

VIETNAMESE CLAUSILIIDAE (GASROPODA: PULMONATA): NEW TAXA AND NOVEL DISTRIBUTION DATA

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Abstract Based on materials from recent field trips *Grandinenia gabijakabi* Grego & Szekeres sp. nov. (from Quang Binh Province), *Grandinenia steffeki* Grego & Szekeres sp. nov. (from Nghe An Province), *Oospira abstrusa ginkae* Grego & Szekeres subsp. nov. (from Dien Bien Province), *Oospira naggsi* Luong & Szekeres sp. nov. (from Dong Nai Province) and *Phaedusa* (P.) *abletti* Pham & Szekeres sp. nov. (from Dien Bien Province) are described as new taxa. The re-discovery and exact localities of *Oospira bouddah* (Bavay & Dautzenberg), *Formosana* (F.) *coudeini* (Bavay & Dautzenberg) and *Liparophaedusa pseudaugani* (Dautzenberg & Fischer) are also reported. The relationship between the *Garnieriinae* genera *Neniauchenia* Nordsieck and *Grandinenia* Minato & Chen is re-evaluated, and the geographical distribution of Vietnamese clausiliids is discussed.

Key words Clausiliidae, taxonomy, zoogeography, Vietnam

INTRODUCTION

The seminal publications of Arthur Bavay, Philippe Dautzenberg and Henri Fischer had provided substantial information on Vietnamese Clausiliidae by 1910. Their material originated mostly from the northern and northeastern parts of Tonkin, northern Vietnam. Compared to other regions of Vietnam and Southeast Asia, the Clausiliidae fauna in this area of Tonkin is particularly diverse, comprising several endemic genera and species. After many decades of very moderate research activity, the early 21st century has brought renewed interest in the clausiliids of Vietnam. The publications of Nordsieck (2002a, 2002b, 2003, 2010, 2011), Maassen & Gittenberger (2007), Grego & Szekeres (2011) and Schileyko (2011) described several new taxa and clarified the status of many others. Here we wish to contribute to the knowledge on Vietnamese clausiliids by describing the findings of recent collections, which were conducted by Hao Van Luong in 2010 and 2013, members of two Natural History Museum (London) Expeditions in 2008 and 2012, Jozef Grego and Jozef Šteffek (Banská Štiavnica) in 2012, and András Hunyadi (Budapest) in 2012. In addition to finding new taxa, these field trips also resulted in the re-discovery of some species that had not been collected

since their descriptions more than a century ago.

The material used in this work can be found in the collections of the Natural History Museum, London (NHMUK) and the Vietnam National Museum of Nature, Hanoi (VNMN), as well as in the private collections of Jozef Grego, Banská Bystrica (GR), András Hunyadi Budapest (HU), and Miklós Szekeres, Szeged (SZ).

SYSTEMATICS

Clausiliidae Gray, 1855

Garnieriinae C Boettger, 1926

Grandinenia Minato & Chen, 1984

Type species: *Steatonenia mirifica* Chen & Gao, 1982

The diagnostic shell features of *Grandinenia* were assessed by Nordsieck (2002b) and since then several new species have been described from southern China (e.g. Chang, 2004a, 2004b; Nordsieck, 2005, 2007, 2012; Grego & Szekeres, 2011), demonstrating a wide range of morphological diversity within *Grandinenia*. As a result, the delimitation of *Grandinenia* from *Neniauchenia* Nordsieck, 2002 [type species: *Clausilia* (*Garnieria*) *rugifera* Möllendorff, 1898], which had been based on minor shell characters, mainly differences between the subcolumellar lamellae and

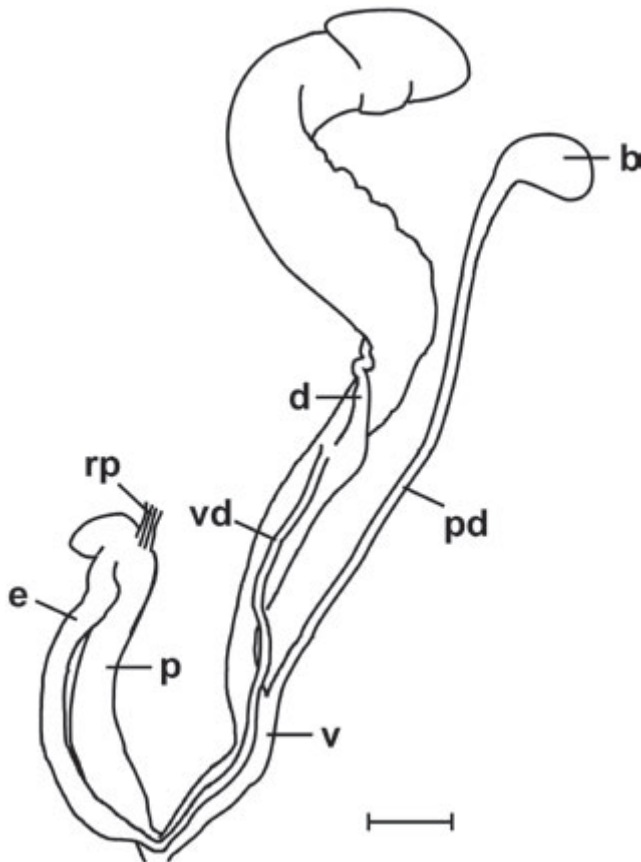


Figure 1 Genitalia of *Grandinenia steffeki* Grego & Szekeres sp. nov.; **b** bursa copulatrix, **d** diverticulum, **e** epiphallus, **p** penis, **pd** pedunculus, **rp** retactor penis, **v** vagina, **vd** vas deferens. Scale bar=2 mm.

the basal plicae (Nordsieck, 2002b), became uncertain. In line with this similarity of shell morphology we found that the genital structure of *Grandinenia steffeki* Grego & Szekeres sp. nov. (Fig. 1), a Vietnamese species with *Neniauchenia*-type lamellae and plicae, agrees with that of *Grandinenia* (Szekeres, 1998; Chang, 2004a). Therefore we consider *Neniauchenia* a junior synonym of *Grandinenia*, a genus that is distributed from southern Laos to the northwestern part of Guangdong Province in China. In Southeast Asia it includes the following species: *G. amoena* (Nordsieck, 2002), *G. ardouiniana* (Heude, 1885), *G. dautzenbergi* (Morlet, 1892), *G. rugifera* (Möllendorff, 1898), *G. tonkinensis* (Nordsieck, 2010), and the two new species described below.

Grandinenia gabijakabi Grego & Szekeres sp. nov.

Fig. 2

Differential diagnosis Medium-size *Grandinenia* differing from other Southeast Asian species of



Figure 2 *Grandinenia gabijakabi* Grego & Szekeres sp. nov., holotype (NHMUK 20140654), 31.2 mm.

the genus by its slender, decollated shell of uniform dark colour. From the superficially similar *Ptychauchenia panhai* Nordsieck, 2010 it can be distinguished by the more exposed, deep-reaching lamella inferior.

Type material Holotype: Vietnam, Quang Binh Province, Quang Ninh District, along the Ho Chi Minh Highway at the NW perimeters of Long Son Village (17°13'23.2" N 106°26'48.1" E), 50 m, leg. J. Grego & J. Šteffek 30.03.2012 (NHMUK 20140654).

Description The slender, uniformly dark brown, decollated shell of 5½ whorls is covered by dense straight striae, which become stronger, more widely spaced and less regular towards the neck. A weak crest is clearly visible at the base of the neck. The circular, protracted peristome has a wide, flat, whitish margin. The lamella superior is well emerged at the aperture, then decreases in height toward its smooth transition to the lamella spiralis. The relatively high positioned lamella inferior bends upward before terminating at the aperture. Inward it reaches deep, forming a thick vertical plate parallel with the superior-spiralis fusion. The lamella subcolumellaris is retracted, but a long part of it is visible in oblique view through the aperture. The plica principalis runs from the dorsolateral side to behind the aperture. It stands separate from the dorsal-dorsolaterally positioned, almost semi-circular plica superior-lunella fusion. At the lower end this complex is also fused to a short basal plica, having only residual anterior and weak posterior

parts. The clausilium plate of the holotype was lost.

Measurements Holotype: shell height 31.2 mm, shell width 6.3 mm, aperture height 7.2 mm, aperture width 7.0 mm.

Etymology The new species is named after the enthusiastic speleologist Gabriel (Gabi) Jakab of Plešivec, Slovakia, who in 2012 participated in the field trip during which this clausiliid was discovered, and who tragically passed away later that year.

Habitat The holotype was found as an empty shell buried under 10 cm of soil at a vegetation-covered cave entrance near the Ho Chi Minh Highway, northwest of Long Son, 200 m south-east of the Cau Khe Cac Bridge. At the same locality *Oospira duci* Maassen & Gittenberger, 2007 was also collected.

Remarks By its dark-coloured, densely striate whorls and more elongate shell *G. gabijakabi* sp. nov. substantially differs from other Southeast Asian species of the genus. By contrast, its appearance is quite similar to that of *Ptychauchenia panhai* Nordsieck, which also occurs in Quang Binh Province. (All confirmed records of *P. panhai* are from here, thus the designation of Cuc Phuong National Park in Ninh Binh Province as its type locality was apparently erroneous.) This clausiliid, however, can easily be distinguished from the new species by its less exposed lamella inferior that becomes fused with the lamella superior-spiralis complex, and by the deeper situated and straighter lunella that joins a long basalis.

The shell of the holotype had been found split across the penultimate whorl, and the matching parts were re-joined subsequently.

Grandinenia steffeki Grego & Szekeres sp. nov.
Fig. 3

Differential diagnosis Medium-size *Grandinenia* with a uniformly dark-coloured, non-decollated shell with an elongated conical apex and an undulate parietal wall at the neck.

Type material Holotype: Vietnam, Nghe An Province, Ky Son District, karst plateau above Muong Long Village (19°31'45.8" N 104°20'41.2" E), 1300 m, leg. J. Grego & J. Šteffek 02.04.2012



Figure 3 *Grandinenia steffeki* Grego & Szekeres sp. nov., holotype (NHMUK 20140654), 35.5 mm.

(NHMUK 20140655). Paratypes (two body-whorl fragments): same locality and collection data (GR/1, SZ/1).

Description The chestnut brown shell of 9½ whorls has a long, gradually tapering apex. The whorls are smooth and glossy with only diffuse fine striae, except for the neck where the parietal wall becomes opaque and irregularly wrinkled. A clearly developed basal crest is present. The aperture is large and rounded, and its dark brown non-deflexed margin is retracted at the sinulus. The lamella superior is strong, its height decreasing toward its smooth fusion with the lamella spiralis. The lamella inferior is well visible at perpendicular view in the aperture. Inward, it emerges and forms a vertical plate before becoming parallel with the spiralis. The lower end of the lamella subcolumellaris emerges at mid-height of the aperture, and a long part of it is visible in oblique view. The plica principalis reaches from the dorsolateral side to behind the aperture. It stands separate from the moderately bent, dorsal-dorsolateral lunella complex that has only a rudimentary plica superior part. The lower end of the lunella is separate from the perpendicularly positioned basalis, which has long anterior and posterior parts. Most of the relatively wide clausilium plate can be viewed through the aperture. It has an inward-bent parietal edge and a drawn-out, pointed tip.

The genital organs (Fig. 1) show all features characteristic for *Grandinenia*, as assessed by Nordsieck (2012). Prominent among these are the long, tubular pedunculus of the bursa copulatrix,

and the diverticulum that inserts at the free oviduct.

Measurements Holotype: shell height 35.5 mm, shell width 6.8 mm, aperture height 6.8 mm, aperture width 6.8 mm. Paratype (only the fragment with intact aperture): aperture height 7.8 mm, aperture width 7.4 mm.

Etymology The species is named after the ever helpful and untimely deceased Jozef Šteffek, a dedicated malacologist of Banská Štiavnica, Slovakia, who participated in the discovery of this clausiliid.

Habitat The live specimen was found together with *Oospira vanbuensis pocsi* (Szekeres, 1969) at a depth of about 5 cm in moist soil, among vegetation of a forest clearing at a limestone slope.

Remarks *Grandinenia steffeki* sp. nov. differs from all other species of the genus by a unique combination of the shell characters. Its long apical part resembles Chinese species [e.g. *G. fuchsi* (Gredler, 1883)], whereas the wrinkled parietal wall is shared with Vietnamese [*G. ardouiniana* (Heude, 1885)] and Laotian [*G. rugifera* (Möllendorff)] species.

Phaedusinae AJ Wagner, 1922

Oospira Blanford, 1872

Type species: *Clausilia philippiana* Pfeiffer, 1847

Oospira abstrusa ginkae Grego & Szekeres
subsp. nov.

Fig. 4

Differential diagnosis Differs from other species of *Oospira* by its papillate suture, and from *O. abstrusa abstrusa* (Szekeres, 1970) by its larger, more elongate shell, and its wider-spaced and stronger sutural papillae.

Type material Holotype: Vietnam, Dien Bien Province, Dien Bien District, Tay Trang (Na U), entrance of the Pa Thom Cave, leg. H. V. Luong 06.03.2010 (NHMUK 20140656). Paratypes: same locality and collection data (VMNH/4); same locality, leg. H. V. Luong 08.06.2013 (VMNH/4 preserved in ethanol, GR/1, SZ/1).

Description The slender, yellowish light-brown shell consists of 9 to 11 $\frac{1}{3}$ whorls. The strong and dense striae of the apex become smoother on



Figure 4 *Oospira abstrusa ginkae* Grego & Szekeres subsp. nov., holotype (NHMUK 20140656), 16.3 mm.

toward the last whorl, and then stronger, wider and less regular over the neck. Below the suture strong, wide-spaced papillae are formed (13 to 15 along the last whorl). The elongated ovoid aperture has a thickened, moderately deflexed margin. The lamella superior becomes very low before its fusion with the outer end of the lamella spiralis. The lamella inferior ends well behind the peristome margin, and in front view its weakly emerged terminal part is inconspicuous. The recessed lamella subcolumellaris is not visible through the aperture. The plica principalis initiates on the ventrolateral side and terminates behind the peristome. Below it there are five to seven lateral-dorsolateral plicae, of which the upper- and lowermost ones are longer than those between them. The clausilium plate cannot be viewed through the aperture.

Measurements Holotype: shell height 16.3 mm, shell width 3.7 mm, aperture height 3.7 mm, aperture width 2.6 mm. Paratypes: (n=10): shell height 16.0–18.7 mm, mean±standard deviation (SD) 17.4±1.1 mm; shell width 3.5–3.8 mm, mean±SD 3.6±0.1 mm; aperture height 3.2–3.9 mm, mean±SD 3.7±0.2 mm; aperture width 2.5–2.7 mm, mean±SD 2.6±0.1 mm.

Etymology The subspecies is named after Jozefina (Ginka) Gregová, the wife of J. Grego.

Habitat Live specimens of the new subspecies were found around the cave entrance covered by broadleaf evergreen secondary forest, among leaf litter accumulated under limestone cliffs. From

the same habitat *Phaedusa (P.) abletti* sp. nov. and *Phaedusa (P.) paviei* (Morlet, 1892) were also collected.

Remarks The nominotypical subspecies *O. a. abstrusa* (Szekeres) has been known from Ninh Binh and Thanh Hoa Provinces (Nordsieck, 2011), about 280 km east-southeast of the type locality of the new subspecies. The new subspecies differs from *O. a. abstrusa* in its slender shape, larger size, and its stronger, wider spaced papillae along the suture.

Oospira bouddah (Bavay & Dautzenberg, 1912)
Fig. 5

This small dextral species was described by Bavay & Dautzenberg (1912) from Ile de la Table (= Tra Ban Island, Quang Ninh Province) and Chiné (= Chi Ne, Hoa Binh Province). As it was not subsequently re-collected, and was also not found during more recent field trips to these regions, its geographical distribution remained uncertain, and was still expected to be found in Quang Binh Province (Nordsieck, 2011; Schileyko, 2011). In 2008 *O. bouddah* was re-discovered in the Ba Vi National Park (in Ha Noi Municipality), where it was collected live from leaf litter along the path from the visitor centre to the Tho Bac Ho Temple (leg. F. Naggs, material in the NHMUK collection), and then found again nearby (21°3'33.2" N 105°21'58.9" E, 1220–1250 m, leg. A. Hunyadi) in 2012. So far this is the only precise recent record of this species. The Ba Vi National Park is quite



Figure 5 *Oospira bouddah* (Bavay & Dautzenberg), Vietnam, Ha Noi Municipality, Ba Vi National Park, beneath the Den Tho Bac Ho memorial (21°3'33.2" N 105°21'58.9" E, 1220–1250 m), 14.5 mm.



Figure 6 *Oospira naggsi* Luong & Szekeres sp. nov., holotype (NHMUK 20140657), 27.4 mm.

far from Tra Ban Island (~220 km) or Chi Ne (~75 km), thus it seems possible that the type material in fact originated from elsewhere.

Oospira naggsi Luong & Szekeres sp. nov.
Fig. 6

Differential diagnosis Large *Oospira* with concave outline and pointed apex, differing from *O. vanbuensis* (Bavay & Dautzenberg, 1899) by its strongly downward-bent lamella inferior, more exposed lamella subcolumellaris, and deeper positioned palatal plicae.

Type material Holotype: Vietnam, Dong Nai Province, eastern part of the Cat Tien National Park near Bau Sau (Crocodile Lake, 11°27'39" N 107°20'24" E), 140 m, leg. Natural History Museum Expedition 14.02.2012 (NHMUK 20140657). Paratypes: same locality and collection data (NHMUK 20140658/3, VNMN/4, GR/1, SZ/1); Vietnam, Dong Nai Province, Cat Tien National Park, at a cave entrance along the Forest Trail (11°27'5.4" N 107°21'34.2" E), leg. Natural History Museum Expedition 14.02.2012 (NHMUK 20140659/3, VNMN/3).

Description The spindle-shaped brown shell consists of 9 to 9½ whorls. The pointed apex is somewhat extended, so that it gives the shell

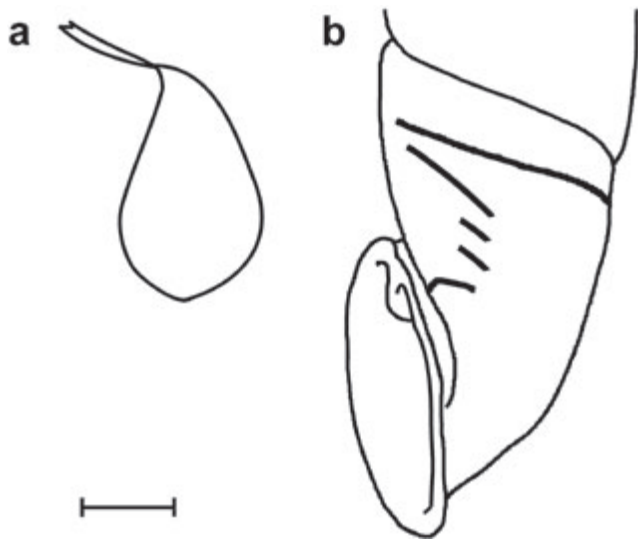


Figure 7 Palatal plicae (a) and clausilium (b) of *Oospira naggsi* Luong & Szekeres sp. nov. Scale bar=2 mm.

a concave outline. The bulging whorls have a glossy surface with densely spaced fine striae, which become stronger over the neck and the rounded basis. The light purple-brown triangular aperture has a broad, flattened, uninterrupted margin. Inside the aperture the strong and marginal lamella superior makes a straight transition into the less emerged lamella spiralis. The lamella inferior ends close to the peristome margin, well below half the height of the aperture. Inward it ascends in a straight line, and then bends close to, and runs parallel with, the spiralis. The well-emerged lamella subcolumellaris reaches the peristome margin immediately below the lamella inferior. Of the lamellae inferior reaches inside beyond one complete whorl, whereas spiralis and subcolumellaris end somewhat shallower, at about the same depth. The plica principalis starts ventrally and reaches to the middle of the neck. Below it, on the lateral-ventrolateral side, there are four or five palatal plicae, of which the upper- and lowermost ones are longer than those between them (Fig. 7a). In old specimens a callus can develop around the palatal plicae, appearing as a lighter patch over the translucent shell wall. The clausilium is not visible through the aperture. Its deltoid-shaped plate widens toward the blunt tip (Fig. 7b).

Measurements Holotype: shell height 27.4 mm, shell width 5.6 mm, aperture height 6.9 mm, aperture width 5.1 mm. Paratypes (n=13): shell height

24.2–30.8 mm, mean±SD 27.4±1.3 mm; shell width 5.5–6.6 mm, mean±SD 5.8±0.3 mm; aperture height 5.8–7.0 mm, mean±SD 6.4±0.4 mm; aperture width 4.5–5.7 mm, mean±SD 5.0±0.3 mm.

Etymology The species is named after Fred Naggs, biodiversity and conservation officer of the Natural History Museum in London, who led the 2012 Natural History Museum Expedition to Vietnam, was instrumental in discovering this new clausiliid, and set up the current collaboration between the Natural History Museum, the Vietnam National Museum of Nature, and the Hoang Lien National Park.

Habitat The specimens were found among leaf litter and under logs in lowland rain forest.

Remarks The type locality of the new species is quite isolated in Southeast Asia, lying about 500 km south and 600 km east-southeast of the nearest clausiliid occurrences at Da Nang and Chantaburi (Thailand), respectively. Accordingly, *O. naggsi* sp. nov. seems to be more closely related to the *Oospira* species of Sumatra and the Malay Peninsula, e.g. *O. salacana* (Boettger, 1890) and *O. penangensis* (Stoliczka, 1873), than to those of Vietnam, e.g. *O. vanbuensis* (Bavay & Dautzenberg). Despite the similarities, it differs from all other species of the genus by its strongly downward-bent lamella inferior that ends just above the marginal subcolumellaris.

Formosana (Formosana) Boettger, 1877

Type species: *Clausilia swinhoei* Pfeiffer, 1865

Formosana (F.) coudeini (Bavay & Dautzenberg, 1899)

Fig. 8

According to the original description (Bavay & Dautzenberg, 1899), this species was collected by Messenger between Lang Son and That Khe (Lang Son Province). However, the failure of finding it during several trips to this region over the past two decades suggests that the type material originated from a different locality. Recently this clausiliid has been re-discovered in the Na Ri District of Bac Kan Province, 2 km south of Ban Dem (22°14'30.4" N 106°0'31.3" E, 640 m, leg. J. Grego & J. Šteffek 06.04.2012, material in the collections GR and SZ), where it was collected in leaf litter under a limestone cliff. To our knowledge, presently this is the only precise recent



Figure 8 *Formosana (E.) coudeini* (Bavay & Dautzenberg), Vietnam, Bac Kan Province, Na Ri District, 2 km S of Ban Dem (22°14'30.4" N 106°0'31.3" E, 640 m), 28.1 mm.

record of this species. The specimens found here are somewhat slimmer and more cylindrical than those of Messager.

Liparophaedusa Lindholm, 1924
Type species: *Clausilia freyi* Bavay & Dautzenberg, 1899

Liparophaedusa pseudaregani (Dautzenberg & Fischer, 1908)
Fig. 9

Only the type series was known of this species, which was collected by Mansuy around Quan-Huyen (= Quang Uyen, Cao Bang Province) at the beginning of the 20th century (Dautzenberg



Figure 9 *Liparophaedusa pseudaregani* (Dautzenberg & Fischer), Vietnam, Cao Bang Province, S periphery of Pac Rao, 3 km from Trung Khanh to Quang Uyen (22°48'57.7" N 106°30'32.0" E, 570 m), 20.4 mm.

& Fischer, 1908). Recently two nearby collection localities of this clausiliid species were discovered near Pac Rao, about 15 km east-northeast of Quang Uyen, namely at 300 m from the Canh Tien junction toward Trung Khanh (22°49'23.1" N 106°30'44.5" E), 530 m, and at 3 km from Trung Khanh to Quang Uyen (22°48'57.7" N 106°30'32.0" E), 570 m, both leg. A. Hunyadi 28.05.2012 (material in the collections HU and SZ). Here live specimens were collected from moist debris under a thick layer of leaf litter. Additionally, *L. pseudaregani* was also found in Guangxi Province, China (Chongzuo Prefecture, Daxin County, near Xialei, leg. H. Yang 2009, material SZ/1), only about 30 km from the two Vietnamese localities.

Phaedusa (Phaedusa) Adams & Adams 1855
Type species: *Clausilia corticina* Pfeiffer, 1842

Phaedusa (P.) abletti Pham & Szekeres sp. nov.
Fig. 10

Differential diagnosis Small *Phaedusa* species with strong sutural papillae and attached peristome.

Type material Holotype: Vietnam, Dien Bien Province, Dien Bien District, Tay Trang (Na U), entrance of the Pa Thom Cave, leg. H. V. Luong 06.03.2010 (NHMUK 20140660). Paratypes: same locality and collection data (VMNH/3, GR/1, SZ/1).

Description The tumid, spindle-shaped shell of 9¼ to 10 whorls has a dark ochre colour. The



Figure 10 *Phaedusa (P.) abletti* Pham & Szekeres sp. nov., (NHMUK 20140660), 13.4 mm.

whorls are covered with striae which, forming a fine reticulate pattern, give the shell a glittering appearance. Toward the neck and the rounded basis the striae become strong and sharp. Below the suture there are strong, sparsely positioned papillae (14 to 17 along the last whorl). The ovoid aperture has a wide, deflexed margin, which at its upper rim is fused to the adjacent whorl. The lamella superior is weakly emerged and short, occasionally represented by only a lump. The lamella spiralis is missing. The well developed lamella inferior descends with a broad turn and bends toward the basis before ending near the peristome margin. The lamella subcolumellaris is retracted, only its end is visible at oblique view in the aperture. The plica principalis is short, extending only about one third of a turn from the dorsolateral side. Dorsolaterally the upper and lower palatal folds are always well recognizable, unlike the few finer plicae between them, which are difficult to notice. Part of the flat clausilium plate is visible through the aperture.

Measurements Holotype: shell height 13.4 mm, shell width 2.9 mm, aperture height 3.4 mm, aperture width 2.6 mm. Paratypes (n=5): shell height 12.1–14.6 mm, mean±SD 13.4±0.9 mm; shell width 3.0–3.4 mm, mean±SD 3.3±0.2 mm; aperture height 3.1–3.7 mm, mean±SD 3.3±0.2 mm; aperture width 2.6–2.9 mm, mean±SD 2.7±0.1 mm.

Etymology The new species is named after Jonathan Ablett, curator of non-marine Mollusca at the Department of Life Sciences, Natural History Museum London, who participated in part of the 2012 Natural History Museum Expedition to Vietnam, and provided valuable help for the authors.

Habitat This clausiliid was found near the cave entrance, together with *Oospira abstrusa ginkae* subsp. nov. and *Phaedusa (P.) paviei* (Morlet).

Remarks This small *Phaedusa* can easily be distinguished from all other species of the genus by its unique, papillate suture. In its size and reduced lamellae it resembles some small subspecies of *P. (P.) lypra* (Mabille, 1887), from which it differs by the attached peristome and the reduced intermediate palatal plicae. Compared to the sympatric and similarly papillate *Oospira abstrusa ginkae* subsp. nov., it has a smaller shell and much more reduced clausiliar structure.



Figure 11 Map of Vietnam, showing the mentioned localities. 1: *Grandinenia gabijakabi* Grego & Szekeres sp. nov., 2: *Grandinenia steffeki* Grego & Szekeres sp. nov., 3: *Oospira abstrusa ginkae* Grego & Szekeres subsp. nov. and *Phaedusa (P.) abletti* Pham & Szekeres sp. nov., 4: *Oospira naggsi* Luong & Szekeres sp. nov., 5: *Oospira bouddah* (Bavay & Dautzenberg), 6: *Formosana (F.) coudeini* (Bavay & Dautzenberg), 7: *Liparophaedusa pseudourengani* (Dautzenberg & Fischer).

ZOOGEOGRAPHICAL COMMENTS

Vietnam has a particularly rich Clausiliidae fauna (Schileyko, 2011) and now numbers about 80 species. The vast majority of these species live in the provinces north of Ha Noi, with the highest diversity in those northeast of the Hong (Red) River. This region of subtropical climate, ragged limestone terrain and patchy forests provided favourable conditions for the evolution of highly endemic taxa, many of which are known only from one or a few localities within the same province. Southward, along the Annamite Mountains, the diversity of species decreases

sharply (Nordsieck, 2011; Schileyko, 2011). The range of the Garnieriinae extends to Quang Binh Province, whereas of the Phaedusinae one species reaches somewhat farther, to the vicinity of Da Nang. Therefore the discovery of *Oospira naggsi* sp. nov. in the Cat Tien National Park of Dong Nai Province was quite surprising. While the few clausiliids of Central Vietnam have a northern origin, this species shows shell features and habitat preference similar to those *Oospira* species that occur in Indonesia and the Malay Peninsula. This suggests that clausiliids colonized Vietnam not only from the north, but also from the southwestern direction, raising the possibility that other Phaedusinae may also be found in southern Cambodia.

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