

Description of the second *Calybium* Morlet, 1892, and the first record of the genus for Vietnam's terrestrial gastropod fauna (Neritimorpha: Helicinoidea: Helicinidae)

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ABSTRACT. This paper described the second species of the genus *Calybium* Morlet, 1892, *Calybium plicatus* sp. nov. was collected in Son Doong Cave, Phong Nha–Ke Bang National Park, Quang Binh Province, Central Vietnam. *Calybium plicatus* sp. nov. has a similar shell shape to *Calybium massiei* Morlet, 1892 but differs in having a smaller shell size, the parietal wall with six evenly spaced parietal lamellae. This discovery represents the first report of the genus *Calybium* in Vietnam.

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Описание второго вида *Calybium* Morlet, 1892, и первая находка рода в составе наземной фауны брюхоногих моллюсков Вьетнама (Neritimorpha: Helicinoidea: Helicinidae)

раковины и наличием шести равномерно расположенных париетальных ламелл на париетальной стенке. Это открытие представляет первую находку рода *Calybium* на территории Вьетнама.

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РЕЗЮМЕ. В данной работе описан второй вид рода *Calybium* Morlet, 1892 — *Calybium plicatus* sp. nov., который был найден в пещере Сон-Донг, национальный парк Фонгня-Кебанг, провинция Куангбинь, Центральный Вьетнам. *Calybium plicatus* sp. nov. имеет схожую форму раковины с *Calybium massiei* Morlet, 1892, но отличается меньшими размерами

Introduction

Helicinidae Férussac, 1822 and a few related families such as Neritiliidae Schepman, 1908, Proserpinellidae Baker, 1923, and Proserpinidae Gray, 1847, represent the earliest branch of gastropods evolved to terrestrial existence [Richling, 2004, 2014; Bouchet *et al.*, 2017]. Helicinidae occur in tropical and subtropical areas of North and South America, Australasia, and the Pacific [Wagner, 1907; Richling, 2014]. Many helicinid genera are widespread, and species-rich, and occupy many habitats, from the forest over limestone and forest floor under leaf litter to limestone cliff environments on offshore islands [Richling, Bouchet, 2013; Richling, 2014]. Their morphology is quite varied and they exhibit a wide range of sizes, from minute snails with a maximum diameter of less than 2 mm to large species with diameters exceeding 25 mm [Dautzenberg, d'Hamonville, 1888; Richling, Bouchet, 2013]. Heli-

cinids are also diverse in Southeast Asia, with representative genera such as *Aphanoconia* Wagner, 1905, *Calybium* Morlet, 1892, *Geophorus* Fischer, 1885, *Geotrochatella* Fischer, 1891, *Sulfurina* von Möllendorff, 1893 [Wagner, 1905, 1907; Zilch, 1979; Inkhavilay *et al.*, 2019].

The genus *Calybium* was described by Morlet and contained a single species, *C. massiei* Morlet, 1892, which was discovered in the area of Khamkeut District, Bolikhamxay Province, Central Laos [Morlet, 1892, 1893; Wagner, 1907]. However, the habitats of this species were not explicitly described by the author, and the type locality was not specifically determined. Recently, Inkhavilay *et al.* [2019] rediscovered *C. massiei* from Tam Mungkorn Cave, Khamkeut District, Bolikhamxay Province, Laos. This finding has further clarified the distribution range of the species. Up to now, more than 130 years since this species was described, no additional information on other species or the biology of the genus *Calybium* was published [Zilch, 1979; Do *et al.*, 2015; Inkhavilay *et al.*, 2019].

During a survey of terrestrial snails in Son Doong Cave, Quang Binh Province, Central Vietnam performed in January 2023, specimens of an unknown *Calybium* species were collected from limestone rocks. Based on these specimens, here we describe a new species and report the genus *Calybium* for the first time to the fauna of Vietnam.

Materials and methods

Collecting area

Son Doong Cave is located in the Phong Nha-Ke Bang cave complex, which is part of the underground system near the Vietnam-Laos border. This cave has a total length of nearly 9 km, with large domes, and a volume of up to 38.5 million cubic meters. There are many large stalactites, up to 80 m high, and more than 200 species of plants have been found in Son Doong Cave, including herbal epiphytes, mosses, vines, shrubs, and small and large trees. The water flowing in the cave erodes and forms a huge underground tunnel. In places where the rock is soft, the upper ceiling collapses, creating large dolines. The climate in the Son Doong Cave fluctuates between 20–25°C.

Species identification and measurements

Specimens were identified following publications by Morlet [1892, 1893], and Wagner [1905, 1907]. The shells were measured with digital vernier calipers to the nearest 0.1 mm. Shell height was measured from the apex to the lowest part of the basal side of the aperture. The shell width was measured at the widest section perpendicular to the coiling axis. Determination of the number of shell

whorls (precision to 0.25 whorl) follows Kerney and Cameron [1979].

Institutional abbreviations:

VNMN, Vietnam National Museum of Nature (Hanoi, Vietnam).

ZVNU: Zoological Collection of Biological Museum, VNU University of Science (Vietnam National University, Hanoi), Vietnam.

Taxonomy

Class Gastropoda Cuvier, 1795
Subclass Neritimorpha Cox, 1960
Order Cycloneritida Frýda, 1998
Superfamily Helicinoidea Férussac, 1822
Family Helicinidae Férussac, 1822
Subfamily Vianinae Baker, 1922

Calybium Morlet, 1892

Calybium Morlet, 1892: 316, 317; 1893: 326, 327.

Calybium – Dautzenberg, 1896: 19; Wagner, 1907: 15; Zilch, 1979: 381.

Type species. *Calybium massiei* Morlet, 1892 (by monotypy).

Diagnosis. *Calybium* is characterized by a dextral, depressed conical, coarse shell, and sharply keeled body whorl. The aperture is parallelogram, the peristome discontinuous, thickened, expanded, and somewhat reflected. Apertural dentition always with six parietal lamellae, other lamellae may be present including one palatal lamella and one basal lamella.

Remarks. Apertural dentition with six lamellae on the parietal wall is always present, distinguishing the genus *Calybium* Morlet, 1892 from all other helicinid genera.

The genus *Geotrochatella* P. Fischer, 1891, with a distribution range in Vietnam, Laos, Thailand, Cambodia, and South China [Pfeiffer, 1863; Morlet, 1892; Wagner, 1907; Inkhavilay *et al.*, 2019], is similar to the genus *Calybium* due to the depressed conical shell and sharply keeled body whorl, coarse dorsal surface with raised riblets or wrinkles, and the almost closed umbilicus, but differs from it by having six lamellae on the parietal wall or maybe other lamellae on the palatal and basal wall [Wagner, 1907; this study].

The shell shape of *Calybium* is somewhat similar to the genus *Geophorus* P. Fischer, 1885, and *Aphanoconia* Wagner, 1905 in general shell shape and closed umbilicus. However, *Calybium* differs from two genera mentioned here in having lamellae on the parietal wall (or maybe lamellae on the palatal and basal wall) [P. Fischer, 1885; Wagner, 1905, 1907].

Calybium massiei Morlet, 1892 (Figs 1, 2B, 2D)

Calybium massiei Morlet, 1892: 316, 317; 1893: 327, pl. 8, figs 2, 2a–d.



FIG. 1. Distribution of *Calybium* Morlet, 1892: blue circle – *Calybium massiei* Morlet, 1892; red triangle – *Calybium plicatus* sp. nov.

РИС. 1. Распространение *Calybium* Morlet, 1892: синий кружок — *Calybium massiei* Morlet, 1892; красный треугольник — *Calybium plicatus* sp. nov.

Calybium masiei [sic] – Wagner, 1905: 369; Wagner, 1907: 15, 16, pl. 2, figs 8–11.

Calybium massiei – Fischer, Dautzenberg, 1904: 45; Inkhavilay *et al.*, 2019: 11, fig. 3B.

Type locality. propè Kham-Keut in Provinciâ Laos dicta (around Khamkeut District, Bolikhamxay Province, Laos) [Morlet, 1892].

Diagnosis. Shell large-sized (up to 20.5 mm), depressed conical, and sharply keeled body whorl; parietal wall with six lamellae, of which the last two lamellae extending close to the callus and quite distinct from the first four lamellae; the end of the columella area strongly thickened, semicircular, and protruded from the surface shell.

Remarks. Specimens of this species were rediscovered in Tam Mungkorn Cave, Khamkeut District, Bolikhamxay Province [Wagner, 1907; Inkhavilay *et al.*, 2019].

Calybium plicatus sp. nov. (Figs 1, 3–5)

Zoobank registration: urn:lsid:zoobank.org:act:D7B00C79-E41F-4274-9F98-E468B1B97C6E

Type material. Holotype, VNMN-IZ 000.002.347, Vietnam, Quang Binh Province, Bo Trach District, Tan Trach Commune, Phong Nha – Ke Bang National Park, Doline 1 area of Son Doong Cave (17°27.51.1'N 106°17.12.7'E), coll. Hoang N.K., 14 January 2023. Paratype: ZVNU.MOL 049 (01 shell with incomplete aperture, and part of last whorl is broken), same data as holotype.

Diagnosis. Shell medium-sized, depressed conical, and sharply keeled body whorl; the calcareous layer on the dorsal side is coarse, strongly undulated and forms evenly spaced domes protruding from the shell surface; parietal wall with six lamellae, of which the sixth very long, curved, and close to the suture; palatal wall with a barrier-shaped lamella that

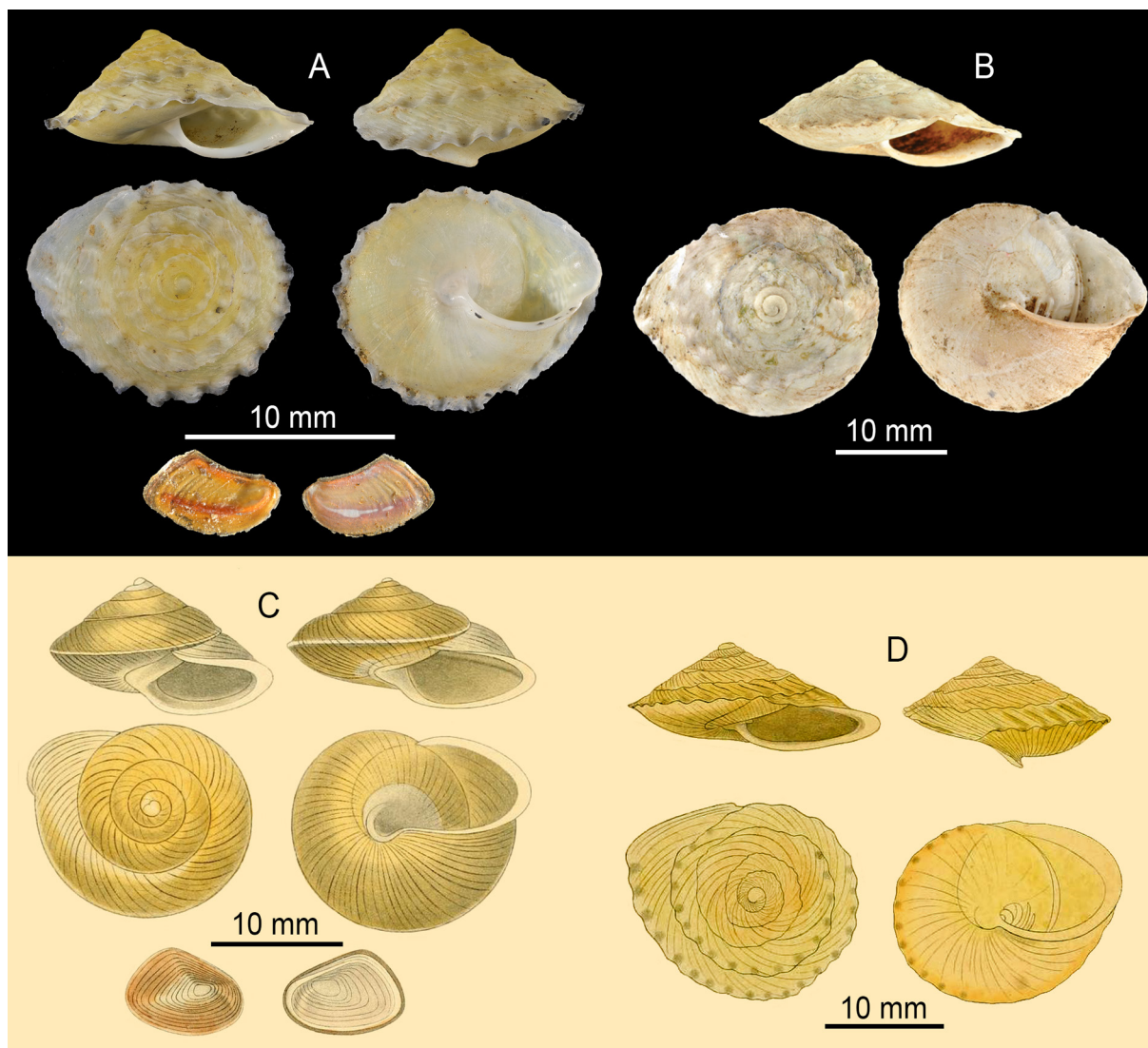


FIG. 2. **A.** *Geotrochatella mouhoti* (Pfeiffer, 1863) (specimen from Ngoc Son-Ngo Luong Nature Reserve, Lac Son District, Hoa Binh Province, ZVNU). **B, D.** *Calybiium massiei* Morlet, 1892 (**B** from Inkhavilay, 2019; **D** from Wagner, 1907). **C.** *Geophorus agglutinans* (G.B. Sowerby II, 1842) (from Wagner, 1907).

РИС. 2. **A.** *Geotrochatella mouhoti* (Pfeiffer, 1863) (экземпляр из природного заповедника Нгокшон-Нгольонг, район Лакшон, провинция Хоабинь, ZVNU). **B, D.** *Calybiium massiei* Morlet, 1892 (**B** из Inkhavilay, 2019; **D** из Wagner, 1907). **C.** *Geophorus agglutinans* (G.B. Sowerby II, 1842) (из Wagner, 1907).

parallel with the parietal lamellae; basal wall with a sickle-shaped lamella with its upper part long and forms ridge and lower part raised a knob-like.

Description. Shell medium-sized, thin, depressed conical, with a relatively acute spire, consists of $6\frac{1}{4}$ – $6\frac{1}{2}$ whorls; protoconch consists of 1.5 whorls, protruding above first whorls of teleoconch, pale yellow to chocolate brown, glossy, seemingly smooth, irregularly ribbed, the ribs are more prominent at the lower part of the whorls; teleoconch consists of 5.0 slowly increasing whorls; suture shallow and not visible. The surface of the teleoconch has a thin, coarse, and calcareous spiral layer, which also forms numerous domes that are regularly spaced and protrude from the surface shell. Furthermore,

this calcareous layer extends and sharpness almost completely covers the suture. The last whorl has a very sharp peripheral keel, which is widened and wavy quite regularly like a curtain, the keel with darker color than other parts of the shell; the apical side is covered by rough, irregular wrinkles, usually stronger at the periphery of whorls, and between the main wrinkles there are fine radial lines; umbilical side usually covered by regularly arranged riblets of ribs, weaker at the around the callus. Aperture parallelogram, peristome discontinuous, thickened, expanded, and reflected; parietal callus thin and opalescent. Apertural denticles are always present, very large, and free from the callus. There are 6 lamellae on the parietal wall, with the most prominent part

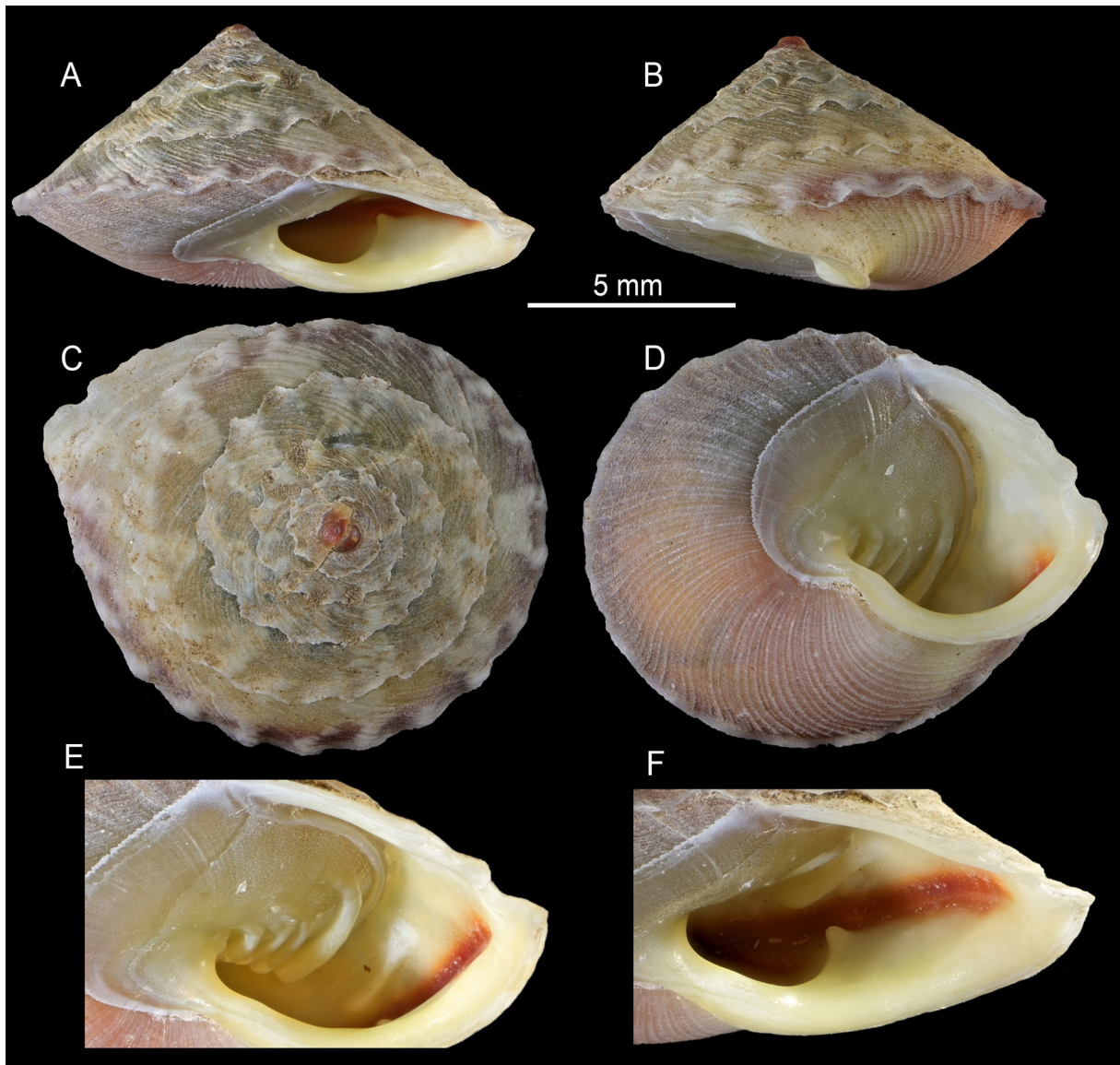


FIG. 3. *Calybiium plicatus* sp. nov. A–F. Holotype VNMN-IZ 000.002.347. A–D. Shell morphology (apertural view, dorsal view, ventral view, and side view). E–F. Details of the apertural dentition. Photos: Nguyen T.S. and Do D.S.

РИС. 3. *Calybiium plicatus* sp. nov. A–F. Голотип VNMN-IZ 000.002.347. A–D. Морфология раковины (вид спереди, вид сверху, вид снизу и вид сбоку). E–F. Детали устьевой арматуры. Фотографии: Нгуен Т.С. и До Д.С.

being the sixth one, which is very long, curved, and close to the suture; the first lamella is the smallest, inverted C-shaped, and located close to the columellar side; 3 middle ones are relatively similar in shape and size, and all smaller than the second one; the fifth one is strong and hook-like shape. A very large and barrier-shaped lamella on the palatal wall, which extends and runs parallel with the parietal lamellae. In the basal wall, there is a sickle-shaped lamella with its lower part long and forms a ridge, the upper raised a knob-like. Umbilicus is always completely closed.

Measurements of holotype (in mm). Shell height 13.1, shell width 7.0, aperture height 2.9, aperture width 6.9.

Distribution. This species is only known from its type locality. However, we assume this species may

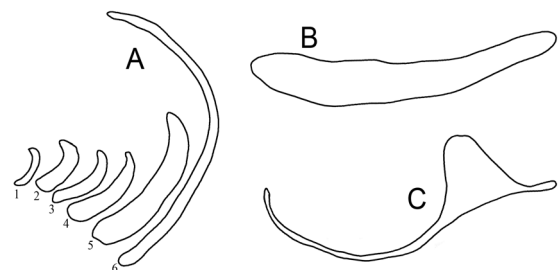


FIG. 4. Morphology of apertural dentition of *Calybiium plicatus* sp. nov. A. Parietal lamellae. B. Palatal lamella. C. Basal lamella. 1–6: Determining the order of lamellae on the parietal wall.

РИС. 4. Морфология устьевой арматуры *Calybiium plicatus* sp. nov. A. Париетальные ламеллы. B. Палатальная ламелла. C. Базальная ламелла. 1–6: Определение порядка ламелл на париетальной стенке.

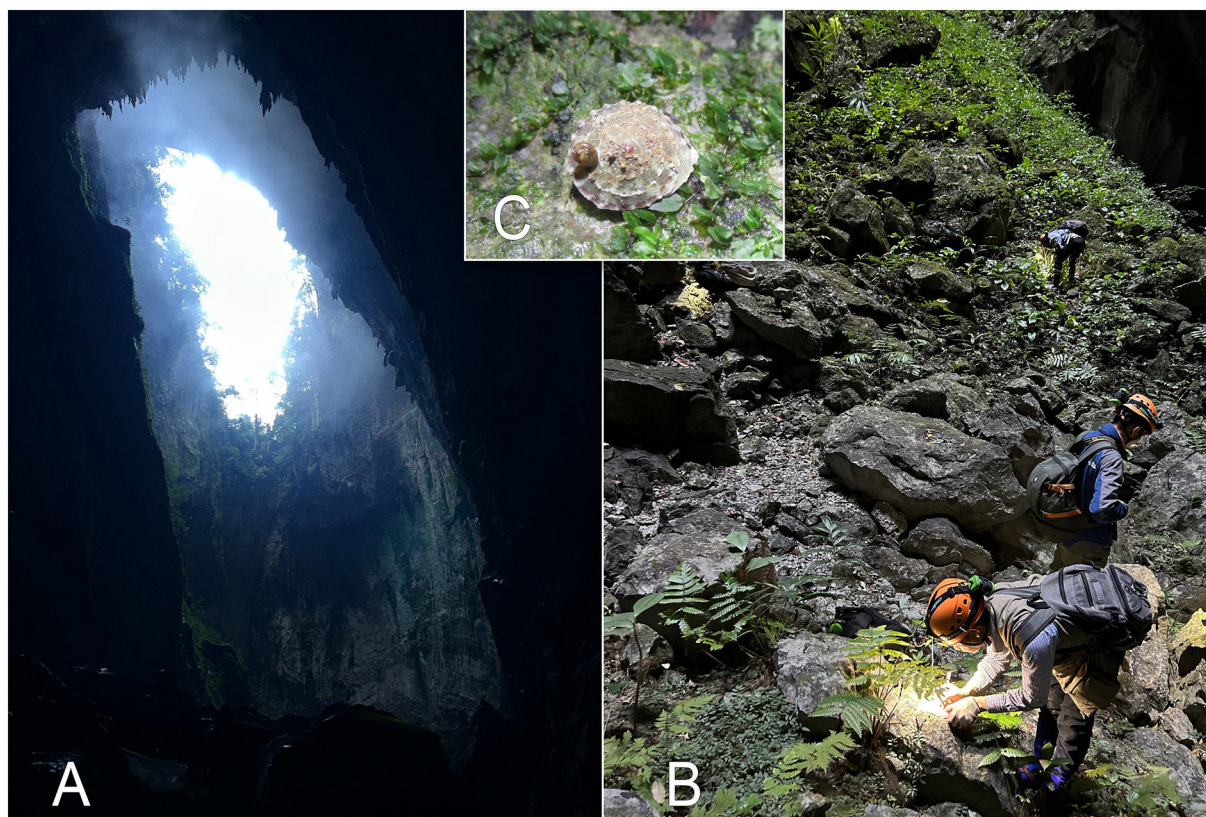


FIG. 5. **A, B.** Habitat picture, from the type locality at Doline 1 of Son Doong Cave, Bo Trach District, Quang Binh Province. **C.** Photo of the new species in habitat. Photos: Vu V.L. (**A, B**), Hoang N.K. (**C**).

РИС. 5. **A, B.** Фотографии местообитания из типовой местности в долине 1 пещеры Сон-Донг, район Ботрач, провинция Куангбинь. **C.** Фотография нового вида в его естественной среде обитания. Фотографии: Ву В.Л. (**A, B**), Хоанг Н.К. (**C**).

occur locally in the limestone mountain range on the Vietnam-Laos border, especially in limestone caves.

Etymology. The species' name is derived from its characteristic apertural dentition, from the Latin word 'plicatus', meaning 'lamellae' that are present at the parietal wall.

Ecology. This species was found on the surface of a large limestone rock in the cave, which had moss, fern, aerophytic algae, and cyanobacteria. In addition, the Son Doong Cave has environmental factors such as light intensity, temperature, and humidity that are often different from those outside (see Fig 5).

Remarks. The characters distinguishing *Calybium plicatus* sp. nov. from *C. massiei* are the smaller shell with a more elevated spire, the parietal wall with six distinguished and evenly spaced lamellae, of which the sixth one is very long with the tip approaching the callus, the fifth one is strong but does not extend to the callus, a large palatal lamella as the barrier, and a very long basal lamella, which is sickle-shaped with upper part long and lower part raised a knob-like.

The finding of a second species in this study suggests that *Calybium* species can be found in the border area between central Vietnam and central Laos, especially limestone areas such as forests over

limestone, caves, and isolated karst. In addition, both *C. massiei* and *Calybium plicatus* sp. nov. were discovered in stable environmental conditions of caves, which may suggest that *Calybium* species are relict species of extinct lineages.

Acknowledgments

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