

# NEW SPECIES OF LAND SNAILS (MOLLUSCA: GASTROPODA: CAENOGASTROPODA AND PULMONATA) OF THE MEKONG DELTA LIMESTONE HILLS (CAMBODIA, VIETNAM)

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**ABSTRACT:** Twenty-two new species of land snails are described from limestone hills on the west flank of the Mekong river delta, in Cambodia and Vietnam. The species belong to the families Assimineidae, Cyclophoridae, Diplommatinidae, Ariophantidae, Helicarionidae, Streptaxidae and Vertiginidae.

**KEY WORDS:** land snails, Cambodia, Vietnam, Mekong Delta Limestone Hills

## INTRODUCTION

The composition and special features of the snail fauna of isolated limestone hills on the west flank of the Mekong Delta (Cambodia, Vietnam) remained virtually unknown (except for a few species described by [VAN BENTHEM JUTTING \(1962\)](#)) until the rampant quarrying of the hills raised concerns among the conservation-minded. The first biodiversity surveys in the area were conducted by the Institute of Tropical Biology, Ho Chi Minh City, Vietnam, in the last years

of the 20th century. Well over a decade later, the exploration of Cambodian part of the hill chain started, spurred once more by concerns over industrial impact on the local biodiversity. By now, the surveys have yielded an extensive collection of terrestrial Mollusca. Taxonomical unravelling is ongoing; this paper is one in a series on the snail fauna of the above-mentioned limestone hills, and is preceded by [VERMEULEN et al. \(2007\)](#), and [VERMEULEN et al. \(in press\)](#).

## THE MEKONG DELTA LIMESTONES

The Mekong Delta Limestones (MDL) consist of a string of small and medium-sized limestone hills along the Vietnamese and Cambodian coast, where the border between the two countries meets the sea ([Fig. 1](#)). The hills are situated along the western flank of the delta of the Mekong River and, although the hills themselves apparently reached sufficiently high above their surroundings to have a history as a permanently terrestrial environment, the surrounding

alluvial plains have known extended periods of inundation. For land snails and other terrestrial fauna preferring limestone environments, the limestone outcrops are islands of suitable habitat in vast plains of uninhabitable territory. This isolation, combined with the fact that the limestone hills nearest to the MDL are hundreds of kilometres away has left an imprint on the snail fauna of the hills. It has been characterised as an island fauna ([VERMEULEN et al. 2007](#)),

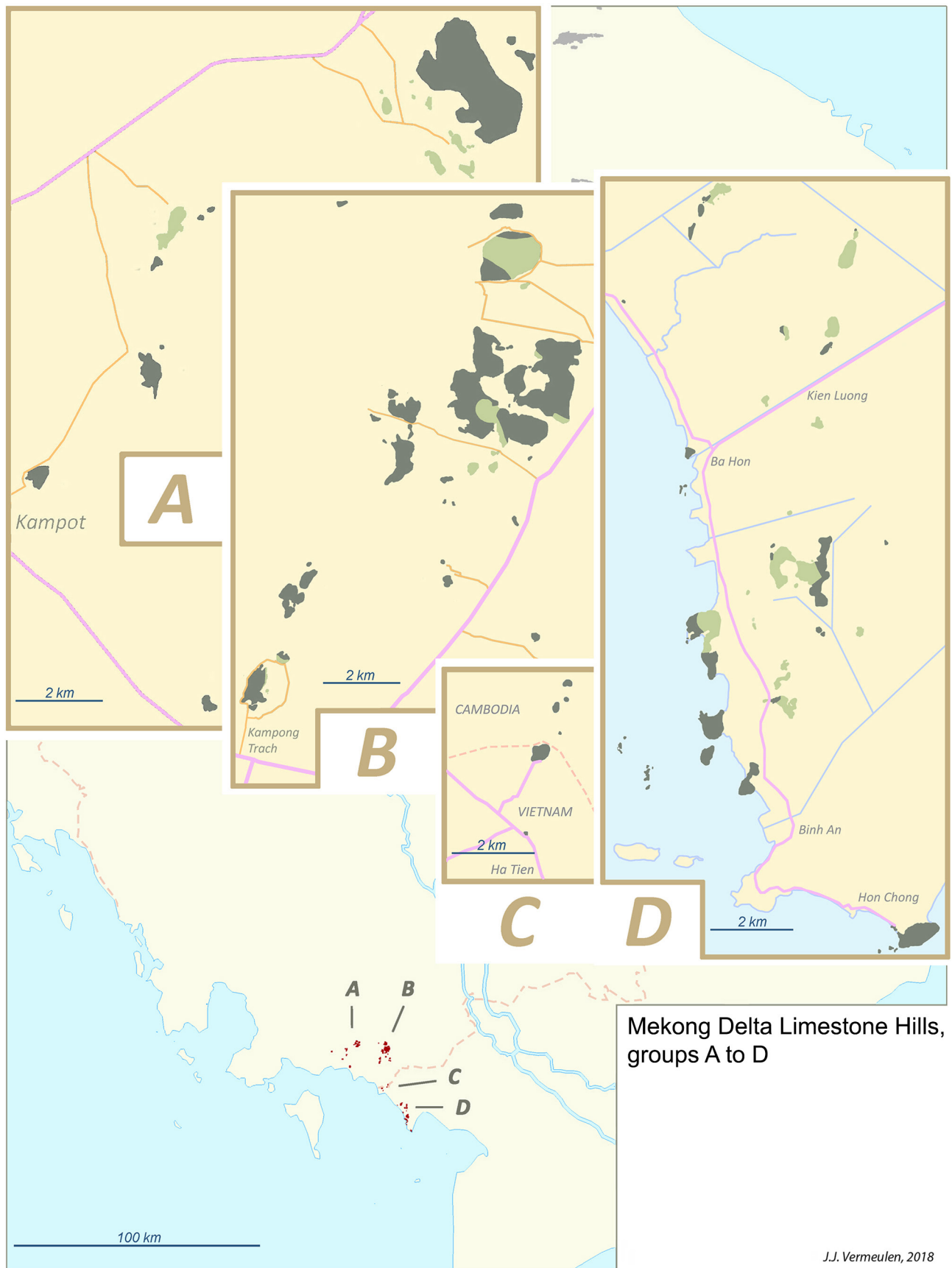


Fig. 1. The Mekong Delta Limestones (MDL). Underlying map: red – MDL outcrops in four groups A, B, C, and D. Inset maps A, B, C, and D: grey – extant, limestone outcrops, light green – extinct, limestone outcrops, no longer of significance for limestone biodiversity



with relatively few species but high rates of endemism. So far, the species list includes 113 species, of which 62 (55%) are potentially endemic to the MDL. Investigation into this fauna is ongoing and far from complete; it is likely that more species, provisionally identified as known and widespread ones, will prove new to science and endemic.

The relevance of quickly describing these new species lies in the fact that the MDL as a whole are under serious threat. Next to a severe general environmental degradation which started during the second half of the last century, four large and several smaller cement factories are active in the area, which, together with numerous local entrepreneurs, quarry the valuable limestone. Fig. 1 shows the state of affairs in

2016, with extant limestone hills (grey) and extinct ones (light green). Conservation organisations involved in nature conservation wish to make visible the degradation of the biodiversity, making use of the categories of the IUCN Red List Program (IUCN RED LIST <https://www.iucnredlist.org/>) to describe the increasing pressure on individual species. For inclusion in the IUCN Red List, species need to be formally described. Distribution maps of the species are presented to demonstrate not only the wealth of the local fauna, but particularly the fact that many species appear to have a very limited distribution, even within the MDL. These distribution patterns may help NGO's to prioritize their efforts.

## MATERIAL AND METHODS

The material studied derives from the private collection of the first author ('V' in the lists of exam-

ined material, below). Type specimens of new species are stored in NHMUK (Natural History Museum of

Table 1. The list of hills of the study area

Country	Group (see Fig. 1)	Area	Hill name	Coordinates highest point (Google Earth)
Cambodia	A	Kampot	La'ang (Phnom)	10°42'25.84"N, 104°21'09.55"E
		Kampot	Chhngauk (Phnom)	10°38'33.82"N, 104°16'17.42"E
		Kampot	Kbal Romeas (Phnom)	10°37'08.03"N, 104°14'41.13"E
		Kampot	Sor Sear (Phnom)	10°33'53.42"N, 104°17'05.17"E
	B	Banteay Meas	Toch (Phnom)	10°42'08.14"N, 104°31'20.01"E
		Banteay Meas	Totung North (Phnom)	10°41'27.90"N, 104°31'14.89"E
		Banteay Meas	Totung South (Phnom)	10°41'02.04"N, 104°31'42.58"E
		Banteay Meas	Teuk Srok (Phnom)	10°39'45.91"N, 104°31'16.43"E
		Banteay Meas	Chruoh Chek (Phnom)	10°38'55.69"N, 104°31'58.22"E
		Banteay Meas	Koun Sat (Phnom)	10°39'53.01"N, 104°32'16.24"E
		Banteay Meas	Kunea Luong (Phnom)	10°39'23.26"N, 104°32'17.12"E
		Banteay Meas	Nameless small hill	10°39'49.44"N, 104°31'55.67"E
		Banteay Meas	Nameless small hill in CMIC concession	10°38'15.43"N, 104°31'32.08"E
		Kampong Trach	Damrey South (Phnom)	10°36'04.79"N, 104°28'37.14"E
Kampong Trach	Kampong Trach (Phnom)	10°34'43.06"N, 104°28'17.67"E		
Vietnam	C	Ha Tien	Teuk Thom (Phnom)	10°26'20.82"N, 104°28'48.30"E
		Ha Tien	Thach Dong (Nui)	10°24'38.33"N, 104°28'29.98"E
		Ha Tien	Da Dung (Nui)	10°25'43.54"N, 104°28'38.18"E
	D	Kien Luong	Nai (Nui)	10°16'37.39"N, 104°36'17.79"E
		Kien Luong	Chau Hang (Nui)	10°16'24.02"N, 104°36'53.79"E
		Kien Luong	Ong North (Nui)	10°18'28.52"N, 104°35'12.49"E
		Kien Luong	Trau (Nui)	10°18'01.31"N, 104°37'14.25"E
		Kien Luong	Ba Tai (Nui)	10°10'16.90"N, 104°36'06.46"E
		Kien Luong	Bai Voi (Nui)	10°13'18.14"N, 104°36'54.85"E
		Kien Luong	Da Lua East (Hon)	10°10'21.79"N, 104°34'42.32"E
Vietnam	D	Kien Luong	Hang Cay Ot (Nui)	10°11'27.02"N, 104°36'34.56"E
		Kien Luong	Hang Tien (Nui)	10°11'07.52"N, 104°35'17.19"E
		Kien Luong	Chua Hang (Nui)	10°08'22.83"N, 104°38'35.80"E
		Kien Luong	Khoe La (Nui)	10°12'18.48"N, 104°35'27.27"E
		Kien Luong	Lo Coc (Hon)	10°10'42.18"N, 104°35'32.09"E
		Kien Luong	Nho (Nui)	10°14'05.77"N, 104°36'30.49"E
		Kien Luong	Son Tra (Nui)	10°12'30.05"N, 104°37'00.33"E

the United Kingdom, London) and RMNH (National Museum of Natural History, formerly Rijksmuseum van Natuurlijke Historie, the Netherlands, Leiden). Duplicate sets of the collection will be stored in institutes in Vietnam and Cambodia. The illustrations were drawn by the first author, with the aid of a Wild M8 stereo microscope with a Camera Lucida device.

## SYSTEMATIC PART

### Family Assimineidae H. Adams et A. Adams, 1856

#### *Acmella trachypleura* sp. n.

Figs 2 (blue dots), 3.

IUCN RED LIST Category, as *Acmella* sp. nov. 'Ba Tai': Vulnerable D2.

**Examined material.** Vietnam: Kien Giang Province, Kien Luong District, Nui Ba Tai (holotype: NHMUK 20180548, paratypes: V 14691/8 shells); Nui Khoe La, north remnant, seaward side (V 14870/1).

**Cross diagnosis.** Uniquely characterised within the genus by the radial ribs developing into semi-elliptic lamellae above the periphery.

**Description.** Shell minute, rather thin, somewhat translucent, white. Surface shiny. Spire conical with slightly convex sides, apex obtuse, whorls convex, the last one slightly shouldered. Sculpture: protoconch minutely punctate, first part of teleoconch (up to 1 1/2–1 3/4 whorl) minutely punctate as the protoconch; other whorls with prosocline radial ribs, those on the last whorl below the periphery rather low and flat, densely placed but somewhat unevenly spaced, distinctly sinuous somewhat below the periphery approx. at the level of the suture of the penultimate whorl, most radial ribs rather abruptly ending approx. at the level of the periphery, but each at a slightly different level, and some with a slightly thickened and higher terminal part; one out of two to four radial ribs continuing above the periphery, where they develop into widely and somewhat unevenly spaced, thick, semi-elliptic lamellae with a rounded edge, which rather abruptly end well below the suture. Spiral sculpture absent. Aperture approx. obliquely and widely inverted-ovate in outline, with a straight parietal side, transition from parietal to basal side narrowly rounded to obtusely angular. Peristome not thickened. Dimensions: height 1.15–1.35 mm; width 0.80–0.85 mm; h/w 1.41–1.63; number of whorls 5 1/8–5 7/8; umbilicus narrow, up to 0.05 mm wide; height aperture 0.32–0.38 mm; width aperture 0.38–0.45 mm.

The first author claims copyright of the illustrations of the snail species.

The toponymy of the study area appears somewhat unsettled. We have used names of hills originating from various sources, some less formal than others. Therefore, we add a table with the hill names used in this paper, with coordinates (Table 1).

**Ecology.** In (disturbed) shrubby, partly deciduous coastal vegetation in rock crevices and in low, partly deciduous woodland, on limestone bedrock.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

**Etymology:** *trachus* (Greek) – rough, *pleuron* (Greek) rib

### Family Cyclophoridae Gray, 1847

#### *Platyrhaphé conula* sp. n.

Figs 2 (green dots), 4–5.

IUCN RED LIST Category, as *Platyrhaphé* sp. nov. 1: Vulnerable B 1ab(i,ii,iii,v) + 2ab(i,ii,iii,v); D2.

**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Hang Cay Ot (V 14820/4 shells); Hon Da Lua, east group, the middle (largest) island, west side (V 14704/>10); Hon Lo Coc (V 14703/>10); Nui Ba Tai (V 9952/>10); ditto, cave on west flank (V 15030/4); ditto, east flank (V 7940/9); Nui Bai Voi, east flank, large doline approx. half-way along length of hill (V 11238/2); ditto, north part (Nui Mo So), Hospital Cave area, large doline (holotype: NHMUK 20180549, paratypes: V 10021/>10); ditto, west flank just below widest part of the hill (V 14701/8); ditto, southwest flank, rocky, locally steep limestone slope (V 14991/1); Nui Hang Tien (V 10014/>10); Nui Khoe La, north remnant, seaward side (V 14702/5); ditto, north remnant, seaward side (V 14867/>10); ditto, north remnant, small, most seaward limestone outcrop off the main hill (V 14900/9); Nui Son Tra, limestone outcrop along north flank of sandstone hill (V 7953/1).

**Cross diagnosis.** Characterised within *Platyrhaphé* by the high-conical spire. *Platyrhaphé bicolor* (Von Martens, 1908) has a similar spire, but is distinctly larger (shell height 8.5 mm versus 2.7–3.8 mm) and lacks the fine, densely placed radial riblets (MARTENS 1908).

**Description.** Shell very small, dextral, white. Spire conical, with flat to slightly concave sides. Whorls



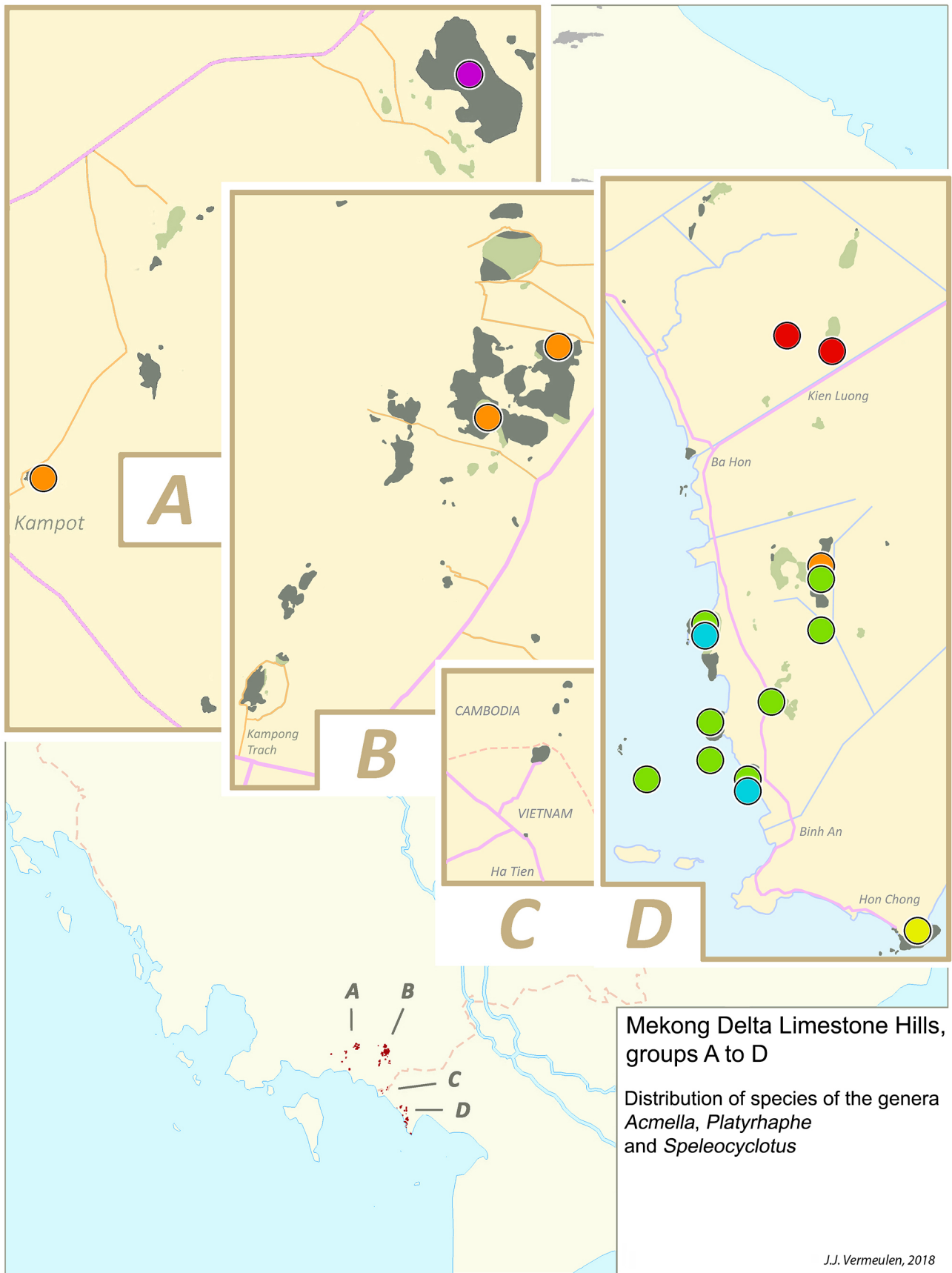
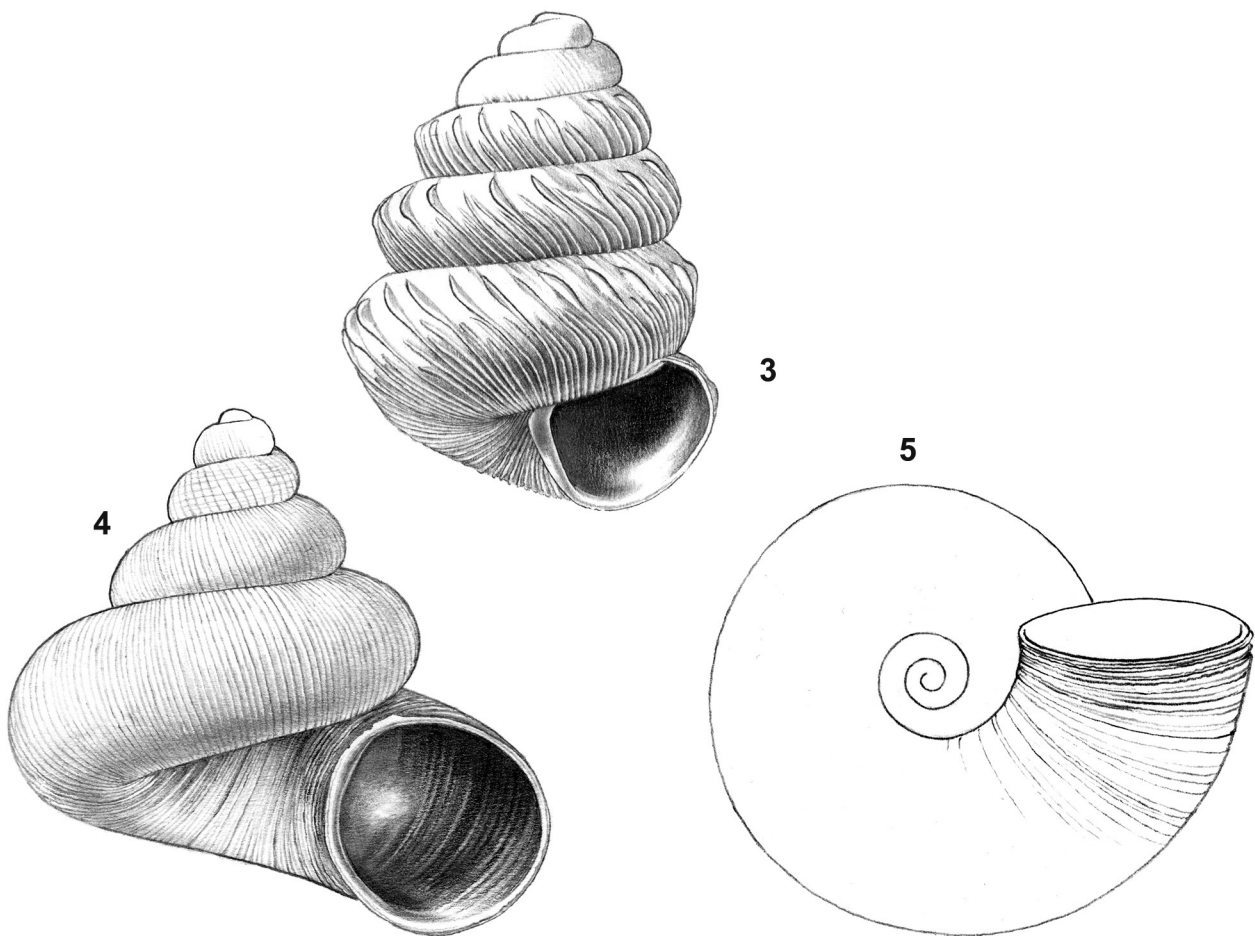


Fig. 2. Distribution of species of the genera *Acmeilla*, *Platyrrhaphe* and *Speleocyclus* in the MDL. Dots of different colours represent different species: blue – *Acmeilla trachypleura*; green – *Platyrrhaphe conula*; yellow – *Speleocyclus macrocoryphe*; orange – *S. microcoryphe*; red – *S. holcobasis*; purple – *S. laangensis*



Figs 3–5. *Acmella trachypleura* sp. n.: 3 – holotype, frontal view, shell height 1.2 mm; *Platyrhaphe conula* sp. n.: 4 – holotype, frontal view, shell height 3.3 mm, 5 – same shell, basal view

distinctly convex, rounded, suture impressed. Sculpture: protoconch minutely rugose with wavy, interconnecting, flat ridges and narrow interstices; teleoconch with radial riblets which are densely placed but evenly spaced, very fine, thin, low thread-like (22–36 riblets/0.5 whorl on the periphery of the start of the last whorl); spiral sculpture slightly to distinctly subordinate, fine, moderately to widely spaced, minutely wavy spiral threads in the interstices of the radial sculpture, most distinctly present on the first teleoconch whorl and in the peripheral zone or just below, absent towards the suture and the umbilical region; this regular sculpture continuing towards the aperture with little interruption. Aperture (slightly) detached from the spire in fully adult shells, not or hardly tilted with regard to the coiling axis, circular. Peristome slightly thickened, not widened. Dimensions: height 2.2–3.5 mm; width 2.7–3.8 mm; h/w 0.81–1.03; number of whorls  $3 \frac{5}{8}$ – $4 \frac{1}{2}$ ; umbilicus 0.5–1.0 mm wide, which is 0.16–0.30 of the shell width; height aperture 1.1–1.4 mm; width 1.1–1.5 mm.

**Ecology.** In (disturbed) shrubby, partly deciduous (coastal) vegetation in rock crevices and in low, partly deciduous woodland, on limestone bedrock.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

**Etymology:** diminutive of *conus* (Latin) – cone

#### Genus *Speleocyclotus* gen. nov.

**Type species.** *Speleocyclotus holcobasis*, sp. n.

**Cross diagnosis.** Shares the widely spaced radial riblets on the first whorls and the thin, translucent, largely corneous operculum with *Cyclophorus* Montfort, 1810, differs from this genus by the small size, the last whorl with densely placed, somewhat unevenly spaced radial riblets with thin, low calcareous crests which easily erode, and which are somewhat more persistent around the umbilicus only. The genus resembles *Cyclotus* Guilding in Swainson, 1840, and *Platyrhaphe* Möllendorff, 1890 in size and general shape; it differs from both by the thin, translucent, largely corneous operculum. We could not detect any



trace of a breathing tube close to the suture, as for instance occurs in *Opisthoporus* Benson, 1851.

**Ecology.** Probably living in deep soil and caves. Fresh-looking specimens have been found in cave clay deposits as well as in organic soil deposits at the bottom of karren crevices and in the twilight-zone in caves.

**Distribution.** Mekong Delta Limestones, but probably not endemic. We have unidentified material that could be included in the genus from elsewhere in the region.

**Etymology:** *spelaion* (Greek) – cave, *cyclotus* – referring to the genus *Cyclotus*

### *Speleocyclotus holcobasis* sp. n.

Figs 2 (red dots), 6–7.

IUCN RED LIST Category, as *Cyclophorus* sp. nov. ‘HC – Periomphalic furrow’: Endangered B1ab(ii,iii,v) + 2ab(ii,iii,v).

**Examined material.** Vietnam: Kien Giang Province. Kien Luong District: Nui Chau Hang (holotype: NHMUK 20180550, paratypes: V 14695/3 shells); Nui Nai (V 14696/2).

**Cross diagnosis.** Identified within the genus by the periomphalic furrow.

**Description.** Shell very small, dextral, white. Spire low-conical with the last half-whorl widened. Whorls convex, rounded, periphery of the last whorl slightly narrower rounded, suture impressed. Sculpture: protoconch punctate; first whorls of teleoconch with evenly spaced, thin, low radial riblets, the first ones rather closely placed, then widely spaced, with 11–20 ribs on the first 1/2 whorl of the teleoconch, surface in between riblets smooth, without spiral striation; outer whorl with densely placed, somewhat unevenly spaced radial riblets with thin, rather high calcareous crests which easily erode, but are persistent near the suture and around the umbilicus, with a slightly more prominent radial riblet per 10–15 riblets (at approx. the same interval as the most widely spaced riblets on the first whorls); towards the aperture radial riblets more prominent, with more persistent calcareous crests, with one or a few obsolete peristomes in between; outer whorl without spiral striation apart from a single, wide but rather shallow, periomphalic furrow on the lower surface, which is visible in the umbilicus all the way to the first whorl. Aperture approx. circular. Peristome slightly thickened and widened, deeply incised at the start of the periomphalic furrow. Dimensions: height 1.8–2.5 mm; width 3.8–4.4 mm; h/w 0.50–0.60; diameters of the first three whorls 0.6–0.7 mm, 1.3–1.5 mm, 2.7–3.2 mm respectively; number of whorls 3 1/8–4; umbilicus 1.0–1.3 mm wide, which is 0.26–0.30 of

the shell width; height aperture 1.3–1.5 mm; width 1.5–1.8 mm.

**Ecology.** Deep soil deposits in moderately disturbed to degraded, partly deciduous woodland on limestone bedrock; in cave entrance.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

**Etymology:** *holcos* (Greek) – furrow, *basis* (Greek) – basis

### *Speleocyclotus microcoryphe* sp. n.

Figs 2 (orange dots), 8–10.

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: Phnom Koun Sat (holotype: NHMUK 20180553); Phnom Teuk Srok, south hill (V 15784/1 shell); Kampot area: Phnom Kbal Romeas (V 15787/1). Vietnam: Kien Giang Province, Kien Luong District: Nui Bai Voi, north part (Nui Mo So), northwest and east flanks (V 15041/1).

**Cross diagnosis.** Differs from *S. laangensis* by the rather low-conical spire, with a not or hardly widened last half-whorl. Also, the shells are slightly more loosely coiled (compare the diameters of the first three whorls), and adult shells are larger.

**Description.** Shell very small, dextral, white. Spire rather low-conical with the last half-whorl not or hardly widened. Whorls convex, rounded, suture impressed. Sculpture: protoconch punctate; first whorls of teleoconch with evenly spaced, thin, low radial riblets, the first ones rather closely placed, then widely spaced, with c. 10 ribs on the first 1/2 whorl of the teleoconch, surface in between riblets smooth, without spiral striation; outer whorl with densely placed, somewhat unevenly spaced radial riblets with thin, low calcareous crests which easily erode, and which are somewhat more persistent around the umbilicus only, with a slightly more prominent radial riblet per 4–10 riblets (at approx. the same interval as the most widely spaced riblets on the first whorls, most conspicuous on the lower surface of the shell); towards the aperture radial riblets more prominent, with somewhat more persistent calcareous crests; outer whorl without spiral striation. Aperture circular. Peristome slightly thickened and widened. Dimensions: height 2.0–2.6 mm; width 3.9–4.7 mm; h/w 0.51–0.55; diameters of the first three whorls 0.7–0.8 mm, 1.5–1.7 mm, 3.0–3.4 mm respectively; number of whorls 3 1/8–3 5/8; umbilicus 1.0–1.2 mm wide, which is c. 0.26 of the shell width; height aperture 1.5–1.6 mm; width 1.5–1.9 mm.

**Ecology.** Deep soil deposits in moderately disturbed to degraded, partly deciduous woodland on limestone bedrock, organic soil deposits in caves.



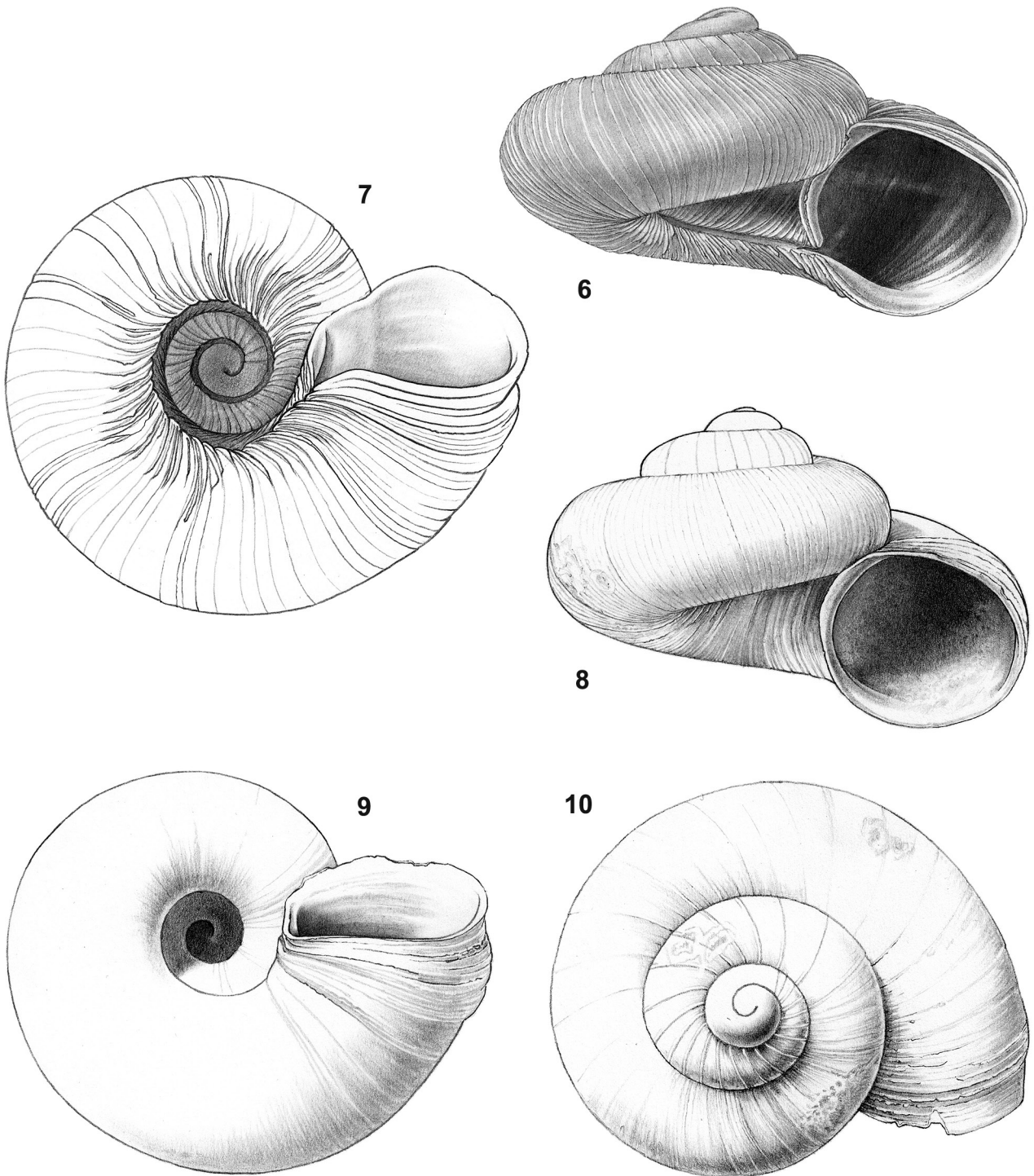
**Distribution.** Cambodia, Kampot Province: Kampot area, Banteay Meas area. Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the MDL.

**Etymology:** *mikros* (Greek) – small, *coryphe* (Greek) – head, top

*Speleocyclotus laangensis* sp. n.

Figs 2 (purple dots), 11–13.

**Examined material.** Cambodia: Kampot Province, Kampot area: Phnom La'Ang, cave with shrine at its entrance, first chamber with collapsed roof



Figs 6–10. *Speleocyclotus holcobasis* sp. n.: 6 – holotype, frontal view, shell height 2.5 mm, 7 – same shell, basal view; *Speleocyclotus microcoryphe* sp. n.: 8 – holotype, frontal view, shell height 2.6 mm, 9 – same shell, basal view, 10 – same shell, apical view

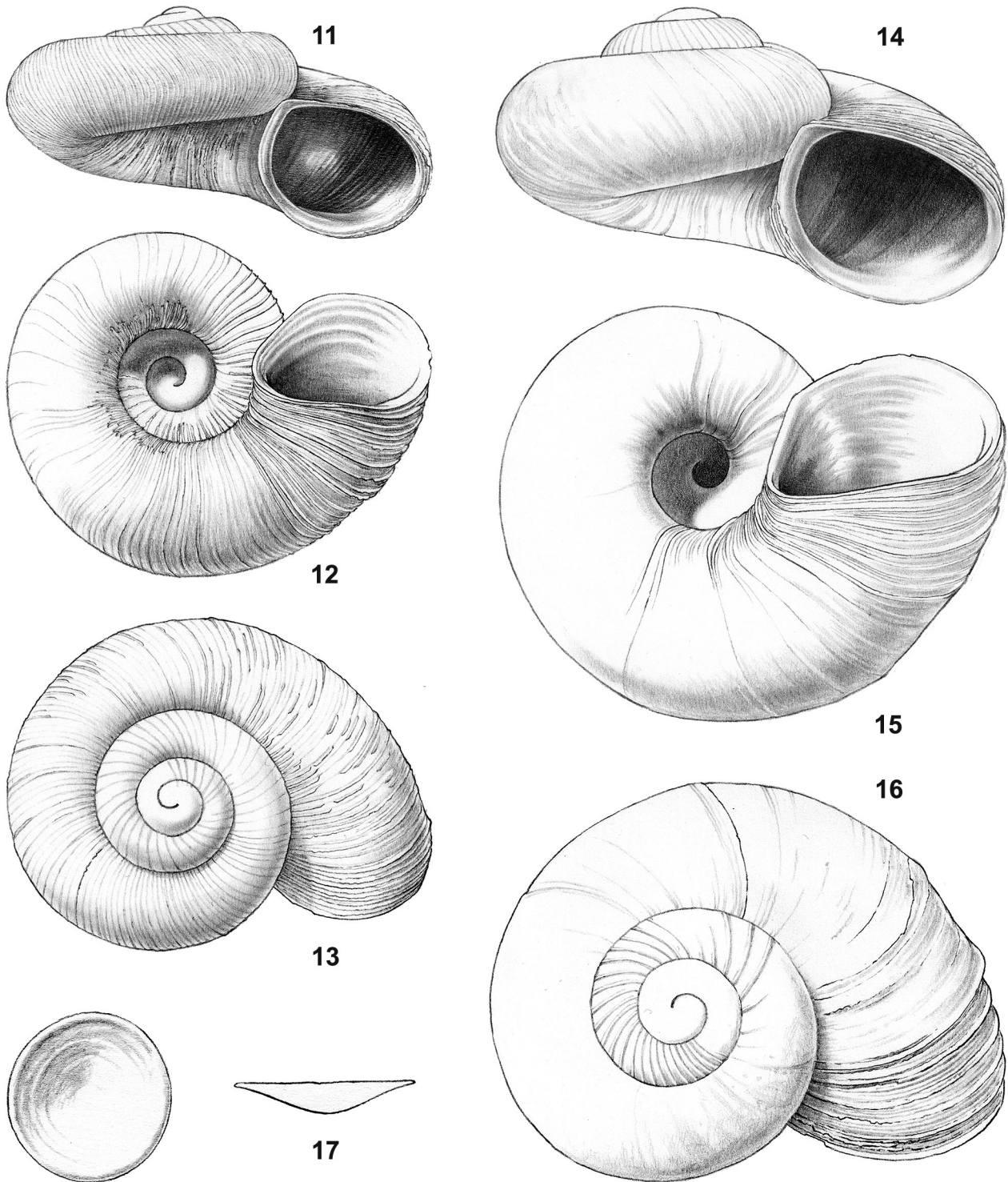




(V 14670/7 shells, 14671/9); ditto, northernmost satellite limestone outcrop along east side of hill (V 14672/1); ditto, southeast-end (holotype: NHMUK 20180551, paratypes: V 16969/>10); ditto, small satellite hill northwest of main hill (V 15786/1).

**Cross diagnosis.** Shares with *S. microcoryphe* the absence of a periomphalic furrow and the rather dense mode of coiling. The differences between the two are given below *S. microcoryphe*.

**Description.** Shell very small, dextral, white. Spire almost flat, with the apical whorls protruding, with



Figs 11–17. *Speleocyclotus laangensis* sp. n.: 11 – holotype, frontal view, shell height 2.0 mm, 12 – same shell, basal view, 13 – same shell, apical view; *Speleocyclotus macrocoryphe* sp. n.: 14 – holotype, frontal view, shell height 2.9 mm, 15 – same shell, basal view, 16 – same shell, apical view, 17 – operculum, outside and lateral view

the last half-whorl widened. Whorls convex, rounded, periphery of the last whorl slightly narrower rounded or not, suture impressed. Sculpture: protoconch punctate; teleoconch: first whorls with evenly spaced, thin, low radial riblets, the first ones rather closely placed, then somewhat more widely spaced, with 14–22 ribs on the first 1/2 whorl of the teleoconch, surface in between riblets smooth, locally with traces of spiral striation; outer whorl with densely placed, somewhat unevenly spaced radial riblets with thin, rather low calcareous crests which rather easily erode, and are most persistent towards the suture and around the umbilicus, with a slightly more prominent radial riblet per 4–10 riblets (at approx. the same interval as the most widely spaced riblets on the first whorls, most conspicuous on the lower surface of the shell); towards the aperture radial riblets more prominent, with more persistent calcareous crests; outer whorl without spiral striation. Aperture approx. circular. Peristome slightly thickened and widened. Dimensions: height 1.7–2.0 mm; width 3.0–3.8 mm; h/w 0.46–0.63; diameters of the first three whorls 0.5–0.6 mm, 1.2–1.3 mm, 2.4–3.1 mm respectively; number of whorls 3 1/8–3 5/8; umbilicus 0.8–1.2 mm wide, which is 0.26–0.34 of the shell width; height aperture 1.0–1.3 mm; width 1.2–1.6 mm.

**Ecology.** In deep soil deposits in (moderately disturbed) partly deciduous woodland on limestone bedrock; in the twilight zone of caves.

**Distribution.** Cambodia, Kampot Province, Phnom La'Ang, including two satellite hills. Presumably a site endemic species.

**Etymology:** the name refers to the type locality.

### *Speleocyclus macrocoryphe* sp. n.

Figs 2 (yellow dot), 14–17.

IUCN RED LIST Category: as *Cyclophorus* sp. nov. 'cave': Endangered B1ab(ii,iii,iv,v) + 2ab(ii,iii,iv,v).

**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Nui Chua Hang (= Pagoda Hill), Hang Gieng Tien, cave in south facing cliff bordering the sea (holotype: NHMUK 20180552, paratypes: V 14684/10 shells); ditto, southeast end of hill, steep sea-facing slope (V 14685/1).

**Cross diagnosis.** Identified within the genus by the mode of coiling, with the first three whorls significantly wider than in the other species, and the much less conspicuous sculpture.

**Description.** Shell (very) small, dextral, white. Spire low-conical with the last half-whorl widened. Whorls convex, rounded, suture impressed. Sculpture: protoconch punctate; first whorls of teleoconch with evenly spaced, thin, low radial riblets, the first ones

rather closely placed, then widely spaced, with 20–22 ribs on the first 1/2 whorl of the teleoconch, surface in between riblets smooth, without spiral striation; outer whorl with somewhat unevenly spaced growth-lines, often with slightly more prominent growth-lines at approx. the same interval as the most widely spaced riblets on the first whorls; towards the aperture the growth-lines are more prominent, some developing in radial riblets without calcareous crests, sometimes with an obsolete peristome in between; outer whorl without spiral striation. Aperture somewhat elliptic. Peristome slightly thickened and widened. Dimensions: height 2.4–2.7 mm; width 4.6–5.2 mm; h/w 0.52–0.58; diameters of the first three whorls 1.0–1.1 mm, 2.0–2.3 mm, 4.7–5.0 mm respectively; number of whorls 2 3/4–3 1/4; umbilicus 1.0–1.3 mm wide, which is 0.22–0.28 of the shell width; height aperture 1.8–2.0 mm; width 2.0–2.3 mm. Operculum (one detached operculum found in cave soil sample with shells of this species only): thin, calcareous, translucent, concave, indistinctly multispiral, outer surface without sculpture.

**Ecology.** In cave entrance in moderately disturbed low, locally shrubby partly deciduous woodland on limestone bedrock; in mineral soil in the dark zone of a cave.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District, Nui Chua Hang. Presumably a site endemic species.

**Etymology:** *makros* (Greek) – large, *coryphe* (Greek) – head, top

### Family Diplommatinidae L. Pfeiffer, 1857

**Note.** We list all MDL Diplommatinidae and the material examined; for the distribution map see: Fig. 18, the species of *Notharinia* excepted (for *Notharinia*, see VERMEULEN et al. in press).

### *Diplommatina decapitata* sp. n.

Figs 18 (purple dots), 19–20.

**Examined material.** Cambodia: Kampot Province, Kampot area: Phnom Chhngauk (holotype: NHMUK 20180561, paratypes: V 15774/>10 shells). Recently also found at Phnom La'Ang.

**Cross diagnosis.** Relatively few *Diplommatina* species are decollate. Among these, *D. concinna* (H. Adams, 1872) (Malaysia, Sarawak) is most similar, but differs by the more distinctly prosocline, somewhat sinuous radial ribs, and the tuba of 3/4–7/8 whorl long. Decollation occurs more frequently among *Diplommatina* from the Lesser Sunda Islands and Maluku. GREÏE (2017) lists: *D. decollata* Van Benthem Jutting, 1958, *D. floris* B. Rensch, 1931, *D. fluminis* B. Rensch, 1931, *D. timorensis* GreÏe, 2017, *D. torquil-*

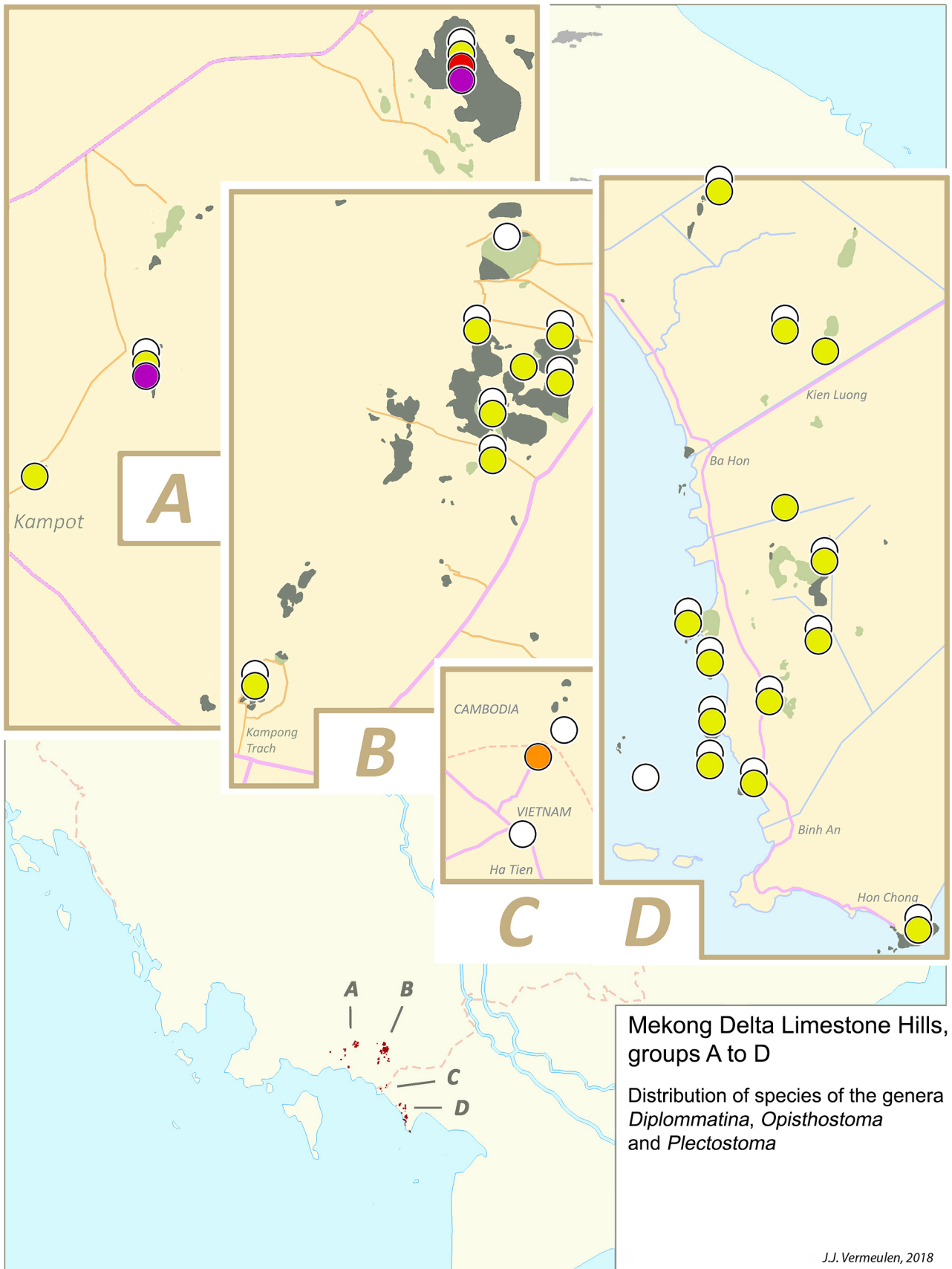
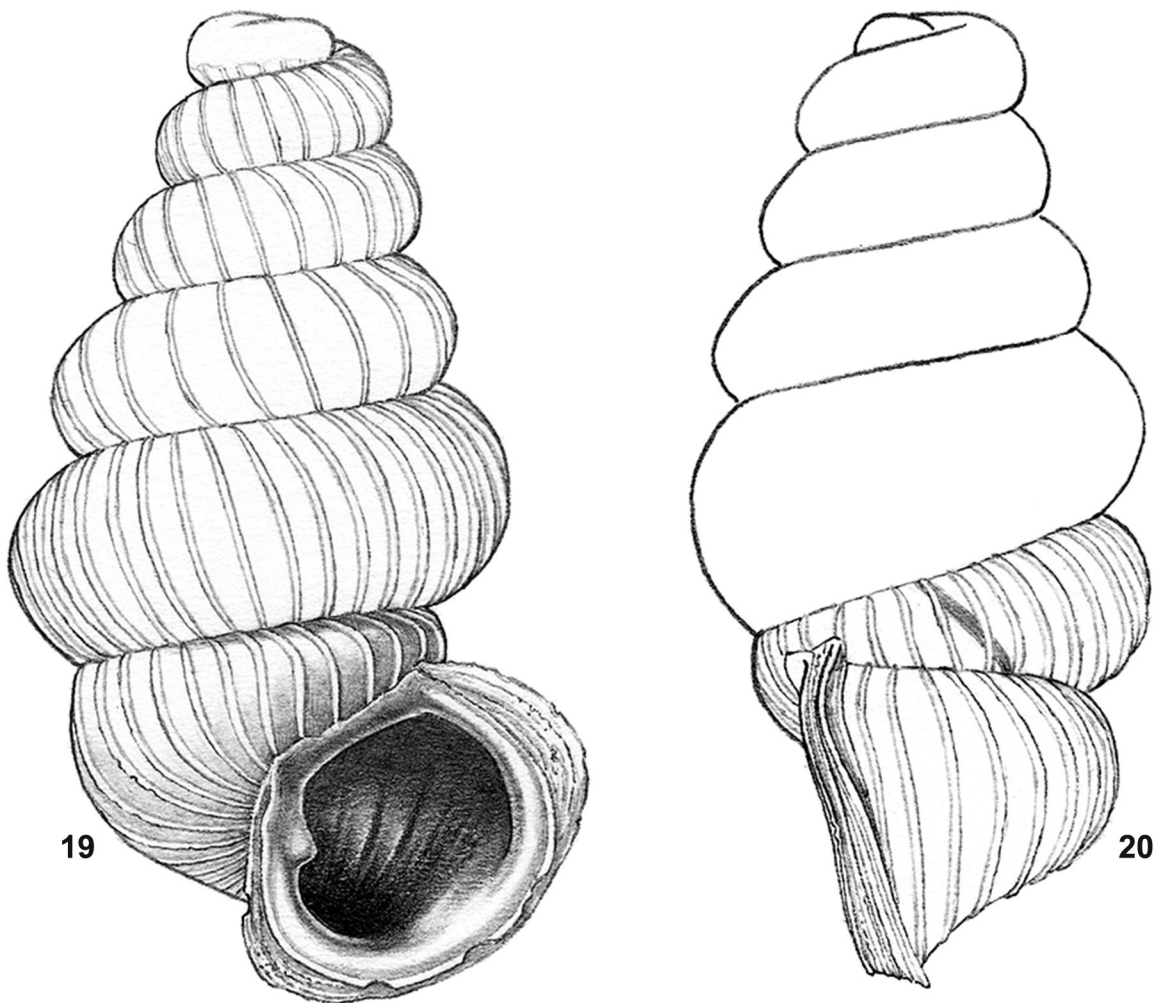


Fig. 18. Distribution of all MDL Diplommatinidae except species of the genus *Notharinia* Vermeulen, Phung et Truong. Dots of different colours represent different species: purple – *Diplommatina decapitate*; white – *Opisthostoma supinum*; orange – *Plectostoma dadungense*; red – *P. haplohelix*; yellow – *P. tonkinianum*





Figs 19–20. *Diplommatina decapitata* sp. n.: 19 – holotype, frontal view, shell height 2.3 mm, 20 – same shell, right lateral view

la Van Benthem Jutting, 1958 (all Indonesia; Sumba, Flores, Sumba, west Timor, and Sumba respectively), which have distinctly more slender shells, *D. leucopsis* Van Benthem Jutting, 1958 (Indonesia, Sumba), which has orthocline radial ribs and an outer peristome only little projecting beyond the inner, *D. moluccensis* Greke, 2017 (Indonesia, Maluku, Tidore), has more densely placed radial ribs.

**Description.** Shell very small, dextral, decollate, fusiform with the penultimate whorl widest. Spire conical with approx. flat sides. Whorls convex. Suture impressed. Constriction level with the angular edge of the peristome or slightly beyond this point, up the spire, with 2 lamellae: 1 low and thin parietalis which continues approx. 1/2 whorl into the tuba, 1 distinct, high columellaris which continues to the aperture. Sculpture: radial ribs slightly prosocline, straight but somewhat curved above the aperture, on the tuba, rather low and thin, rather densely placed on the penultimate whorl (5–7 ribs/0.5 mm), more widely spaced on the previous whorl (3–4 ribs/0.5 mm); spiral striation present, inconspicuous or lo-

cally absent in some shells. Aperture hardly tilted with regard to the coiling axis; columellaris distinct, downwards directed. Peristome double, expanding; palatal side slightly sinuous, rounded; basal side broadly rounded; basal edge not sinuous, narrowly rounded; outer peristome expanding beyond the inner, widely so on the palatal side and in the basal edge; inner peristome slightly protruding from the outer, with a palatal lip, not expanding over the shell on the columellar side, little expanding on the parietal side. Umbilicus closed. Dimensions: height 2.0–2.3 mm (decollated shell); width 1.0–1.15 mm; h/w 1.8–2.2; number of whorls 5 1/2–6 1/2, including a tuba of 1–1 1/8 whorl; height aperture 0.4–0.5 mm; width 0.4–0.45 mm.

**Ecology.** In moderately disturbed to degraded partly deciduous woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Kampot area. Presumably endemic to the Cambodian part of the MDL.

**Etymology:** *decapitatus* (Latin) – beheaded, referring to the decollate apex



***Opisthostoma supinum* Van Benthem Jutting, 1962**

Fig. 18 (white dots).

VAN BENTHEM JUTTING 1962: 13.

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: nameless small limestone hill in CMIC-concession (V 15793/>10 shells); Phnom Koun Sat (V 15791/>10); Phnom Kunea Luong, east hill (V 15792/>10); Phnom Teuk Srok, north hill (V 15789/>10); ditto, south hill (V 15790/>10); Phnom Totung (V 15788/1); Kampong Trach area: Phnom Kampong Trach (V 15794/2); Kampot area: Phnom Chhngauk (V 15795/1); Phnom La'Ang, cave with shrine at its entrance, first chamber with collapsed roof (V 16936/1); ditto, limestone-enclosed valley at southwest-end. (V 16935/6); ditto, northernmost satellite limestone outcrop along E side of hill (V 16937/>10); ditto, southeast-end. (V 16934/5); Phnom Teuk Thom (V 15796/>10). Vietnam: Kien Giang Province, Ha Tien Town area: Nui Thach Dong, near Ha Tien (V 11479/>10); Kien Luong District: Nui Nai (V 14845/2); Nui Ong (V 14794/6); Hang Cay Ot (V 14827/3); Hon Da Lua, east group, the middle (largest) island, west side (V 14714/>10); Hon Lo Coc (V 14735/>10); Nui Ba Tai (V 9963/>10); Nui Bai Voi, east flank, large doline approx. half-way along length of hill (V 11244/>10); ditto, north part (Nui Mo So), Hospital Cave area (V 11269/>10); ditto, north part (Nui Mo So), northwest and east flanks (V 9941/>10); ditto, southwest flank, rocky, locally steep limestone slope (V 14998/8); Nui Hang Tien (V 11324/>10); Nui Khoe La, north remnant, seaward side (V 14863/>10); ditto, north remnant, small, most seaward limestone outcrop off the main hill (V 14898/>10); ditto, south remnant, landward side (V 14921/>10); Nui Son Tra, limestone outcrop along north flank of sandstone hill (V 7954/>10); Nui Chua Hang (= Pagoda Hill), north flank of hill, and west end, slopes bordering temple complex (V 9998/>10); southeast end of hill, steep sea-facing slope (V 14963/>10).

**Ecology.** Soil deposits in disturbed and secondary semi-deciduous (coastal) woodland and other degraded vegetation on limestone bedrock.

**Distribution.** Cambodia, Kampot Province. Vietnam, Kien Giang Province: Ha Tien Town area, Kien Luong District. Presumably endemic to the MDL.

***Plectostoma dadungense* sp. n.**

Figs 18 (orange dot), 21–23.

**Examined material.** Vietnam: Kien Giang Province, Ha Tien Town area: Nui Da Dung (holotype: NHMUK 20180562, paratypes: V11432/8 shells).

**Cross diagnosis.** Identified among Continental Asiatic *Plectostoma* with the aperture to the left of the spire by the sinuous peristome, with the upper right side conspicuously protruding and the upper left side receding. In strictly frontal view this is not so obvious; in left lateral view the structure is more easily visible. *Plectostoma tonkinianum* (Dautzenberg et Fischer, 1905), from the MDL, and illustrated in LIEW et al. (2014: 62), also differs by having a more distinctly ovoid spire, with the last whorl much more narrowly coiled than the penultimate.

**Description.** Shell very small, dextral with a sinistral tuba. Spire conical with convex sides, almost ovoid. Apex slightly oblique. Whorls convex, rounded, suture impressed. Constriction with 4 teeth: 1 parietalis a little into the tuba; 1 longitudinal palatalis close to the suture, 1 transverse palatalis; 1 small, knob-shaped columellaris. Tuba coiled around an axis different from the axis of the spire, gradually narrowed towards the constriction, approx. rounded below. Sculpture: radial ribs on the spire prosocline, slightly sinuous or with a shallow loop to the right, but those towards the tuba not sinuous; rather closely placed (8–9 ribs/0.5 mm on the last whorl of the spire; 7–9 ribs/0.5 mm on the penultimate whorl); those on the tuba not sinuous; a fine spiral striation present. Aperture not or hardly tilted with regard to the coiling axis, positioned to the left of the spire, level with approx. the start of its penultimate whorl, approx. obtusely rectangular, with the upper right side conspicuously protruding, and the upper left side receding. Peristome touching the spire, simple, on the outside without congested lamellae, or with a few very thin ones; slightly spreading, thickened, with or without a slight lip along the palatal side. Dimensions: height of spire without tuba 2.8–3.3 mm; width 1.8–2.0 mm; h/w 1.5–1.9; width including tuba 3.0–3.2 mm; umbilicus 0.2–0.3 mm wide; number of whorls 5 7/8–6 3/8, excluding the tuba of c. 1/2 whorl; height aperture (measured on the inside) 0.8–0.9 mm; width 0.9–1.0 mm.

**Ecology.** Rock faces in degraded, species-poor semi-deciduous regrowth woodland on limestone bedrock.

**Distribution.** Vietnam, Kien Giang Province, Ha Tien Town area, Nui Da Dung. Presumably a site endemic species.

**Etymology:** named after the type locality

***Plectostoma haplohelix* sp. n.**

Figs 18 (red dot), 24–26.

**Examined material.** Cambodia: Kampot Province, Kampot area: Phnom La'Ang, cave with shrine at its entrance, first chamber with collapsed roof (V 16931/>10 shells; holotype: NHMUK 20180563,

paratypes: V 16932/>10); ditto, limestone-enclosed valley at southwest-end (V 16930/4); ditto, northernmost satellite limestone outcrop along east side of hill (V 16933/>10); ditto, southeast-end. (V 16929/>10).

**Cross diagnosis.** Most similar are *P. umbilicatum* (Van Benthem Jutting, 1952) and *P. sinyumense* (Maassen, 2001) (both Peninsular Malaysia), which differ by their orthocone, straight radial ribs and by the absence of teeth in the constriction (VAN

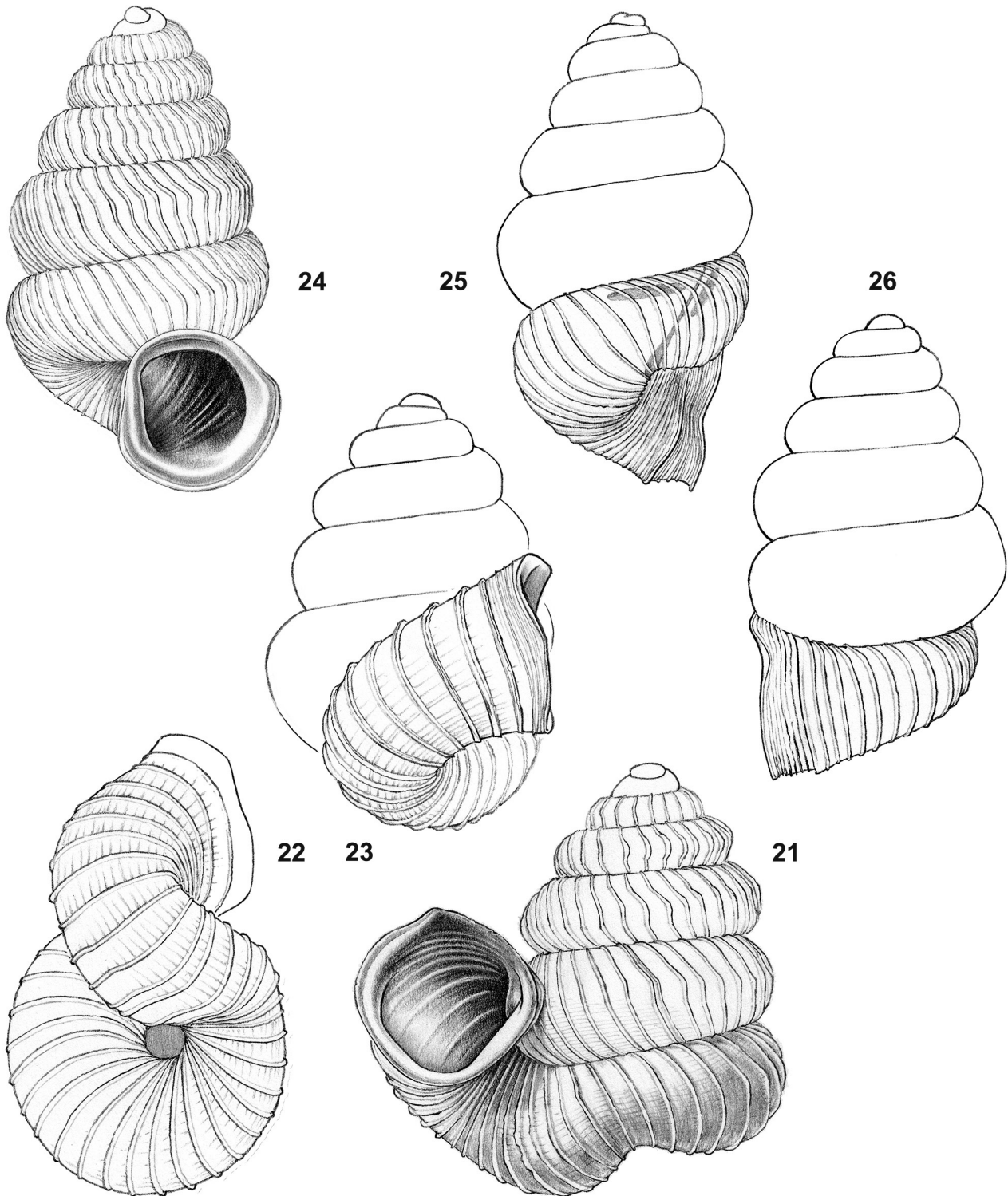


Fig. 21–26. *Plectostoma dadungense* sp. n.: 21 – holotype, frontal view, shell height 3.1 mm, 22 – same shell, basal view, 23 – same shell, left lateral view; *Plectostoma haplohelix* sp. n.: 24 – holotype, frontal view, shell height 4.5 mm, 25 – same shell, left lateral view, 26 – same shell, right lateral view

BENTHEM JUTTING 1952, MAASSEN 2001). *Plectostoma dindingense* Liew, Vermeulen, Marzuki et Schilthuisen, 2014 (Peninsular Malaysia) has more convex whorls, straight radial ribs and no teeth in the constriction (LIEW et al. 2014).

**Description.** Shell small, dextral. Spire conical with convex sides, almost ovoid. Apex slightly oblique. Whorls convex, rounded, suture impressed. Constriction with 4 teeth: 1 parietalis which starts as a high lamella, then continues into the tuba while gradually decreasing in height; 2 transverse palatales, one following the basal and lower palatal side of the constriction, a second high up on the palatal wall, close to the suture; 1 distinct longitudinal or somewhat oblique palatalis at the start of the tuba, close to the suture. Tuba coiled around the same axis as the spire, but somewhat tighter than the last whorl of the spire, particularly at the start of the tuba, gradually narrowed towards the constriction, rounded below. Sculpture: radial ribs on the spire prosocline, slightly sinuous or with a shallow loop to the right, but those close to the tuba not sinuous; closely placed to moderately spaced (4–11 ribs/0.5 mm on the last whorl of the spire; 7–14 ribs/0.5 mm on the penultimate whorl); those on the tuba not sinuous; spiral striation absent or inconspicuous, a fine, slightly oblique striation. Aperture hardly tilted with regard to the coiling axis, positioned below the spire, approx. circular or obtusely rectangular, usually with a slight edge on the palatal side. Peristome touching the spire, double; outer peristome hardly spreading, consisting of a single slightly more prominent radial rib only; inner peristome widely protruding from the outer, with low lamellae on its outer surface, spreading, thickened, with or without a slight lip along the palatal side. Umbilicus open in slightly oblique view, a narrow slit. Dimensions: height 3.9–4.8 mm; width 1.9–2.5 mm; h/w 1.7–2.1; number of whorls 6 3/8–7 3/8, including the tuba of c. 1/2 whorl; height and width aperture (measured on the inside) 0.85–1.0 mm.

**Ecology.** Rock faces in (moderately disturbed) partly deciduous woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Phnom La'Ang, including a small satellite hill to the south-east. Presumably a site endemic species.

**Etymology:** *haplos* (Greek) – simple, *helix* (Greek) – spire

### *Plectostoma tonkinianum* (Dautzenberg et Fischer, 1905)

Fig. 18 (yellow dots).

*Opisthostoma tonkinianum* DAUTZENBERG & FISCHER 1905: 444.

*Plectostoma tonkinianum* LIEW et al. 2014: 61.

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: nameless small limestone hill (V 15779/3 shells); ditto in CMIC-concession (V 15780/5); Phnom Koun Sat (V 15777/>10); Phnom Kunea Luong, east hill (V 15778/4); Phnom Teuk Srok, north hill (V 15775/>10); ditto, south hill (V 15776/>10); Kampong Trach area: Phnom Kampong Trach (V 15781/>10); Kampot area: Phnom Chhngauk (V 15782/>10); Phnom Kbal Romeas (V 15783/5). Recently also found at Phnom La'Ang. Vietnam: Kien Giang Province, Kien Luong District: Nui Chau Hang (V 14946/3); Nui Nai (V 14831/>10); Nui Ong (V 14795/6); Hang Cay Ot (V 14807/>10); Hon Lo Coc (V 14737/>10); Nui Ba Tai (V 11502/>10, V 9957/>10); ditto, east flank (V 7937/5); Nui Bai Voi, east flank, large doline approx. half-way along length of hill (V 11243/>10); ditto, north part (Nui Mo So), Hospital Cave area (V 11270/>10); ditto, southwest flank, rocky, locally steep limestone slope (V 14993/>10); Nui Hang Tien (V 10010/>10); Nui Khoe La, north remnant, small, most seaward limestone outcrop off the main hill (V 14889/>10); ditto, south remnant, landward side (V 14922/>10); Nui Nho (V 14763/6); Nui Son Tra, limestone outcrop along north flank of sandstone hill (V 15018/1); Nui Chua Hang (= Pagoda Hill), north flank of hill, and west end, slopes bordering temple complex (V 10000/>10); ditto, southeast end of hill, steep sea-facing slope (V 14962/>10).

**Ecology.** Exposed or sheltered rock faces in disturbed and secondary semi-deciduous (coastal) woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province. Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the MDL (the name is misleading, see LIEW et al. 2014: 61).

### Family Ariophantidae Godwin-Austen, 1888

#### *Macrochlamys psyche* sp. n.

Figs 27 (red dots), 28–30.

IUCN RED LIST Category, as *Macrochlamys* sp. nov.  
'White, umbilicate': Endangered B1ab(i,ii,iii,iv,v)  
+ 2ab(i,ii,iii,iv,v).

**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Nui Bai Voi, cave in south flank of southern end of hill (V 14686/1 shell); ditto, east flank, large doline approx. half-way along length of hill (V 11249/2); ditto, north part (Nui Mo So), Hospital Cave area (V 11279/1); ditto, north part (Nui Mo So), Hospital Cave, left gallery (holotype: NHMUK 20180564); ditto, west flank just below widest part of the hill (V 14688/9); Nui Khoe La, north remnant, seaward side (V 14690/3).



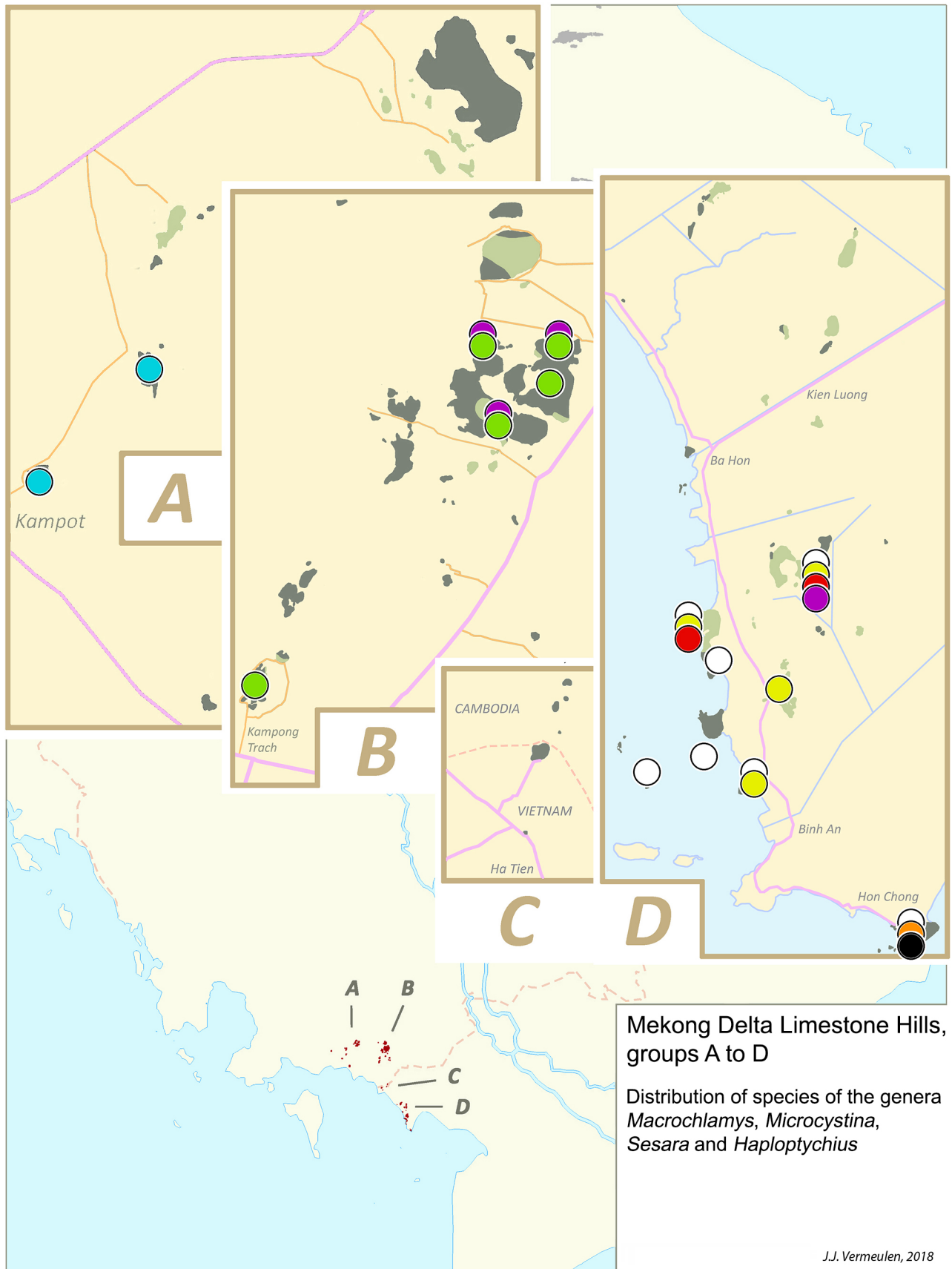


Fig. 27. Distribution of the genera *Macrochlamys*, *Microcystina*, *Sesara* and *Haploptychius* in the MDL. Dots of different colours represent different species: red – *Macrochlamys psyche*; white – *Microcystina bataiensis*; orange – *M. exul*; green – *M. obliquestriatai*; yellow green – *M. sericata*; purple – *Sesara polita*; blue – *S. sesarella*; black – *Haploptychius perlissus*

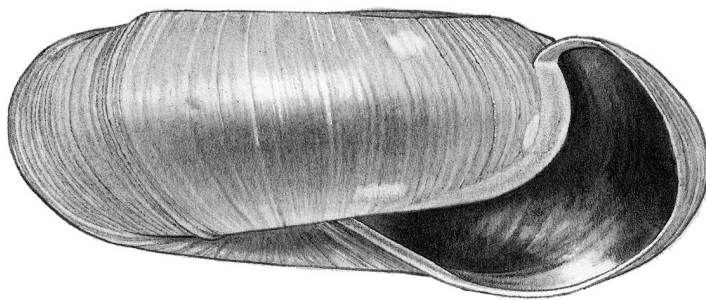




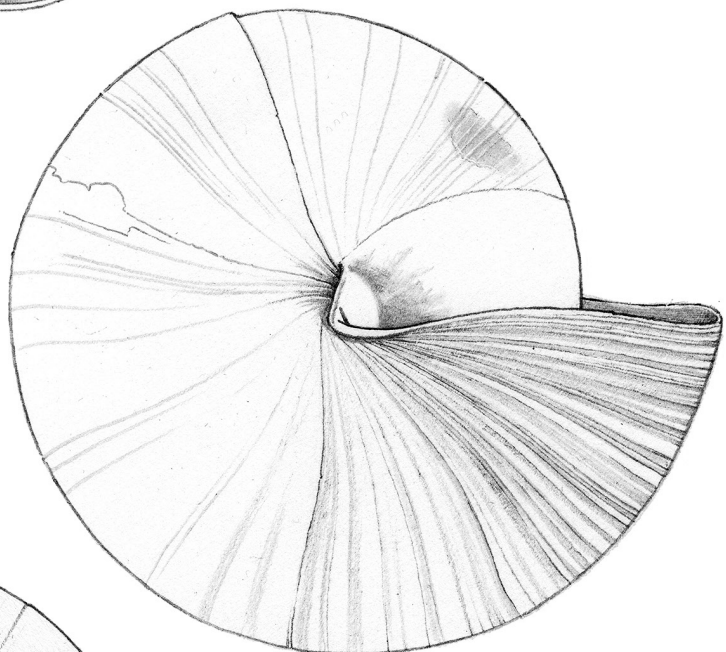
**Cross diagnosis.** Distinct from a sympatric species provisionally identified as *Sarika resplendens* (Philippi, 1846) by the white (not brown) shell, the discoid (not lenticular) outline, and the more distinctly convex whorls (PHILIPPI 1846). Among *Macrochlamys* from Cambodia and surrounding countries, *M. psyche* is characterised by the combination of its white

shell, dense mode of coiling and its slightly impressed spire.

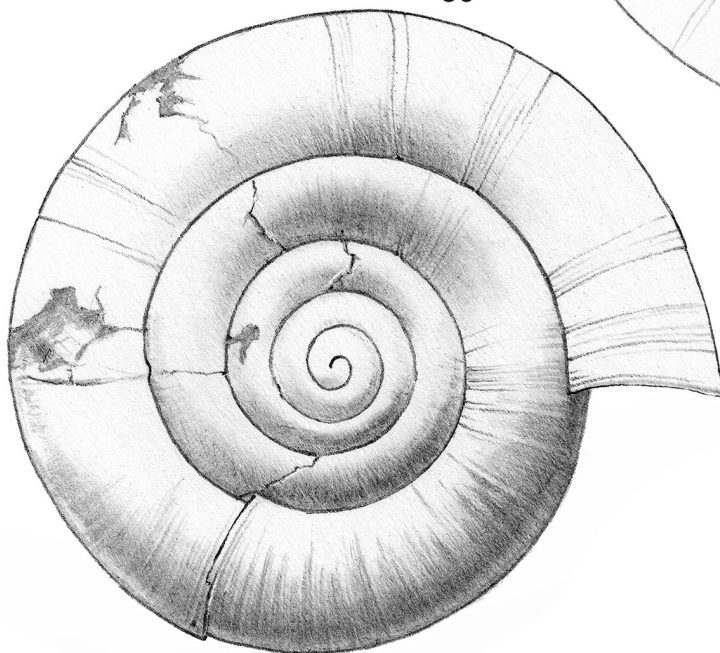
**Description.** Shell medium-sized, rather thin, hardly translucent, white, a few growth-lines near the aperture sometimes marked with olive green. Outline discoid; spire slightly sunk, with the apex slightly protruding. Surface glossy. Protoconch whorls slight-



28



29



30

Figs 28–30. *Macrochlamys psyche* sp. n.: 28 – holotype, frontal view, shell height 7.2 mm, 29 – same shell, basal view, 30 – same shell, apical view



ly convex, next whorls distinctly convex, last whorl well-rounded at the periphery, towards the suture more narrowly rounded, below the periphery more broadly rounded, suture impressed, umbilical area shallowly impressed. Sculpture: protoconch smooth at 40× magnification, transition to teleoconch hardly marked; teleoconch above and below the periphery with inconspicuous growth-lines at irregular intervals, the ones near the aperture somewhat more distinct; spiral sculpture subordinate to the radial sculpture, above and below the periphery locally traces of inconspicuous, fine (just visible at 40 times magnification), densely placed, wavy, shallow grooves. Aperture obliquely crescent-shaped, well-rounded at the periphery, above more narrowly rounded, below more broadly rounded. Peristome not expanding, not thickened. Umbilicus closed. Dimensions: height 6.0–7.5 mm; width 14.5–19.0 mm; h/w 0.38–0.43; diameters of the first four whorls 2.0–2.5 mm, 3.8–4.8 mm, 6.0–7.0 mm, 10.0–11.0 mm respectively; number of whorls 4 3/8–5; height aperture 5.2–7.2 mm; width aperture 7.0–10.0 mm. Animal white.

**Ecology.** In caves as well as in soil deposits in deep karren clefts.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably an endemic to the Vietnam part of the MDL.

**Note.** We provisionally include this in *Macrochlamys*, using the genus as a receptacle of medium-sized, approx. lenticular species of unknown affinities.

**Etymology:** *psyche* (Greek) – ghost, a noun in apposition, referring to the pallid appearance of the species in combination with the eternal darkness of its habitat.

### *Microcystina bataiensis* sp. n.

Figs 27 (white dots), 31–33.

IUCN RED LIST Category, as *Microcystina* sp. nov. ‘Ba Tai’: Vulnerable D2.

**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Hon Da Lua, east group, the middle (largest) island, west side (V 14707/>10 shells); Hon Lo Coc (V 14708/6); Nui Ba Tai (V 11503/10, V 9983/1, holotype: NHMUK 20180565 and paratypes: V 9955/>10); ditto, cave on west flank (V 14705/1); Nui Bai Voi, east flank, large doline approx. half-way along length of hill (V 11250/8); ditto, north part (Nui Mo So), Hospital Cave area (V 11281/6); ditto, north part (Nui Mo So), northwest and east flanks (V 9943/10); ditto, southwest flank, rocky, locally steep limestone slope (V 15000/2); ditto, west flank just below widest part of the hill (V 14706/>10); Nui Khoe La, north remnant, seaward side (V 15042/7); ditto, north remnant, small, most seaward limestone outcrop off the main hill (V 15092/>10); ditto, south remnant, landward side (V 15093/>10); Nui Chua

Hang (= Pagoda Hill), north flank of hill, and west end, slopes bordering temple complex (V 17304/>10).

**Cross diagnosis.** Uniquely identified within the genus by the rather wide, shallow sutural furrow in the outer whorls; all radial sculpture starts only on the edge of this furrow. In addition, it is characterised by its open umbilicus among sympatric species with a comparatively distinct radial sculpture (i.e. *M. exul* and *M. obliquestriata*, below). The sculpture, including the sutural furrow, reminds of *Sarika* Godwin Austen, 1907 (GODWIN AUSTEN 1897–1914) which has, however, larger and brown-coloured shells.

**Description.** Shell very small, thin, slightly translucent, white. Outline lenticular to almost discoid; spire little elevated, narrowly rounded. Surface shiny. Protoconch whorls almost flat, next whorls somewhat convex, last whorl well-rounded at the periphery, sometimes somewhat narrowly rounded, sometimes slightly shouldered above the periphery, below the periphery broadly rounded, umbilical area rather shallowly impressed. Sculpture: protoconch approx. smooth at 40× magnification, transition to teleoconch hardly marked; teleoconch above the periphery with growth-lines, locally developed into inconspicuous, very fine, densely placed radial riblets; in addition to these with distinct, coarse, widely spaced, wide but shallow, distinctly curved radial grooves which curve away from the direction of shell growth towards the suture, which start at whorl 2 1/4–3, and are often reduced to notches in the edge of the sutural furrow on the last 1/4–3/8 whorl; below the periphery mainly growth-lines; spiral sculpture only locally present, subordinate to the finest radial sculpture, inconspicuous, very fine, densely placed, very shallow grooves above as well as below the periphery. Aperture obliquely crescent-shaped, rounded to somewhat obtusely angular at the periphery, broadly rounded on the basal side. Peristome not expanding, in fully adult specimens slightly thickened on the palatal and basal side. Umbilicus open, narrow, bordered by a distinctly angular last whorl. Dimensions: height 1.2–2.0 mm; width 2.6–4.1 mm; h/w 0.41–0.57; diameters of the first four whorls 0.45–0.70 mm, 0.90–1.20 mm, 1.4–2.1 mm, 2.4–3.1 mm respectively; number of whorls 3 7/8–4 7/8; umbilicus 0.08–0.15 mm diameter, which is 0.02–0.05 of the shell diameter; height aperture 0.8–1.3 mm; width aperture 1.3–2.0 mm.

**Ecology.** In disturbed and secondary semi-deciduous (coastal) woodland on limestone bedrock, soil deposits in the twilight zone of caves.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

**Notes.** The illustrated specimen is slightly gerontic, which accounts for the unusual thickening of the basal peristome.

**Etymology:** the name refers to the type locality.



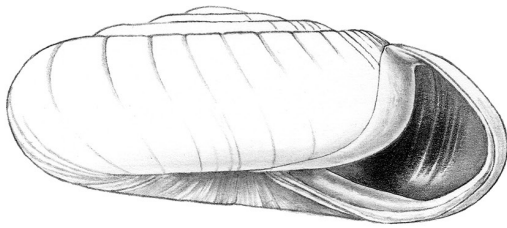
*Microcystina exul* sp. n.

Figs 27 (orange dot), 34–36.

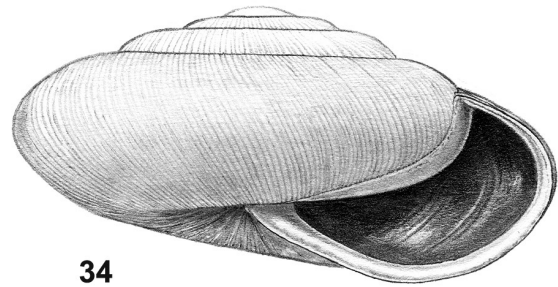
**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Nui Chua Hang (= Pagoda Hill), Hang Gieng Tien, cave in south facing cliff bordering the sea (V 14976/2 shells); ditto, Hang Kim Cuong

(Grotte des Diamants) (V 15490/2); ditto, north flank of hill, and west end, slopes bordering temple complex (V 11312/2); ditto, southeast end of hill, steep sea-facing slope (holotype: NHMUK 20180566, paratypes: V 15094/4).

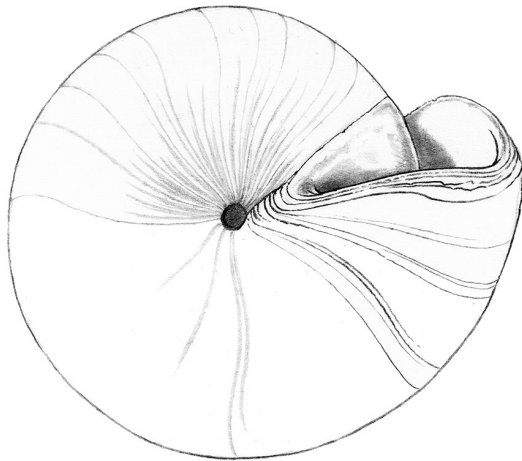
**Crossdiagnosis.** Together with *M. obliquestriata*, below, it is characterised among white-shelled *Microcystina* with a radial sculpture including rather wide, shallow



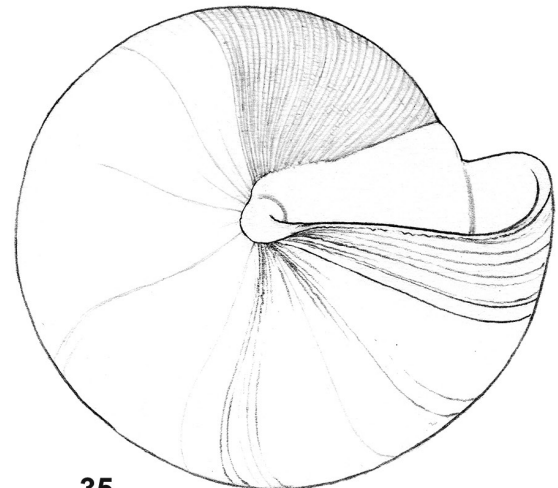
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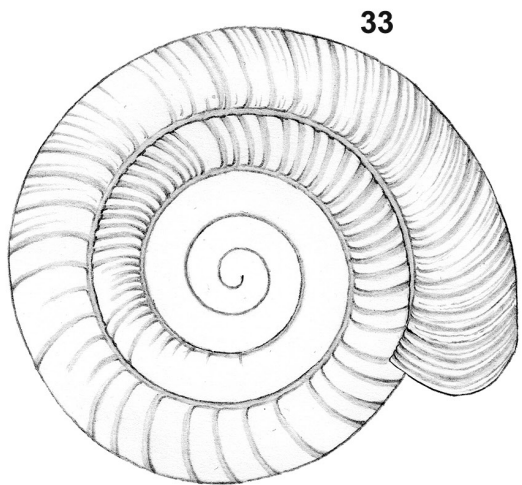
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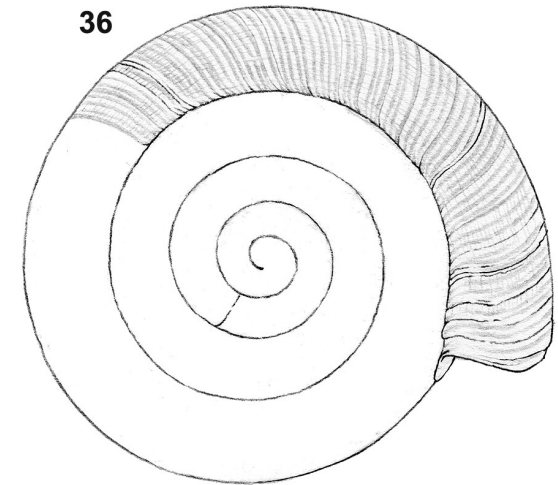
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Figs 31–36. *Microcystina bataiensis* sp. n.: 31 – holotype, frontal view, shell height 1.5 mm, 32 – same shell, basal view, 33 – same shell, apical view; *Microcystina exul* sp. n.: 34 – holotype, frontal view, shell height 2.3 mm, 35 – same shell, basal view, 36 – same shell, apical view

radial furrows, like *M. nana* (Von Moellendorff, 1897), *M. vitreiformis* (Von Moellendorff, 1897) (both from Java and surrounding islands, MÖLLENDORFF 1897, also see: VERMEULEN & WHITTEN 1998: 120 for illustrations), by its closed umbilicus. *M. microrhynchus* Vermeulen, Liew et Schilthuizen, 2015 (from Borneo) with similar sculpture and a closed umbilicus, differs by the triangular spur protruding from the columellar peristome and covering the umbilicus. In addition, the shell of *M. exul* is more loosely coiled than any of the species mentioned above, compare the diameters of the third whorl.

**Description.** Shell very small, rather thin, hardly translucent, white. Outline lenticular; spire little elevated, narrowly rounded. Surface with a silky lustre. Protoconch whorls somewhat convex, next whorls somewhat convex, last whorl somewhat narrowly rounded at the periphery, above and below the periphery broadly rounded, suture not or hardly impressed, umbilical area shallowly impressed. Sculpture: protoconch approx. smooth at 40× magnification; transition to teleoconch hardly marked; teleoconch above and below the periphery with growth-lines at irregular intervals developing into distinct, coarse, rather wide but shallow, distinctly curved radial grooves which slightly curve in the direction of shell growth towards the suture, and which are less conspicuous on the first 1 3/4–2 1/4 whorls; spiral sculpture subordinate to the radial sculpture, rather inconspicuous, fine, densely placed, shallow grooves above and below the periphery. Aperture obliquely crescent-shaped, somewhat obtusely angular at the periphery, broadly rounded above and below. Peristome not expanding, in fully adult specimens slightly thickened on the palatal and basal side. Umbilicus closed. Dimensions: height 1.2–2.0 mm; width 2.6–4.1 mm; h/w 0.41–0.57; diameters of the first four whorls 0.7–0.9 mm, 1.4–1.6 mm, 2.5–2.8 mm, 3.8–4.0 mm respectively; number of whorls 3 7/8–4 1/2; height aperture 1.3–1.5 mm; width aperture 2.0–2.5 mm.

**Ecology.** Soil deposits in disturbed semi-deciduous and secondary (coastal) woodland on limestone bedrock, soil deposits in the twilight zone of caves.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District, Nui Chua Hang. Presumably a site endemic species.

**Etymology:** *exul* (Latin), a noun in apposition, a banned person, referring to its occurrence at the far end of the MDL.

### *Microcystina obliquestriata* sp. n.

Figs 27 (green dots), 37–39.

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: Phnom Koun Sat (holotype:

NHMUK 20180567, paratypes: V 15938/10 shells); Phnom Kunea Luong, east hill (V 15939/2); Phnom Teuk Srok, north hill (V 15936/8); ditto, south hill (V 15937/1); Kampong Trach area: Phnom Kampong Trach (V 15940/fragments only).

**Cross diagnosis.** Shares the radial sculpture and closed umbilicus with *M. exul*, above; differs by having a more densely coiled shell. In addition, the radial sculpture curves away from the direction of shell growth when approaching the suture (curving towards the direction of the shell growth in *M. exul*).

**Description.** Shell very small, rather thin, hardly translucent, white. Outline lenticular; spire usually somewhat elevated, rounded. Surface with a silky lustre. Protoconch whorls somewhat convex, next whorls somewhat convex, last whorl somewhat narrowly rounded at the periphery, above and below the periphery broadly rounded, suture not or hardly impressed, umbilical area shallowly impressed. Sculpture: protoconch approx. smooth at 40× magnification; transition to teleoconch hardly marked; teleoconch above and below the periphery with growth-lines, on most of the shell surface developed into rather inconspicuous, very fine, densely placed radial riblets, in addition to these with distinct, coarse, usually widely but unevenly spaced, but in some shells locally rather densely placed, rather wide but shallow, distinctly curved radial grooves which curve away from the direction of shell growth towards the suture; spiral sculpture subordinate to all radial sculpture, locally traces of inconspicuous, fine, rather densely placed, shallow grooves above and below the periphery. Aperture obliquely crescent-shaped, somewhat obtusely angular at the periphery, broadly rounded above and below. Peristome not expanding, somewhat thickened on the palatal and basal side. Umbilicus closed. Dimensions: height 1.5–1.9 mm; width 3.0–3.7 mm; h/w 0.48–0.56; diameters of the first four whorls 0.6–0.7 mm, 1.1–1.3 mm, 1.8–2.2 mm, 2.6–3.1 mm respectively; number of whorls 4–4 5/8; height aperture 0.9–1.3 mm; width aperture 1.5–2.0 mm.

**Ecology.** Soil deposits in disturbed semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province: Banteay Meas area, Kampong Trach area. Presumably endemic to the Cambodian part of the MDL.

**Etymology:** *obliquus* (Latin) – slanted, *striatus* (Latin) – finely grooved

### *Microcystina sericata* sp. n.

Figs 27 (yellow dots), 40–42.

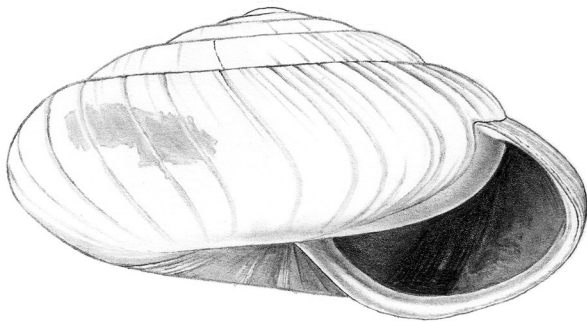
IUCN RED LIST Category, as *Microcystina* sp. nov. 'Kien Luong': Endangered B1ab(i,ii,iii,iv,v) + 2ab(i,ii,iii,iv,v). Re-assessment is necessary because of new distribution data.



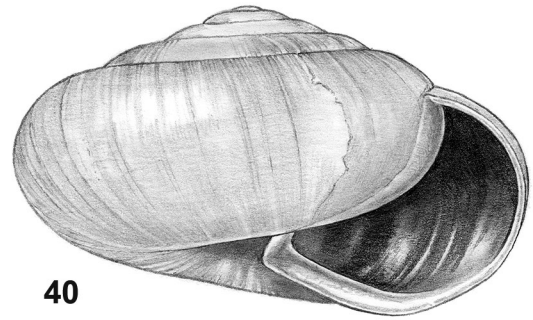


**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Hang Cay Ot (V 15101/>10 shells); Nui Ba Tai (V 11484/>10); ditto, cave on southeast slope of northern hill (V 14693/1); ditto, cave on west flank (holotype: NHMUK 20180568,

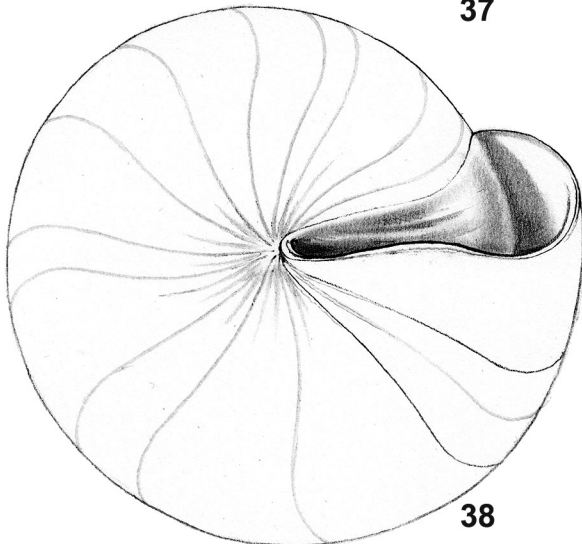
paratypes: V 14692/>10); Nui Bai Voi, north part (Nui Mo So), northwest and east flanks (V 15103/3); ditto, west flank just below widest part of the hill (V 14694/>10); Nui Khoe La, north remnant, seaward side (V 15102/10).



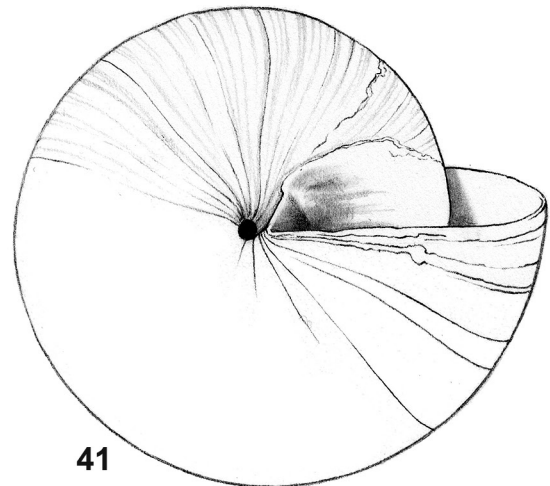
37



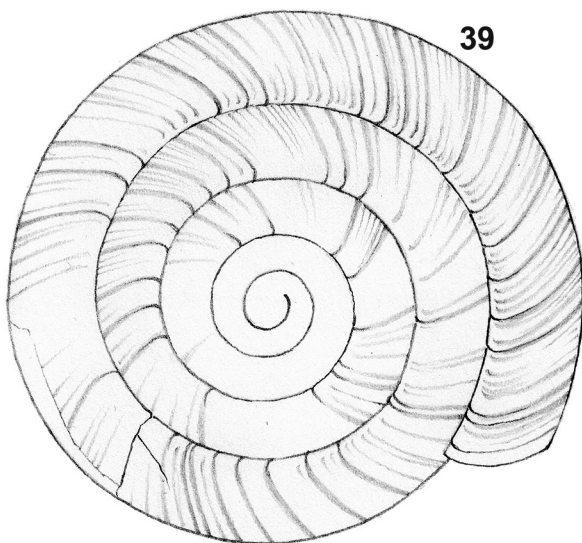
40



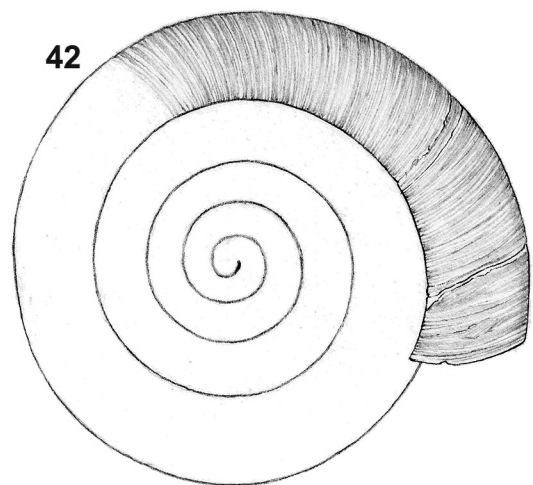
38



41



39



42

Figs 37–42. *Microcystina obliquistriata* sp. n.: 37 – holotype, frontal view, shell height 1.9 mm, 38 – same shell, basal view, 39 – same shell, apical view; *Microcystina sericata* sp. n.: 40 – holotype, frontal view, shell height 2.2 mm, 41 – same shell, basal view, 42 – same shell, apical view

**Cross diagnosis.** Most similar to *M. sinica* Von Moellendorff, 1885 (illustrated in VERMEULEN et al. 2015: 47), but distinctly larger in all aspects (*M. sinica*: height up to 1.1; width up to 1.7 mm; diameters of the first four whorls 0.3–0.5 mm, 0.5–0.8 mm, 0.8–1.3 mm respectively, from l.c., MÖLLENDORFF 1885). Among MDL species, it stands out by its sculpture, which gives the shell surface a silky sheen, as in the species described above, but it lacks the wide, shallow radial grooves present in those species. In addition, the shell is less flattened.

**Description.** Shell very small, thin, somewhat translucent, white. Outline lenticular; spire somewhat elevated, narrowly rounded. Surface with a silky lustre. Protoconch whorls somewhat convex, next whorls somewhat convex, last whorl rounded at the periphery and above, below the periphery broadly rounded, suture not or hardly impressed, umbilical area rather shallowly impressed. Sculpture: protoconch approx. smooth at 40× magnification except for a very fine, dense spiral striation, transition to teleoconch hardly marked; teleoconch above the periphery growth-lines, on parts of the shell surface developed into rather inconspicuous, unevenly spaced, fine densely placed radial riblets, which end approx. perpendicular to the suture; spiral sculpture subordinate to all radial sculpture, inconspicuous, very fine (just visible at 40× magnification), very densely placed, shallow grooves; below the periphery with growth-lines only, and some traces of spiral striation. Aperture obliquely crescent-shaped, rounded at and above the periphery, broadly rounded below. Peristome not expanding, not or hardly thickened on the palatal and basal side. Umbilicus open, sometimes approx. closed. Dimensions: height 1.9–2.3 mm; width 3.4–3.9 mm; h/w 0.54–0.61; diameters of the first four whorls 0.65–0.80 mm, 1.1–1.5 mm, 1.9–2.3 mm, 3.1–3.7 mm respectively; number of whorls 4–4 1/2; umbilicus up to 0.15 mm diameter, which is up to 0.06 of the shell diameter; height aperture 1.3–1.5 mm; width aperture 1.7–2.2 mm.

**Ecology.** Soil deposits in disturbed semi-deciduous woodland and secondary woodland on limestone bedrock, soil deposits in the twilight zone of caves, also in the dark zone of caves, around *Ficus*-roots.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

**Etymology:** *sericatus* (Latin) – clothed in silk

### Family Helicarionidae Bourguignat, 1877

#### *Sesara polita* sp. n.

Figs 27 (purple dots), 43–45.

IUCN RED LIST Category, as *Sesara* sp. nov. ‘Bai Voi’: Critically Endangered B1ab(i,ii,iii,v) + 2ab(i,ii,i-

ii,v). New distribution data make necessary re-assessment.

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: Phnom Koun Sat (V 15867/6 shells); Phnom Teuk Srok, north hill (V 15865/5); ditto, south hill (holotype: NHMUK 20180569, paratype: V 15866/1). Vietnam: Kien Giang Province, Kien Luong District: Nui Bai Voi, southwest flank, rocky, locally steep limestone slope (V 14689/3).

**Cross diagnosis.** Similar to *S. bouyei* (Crosse, 1863) (Vietnam, ‘Pulau Condor’ = Con Son Island) but larger (a probable type specimen of *S. bouyei*, measured from a photograph: height c. 3.2 mm; width c. 6.2 mm; diameters of the first four whorls c. 0.8 mm, c. 1.5 mm, c. 2.6 mm, c. 4.2 mm respectively; number of whorls c. 5 1/8). In addition, *Sesara bouyei* has a white shell, and a shorter palato-basal lamella. *Sesara triodon* Tanmuangpak, Tumpeesuwan et Tumpeesuwan, 2017 (Thailand), also has a lenticular, smooth shell with a rounded periphery. This species is characterised by the deeply concave palato-basal side of the aperture, and an additional supra-palatal knob on the peristome.

**Description.** Shell rather small, thin, slightly translucent, somewhat greenish corneous. Outline lenticular; spire little elevated, rounded. Surface glossy. Protoconch whorls almost flat, next whorls slightly convex, last whorl well-rounded at the periphery, but towards the aperture obtusely angular at the periphery. Sculpture: protoconch smooth or slightly and minutely pitted (just visible at 40× magnification); teleoconch with a few inconspicuous growth-lines; spiral sculpture inconspicuous, locally with very fine, densely placed but somewhat unevenly spaced, shallow grooves above as well as below the periphery. Aperture obliquely crescent-shaped, obtusely angular at the periphery, broadly rounded on the basal side, approx. flat or slightly concave in between. Peristome not expanding, thickened on the palatal and basal side, and with 2(–3) teeth: 1 inconspicuous to distinct, knob-shaped, rounded to obtuse basalis; 1 distinct, transverse palato-basal lamella which is usually (rather) abruptly cut off at both ends, and has a slightly convex to deeply concave, sometimes unevenly serrated crest, so that it seems almost divided into 2 separate teeth. Umbilicus closed. Dimensions: height 4.8–6.0 mm; width 9.5–12.0 mm; h/w 0.50–0.55; diameters of the first four whorls 1.0–1.3 mm, 1.8–2.3 mm, 3.1–4.0 mm, 5.1–6.5 mm respectively; number of whorls 5 1/2–6 1/8; height aperture 3.3–4.0 mm; width aperture 5.0–6.0 mm.

**Ecology.** In disturbed semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Banteay Meas area. Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the MDL.

**Etymology:** *politus* (Latin) – polished





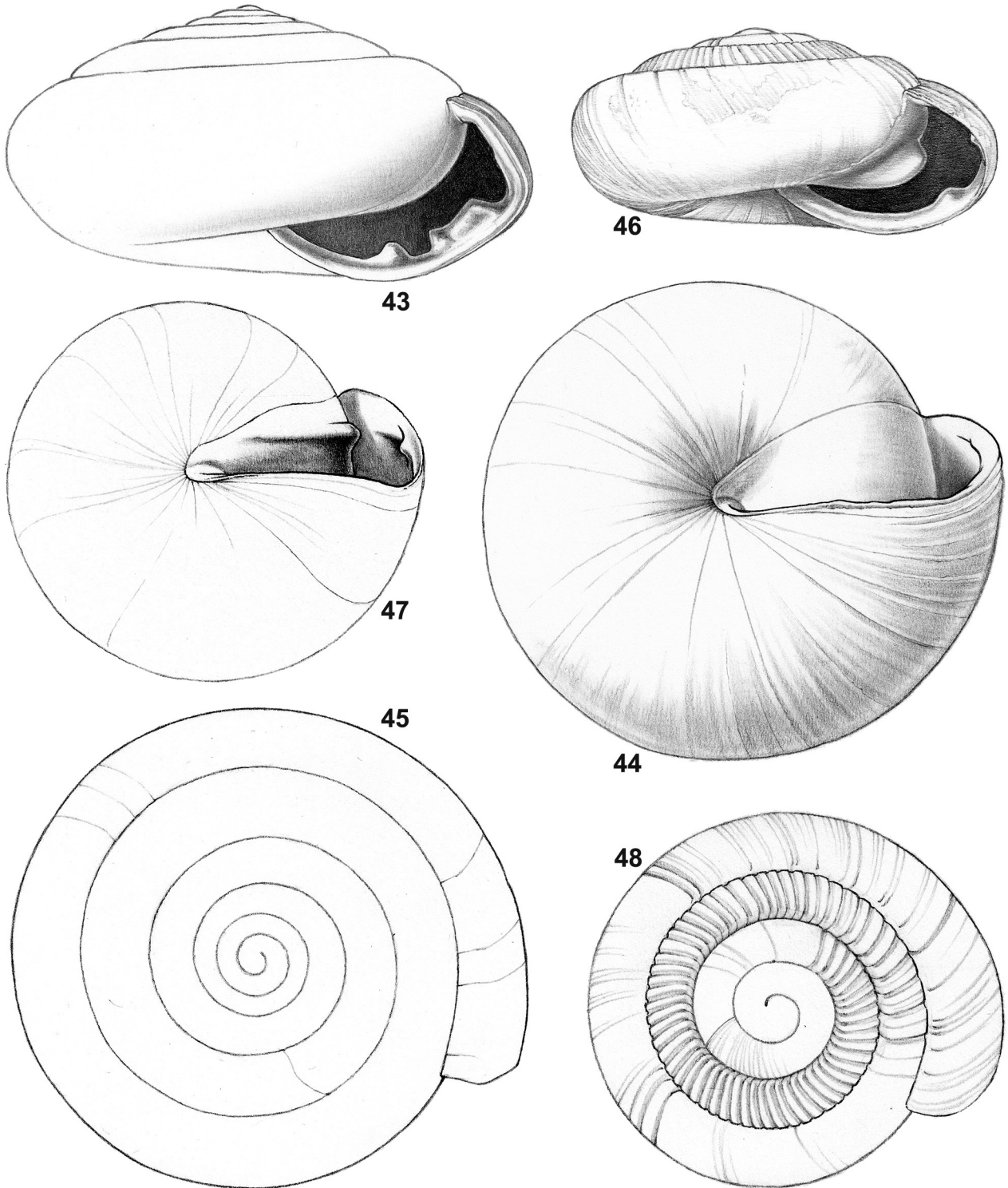
*Sesara sesarella* sp. n.

Figs 27 (blue dots), 46–48.

**Examined material.** Cambodia: Kampot Province, Kampot area: Phnom Kbal Romeas (holotype:

NHMUK 20180570, paratype: V 15941/1 shell); Phnom Sor Sear (V 15942/4).

**Cross diagnosis.** Among the few lenticular *Sesara* species with a rounded periphery, e.g. *S. bouyei* (see: [CROSSE 1863](#), Vietnam, ‘Pulau Condor’ = Con Son Island), *S. triodon* (see: [TANMUANGPAK et al. 2017](#),



Figs 43–48. *Sesara polita* sp. n.: 43 – holotype, frontal view, shell width 9 mm, 44 – same shell, basal view, 45 – same shell, apical view; *Sesara sesarella* sp. n.: 46 – holotype, frontal view, shell width 2.8 mm, 47 – same shell, basal view, 48 – same shell, apical view



Thailand), *S. sesarella* is distinguished by the shallow, wide radial furrows on the middle whorls, as well as by the presence of a parietal lamella. In addition, it is distinctly smaller.

**Description.** Shell very small, rather thin, translucent, white to pale corneous. Outline approx. lenticular to almost discoid; spire little elevated, rounded. Surface shiny. Protoconch whorls almost flat, next whorls slightly convex, last whorl well-rounded at the periphery, broadly rounded below. Sculpture: protoconch with a few traces of radial folds, with very fine, inconspicuous, densely placed, very shallow, vaguely delineated spiral grooves; first whorl of teleoconch with some inconspicuous growth-lines, from approx. the start of the second whorl to approx. the start of the last whorl with widely and more or less evenly spaced, distinct, shallow and wide radial furrows, last whorl with a few scattered, unevenly spaced, inconspicuous, shallow, narrow furrows which above the periphery, and some scattered growth-lines below the periphery; spiral sculpture as on the protoconch, present above as well as below the periphery. Aperture obliquely crescent-shaped, palatal and basal side evenly rounded. Peristome not expanding, thickened on the palatal and basal side, and with 3 teeth:

1 thick, transverse, rounded parietal lamella which is highest towards the periphery and rather abruptly stops well before reaching the angular corner; 1 more or less transverse, low, knob-shaped, rounded palato-basalis; 1 small, knob-shaped palatalis. Umbilicus closed (open and narrow in juveniles). Dimensions: height 1.35–1.50 mm; width 2.7–2.9 mm; h/w 0.48–0.52; diameters of the first four whorls 0.6–0.7 mm, 1.2–1.3 mm, 1.8–2.0 mm, 2.6–2.8 mm respectively; number of whorls 4-4 1/4; height aperture 0.9–1.0 mm; width aperture 1.4–1.5 mm.

**Ecology.** Soil deposits in disturbed semi-deciduous woodland and secondary woodland on limestone bedrock.

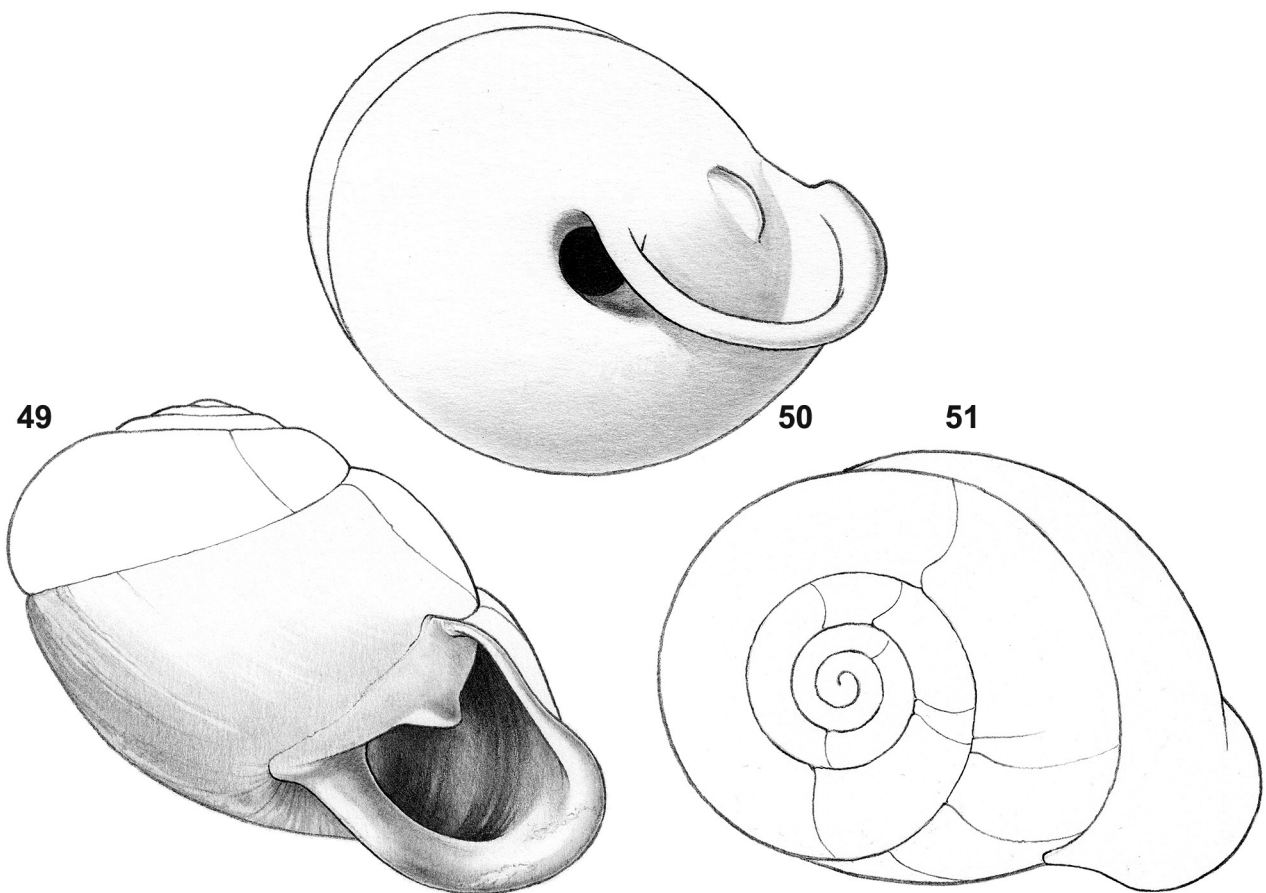
**Distribution.** Cambodia, Kampot Province, Kampot area. Presumably endemic to the Cambodian part of the MDL.

**Etymology:** *sesarella* – diminutive of the generic name *Sesara*

#### Family Streptaxidae Gray, 1860

#### *Haploptychius perlissus* sp. n.

Figs 27 (black dot), 49–51.



Figs 49–51. *Haploptychius perlissus* sp. n.: 49 – holotype, frontal view, shell height 7.8 mm, 50 – same shell, basal view, 51 – same shell, apical view



**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Nui Bai Voi, north part (Nui Mo So), Hospital Cave area (V 11289/1 shell); Nui Chua Hang (= Pagoda Hill), north flank of hill, and west end, slopes bordering temple complex (holotype: NHMUK 20180571, paratypes: V 11318/5).

**Cross diagnosis.** Few *Haploptychius* are entirely devoid of radial sculpture. In Indochina, *H. dorri* (Dautzenberg, 1894) (from northern Vietnam, DAUTZENBERG 1894) shares this character with *H. perlissus*. *H. perlissus* differs by the penultimate whorl which is smaller compared to the ultimate when the shell is observed frontally, and bulges less distinctly to the left. Also, the palatal side of the aperture is almost straight, not distinctly sinuous as in *H. dorri*.

**Description.** Shell rather small, thin, slightly translucent, white. Outline obliquely lenticular, with the last whorl deviating 35–45° from the axis of the first whorls; spire little elevated, rounded. Surface glossy. Protoconch whorls almost flat, next whorls slightly convex, last whorl broadly rounded. Sculpture: protoconch smooth; teleoconch with a few slightly reinforced growth-lines, marking periods of stasis during development; spiral sculpture: some very fine (just visible at 40 times magnification) traces of spiral striation locally. Aperture approx. semi-elliptic, with the palatal side almost straight, basal side rounded, columellar side broadly rounded, with 1 short parietal lamella. Peristome expanded, thickened on the palatal, basal and columellar side. Umbilicus closed. Dimensions: height 7.5–8.5 mm; width 9.5–11.5 mm; h/w 0.65–0.85; diameters of the first three whorls 0.8–0.9 mm, 1.5–1.7 mm, 2.7–3.2 mm respectively; number of whorls 5 3/8–5 5/8; height aperture 4.5–5.0 mm; width aperture 4.5–6.0 mm.

**Ecology.** In disturbed semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

**Etymology:** *per-* (Latin, prefix) – very, *lissus* – smooth

### Family Vertiginidae Fitzinger, 1833

**Note.** We list all MDL Vertiginidae, with the material examined, for the distribution maps, see Fig. 52 (the soil dwellers with white shells: *Acinolaemus*), and Fig. 53 (rock dwellers with brown shells: *Anauchen*, *Aulacospira*, and *Hypselostoma*).

### *Acinolaemus carcharodon* Vermeulen, Phung et Truong, 2007

Fig. 52 (orange dots).

VERMEULEN et al. 2007: 87.

**IUCN RED LIST Category:** Vulnerable B1ab(i,ii,iii,iv,v) + 2ab(i,ii,iii,iv,v).

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: Nameless small limestone hill (V 15986/1 shell); Phnom Koun Sat (V 15985/>10). Vietnam: Kien Giang Province, Kien Luong District: Nui Nai (V 14841/>10); Hang Cay Ot (V 14824/3); Hon Lo Coc (V 14736/>10); Nui Ba Tai (V 9966/>10); Nui Bai Voi, east flank, large doline approx. half-way along length of hill (V 11260/1); ditto, north part (Nui Mo So), Hospital Cave area (V 11296/6); ditto, north part (Nui Mo So), Hospital Cave area, large doline (V 10024/6); ditto, west flank just below widest part of the hill (V 14984/>10); Nui Hang Tien (V 11326/8); Nui Khoe La, north remnant, seaward side (V 14865/>10); Nui Chua Hang (= Pagoda Hill), north flank of hill, and west end, slopes bordering temple complex (holotype: RMNH 108985, paratypes: V 11320/>10); ditto, southeast end of hill, steep sea-facing slope (V 14966/>10).

**Ecology.** Soil deposits in disturbed to degraded, semi-deciduous (coastal) woodland and secondary vegetation on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Banteay Meas area. Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the MDL.

### *Acinolaemus pyramidalis* (Vermeulen, Phung et Truong, 2007)

Fig. 52 (yellow dots).

*Montapiculus pyramidalis* VERMEULEN et al. 2007: 91.

**IUCN RED LIST Category,** as *Montapiculus pyramidalis*: Near Threatened B1ab(ii,iii,iv,v) + 2ab(ii,iii,iv,v).

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: Phnom Koun Sat (V 15978/>10 shells). Vietnam: Kien Giang Province, Ha Tien Town area: Nui Da Dung, near Ha Tien (V 11440/>10). Kien Luong District: Nui Chau Hang (V 14948/>10); Nui Nai (V 14840/>10); Nui Ong (V 14790/>10); Hang Cay Ot (V 14815/>10); Hon Da Lua, east group, the middle (largest) island, west side (V 14721/1); Hon Lo Coc (V 14733/>10); Nui Ba Tai (V 15037/>10); Nui Bai Voi, east flank, large doline approx. half-way along length of hill (V 11261/2); ditto, north part (Nui Mo So), Hospital Cave area, large doline (V 10028/2); ditto, west flank just below widest part of the hill (V 14980/7); Nui Hang Tien (V 11329/2); Nui Khoe La, north remnant, seaward side (V 14859/>10); ditto, small, most seaward limestone outcrop off the main hill (V 14902/3); Nui Khoe La, south remnant, landward side (V 14927/2); Nui Son Tra, limestone outcrop along north flank of sandstone hill (V 7952/2); Nui Chua Hang (= Pagoda Hill), north flank of hill, and

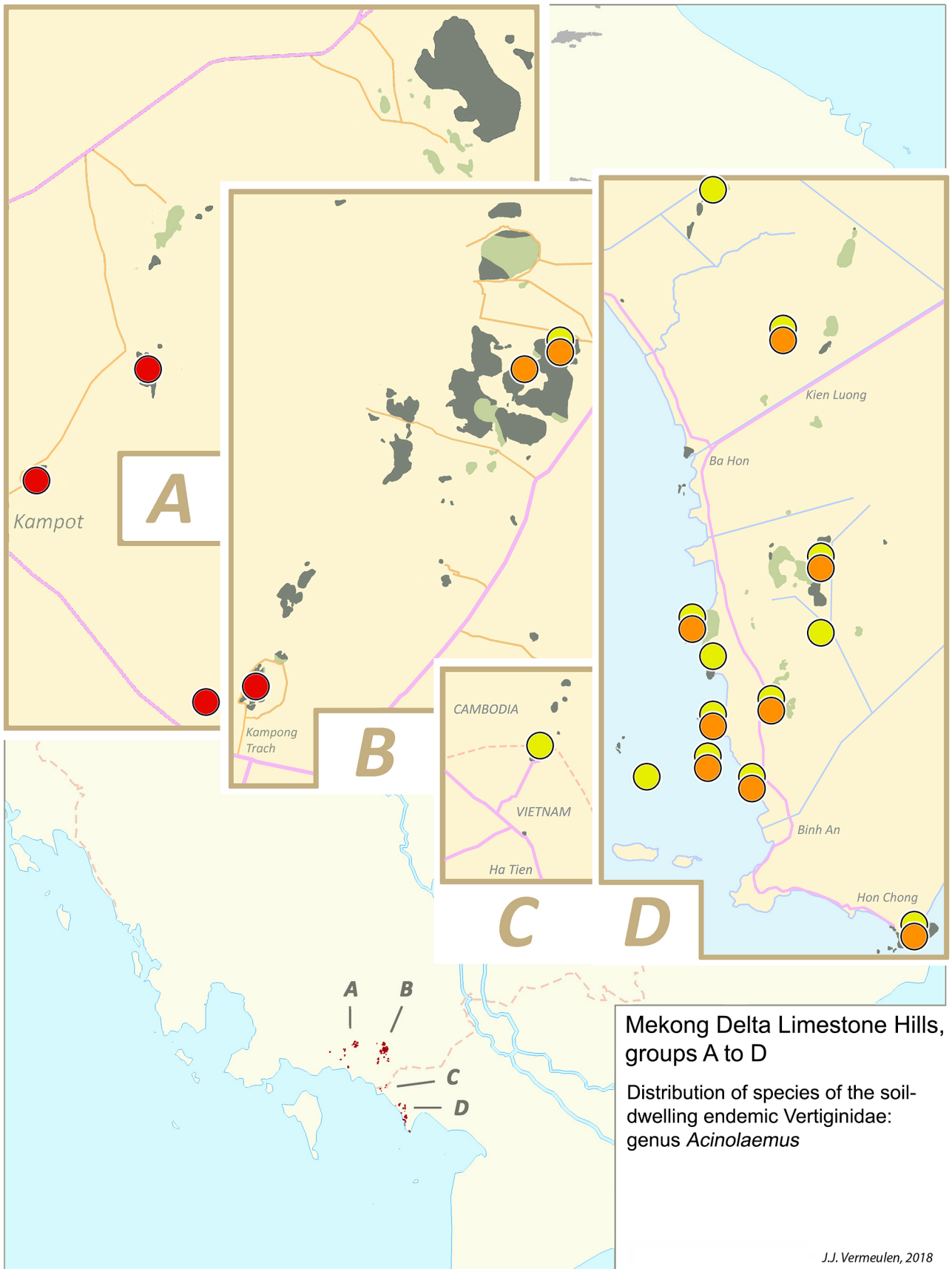


Fig. 52. Distribution of soil-dwelling Vertiginidae endemic to the MDL, genus *Acinolaemus*. Dots of different colours represent different species: orange – *Acinolaemus carcharodon*; yellow – *A. pyramidalis*; red – *A. rectus*



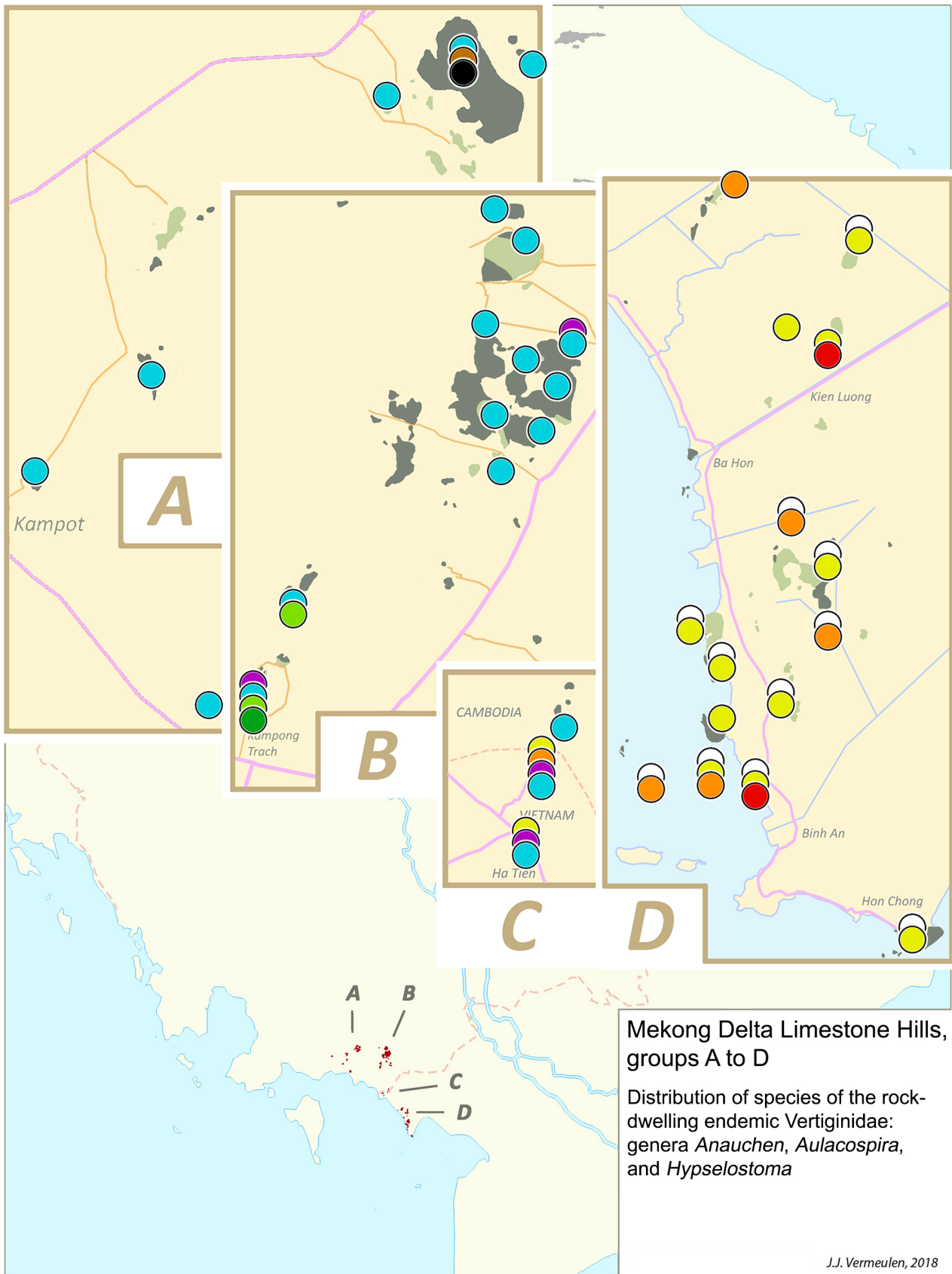


Fig. 53. Distribution of rock-dwelling Vertiginidae endemic to the MDL, genera *Anauchen*, *Aulacospira*, and *Hypselostoma*. Dots of different colours represent different species: dark green – *Anauchen chaunosalpinx*; brown – *A. depressus*; white – *A. informis informis*; red – *A. informis parcedentata*; purple – *Aulacospira conica*; light green – *Hypselostoma benetuitum*; light blue – *H. cambodjense*; orange – *H. dilatatum*; black – *H. discobasis*; yellow – *H. rupestre*

west end, slopes bordering temple complex (holotype: RMNH 108989, paratypes: V 11321/10); ditto, southeast end of hill, steep sea-facing slope (V 14971/>10).

**Ecology.** Soil deposits in disturbed to degraded, semi-deciduous (coastal) woodland and secondary vegetation on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Banteay Meas area. Vietnam, Kien Giang Province: Ha Tien Town area, Kien Luong District. Presumably endemic to the MDL.

***Acinolaemus rectus* sp. n.**

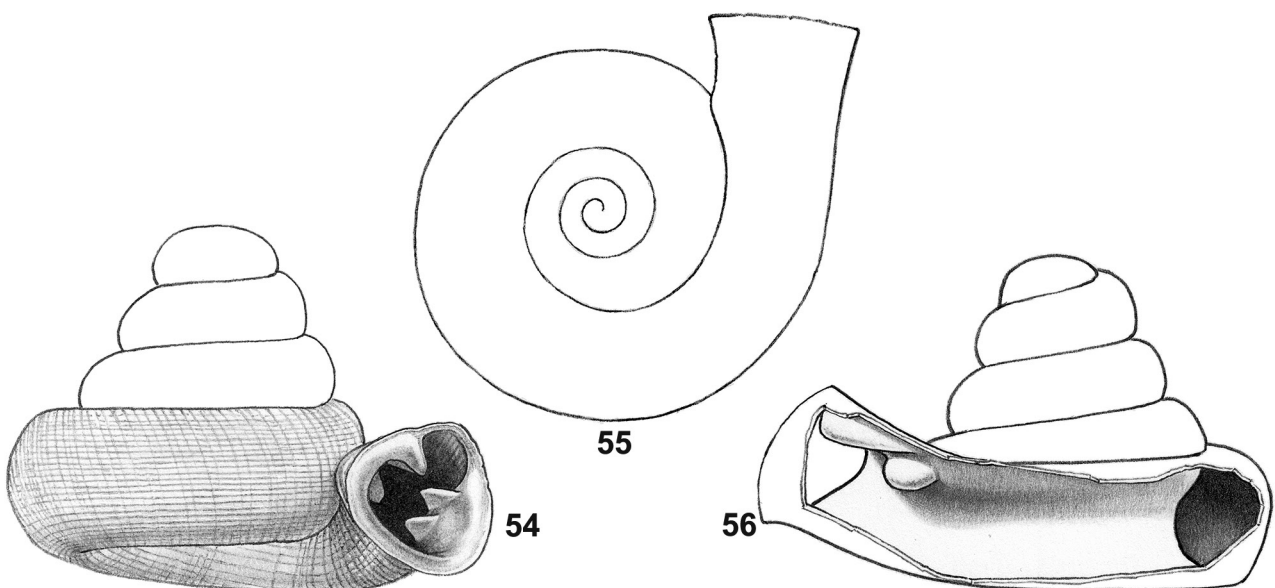
Figs 52 (red dots), 54–56.

**Examined material.** Cambodia: Kampot Province, Kampong Trach area: Phnom Kampong Trach (V 15979/>10 shells); Kampot area: Phnom Chhngauk (holotype: NHMUK 20180572, paratypes: V 15980/>10); Phnom Kbal Romeas (V 15981/>10); Phnom La'Ang, northernmost satellite limestone outcrop along east side of hill (V 17068/>10); Phnom Sor Sear (V 15982/2).

**Cross diagnosis.** Included in *Acinolaemus* because of the angular and upper palatal lamella which are positioned so that they together separate the angular corner of the aperture. Most similar to *A. pyramidalis* (Vermeulen, Phung et Truong 2007) (= *Montapiculus pyramidalis* which has a similar configuration of lamellae in the aperture), differs by the porrect or slightly upturned free part of the spire.

**Description.** Shell minute, thin, translucent, white. Spire conical with slightly concave sides; apex not

protruding, rounded. Surface with a silky lustre. Whorls convex, rounded, last whorl broadly rounded or slightly flattened at the periphery, rounded above and below, edge of the umbilical impression and surface inside rounded, last part of the last whorl shortly detached, with the aperture (slightly) distant from the spire, horizontal or slightly upwards directed. Suture deeply impressed. Sculpture: protoconch minutely granular (hardly visible at 40× magnification), with very fine, inconspicuous, well-spaced spiral threads, particularly below the periphery; teleoconch with some unevenly spaced, flat growth-lines, locally with low, well and rather evenly spaced, very thin riblets in between; spiral sculpture hardly predominant over the coarsest radial riblets, fine, well and evenly spaced, thin threads. Aperture free, with the parietal edge distant from the previous whorl, slightly tilted upwards with regard to the coiling axis or not, approx. triangular with rounded edges, free portion of the spire not narrowed towards the aperture, then slightly expanding; teeth 4: 1 distinct, rather long angular lamella which increases in height towards the aperture, and abruptly ends at the peristome, 2 short and rather high palatal lamellae, the lower somewhat deeper inside the aperture, and one short and high, almost knob-shaped parietalis deep inside the aperture. Peristome thin, with a slight convexity on the upper palatal side, close to the edge, corresponding with an indentation on the outside. Umbilicus open, wide, with more than two whorls visible inside. Dimensions: height of shell 1.2–1.7 mm; width 1.6–2.0 mm; height of spire (excluding free portion of the last whorl) 1.1–1.5 mm; width 1.2–1.4 mm; h/w 0.88–1.07; umbilicus 0.65–0.80 mm wide, which



Figs 54–56. *Acinolaemus rectus* sp. n.: 54 – holotype, frontal view, shell height 1.35 mm, 55 – same shell, basal view, 56 – same shell, right lateral view showing internal dentition



is 54–58% of the spire width; number of whorls 4 3/8–5 3/8; height aperture 0.5–0.7 mm; and width 0.5–0.6 mm.

**Ecology.** Soil deposits in disturbed to degraded, semi-deciduous woodland and secondary vegetation on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Kampot area. Presumably endemic to the Cambodian part of the MDL.

**Etymology:** *rectus* (Latin) – straight

### *Anauchen chaunosalpinx* sp. n.

Figs 53 (dark green dot), 57–59.

**Examined material.** Cambodia: Kampot Province, Kampong Trach area: Phnom Kampong Trach (holotype: NHMUK 20180573, paratypes: V 15989/>10 shells).

**Cross diagnosis.** Inclusion in *Anauchen* based on the assumption that the large lamella on the parietal side of the aperture is indeed a parietalis, not a parietalis and an angularis combined (see note below). Within the genus identified by the (high-)conical spire, combined with the long, slightly to distinctly downturned free part of the last whorl. *Gyliotrachela torticollis* Van Benthem Jutting, 1962 (Cambodia: Battambang), has a similar shape, but differs by having a lower conical spire, a distinctly shouldered last whorl, and no hook-shaped teeth in the aperture.

**Description.** Shell very small, thin, opaque, dark red-brown with some whitish growth-lines. Spire (high-)conical with concave sides; apex somewhat protruding, rounded. Surface with a silky lustre. Whorls: protoconch and first teleoconch whorls convex, penultimate whorl moderately convex, last whorl narrowly rounded at the periphery, slightly convex above, somewhat shouldered in the last 1/2 whorl, almost flat below the periphery, edge of umbilical impression obtusely angular, surface inside somewhat concave with a deep furrow just below the edge; last part of the last whorl detached, with the aperture distant from the spire, obliquely downwards directed, slightly to distinctly so. Suture deeply impressed. Sculpture: protoconch somewhat granular, with very fine, inconspicuous, well-spaced spiral threads; teleoconch with some scattered, unevenly spaced, flat growth-lines, in some shells locally with inconspicuous, low, obtuse, unevenly spaced riblets in between; spiral sculpture predominant, very fine, widely but somewhat unevenly spaced, thin, somewhat flattened threads. Aperture free, with the parietal edge widely distant from the previous whorl, slightly tilted downwards with regard to the coiling axis, approx. circular to somewhat elliptic, free portion of the spire gradually narrowed towards the aperture, then expanding; teeth 6–7: 1 distinct,

high, rather long parietal lamella with a rounded profile, starting rather deep inside the aperture and somewhat abruptly ending at both ends, 1 antrorsely hook-shaped, rather small supra-palatalis deep inside, 1 similar but much larger palatalis, with or without 1 inconspicuous, small, short, low, ridge-shaped infrapalatis, 1 antrorsely hook-shaped, rather small infracolumellaris, 1 rather long, high columellar lamella, 1 very small, knob-shaped infraparietalis. Peristome gradually spreading, thin, with a distinct convexity on the upper palatal side, close to the edge, corresponding with an indentation on the outside. Umbilicus open, wide, with more than two whorls visible inside. Dimensions: height of shell 3.4–4.4 mm; width 3.1–3.7 mm; height of spire (excluding free portion of the last whorl) 2.6–3.0 mm; width 2.1–2.2 mm; h/w 1.18–1.43; umbilicus 0.7–1.0 mm wide, which is 32–48% of the spire width; number of whorls 5–6; height and width aperture 1.2–1.7 mm.

**Ecology.** Rock surfaces in disturbed to degraded, semi-deciduous woodland and secondary vegetation on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Kampong Trach area, Phnom Kampong Trach. Presumably a site endemic species.

**Notes.** The large lamella on the parietal side of the aperture is well-rounded in profile, without a notch or lower portion somewhere along its length that may indicate that it is a composite of an angularis and a parietalis. If this were the case, the species should be included in *Hypselostoma*.

**Etymology:** *chaunos* (Greek) – lax, wide, *salpinx* (Greek) – trumpet

### *Anauchen depressus* sp. n.

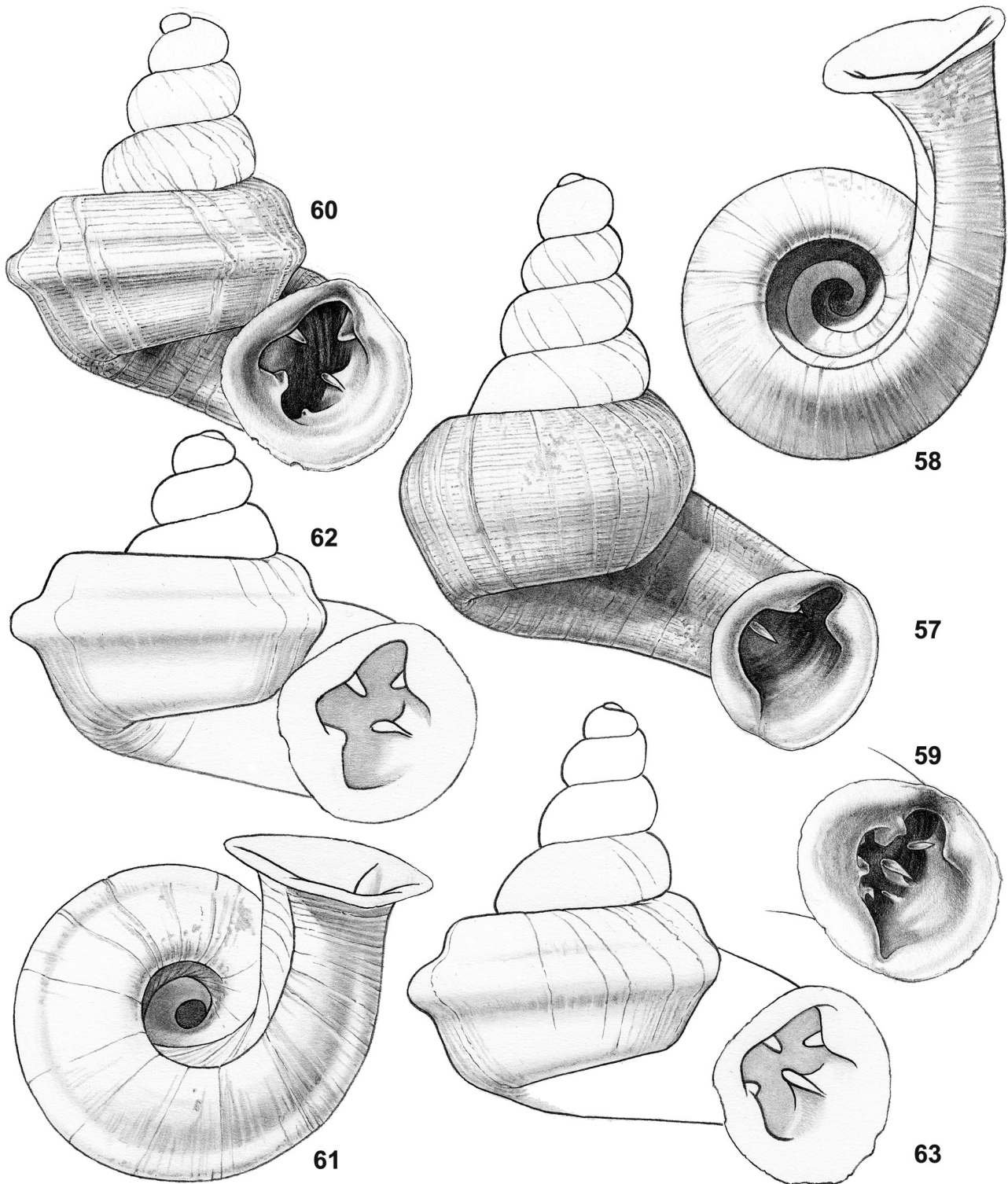
Figs 53 (brown dot), 60–63.

**Examined material.** Cambodia: Kampot Province, Kampot area: Phnom La'Ang, cave with shrine at its entrance, first chamber with collapsed roof (V 17070/3 shells); ditto, southeast-end (holotype: NHMUK 20180574, paratypes: V 17069/>10).

**Cross diagnosis.** In general shape reminiscent of *A. sichang* Panha et Burch, 2002 (Thailand), which differs by having a distinct furrow on the last whorl, between the peripheral ridge and the suture (PANHA & BURCH 2002). It also has a narrower umbilicus. Among *Anauchen* from the MDL it is characterised by the presence of a peripheral ridge on the last whorl.

**Description.** Shell very small, thin, opaque, dark red-brown with (some) whitish growth-lines, sometimes pale corneous to white. Spire (depressed-)conical with concave sides; apex somewhat protruding, rounded. Surface rather dull. Whorls: protoconch and first teleoconch whorls convex, penultimate whorl (moderately) convex, last whorl with an ob-





Figs 57–63. *Anauchen chaunosalpinx* sp. n.: 57 – holotype, frontal view, shell height 4.0 mm, 58 – same shell, basal view, 59 – same shell, aperture in frontal view; *Anauchen depressus* sp. n.: 60 – holotype, frontal view, shell height 3.2 mm, 61 – same shell, basal view, 62 – paratype from the same location, frontal view, shell height 3.3 mm, 63 – paratype from the same location, frontal view, shell height 2.7 mm

tuse, distinctly protruding peripheral ridge, convex and distinctly shouldered above, convex below, edge of umbilical impression narrowly rounded to obtusely angular, surface inside somewhat concave and with a (deep) furrow just below the edge; last part

of the last whorl somewhat detached, with the aperture close to the spire or somewhat distant from it, horizontal or slightly downwards directed. Suture deeply impressed. Sculpture: protoconch somewhat granular; teleoconch with a minutely granulate sur-

face (just visible at 40× magnification), with some scattered, unevenly spaced, flat growth-lines; spiral sculpture predominant, rather fine, moderately to widely but somewhat unevenly spaced, wavy, thin, somewhat flattened threads which are shiny in contrast with the dull shell surface. Aperture free, with the parietal edge slightly to widely distant from the previous whorl, slightly tilted downwards with regard to the coiling axis or not, approx. circular to obtusely rectangular, free portion of the spire gradually narrowed towards the aperture, then abruptly expanding; teeth 4–5: 1 distinct, high, short parietal lamella with a rounded profile, starting rather deep inside the aperture and abruptly ending at both ends, 1 similarly shaped but small supra-palatalis, 1 similarly shaped, rather small palatalis with a proximaly thickened crest, with or without 1 inconspicuous, small, short, low, ridge- or almost knob-shaped infrapalatalis, with 1 rather low, rather short columellar lamella. Peristome rather abruptly spreading, thin, with a distinct convexity on the upper palatal side, close to the edge, corresponding with an indentation on the outside. Umbilicus open, wide, with less than two whorls visible inside. Dimensions: height of shell 2.6–3.5 mm; width 3.0–3.7 mm; height of spire (excluding free portion of the last whorl) 1.9–2.6 mm; width 2.0–2.4 mm; h/w 0.90–1.15; umbilicus 0.7–1.0 mm wide, which is 33–45% of the spire width; number of whorls 4 1/8–5 1/8; height aperture 1.3–1.4 mm, width aperture 1.2–1.4 mm.

**Ecology.** Rock surfaces in disturbed to degraded, semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Phnom La'Ang. Presumably a site endemic species.

**Etymology:** *depressus* (Latin) – low

### *Anauchen informis informis* Vermeulen, Phung et Truong, 2007

Fig. 53 (white dots).

VERMEULEN et al. 2007: 87.

IUCN RED LIST Category: Vulnerable B1ab(i,ii,iii,iv,v) + 2ab(i,ii,iii,iv,v); D2.

**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Nui Trau, north end, remnant of hill after quarrying (V 15063/>10 shells); Hang Cay Ot (V 15060/1); Hon Da Lua, east group, the middle (largest) island, west side (V 15064/>10); Hon Lo Coc (V 15058/9); Nui Ba Tai (V 15062/>10); Nui Bai Voi, east flank, large doline approx. half-way along length of hill (holotype: RMNH 108986, paratypes: V 11258/>10); ditto, north part (Nui Mo So), Hospital Cave area (V 11295/4); ditto, north part (Nui Mo So), Hospital Cave area, large doline (V 10023/3); ditto, north part (Nui Mo So), northwest

and east flanks (V 9939/>10); ditto, southwest flank, rocky, locally steep limestone slope (V 15057/>10); Nui Khoe La, north remnant, seaward side (V 15061/>10); ditto, small, most seaward limestone outcrop off the main hill (V 15056/>10); Nui Khoe La, south remnant, landward side (V 15059/>10); Nui Nho (V 15054/>10); Nui Son Tra, limestone outcrop along north flank of sandstone hill (V 15053/>10); Nui Chua Hang (= Pagoda Hill), north flank of hill, and west end, slopes bordering temple complex (V 9999/>10); ditto, southeast end of hill, steep sea-facing slope (V 15055/>10).

**Ecology.** Rock surfaces in disturbed to degraded and species-poor, semi-deciduous (coastal) woodland and secondary woodland on limestone bedrock.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

### *Anauchen informis parcedentata* Vermeulen, Phung et Truong, 2007

Fig. 53 (red dots).

VERMEULEN et al. 2007: 87.

IUCN RED LIST Category: Vulnerable B1ab(i,ii,iii,v) + 2ab(i,ii,iii,v); D2.

**Examined material.** Vietnam: Kien Giang Province, Kien Luong District: Nui Chau Hang (V 15052/>10 shells); Nui Ba Tai (V 11499/>10, V 9984/3, holotype: RMNH 108987, paratypes: V 9956/>10).

**Ecology.** Rock surfaces in disturbed to degraded, semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Vietnam, Kien Giang Province, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

### *Aulacospira conica* Vermeulen, Phung et Truong, 2007

Fig. 53 (purple dots).

VERMEULEN et al. 2007: 89.

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: Phnom Koun Sat (V 15983/2 shells); Kampong Trach area: Phnom Kampong Trach (V 15984/1). Vietnam: Kien Giang Province, Ha Tien Town area: Nui Da Dung, near Ha Tien (V 11431/7); Nui Thach Dong, near Ha Tien (holotype: RMNH 108988, paratypes: V 11464/4).

**Ecology.** Rock surfaces in disturbed to degraded and species-poor, semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Banteay Meas area. Vietnam, Kien Giang Province, Ha Tien Town area. Presumably endemic to the MDL.



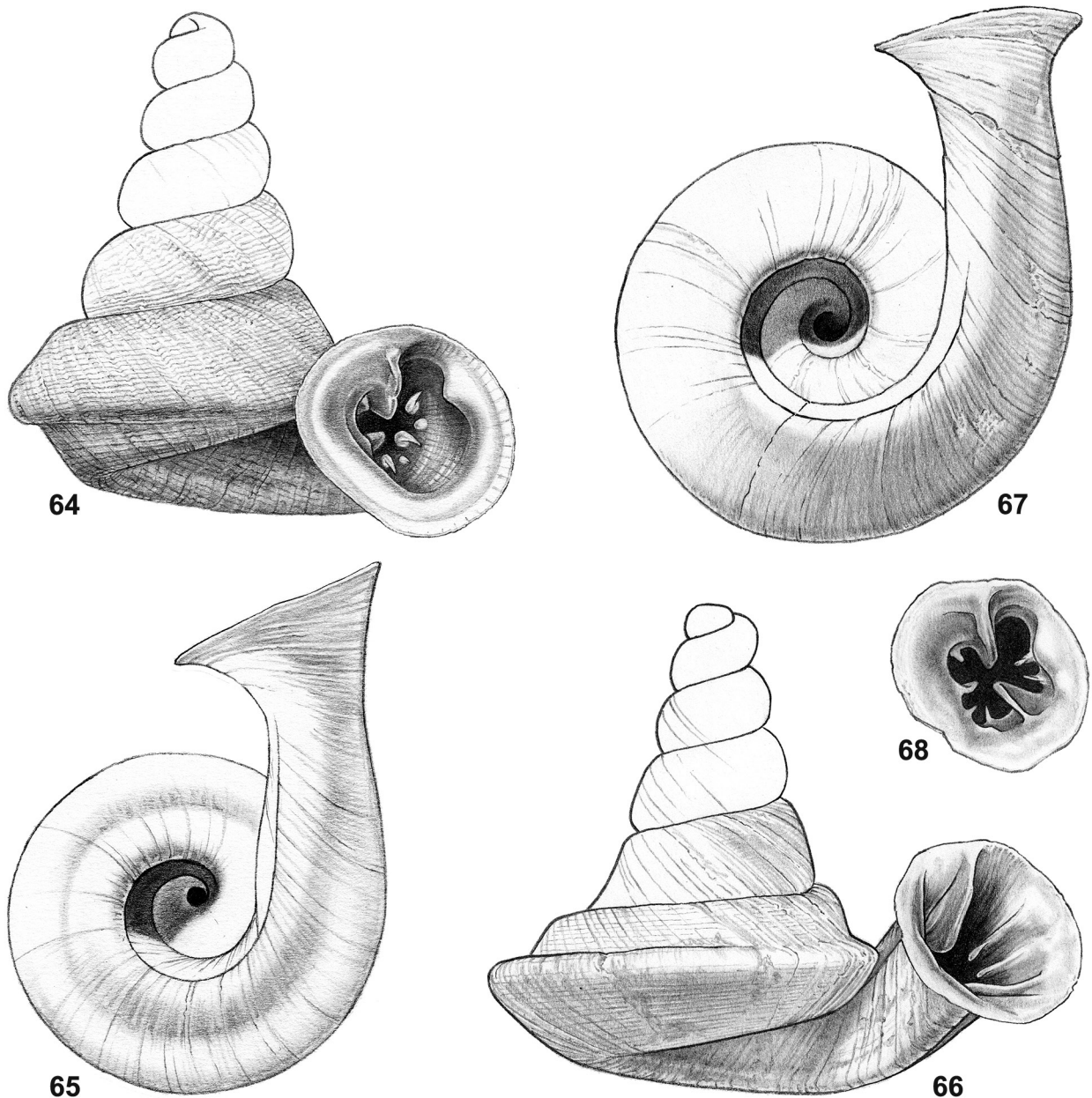
*Hypselostoma benetuitum* sp. n.

Figs 53 (light green dots), 64–65.

**Examined material.** Cambodia: Kampot Province, Kampong Trach area: Phnom Damrey, south hill (V 15987/6 shells); Phnom Kampong Trach (holotype: NHMUK 20180575, paratypes: V 15988/>10).

**Cross diagnosis.** Characterised within the genus by the presence of three hook-shaped teeth on the palatal side of the aperture. Among *Hypselostoma* from the MDL (including *H. discobasis*, below) also characterised by the peripheral ridge of the last whorl, which has a furrow along its lower edge.

**Description.** Shell very small, thin, opaque, pale brown-corneous with some whitish growth-lines, to white. Spire high-conical with concave sides; apex somewhat protruding, rounded. Surface slightly shiny. Whorls: protoconch and first teleoconch whorls convex, penultimate whorl moderately convex, last whorl with an obtuse, distinctly protruding peripheral ridge, above this slightly convex to slightly concave, immediately below the periphery deeply concave and furrowed, lower down flat to slightly convex all the way down to the edge of the umbilical impression, edge of umbilical impression obtusely angular, surface inside about flat and with a furrow just below the edge, last part of the last whorl detached,



Figs 64–68. *Hypselostoma benetuitum* sp. n.: 64 – holotype, frontal view, shell height 2.8 mm, 65 – same shell, basal view; *Hypselostoma discobasis* sp. n.: 66 – holotype, frontal view, shell height 3.3 mm, 67 – same shell, basal view, 68 – same shell, aperture in frontal view





with the aperture distant from the spire, horizontal. Suture deeply impressed. Sculpture: protoconch somewhat granular, with very fine, inconspicuous, well-spaced spiral threads; teleoconch with some unevenly spaced, flat growth-lines, with inconspicuous, low, obtuse, well-spaced, very thin riblets in between; spiral sculpture hardly predominant over the radial riblets, rather fine, somewhat oblique, widely and somewhat unevenly spaced, but often more densely placed towards the periphery, wavy, thin threads. Aperture free, with the parietal edge widely distant from the previous whorl, slightly tilted upwards with regard to the coiling axis or not, approx. ovate to elliptic, free portion of the spire not narrowed towards the aperture, then expanding; teeth 6–8: 1 distinct, high, long lamella in angular position which somewhat abruptly ends at both ends, which starts deep inside the aperture and ends at some distance from the edge of the peristome, and which has a depression in its crest approx. half-way its length, 3 rather distinct, short, antrorsely hook-shaped palatal teeth, with or without 1–2 much smaller, knob-shaped teeth in between, slightly in front of the hook-shaped teeth, 1 short, rather high columellar lamella with a rounded profile, and one small, knob-shaped parietalis. Peristome rather gradually spreading, thin, with a distinct convexity on the upper palatal side, close to the edge, corresponding with an indentation on the outside. Umbilicus open, wide, with less than two whorls visible inside. Dimensions: height of shell 2.1–3.0 mm; width 2.3–3.1 mm; height of spire (excluding free portion of the last whorl) 1.8–2.5 mm; width 1.7–1.8 mm; h/w 1.06–1.39; umbilicus 0.5–0.7 mm wide, which is 33–39% of the spire width; number of whorls 4  $\frac{3}{4}$ –6  $\frac{1}{2}$ ; height 0.9–1.2 mm; and width aperture 1.0–1.2 mm.

**Ecology.** Rock surfaces in disturbed to degraded, semi-deciduous woodland and secondary vegetation on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Kampong Trach area. Presumably endemic to the Cambodian part of the MDL.

**Etymology:** *bene-* (Latin, as prefix) – good, *tueor* (Latin) – to protect

### *Hypselostoma cambodjense* Van Benthem Jutting, 1962

Fig. 53 (light blue dots).

VAN BENTHEM JUTTING 1962: 3.

**Examined material.** Cambodia: Kampot Province, Banteay Meas area: Nameless small limestone hill (V 15912/>10 shells); ditto, in CMIC-concession (V 15913/>10); Phnom Chruoh Chek (V 15909/3); Phnom Koun Sat (V 15910/>10); Phnom Kunea Luong, east hill (V 15911/>10); Phnom Teuk Srok,

north hill (V 15907/>10); ditto, south hill (V 15908/>10); Phnom Toch (V 15905/>10); Phnom Totung (V 15906/>10); Kampong Trach area: Phnom Damrey, south hill (V 15914/>10); Phnom Kampong Trach (V 15915/>10); Kampot area: Phnom Chhngauk (V 15916/>10); Phnom Kbal Romeas (V 15917/>10); Phnom La'Ang, cave with shrine at its entrance, first chamber with collapsed roof (V 17075/6 & V 17076/>10); ditto, limestone-enclosed valley at southwest-end (V 17071/>10); ditto, southeast-end (V 17074/>10); ditto, southeast-end (V 17299/>10); ditto, small satellite hill north-west of main hill (V 16034/>10); Phnom Sor Sear (V 15918/>10); Phnom Teuk Thom (V 15919/3). Vietnam: Kien Giang Province, Ha Tien Town area: Nui Da Dung, near Ha Tien (V 11428/>10); Nui Thach Dong, near Ha Tien (V 11465/>10).

**Ecology.** Rock surfaces in disturbed to degraded, semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province. Vietnam, Kien Giang Province, Ha Tien Town area. Presumably endemic to the MDL.

### *Hypselostoma dilatatum* Van Benthem Jutting, 1962

Fig. 53 (orange dots).

VAN BENTHEM JUTTING 1962: 5.

**Examined material.** Vietnam: Kien Giang Province, Ha Tien Town area: Nui Thach Dong, near Ha Tien (V 11462/>10 shells); Kien Luong District: Nui Ong (V 15075/>10); Hon Da Lua, east group, the middle (largest) island, west side (V 15076/>10); Hon Lo Coc (V 15077/>10); Nui Nho (V 15074/>10); Nui Son Tra, limestone outcrop along north flank of sandstone hill (V 7958/>10).

**Ecology.** Rock surfaces in disturbed to degraded, semi-deciduous (coastal) woodland and secondary woodland on limestone bedrock.

**Distribution.** Vietnam, Kien Giang Province: Ha Tien Town area, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

### *Hypselostoma discobasis* sp. n.

Fig. 53 (black dot), 66–68.

**Examined material.** Cambodia: Kampot Province, Kampot area: Phnom La'Ang, southeast-end (holotype: NHMUK 20180576, paratypes: V 17073/5 shells).

**Cross diagnosis.** Characterised among *Hypselostoma* by the peripheral ridge around the last whorl, which is furrowed along its upper edge, but grades without a depression into the lower surface of the shell.

**Description.** Shell very small, thin, opaque, brown-corneous, with some whitish growth-lines, to white. Spire high-conical with concave sides; apex somewhat protruding, rounded. Surface rather dull. Whorls: protoconch and first teleoconch whorls convex, penultimate whorl slightly convex to slightly concave, last whorl with an obtuse, distinctly protruding peripheral ridge, immediately above this distinctly concave, then convex and distinctly shouldered, below the periphery slightly convex all the way down to the edge of the umbilical impression, surface inside about flat and with a deep furrow just below the edge; last part of the last whorl detached, with the aperture distant from the spire, slightly upwards directed. Suture deeply impressed. Sculpture: protoconch somewhat granular, with very fine, inconspicuous, well-spaced spiral threads; teleoconch with unevenly spaced, flat growth-lines, over most of the shell surface with inconspicuous, low, obtuse, somewhat unevenly spaced very thin riblets in between; spiral sculpture hardly predominant over the radial riblets, rather fine, somewhat oblique, moderately and somewhat unevenly spaced, but more densely placed towards the periphery, wavy, thin threads. Aperture free, with the parietal edge widely distant from the previous whorl, slightly tilted upwards with regard to the coiling axis, approx. elliptic to obtusely rectangular, free portion of the spire not narrowed towards the aperture, then abruptly expanding; teeth 8–9: 1 distinct, high, long lamella in angular position which starts deep inside the aperture and continues to almost the edge of the peristome, and which is rounded in profile, 2–3 low, long suprapalatal lamellae which start as short, low, slightly bulbous lamellae, and then continue, with or without a small interruption, as low lamellae of somewhat irregular height and thickness, 1 long, rather high palatal lamella, 1 similar, but shorter and lower infrapalatalis, 1 still lower and shorter infracolumellaris, 1 rather long and high columellaris, and 1 rather short and low parietalis which, deep inside the aperture, runs parallel to the palatalis. Peristome rather abruptly spreading, thin, with a slight convexity on the upper palatal side, close to the edge, corresponding with an indentation on the outside. Umbilicus open, wide, with less than two whorls visible inside. Dimensions: height of shell 2.5–3.0 mm; width 3.3–3.8 mm; height of spire (excluding free portion of the last whorl) 2.2–2.8 mm; width 2.0–2.5 mm; h/w 1.05–1.12; umbilicus 0.8–1.2 mm wide, which is 40–48% of the spire width; number of whorls 5 1/8–5 7/8; height and width aperture 1.2–1.3 mm.

**Ecology.** Rock surfaces in disturbed to degraded, semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Cambodia, Kampot Province, Phnom La'Ang. Presumably a site endemic species.

**Etymology:** *diskos* (Greek) – plate, *basis* (Greek) – basis

***Hypselostoma rupestre* Van Benthem Jutting, 1962**

Fig. 53 (yellow dots).

VAN BENTHEM JUTTING 1962: 6.

**Examined material.** Vietnam: Kien Giang Province, Ha Tien Town area: Nui Da Dung, near Ha Tien (V 11429/>10 shells); Nui Thach Dong, near Ha Tien (V 11463/1); Kien Luong District: Nui Chau Hang (V 15088/>10); Nui Nai (V 15079/>10); Nui Trau, north end, remnant of hill after quarrying (V 15086/>10); Hang Cay Ot (V 15089/>10); Hon Lo Coc (V 15081/>10); Nui Ba Tai (V 11500/>10, V 9981/>10, V 9958/>10); ditto, east flank (V 7939/9); Nui Bai Voi, east flank, large doline approx. half-way along length of hill (V 11259/>10); ditto, north part (Nui Mo So), Hospital Cave area (V 11294/>10); ditto, north part (Nui Mo So), Hospital Cave area, large doline (V 10018/5); ditto, north part (Nui Mo So), northwest and east flanks (V 9942/>10); ditto, southwest flank, rocky, locally steep limestone slope (V 15087/>10); ditto, west flank just below widest part of the hill (V 15083/6); Nui Hang Tien (V 10015/>10); Nui Khoe La, north remnant, seaward side (V 15082/>10, V 15078/>10); ditto, small, most seaward limestone outcrop off the main hill (V 15085/>10); Nui Khoe La, south remnant, landward side (V 15084/>10); Nui Chua Hang (= Pagoda Hill), north flank of hill, and west end, slopes bordering temple complex (V 9995/>10); ditto, southeast end of hill, steep sea-facing slope (V 15080/>10).

**Ecology.** Rock surfaces in disturbed to degraded, semi-deciduous woodland and secondary woodland on limestone bedrock.

**Distribution.** Vietnam, Kien Giang Province: Ha Tien Town area, Kien Luong District. Presumably endemic to the Vietnam part of the MDL.

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