

## A new species of *Hemiplecta* Albers, 1850 (Gastropoda, Pulmonata, Ariophantidae) from Sumatra, Indonesia

David P. Cilia<sup>1\*</sup> & John Abbas<sup>2</sup>

<sup>1</sup>29, Triq il-Palazz l-Ahmar, Santa Venera, Malta

<sup>2</sup>8, Jalan Demaga Baru, Muara Angke, Jakarta Utara Pos 14450, Jakarta, Indonesia

\*Corresponding author, e-mail: dpcilia@gmail.com

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**ABSTRACT** The ariophantid *Hemiplecta belerang* sp. nov. from South Sumatra is described in this paper. It is compared with its closest congeners, from which it is geographically and reproductively isolated.

**KEY WORDS** Ariophantidae; *Hemiplecta belerang* n. sp.; Sumatra; Indonesia.

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### INTRODUCTION

The family Ariophantidae Godwin-Austen, 1888 is nested within the limacoid clade of pulmonates and is native to south-east Asia and India (Hausdorf, 2000).

The family includes the genus *Hemiplecta* Albers, 1850, a group of medium to large-sized ground-inhabiting snails (Boonngam et al., 2008; Schilthuizen, 2008), and the Sumatran representatives include *H. abbasi* Maassen, 2009, *H. goliath* van Benthem Jutting, 1959, *H. humphreysiana* (Lea, 1840), *H. obliquata* (Reeve, 1852) and *H. obliqueundulata* van Benthem Jutting, 1959 (see van Benthem Jutting, 1959; Dharma, 2005; Maassen, 2009).

A new species belonging to the genus collected from a forest boundary west of Mount Sekincau in Lampung (Sumatra) is described in this paper.

**ACRONYMS.** Depositories: collection of Barna Páll-Gergely, Mosonmagyaróvár, Hungary (BP); collection of David P. Cilia, Santa Venera, Malta (DC); Field Museum of Natural History, Chicago, Illinois (FMNH); Hebrew University of Jerusalem, Israel (HUJ); collection of John Abbas, Jakarta, Indonesia (JA); Muséum National

d'Histoire Naturelle, Paris, France (MNHN); Natural History Museum, London, United Kingdom (NHMUK); National Museum of Natural History, Mdina, Malta (NMNH); Zoological Department of Tel Aviv University, Israel (TAU); Institut für Evolutionsbiologie und Umweltwissenschaften/ Zoologisches Museum Universität Zürich-Irchel, Switzerland (ZMZ).

Morphology and anatomy. DG = dart gland; DGR = dart gland retractor muscle; D = diameter; E = epiphallus; EC = epiphallic caecum; F = flagellum; GA = genital atrium; H = height; ht = holotype; P = penis; PRM = penial retractor muscle; S = spermatheca; sd = standard deviation; U = umbilicus; V = vagina; VD = vas deferens; x = mean value.

### MATERIALS AND METHODS

11 specimens of the new species were analyzed for key morphological and biometric features of shells and animals.

The mean value of two readings for height, diameter and umbilical width for adult specimens was taken using a dial caliper of a resolution of 50 µm.

Results were rounded off to the nearest 0.1 mm; the umbilical width was measured by inserting the caliper inside the umbilicus and taking into account only the ultimate whorl. Whorls were counted, including the nucleus.

Statistical data was used and compared with peculiar morphological characteristics of other *Hemiplecta* species to allow for differential analysis. Alcohol-preserved specimens were dissected to allow examination of genitalia; for this, the nomenclature of reproductive anatomical structures follows Maassen (2009) and Schileyko (2003). Systematics in the present paper follow Bouchet & Rocroi (2005).

## RESULTS

### SYSTEMATICS

Superfamily Helicarionoidea Bourguignat, 1877

Family Ariophantidae Godwin-Austen, 1888

Subfamily Ariophantinae Godwin-Austen, 1888

Genus *Hemiplecta* Albers, 1850

Type species *Helix humphreysiana* Lea, 1840

#### *Hemiplecta belerang* n. sp.

EXAMINED MATERIAL. Holotypus, limits of forest on Mount Sekincau, north Lampung, south Sumatra, Indonesia (-05°01'15"N, 104°15'37"E), at an altitude of c. 1000m above sea level, leg. J. Abbas (NHMUK 20120045). Paratypes (10 specimens), same data as holotype: DC RG1828 (1 specimen); HUI 53491 (1 specimen); JA unreg. (1 specimen); NHMUK 20120046 (2 specimens); MNHN 25050 (2 specimens); NMNH unreg. (1 specimen); FMNH 328341 (1 specimen); BP unreg. (1 specimen).

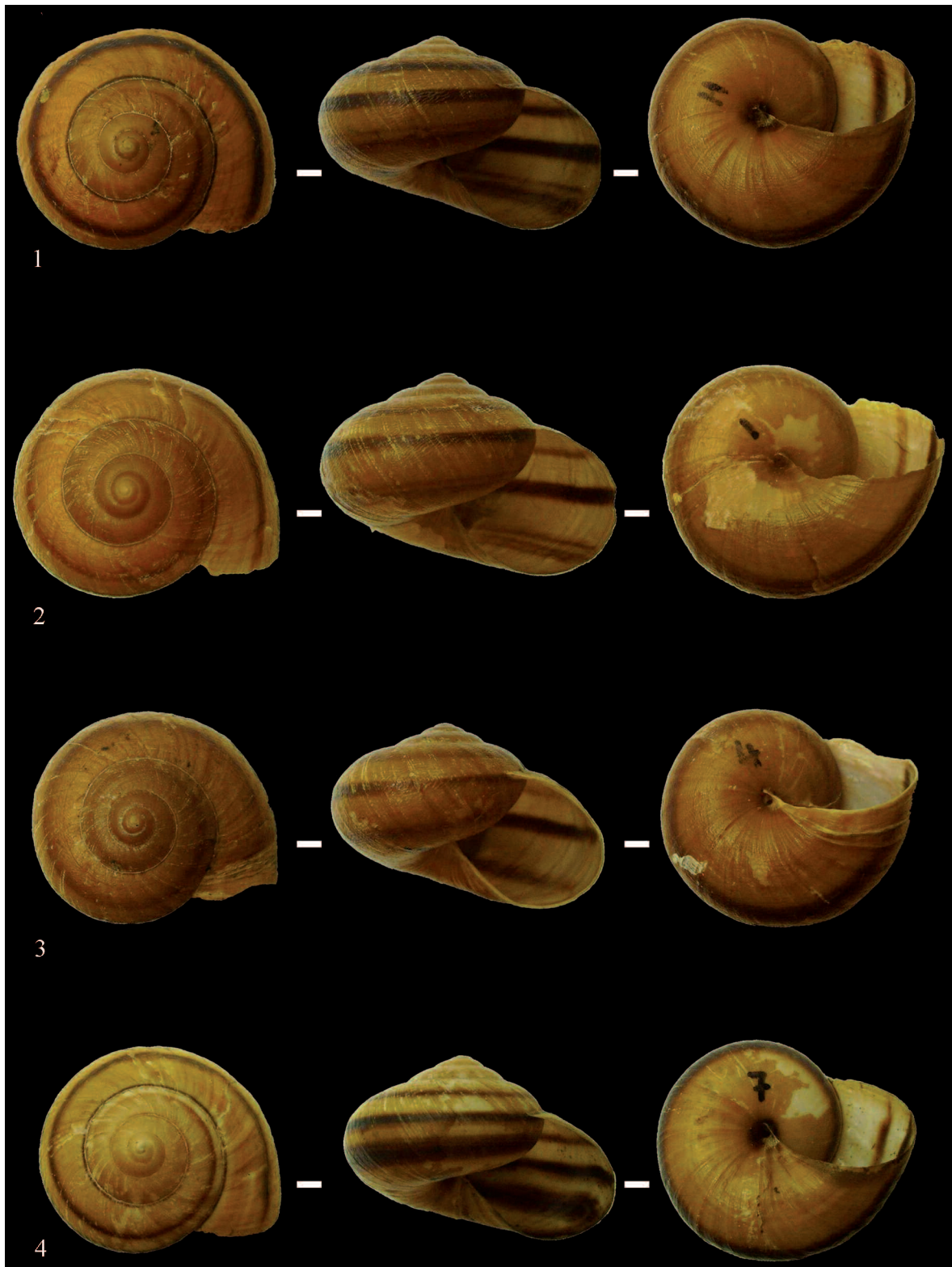
DESCRIPTION OF HOLOTYPE. Shell dextral, 38 mm wide, 26 mm high, well-rounded and thin shell, more wide than tall (Fig. 1). Pale yellow-brown base colour with a beige periostracum, with three narrow dark brown spiral stripes, the middle of which lies at the periphery of the whorls. The upper boundary of the central band coincides with a very slight thickening on the shell, and is concealed within the shell from the penultimate whorl inwards; the uppermost band is only evident on the outer

couple of whorls, beyond which it fades into the base colouration. The lowermost band is the faintest of the three. Whorl number is 5.5, and microsculpture consisting of intricate rugose malleation with a slight emphasis on concentric furrows characterizes the outermost 1.5 whorls. Towards the aperture, especially on the ventral side, faintly impressed growth striae with highly irregular spacing and prominence become more evident than these spiral furrows. Low-profile apex and moderately convex whorls, the suture between which is delineated by a very thin dark brown band mostly discernible on the final whorl. Very small umbilicus, about 4% of the maximum diameter of the shell, containing an insertion of the columellar side of the peristome, flushed with a dark brown that abruptly fades out onto the ventral side. Aperture an oblique oblong except for its columellar attachment, which in apertural view departs in a diagonal straight line from the umbilicus before rounding off sharply. Peristome interrupted, thin, non-reflected and with very slight, homogenous thickening. Internal aspect white with a pearly lustre, the three main brown bands showing through.

Animal. Orange-brown body with dark brown foot, and grey to black tentacles with a very pale pink-orange tip.

Genitalia (Figs. 5-8). The right ommatophoral retractor crosses the genitalia, running between the male and female genital tracts. The penis is cylindrical and much shorter than the epiphallus, with its inner wall featuring several tubercles (Fig. 6).

The penial papilla is very short (Fig. 7). At the distal part of the penis, just before the penial papilla, the tuberculated inner surface is crinkled (Fig. 7). This crinkled structure is not visible from the outside, and the penial sheath remains smooth. The penial retractor inserts at a slender and rather long caecum halfway along the epiphallus. The retractor is about 2.5 times longer than the epiphallic caecum. There are high parallel folds running on the inner wall of the epiphallus, with lower folds in between (Figs. 7, 8). The flagellum is short and conical. The linear folds of the inner surface of the epiphallus became rather irregularly wrinkled in the flagellum (Fig. 8). There is a slender axial thread in the lumen of the flagellum attached at the end of the flagellum (Fig. 8). The vas deferens enters the epiphallus laterally. The vagina is about as long as the penis.



Figures 1-4. Shell of *Hemiplecta belerang* sp. nov., limits of forest on Mount Sekincau, north Lampung, south Sumatra, Indonesia (-05°01'15"N, 104°15'37"E). Fig. 1: holotype (NHMUK 20120045). Fig. 2: paratype 1 (FMNH 328341). Fig. 3: paratype 4 (DC RG1828). Fig. 4: paratype 7 (MNHN 25050).

The spermatheca is long and thin, not conspicuous compared to the rest of the structure, while the dart gland is extremely long and thick, with a short retractor muscle attached at its end.

Radula (Figs. 9-11). Teeth packed in neat, slightly undulating rows. The central teeth are flat and ovate, ending in a blunt “V”-shape, and about 75 µm tall and 25 µm wide (Fig. 10). Marginal teeth are about half as wide and somewhat more pointed, in profile vaguely resembling a very flattened “W”-shape (Fig. 11). Transitional lateral teeth are present in between the two.

VARIABILITY. The specimens examined are 36-41 mm wide and 25-28 mm high (see Tab. 1 for details; Figs 2-4). The lowermost band on the shell may feature blurred edges, in some instances almost extending to and blending with the central band; however, a colour gradient between the two is present without exception. The shade of colour contained in the umbilicus is not a consistent feature, however, it is always darker than the base colour.

ETYMOLOGY. The name is derived from the Belirang-Beriti volcanic complex, within which the known range of the species occurs. ‘Belerang’ also means ‘sulphur’ in Indonesian, reminding one of the pale yellow-brown base colour of the shell.

DISTRIBUTION AND BIOLOGY. This species is hitherto only known from the type locality, where it

is found around or at the base of small bushes in humid and mossy areas. No individuals occur in the more densely forested parts. Similar to congeners (Mienis, 2010), *H. belerang* is a herbivore and a facultative detritivore.

COMPARATIVE NOTES. The shell of the new species is typical *Hemiplecta*, but smaller than all other species yet known from Sumatra. The largest, which is *Hemiplecta goliath* van Benthem Jutting, 1959, together with *Hemiplecta humphreysiana* (Lea, 1840) have smoother surfaces, more obvious carinae and rather flat whorls, not to mention completely different forms. From Collinge (1902) it can also be seen that the vagina and oviduct of *H. humphreysiana* are very long, as are the penis, the epiphallus and the vas deferens. *H. abbasi* Maassen, 2009 is darker-coloured with a larger umbilicus (6% of maximum shell diameter in five topotypes studied); anatomically, the new species has longer epiphallic caecum and vas deferens, thinner spermatheca, a narrower spermooviduct and a relatively larger dart sac. Both shell and genital characters make it clear that *H. belerang* and *H. abbasi* are more closely related to each other than any of them is to *H. humphreysiana*.

*H. obliqueundulata* van Benthem Jutting, 1959 has two very wide dark brown spiral bands, with the upper one fading towards the suture and lacking clear delineation.

	ht	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10	x
<b>H</b>	26.2	27.5	27.0	24.1	25.0	27.8	27.7	24.7	27.3	25.7	27.2	26.4
<b>D</b>	38.4	39.3	39.0	37.3	37.4	38.7	41.1	37.0	38.9	36.0	39.2	38.4
<b>U</b>	1.7	1.7	1.8	1.3	1.6	1.5	1.5	1.6	1.7	1.5	1.5	1.5
<b>H/D</b>	0.68	0.70	0.68	0.65	0.67	0.72	0.67	0.67	0.70	0.71	0.69	0.69
<b>U/D</b>	0.04	0.04	0.05	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
<b>U%</b>	4.43	4.33	4.56	3.49	4.28	3.88	3.65	4.32	4.37	4.17	3.83	4.12

Table 1. Dimensions of the type specimens of *Hemiplecta belerang* sp. nov. H, D and U are measured in millimetres.

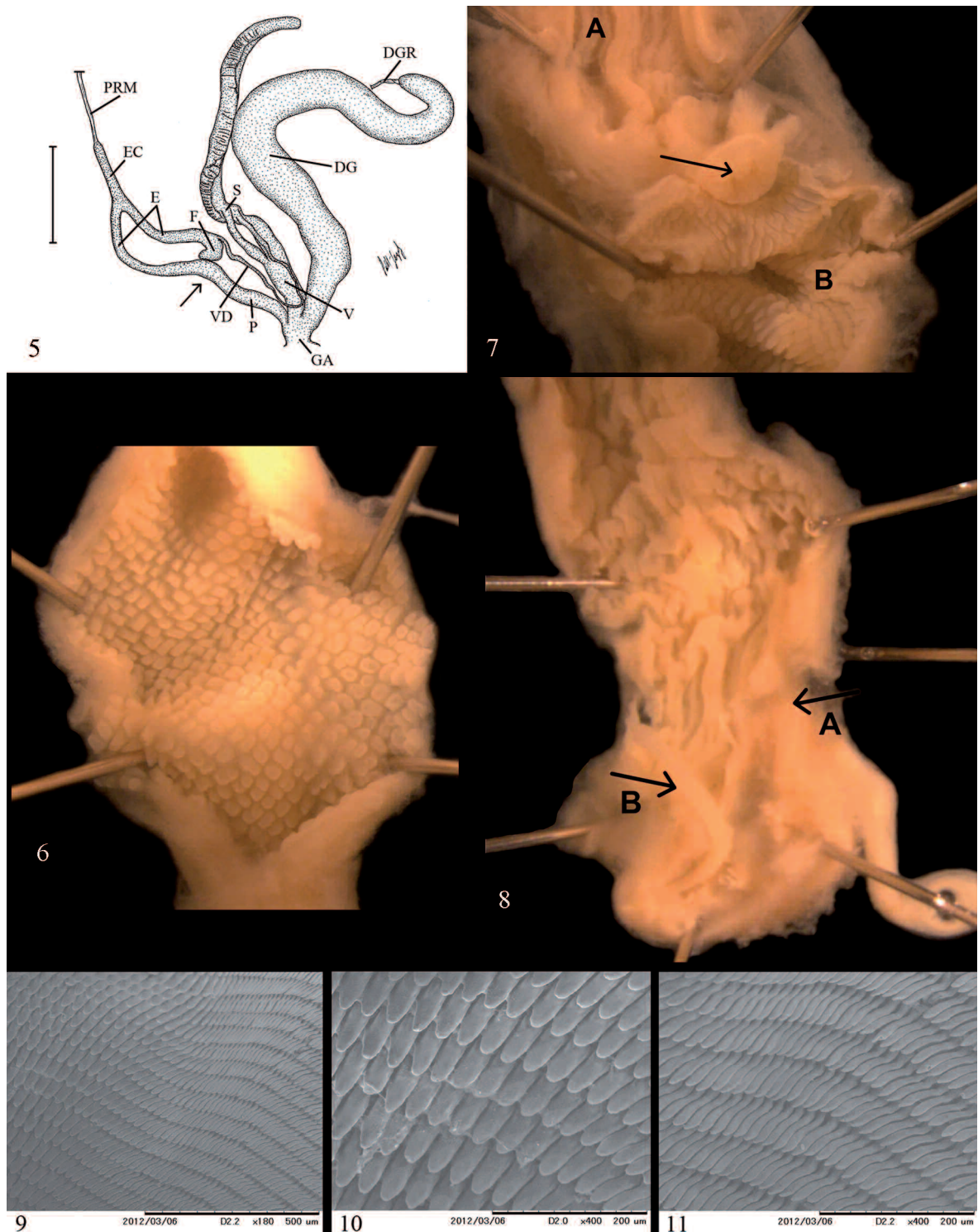


Figure 5. Genital structure of *Hemiplecta belerang* n. sp., arrow indicates of the border between the penis and epiphallus (scale bar represents 10 mm). Figure 6. Inner structure of the penis. Figure 7. Inner structure of the male genital tract at the transition of epiphallus (A) and penis (B), arrow shows the penial papilla. Figure 8. Inner structure of the distal part of the epiphallus and the flagellum, arrow A indicates the border between the two organs, arrow B shows the axial thread. Figures 9-11. Radula of *Hemiplecta belerang* n. sp. Fig. 9. Central teeth and marginal teeth, showing transitional elements. Fig. 10. Central teeth. Fig. 11. Marginal teeth.

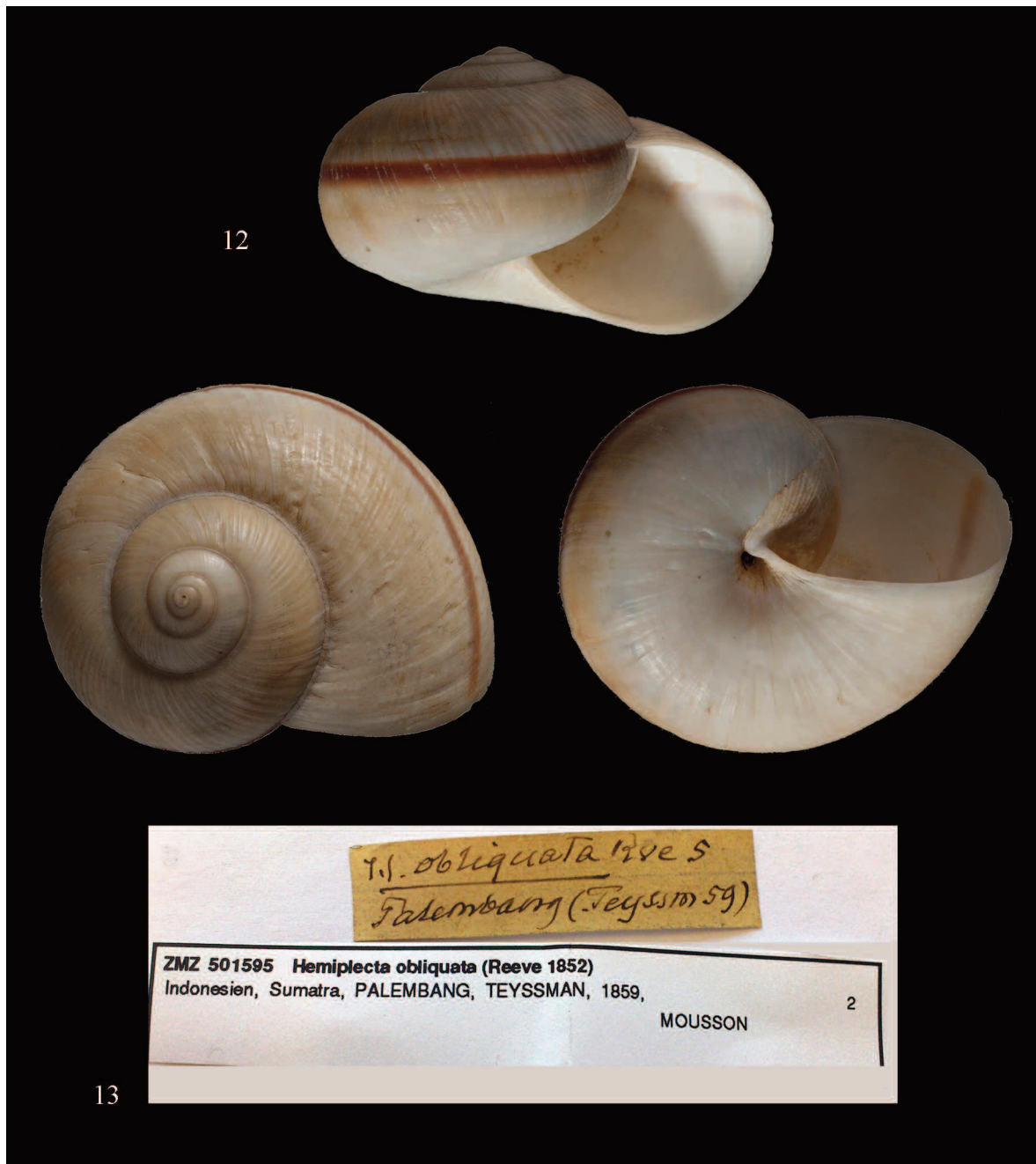


Figure 12. Shell of *Hemiplecta obliquata* (Reeve, 1854), Palembang, Sumatra, Indonesia: the larger specimen from Mousson's collection, collected by Teysman in 1859 (ZMZ 501595) and (Fig. 13) original and current labels for the specimen.

In this species, the umbilicus is larger (6% of maximum shell diameter in six specimens studied), the apical whorls have a dark colour, and the surface is highly uneven and rough.

The aperture is clearly more elongated laterally than in the new species. *H. belerang* and *H. abbasi*

are not sympatric, with *H. obliqueundulata*'s range commencing 200 km towards the northwest in the same mountain range.

A species with affinities to *H. obliqueundulata* is *H. obliquata* (Reeve, 1854). *H. obliquata* was originally described from Borneo in the genus *Helix*

(Reeve, 1854: pl. 74, fig. 384). The single figure, reproduced by Pilsbry (1886: p.76, pl. 21, fig. 16), shows a pale whitish specimen with a periphery “encircled by a chestnut band pale-edged along the upper side” and a very faint trace of a wide, pale brown band above it, though this is not mentioned in the accompanying text.

Martens (1867: p. 235; 1881: p. 1, pl. 1, figs. 1-3) reiterates this (“flavido-alba, fascia peripherica sat angusta obscure castanea”) and also mentions the pale brown band, from bleached specimens (“Beide Exemplare in Mousson's Sammlung sind etwas verbleicht”) collected from Palembang (Sumatra) by Teysmann in 1859 to be deposited in Mousson's collection.

In the latter work he also illustrates three aspects of one shell – off-white, with regular ribbing, and a relatively wide umbilicus. These two specimens are to be nowadays found in Mousson's collection at the Zoological Museum of the University of Zurich; their maximum diameters are of 50.3 mm and 53.8 mm and their heights are of 33.6 mm and 34.2 mm respectively (Figs. 12-13).

A taxon described from a single specimen from Hujung, in south Sumatra at an altitude of 2 km, is *H. hoodjongensis* (Smith, 1887). This species is about as large as *H. obliquata* (10 mm larger than *H. belerang* in any direction) and similarly globose, but with a higher spire and two very-well defined brown peripheral striae, central and adapical. The picture in Kobelt (1905: pl. 261, fig. 1) shows this altogether more globose shell as having regularly spaced axial striae. In any case, van Benthem Jutting (1959) regards this specimen as a synonym of *H. obliquata*.

In the authors' opinion, *H. abbasi*, *H. belerang*, *H. hoodjongensis*, *H. obliquata* and *H. obliqueundulata* may represent a lineage now restricted to high altitudes as relict populations, descended from a common ancestor that inhabited the Sumatran mountain chain when different abiotic conditions were predominant.

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