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II PULMONATA: PUPILLIDAE, CLAUSILIIDAE
III PROSOBRANCHIA: HYDROCENIDAE, HELICINIDAE

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AND
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NON-MARINE MOLLUSKS OF BORNEO
II PULMONATA: PUPILLIDAE, CLAUSILIIDAE
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FRED G. THOMPSON AND S. PETER DANCE[1]

ABSTRACT: The Bornean land snails of the families Pupillidae, Clausiliidae, Hydrocenidae, and Helicinidae are reviewed based on collections from 38 localities in Sarawak and Sabah and on previous records from the island. The following species are recorded: PUPILLIDAE—*Pupisoma orcula* (Benson), *Costigo puluiusculum* (Issel) new combination, *Costigo moleculina* Benthem-Jutting, *Nesopupa moreleti (Brown)*, *N. malayana* Issel; *Boysidia (Dasypupa) salpinx* new subgenus and species, *B. (D.) paini* new species. The following Malayan species are referred to the subgenus *Dasypupa: B. (D.) terae* (Tomlin), *B. (D.) megaphona* (Benthem-Jutting), *B. (D.) elephas* (Benthem-Jutting), and *B. (D.) perigyra* (Benthem-Jutting). CLAUSILIIDAE: *Phaedusa borneensis* (Pfr.), *P. filicostata stenotrema* new species. HYDROCENIDAE: *Georissa bangueyensis* Smith, *G. borneensis* Smith, *G. everetti* Smith, *G. gomantonensis* Smith, *G. hosei* Godwin-Austen, *G. kobelti* Gredler, *G. niahensis* Godwin-Austen, *G. saulae* (Benthem-Jutting) new combination, *G. scalinella* (Benthem-Jutting) new combination, *G. similis* Smith, *G. williamsi* Godwin-Austen, *G. hadra* new species, *G. pyrrhoderma* new species, and *G. xesta* new species. Names placed in synonymy include *G. flavescens* Smith (= *G. gomantonensis*) and *G. hungerfordi* Godwin-Austen (= *G. williamsi*). No HELICINIDAE were collected. Species previously recorded from the island are listed.

RESUMEN: Los caracoles terrestres de Borneo, pertenecientes a las familias Pupillidae, Clausiliidae, Hydrocenidae y Helicinidae fueron revisados en base a colecciones de 38 localidades en Sarawak y Sabah, así como a registros previos de la isla. So registraron las siguientes especies: PUPILLIDAE: *Pupisoma orcula* (Benson), *Costigo puluiusculum* (Issel) nueva combinación, *Costigo moleculina* Benthem-Jutting, *Nesopupa moreleti* (Brown), *N. malayana* Issel; *Boysidia (Dasypupa) salpinx* nuevo subgénero y especie, *B. (D.) paini* nueva especie. Las siguientes especies malayas se refieren al subgénero *Dasypupa: B. (D.) terae* (Tomlin), *B. (D.) megaphona* (Benthem-Jutting), *B. (D.) elephas* (Benthem-Jutting) y *B. (D.) perigyra* (Benthem-Jutting). CLAUSILIIDAE: *Phaedusa borneensis* (Pfr.), *P. filicostata* stenotrema nueva especie. HYDROCENIDAE: *Georissa bangueyensis* Smith, *G. borneensis* Smith, *G. everetti* Smith, *G. gomantonensis* Smith, *G. hosei* Godwin-Austen, *G. kobelti* Gredler, *G. niahensis* Godwin-Austen, *G. saulae* (Benthem-Jutting) nueva combinación, *G. scalinella* (Benthem-Jutting) nueva combinación, *G. similis* Smith, *G. williamsi* Godwin-Austen, *G. hadra* nueva especie, *G. pyrrhoderma* nueva especie y *G. xesta* nueva especie. Nombres ubicados en sinonimia incluyen *G. flavescens* Smith (=*G. gomantonensis*) y *G. hungerfordi* Godwin-Austen (= *G. williamsi*). No se colectaron especímenes de HELICINIDAE. Se mencionan especies previamente registradas en la isla.

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INTRODUCTION

In 1970 the first of a projected series of papers was published on mollusks of Borneo (Dance 1970), based upon collections made by Dr. G. E. Wilford and his associates of the Geological Survey, Malaysia. It dealt with the Streptaxidae. This paper, comprising parts II and III of the series, covers two families of Pulmonata as well as the Archeogastropoda.

The land snail fauna of Borneo is poorly known, even though more than 350 species have been reported from the island (Martens 1908, Solem 1964). The majority of the species recorded are endemic and have been collected in Sarawak, Brunei, and Sabah, an area comprising about a third of the island. The southern portion, Kalimantan, is virtually unknown malacologically, except for a few species collected randomly at coastal localities by travelers. Many species have been recorded from the island only once, and their original descriptions frequently lack important diagnostic details. Few distributional data have been available, and many species have been reported merely from "Borneo."

The collections on which the present studies are based originated from the same places in northern Borneo from which most species have been recorded previously (Fig. 1). These collections are rich in small or minute taxa that usually frequent limestone, and most are abundantly represented (Dance 1970:149-150). Larger species, such as the Cyclophoridae, Camaenidae, and Bradybaenidae, are poorly represented, and our material of these does not constitute a major addition to the known fauna. Almost all of our material consists of dried shells. No live specimens were preserved for anatomical studies.

As was anticipated, our material contains many new taxa. On the other hand many taxa previously recorded from Borneo are missing from our material. From this we estimate that less than 25% of the Bornean fauna is known. Our accounts of particular families list all species recorded from Borneo and satellite islands to facilitate future investigations by other workers.

ACKNOWLEDGEMENTS

We are grateful to the following people who have helped us in various ways. Dr. Alan Solem (Field Museum of Natural History), Dr. Ronald Janssen (Senckenbergischen Naturforschenden Gesellschaft) and Dr. Fred Naggs (British Museum, Natural History) loaned specimens essential to this report. Mr. Terrence E. Crowley compared specimens from our material with types in the British Museum (Natural History). Dr. F. E. Loosjes, Wageningen,

Netherlands, compared relevant specimens of Clausiliidae. Kurt Auffenberg, Florida State Museum, helped prepare illustrations and performed numerous other minor but essential tasks. The excellent drawings of *Boysidia* were made by Wendy Zomlefer, Staff Illustrator, Florida State Museum. Micrographs of hydrocenid shells were made by Kurt Auffenberg with an HITACHI 5-415A scanning electron microscope in the Department of Zoology, University of Florida.

II PULMONATA
PUPILLIDAE

The classification used in this paper follows Pilsbry (1927:vii-xii) and Baker (*in* Pilsbry 1935:191-209). Thiele (1931:503-514) disregarded name priorities and used VERTIGINIDAE Stimpson 1851 to replace PUPILLIDAE Turton 1831. Zilch (1959:146-174), who rearranged the pupillid genera among five families on the basis of shell characteristics, employed a different nomenclature for family and subfamily units.

NESOPUPINAE STEENBERG 1925

Pupisoma orcula (BENSON)

This widely distributed species has not been reported from Borneo previously. It was found at the following stations. SABAH: Kinabatangan Valley, Batu Tumanggong Besar, 1 mi downstream from Sakau, 05°34′N, 118°20′E, (UF 35936). SARAWAK: First Div., Bau area, Gunong Kapor (UF 35933); First Div. S of Serian, Gunong Selabor, 00°55′N, 110°25′E, (UF 35939, 35931); Fourth Div. SW of Marudi, Beluru area, Bukit Vrong, 04°00′N, 114°12′E, (UF 35932); Fourth Div., Lower Tutoh Valley, nr. Gunong Mulu; Melinau Paku Cave, 04°03′N, 114°48′E, (UF 35935); Fourth Div., Lower Tutoh Valley, nr. Gunong Mulu, small hill towards headwaters of Melinau Paku Riv., 04°03′N, 114°48′E, (UF 35934); Fourth Div., Lower Tutoh Valley, nr. Gunong Mulu, junct. Melinau Riv. and Melinau Paku Riv. (UF 35937); Fourth Div., small hill N of lower Melinau Riv. 04°03′N, 114°48′E, (UF 35938); Fourth Div., Tatau Valley, Bukit Sarang, 02°45′N, 113°02′E, (UF 35929); Fifth Div., Gunong Budah, Medalam Valley, trib. to Limbang Riv., 04°08′N, 115°05′E, (UF 35930).

Costigo pulvisculum (Issel)

Helix pulvisculum Issel 1874; Ann. Mus. Civ. Stor. Nat. Genova 6:406; pl. 5, figs. 24-27.—Tryon 1887; Man. Conch 3:191; pl. 42, figs. 55-57.

Pupisoma pulvisculum (Issel), Smith 1898; Proc. Malac. Soc. London 3: 29.—Pilsbry 1920; Man. Conch. 26:30-31.

TYPE LOCALITY.—Sarawak.

DISTRIBUTION.—Now recorded from the following localities. SABAH: southeast portion, 15 mi NNW Kalabakan, head of Cowie Harbour (UF 35940); Kinabatangan Valley *ca* 1 mi downstream fr. Laab

05°27′N, 117°59′E, (UF 35941). SARAWAK: Fifth Div., Limbang Valley, *ca* 2 mi NE junct. Medalam Riv. and Limbang Riv. 04°20′N, 114°58′E, (UF 35942). Smith (1898:29) also recorded the species from Lombok.

REMARKS.—Pilsbry (1920:30-31) suggested that this species is synonymous with *P. orcula* (Benson), but we do not agree. The specimens before us comply well with Issel's description and figures. They are about half the size of *P. orcula*, they lack the spiral sculpture typical of *Pupisoma*, and they have a granulose-striate surface, as in *Costigo*. Consequently, we consider *pulvisculum* to be an edentate species of *Costigo*.

Costigo moleculina Benthem-Jutting

Costigo moleculina Benthem-Jutting 1940; Treubia 17:331; figs. 1-2.—1952; Treubia 21:352-353; fig. 31.

TYPE LOCALITY.—West Java, forest between Tjisolok (Pelabuanratu) and the hot springs (Tjipanes), some miles inland.

DISTRIBUTION.—Previously known only from the type locality. We now add the following station in Borneo. SABAH: Kinabatangan Valley, Batu Tumanggong Besar, 1 mi downstream from Sukau, 05°34′N, 118°20′E (UF 35943).

REMARKS.—Apart from their smaller size, our two specimens agree well with the original description. *Costigo gracilis* (Haas) from Luzon is similar in appearance and intermediate in length, though more slender (Haas 1937:9-10, figs. 21-23). Both species differ from other *Costigo* species by having only two teeth within the aperture, a columellar, and a parietal lamella. Additional material may show that the two forms are conspecific. Measurements in mm for our specimens and the types of the two nominate forms are:

	length	*width*
Costigo gracilis, type	2.0	1.25
Costigo moleculina, type	2.2	1.4
Costigo moleculina, Sabah	1.83	1.27
Costigo moleculina, Sabah	1.77	1.24

The following Nesopupinae also have been recorded from Borneo.

Nesopupa moreleti (Brown)

Pupa moreleti Brown 1870; J. Conchyl. 18:393.—Pfeiffer 1877; Monogr. Helic. Viv. 8:391.—Smith; Ann. Mag. Nat. Hist. (6), 13:458.

Nesopupa moreleti (Brown) Pilsbry 1920; Man. Conch. 25:339-340; pl. 32, figs. 1-3, 6.

TYPE LOCALITY.—Labuan Island, off the north coast of Borneo.

DISTRIBUTION.—Pilsbry (1920:339-340) recorded the species from the Philippine Islands.

Nesopupa malayana (Issel)

Vertigo malayana Issel 1874; Ann. Mus. Civ. Stor. Nat. Genova 6:416; pl. 5, figs. 30-32.

Nesopupa malayana (Issel) Pilsbry 1920; Man. Conch. 25:342-343; pl. 32, figs. 14-16.

TYPE LOCALITY.—"Borneo."

DISTRIBUTION.—Pilsbry (1920:343) recorded the species from the Philippine Islands.

GASTROCOPTINAE PILSBRY 1917

Boysidia and *Hypselostoma* are closely related genera that differ only in the position of the aperture and in sculpture. *Boysidia* has an adnate peristome and lacks spiral striations. *Hypselostoma* has a solute peristome and has spiral striations in addition to axial sculpture. When Pilsbry (1917) reviewed *Boysidia* and *Hypselostoma*, most known species were assignable to either genus with little difficulty. The generic affinities of a few were less clear. Since then the number of known taxa has more than doubled (Rensch 1932, 1934; Haas 1937; Tomlin 1939; Benthem-Jutting 1949, 1960, 1961, 1962; this paper). Species were assigned to either genus because of the position of the aperture. No attention was given to other characteristics of the shell, nor was any allowance made for the possibility that a solute aperture may have evolved more than once from the typical condition in *Boysidia*. Consequently both genera contain a heterogeneous assortment of species. Neither is comprehensible in its present composition, and further generic subdivision is necessary. Three species occur in Borneo which exemplify this problem.

Boysidia Ancey 1981

The following three Bornean species are placed in a new subgenus because they cannot be assigned to *Boysidia s. s.* nor to *Hypselostoma* Benson 1856. The reasons for this are as follows. Characteristics of the sculpture are similar to *Boysidia*, the advanced apertures of two are typical of *Hypselostoma*, and characteristics of the aperture barrier are a typical for either genus, but apparently derive from the generalized pattern that occurs in *Boysidia*. The new subgenus also accommodates some Malayan species.

Dasypupa NEW SUBGENUS

TYPE SPECIES: ***Boysidia (Dasypupa) salpinx* new species.**

A subgenus of *Boysidia* in which the columellar lamella is tubercular and deeply recessed within the aperture (Figs. 2, 4), not blade-like as in *Boysidia* Ancey or *Paraboysidia* Pilsbry. The parietal-angular lamellae are

concrescent into a short, flexed, bilobed blade (Fig. 5). The shell is conical, spire depressed-conical to elongate-conical, with minute rough periostracal fimbriations parallel to the lines of growth (Figs. 2-6). Spiral striations are absent in contrast to *Hypselostoma*, in which some species of *Dasypupa* have been placed. Occasional raised spiral threads may be present due to fusion of short segments of granular sculpture. The peristome may be adnate to or solute from the previous whorl.

ETYMOLOGY.—*Dasypupa*, from the classical Greek *dasys* meaning shaggy, plus *pupa*, and alludes to the rough microsculpture of the shell.

Boysidia (Dasypupa) salpinx NEW SPECIES

SHELL (Figs. 2-6, 7-8).—Small-sized, about 1.8-2.1 mm high and 2.2-2.6 mm wide. Spire depressed-conical. Shell about 0.70-0.89 times as high as wide. Opaque; reddish-brown with a dull sheen. Umbilicus open, about 1/4 width of shell, showing previous whorl (Fig. 3). About 4 whorls. Embryonic whorls 1.5, protruding, rounded, sculptured with a dense mesh of fine granules. Succeeding whorls angular at periphery, sculptured with irregularly spaced growth striations that are interspersed with finer, rough periostracal threads (Fig. 6). Last whorl bluntly angular and flattened above and below periphery; weakly furrowed above and below angle along last quarter whorl. Last half whorl with a furrow along umbilical wall. Aperture projecting forward for a short distance beyond previous whorl, tilted upward slightly due to ascent of last quarter whorl (Fig. 8). Aperture about as wide as high; nearly quadrangular, with a rounded base. Peristome broadly expanded. Interior of aperture with 4-6 teeth. Parietal-angular lamella fused and extending forward nearly to edge of aperture. Palatal plica, basal plica, and columellar lamella short, compressed-tubercular and deeply immersed in aperture (Fig. 4). Occasionally a small tubercular supracolumellar and subcolumellar lamella may also be present. Outer surface weakly indented over palatal plica.

Measurements in mm of holotype and three paratypes (UF 35946) follow.

	length	width	aper. h.	aper. w.	whorls
Holotype	2.02	2.26	1.24	1.27	4.0
Paratype	1.74	2.51	1.24	1.30	3.9
Paratype	1.86	2.17	1.15	2.21	4.0
Paratype	2.11	2.60	1.21	1.27	4.1

Measurements for three specimens from UF 35945 are:

length	width	aper. h.	aper. w.	whorls
2.11	2.33	1.24	1.30	4.0
2.57	2.79	1.30	1.33	4.4
2.70	2.82	1.55	1.47	4.5

TYPE LOCALITY.—Gunong Subis, a limestone massif about 40 mi SW of Mira, Niah area, Fourth Div., Sarawak, Borneo, 03° 51′N, 113°45′E. HOLOTYPE: UF 35944; collected in 1962 by G.E. Wilford. Paratypes: UF 36946 (26 specimens), UF 36281 (2 SEM spec.), S. Dance coll. (8 spec.); British Museum (Natural History) (2); Sarawak Museum, Kuching (2); same data as holotype.

DISTRIBUTION.—Known from northwestern Borneo from the type locality and two other stations widely separated from it. SARAWAK: First Div., Bau area, entrance of main cave at Gunong Kapor, 01°17′N, 110°04′E (UF 35945); First Div., Gunong Selabor, an isolated limestone mountain S of Serian, 00°55′N, 110°25′E (UF 35947, 35948).

REMARKS.—This snail occurs at three widely separated localities, yet we can find no significant differences that will distinguish any of the populations. Specimens from Gunong Kapor (UF 35945) tend to be larger and more frequently have a subcolumellar lamella, but other characteristics of the shell are typical for the species.

ETYMOLOGY.—*Salpinx*, from the classical Greek meaning a trumpet, in allusion to the forward projecting, flared aperture.

Boysidia (Dasypupa) paini NEW SPECIES

SHELL (Figs. 9, 10).—Medium-small, 2.67-2.95 mm long; broadly conical, major width 0.83-1.01 times length of shell; minor width 0.73-0.84 times length of shell. Umbilicus narrow, about 1/6-1/9 times width of shell; base of last whorl angulate around umbilicus. Color reddish-brown, lusterless, opaque. Whorls 4.0-4.4. Embryonic whorls 1.5, protruding and rounded; with very fine granular sculpture. Succeeding whorls angular along periphery and with a deeply impressed suture; flattened above and below peripheral angle. Last quarter whorl ascending slightly; with a shallow impressed zone above and below peripheral angle, weakly constructed behind aperture. Whorls sculptured with growth striations that are interpersed with coarse, elongate, periostracal granules aligned parallel to growth striations. Aperture slightly oblique, rhomboid, higher than wide, about 0.52-0.60 times height of shell; interior hyaline reddish-brown. Peristome broadly expanded, tightly appressed against previous whorl (Fig. 10). Interior of aperture with four deeply immersed teeth. Parietal-angular lamellae fused and bilobed; angular portion low and flexed to the right. Palatal plica, basal plica, and columellar lamella small, nearly equal in size, compressed-tubercular. Outer surface weakly indented over palatal plica.

Measurements in mm of three specimens are:

	length	maj. width	min. width	aper. h.	aper. w.	whorls
Holotype	2.95	2.64	1.92	1.64	1.49	4.4
Paratype	2.91	2.95	2.23	1.71	1.61	4.2
Paratype	2.67	2.20	1.95	1.46	1.24	4.0

Specimens from Gunong Budah (UF 35950) differ by being slightly narrower and having a narrower umbilicus about 1/9 the width of the shell. Other aspects of the shell are typical.

TYPE LOCALITY.—Foot of cliff about 400 yards north of the main entrance to Deer Cave, Melinau Paku Valley, Fourth Div., Sarawak, Borneo, 04°05′N, 114°53′E. HOLOTYPE: UF 35949; collected by J. R. D. Wall in 1964. PARATYPES: UF 35951 (6); S. P. Dance Collection (3).

DISTRIBUTION.—Known in Borneo from one other station near the type locality. SARAWAK: Fifth Division, SW flank Gunong Budah, Medalam Valley, a tributary of the Limbang River; 04°08′N, 115°05′E (UF 35950).

REMARKS:—*Boysidia (D.) paini* is distinguished from other *Dasypupa* by its broadly conical shape and adnate aperture. It is similar in appearance to *B. salpinx,* but the latter species has a solute aperture and a wider umbilicus. It is less similar in shape to *B. (D.) procera,* and differs in other respects as discussed under that species.

ETYMOLOGY.—*Boysidia (Dasypupa) paini* is named for Mr. Tom Pain of London, England, well known as the author of many papers on tropical snails.

Boysidia (Dasypupa) procera NEW SPECIES

SHELL (Figs. 11, 12).—Medium-sized, about 3.1-3.4 mm long; elongate-conical, major width 0.69-0.74 times height of shell, minor width 0.59-0.60 times height of shell; sides of spire straight. Shell lusterless, opaque, reddish-brown, with 5.0-5.1 whorls; Embryonic whorls 1.5, rounded, protruding. Succeeding whorls with a deeply impressed suture, angulate at the periphery, nearly flattened above periphery. Last whorl slightly constricted behind peristome, with a low cord-like peripheral keel and a shallow, impressed groove above keel. Base of last whorl with an angulate rim around umbilicus, which is about 1/5 width of shell. Postembryonic whorls sculptured with oblique, irregular growth striations and rough granular periostracal growth threads. Aperture free from and slightly advanced beyond previous whorl, subcircular, nearly as high as wide, about 0.39-0.45 times length of shell. Peristome broadly expanded; outer lip and columellar lip oblique and nearly parallel. Interior of aperture with 4-5 deeply immersed teeth; parietal-angular lamella bilobed with angular segment lower, flexed to the right and advancing nearly to edge of aperture; palatal plica, basal plica, and columellar lamella subequal, small and compressed-tubercular; a very small supracolumellar lamella may also be present. Outer surface weakly indented over palatal plica.

Measurements in mm of two complete specimens are:

	length	maj. width	min. width	aper. h.	aper. w.	whorls
Holotype	3.41	2.51	2.02	1.55	1.58	5.1
Paratype	3.10	2.14	1.86	1.33	1.33	5.0

TYPE LOCALITY.—Southwest flank of Gunong Budah, Medalam Valley, a tributary of the Limbang River, Fifth Division, Sarawak, Borneo 04°08′N, 115°05′E. HOLOTYPE: UF 38022; collected by G. E. Wilford in 1966. PARATYPES: UF 38023 (1 complete specimen and two fragments); same data as for the holotype.

DISTRIBUTION.—Known only from the type locality.

REMARKS.—This species is distinguished by its elongate shell, solute aperture, nearly round peristome and wide umbilicus. It is most similar to *B. (D.) paini,* which occurs at the same locality, but the latter species has a shorter, broader shell, fewer whorls, an adnate peristome, a narrower umbilicus, and a rectangular-shaped peristome. The aperture also is relatively larger, being more than half the length of the shell.

ETYMOLOGY.—The specific epithet *procera* is from the Latin *procerus* meaning drawn out or elongate, in allusion to the relatively elongate shell compared to other Bornean species.

The following Malayan species are referred to the subgenus *Dasypupa.*

Boysidia (Dasypupa) terae (Tomlin)

Hypselostoma terae Tomlin 1939; J. Conch. 21:146; pl. 12, Fig. 2.—Benthem-Jutting 1949; Bull. Raffles Mus. (19):56.-1949; Bull. Raffles Mus. (21): 21; figs. 10.

TYPE LOCALITY.—Bukit Chintamani, Penang.

Boysidia (Dasypupa) megaphona (Benthem-Jutting)

Hypselostoma megaphona Benthem-Jutting 1949; Bull. Raffles. Mus. (21):21-23; figs. 11.

TYPE LOCALITY.—Buki Charas, near Kuantan, Penang.

Boysidia (Dasypupa) elephas (Benthem-Jutting)

Hypselostoma elaphas Benthem-Jutting 1949; Bull. Raffles Mus. (21):23-24; figs. 12.

TYPE LOCALITY.—Bukit Tenggek, Penang.

Boysidia (Dasypupa) perigyra (Benthem-Jutting)

Hypselostoma perigyra Benthem-Jutting 1949; Bull. Raffles Mus. (21):25-26; figs. 14.

TYPE LOCALITY.—Bukit Tabun, Kanching, Selangor.

CLAUSILIIDAE

Loosjes (1953) gave a thorough review of the CLAUSILIIDAE of the Indo-Australian region. He recorded five species as occurring in Borneo:

Phaedusa borneensis (Pfeiffer) (pp. 28-31)
Phaedusa dorsoplicata Loosjes (pp. 31-33)
Phaedusa filicostata filialis (Martens) (pp. 50-53)
Pseudonenia scalariformis Loosjes (pp. 78-79)
Paraphaedusa schwaneri (Martens) (pp. 144-147)

We have two species in our material from northern Borneo. One is well known. The other represents a new subspecies.

Phaedusa borneensis (Pfeiffer)
(Figures 13-15, 19)

Three lots of this species come from within the range recorded by Loosjes. SARAWAK: First Div., south of Serian, Semabang entrance to Lobang Batu Cave, western side of Gunong Selabor, 00°55′N, 110°25′E (UF 35928); First Div., Bau Area, Gunong Kapor, entrance to main cave, 01°17′N, 110°04′E (UF 35924); Fourth Div., Niah area, Gunong Subis, *ca* 40 mi SW of Miri, 03°51′N, 113°45′E (UF 35927).

Phaedusa filicostata stenotrema New Subspecies

Shell (Figs. 16-18, 20-21, 25).—Terrete-fusiform, sides of spire slightly convex, nearly straight-sided, medium-sized, about 17-21 mm long, about 4.28-5.26 times as long as wide. Lower whorls narrow, last three whorls comprising 0.62-0.67 length of shell. Brown in color, barely transparent, shiny; interior of aperture light brown; peristome white. Whorls 9.5-11.2, weakly arched with a moderately impressed suture. A barely visible subsutural spiral cord occurs along lower whorls. Embryonic shell with 3 whorls, sculptured with fine thread-riblets that weakly crenulate the suture. Following whorls sculptured with similar oblique thread-riblets that are frequently poorly defined. Riblets becoming stronger and more widely spaced on last whorl. Penultimate whorl with 10-15 thread-riblets/mm; back of last whorl with 8-11 riblets/mm. Aperture subelliptical, narrow, about 0.68-0.75 times as wide as high; free from and projecting forward from previous whorl (Figs. 24, 25). Plane of aperture nearly parallel to axis of shell. Peristome broadly expanded, narrowest above sinulus, widest along basal lip. Edge of outer lip straight-sided or weakly concave. Sinulus slightly deeper than wide, pointed at apex. Superior lamella thick, oblique, slightly converging toward outer lip, short, confined to parietal edge of aperture, widely separated and offset to the center from spiral lamella. Inferior lamella extending into aperture for one whorl, converging toward, but separated from upper end of spiral lamella; inferior lamella gradually decreasing in height posteriorly and anteriorly where it flexes to descend partially down columellar side of aperture. Columellar lamella lower and shorter than inferior lamella, not visible from aperture. Spiral lamella about as high as inferior lamella; oblique, sloping

toward principal plica; spiral lamella beginning on parietal wall 1/4 whorl behind aperture and continuing for 3/4 whorl to ventral side. Principal plica extending from middle of right side to a little to left of dorsal side. Palatal barrier consisting of 4-7 palatal plicae confined to left side in a crescent that may be on a lunella-like callus (Figs. 24, 25). Upper palatal plica about 1/3 as long as principal plica and diverging from it. Lowest plica short, and oblique. Other plicae short and tubercular or absent. Clausilium plate 2.1 mm long, 1.3 mm wide; sides diverging to widest point about 1/3 of distance from end, weakly pointed and folded (Figs. 22, 23). Pedicel long and slender, lying at about 70° to plate (clausilium from specimen 19.5 mm long).

Measurement in mm of three specimens are:

	length	width	aper. h.	aper. w.	whorls
Holotype	20.5	3.9	4.6	3.2	11.2
Paratype	17.1	4.0	4.4	3.3	9.5
Paratype	19.1	3.9	4.6	3.4	10.8

TYPE LOCALITY.—Melinau Limestone, near Gunong Mulu, lower Tutoh Valley, Fourth Division, Sarawak, Borneo (04°03'N, 114°48'E). HOLOTYPE: UF 36426, collected by G. E. Wilford in 1961. PARATYPES: UF 35926 (4 complete specimens, 5 fragments), Rijksmuseum van Natuurlijke Historie 55518 (3 specimens); S. P. Dance (1 specimen); same data as holotype.

DISTRIBUTION.—Known only from the type locality.

REMARKS.—*Phaedusa filicostata* (Stoliczka) includes six other subspecies (Loosjes 1953: 38-53). Five are confined to the Malayan Peninsula. One, *P. f. filialis* (von Martens) is found in southeastern Kalimantan, Borneo. *P. f. stenotrema* is most similar to *P. f. tenuicosta* (Nevill), a subspecies widely distributed in the Malayan Peninsula. It differs from *tenuicosta* by its usually smaller size, relatively more obese shell with a lower L/W ratio, lower whorl count and narrower aperture in which the outer lip is straight-sided or slightly concave in outline. In addition the axial riblets of *stenotrema* are nearly straight in contrast to the wavy riblets of *tenuicosta*. Loosjes gave measurements for eleven population samples of *tenuicosta*. His sample of smallest specimens from Kelantan are as narrow as *stenotrema*, but they are longer and have a higher whorl count. *P. f. filialis* has little similarity to *P. f. stenotrema*. It is a much larger subspecies with flat whorls and heavy palatal plicae (Loosjes 1953:50-53). *P. f. stenotrema* is sympatric with *P. borneensis* (Pfr). The latter is distinguishable from *stenotrema* by its swollen neck and its more rugose sculpture (Figs. 13-15, 19).

ETYMOLOGY.—*stenotrema*, from the classical Greek *stenos* meaning narrow, and *trema* meaning hole, alluding to the narrow aperture characteristic of the new subspecies.

III PROSOBRANCHIA, ARCHAEOGASTROPODA

Two families are represented in the Bornean fauna, the HYDROCENIDAE and the HELICINIDAE. Their classification within the ARCHEOGASTROPODA follows Thompson (1980). As neither family has been reviewed for many years, complete synonymies are given for the Bornean species.

HYDROCENIDAE

Introduction

Hydrocenids are an important component of the land snail fauna of Borneo. More species are found here than are known from any other area of comparable size. Seven genus-group taxon names have been proposed for the Hydrocenidae: *Hydrocena* Pfeiffer 1847, *Georissa* Blanford 1864, *Chondrella* Pease 1871, *Georissops* Pilsbry and Hirase 1908, *Omphalorissa* Iredale 1933, *Monterissa* Iredale 1944, *Petrorissa* Kuroda and Habe, *in* Habe 1949. No review of the family has been made since 1876 (Pfeiffer), and there is no general agreement as to the status of the generic names. For purposes of this paper we follow the traditional use of *Georissa* for southeast Asiatic and Pacific species, with *Chondrella* and *Georissops* as subgenera. *Petrorissa* is a synonym of *Georissa s.s.* All of the Bornean species belong in *Georissa s.s.* because of their opercular structure. The shell sculpture varies greatly between the Bornean species and nearly encompasses the range of variation known for the family. The protoconch characteristically is elongate-ovate in shape and is set off from the postembryonic shell as a small dome-like cap. It is minutely sculptured with a dense mesh of fine reticulating raised threads (Figs. 26-31). No characteristics of specific or group significance in this sculpture were noticed among the Bornean species. Resorption of the internal whorl septa occurs. In all Bornean species the septum lies between 1.0-1.5 whorls behind the aperture (Figs. 32-38). The remnant of the the axis is a short tube-like cavity, which apparently accommodates a caecum on the ventral side of the stomach. In *Hydrocena s.s.* the septum extends into the shell for only a half whorl and the axial tube is reduced to a triangular pit.

Opercula are available for all of the species studied. No conspicuous characteristics of specific distinction are apparent. The opercula are concentric, calcareous, and broadly ovate. The outer surface is smooth with a few fine concentric striations. The inner surface has a peg originating from the lower left quadrant. The peg is moderately stocky and projects inward at an angle of about 25° to the face of the operculum. Each operculum is smaller than the aperture and is retractable within the shell for about a quarter whorl. The opercula of various species are illustrated (Figs. 39-42).

Thirteen species have been described from Borneo; eight are repres-

ented in the material at hand. Most of the earlier descriptions are brief, some are in Latin, and their accompanying illustrations are sketchy and uninformative. It was necessary in many cases to compare our material with type specimens in order to establish correct identifications, for this could not be determined from the literature. We find it essential to redescribe the species represented in our material. A list of previously named species recorded from Borneo and satellite islands is given below along with their current status.

Previous authors	*This report*
Georissa bangueyensis Smith 1895	valid species (?)
Georissa borneensis Smith 1895	valid species
Georissa everetti Smith 1895	valid species
Georissa flavescens Smith 1895	syn. of *G. gomantonensis* Smith
Georissa gomantonensis Smith 1893	valid species
Georissa hosei Godwin-Austen 1889	valid species
Georissa hungerfordi Godwin-Austen 1889	syn. of *G. williamsi* G.-A.
Georissa kobelti Gredler 1902	valid species
Georissa niahensis Godwin-Austen 1889	valid species (?)
Hydrocena saulae Benthem-Jutting 1966	*Georissa saulae* (Benthem-Jutting), valid species
Hydrocena scalinella Benthem-Jutting 1966	*Georissa scalinella* (Benthem-Jutting), valid species
Georissa similis Smith 1893	valid species
Georissa williamsi Godwin-Austen 1889	valid species

The following new taxa are added to this list

Georissa hadra **new species**
Georissa pyrrhoderma **new species**
Georissa xesta **new species**

No doubt additional species remain to be discovered in northern Borneo. Apparently some species are restricted to single isolated limestone hills, and large areas of suitable habitat have not yet been explored for mollusks. As Kalimantan is virtually *terra incognita* for mollusks our concepts of Bornean hydrocenids will need to be revised eventually.

Species Relationships

The Bornean *Georissa* are divisible into four species groups which are rather well defined by shell characteristics.

1.) The *hosei* group: Medium- to large-sized species (2-4 mm) with slender apical whorls separated by a very deep suture, and with a peripheral spiral row of obliquely compressed nodes (other spiral rows of nodes may be present). *G. hadra*; *G. hosei*, *G. kobelti*, *G.*

scalinella, *G. saulae*, and perhaps *G. niahensis*. Related species occur in the Philippine Islands. *G. monterosatiana* from Malaya may also belong here.

2.) The *borneensis* group: Medium-sized (about 2 mm), broadly conical species with reddish shells. Sculpture consisting of growth striations and/or spiral threads (a spiral row of fluted nodes may be present on the shoulder). *G. borneensis* and *G. pyrrhoderma*. Related species are not known from other areas.

3.) The *everetti* group: Medium-sized (about 2 mm), broadly conical species, citron yellow in color, sculptured with spiral or obliquely spiral threads and growth striations or threads. *G. everetti* and *G. gomantonensis*. Similar species are not known from adjacent islands or the mainland.

4.) The *williamsi* group: Small- to medium-sized species (1.5-3.0 mm) with a narrowly conical shell, light brown in color, sculptured with spiral threads. Growth striations and riblets may also be present. *G. williamsi*, *G. xesta*, *G. similis*, and *G. bangueyensis*. Similar species occur on other islands in Indonesia, the Philippine Islands, and Southeast Asia.

It is not realistic to deduce zoogeographic patterns of relationships at present. Hydrocenids are small species seldom collected, and the molluscan fauna of vast expanses of Southeast Asia remains unknown. Any faunal comparisons made at present would be highly tenuous.

Ecological Deployment

Species of *Georissa* live on limestone or in close association with calcareous terrain. Saul (1966:7) reported that the Bornean *Hydrocena* (=*Georissa*) *scalinella* (Benthem-Jutting) and *H.* (=*G.*) *saulae* (Benthem-Jutting) occur on moist limestone among mosses and other plants in cool, shaded places. Kurt Auffenberg informs me that on Luzon he found *G. rufescens* Moellendorff only on damp limestone in cool, shaded habitats. Some species are adapted to a wider array of microhabitats. Berry (1965) reported that the Malayan *G. monterosatiana* Godwin-Austen and Nevill is found on mossy limestone, bare rocks, soil, and tree trunks near limestone hills. Berry (1961) stated that *G. monterosatiana* feeds on algae, fragments of moss, and lichens. None of the species reported in this paper was collected alive, and no data are available on their ecological deployment. Judging from the abundance and distribution of the material at hand, some species, such as *G. hosei*, *G. gomantonensis*, *G. williamsi*, and *G. similis*, are generalized in their deployment, similar to *G. monterosatiana*. Apparently, other species such as *G. hadra*, *G. pyrrhoderma*, *G. scalinella*, and *G. saulae*, are more restricted, for they are known only from single samples from localities where several collections were made.

Bornean Species Erroneously Described As Hydrocenidae

cornea Pfeiffer, *Hydrocena*; Proc. Zool. Soc. London 1854:308. (Type locality: Borneo and Bashee Island). = A synonym of *Assiminea subcornea* Neville 1885; ASSIMINEIDAE (Abbott 1958:267).

glabrata Pfeiffer, *Hydrocena*; Proc. Zool. Soc. London 1854:308. (Type locality: Island of Borneo). = *Omphalotropis glabrata* (Pfeiffer), ASSIMINEIDAE (Abbott 1958:268)

The Bornean Species
Georissa hadra, New Species

Shell (Figs. 43-46).—Relatively large, about 3-4 mm long. Spire pink, grading to yellowish-orange below. Elongate-conical with an attenuate apex due to the deeply impressed suture; spire straight-sided. Shell about 0.66-0.75 times as wide as high. Shell wall very thick (Fig. 32) with 3.5-4.1 whorls in larger specimens (3.6 in holotype). Whorls flattened above periphery and narrowly shouldered along suture. Protoconch subcircular, superficially smooth. Subsequent whorls with numerous fine spiral lirations and 1-3 rows of enlarged and obliquely flattened spiral nodes (Fig. 45, 46). Nodes most distinct on spire; usually reduced in size or obsolete on body-whorl; occasionally another spiral row of nodes may be present along outer edge of shoulder near suture. Spiral sculpture incised by rather coarse, oblique, irregular growth striations. Spiral sculpture very weak on base of shell. Umbilical shield indented, bounded by a narrow crest that is continuous with outer edge of columellar lip. Columellar callus wide, with a concave face; edge of callus slightly bulging below middle into aperture opening. Aperture about 0.37-0.45 times length of shell; subovate in shape. Axis of aperture at about 28-33° to axis of shell; plane of aperture in lateral profile 64-67° to shell axis. Outer lip thickened internally, nearly blunt-edged, straight in lateral profile.

Measurements based on fifteen specimens selected to demonstrate variation are as follow (holotype in parentheses): length, 3.16-4.03 mm (3.66); width, 2.36-2.67 mm (2.36); aperture height, 1.36-1.71 mm (1.36).

Type Locality.—Butik Besungai, a small limestone hill 0.5 miles southwest of Batu Gading, and about 4 miles northeast of Long Lama, Baram Valley, Fourth Division, Sarawak (03°52′N, 114°25′E). HOLOTYPE: UF 36107; collected 16 June 1962 by D. J. Stevens. PARATYPES: UF 36108 (100), UF 36109 (4 SEM mounts), S.P. Dance Coll. (46); SMF 255738/5; BMNH. (5); Sarawak Museum (3); same data as holotype.

Distribution.—Known only from the type locality.

Remarks.—This snail belongs to a complex of Bornean species that also includes *G. hosei* Godwin-Austen, *G. saulae* (Benthem-Jutting), and *G. scalinella* (Benthem-Jutting). The group also includes *G. rufescens* Moellendorff from Luzon, Philippine Islands, and *G. styloptyche* Moellendorff

from Coron Island, Calamianes Archipelago. The group is characterized by having spiral series of enlarged nodes and a deeply channelled suture producing nearly scalariform whorls on the spire. *G. hadra* differs from all other described species of this group by its large size, larger whorl count, thick shell, and pink spire.

ETYMOLOGY.—The specific name, *hadra,* is from the classical Greek, *hadros,* meaning well developed, stout, and alludes to the characteristically thick shell.

Georissa hosei GODWIN-AUSTEN

Georissa hosei Godwin-Austen 1889; Proc. Zool. Soc. London: 353; pl. 39, Fig. 11.-Smith 1893; Linn. Soc. Zool. 24:351; pl. 25, Fig. 27.

SHELL (Figs. 47-49a).—Small, 1.9-2.6 mm long. Adults elongate-conical with an attenuated spire and a very deep suture. Shell about 0.69-0.81 times as wide as high (smaller specimens proportionately wider). Whorls 2.8-3.3. Protoconch bulbous, superficially smooth. Subsequent whorls flattened above, and with strong spiral sculpture dominated by an enlarged supraperipheral series of crispate nodes and usually by a similar, but smaller subperipheral series; supraperipheral series bordered above by 5-8 fine spiral lirae broken into short segments by axial threads (Fig. 49a); there are 4-6 similar spiral lirae between supraperipheral and subperipheral series; base with 3-8 similar lirae that diminish near umbilical callus. Aperture ovate, about 0.41-0.51 times height of shell, slightly higher than wide; parietal wall lying at about 45° to shell axis; umbilical callus strongly indented; outer lip inserting on base of penultimate whorl far in front of parietal edge. Aperture very oblique in lateral profile, lying at about 59-64° to axis of shell.

Measurements for three population samples are given in Table 1. UF 35919 contains the largest specimens seen. Measurements and proportions given above are based on these.

TABLE 1.—*Georissa hosei*: measurements of specimens from three population samples selected to show variation. Two sets are selected from UF 35919. One consisting of large specimens. The other of medium-sized specimens. Sets from UF 35920 and UF 35915 are the largest specimens in the samples.

	UF 35919	UF 35919	UF 35920	UF35915
Number	8	6	5	5
Length	1.92-2.57	1.52-1.86	1.49-1.77	1.36-1.86
Width	1.55-1.86	1.27-1.46	1.24-1.40	1.27-1.55
Aper. h.	0.84-1.09	0.71-0.87	0.74-0.87	0.74-0.84
Whorls	2.8-3.1	2.4-2.7	2.4-2.7	2.3-2.7
Wid./len.	0.69-0.81	0.78-0.88	0.79-0.85	0.83-0.93
Wid./len.	0.41-0.51	0.44-0.50	0.47-0.56	0.45-0.55

OPERCULUM (Fig. 39).—Concentric; calcareous; broadly ovate. Outer surface smooth with a few fine incremental striations. Inner surface with peg originating from outer left cones; peg moderately stocky, projecting baso-laterally at an angle of about 25° to axis, and inward at abolut 27° to face of operculum; peg with a low knob on outer edge.

TYPE LOCALITY.—"Borneo." Lectotype by present designation: British Museum (Natural History) 89.12.7.72; collected by C. Hose, 1889; one of two syntypes.

DISTRIBUTION.—Widely distributed in Sarawak, Borneo. Known from the following localities SARAWAK: Fourth Div., Baram Valley, Bukit Besungai, *ca* 4 mi NE Long Lama (03°52′ N, 114°25′E) (UF 35916, 35918); Fourth Div., Tatau Valley, Bukit Sarang (02°45′N, 113°02′E) (UF 35914, 35915, 35921); Fourth Div., Gunong Subis, Niah area, *ca* 40 mi SW Miri (03°51′N, 113°45′E) (UF 35917); Fourth Div., on Baram Riv., Batu Gading, 25 mi above Marudi (03°53′N, 114°30′E) (UF 35919); First Div., Gunong Selabor, S of Serian, Semabang entrance to Lobang Batu Cave (00°55′N, 110°25′E) (UF 35920); Fourth Div., Batu Gading area, mouth of Labang Tukeng Cave, nr Kejin Trib. of Baram River, *ca* 4 mi SE Long Lama 03°50′N, 114°28′E) (UF 35913).

Smith (1893:351) recorded the species from Jambusan (Sarawak), a place we have not been able to locate. Presumably it comes from within the range given above.

REMARKS.—This species is variable in the length of the spire and in the intensity of the sculpture. Some population samples, consisting of less mature shells, have a proportionately shorter spire, and thus appear proportionately stocky. Occasionally the sculpture is less pronounced, but in all specimens examined the supraperipheral series of crispate nodes is present.

Four other Bornean species have similar sculpture: *Georissa scalinella* Benthem-Jutting, *G. saulae* Benthem-Jutting, *G. kobelti* Gredler, and *G. hadra* Thompson and Dance. They differ from *G. hosei* in color, size, and details of sculpture, as discussed under those species.

Georissa kobelti GREDLER

Georissa kobelti Gredler 1902; Nachr. Deut. Malak. Gesellschaft 34:61.-Zilch 1973; Arch. Molluskenkunde 103:265, Taf. 12, Fig. 11.

SHELL (Figs. 50-52).— Moderately small, about 2-3 mm long. Elongate-conical, about 0.66-0.79 times as wide as high. Color uniform light yellow-brown. Spire straight-sided with a deeply impressed suture. Whorls 2.7-3.9, uniformly rounded, regularly increasing in size. Protoconch ovate, bulbous, minutely granulose. First postembryonic whorl with about 10-14 fine, wavy spiral threads that are crossed by finer, irregularly spaced growth striations. On lower whorls some threads become enlarged and

rugose, bearing numerous oblique scale-like nodes (Fig. 52); enlarged spiral threads usually interspersed with smaller threads; penultimate whorl with about 8-12 enlarged threads above insertion of lip; occasional specimens with a conspicuously enlarged supraperipheral row of nodes (Fig. 52). Last whorl in large specimens with reduced sculpture. Spiral sculpture rather uniform over surface of whorls except on base around umbilical area where spiral cords become obsolete. Umbilical callus indented, without conspicuous bounding ridge. Aperture subovate, about 0.37-0.48 times height of shell; parietal-columellar margin straight-edged or weakly convex. Axis of aperture at 24-36° to axis of shell; plane of aperture at 30-41° to axis of shell. Peristome uniformly rounded to columella; not thickened internally; straight-edged in lateral profile.

Measurements in mm of five specimens selected to show variation are as follows.

	length	width	aperture	whorls
SMF 215893/4	3.00	1.98	1.12	3.8
SMF 215893/4	2.33	1.74	0.99	3.2
UF 36171	2.39	1.71	0.96	3.1
UF 36171	2.11	1.61	0.90	2.9
UF 36171	2.08	1.64	0.90	2.8

TYPE LOCALITY.—Niah, Baram (Sarawak, Borneo). LECTOTYPE: Senckenbergische Naturforschende Gesellschaft 215893a (Zilch 1973:265).

DISTRIBUTION.—Known only from a single locality in the Niah Hills in northern Borneo. We have examined the following specimens: SARAWAK: Fourth Div., Beluru Area, SW of Marudi, eastern part of Bukit Vrong (04°00'N, 114°12'E) (UF 36170, 4 spec.). In addition we have examined two syntypes of *G. kobelti* (SMF 215893/4).

REMARKS.—This species is closely related to *G. hosei* Godwin-Austen. It differs from *G. hosei,* as well as others in the *hosei* group by its scale-like nodes arranged on spiral threads. In addition, none of the spiral threads are conspicuously enlarged on the lower whorls.

Georissa saulae (BENTHEM-JUTTING)

Hydrocena saulae Benthem-Jutting 1966; J. Conch. 26:40-41; fig. 2.

TYPE LOCALITY.—Laying Cave, Crocker Range, Keningau, Sabah. Holotype in the Zoological Museum, University of Amsterdam.

This species is known only from the type locality. It and the closely related *G. scalinella* (Benthem-Jutting) occur far to the east of other Bornean species of the *hosei* group. *G. saulae* and *G. scalinella* are very closely related. *G. saulae* differs from *G. scalinella* by having a more elevated spire and less scalariform whorls. The two may be only subspecifically distinct. Additional material from the Crocker Range may clarify their relationship.

A specimen of *G. saulae* is illustrated (Fig. 53, 54) so that its sculptural characteristics can be compared. The surface is covered with closely spaced, oblique, lamelliform axial threads that are more crowded and elevated than in related species, except *G. scalinella*. Superimposed on the axial threads are a few spiral lirations. The peripheral liration has enlarged flattened nodes and usually there is a subperipheral series also. Measurements of five specimens, UF 25057 (2), UF 36110 (1), and UF 36111 (2), are as follow: length of shell, 1.71-1.88mm; width, 1.27-1.38mm; aperture height, 0.67-0.35; 3.3-3.5 whorls; width/length, 0.72-0.78; aperture height/shell length, 0.38-0.40.

Shell lengths are comparable to measurements given by Benthem-Jutting; the widths are not. Benthem-Jutting measured the greatest width of specimens whereas our measurements of width are made perpendicular to the axis of the shell.

Georissa scalinella (Benthem-Jutting)

Hydrocena scalinella Benthem-Jutting 1966; J. Conch. 26:39-40, Fig. 1.

Type Locality.—Lahad Datu Caves on Teck Guan Estate, Sabah. Known only from the type locality. Holotype in the Zoological Museum, University of Amsterdam.

Georissa niahensis Godwin-Austen

Georissa niahensis Godwin-Austen 1889; Proc. Zool. Soc. London 1889: 373-4; pl. 39, Fig.8.

Type locality.—Niah Hills (Sarawak), Borneo. Lectotype by present designation: British Museum (Natural History) 89.12.7.69; collected by A. Everett, one of two syntypes. The lectotype is the specimen figured by Godwin-Austen.

Remarks.—Our sample contains no specimens identifiable with this species. We have examined the lectotype and the smaller syntype. Measurements of the lectotype are: length, 3.22 mm; width, 2.11 mm; aperture height, 1.36 mm; 4.2 whorls; width/length, 0.66; aperture/length, 0.42 (See Table 2 to compare with *G. williamsi*). The smaller syntype is immature. Godwin-Austen gives slightly larger measurements for the lectotype. He also states that the syntypes were ruddy ochre in color. Currently they are faded nearly white.

G. niahensis is similar in sculpture to *G. williamsi* but is much larger. *G. niahensis* also shows similarities to the *hosei* group in the depth of the suture and the relatively rapidly expanding whorls, but it lacks the node-like sculpture found among species of that group. Additional collections from the Niah Hills are needed to clarify the status of this species.

TABLE 2.—*Georissa williamsi* Godwin-Austen and *G. xesta*, new species. Measurements in mm of large specimens selected to show maximum variation. Smaller specimens of *G. williamsi* from UF 35908 completely encompass the variation tabulated for UF 35912 and UF 35911. Holotype of *G. xesta* in parentheses.

	williamsi			*xesta*
	UF 35908	UF 35912	UF 35911	UF 35968-9
Number	9	8	10	7
Length	1.83-2.29	1.30-1.73	1.46-1.73	1.58-2.05 (1.83)
Width	1.40-1.55	1.02-1.24	1.09-1.20	1.15-1.33 (1.21)
Aper. h.	0.71-0.81	0.59-0.71	0.59-0.71	0.65-0.71 (0.68)
Whorls	3.4-4.0	3.3-3.8	3.0-3.4	3.2-3.8 (3.7)
Wid./len.	0.65-0.76	0.65-0.79	0.68-0.77	0.65-0.73 (0.66)
Aper./len.	0.33-0.41	0.35-0.43	0.39-0.45	0.35-0.41 (0.37)

Georissa everetti Smith

Georissa everetti Smith 1895; Proc. Zool. Soc. London 1895; 125; pl. 4, Fig. 15.

Shell (Figs. 55-57).—Small, about 1.95-2.20 mm long. Ovate-conical in shape, about 0.69-0.77 times as wide as high. Spire convex in outline. Light yellow; occasionally with an orange-tinted spire. Whorls 3.3-3.6. Protoconch bulbous, globose, superficially smooth. Subsequent whorls uniformly rounded with a deeply impressed suture; *sculptured with oblique incremental thread-riblets that are decussated by oblique spiral threads* (Fig. 57). Incremental riblets most distinct on spire, becoming obsolete on last half of body whorl. Spiral threads usually strongest on body whorl. Continuous and uniform from suture to base. Umbilical area indented and bordered by a columellar lip. Aperture subovate in shape, about 0.41-0.48 times length of shell. Axis of aperture at about 53-59° to shell axis. Plane of aperture in lateral profile lying about 33-36° to shell axis. Columellar callus rounded in front, concave in outline along aperture opening. *Basal lip conspicuously thickened internally*. Outer lip slightly sinuous in lateral profile.

Measurements based on ten specimens are given (UF 36157). No population differences are apparent between the two samples examined. Length, 1.95-2.20 mm; width, 1.46-1.55 mm; aperture height, 0.87-1.00 mm.

Type Locality.—"Rumbang, W. Sarawak." We have not been able to find this place on any maps. Presumably it is in the vicinity of Kuching. Holotype: British Museum (Natural History) 93.6.7.69.

Distribution.—Widely distributed in Sarawak, Borneo, but apparently sparse in occurrence. We have examined specimens from the following localities. SARAWAK: Fourth Div., Niah Area, Gunong Subis, a limestone massif about 40 mi SW of Miri (03°51'N, 113°45'E) (UF 36156); First Div., Wah Mountain, immediately S of Bra-Ang Wah Village, 23 mi S Kuching (01°13'N, 110°16'E) (UF 36157).

REMARKS.—This species was founded on a single specimen, and has not been reported since its original discovery. The holotype was compared with our specimens, and they agree well in all important characteristics. *G. everetti* is unique within the genus because of the decussate sculpture produced by oblique spiral threads and the oblique axial riblets. The thickened basal lip is also unusual.

Georissa gomantonensis SMITH

Georissa gomantonensis Smith 1893; J. Linn. Soc. Zool. 24:351; pl. 25, fig. 25.

Georissa flavescens Smith 1895; Proc. Zool. Soc. London 1895:126; pl. 4, fig. 17.

SHELL (Figs. 58-60).—Small, about 1.88-2.14 mm long; broadly ovate-conical, about 0.76-0.85 times as wide as high; sides of spire weakly convex due to slightly increased rate of descent of last whorl. Shell citron yellow in color. Whorls 3.0-3.2. Protoconch globose and superficially smooth. Subsequent whorls inflated and evenly rounded with a deeply impressed suture, and with a narrow, shallow channel on shoulder bordering suture. Channel bordered laterally by single row of oblique, compressed, small nodes (Fig. 58). Whorls sculptured below nodes with spiral threads parallel with suture and about as wide as their interspaces. Spiral threads strongest above periphery, weakly developed or obsolete on base; 17-21 spiral threads on penultimate whorl between upper suture and insertion of lip. Umbilical callus weakly indented, bounded laterally by a narrow crest. Aperture subovate, height about 0.44-0.48 times height of shell; parietal-columellar margin weakly concave in outline. Axis of aperture at 32-36° to shell axis; plane of aperture in lateral profile 28-34° to shell axis. Outer lip very slightly sinuous in lateral profile, thin. Basal lip slightly thickened within.

Measurement of eight specimens (UF 36172) selected to show maximum variation: length of shell, 1.86-2.14 mm; width of shell, 1.46-1.74 mm; aperture height, 0.90-0.96 mm.

TYPE LOCALITIES.—*Georissa gomantonensis*: Gomanton, N. Borneo (=Sabah). Holotype: British Museum (Natural History) 92.7.20.39. *Georissa flavescens*: Gomanton, N.E. Borneo (=Sabah). Lectotype by present designation: British Museum (Natural History) 93.6.8.11, one of 3 syntypes.

DISTRIBUTION.—Known from scattered localities in eastern Sabah, Borneo. We have examined specimens from the following places. SABAH: Kinabatangan Valley, limestone scarp 3 mi NNW Laab, 7 mi E Lamag (05°32′N, 117°59′E) (UF 36172, 36173 SEM); Kinabatangan Valley, northern flank Bukit Gomantong, 22 mi S of Sandakan (05°30′N, 118°10′E) (UF 36174); Kinabatangan Valley, NE end Bukit Kuntos nr Mile 6 on track from Suanlamba to Gomantong Caves, 22 mi S of Sandakan (05°31′N, 118°17′E)

(UF 36176); Kinabatangan Valley, Batu Tumanggong Besar, 1 mi downstream from Sukau (05°34′N, 118°20′E) (UF 36176); Tabin Valley, trib. lower Segama Riv., limestone ridge W of lower Tabin River (05°24′N, 118°48′E) (UF 36177); head of Cowie Harbour, limestone outcrop *ca* 15 mi NNW Kalabakan (04°28′N, 117°28′E) (UF 36178).

REMARKS.—This species is similar in size, shape, color, and sculpture to *G. everetti* Smith. It differs from the latter species by its broader shape, its shoulder channel bordering the suture and its sculpture. *G. gomantonensis* is 0.76-0.85 times as wide as high; the subsutural channel is bordered by a row of small, obliquely compressed nodes and the spiral threads run parallel to the suture. *G. everetti* is 0.69-0.77 times as high, lacks a channel on the shoulder of the whorls, lacks a spiral row of compressed nodes, the spiral threads are oblique to the suture and are crossed by oblique axial threads. Other Bornean species of similar shape are *G. borneensis* Godwin-Austen, *G. bangueyensis* Smith, and *G. pyrrhoderma* Thompson and Dance. These species differ so much in color and sculpture, however, that no close relationship to *G. everetti* and *G. gomatonensis* should be assumed.

Georissa borneensis SMITH
Figures 61-62

Georissa borneensis Smith 1895; Proc. Zool. Soc. London 1895:126; pl. 4, Fig. 18.

TYPE LOCALITY.—Gomanton, N.E. Borneo (=Sabah). Lectotype by present designation: British Museum (Natural History) 94.7.20.61, one of six syntypes; collected by A. Everett. Known only from the type locality.

REMARKS.—The original description incorrectly defines and illustrates this species. None of the six syntypes has the dimensions given by Smith, and the original figure shows an ovate-conical shell in contrast to the turbinate-conical shell of the species. Smith stated that the outside of the shell is reddish and the interior is bright red. The syntypes now are faded nearly white. In addition to the color of the aperture the species is characterized as follows. It has strong growth striations that become almost rib-like in some instances; spiral sculpture is absent. The peristome is internally thickened. The shell is turbinate-conical in shape with the periphery lying well below the middle of the body whorl, and the suture is channelled with a narrow shoulder (Fig. 62). Measurements in mm of the type specimens are as follows (lectotype in parenthesis): length, 2.20-2.42 (2.39); width, 1.78-1.83 (1.77); aperture height, 0.93-0.96 (0.96); whorls, 3.3-3.5 (3.4); width/length, 0.73-0.80 (0.74); aperture/length, 0.39-0.40 (0.40).

Georissa borneensis differs from other Bornean species by its thickened peristome, sculpture, shape, and suture. We associate it with *G. pyrrho-*

derma because of similarities in color. Otherwise it is intermediate in aspect between *G. pyrrhoderma* and the *G. williamsi* species group.

Georissa pyrrhoderma, New Species

Shell (Figs. 63-65).—Small, adults about 1.9-2.1 mm long. Orange-red in color; interior hyaline. Broadly conical, about 0.79-0.86 times as high as wide. Spire very slightly convex in outline. Whorls of spire relatively small and with a deeply impressed suture. Whorls 2.8-3.1. Protoconch nearly circular and bulbous. Subsequent whorls strongly inflated and uniformly rounded; sculptured with relatively weak spiral threads and numerous close growth striations; about 18-21 spiral threads on penultimate whorl above insertion of lip; spiral threads usually absent on base of shell. Occasional specimens with a supraperipheral spiral row of small compressed nodes (Figs. 64,65), which when present are predominant on the middle whorl. Umbilical callus slightly concave, very wide compared with other Bornean species; *not bounded laterally by a narrow crest*. Aperture subovate in shape; relatively large, height about 0.48-0.54 times length of shell. Parietal-columellar margin straight. Axis of aperture at 28-34° to shell axis. Plane of aperture at 26-34° to shell axis. Peristome uniformly thin, straight in lateral profile.

Measurements based on sixteen specimens selected to show maximum variation are given (holotype in parentheses). Length of shell, 1.92-2.23 mm (2.23); width of shell,. 1.64-1.80 mm (1.80); height of aperture, 0.99-1.12 mm (1.12).

Most of the shells comprising the type series are weathered and encrusted and few are unblemished. The holotype is a fresh specimen but has a small puncture in the penultimate whorl behind the insertion of the lip.

Type Locality.—Borneo, Sarawak, First Division, western side of Gunong Selabor, Semabang entrance to Lobang Batu Cave. Gunong Selabor is an isolated limestone mountain south of Serian, in southwestern Sarawak (00°55′N, 110°25′E). HOLOTYPE: UF 36183 collected in 1962 by G.E. Wilford. PARATYPES: UF 36184 (100), UF 36185 (4 SEM specimens) SMF 255739/5; S.P. Dance Coll. (53); BMNH (5); Sarawak Museum (3).

Distribution.—Known only from the type locality.

Remarks.—*G. pyrrhoderma* belongs to a group of Bornean species that also includes *G. borneensis* Smith. The group consists of species having broadly conical, reddish shells. *G. pyrrhoderma* is distinguished from *G. borneensis* by its sculpture of conspicuous spiral threads. Other aspects of the shell cannot be adequately compared because of insufficient material of *G. borneensis*. The two species are geographically remote from each other on Borneo and on Banggi Island.

Etymology.—The name *pyrrhoderma* is from the Greek, *pyrrhos*,

meaning red or flame-colored, and *derma*, meaning skin or hide, in allusion to the color of the shell.

Georissa williamsi Godwin-Austen

Georissa williamsi Godwin-Austen 1889; Proc. Zool. Soc. London 1889: 353; pl. 39, Fig. 10.

Georissa hungerfordi Godwin-Austen 1889; Proc. Zool. Soc. London 1889: 354; pl. 39, Fig. 9.

Georissa lowi Smith 1893; J. Linn. Soc. Zool. 24:351.

Georissa javana Moellendorff 1897; Nachr. Blatt. Deut. Malak. Gesell. 29:97.-Paravincini 1935; Arch. Moll. 67:179.-Laidlaw 1935; Bull. Raffles Mus. 10:99, Figs. 2-6, Zilch 1973; Arch. Moll. 103:265; pl. 12, fig. 8.

Hydrocena (Georissa) javana (Moellendorff) Benthem-Jutting 1940; Treubia, 17:332.-Benthem-Jutting 1948; Treubia 19:544-545, Figs. 5 (shell), 6 (operculum):1959; Beaufortia:59.

Georissa javana intermedia Moellendorff 1897; Nachr. Blatt. Deut. Malak. Gesell. 29:97.-Zilch 1973; Arch. Moll. 103:265; pl. 12, Fig. 9.

Shell (Figs. 66-68).—Minute-sized, reaching a length of 2.3 mm. Yellowish-brown to rust colored. Elongate-conical, about 0.65-0.76 times as high as wide in large specimens; smaller specimens relatively broader (Table 2). Spire slightly convex in outline. Columella narrow; internal partition extending to 1.0 whorls behind aperture. Whorls 3.5-4.0 in large specimens. Protoconch bulbous, superficially smooth. Subsequent whorls sculptured with rather heavy spiral cords that parallel suture. Shells over 2 mm long with 7-8 cords on penultimate whorl and 12-16 cords on last whorl. Cords strongest on shoulder of whorl, weakest on base. Interspaces with occasional weak growth striations. Sculpture variable; some specimens nearly smooth on last half of body whorl. Umbilical callus small; strongly indented. Aperture broadly ovate, 0.33-0.41 times length of shell. Plane of aperture in lateral profile at about 30-34° to axis of shell. Axis of aperture at 27-45° to axis of shell. Columellar callus wide; rounded. Outer lip slightly sinuous in lateral profile; insertion not noticeably advanced forward as in *G. hosei* group.

Measurements of large specimens from three population samples are in Table 2.

Type Localities.—*Georissa williamsi*: Borneo. Holotype: British Museum (Natural History) 89.12.7.71; collected by C. Hose. *Georissa hungerfordi*: Borneo. Lectotype by present designation: British Museum (Natural History) 91.3.17.864; collected by Sir Hugh Low; one of two syntypes. *Georissa lowi*: Borneo. Holotype same as *G. hungerfordi* because Smith proposed *G. lowi* as a substitute name. He assumed that *G. hungerfordi* G.-A. 1889 was preoccupied by *G. hungerfordiana* Moellendorff 1885 which is not so because the two are not primary homonyms. *Georissa*

javana: Gunung Gede, Java, 7500 ft alt. Lectotype: Senckenbergische Naturforschende Gesellschaft SMF 227955 (Zilch 1973:265; Taf. 12, fig. 8). *Georissa javana intermedia:* Gunung Gede, Java, 5000 ft alt. Lectotype: Senckenbergische Naturforschende Gesellschaft SMF 227966 (Zilch 1973:265; Taf. 12, Fig. 9).

DISTRIBUTION.—Widely distributed on Java (Benthem-Jutting 1948: 544), Sumatra (Benthem-Jutting 1959: 59), Christmas Island (Laidlaw 1935) and Borneo. Known from the following localities in Borneo. SARAWAK: First Division, SE end of Bau Limestone outcrop (01°03′N, 110°27′E) (UF 35908); Fourth Division, Tatau Valley, Bukit Sarang (02°45′N, 113°02′E) (UF 35906, 35907, 35910); 25 mi S Kuching, 1 mi NE Pankalan Ampat, hill 0.5 mi E Temerang (01°11′N, 110°12′E) (UF 35905); Beluru Area, SW of Marudi, Bukit Vrong (04°00′N, 114°12′E) (UF 35911, 35912); Beluru Area, SW of Marudi, nr. Bukit Kudi (04°00′N, 114°12′E) (UF 35909).

REMARKS.—*Georissa williamsi* belongs to a species group that also includes *G. xesta* Thompson and Dance, *G. bangueyensis* Smith, *G. niahensis* Godwin-Austen, and *G. similis* Smith. Similar species are recorded from nearby islands. The group is characterized by its elongate-conical shape, small size, and spiral cords. *G. niahensis* is known only from two specimens, and it is difficult to discuss its characteristics other than to say it is a much larger, stockier species, reaching a length of 3.6 mm. *G. similis* is similar in size and appearance to *G. williamsi*, except that it has radial ribs in addition to spiral cords, and is more slender. Other differences are discussed under *G. similis*.

G. williamsi occurs in numerous isolated colonies, and some are distinctive in the size attained by adults and in the intensity of the sculpture, particularly on the later whorls. We can find no differences that will separate any of the named forms listed in the synonymy. We suspect that species named from other places will also be proved synonymous with *williamsi* when they become better known.

Georissa xesta, NEW SPECIES

SHELL (Figs. 69-70).—Small, adults about 1.6-2.0 mm long; elongate-conical, about 0.65-0.73 times as wide as high. Spire straight-sided. Shell thin. Periostracum yellowish to rust-colored. Whorls 3.2-3.8 in adult shells. Protoconch bulbous, superficially smooth. Subsequent whorls strongly arched with a deeply impressed suture; sculptured with very low, weak, spiral threads, which may be absent in some specimens; spiral threads, when present, equally developed as far as umbilical callus, crossed by irregularly spaced growth striations. Umbilical region conspicuously indented. Columellar callus thick and rounded. Aperture subcircular, weakly concave across parietal margin; aperture about 0.35-0.41 times length of shell. Axis of aperture at about 27-34° to shell axis, plane of

aperture at about 16-22° to shell axis. Outer lip weakly sinuous in lateral profile.

Measurements of the holotype and six paratypes are given in Table 2.

TYPE LOCALITY.—A small limestone ridge quarried for rock 5 mi W Kudat, Sabah, Borneo (06°57'N, 116° 48'E). HOLOTYPE: UF 35968; collected in 1966 by G.E. Wilford. PARATYPES: UF 35969 (63), UF 35970 (5), S.P. Dance Coll. (10), SMF 255740/6, BMNH (5) same data as the holotype.

DISTRIBUTION.—Known only from the type locality.

REMARKS.—This subspecies differs from *G. williamsi* in the intensity of its spiral sculpture. Upon superficial examination *G. xesta* appears to be smooth, but spiral sculpture is apparent when viewed with strong reflected light. Its relationship to *G. bangueyensis* Smith is discussed under that species.

ETYMOLOGY.—The specific epithet *xesta* is derived from the Greek *xestos*, meaning smooth or shaven, alluding to its weak sculpture.

Georissa bangueyensis SMITH

Georissa bangueyensis Smith 1895; Proc. Zool. Soc. London 1895:126; pl. 4, fig. 16.

TYPE LOCALITY.—Banguey Island (=Banggi Island), Sabah, Borneo. Lectotype by present designation: British Museum (Natural History) 93.6.7.9, one of six cotypes; collected by A. Everett. Known only from the type locality.

REMARKS.—The status of this species is uncertain. It is similar to *G. xesta*, but it is stockier and has a proportionally larger aperture. Measurements for the type series are as follow (lectotype in parenthesis): length, 1.62-1.81 mm (1.70); width, 1.21-1.30 mm (1.21); aperture height, 0.72-0.75 mm (0.75); whorls 3.2-3.5 (3.4); width/length, 0.69-0.75 (0.71); aperture/length, 0.42-0.44 (0.44) (see Table 2 for comparison with *G. xesta*). The sculpture consists of barely evident growth striations and a few weak spiral striations. Smith (1895:126) stated that the species is reddish in color. The type specimens are now faded to nearly white. The strong umbilical callus mentioned by Smith does not differ significantly from that of related species. Additional specimens from Banggi Island may show that *G. bangueyensis* and *G. xesta* are conspecific, but we do not feel warranted in making this assumption at present.

Georissa similis SMITH

Georissa similis Smith 1893; J. Linnean Soc. Zool. 24:351; pl. 25, Fig. 26.
Hydrocena (*Georissa*) *gomantonensis* (Smith), Solem 1964; Sabah Soc. J. 2:8; Fig. I, 1.

SHELL (Figs. 73-75).—Medium-sized, about 2.5-2.9 mm long; elongate-

conical, about 0.62-0.70 times as high as wide; spire straight-sided, or very weakly convex in profile. Color light brown, glossy. Columella large, tubular; internal partition extending to 1.5 whorls behind aperture (Fig. 38). Shell thin, translucent. Large specimens with about 3.0-3.5 whorls (3.3 in holotype). Protoconch bulbous, ovate in shape from above (Fig. 31). Subsequent whorls strongly arched with a very deeply impressed suture; sculptured with fine spiral threads and stronger, weakly sigmoid, retractively slanting riblets that are almost as wide as their interspaces. Riblets continuous but diminished onto the base. Spiral threads and riblets give a matted appearance to surface of shell. Umbilical area indented; bounded laterally by a thin crest continuing from outer edge of columellar lip. Callus wide, rounded, bulging below middle; weakly granular. Aperture semilunar in shape, about 0.35-0.41 times height of shell; axis of aperture at about 28-31° to axis of shell; plane of aperture in lateral profile at about 22-30° to shell axis.

Measurements in mm of eleven large specimens (UF 36094) selected to show maximum variation are as follow: length 2.51-2.91; width, 1.74-1.86; aperture height, 1.00-1.12.

TYPE LOCALITY.—*Georissa similis*: Gomanton Hill, North Borneo (=Sabah). Lectotype by present designation: British Museum (Natural History) 92.7.23.51, one of two syntypes. *Georissa gomantonensis*: Gomanton, North Borneo (=Sabah). Holotype: British Museum (Natural History) 92.7.20.39.

DISTRIBUTION.—Known only from extreme northeastern Borneo from limestone outcrops in the Kinabatangan and Segama Valley and the Gomantong Hills. We have examined specimens from the following localities. SABAH: Kinabatangan Valley, Bukit Kolop, 4 mi WSW Latangan (05°20′N, 117°32′E) (UF 36099); Kinabatangan Valley, Batu Tumanggong Besar, 1 mi downstream from Sukau (05°34′N, 118°20′E) (UF 36096); limestone outcrop along Kinabatangan River 1 mi downstream from Laab (05°27′N, 117°59′E) (UF 36094, 36100); Kinabatangan Valley, limestone scarp, 3 mi NNW Laab, 7 mi. E. Lamag (05°32′N, 117°57′E) (UF 36168); limestone hill nr. Mile 2½ on track from Suanlamba to Gomantong Caves, 18 mi S Sandakan (05°36′N, 118°17′E) (UF 36097); northern flank Bukit Gomantong, 22 mi S Sandakan (05°30′N, 118°10′E) (UF 36169); limestone ridge in Tabin Valley, a tributary of lower Segama River (05°22′N, 118°54′E) (UF 36098); ridge W of Tabin River, tributary to lower Segama River (05°24′N, 118°48′E) (UF 36095).

REMARKS.—*Georissa similis* is similar in size and appearance to *G. williamsi* and *G. xesta*. It differs from *G. williamsi* and *G. xesta* by its more slender shape, fewer whorls, and its axial riblets. The obesity and number of whorls are variable among the three taxa and overlap occurs between them in these characters. *G. similis* is readily and consistently distinguishable from the others by its sculpture.

The type specimens of *G. similis* are immature and do not show the axial sculpture as well as do larger, more developed specimens.

HELICINIDAE

No helicinids are present in the collection. The following species are recorded from Borneo.

Geophorus agglutinans eos WAGNER

Geophorus agglutinans eos Wagner 1911; Martini-Chemnitz Syst. Conchyl. Cab., n.f., abt. 18 (2):143; Taf. 31, figs. 1-4.

TYPE LOCALITY.—Gunung Sekerat, on the east, Kutei Prov., Kalimantan, Indonesian Borneo. Known only from the type locality.

Sulfurina martensi (ISSEL)

Helicina martensi Issell 1874; Ann. Mus. Civ. Stor. Nat. Genova 6:444-445; pl. 2, figs. 23-25.

Helicina citrina var. *minor* Martens 1873; Malak. Blatt. 20:161.

Sulfurina martensi (Issel) Wagner 1905; Helicinenstudien, *in*: Denk. Akad. Wien 77:375; taf. 2, figs. 8 a-c.-Wagner 1911; Martini-Chemnitz Syst. Conch. Cab., n.f., abt. 18 (2):24; Taf. 3, figs. 22-24.

TYPE LOCALITY.—Borneo.

DISTRIBUTION.—Labuan Is., Palawan Is., Borneo (Wagner 1911:24).

Aphanoconia usukanensis (GODWIN-AUSTEN)

Helicina usukanensis Godwin-Austen 1889; Proc. Zool. Soc. London 1889:352; pl. 39, Fig. 7.-Smith 1895; Proc. Zool. Soc. London 1895:125.

TYPE LOCALITY.—Usukan Island, Borneo.

DISTRIBUTION.—Known from Mengalun Island, Usukan Island, Banggi Island, Mantangak Island, Palawan, Sibutu Island, Bilatan Island, Sulu Islands (Smith 1895:125).

Aphanoconia borneensis (MARTENS)

Helicina borneensis Martens 1864; Monatsb. Berlin Akad.: 120.-Pfeiffer 1865; Monogr. Pneum. Viv. 3:238.-Martens 1868; Ostasien Zool. 2:171.-Issel 1874; An. Mus. Civ. Stor. Nat. Genova 6:81- Sowerby 1866; Thes. Conch. 3:286; pl. 270, Figs. 194, 196, 211, 212.

Aphanoconia borneensis, Wagner 1905; Helicinenstudien, *in*: Denk. Akad. Wien 77:47; Taf. 5; Figs. 19a-c.-Wagner 1911; Martini-Chemnitz. Syst. Conch. Cab., n.f., abt. 18(2):175; pl.35, Figs. 1-4.

TYPE LOCALITY.—Singdawang, Kalimantan, Indonesian Borneo. Known only from the type locality.

Aphanoconia trichroa WAGNER

Aphanoconia trichroa Wagner 1905; Helicinenstudien, *in*: Denk. Akad. Wien 77: 44; Taf. 5, figs. 15-16.--Wagner 1911; Martini-Chemnitz Syst. Conch. Cab., n.f., abt. 18(2):173; Taf. 35, figs. 10-13.

TYPE LOCALITY.—Banguei (=Banggi Island), Sabah, Borneo.

DISTRIBUTION.— Known only from Banggi Island and Sibatu Island off the northeast coast of Borneo (Wagner 1911:173).

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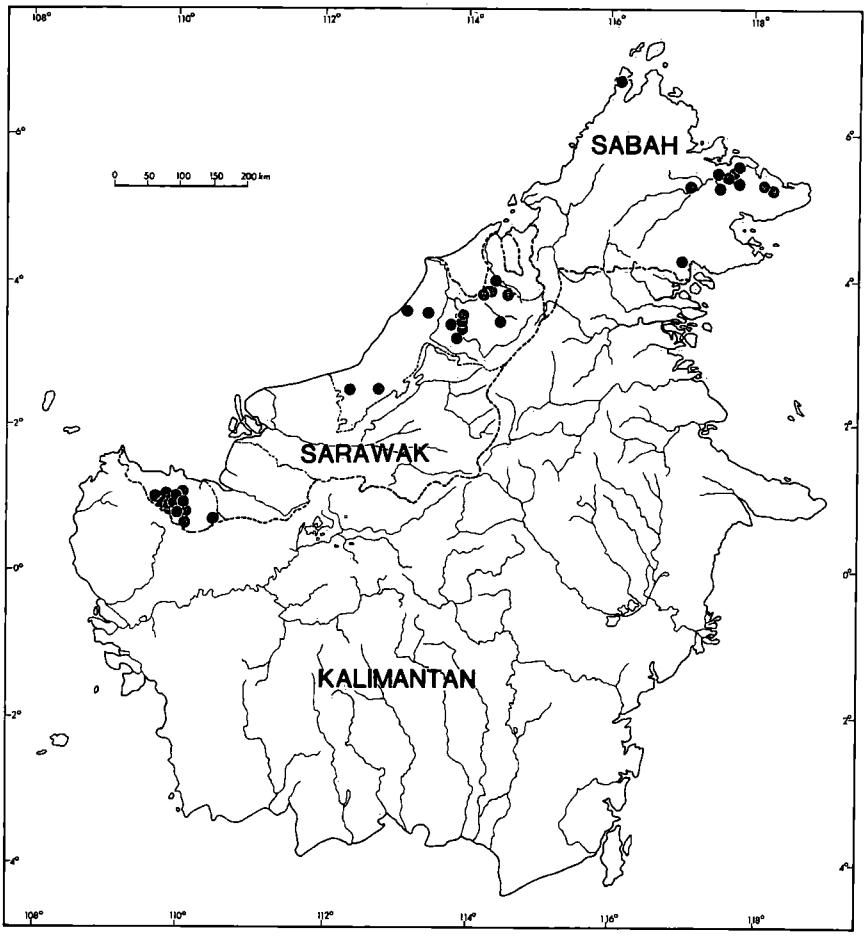
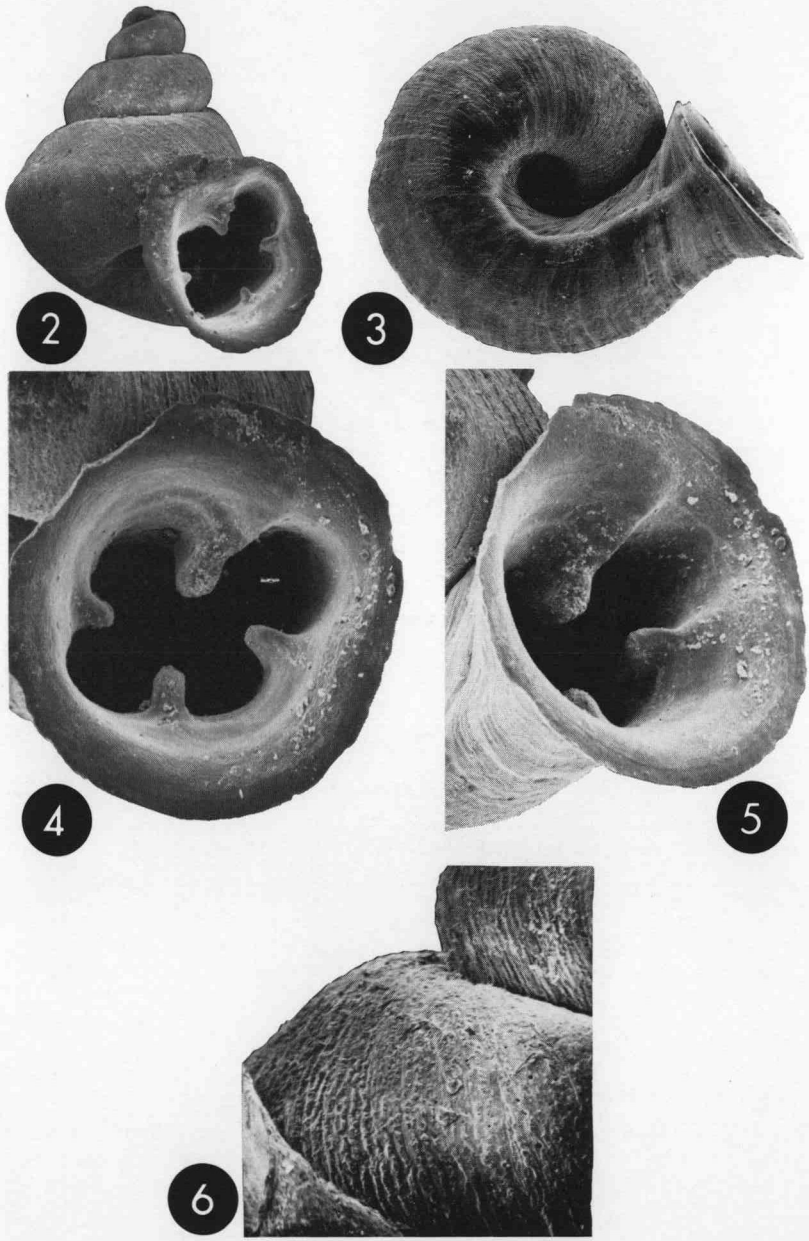
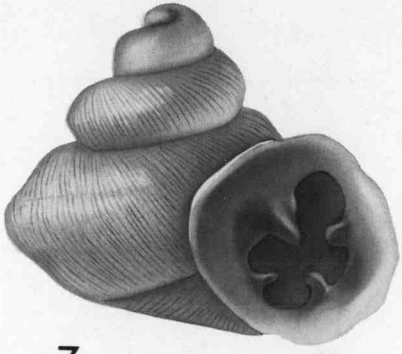


Figure 1. Map of Borneo showing stations from which material for this study was collected.



Figures 2-6. *Boysidia* (*Dasypupa*) *salpinx*, n.sp., paratypes (UF 36281) Fig. 2 (X18), Fig. 3 (X22), Fig. 4 (X44), Fig. 5 (X44), Fig. 6 (X60).



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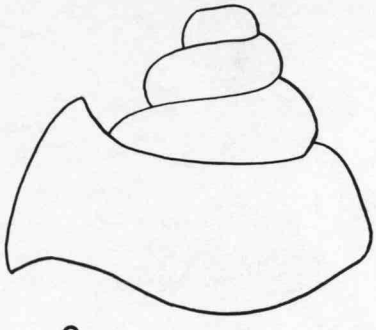

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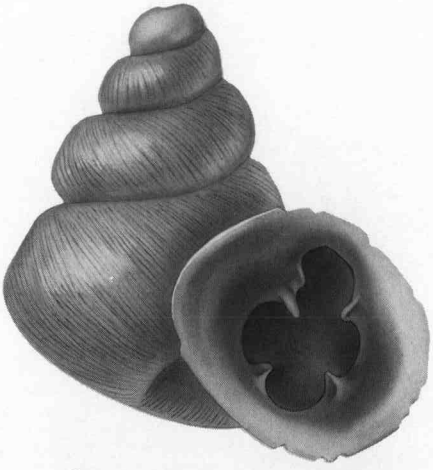
Figures 7-8. *Boysidia* (*Dasypupa*) *salpinx*, n.sp. Holotype (UF 35944).



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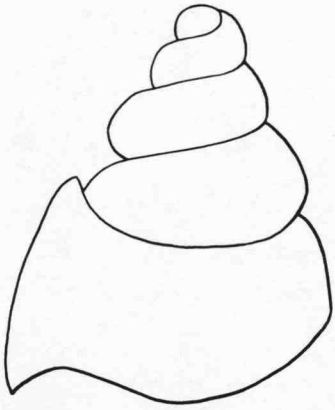

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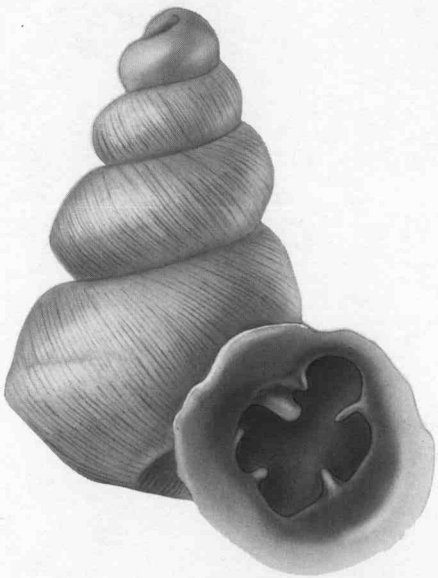
Figures 9-10. *Boysidia* (*Dasypupa*) *paini*, n.sp. Holotype (UF 35949).



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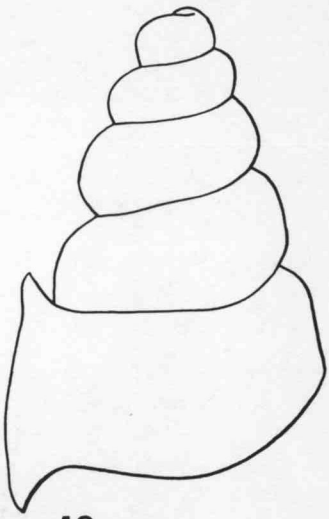

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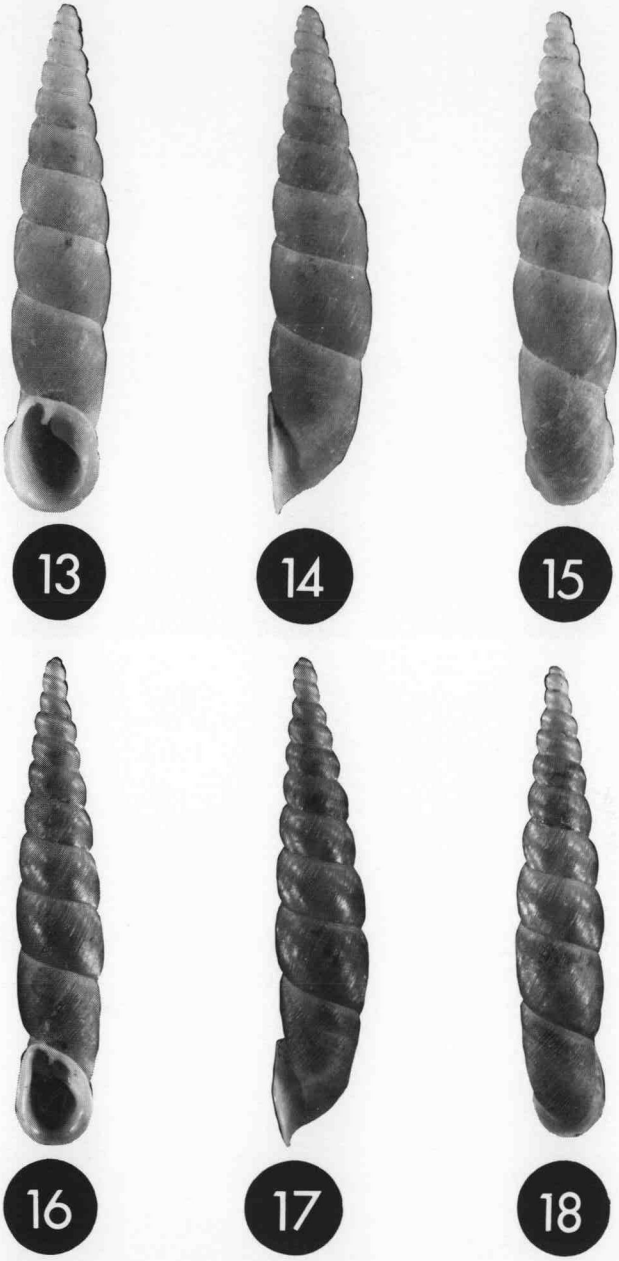
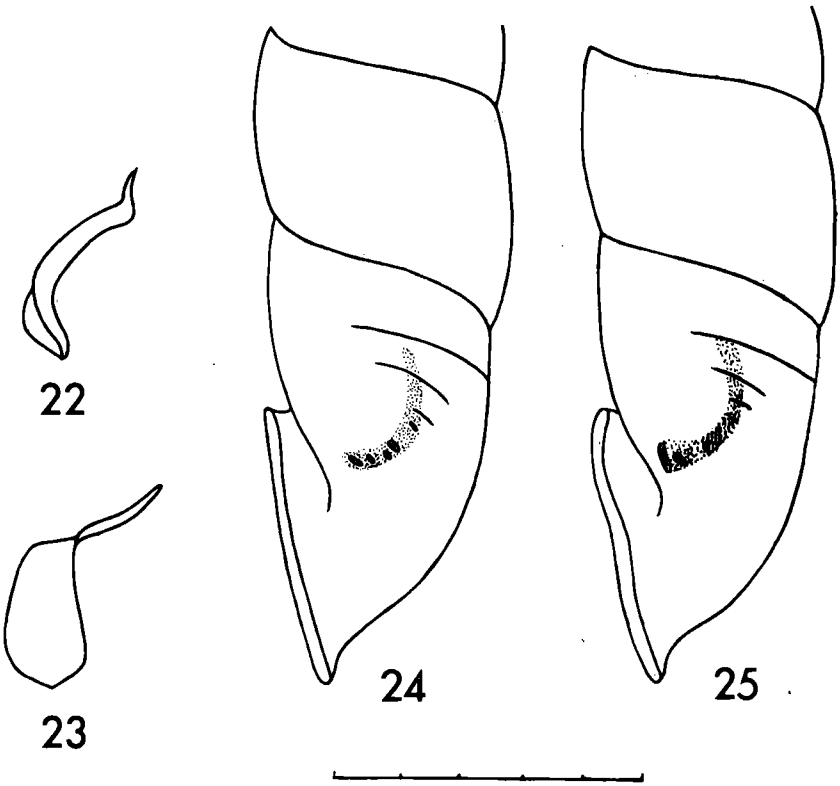
Figures 11-12. *Boysidia* (*Dasypupa*) *procera*, n.sp. Holotype (UF 38022).

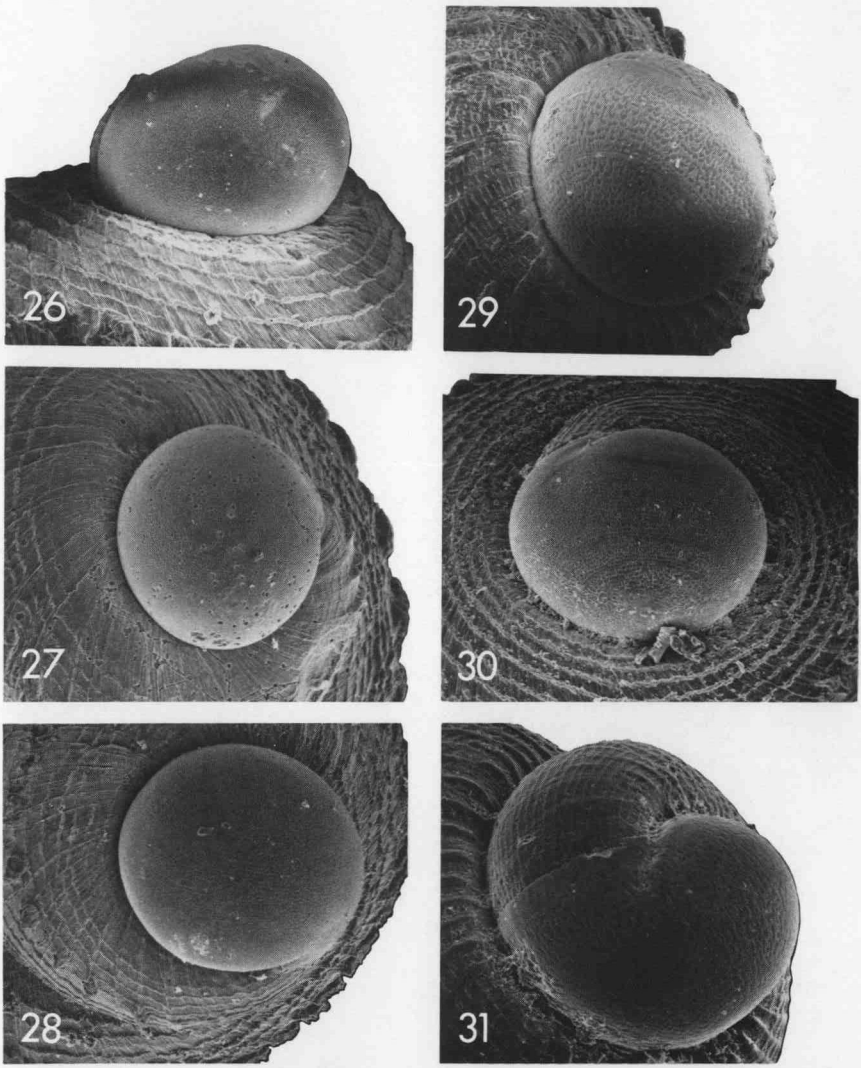


Figures 13-18. Bornean clausiliids. Figs. 13-15.-*Phaedusa borneensis* (Pfr.) (UF 35928). Figs. 16-18.-*Phaedusa filicostata stenotrema*, n.ssp. Holotype (UF 36426).

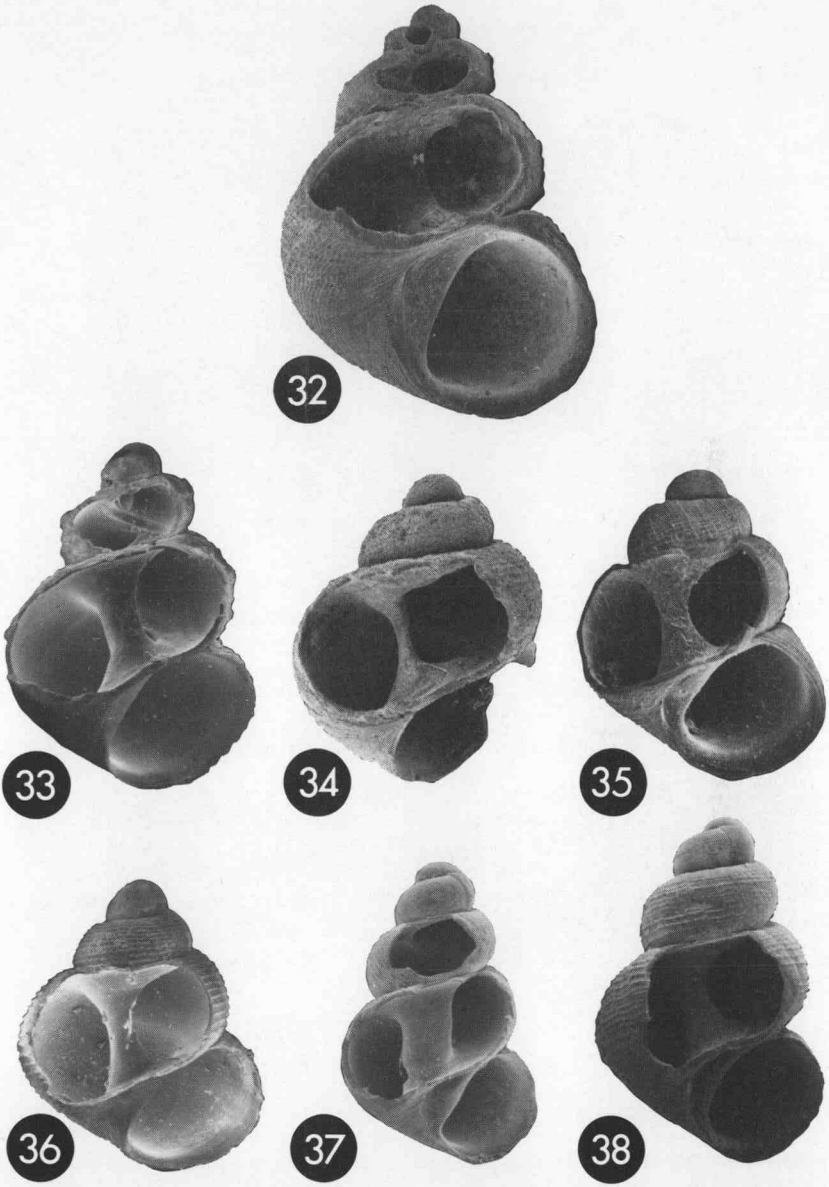
Figures 19-21. Bornean clausiliids. Fig. 19.-*Phaedusa borneensis* (Pfr.) (UF 35928). Figs. 20-21.-*Phaedusa filicostata stenotrema*, n.ssp. Holotype (UF 36426).



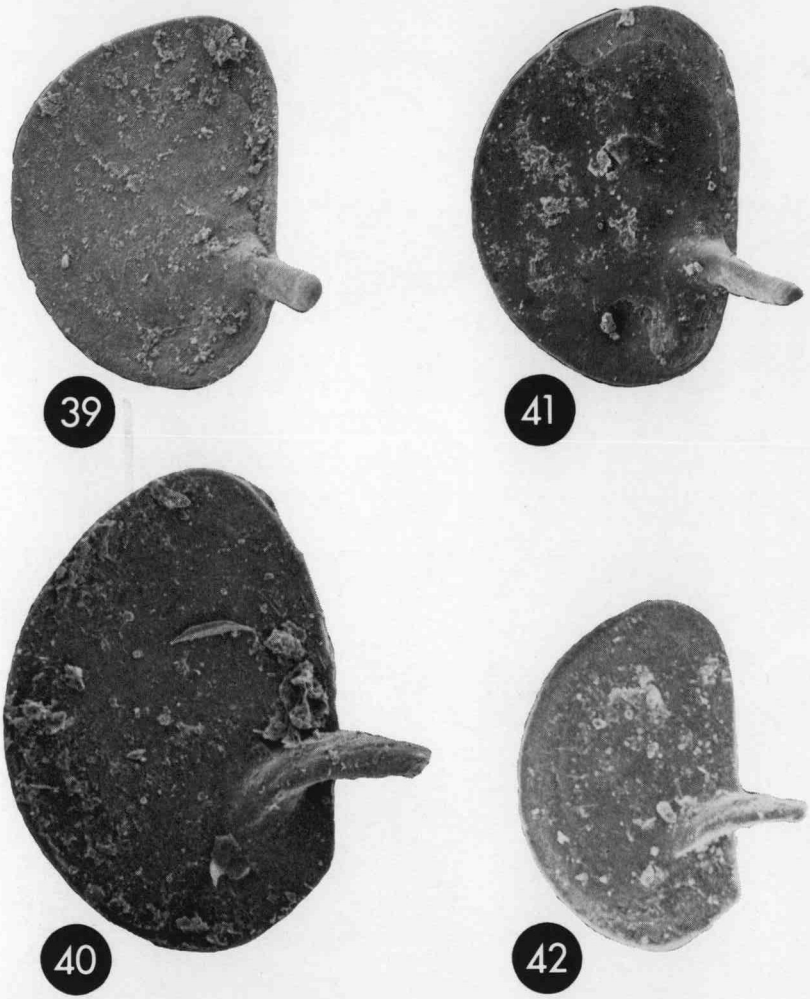
Figures 22-25. *Phaedusa filicostata stenotrema* n.ssp. Figs. 22, 23. Clausilium. lateral and frontal views. Figs. 24, 25. Paratypes (UF 35926); location of plicae within last whorl. Scale equals 5 mm.



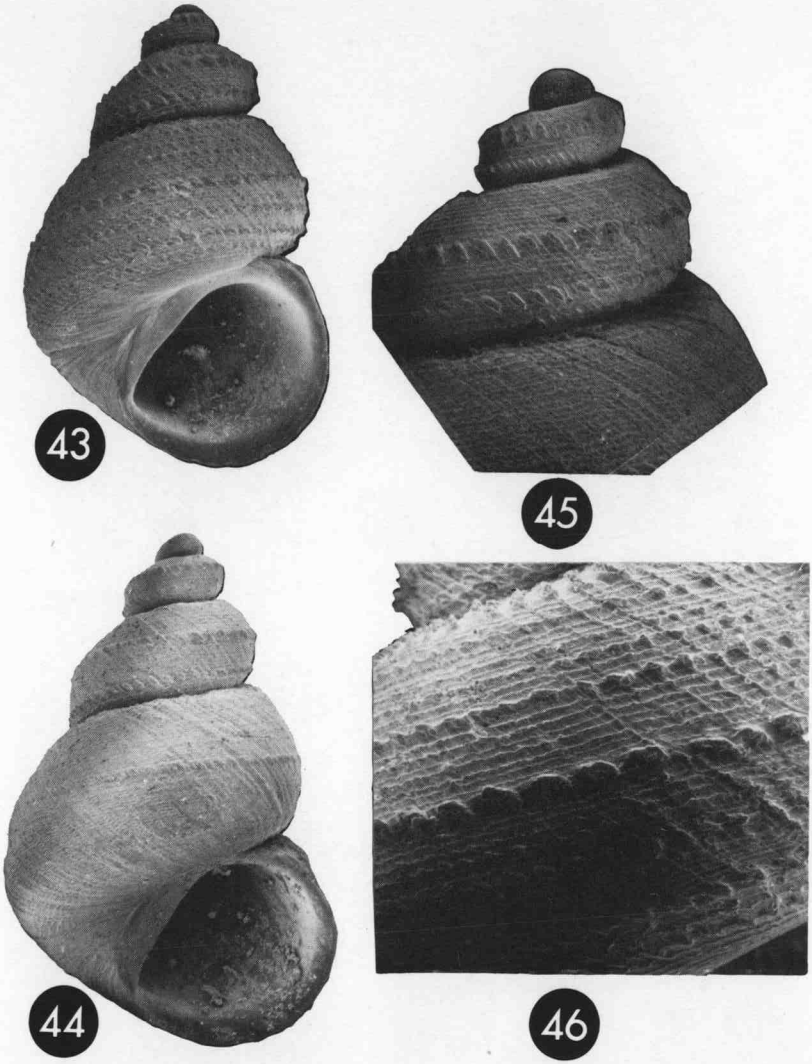
Figures 26-31. Protoconch and embryonic sculpture of Bornean *Georissa*. Fig. 26.-*G. hosei* G.-A. (UF 35919) (X92). Fig. 27.-*G. hadra*, n.sp. (UF 36109) (X92). Fig. 28.-*G. kobelti* Gr. (UF 36179) (X92). Fig. 29.-*G. sauli* (Ben.-Jutt.) (UF 36111) (X92). Fig. 30.-*G. pyrrhoderma*, n.sp. (UF 36185) (X92). Fig. 31.-*G. similis* Smith (UF 36100) (X122).



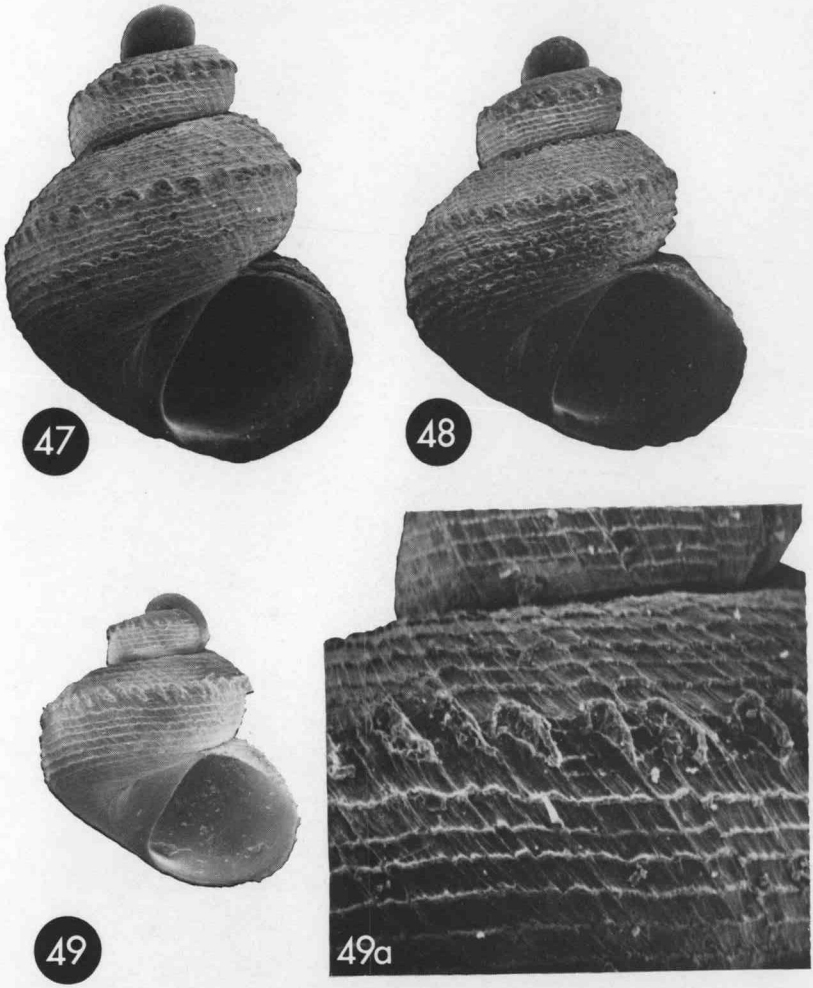
Figures 32-38. Axial tubes in Bornean *Georissa*. Fig. 32.-*G. hadra* n.sp. (UF 36109) (X17). Fig. 33.-*G. hosei* G.-A. (UF 35919) (X21). Fig. 34.-*G. pyrrhoderma* n.sp. (UF 36185) (X21). Fig. 35.-*G. everetti* Smith (UF 36158) (X21). Fig. 36.-*G. gomantonensis* Smith (UF 36173) (X21). Fig. 37.-*G. similis* Smith G.-A. (UF 36100) (X28). Fig. 38.-*G. williamsi* G.-A. (UF 35912) (X28).



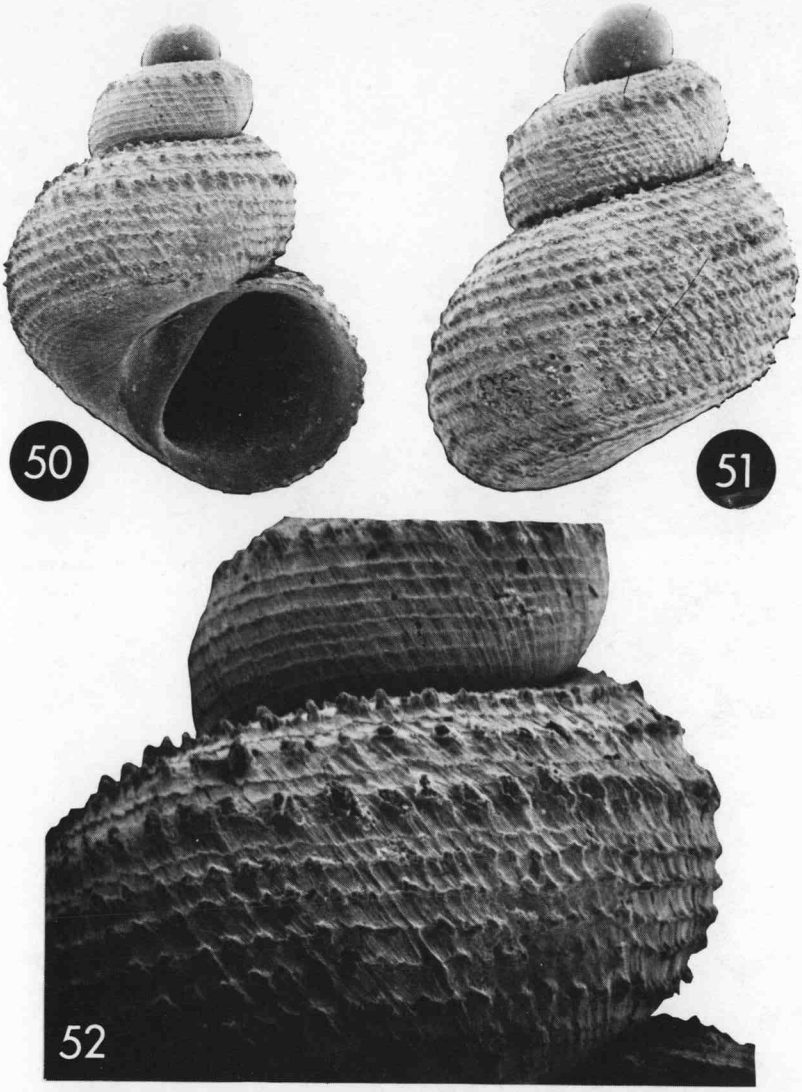
Figures 39-42. Inner view of opercula of some Bornean *Georissa*. Fig. 39.-*G. hosei* G.-A. (UF 35919) (X72). Fig. 40-.*G. xesta*, n.sp. (UF 35970) (X72). Fig. 41.-*G. pyrrhoderma*, n.sp. (UF 36185) (X72). Fig. 42.-*G. similis* Smith (UF 36100) (X108).



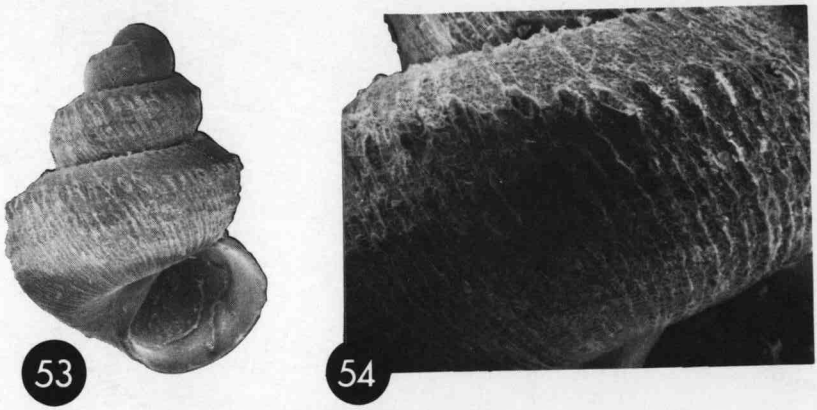
Figures 43-46. *Georissa hadra*, n.sp. Paratypes (UF 36109). Fig. 43 (X18). Fig. 44 (X18). Fig. 45 (X30). Fig. 46 (X44).



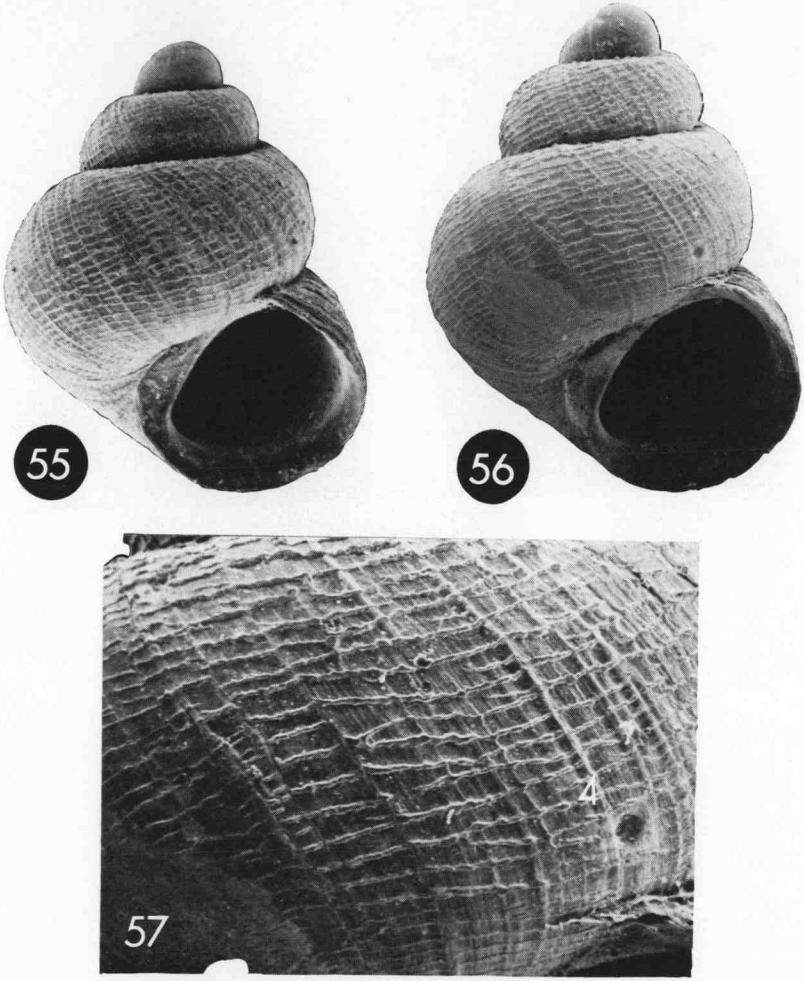
Figures 47-49a. *Georissa hosei* Godwin-Austen (UF 35919). Figs. 47-49 (X27). Fig. 49a (X70).



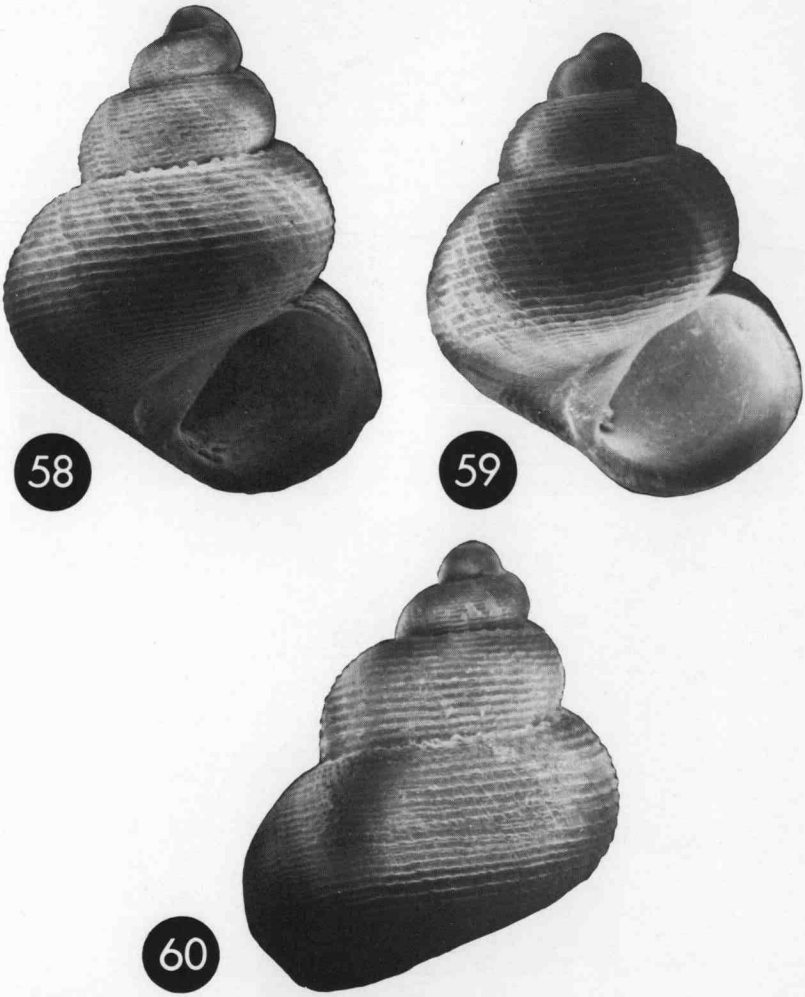
Figures 50-52. *Georissa kobelti* Gredler (UF 36179). Figs. 50-51 (X32). Fig. 52 (X82).



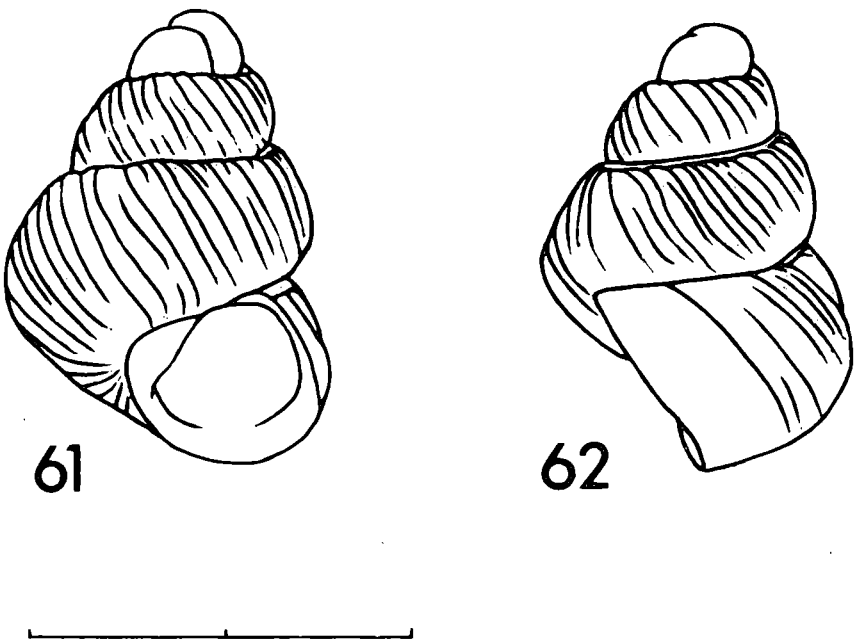
Figures 53-54. *Georissa sauli* (Benthem-Jutting) (UF 36110). Fig. 53 (X26). Fig. 54 (X68).



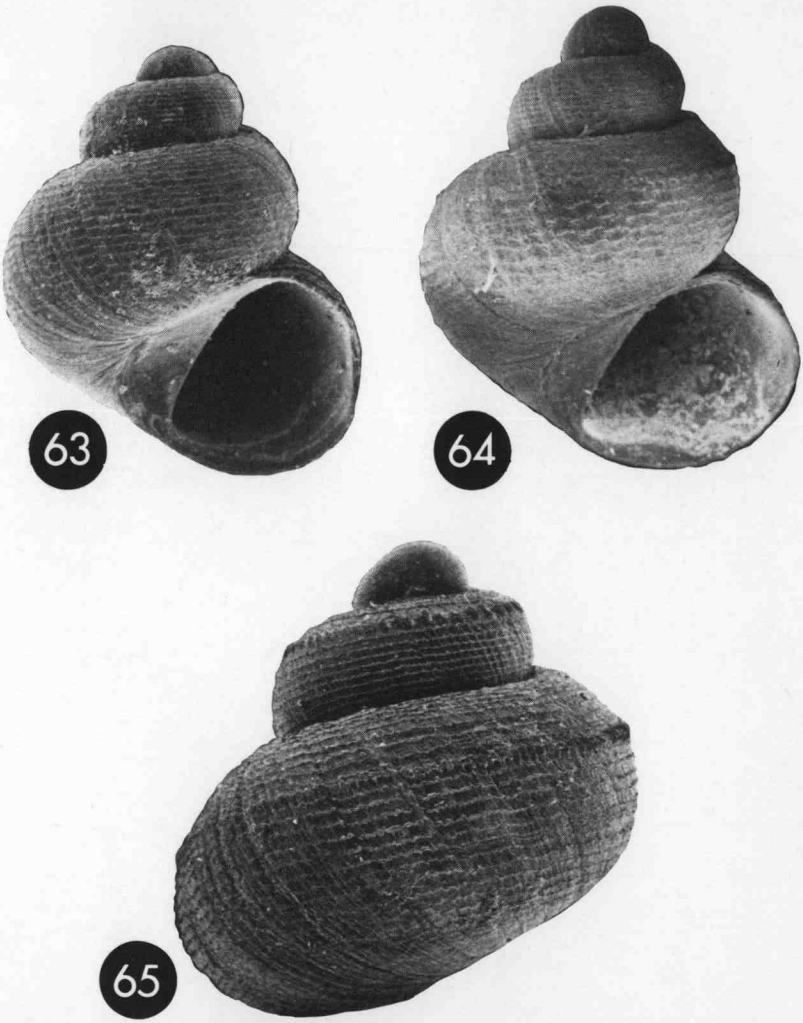
Figures 55-57. *Georissa everetti* Smith (UF 36158). Figs. 55-56 (X29). Fig. 57 (X77).



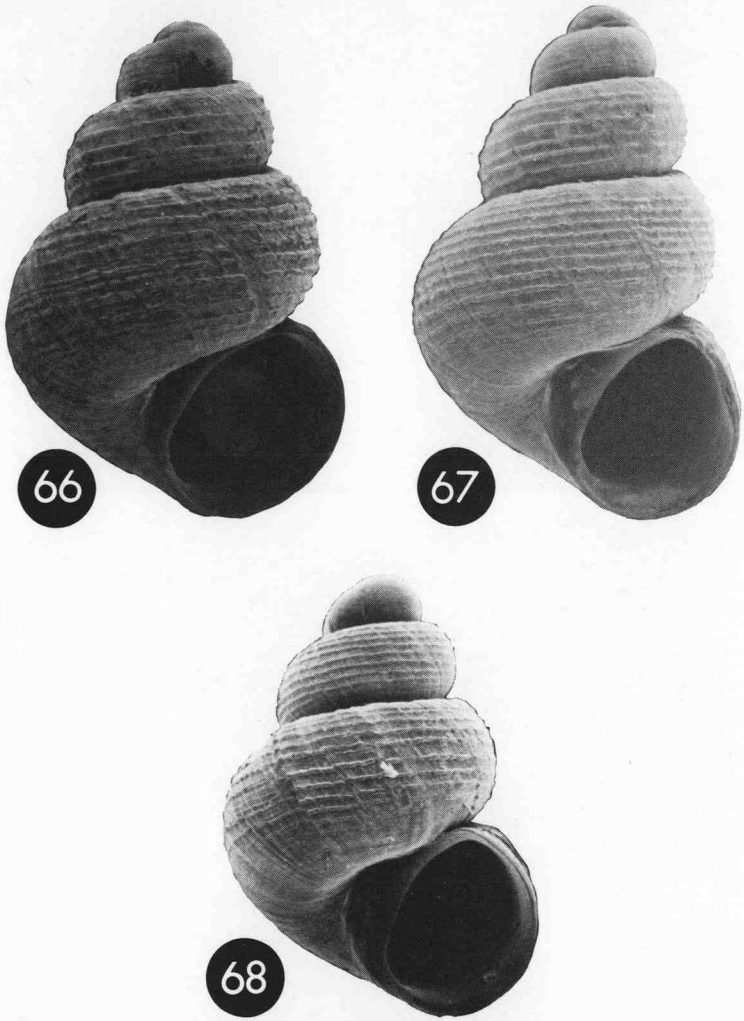
Figures 58-60. *Georissa gomantonensis* Smith (UF 36173). (X28).



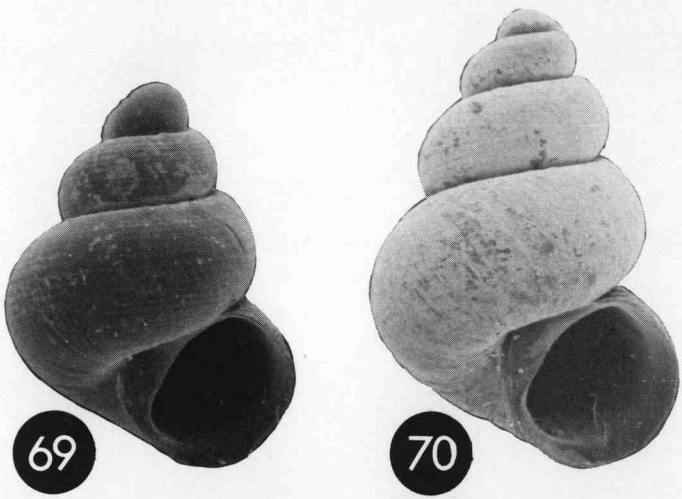
Figures 61-62. *Georissa borneensis* Smith. Lectotype (BMNH 94.7.20.61). Scale equals 2 mm.



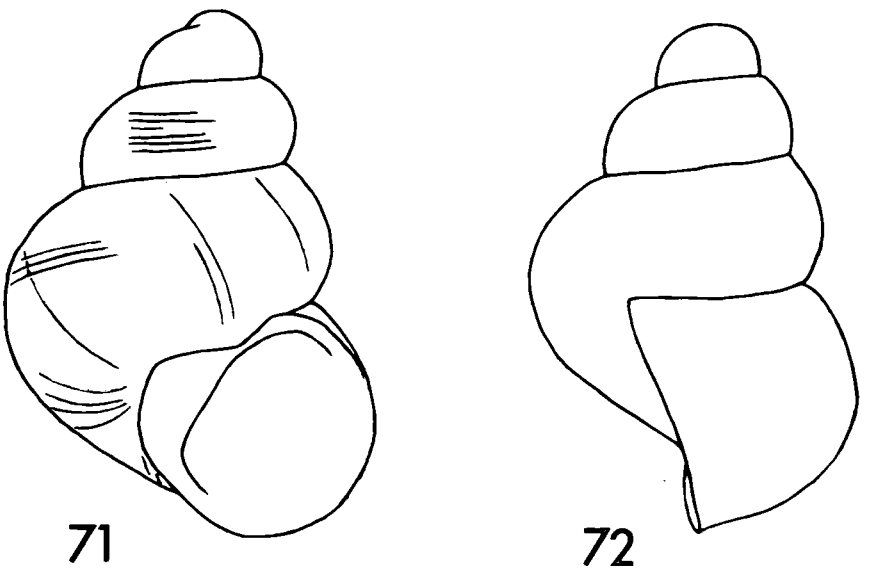
Figures 63-65. *Georissa pyrrhoderma*, n.sp. Paratypes (UF 36185). Figs. 63, 64 (X29). Fig. 65 (X38).



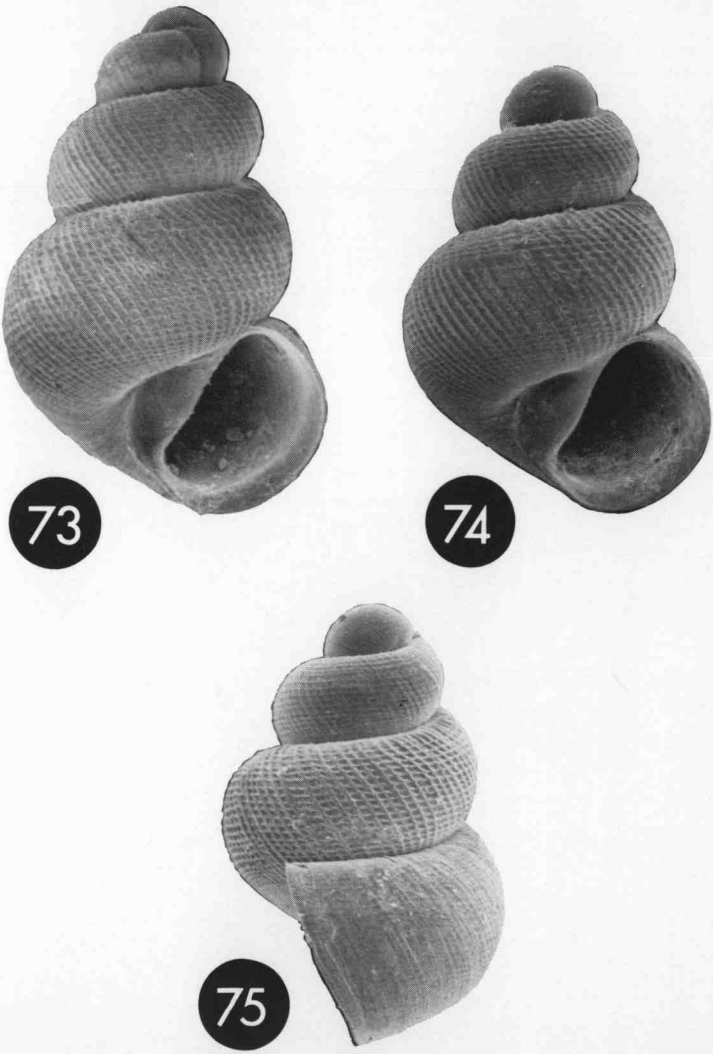
Figures 66-68. *Georissa williamsi* Godwin-Austen (UF 35912) (X41).



Figures. 69-70. *Georissa xesta*, n.sp. Paratypes (UF 35970) (X33).



Figures. 71-72. *Georissa banguenyensis* Smith. Lectotype (BMNH 93.6.7.9). Scale equals 1 mm.



Figures 73-75. *Georissa similis* Smith. (UF 36100) (X47).

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