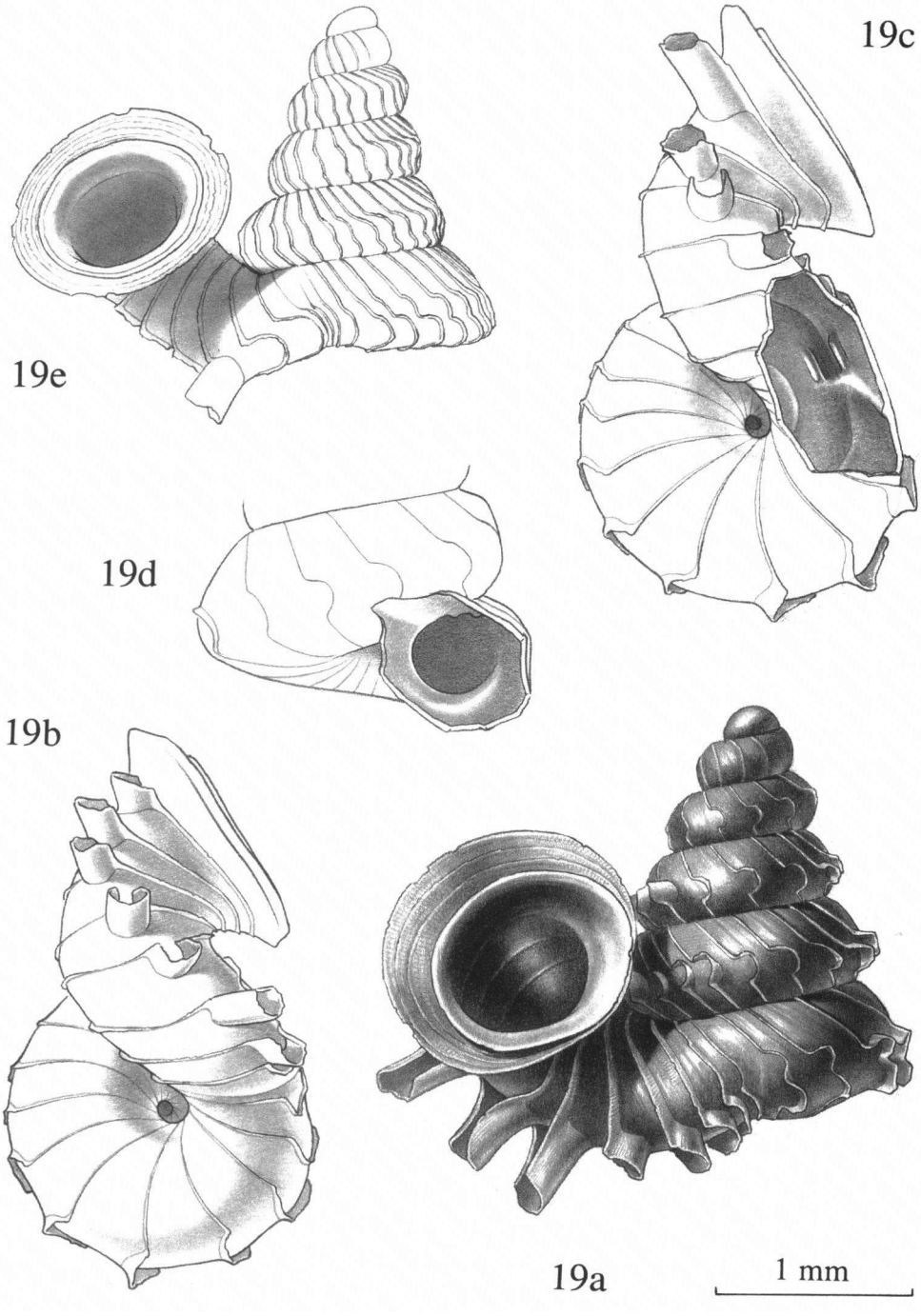
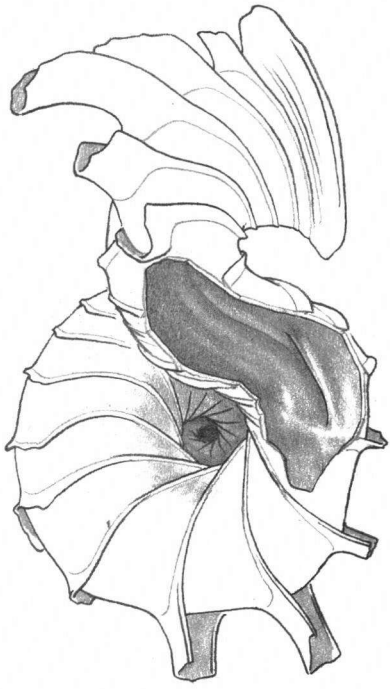

19c
19e
19d
19b
19a
1 mm

20b



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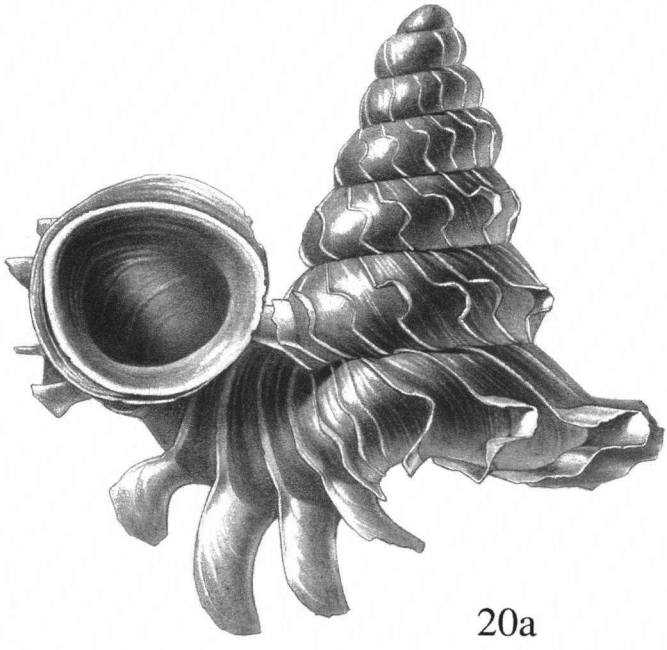

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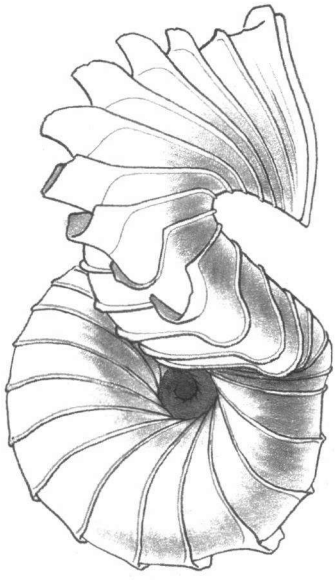
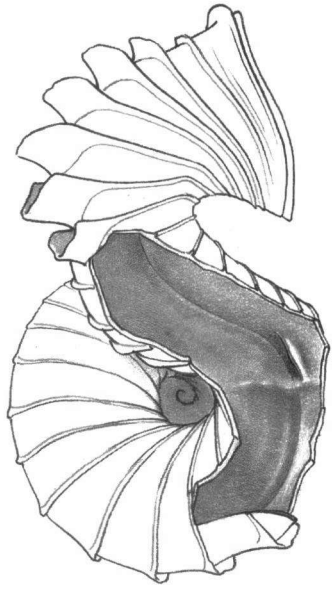
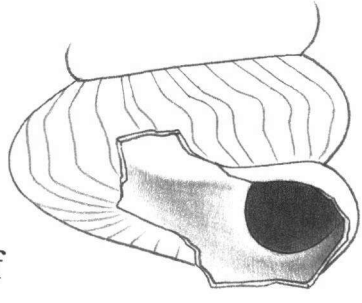


1 mm

20h

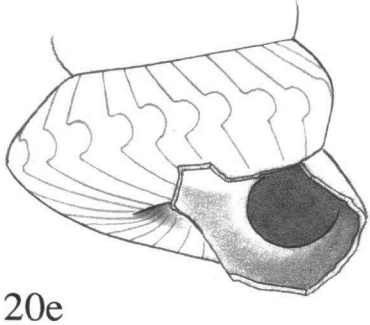


20d

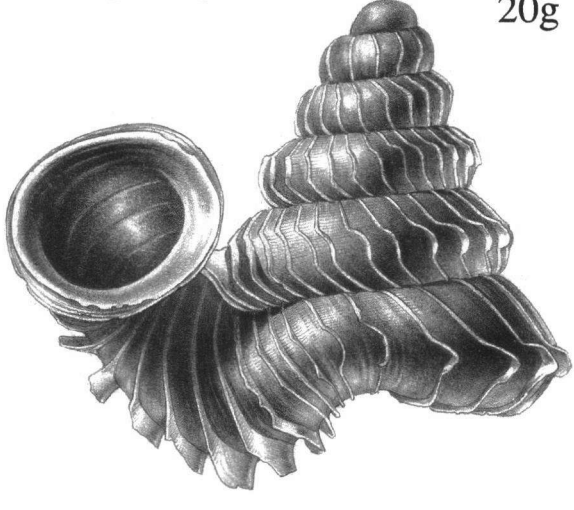


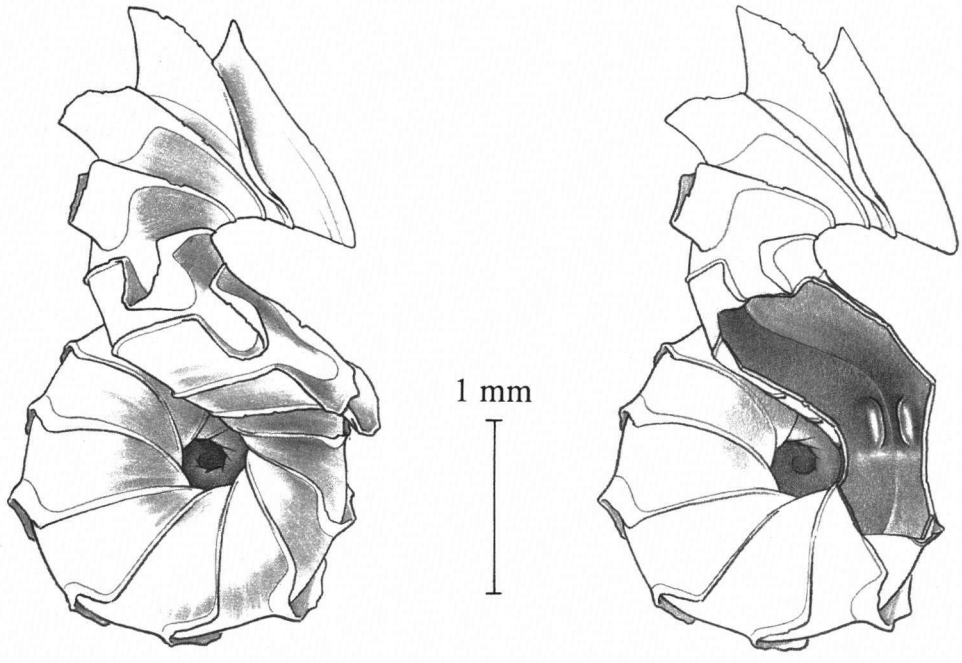
20f

20g



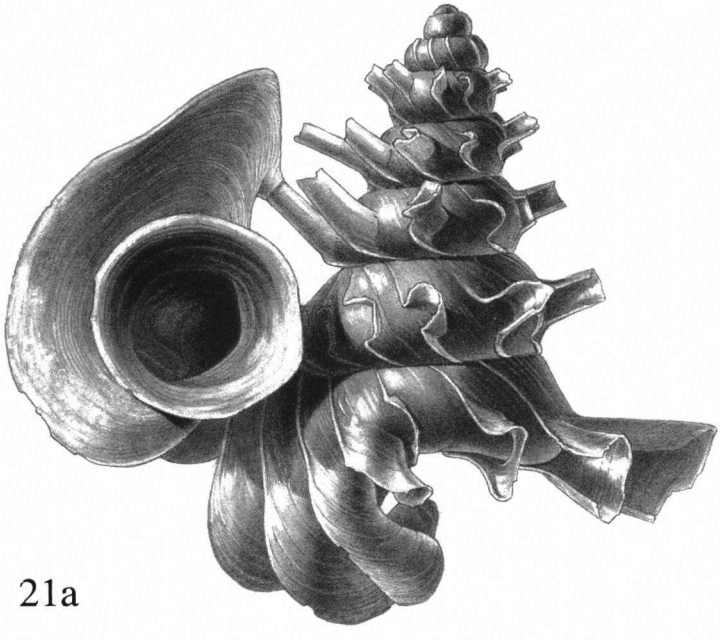
20e



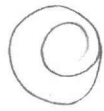


21b

21c

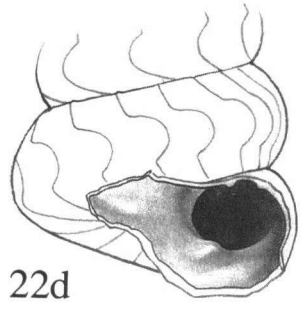


21a



22e

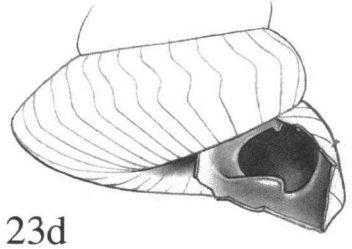
1 mm



22d

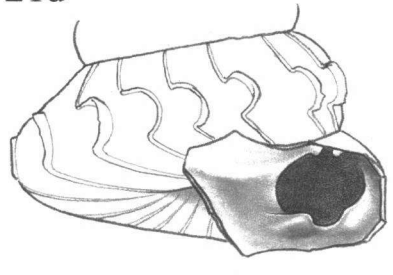
23e

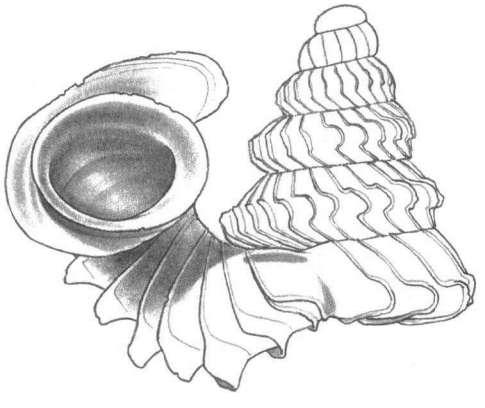
1 mm



23d

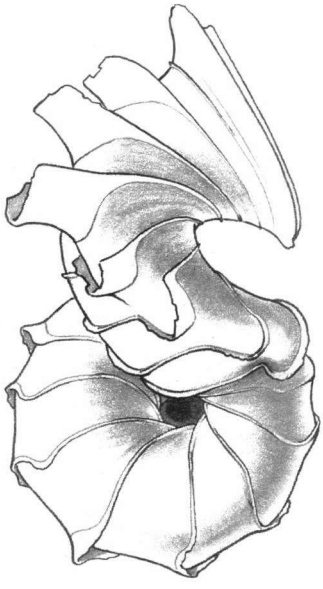
21d



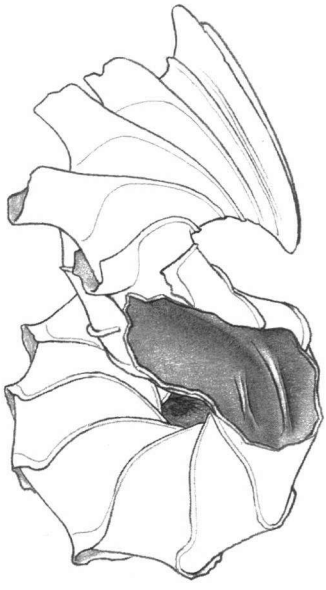


21e

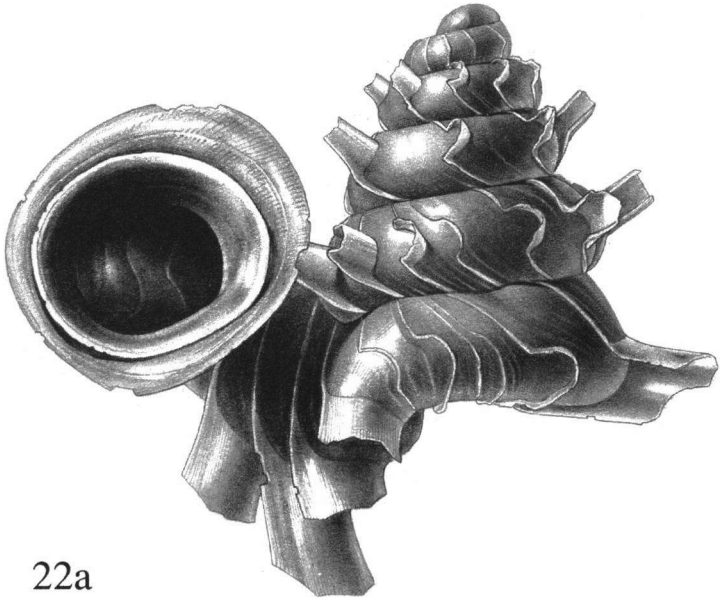
1 mm



22b

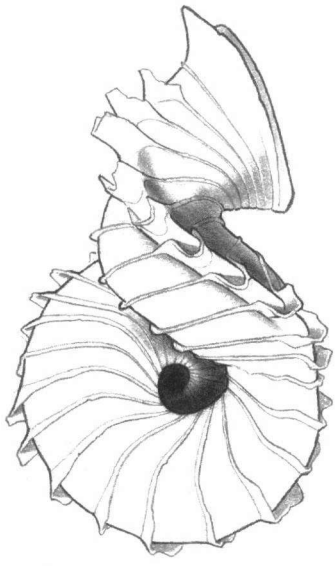


22c



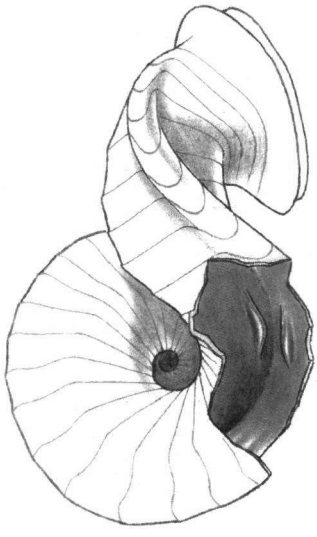
22a

1 mm

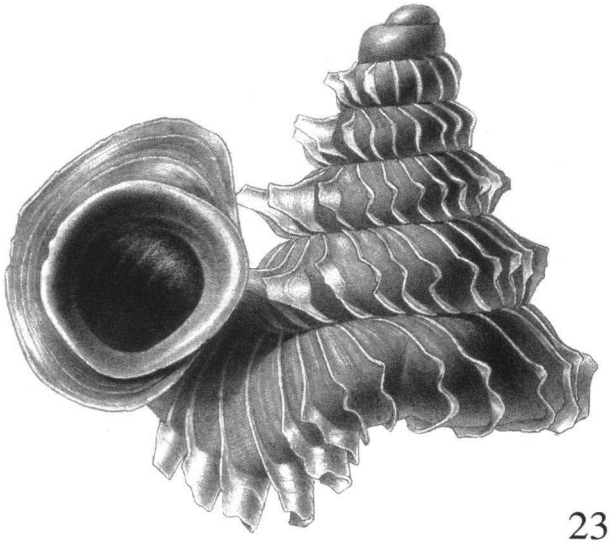


23b

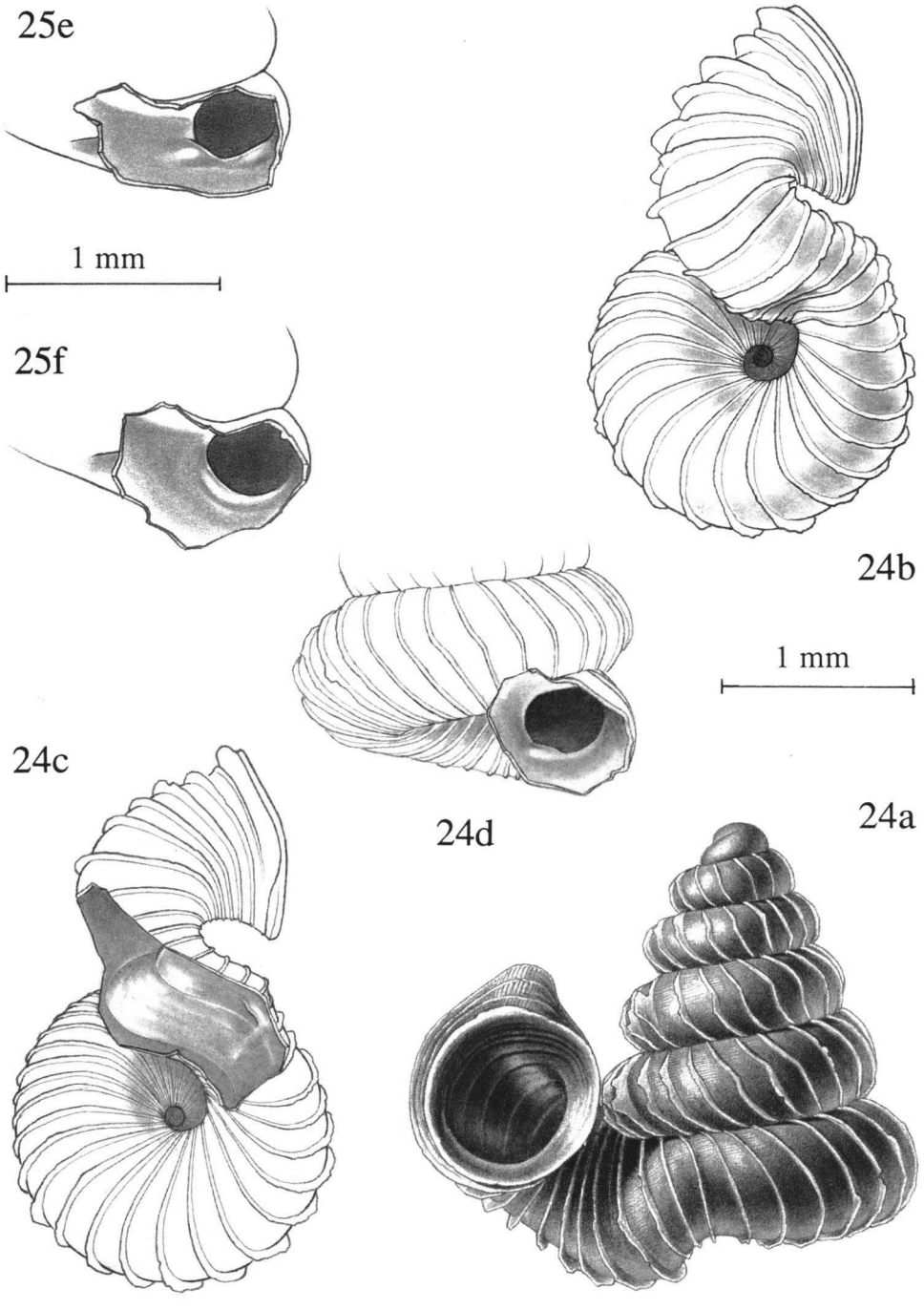
1 mm

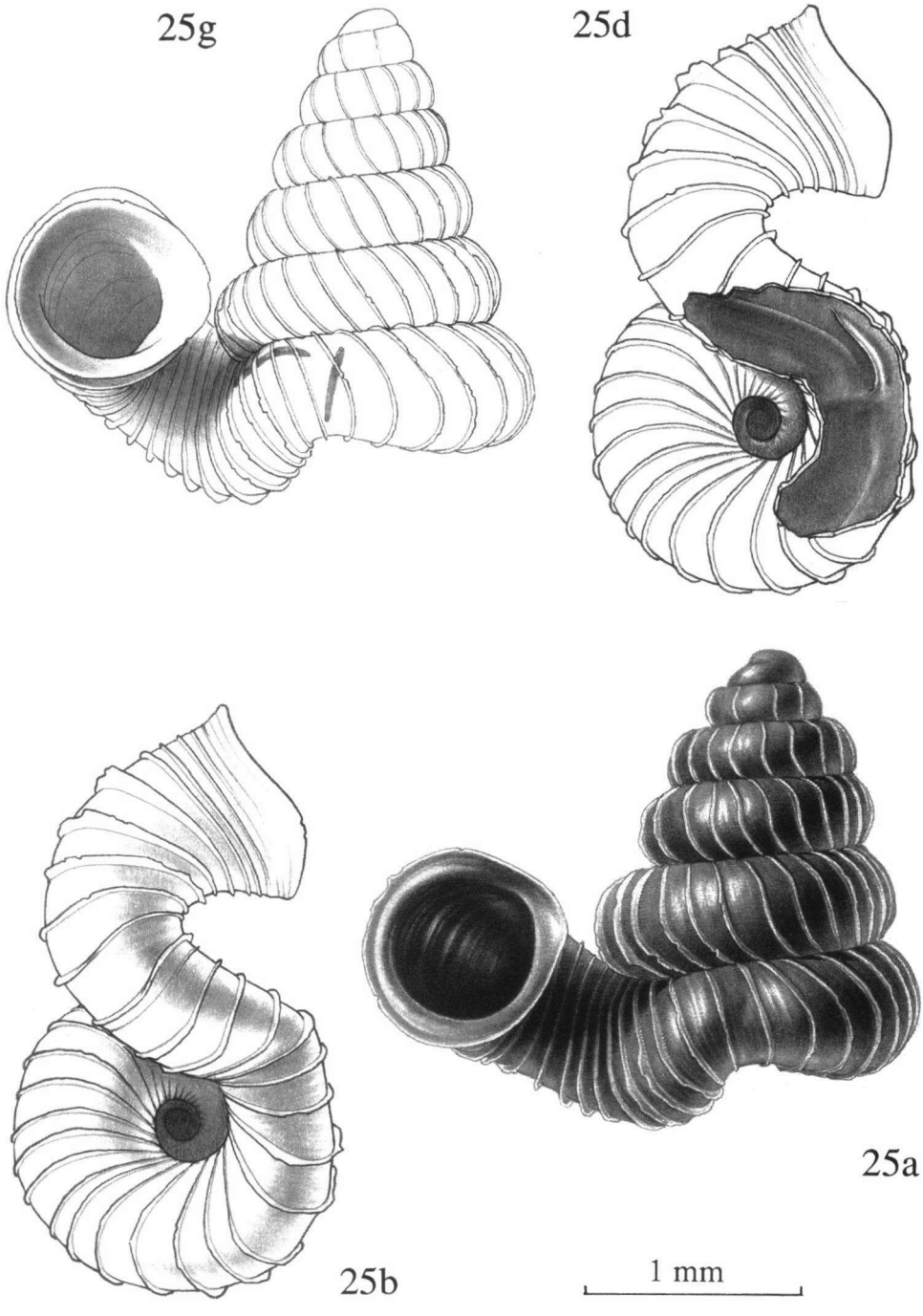


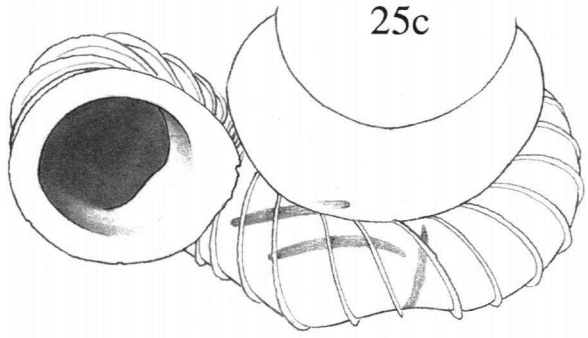
23c



23a

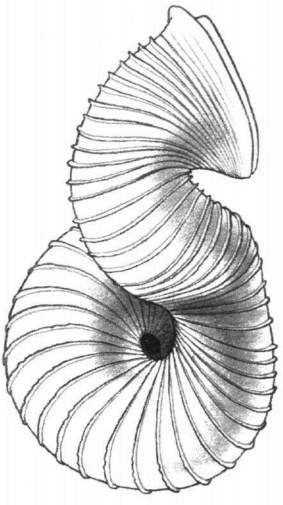

25e
1 mm
25f
24b
1 mm
24c
24d
24a


25g
25d
25b
25a
1 mm



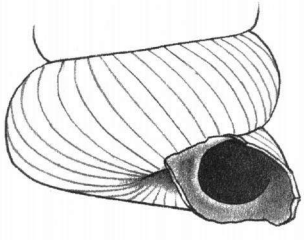
25c

1 mm

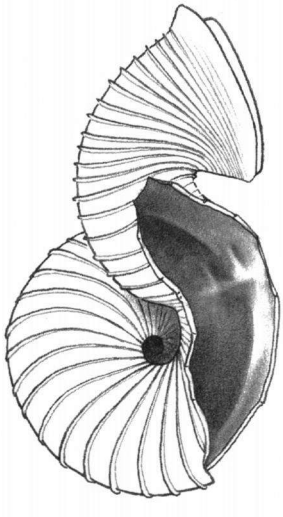


26b

1 mm

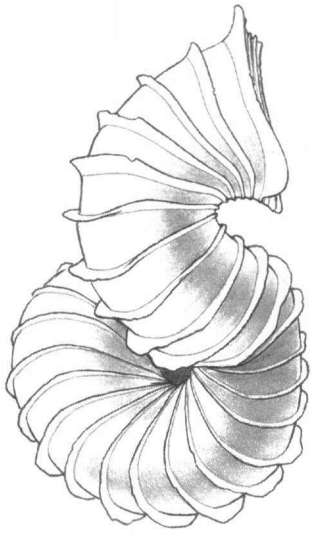


26d



26c

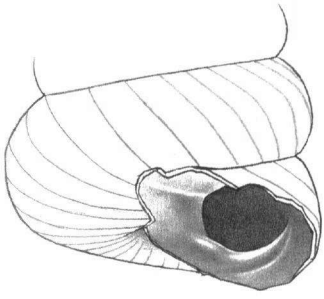
26a

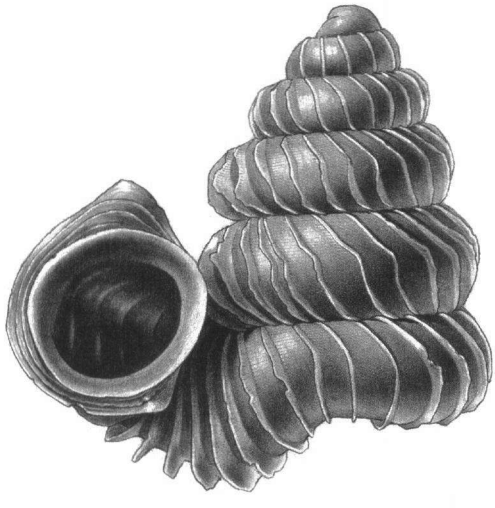


27b

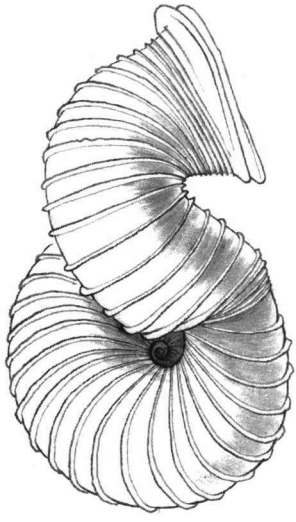
1 mm

27c

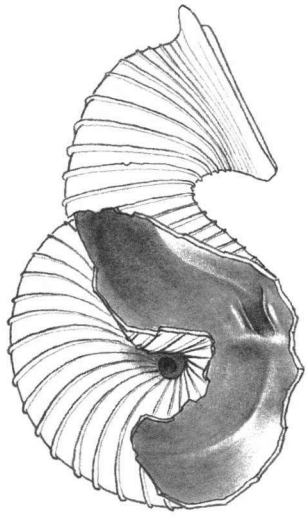




27a

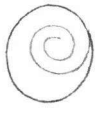


1 mm



28b

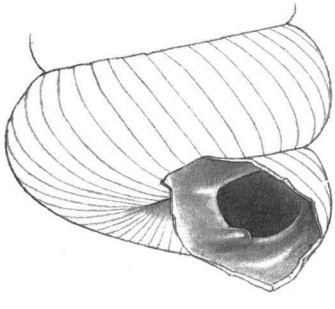
28c

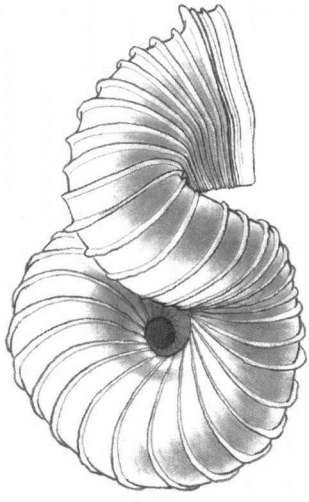


28e

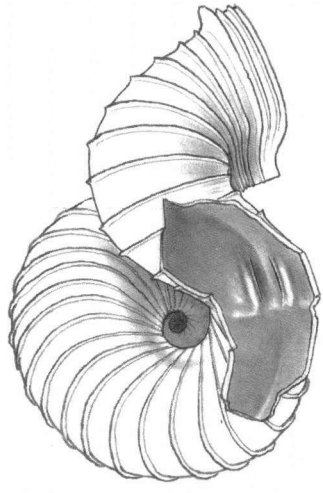
28a

28d





1 mm



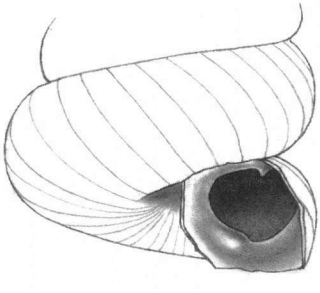
29b

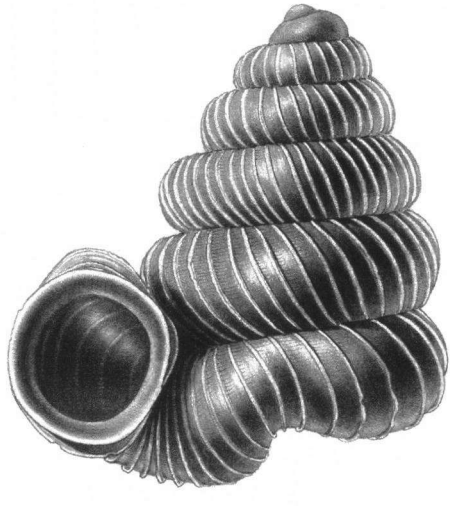
29c

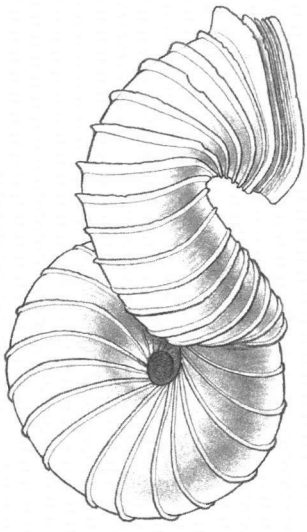
29e

29a

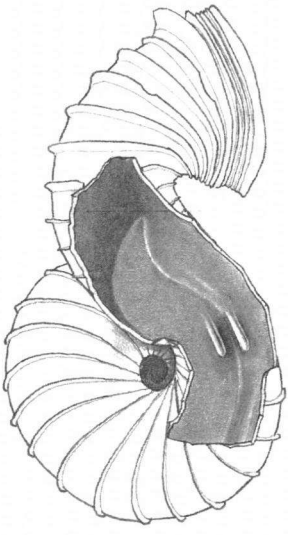
29d







30b

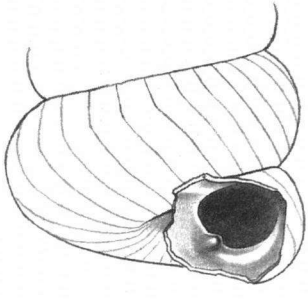


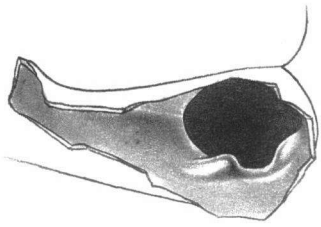
30c

1 mm

30a

30d

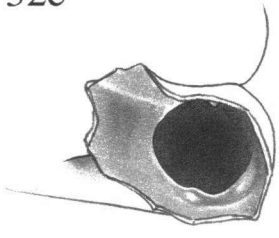


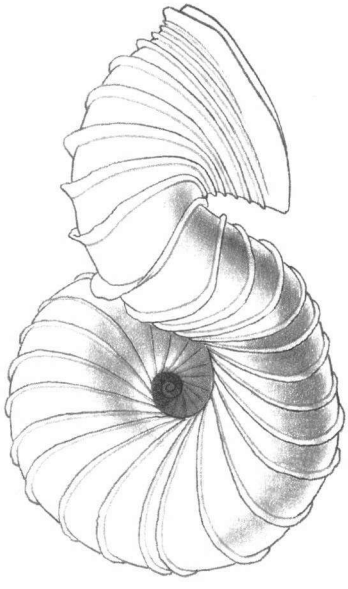


32d

1 mm

32e

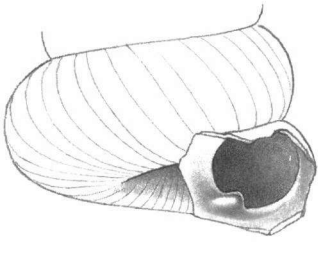




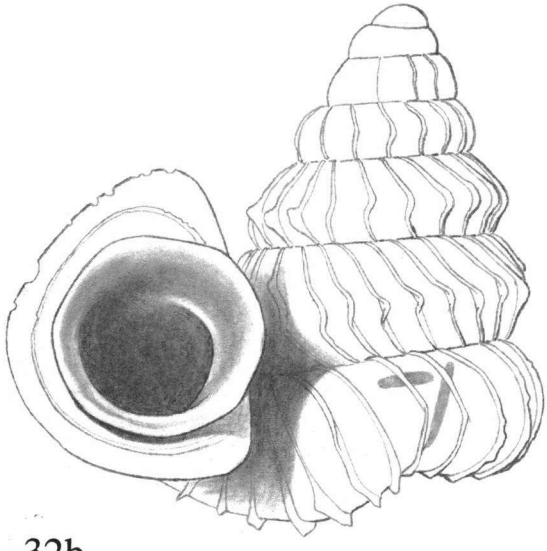
31b

31a

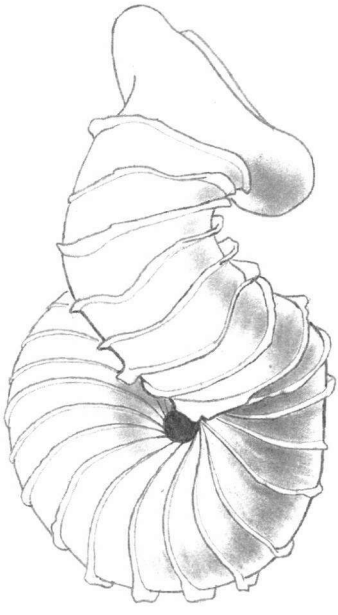
31c



1 mm

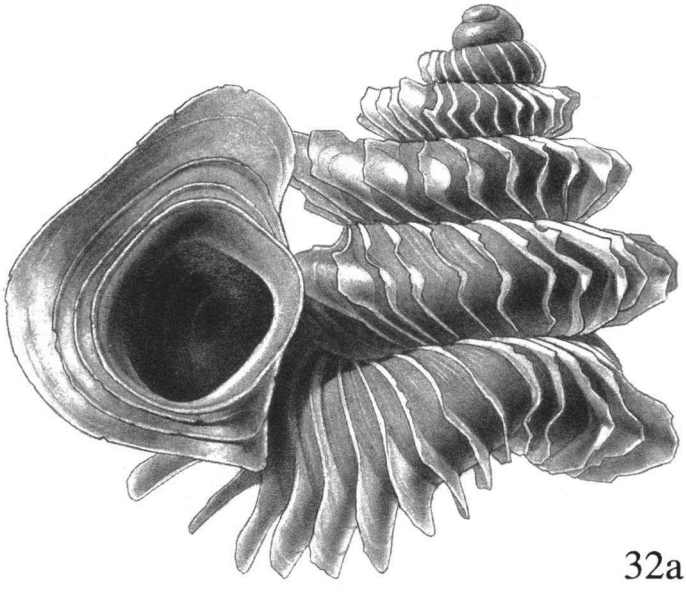


32b

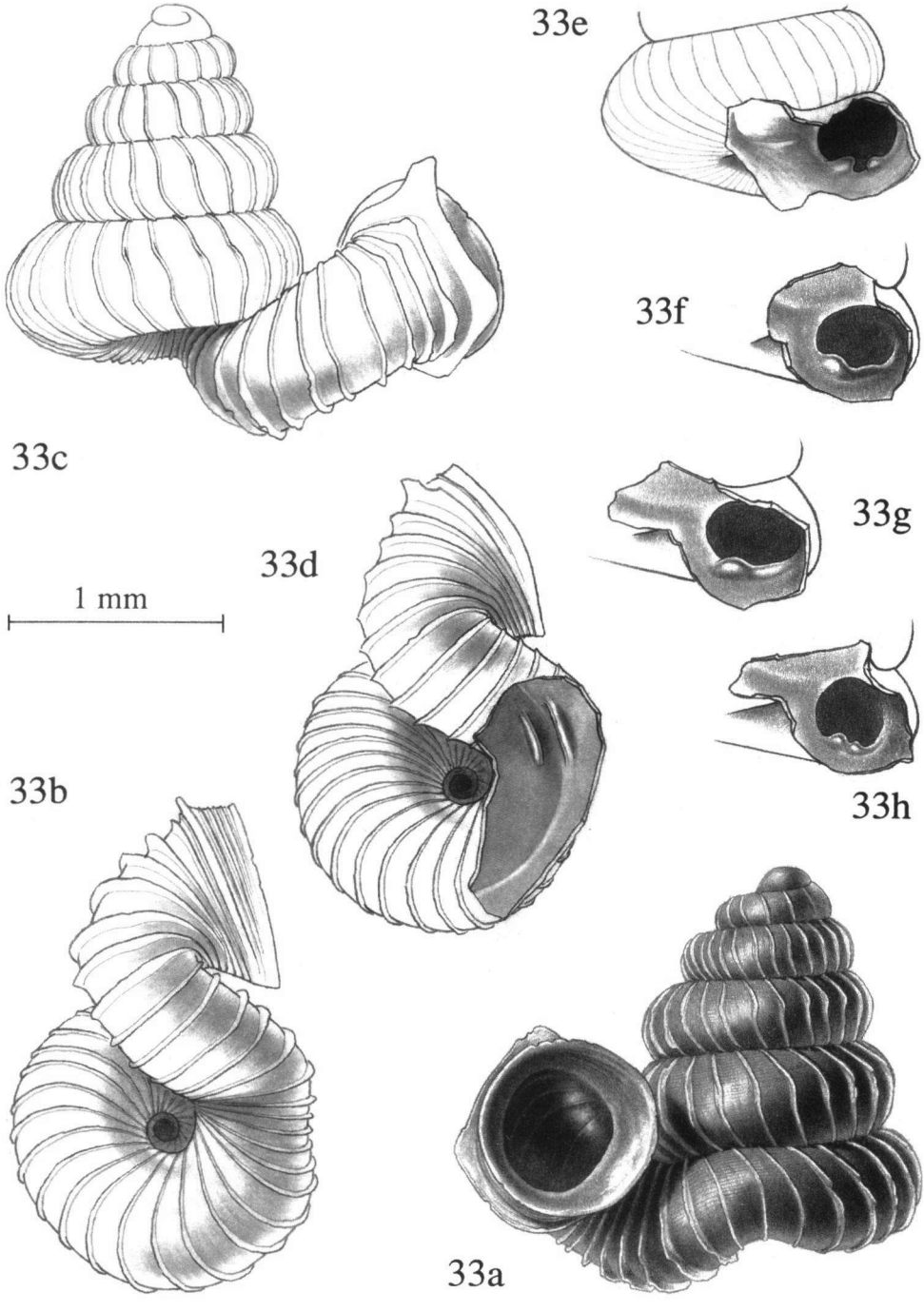


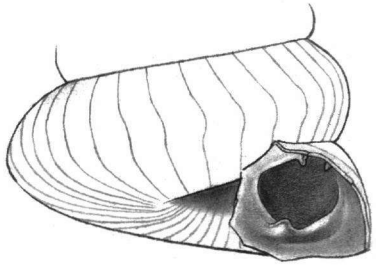
32c

1 mm



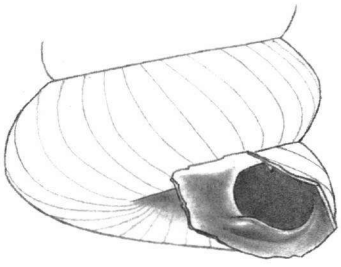
32a


33e
33f
33c
33g
33d
1 mm
33h
33b
33a

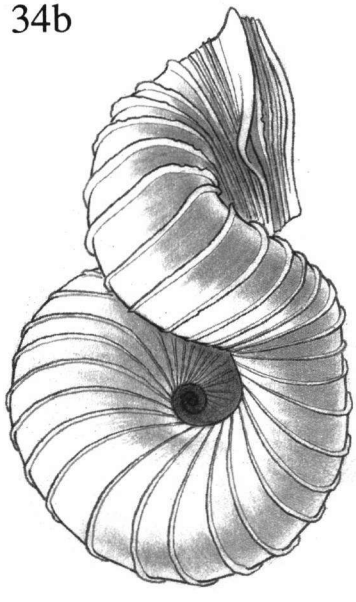


34c

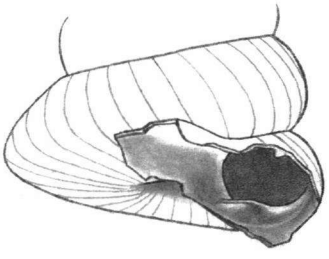
35c



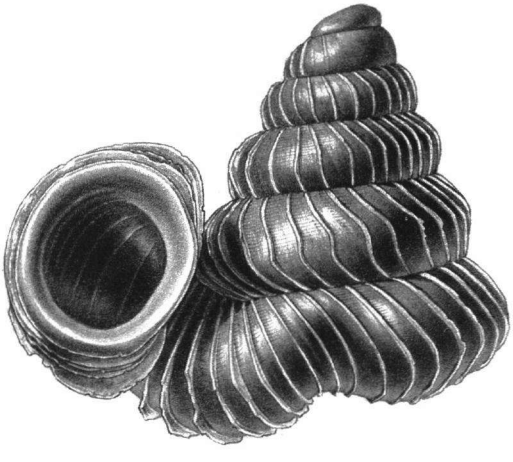
34b



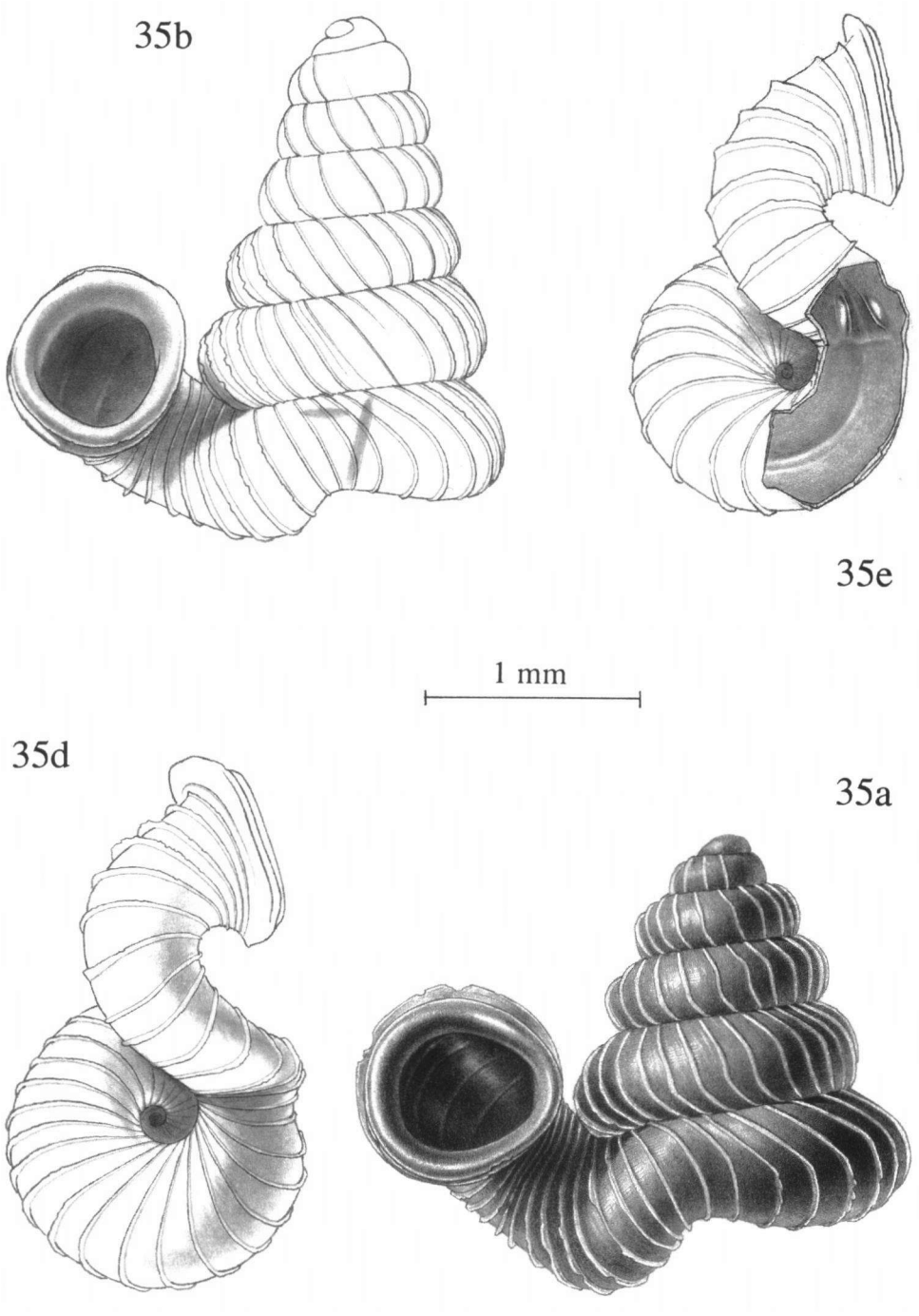
35f

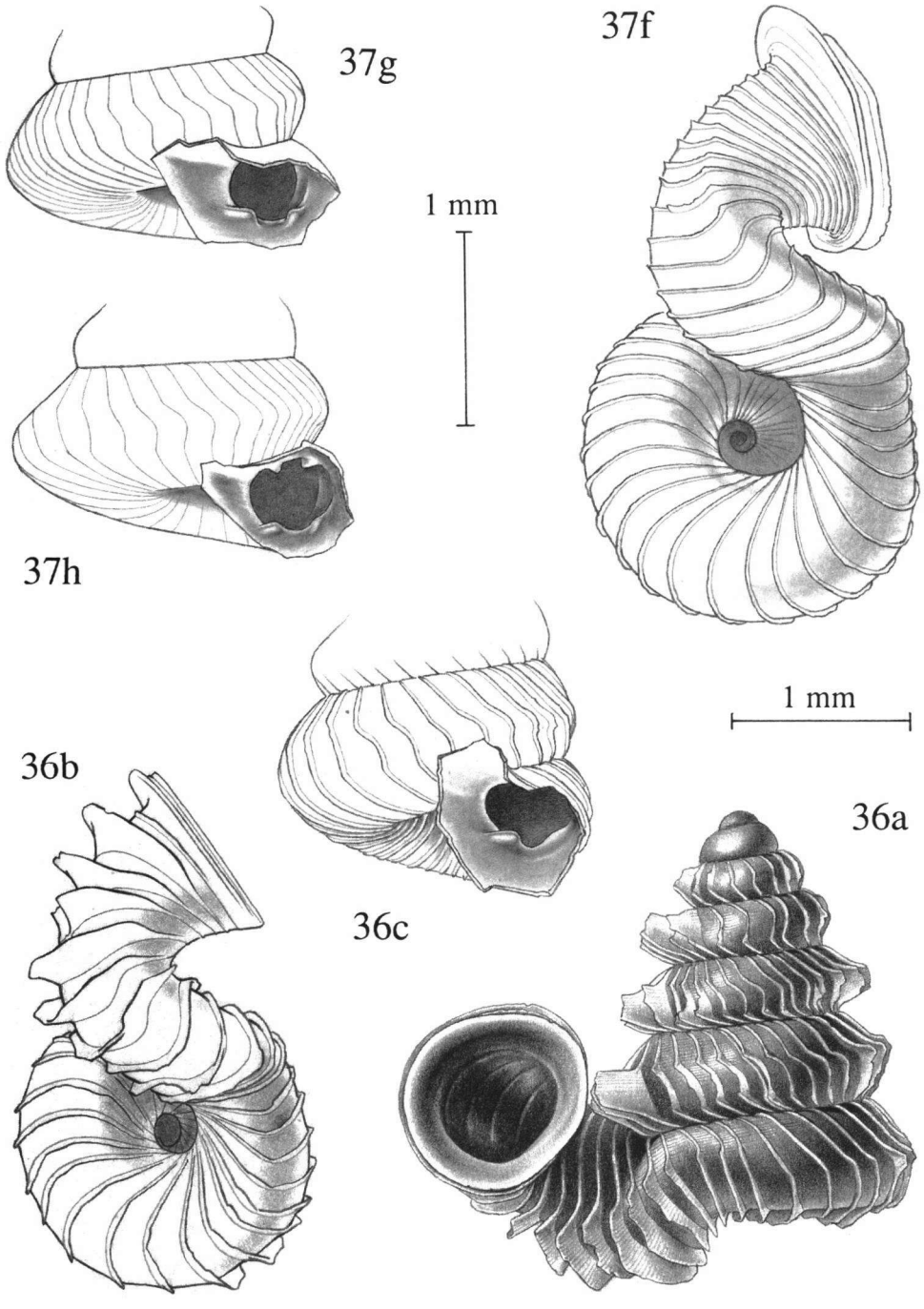


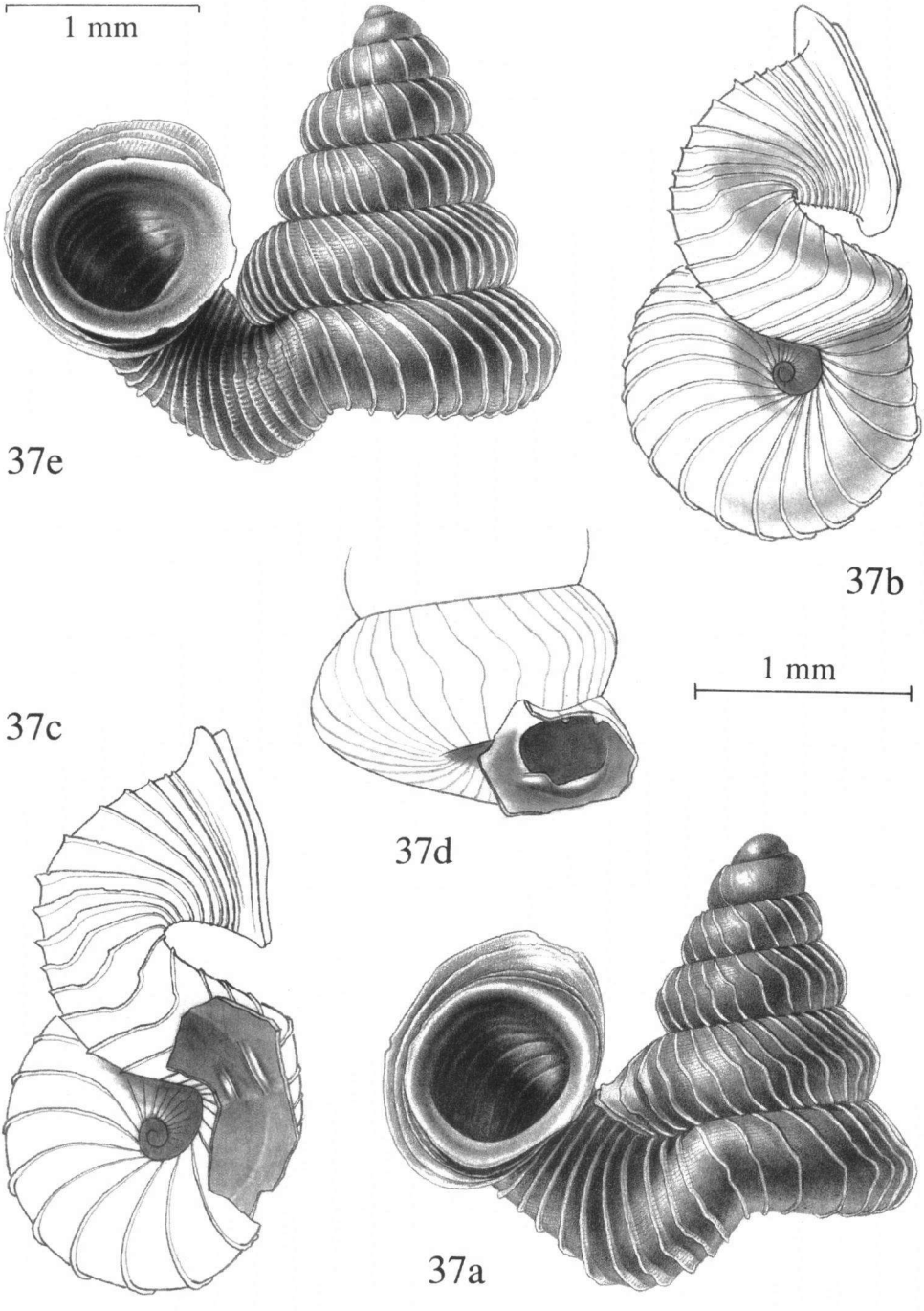
34a

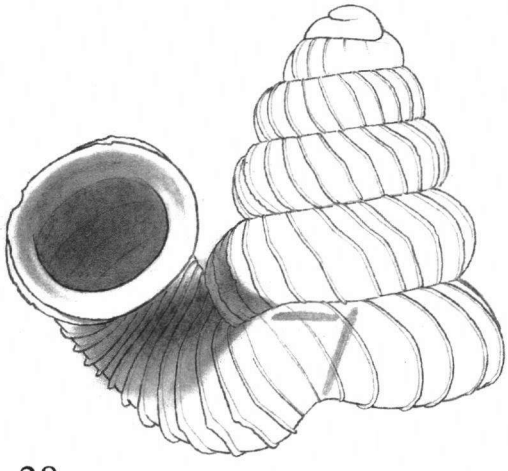


1 mm

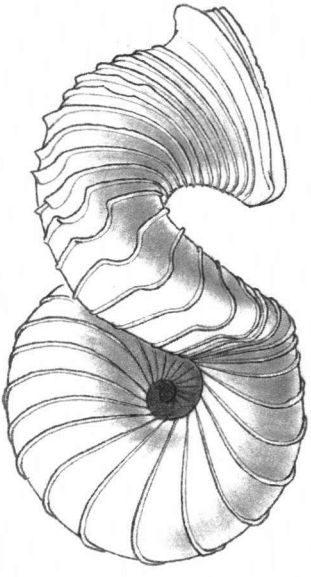

35b
35e
1 mm
35d
35a


37g
37f
1 mm
37h
1 mm
36b
36a
36c


1 mm
37e
37b
1 mm
37c
37d
37a

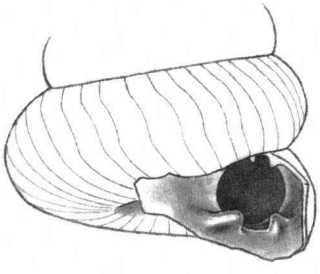


38c



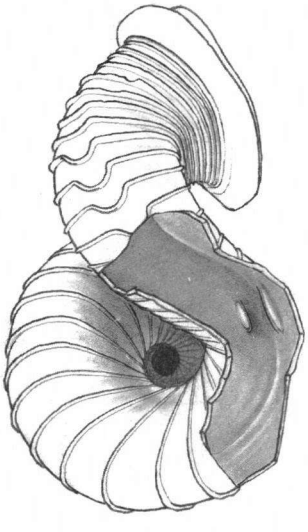
38b

38e

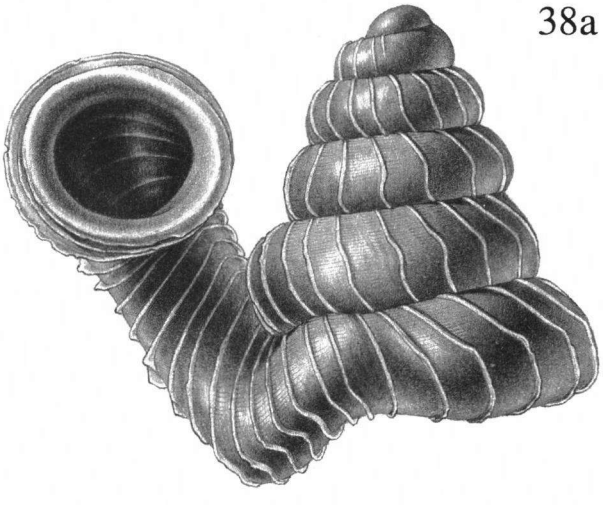


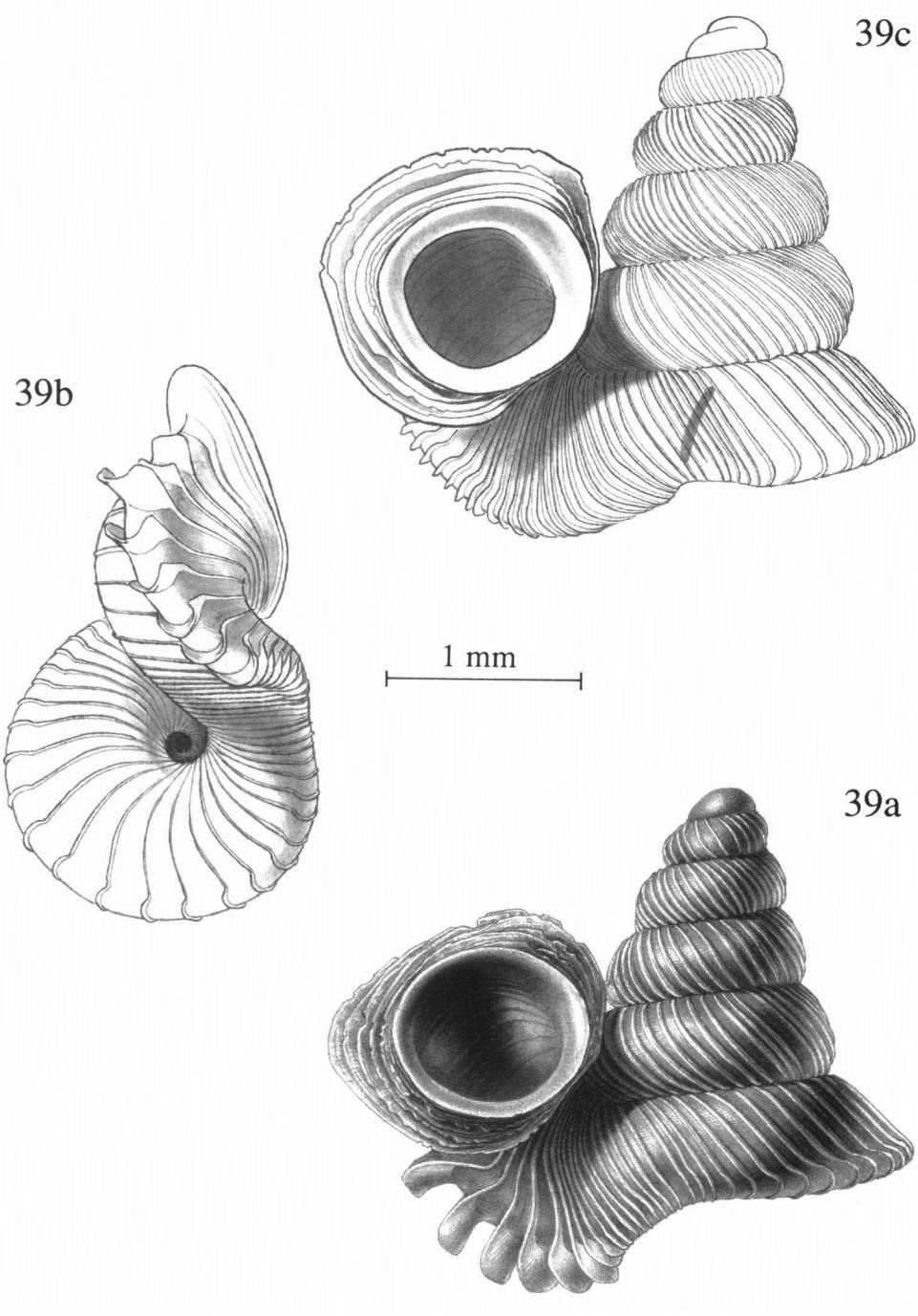
1 mm

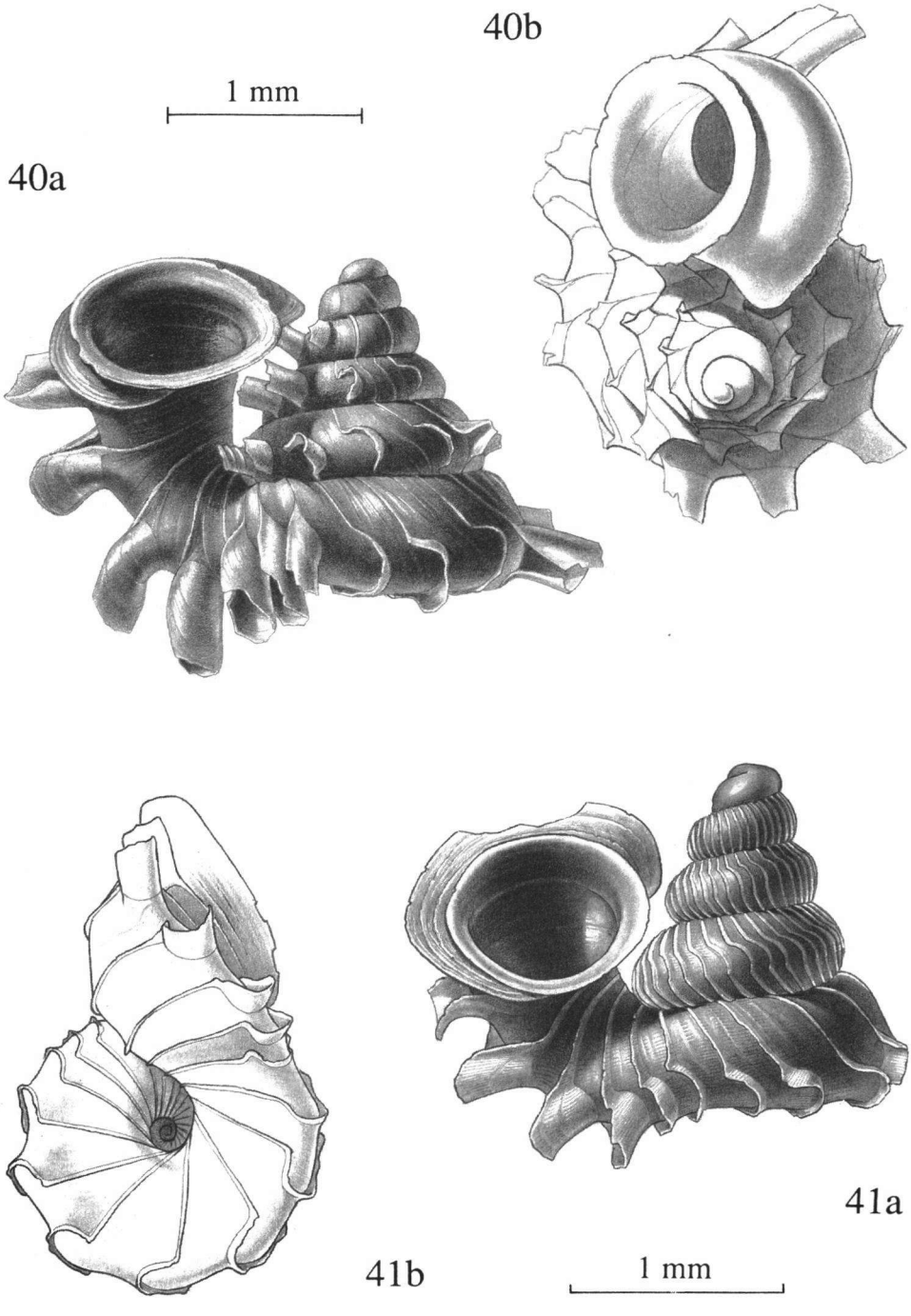
38d

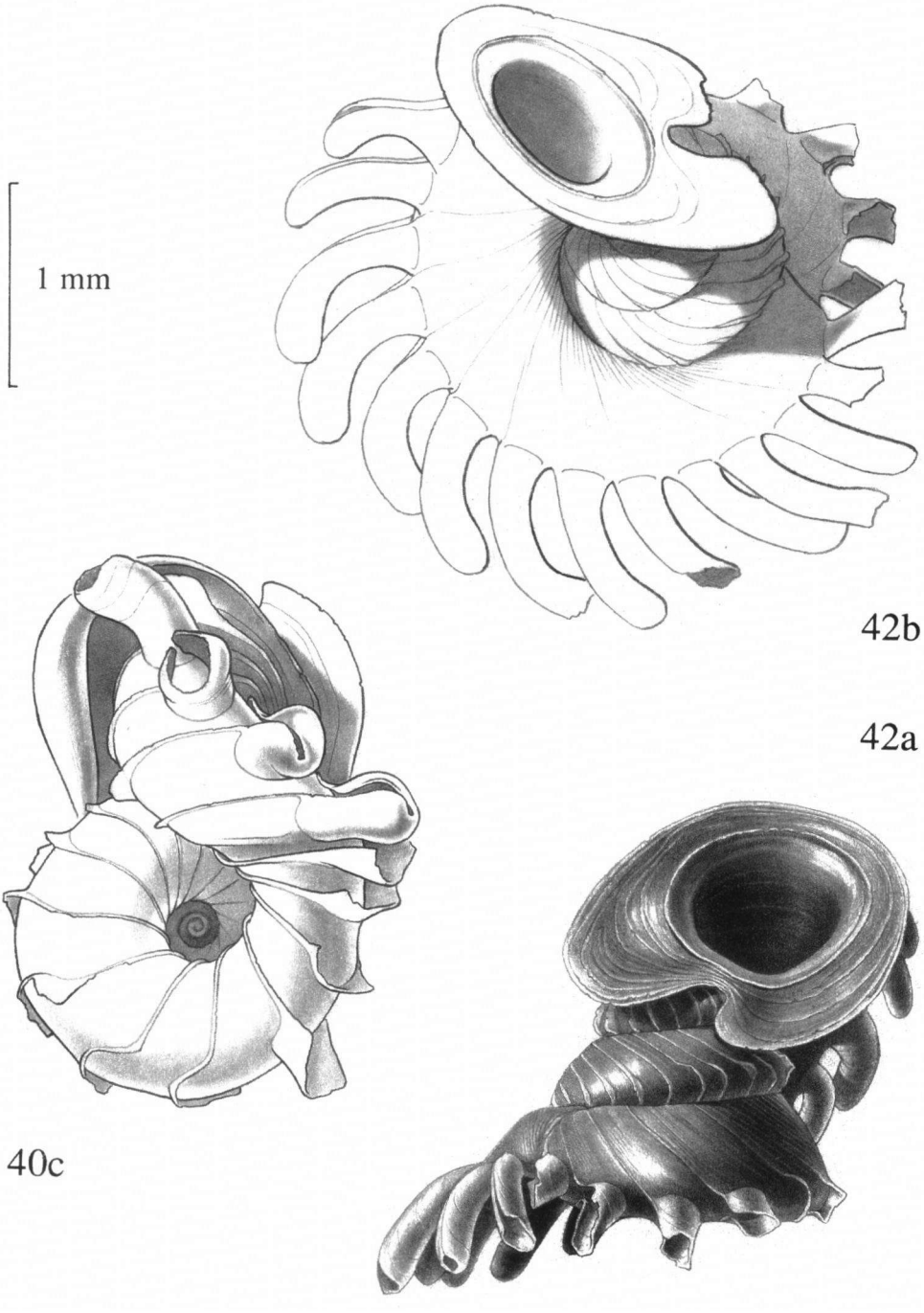


38a




39c
39b
1 mm
39a

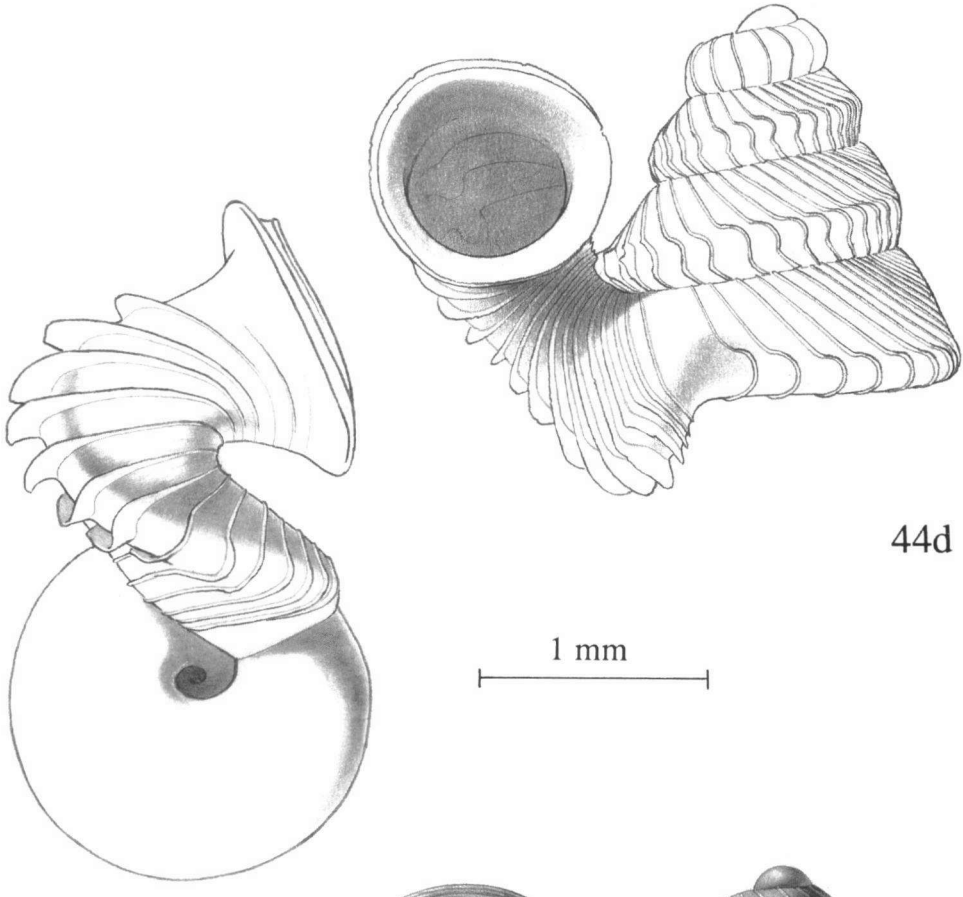

40b
1 mm
40a
41a
41b
1 mm


1 mm
42b
42a
40c

43b

43a

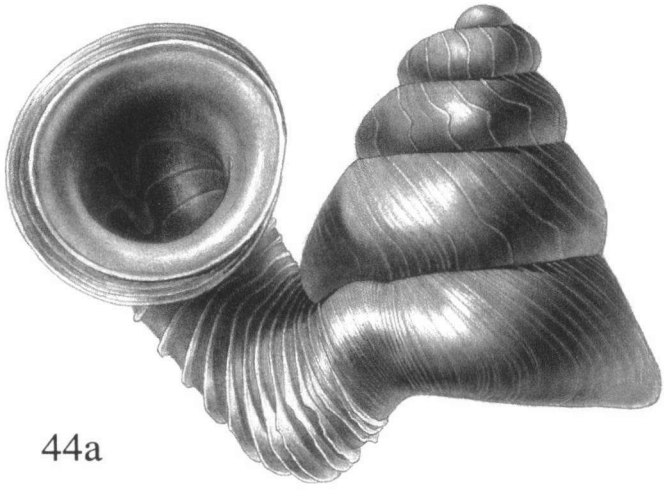
1 mm



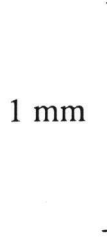
44d

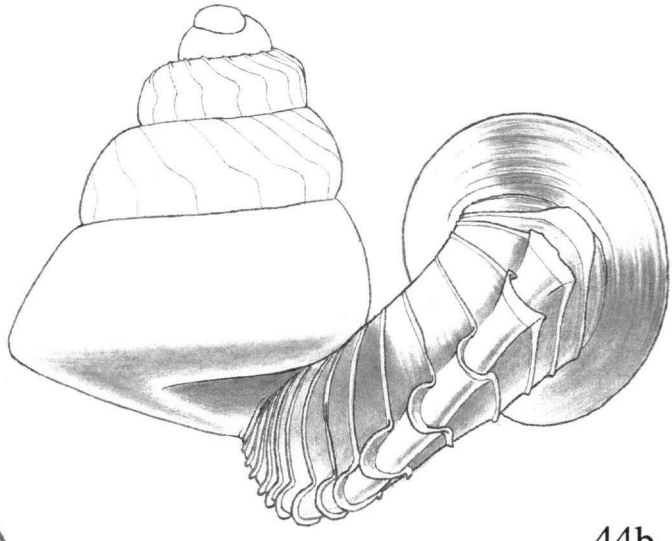
1 mm

44c



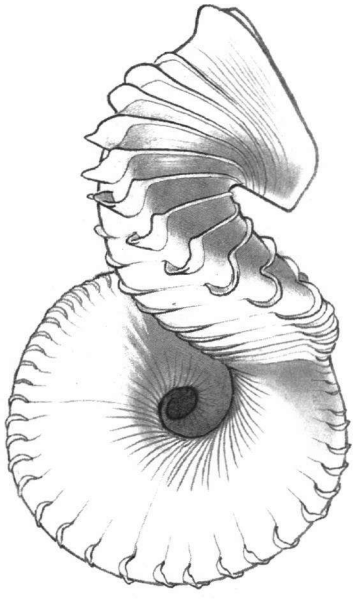
44a



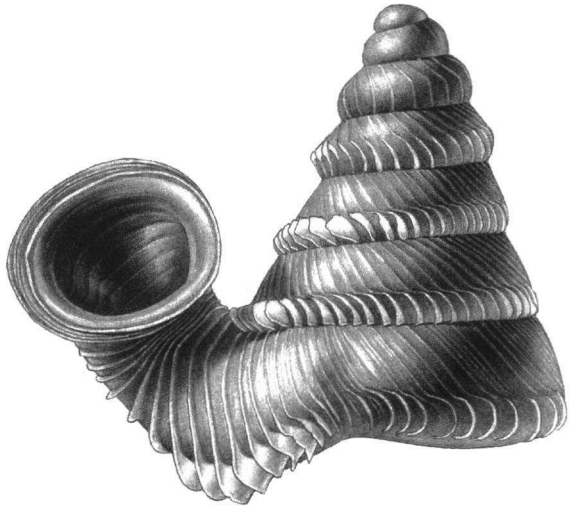


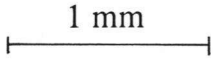
44b

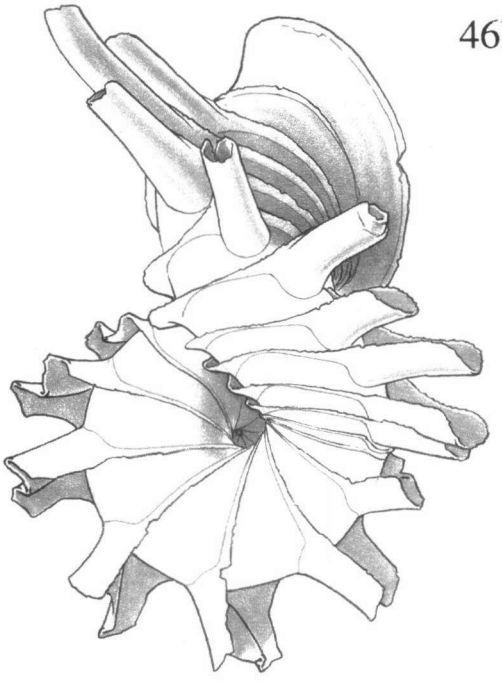
45a

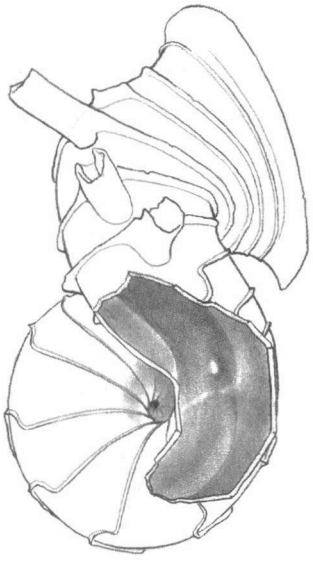


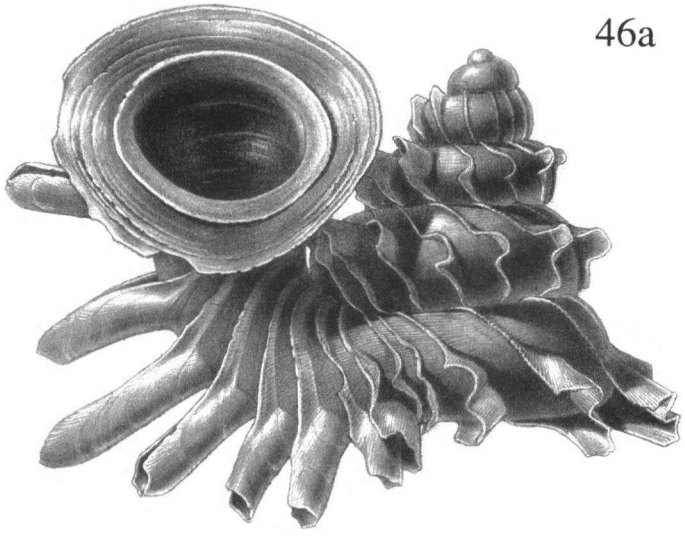
45b



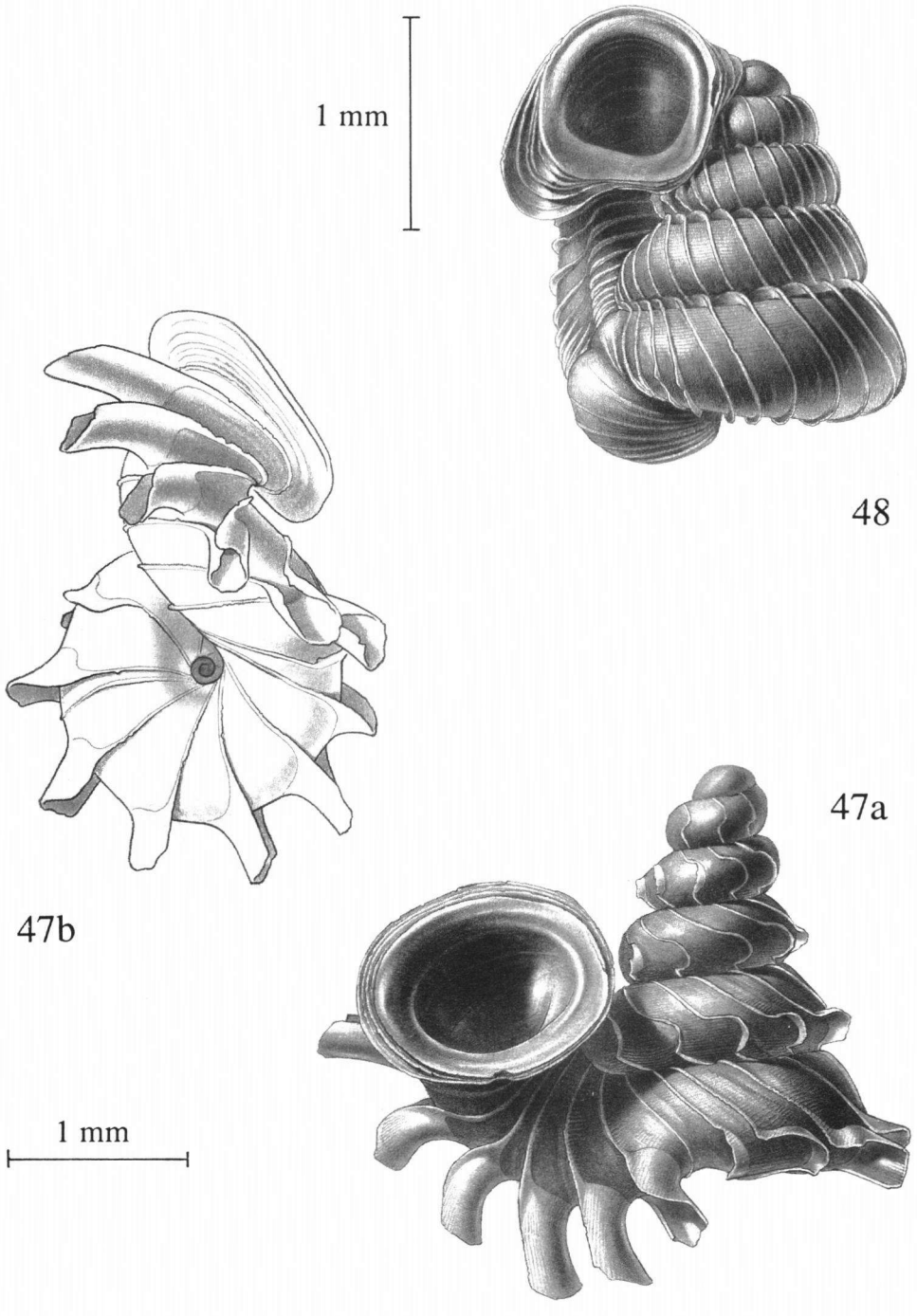


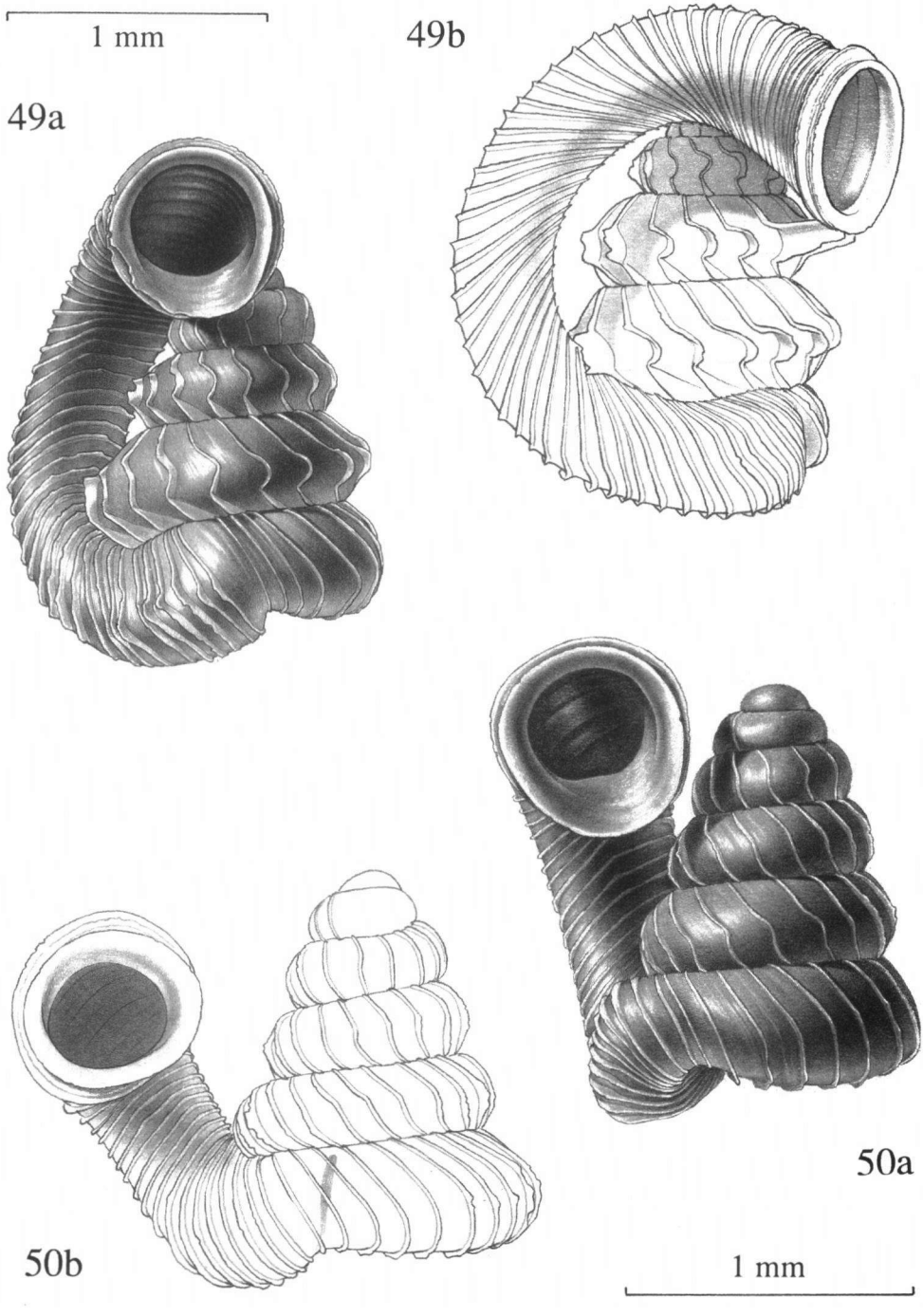

46b

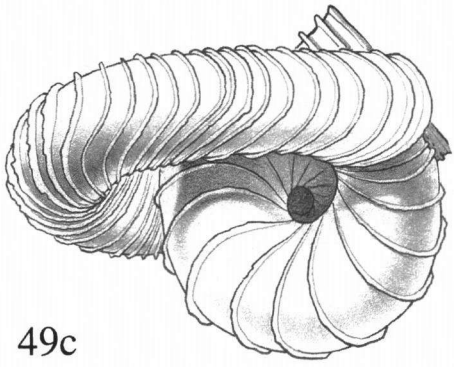

46c


46a


1 mm

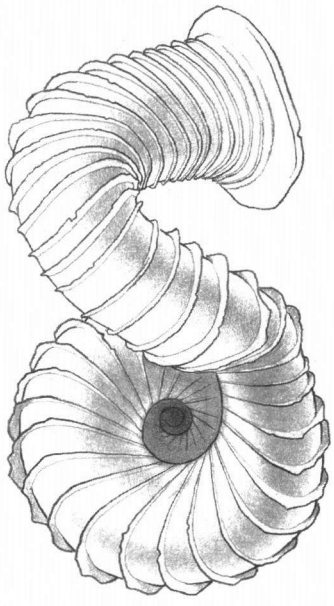

1 mm
48
47b
47a
1 mm


1 mm
49a
49b
50a
50b
1 mm



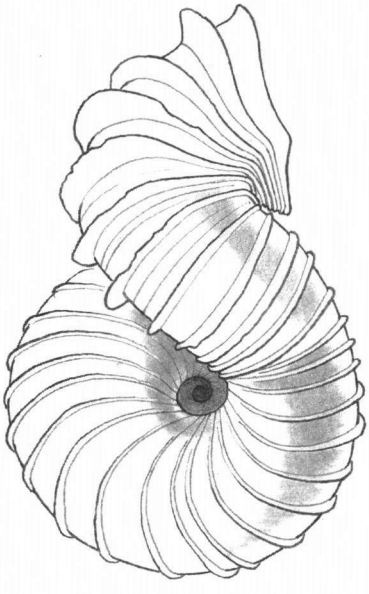
49c

1 mm



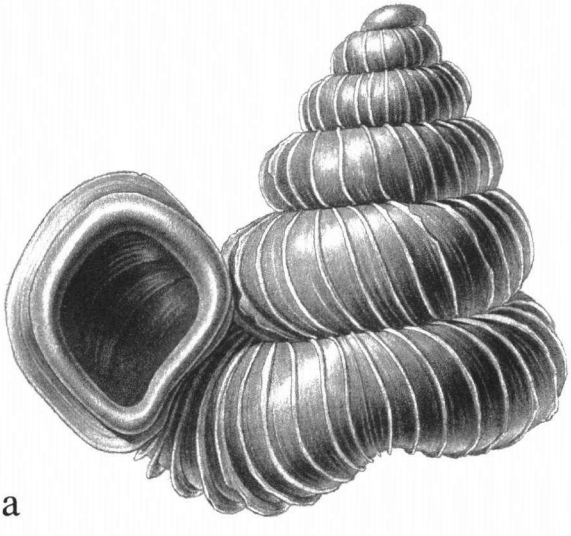
50c

1 mm

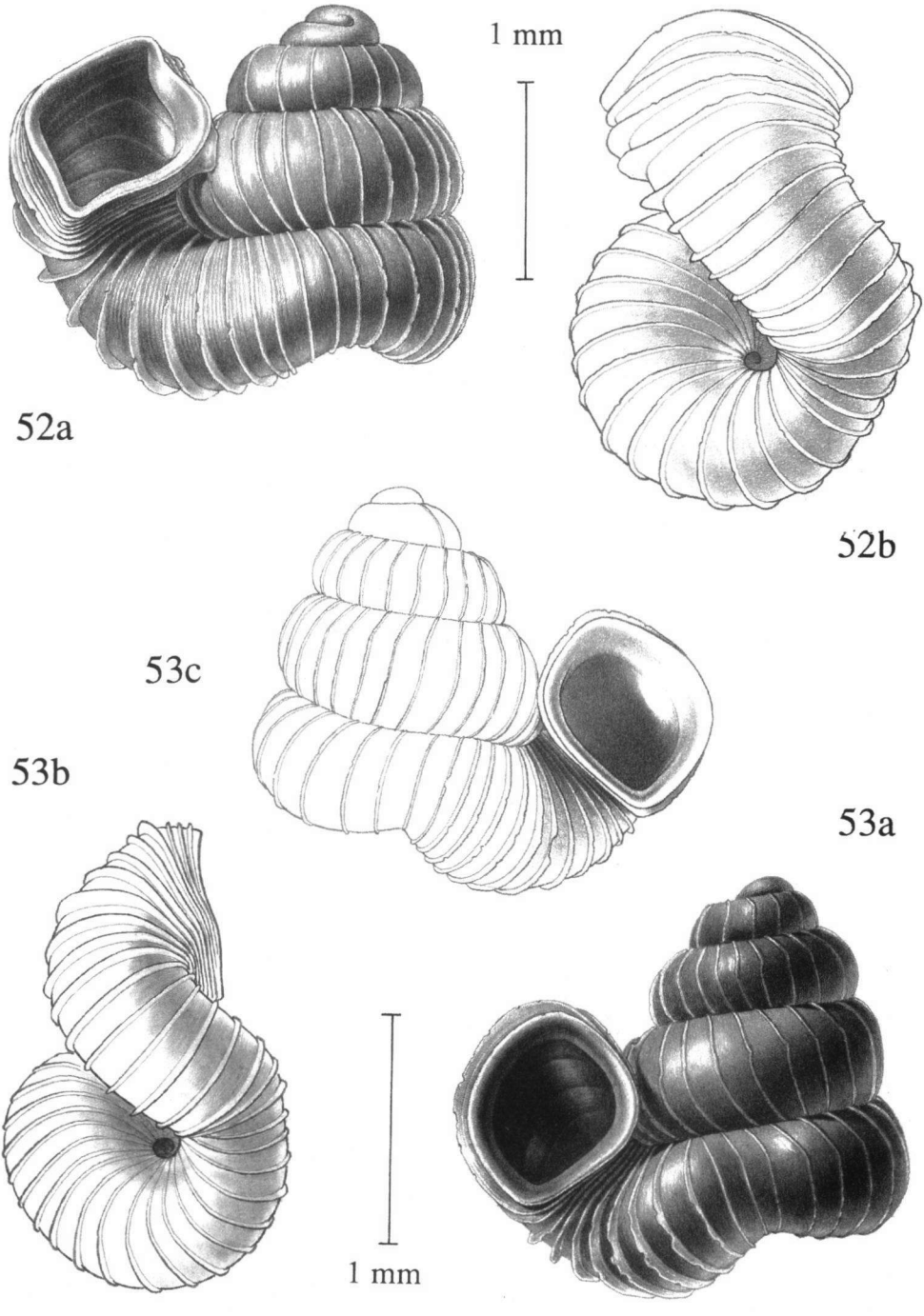


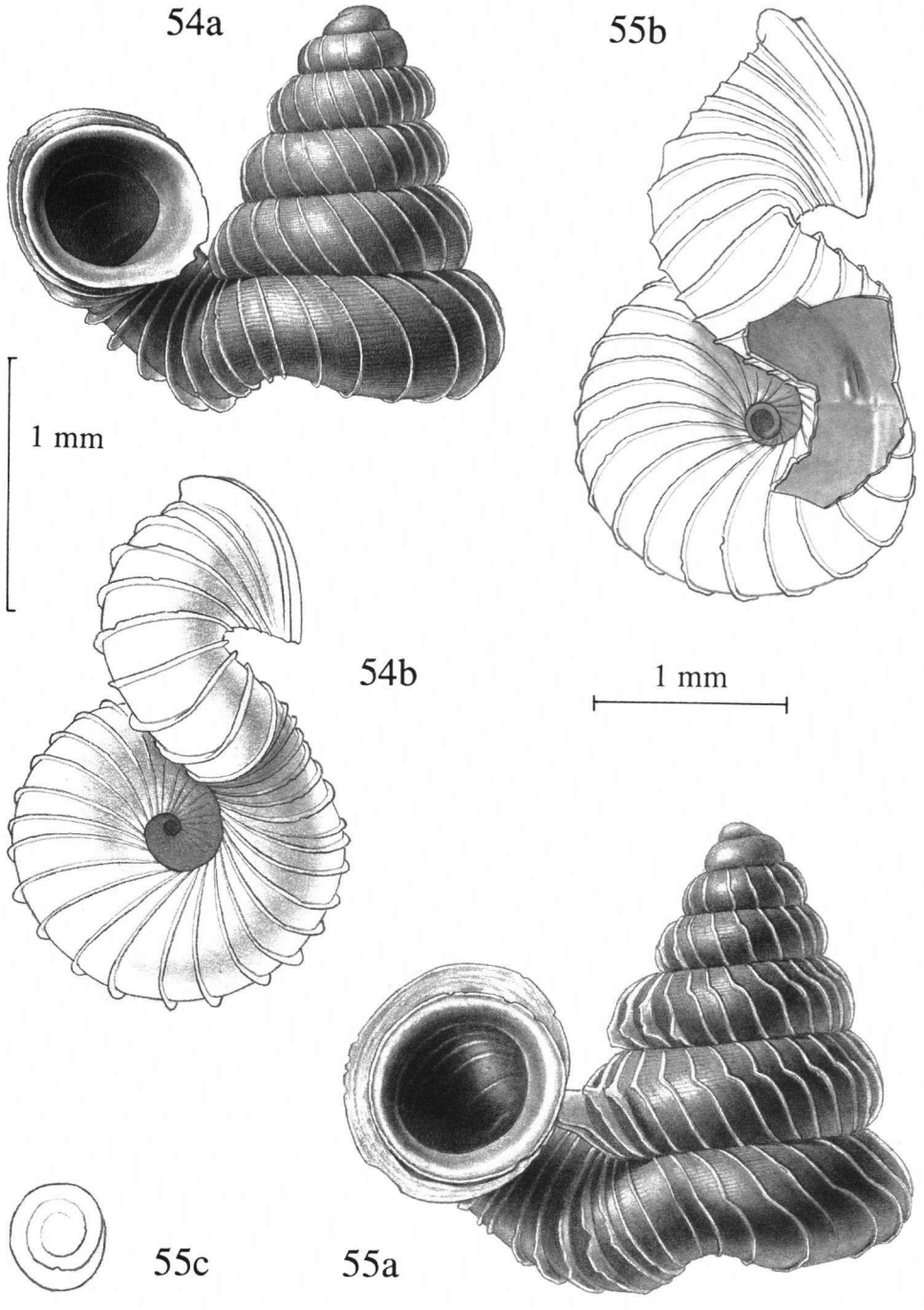
51b

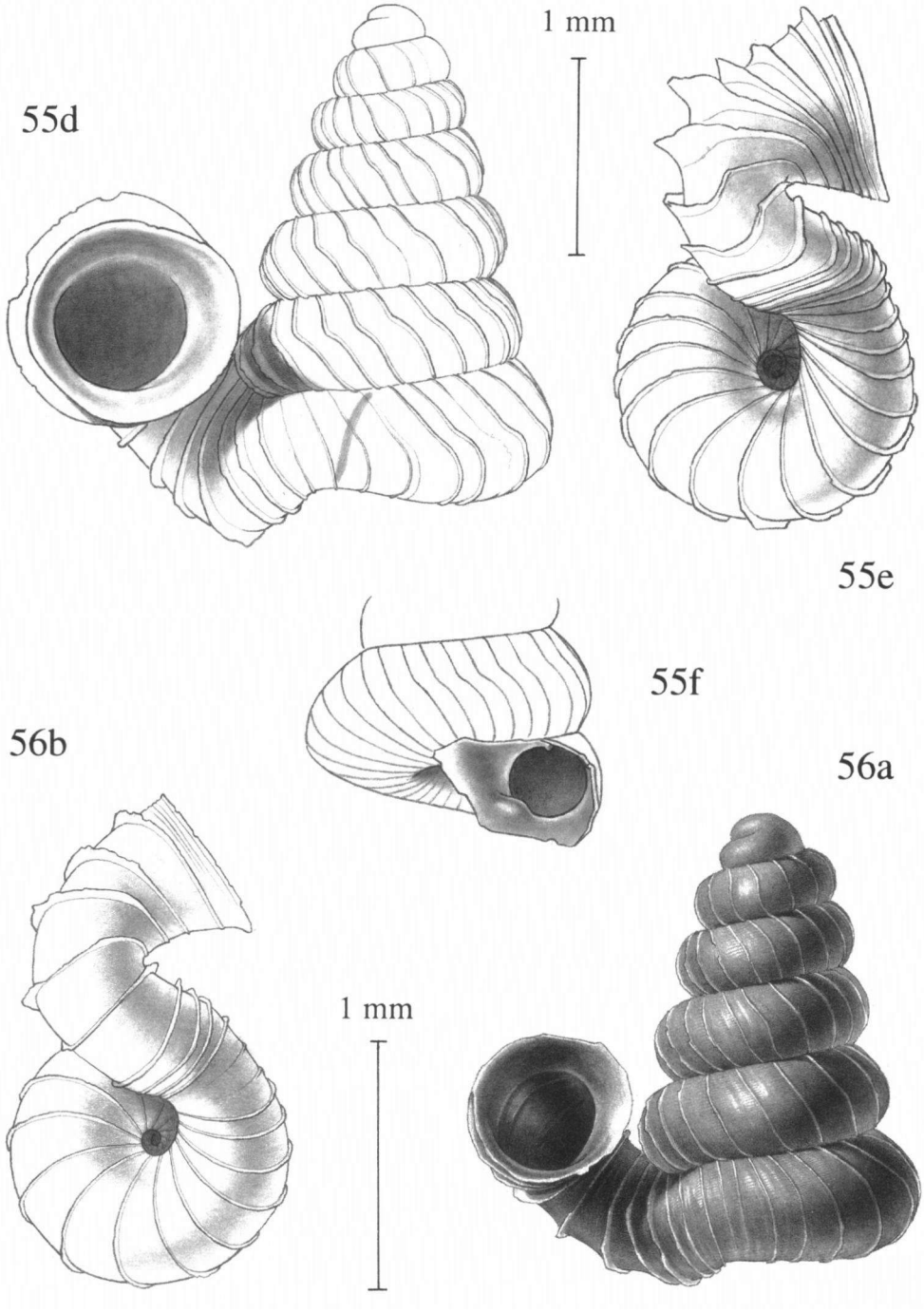
1 mm

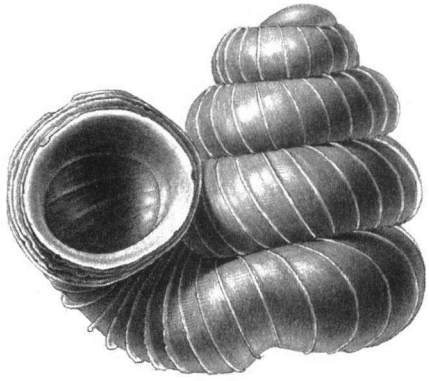


51a

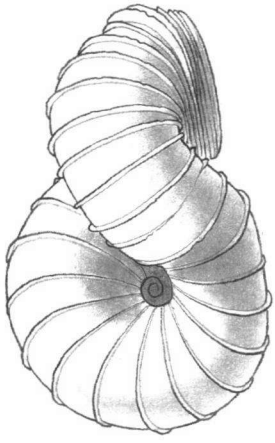

1 mm
52a
52b
53c
53b
53a
1 mm


54a
55b
1 mm
54b
1 mm
55c
55a


1 mm
55d
55e
55f
56b
56a
1 mm

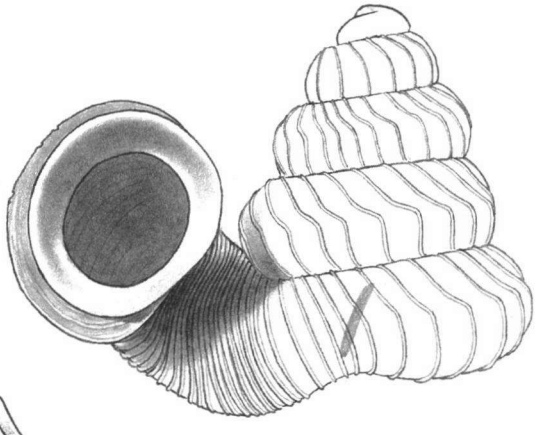


1 mm



57a

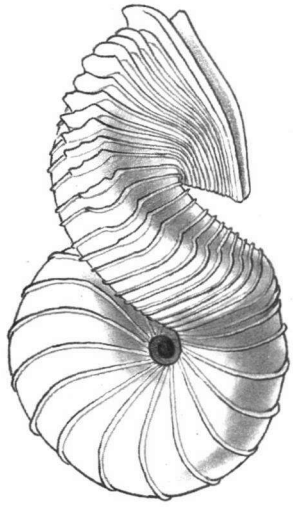
57b



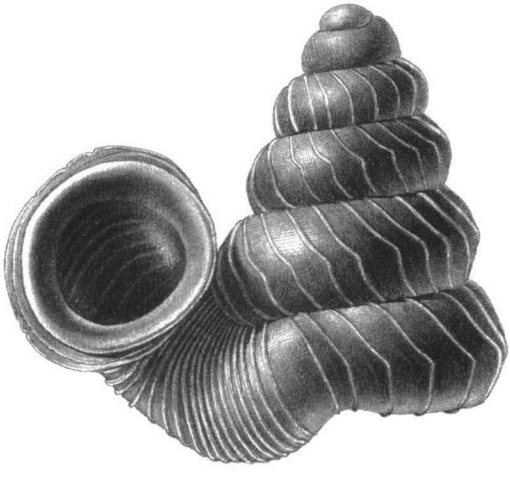
58c

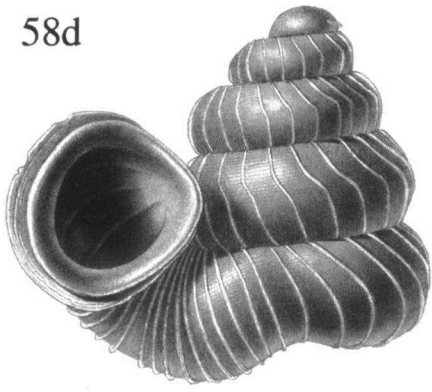
58b

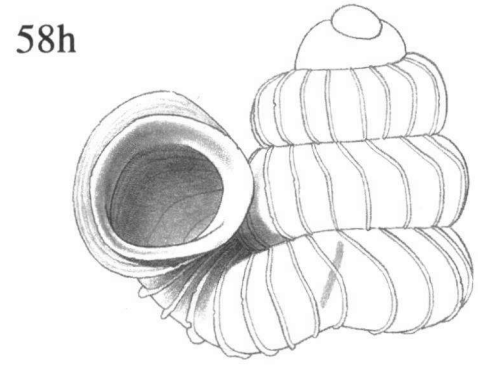
58a



1 mm

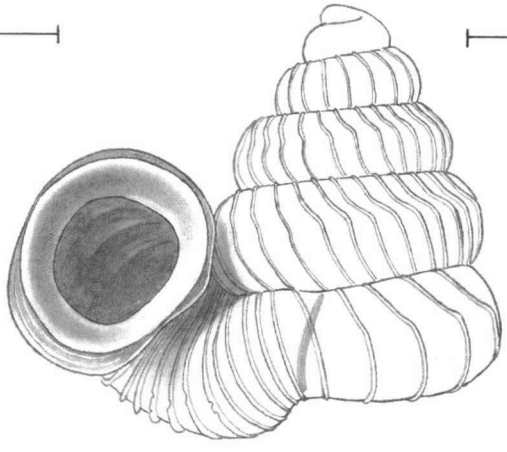






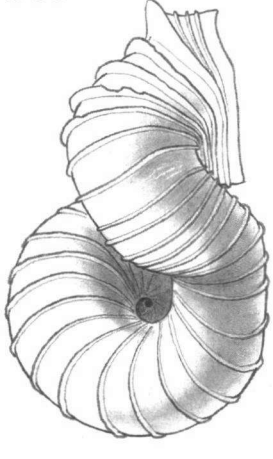
1 mm

1 mm

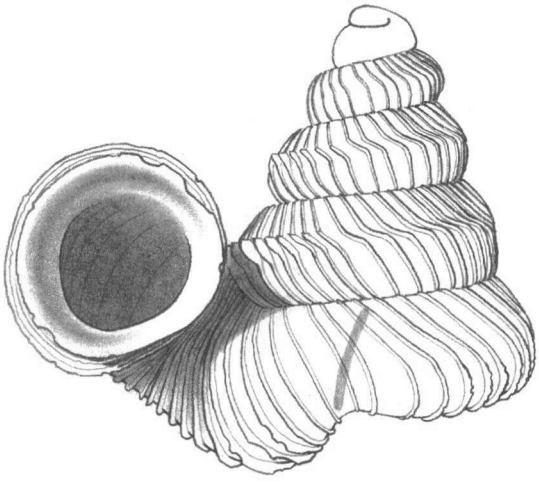


1 mm

58g

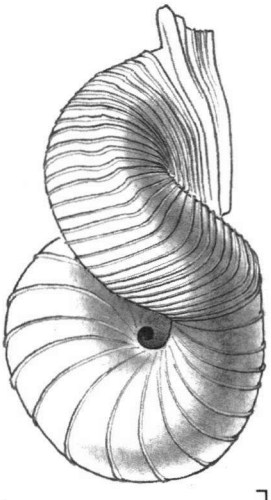


1 mm

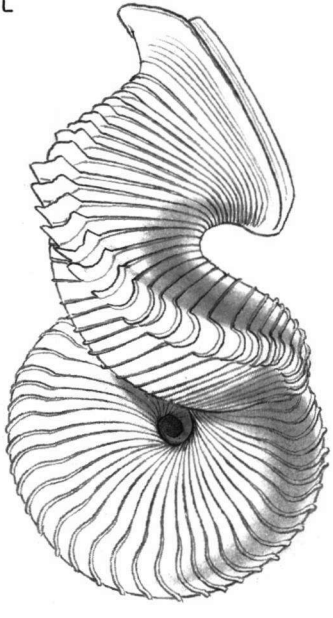


1 mm

58 i



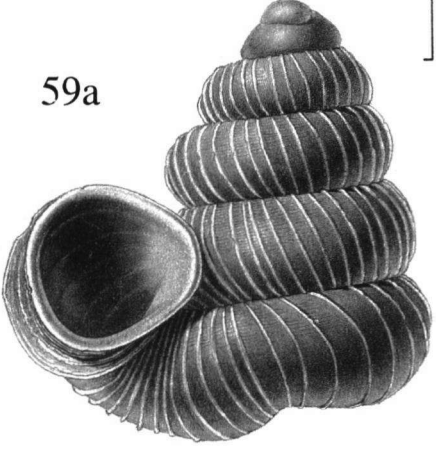
59b

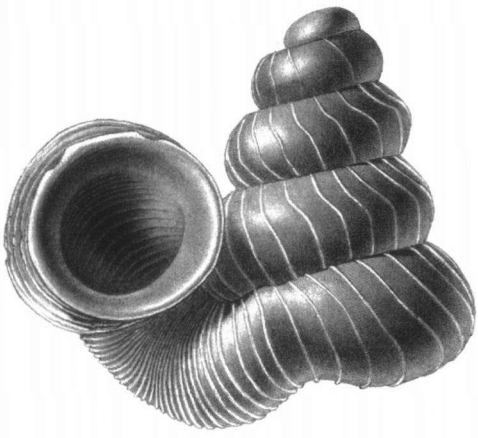


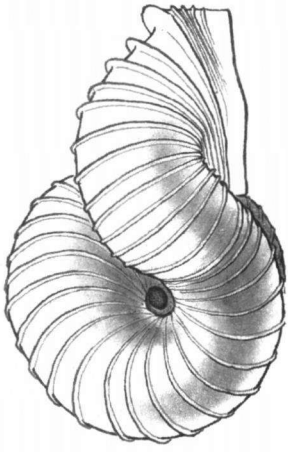
58 j

1 mm

59a





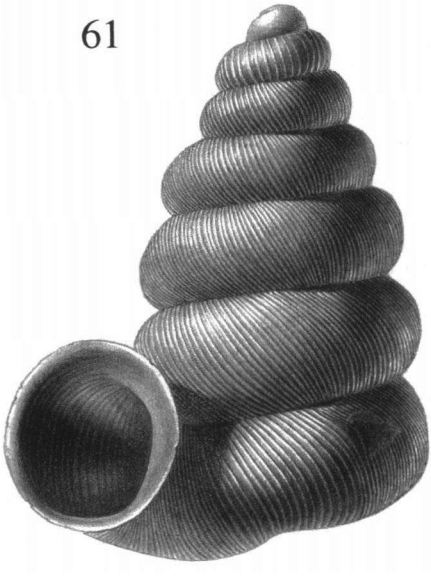


60a

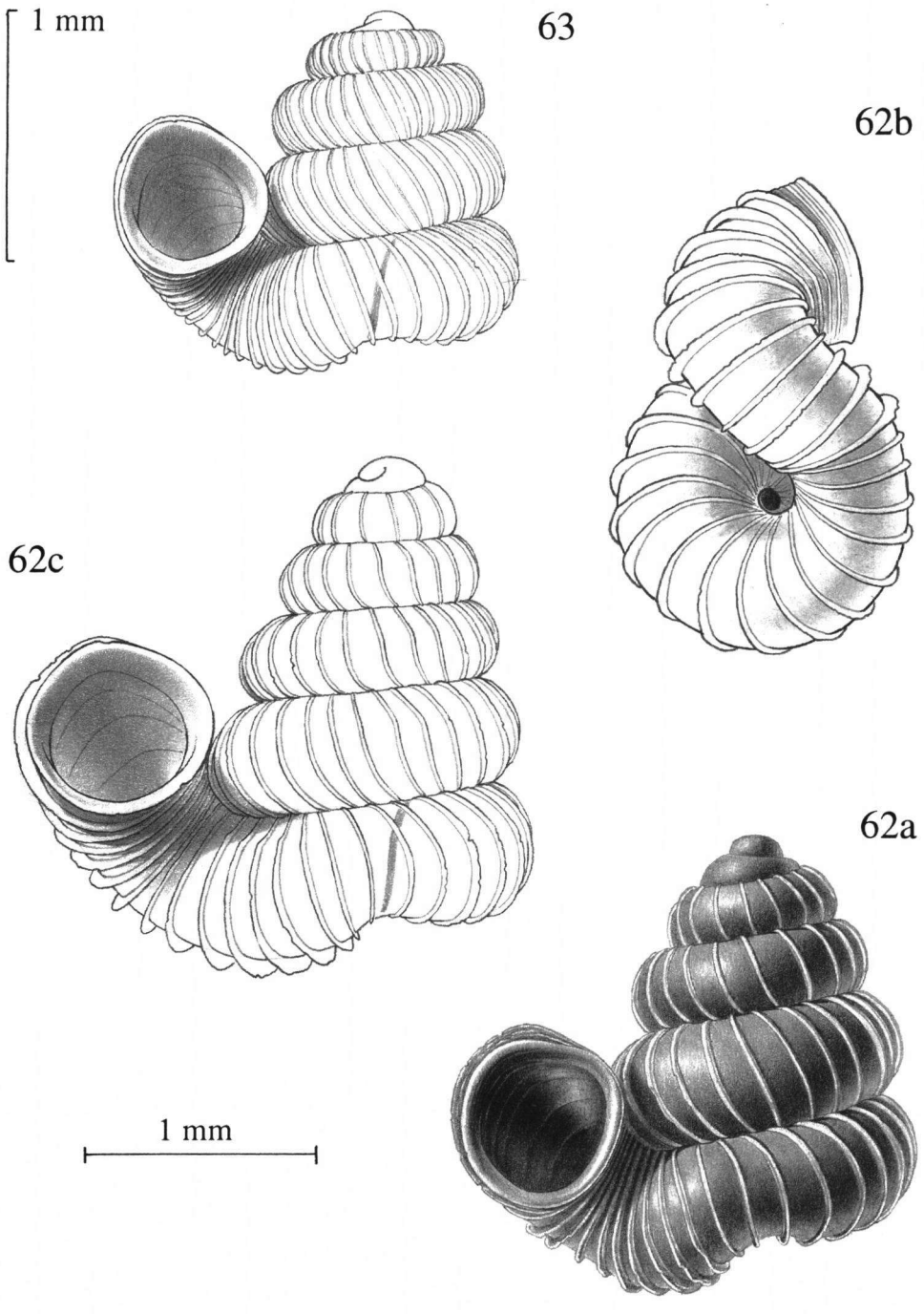
1 mm

60b

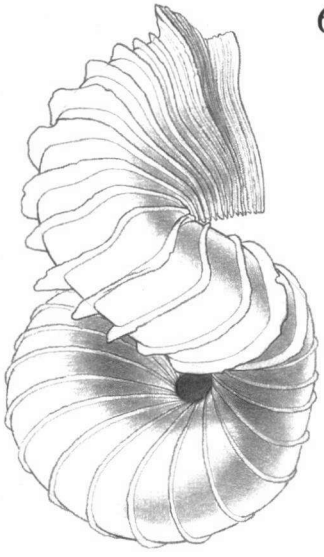
61



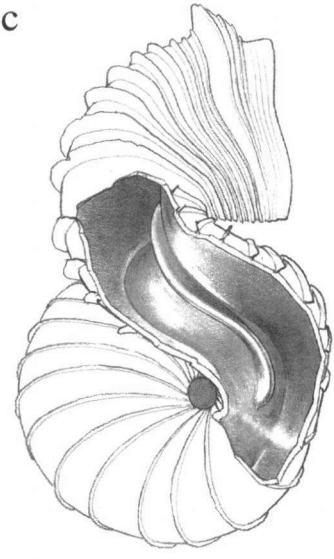
1 mm


1 mm
63
62b
62c
62a
1 mm

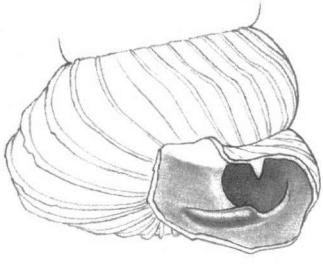
64b



64c

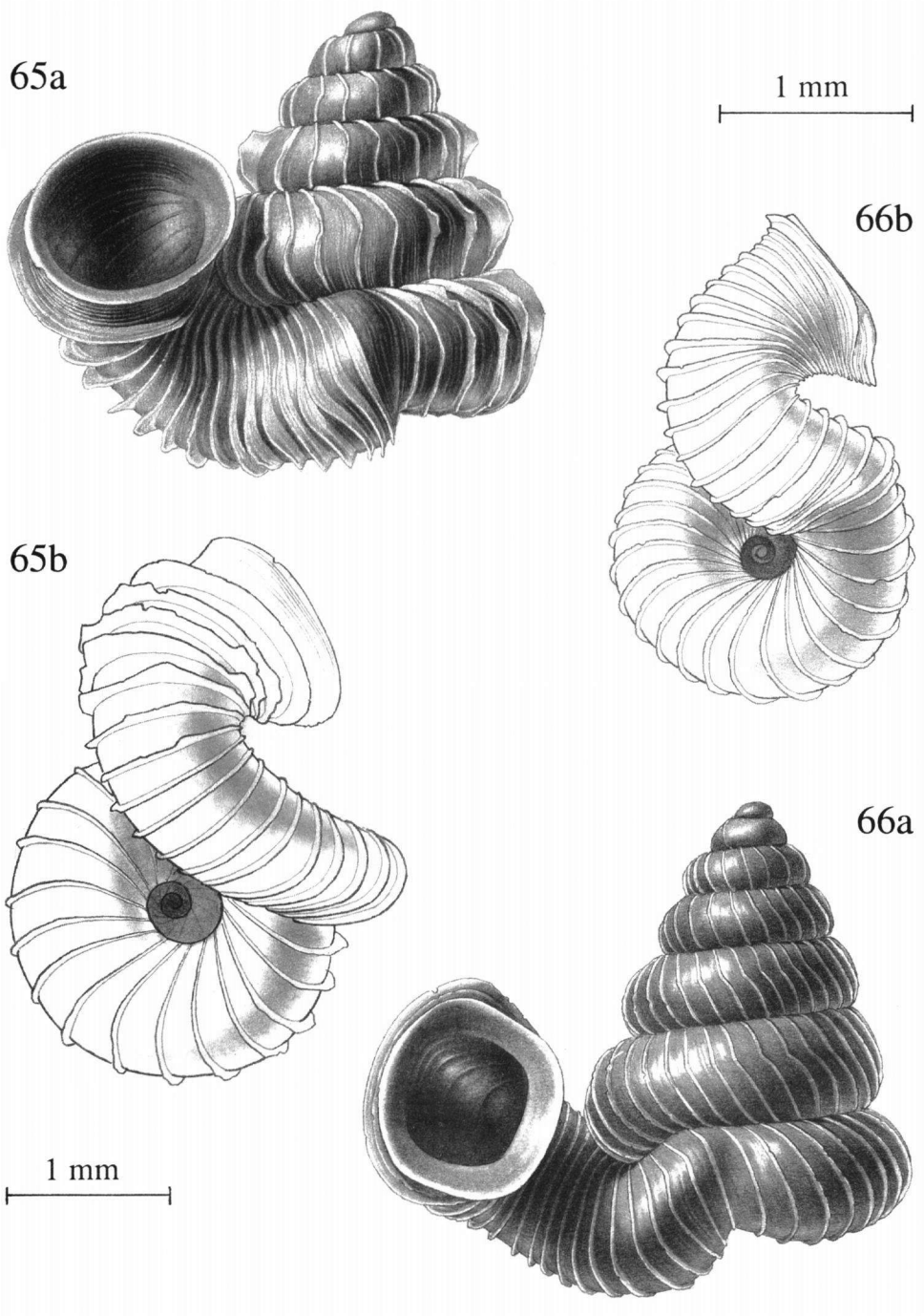


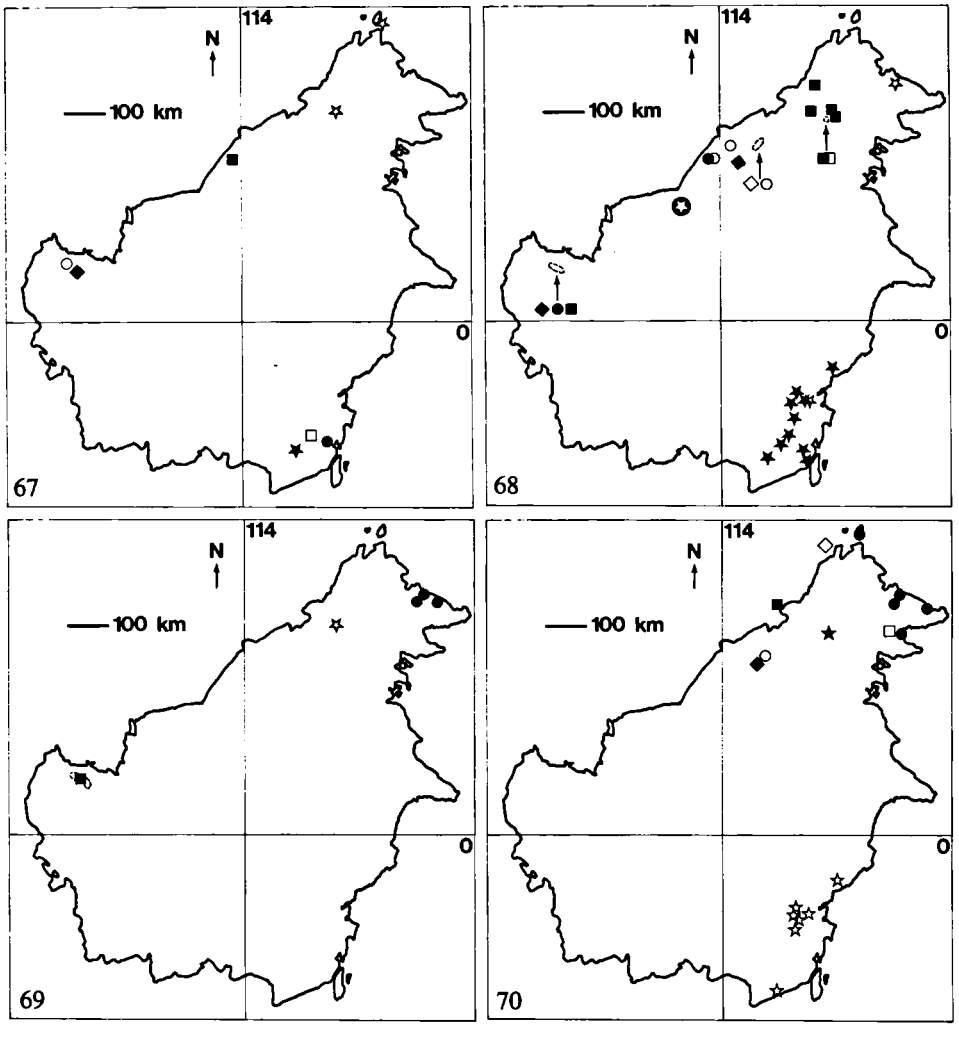
1 mm

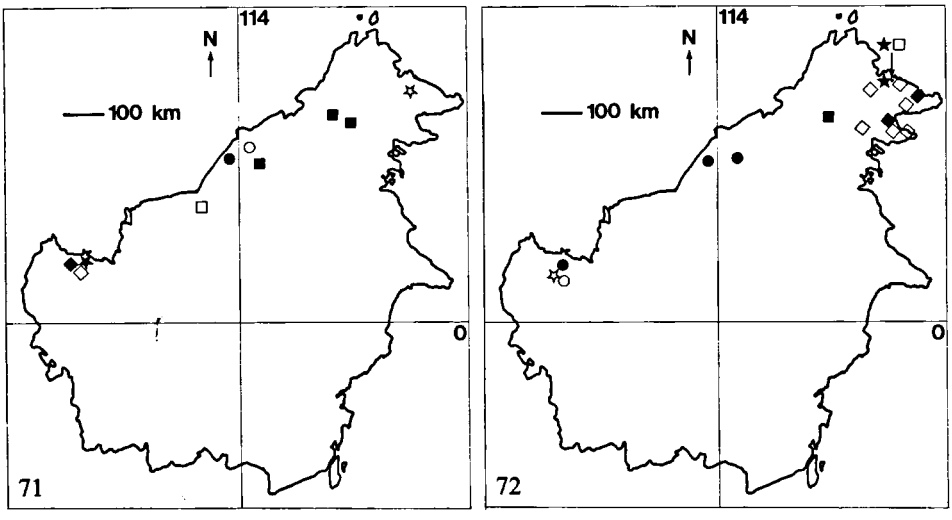


64d

64a


65a
1 mm
66b
65b
66a
1 mm


N
114
100 km
0
67
68
69
70


N
114
0
100 km
71
N
114
0
100 km
72