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New aquatic molluscs from Laos.

By

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With plate 6-7 and 13 textfigures.

In the years 1968 and 1969 a systematic survey of the molluscan fauna of the Mekong drainage in Southeast Asia was carried out within the framework of the research on schistosomiasis in this area. This survey was sponsored by a grant of the U.S. Army Research and Development Command (Grant No DA-MD-49-193-66-G9199 and No DA-CRD-AFE-S92-544-69-G146). As the description of new species is beyond the scope of a faunistic report mainly compiled for the use of parasitologists, the new species which were found during this survey are described in separate papers by the respective collectors. Although the collecting team visited many localities in the Mekong valley between the Burmese and Vietnamese border, particular attention was paid to the molluscan fauna in and around the foci of schistosomiasis at Khong Island and Kratie. Some of the localities had already been visited by the French explorers LEVAY, HARMAND, RATTE, JULLIEN, MASSIE and DUGAST and became still better known through publications on the mission of PAVIE in Indo-China.

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Gastropoda CUVIER, 1804.

Bithyniidae WALKER, 1927

Hydrobioides NEVILL, 1884.

The difference between *Hydrobioides* NEVILL and *Parafossarulus* ANNANDALE is restricted to the shell sculpture only. As the following species is a link between the two above genera — it is coarser sculptured than all species of *Hydrobioides* and weaker sculptured than all species of *Parafossarulus* — *Parafossarulus* is therefore placed into the synonymy of *Hydrobioides*.

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Hydrobioides vogeli n. sp.

pl. 6 fig. 1.

Diagnosis: A species of *Hydrobioides* NEVILL which differs from all species formerly assigned to this genus by its coarser spiral sculpture and from all species formerly classified with *Parafossarulus* ANNANDALE by the lack of spiral ridges.

Description: Shell of medium size for the genus, ovate-conoidal, moderately thick, translucent, olive-brown, sculptured with coarse spiral lines which are crossed by delicate growth lines. This sculpture causes a silky lustre. The 5 convex whorls increase regularly in size and are separated by a deep suture. Umbilicus chink-like. — Aperture large, oval, angled above and well rounded below; peristome expanded, continuous, appressed to the penultimate whorl, lipped and with distinct outer varix parallel to the margin. — Operculum oval, calcareous, concentric with subcentral nucleus. — Soft parts and radula unknown.

Size A 7·0-8·0 mm; D 4·6-5·3 mm.

Type locality and distribution Small pond north of the air-strip on Khong Island, South Laos.

Material: Holotype SMRL 16011/A; paratypes 16011/3.

Etiology: This species is dedicated to the collector, Prof. HANS VOGEL, Hamburg.

Hydrobiidae TROSCHEL, 1857.

Lithoglyphinae P. FISCHER, 1885.

Wykoffia BRANDT, 1968.

In 1968 BRANDT established this new genus for all those species formerly assigned by POIRIER (1881) to the genus *Jullienia* CROSSE & FISCHER and left that genus as a monotypical taxon for *Melania flava* DESHAYES as it was originally understood by its authors. BRANDT doubted that the radula of *Jullienia costata* POIRIER as figured by the author of this species, really showed a radula of a *Jullienia* in the old sense. This doubt was justified. *Jullienia costata* is not congeneric with the other species placed by POIRIER in the genus *Jullienia*, except for *Lacunopsis tricostata* DESHAYES, the type species of *Wykoffia* BRANDT. The rhachisis of *Jullienia costata* POIRIER and *Lacunopsis tricostata* DESHAYES show simple, triangular cutting edges, those of all other species placed in the genus *Jullienia* have multiserrate cutting edges. The genus *Wykoffia* is therefore restricted to the type species, *Lacunopsis tricostata* DESHAYES, *Jullienia costata* POIRIER and the new species described below. *Jullienia acuta* POIRIER, *J. nodulosa* POIRIER, *J. harmandi* POIRIER and *J. crooki* BRANDT are replaced into the genus *Jullienia* as they are closely related to the type species of this genus, *Melania flava* DESHAYES, as will be shown in another paper. Therefore the description of the genus *Wykoffia* has to be modified.

Shell of medium or small size for the subfamily, hemispherical, depressed, with very low, semiglobose spire and large, ear-shaped body whorl. All species

known of this genus show a distinct spiral sculpture. The aperture is large, semicircular. The peristome is thick, connected by a thick, parietal and columellar callus. The columella is compressed but does not form a flat septum as in *Lacunopsis*. With regard to its shell characteristics this genus stands between *Lacunopsis* and *Jullienia*, but the radula is similar to that of *Lacunopsis*. The operculum is typical for the subfamily.

Animal with black and yellow pigmentation. Rhachis of the radula with simple, triangular cutting edge. Male reproductive organs with a simple, prong-shaped verge, with a single duct and without appendages.

Type species: *Lacunopsis tricostata* DESHAYES (textfig. 1).

Distribution: Mekong between Khong Island in Laos and Samboc in Cambodia.

Wykoffia minima n. sp.

pl. 6 fig. 2, textfig. 2.

Diagnosis: A species of *Wykoffia* BRANDT which differs from *W. tricostata* (DESHAYES) and *W costata* (POIRIER) by its much smaller size and more obtuse margin of the ventral face of the body whorl.

Description: Shell small for the genus, semiglobose, rather solid, dull, semitranslucent, of white ground colour, but covered with a thick olive-green or brown periderm. The $3^1/_2$ whorls are somewhat convex and increase rapidly in size. The spire is low and short, the body whorl large and ear-shaped. The protoconch is smooth, the remaining whorls are sculptured with four spiral ridges, two strong ridges between suture and periphery, a weaker ridge on the periphery and another weak ridge on the base. The umbilicus is closed. The ventral face of the body whorl forms together with the aperture a flat plain, but this is not surrounded by an obtuse keel like in the type species. The face is always of a greyish colour. — The aperture is large, semicircular; the peristome is very thick showing distinctly the growth lines. It is connected by a thick parietal callus. — The operculum is brown, thin, flexible, semicircular, paucispiral with subcentral nucleus.

Size: A 2·5-2·9 mm; D 2·8-3·2 mm.

Animal greyish with deeply embedded yellowish pigment spots on tentacles and the sides of the back. A fine black pigmentation is dusted over back, head and rostrum. The tentacles are round and filiform. The truncate rostrum is of half the length of the tentacles. — The radula has a trapezoidal rhachis with finger-shaped wings; its cutting edge is elongately triangular and pointed; it is not serrated. At the middle of the basal line there is a squarish projection. Between the wings and this projection there are 2 basal cusps (not 3 as in *costata* and *tricostata*), the innermost being the largest. The laterals have the cusp formula 3-1-3(4), the marginals have 8 or 4 cusps respectively.

Type locality: Mekong at Muang Khong, South Laos.

Distribution: Mekong between Pakse and Khong.

Material: Holotype SMRL 16335/A; paratypes 16335/300. — SMRL 16075/6 - Mekong 7 km N of Pakse, Laos; 16176/20 - Mekong at Sompamit Falls, Khone, Laos; 16179/30 - Mekong at Ban Na, Khong Island, Laos.

Paraprososthenia ANNANDALE, 1919.

Shell elongately conic or turreted or rarely somewhat cylindrical; sculptured with spiral ridges which may be dissolved into spiral rows of tubercles. Protoconch heterostrophic. Peristome never thick-lipped, sometimes outer margin somewhat projecting. Cutting edge of rhachis with several lateral cusps.

Type species: *P. minuta* ANNANDALE (fossil).

Paraprososthenia brandti n. sp.

pl. 6 fig. 3, textfig. 3.

Diagnosis: A species of *Paraprososthenia* ANNANDALE which differs from its closest relative, *P. hanseni* BRANDT, by its three strong spiral ridges. It differs from all other species of this genus by its more solid shell and stouter shape.

Description: Shell rather large for the genus, conic, solid, with relatively broad base and moderately long, conic spire; diaphanous, translucent, somewhat glossy; the 5 whorls increase regularly in size and are separated by a shallow suture; they are almost flat; the protoconch is smooth, the remaining whorls are sculptured with three strong spiral ridges which are rarely tuberculated. There may be a fourth weak spiral ridge below the periphery. — The aperture is comparatively large; it is somewhat exserted; peristome continuous, appressed to the penultimate whorl, somewhat thickened, but less so than in *Hydrorissoia*. — Operculum oval, thin, corneous, translucent, paucispiral; nucleus placed near the lower half of the columellar margin.

Size: A 5·0-6·0 mm; D 2·8-3·4 mm.

No data are available on the pigmentation of the animal as only specimens preserved in alcohol were available for description. — Radula with trapezoidal rhachis with long, triangular cutting edge which carries a large, pointed mesocone and 5 small cusps on either side of it. The wings are produced into finger-shaped processes. In the middle of the basal line there is a squarisch projection. Between this projection and the wings there are 5 small basal cusps. The innermost is very large and protruding, the other 4 are relatively small. The laterals have a cusp formula 2(3)-1-8(9), the inner marginals have 9 large and 3 small cusps, the outer marginals have 14 large and 4 small cusps. — The male reproductive organs show a bent, short (contracted in alcohol), somewhat compressed verge with pointed tip. There is only a single duct and no appendages.

Type locality: Sedone river at Khong Sedone, N of Pakse in Laos.

Distribution: Known from the Sedone river only.

Material: Holotype SMRL 16109/A; paratypes 16109/60 and 20 specimens each in the collections of USNM, SMF, ZMH and of the author.

Paraprososthenia hydrorissoidea n. sp.

pl. 6 fig. 4, textfig. 4.

Diagnosis: A species of *Paraprosothenia* ANNANDALE which differs from its closest relative, *P. hanseni* BRANDT, by its less numerous spiral rows of tubercles, almost flat whorls, smaller size, narrower spire and larger aperture. Except

for the thin lip this species looks like a *Hydrorissoia*; it has, however, a serrated cutting edge at the rhachis.

Description: Shell small, rather short for the genus, with narrow, conic spire and large body whorl; whitish, diaphanous, translucent; the 5 whorls are almost flat and are separated by a very shallow suture. They increase regularly in size. The protoconch is smooth, the remaining whorls are sculptured with spiral rows of tubercles. There are two rows between periphery and suture, one on the periphery which may be seen on the postnuclear whorls just above the suture, and one below the periphery on the base of the body whorl; there may be traces of one or two basal spiral rows of very weak tubercles around the periomphalic area. The body whorl measures about $^5/_8$ of the height of the shell. — The aperture is large and extended; it measures $^3/_8$ of the length of the shell. The peristome is connected by a parietal callus; it is moderately thickened (less so than in *Hydrorissoia*) and somewhat expanded in adult specimens; it is angled above and well rounded below. The columellar callus covers the umbilicus. — The operculum is oval, thin, corneous, paucispiral; nucleus near the lower half of the columellar margin.

Size: A 3·6-4·1 mm; D 1·8-2·1 mm.

Animal sand-coloured with black and white pigmentation. The white pigment spots are particularly dense on the rostrum and at the sides of the foot. Tentacles round and filiform. The eyes are placed into very moderate swellings at the bases of the tentacles. Rostrum of about half the length of the tentacles. — Radula with trapezoidal rhachis. There are 4 small, pointed cusps on either side of the middle cusp on the cutting edge. Of the 4 basal cusps on either side, the innermosts are the largest. Laterals with the cusp formula 2-1-8, inner marginals with 16-18 cusps, outer with 12-14. — Male reproductive organs with a simple, prong-like verge without appendages and with a single duct. The verge ends in a pointed tip.

Type locality: Mekong at Muang Khong, near hospital, Khong Island, South Laos.

Distribution: Mekong between Khong Island and Sambor in North Cambodia.

Material: Holotype SMRL 16363/A; paratypes 16363/4. — SMRL 16082/10 - Mekong at Sompamit Falls, Khone, Laos; 16257/30 - Mekong at Ban Na on Khong Island, Laos; 16352/6 - Mekong at Ban Houay on Khong Island, Laos; 16344/3 - Mekong at Papaeng Falls, east of Khone; 16398/5 - Mekong at Sambor, Cambodia.

Hubendickia BRANDT, 1968.

Hubendickia incerta n. sp.

pl. 6 fig. 5, textfig. 5.

Diagnosis: A species of *Hubendickia* BRANDT which differs from all other species of this genus by its short, fusiform or ovate-conoidal shape and its weak axial sculpture.

Description: Shell small for the genus, ovate-conoidal or fusiform, with pointed apex which turns obtuse with age through erosion. Ground colour whitish, but covered with a thin greenish periderm. Texture thin but solid; translucent, moderately glossy. The sculpture consists of weak axial ribs which may

be reduced to sharp striae only. There are about 24 riblets on the penultimate whorl and 28 on the body whorl. On the body whorl the riblets generally become obsolete, particularly so on the lower half. Sometimes the riblets are developed below the suture only. The 6 whorls are moderately convex and are separated by a well incised suture. The body whorl measures about 3/5 of the length of the shell. The umbilicus is closed. — The aperture is comparatively large. It measures 2/5 of the length of the shell. It is obliquely oval, elongate, angled above and well rounded at the base with an obtuse angle below the columella. The basal part is somewhat protruding. The peristome is moderately thick, but much thinner than in *Pachydrobia*; it is brownish and very glossy, similar to the peristome of *Manningiella expansa* BRANDT; within the aperture is white. — The thin operculum is ovate, translucent, paucispiral; nucleus near the lower half of the columellar margin.

Size: A 3·8-5·0 mm; D 1·6-2·0 mm.

Animal sand-coloured with few black pigment patches and many small whitish pigment spots dusted over head, tentacles and rostrum. These spots are particularly dense at the sides of the foot. — Rhachis trapezoidal, with 4 small cusps on either side of the middle cusp on the cutting edge and 3 basal cusps on either side. — Male reproductive organs with rather short, finger-shaped verge; it is pointed at the tip, bent in the middle, with a single duct and without appendages.

Distribution: Mekong between Khong and Khone, Laos.

Type locality: Mekong at Ban Na on Khong Island.

Material: Holotype SMRL 16388/A; paratypes 16388/7. — SMRL 16095/1 Mekong at Sompamit Falls near Khone; 16096/5 - Mekong at Muang Khong, Khong Island.

Note: This species is only tentatively placed in the genus *Hubendickia*. Elongate specimens may not look too strange within this genus, short, oval specimens, however, with eroded apex, look more like axially sculptured *Manningiella* than like *Hubendickia*. The species was assigned to this genus with regard to its axial sculpture, a feature which this genus only shares with *Pachydrobia*, and its feebly lipped peristome. As *Manningiella pellucida* (BAVAY) and *Manningiella microsculpta* (BRANDT) this species also proves the close relationship between *Manningiella* and *Hubendickia*.

Hubendickia rolibrandti n. sp.

pl. 6 fig. 6, textfig. 6.

Diagnosis: A species of *Hubendickia* BRANDT which differs from all other species of this genus by its coarse, axial striae and its three weak spiral ridges.

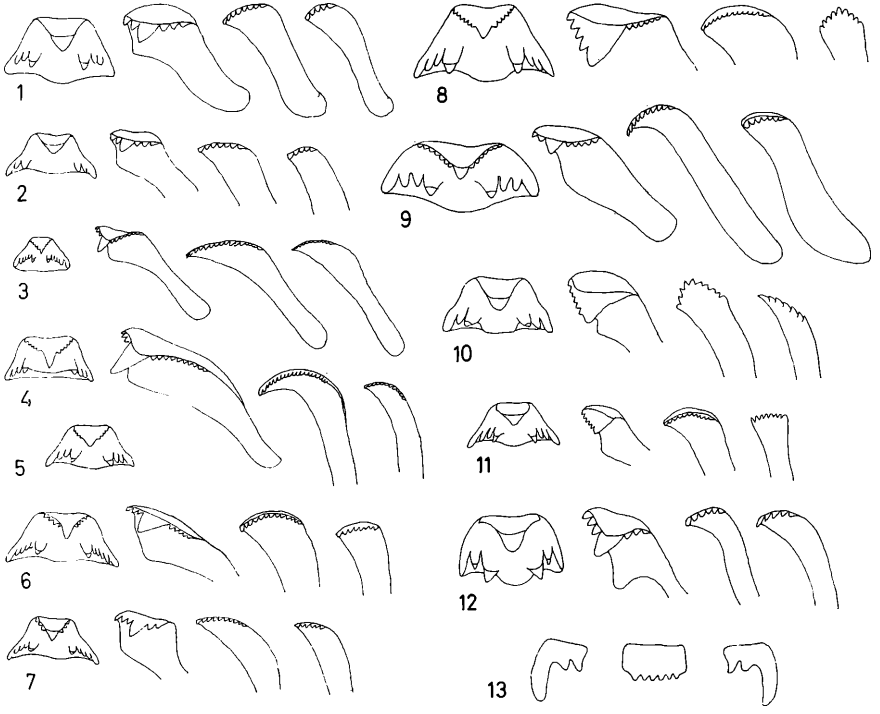
Description: Shell of medium to large size for the genus, cylindrically fusiform, corneous, translucent, rather thin but solid, somewhat glossy; apex homoeostrophic, the five to six whorls are only slightly convex; they are sculptured with irregular, coarse striae which are crossed by three very weak spiral ridges, one below the suture, one on the periphery and one slightly above it. Body whorl large, cylindrical, its height is 2/3 of the length of the shell. — Aperture large, ovate, angled above and well rounded below. Peristome connected

by a rather thin parietal callus, moderately lipped, outer margin somewhat protracted. — Operculum ovate, thin, corneous, paucispiral with subcentral nucleus.

Size: A 5·0-8·0 (eroded 3·5-7·0) mm; D 1·9-3·0 mm.

Animal light grey with black and whitish pigment dots dusted over head and back. Foot straight in front, with a row of sensory cells which are of semicircular shape; their walls are translucent. Tentacles long and filiform; the eyes are placed at their bases in moderate swellings. Rostrum trunk-shaped, half the length of the tentacles. — Male reproductive organs with prong-shaped verge, without appendage and with a single duct. — Rhachis trapezoidal, its cutting edge with a pointed mesocone and 3 small cusps on either side. Cusp formula of the laterals 3-1-6, marginals with 16 or 10 cusps respectively.

Type locality: Mekong at Muang Khong (near Wat), Laos.
Distribution: Mekong between Pakse and Khone, Laos.



Textfig. 1-13. Radula (1-4, 6-12 half-row, 5 rhachis, 13 one row); ×100. — 1) *Wykoffia tricostata* (Deshayes); 2) *Wykoffia minima* n. sp.; 3) *Paraprososthenia brandti* n. sp.; 4) *Paraprososthenia hydrorissoidea* n. sp.; 5) *Hubendickia incerta* n. sp. 6) *Hubendickia rolfbrandti* n. sp.; 7) *Manningiella rolfbrandti* n. sp.; 8) *Jullienia nucula* n. sp.; 9) *Jullienia rolfbrandti* n. sp.; 10) *Lacunopsis concava* n. sp.; 11) *Lacunopsis deiecta* n. sp.; 12) *Lithoglyphopsis aperta* n. sp.; 13) *Clea (Anentome) spinosa* n. sp.

Material: Holotype SMRL 16076/A; paratypes 16076/1000. — SMRL 16046/30 - Mekong at Ban Na on Khong Island; 16047/90 - Mekong near hospital Muang Khong; 16308/20 - Mekong at Sompamit Falls, Khone; 16352/10 - Mekong at Ban Houay on Khong Island.

Manningiella BRANDT, 1970.

Manningiella conica n. sp.

pl. 6 fig. 7.

Diagnosis: A species of *Manningiella* BRANDT which differs from all other species known from this genus by its regularly conic spire and large aperture.

Description: Shell of medium size for the genus, rather thin but solid; of white ground-colour, but covered with a greyish-olive periderm; the spire is regularly conic with pointed apex; the body whorl is ovate and measures about 3/4 of the length of the shell. The sculpture consists of very delicate growth lines only; there is no trace of a microsculpture. The 5 whorls increase regularly in size; they are almost flat, but separated by a well incised suture. — The aperture is large and measures about 1/2 of the length of the shell. It is somewhat expanded, ovate in shape, with an angle at the upper insertion of the peristome and well rounded at the base. It is white within. Peristome connected by a distinct parietal callus, rather sharp without, not lipped, somewhat extended at the base; columellar margin straight. Umbilicus closed. — Operculum ovate, thin, corneous, transparent, paucispiral with eccentric nucleus. — Animal and radula unknown as only dead shells were collected.

Size: A 3·0-3·8 mm; D 1·8-2·0 mm.
Type locality: Mekong at Ban Na on Khong Island, Laos.
Distribution: Known from the type locality only.
Material: Holotype SMRL 16275/A; paratypes 16275/12.
Relationship: This species looks similar to young *Lithoglyphopsis aperta*. As the anatomy is still unknown it is only tentatively placed into this genus.

Manningiella rolfbrandti n. sp.

pl. 6 fig. 8, textfig. 7.

Diagnosis: A species of *Manningiella* BRANDT which differs from its closest relative, *M. microsculpta* (BRANDT), by its greyish-olive colour, less translucent texture and lack of microsculpture.

Description: Shell of medium size for the genus, ovate-conoidal, with regularly conic spire and large, ovate body whorl. Young specimens with pointed apex, which becomes obtuse with age through erosion. The 3 to 4 remaining whorls are moderately convex and separated by a linear suture. The shell is olive-greenish or rarely straw-coloured, somewhat glossy and slightly diaphanous when young; dull and not translucent when old. The sculpture consists of very delicate growth lines only. The large body whorl measures almost 4/5 of the height of the shell. — Aperture large, elongately oval, whitish within, well rounded below and angled above. Peristome moderately thick, similar to that of *Huben-*

dickia incerta. It is connected by an almost straight parietal callus; the slightly curved columella covers the umbilicus completely. — Operculum thin, corneous, ovate, paucispiral with lateral nucleus.

Size: A 4·6-5·5 mm; D 2·7-3·0 mm.

Animal grey, mottled with black and dusted with fine, sand-coloured spots, particularly on head, tentacles, rostrum and sides of the back. On the tentacles this yellow pigmentation may merge into a lemon-colour. Rarely this may also be seen on the rostrum and the front part of the foot. Foot straight in front, well rounded behind. Tentacles of moderate length, round, tapering. Rostrum of half the length of the tentacles, truncate in front. The eyes are placed into moderate swellings at the bases of the tentacles. — Radula with trapezoidal rhachis; cutting edge low, with 7 rounded cusps; the wings are finger-shaped; between the wings and a central, basal projection, there are 4 basal cusps, the innermost being the largest. Laterals with the cusp formula 0(?)-1-5, the inner marginals have 14 cusps, the outer marginals 10. — Male reproductive organs with a long, prong-like verge which ends in a pointed tip. It is extremely long compared to the size of the animal; it has a single duct only and no appendages.

Type locality: Mekong at Muang Khong near Wat, Laos.

Distribution: Only known from the Mekong river near Khong Island in Laos.

Material: Holotype SMRL 16287/A; paratypes 16287/100. — SMRL 16286/50 - Mekong at Muang Khong near hospital.

Parasitology: This species has been exposed to miracidia of *Schistosoma japonicum,* obtained from the stool of a Laotian patient. The miracidia entered the animal, though development into sporocysts has not been observed as all infected snails died in the tank. All gastropods collected around Khong Island were exposed to miracidia of *Schistosoma japonicum.* They entered only *Hydrorissoia hospitalis, Manningiella expansa, Pachydrobia bavayi* BRANDT and this species.

Jullienia CROSSE & FISCHER, 1876.

Jullienia rolibrandti n. sp.

pl. 6 fig. 9, textfig. 9.

Diagnosis: A species of *Jullienia* CROSSE & FISCHER which differs from *J. flava* (DESHAYES) and *J. acuta* POIRIER by its much shorter spire, its flattened base and by having less and weaker spiral ridges on the lower half of the body whorl.

Description: Shell above medium size for the genus, subglobose-conoidal, with short, pointed spire and large, inflated body whorl. The shell is moderately thick but very solid, translucent, of yellowish-green colour and somewhat glossy. The sculpture consists of several strong spiral ridges on the upper half and the periphery of the whorls and some weaker ridges on the base of the body whorl. There are two strong spiral ridges between suture and periphery, one on the periphery and one below it. On the base of the body whorl there are three weaker spiral ridges. The base is somewhat flattened. Sometimes there is a very weak ridge immediately below the suture. The two uppermost ridges are often tuberculated. The growth lines are strong and narrow, particularly so at the crossings

with the spiral ridges. The flattened lower part of the body whorl is bordered at the left side by a very obtuse carina. The 3½ whorls are convex and increase rapidly in size. The apex is smooth, glossy and somewhat mammilated. — The aperture is large, semicircular, extended. The peristome is thick, but less so than in *J. acuta*. It is connected by a thick parietal callus. The columella is somewhat compressed but does not form a flat septum as in *Lacunopsis*. — Operculum semicircular, corneous, translucent, paucispiral, nucleus near the lower half of the columellar margin.

Size: A 6·5-7·7 mm; D 5·2-7·0 mm; d 3·9-4·8 mm.

Radula with trapezoidal rhachis. Its cutting edge has 7 small cusps on either side of the pointed mesocone. Laterals with the cusp formula 2(3)-1-5, inner marginals with 10 cusps, outer with 7.

Type locality: Mekong at Khong Island, Muang Khong, near Wat.

Distribution: Mekong between Bandan in Thailand and Khone in South Laos, but probably also south of the Cambodian-Laotian border. South of Stung Treng this species is replaced by *J. flava* (Deshayes).

Material: Holotype SMRL 16326/A; paratypes 16326/100. — SMRL 16340/100 - Mekong at Khong Island, near hospital; 16191/50 - Mekong at Ban Na, Khong Island; 16413/50 - Mekong at Sompamit Falls, Khone.

Jullienia nucula n. sp.

pl. 6 fig. 10, textfig. 8.

Diagnosis: A species of *Jullienia* Crosse & Fischer which differs from its closest relative, *J. harmandi* Poirier, by its subglobose shape, rounded ventral face of the body whorl, small aperture, concave umbilical area and by its numerous spiral ridges on the lower half of the body whorl.

Description: Shell rather small for the genus, subglobose, with low, conic spire and large body whorl. The 3½ whorls are convex and separated by a rather deep suture; they increase rapidly in size. The large body whorl measures about 8/9 of the length of the shell. The mammilate apex is smooth and glossy, the remaining whorls are sculptured with several spiral ridges which are crossed by delicate growth lines. There are 3 or 4 spiral ridges between suture and periphery and 7 or 8 on the lower half of the body whorl. The peripheral belt is void of spiral sculpture. The shell is whitish or greenish-diaphanous, translucent, moderately thick and solid. The ventral face of the body whorl is well rounded, only the base around the umbilical area is moderately flattened and even a little concave in the middle beside the columella. — Although the aperture is large, it is smaller than that of all other species of the genus; it is semicircular and very oblique. Peristome thick, connected by a very thick parietal and columellar callus which is somewhat compressed at the lower part, but does not form a flat septum as in *Lacunopsis*. There is a weak but distinct denticle in the middle of the edge. The aperture measures about ½ of the height of the body whorl. — Operculum semicircular, thin, translucent, corneous, paucispiral; nucleus near the lower half of the columellar margin.

Size: A 4·2-5·1 mm; D 3·7-4·5 mm.

Radula with trapezoidal rhachis. Its cutting edge has 6 small cusps on either side of the large, pointed mesocone. There are 3 basal cusps on either side. The

laterals have a cusp formula 0-1-6. There are no endocones but the inner side of the large, triangular mesocone is serrated. The inner marginals have 13-15 cusps, the outer 9 to 10.

Type locality: Mekong at Muang Khong, Khong Island.
Distribution: Mekong between Khong and Sambor.
Material: Holotype SMRL 16330/A; paratypes 16330/40 and 10 specimens each in SMF, ZMH and USNM. — SMRL 16337/4 - Mekong at Sompamit Falls, Khone, Laos; 16331/3 - Mekong, 2 km S of Muang Khong; 16332/5 - Mekong at Sambor, Cambodia; 16050/5 - Mekong at Ban Na, Khong Island.

Lacunopsis DESHAYES, 1876.

Lacunopsis rolibrandti n. sp.

pl. 7 fig. 11.

Diagnosis: A species of *Lacunopsis* DESHAYES which differs from *L. globosa* BAVAY by its flat and sharply outlined columellar septum, auriform shape and large denticle on the edge of the septum. It differs from *L. harmandi* POIRIER by its spiral row of tubercles and the denticle at the edge of the septum.

Description: Shell rather large, subglobosely auriform, with low, rounded spire and large, exserted aperture. The ground colour is white but the shell is covered with a thick, green periderm. The 4 whorls increase rapidly in size; they are moderately convex and separated by a shallow but well incised suture. The reddish apex is almost smooth, the other whorls are sculptured with curved, densely placed growth lines. There is a subsutural ridge on the body whorl which carries a spiral row of obtuse tubercles. — The ear-shaped aperture is exserted to the right; it is semicircular and whitish within. The peristome is well rounded; its upper insertion does not continue into the sharp ventral keel but terminates above its beginning. The septum of the columella is only moderately broad. Its edge carries a thick tubercle in the middle. The porcelaneous layer of the septum does not transgress over the whole ventral face of the body whorl as in *L. harmandi*, but is sharply outlined against the semilunar rest of the face which is covered by the periderm. The keel which borders this face at the left side is often produced into a sharp, raised ridge. — Operculum ovate, brown, translucent, paucispiral; nucleus placed near the lower part of the columellar margin. — Soft parts unknown.

Size: A 8·0-9·0 mm; D 9·0-10·0 mm; d 7·0-8·0 mm.
Type locality: Mekong at Muang Khong, Khong Island.
Distribution: Known from the type locality only.
Material: Holotype SMRL 16208/A; paratypes 16208/3.

Lacunopsis concava n. sp.

pl. 7 fig. 12, textfig. 10.

Diagnosis: A species of *Lacunopsis* DESHAYES which differs from its closest relative, *L. levayi* BAVAY, by its lack of tubercles and by the conspicuous excavation beside the columella.

Description: Shell subglobose, with low, but somewhat conic spire and large, globose body whorl; thick, only moderately translucent, covered with a somewhat glossy periderm which is greenish in young specimens, but merges into yellow with age. The 4 whorls are somewhat convex and separated by a distinct suture. The apex is pale, never reddish, and is often eroded. There is an obtuse subsutural shoulder on the body whorl and sometimes also on the penultimate whorl. There are few rudimentary spiral lines seen on the upper part of the last whorls. The ventral face of the body whorl is not flattened, but distinctly concave beside the columellar callus. The cavity is generally bordered by a very short, curved carina which originates at the middle of the parietal callus and ends beside the columella, where it joins with the peristome. This cavity causes the columella to form a sinuous broadening in the middle. — Aperture broadly semicircular; peristome continued by a thick parietal and columellar callus which forms a narrow septum at the lower part. There is no denticle but a moderate swelling. The outer part of the peristome is very thick, but not lipped as in *Pachydrobia* and *Jullienia*. — Operculum ovate, brown, corneous, translucent, paucispiral; nucleus near the lower end of the columellar margin.

Size: A 7·5-9·0 mm; D 8·0-9·0 mm; d 5·0-6·0 mm.

As the animals were preserved in alcohol, they showed only black pigment patches. — Radula with trapezoidal rhachis; this carries a simple, triangular cutting edge and 4 basal cusps on either side. The innermost cusps are large and distinct, the 3 others very weak. The laterals have one large, triangular cusp whose inner cutting edge is serrated at the base. There are 5 to 7 very irregular cusps beside the large cusp. The inner marginals have 10 cusps, the outer 7.

Type locality: Mekong river at Muang Khong near the hospital; Khong Island.

Distribution: Known from the Mekong between Pakse in Laos and Sandan in North Cambodia.

Material: Holotype SMRL 16404/A; paratypes 16404/5. — SMRL 16402/2 - Mekong at Muang Khong near Wat; 16405/2 - Mekong 2 km north of Pakse; 16406/2 - Mekong at Sandan, North Cambodia.

Lacunopsis deiecta n. sp.

pl. 7 fig. 13, textfig. 11.

Diagnosis: A species of *Lacunopsis* DESHAYES which differs from *L. sphaerica* BAVAY by its conic spire and sharp, ventral keel. It differs from *L. conica* BRANDT which is similar in shape, by its sharp ventral keel and somewhat larger size.

Description: Shell rather small for the genus, with small, conic spire and large, ear-shaped body whorl. Solid, but not very thick, translucent, of white ground colour, but covered with a greenish or brownish-olive periderm. The reddish apex is generally eroded. The $3^1/_2$ whorls increase rapidly in size and are separated by a shallow, but well incised suture. The sculpture consists of regular, curved growth lines. Rarely rudimental traces of spiral lines and of a subsutural spiral ridge may be seen. — Aperture large, semicircular. Peristome sharp, only moderately thickened within; it is connected by a thick, porcelaneous parietal and columellar callus which forms a moderately broad septum. The

edge of this septum shows in the middle a blunt denticle. The part of the face of the body whorl beside this septum forms a slanting, oblique, semilunar plain which is bordered at the left side by a sharp keel. This semilunar plain is covered by periderm, not by an extension of the porcelaneous layer as in *L. harmandi* POIRIER and some other species. — Operculum ovate, thin, corneous, translucent, with a minute dent at the columellar side corresponding with the denticle of the edge of the septum; it is paucispiral, its nucleus is placed near the lower part of the columellar margin.

Size: A 5·5-7·0 mm; D 5·0-6·5 mm; d 3·5-4·5 mm.

No reliable data on the colour pattern of the animal can be given, as only animals preserved in alcohol were available for description. — The radula has a trapezoidal rachis with simple, triangular cutting edge. There are 3 basal cusps on either side. The laterals have a large, triangular middle cusp whose inner edge is serrated. There may be 4 minute cusps beside it at the outer side. The inner marginals have 11 cusps, the outer 8.

Type locality: Mekong at Muang Khong near hospital, Khong Island in South Laos.

Distribution: Known between Khong and the rapids near Khone.

Material: Holotype SMRL 16198/A; paratypes 16198/7. — SMRL 16345/8 - Mekong at Prapaeng Falls, South Laos; 16409/7 Mekong at Sompamit Falls, South Laos.

Variability: This species varies only slightly with regard to shape and size. The spire may be more conic or more rounded. At the Prapaeng Falls specimens with almost completely porcelaneous ventral faces were found. Some specimens had a pale apex, others showed only a moderately excavated ventral face.

Lithoglyphopsis THIELE, 1928.

Lithoglyphopsis aperta n. sp.

pl. 7 fig. 14; textfig. 12.

Diagnosis: A species of *Lithoglyphopsis* THIELE which differs from *L. dugasti* (MORLET) — described as a *Lacunopsis* —, the only compatriot of this species, by its much smaller size and very large aperture.

Description: Shell rather small for the genus, globose, young specimens with a short, sharp spire which may even show concave side-lines, old specimens with eroded spire and therefore obtuse. The shell is rather solid but not very thick. It is of white ground-colour, but covered with an olive-coloured periderm. Only very young shells are translucent. The sculpture consists of very fine growth lines only. The 6 whorls — when the shell is complete — are somewhat convex and increase regularly in size, only the body whorl is suddenly inflated. When the spire is eroded, the apex of the shell is closed by a secondary layer of shell substance. — The aperture is large, somewhat extended, oval, with an angle above and a well rounded base. The peristome is sharp, continuous and connected by a thick and broad parietal callus. It is thickened within. The columellar margin is very broad and thick, the upper margin is sometimes produced into a beak-like

process with a distinct axial canal. The inner margin of the peristome is of the same olive-colour as the shell, the aperture, however, is whitish within. — Operculum ovate, thin, transparent, corneous, paucispiral with eccentric nucleus.

Size: A 2·0-4·0 mm; D 1·3-3·0 mm.

Soft parts and anatomy unknown. — From a dessicated animal the radula was obtained. The rhachis is typical for the genus with its squarish shape, the simple, triangular cutting edge and the 2 basal cusps on either side. The wings, however, which are rectangular in the type species, are extended into finger-shaped processes. The cusp formula of the laterals is 3-1-3, the inner marginals have 6 cusps, the outer marginals 5.

Type locality: Mekong at Ban Na on Khong Island, Laos.

Distribution: Only known from the Mekong between Cham Passak and Sompamit Falls near Khone in Laos.

Material: Holotype SMRL 16282/A; paratypes 16282/30. — SMRL 16086/5 - Mekong at Cham Passac (Bassac), Laos; 16087/4 - Mekong at Muang Khong near hospital; 16319/30 - Mekong at Sompamit Falls near Khone; 16336/30 - Mekong at Muang Khong near Wat, Laos.

Stenothyridae P. FISCHER, 1887.

Stenothyra laotiensis n. sp.

pl. 7 fig. 15.

Diagnosis: A species of *Stenothyra* BENSON which differs from *S. cambodiensis* BRANDT by its broad, rhomboidal shape (similar to *jiraponi* BRANDT), from small forms of *koratensis* BRANDT and *basisculpta* BRANDT by its complete lack of spiral sculpture and from *jiraponi* by its extremely small size.

Description: Shell small, thin, transparent, corneous, glossy; smooth except for the delicate growth lines; with large, inflated body whorl and small, conic spire. The outline of the shell is almost rhomboidal with one pointed angle, the apex, and three rounded angles. The 4 convex whorls are separated by a deeply incised suture which is often bordered by a brownish margin. The body whorl is large and inflated; it is distinctly "bossed" at the left side, but regularly rounded at the right side; it is somewhat compressed dorso-ventrally; it measures about 3/4 of the height of the shell. The umbilicus is a short chink beside the columellar side of the aperture. — Aperture small, ovate, very oblique, constricted; its altitude is less than 1/3 of the height of the body whorl. — Operculum oval, corneous, brittle, glossy, transparent, with two short, high, straight ridges and one long, low, semicircular on the inner surface; paucispiral, with almost central nucleus. — The radula and soft parts have not yet been studied.

Size: A 1·6-2·1 mm; D 0·9-1·3 mm.

Type locality: Mekong at hospital Muang Khong on Khong Island, Laos.

Distribution: Known from the Mekong in South Laos.

Material: Holotype SMRL 16234/A; paratypes 16234/30. — SMRL 16225/10 - Mekong branch at Papaeng Falls, Laos; 16239/30 - Mekong at Wat Muang Khong, Laos.

Buccinidae, Buccininae SWAINSON, 1840.

Clea A. ADAMS, 1855.

Clea (Anentome) COSSMANN, 1901.

Clea (Anentome) spinosa n. sp.

pl. 7 fig. 15, textfig. 13.

Diagnosis: A species of *Clea (Anentome)* COSSMANN which differs from all other species known of this genus by its small size and two rows of spines.

Description: Shell conoidal with rather broad base; solid but not very thick; whitish but covered with a thick olive-coloured periderm. The 5 whorls are convex and show an extremely strong sculpture on the postnuclear and last whorls. The protoconch is smooth, the first two postnuclear whorls carry two raised and tuberculated spiral ridges, the last two whorls have two spiral rows of strong, whitish spines and the body whorl carries a third spiral row of spines below the periphery. The spines on the uppermost row are the strongest. Below the third row of spines there are 7 to 9 spiral ridges partly placed on the base of the body whorl, partly on the siphonic canal. The spines of the last whorl are connected by obtuse ribs which begin at the suture and end at the third row os spines. There are 10-11 spines on the uppermost row on the penultimate whorl and on the body whorl. The body whorl measures about 3/4 of the height of the shell. It is produced into a short, broad and somewhat curved siphonic process. — The aperture is large and brownish within; at the base it is extended into the broad siphonic canal. The peristome is not expanded and is connected by a glossy, brownish callus in young specimens; it is continuous in old specimens. — The operculum is narrowly almond-shaped, concentric, with a basal nucleus; it is thin, brittle, roughened and only slightly translucent.

Size: (holotype) A 9·5 mm; D 7·0 mm. All paratypes seem to be not completely adult.

Animal greyish, mottled with black and dusted with fine, white pigment spots, particularly on the long siphon. Foot truncate in front and rounded behind. Tentacles long and thin, filiform; the eyes are placed at the bases of the tentacles in distinct sockets. Proboscis eversible, when fully extended it measures about double the length of the tentacles. — Male reproductive organs with a very large, vermiform verge whose tip is somewhat pointed. There are no appendages at the verge. — Radula with 3 teeth in one row. Rhachis with 6 small cusps, marginals with 3, somewhat curved cusps.

Type locality: Mekong at Muang Khong, Laos.

Distribution: Known from the Mekong at Khong and near Khone in South Laos.

Material: Holotype SMRL 16534/A; paratypes 16534/4. — SMRL 16532/2 Mekong at Sompamit Falls near Khone.

Relationship: This species does not seem to be closely related to any species of *Anentome*. *C. scalarina* (DESHAYES) a species with a tuberculated shoulder on the last whorls, may be the closest relative. This new species looks like a *Coralliophila* in miniature.

Bivalvia Linnaeus, 1758.

Corbiculidae Gray, 1847.

Corbicula Mühlfeld, 1811.

Corbicula crocea n. sp.

pl. 7 fig. 17.

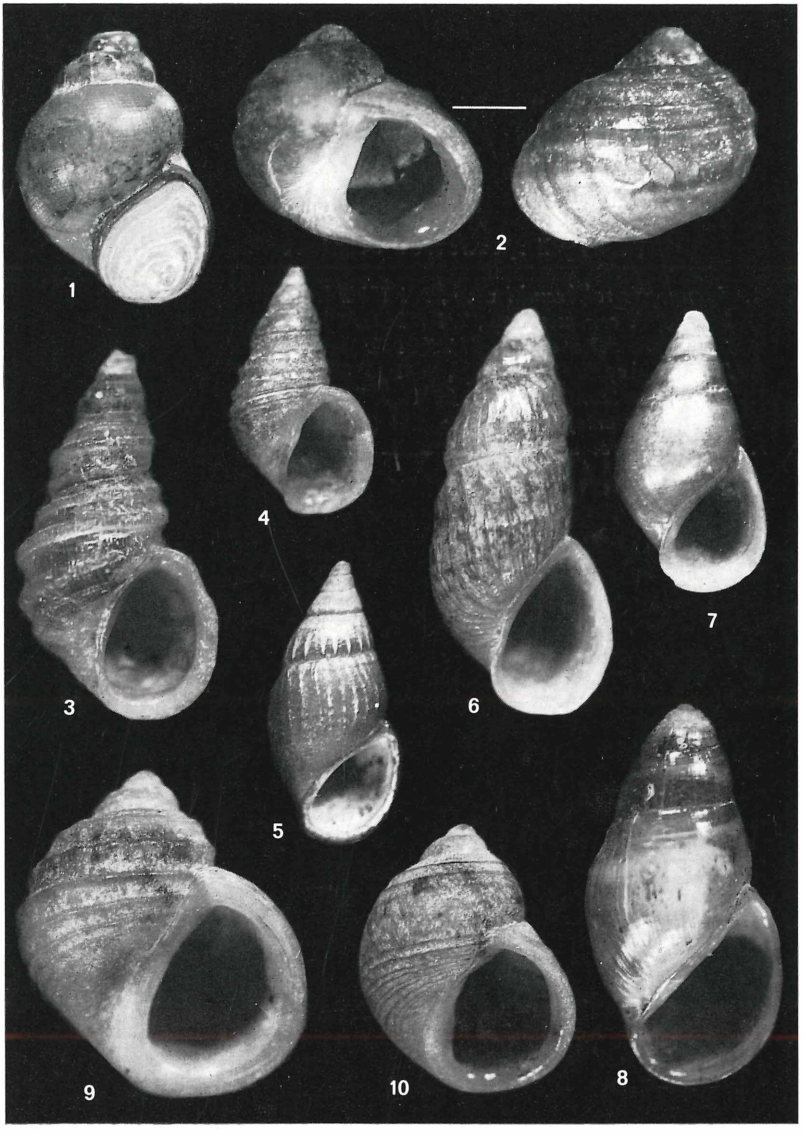
Diagnosis: A species of *Corbicula* Mühlfeld which differs from all other species of this genus by its reddish-yellowish colour.

Description: Shell oval, with exserted umbones, thin but solid, compressed, only slightly translucent, salmon-coloured with brownish or reddish-yellow periderm. Umbones exserted but barely prominent, somewhat turned to the anterior end. The sculpture consists of regular concentric riblets whose interspaces are of about double the breadth of the ribs. Anterior side somewhat shorter than posterior side; all sides regularly curved, only in old specimens the ventral side appears less curved than the dorsal side. Nymphs narrow, almost smooth, lunule and escutcheon not marked. Ligament short, thin, brown. Shell cream-coloured within with salmon-coloured beak cavities. Hinge plate very narrow. There are 2 anterior and 2 posterior laterals in the right valve and 1 posterior and 1 anterior lateral in the left valve. AI, PI, AII and PII are serrated, AIII and PIII are smooth. C1 and C4 almost lamelliform, the other 4 cardinals triangular. Pallial line regularly curved, anterior and posterior muscle scars shallow, almost of the same size. — The soft parts have not yet been studied.

Size: A 13-14 mm; L 14-17 mm; D 6-8 mm.
Type locality: Huai Chompu at Paksong, E of Pakse.
Distribution: Known from the type locality only.
Material: Holotype SMRL 17011/A; paratypes 17011/20.

Explanation of plate 6.

Fig. 1. *Hydrobioides vogeli* n. sp., 5/1 (SMRL 16011/A).
Fig. 2. *Wykoffia minima* n. sp., 10/1 (SMRL 16335/A).
Fig. 3. *Paraprososthenia brandti* n. sp., 8/1 (SMRL 16109/A).
Fig. 4. *Paraprososthenia hydrorissoidea* n. sp., 8/1 (SMRL 16363/A).
Fig. 5. *Hubendickia incerta* n. sp., 8/1 (SMRL 16388/A).
Fig. 6. *Hubendickia rolfbrandti* n. sp., 8/1 (SMRL 16076/A).
Fig. 7. *Manningiella conica* n. sp., 10/1 (SMRL 16275/A).
Fig. 8. *Manningiella rolfbrandti* n. sp., 10/1 (SMRL 16287/A).
Fig. 9. *Jullienia rolfbrandti* n. sp., 6/1 (SMRL 16326/A).
Fig. 10. *Jullienia nucula* n. sp., 6/1 (SMRL 16330/A).



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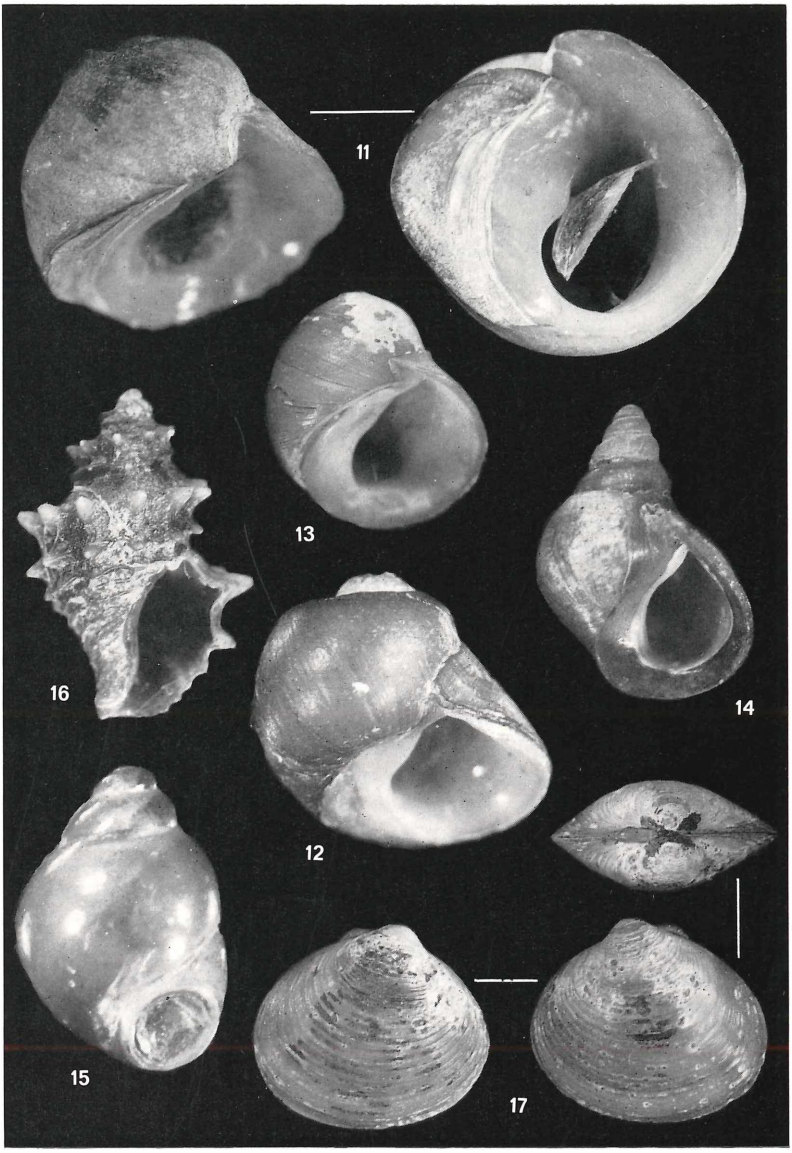
Explanation of plate 7

Fig. 11. *Lacunopsis rolfbrandti* n. sp., 5/1 (SMRL 16208/A).
Fig. 12. *Lacunopsis concava* n. sp., 5/1 (SMRL 16404/A).
Fig. 13. *Lacunopsis deiecta* n. sp., 5/1 (SMRL 16198/A).
Fig. 14. *Lithoglyphopsis aperta* n. sp., 10/1 (SMRL 16282/A).
Fig. 15. *Stenothyra laotiensis* n. sp., 20/1 (SMRL 16234/A).
Fig. 16. *Clea (Anentome) spinosa* n. sp., 5/1 (SMRL 16524/A).
Fig. 17. *Corbicula crocea* n. sp., 2/1 (SMRL 17011/A).



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