RAFFLES BULLETIN OF ZOOLOGY **67**: 694–700
Date of publication: 4 December 2019
DOI: 10.26107/RBZ-2019-0050
http://zoobank.org/urn:lsid:zoobank.org:pub:45C7D1BA-73D7-4867-A44D-E375BB0790B3

Two new species of *Entadella* Páll-Gergely & Hunyadi in Páll-Gergely et al., 2016 from Vietnam (Gastropoda: Heterobranchia: Camaenidae)

Barna Páll-Gergely[1*] & András Hunyadi[2]

Abstract. Two new camaenid species, *Entadella concava*, new species, and *Entadella kilchomani* Páll-Gergely, new species, are described from northern Vietnam. Both are known from their respective type localities only. The reproductive anatomy of the latter species is described and illustrated, with special attention on the inner structures of genital organs. This species is anatomically characterised by a strongly developed flagellum with a pointed tip and a blunt, caecum-like tip.

Key words. land snail, taxonomy, anatomy, systematics, Southeast Asia

INTRODUCTION

The genus *Entadella* Páll-Gergely & Hunyadi in Páll-Gergely et al., 2016, comprises of three species, namely *E. entadiformis* Páll-Gergely & Hunyadi in Páll-Gergely et al., 2016, *Entadella cavaleriei* (Bavay, 1913) from China, and *Entadella athrix* (Möllendorff, 1901) from northern Vietnam (Páll-Gergely et al., 2016). *Entadella* was delimited from *Camaena* Albers, 1850 (type species: *Helix cicatricosa* O. F. Müller, 1774) based on the following traits: penial verge with lateral opening (terminal in *Camaena*), vagina short (long in *Camaena*), shell depressed, unicoloured (rather globular and often banded in *Camaena*), protoconch smooth, glossy, sometimes with tubercles (irregular, "hammered" in *Camaena*). In the present paper we describe two additional new species from northern Vietnam, which are probably strict endemics. With this, the number of *Entadella* species becomes five. *Entadella cavaleriei* is characterised by a wide umbilicus, which occupies around one third of the shell's width and thus, differs from all other *Entadella* species that have narrow umbilicus.

MATERIAL AND METHODS

Determination of the number of shell whorls (precision to 0.25 whorl) follows Kerney & Cameron (1979: p. 13). The ethanol-preserved paratype of *Entadella kilchomani* Páll-Gergely, new species, was dissected under a Zeiss stereomicroscope, photographs were taken using a Keyence LHX5000 digital microscope. In the description of the reproductive system, we used the terms "proximal" and "distal" relative to the hepatopancreas.

Abbreviations.
D: shell diameter
HA: Collection András Hunyadi (Budapest, Hungary)
H: shell height
HNHM: Hungarian Natural History Museum (Budapest, Hungary)
NHM: The Natural History Museum (London, UK)
NHMUK: when citing NHM registered specimens
SMF: Senckenberg Forschungsinstitut und Naturmuseum (Frankfurt am Main, Germany)

Taxon names. The new taxon name *Entadella kilchomani* Páll-Gergely, new species, is the responsibility of Barna Páll-Gergely. The authorship of this new taxon name should be cited as *Entadella kilchomani* Páll-Gergely in Páll-Gergely & Hunyadi, 2019.

SYSTEMATICS

Family Camaenidae Pilsbry, 1893

Genus *Entadella* Páll-Gergely & Hunyadi in Páll-Gergely, Hunyadi, Otani & Asami, 2016

Entadella Páll-Gergely et al., 2016: 170.

Type species. *Entadella entadiformis* Páll-Gergely & Hunyadi in Páll-Gergely, Hunyadi, Otani & Asami, 2016 (by original designation).

[1]Plant Protection Institute, Centre for Agricultural Research, Herman Ottó Street 15, Budapest, H-1022, Hungary; Email: pall-gergely.barna@agrar.mta.hu, pallgergely2@gmail.com (*corresponding author)

[2]Adria sétány 10G 2/5., Budapest 1148, Hungary

ISSN 2345-7600 (electronic) | ISSN 0217-2445 (print)

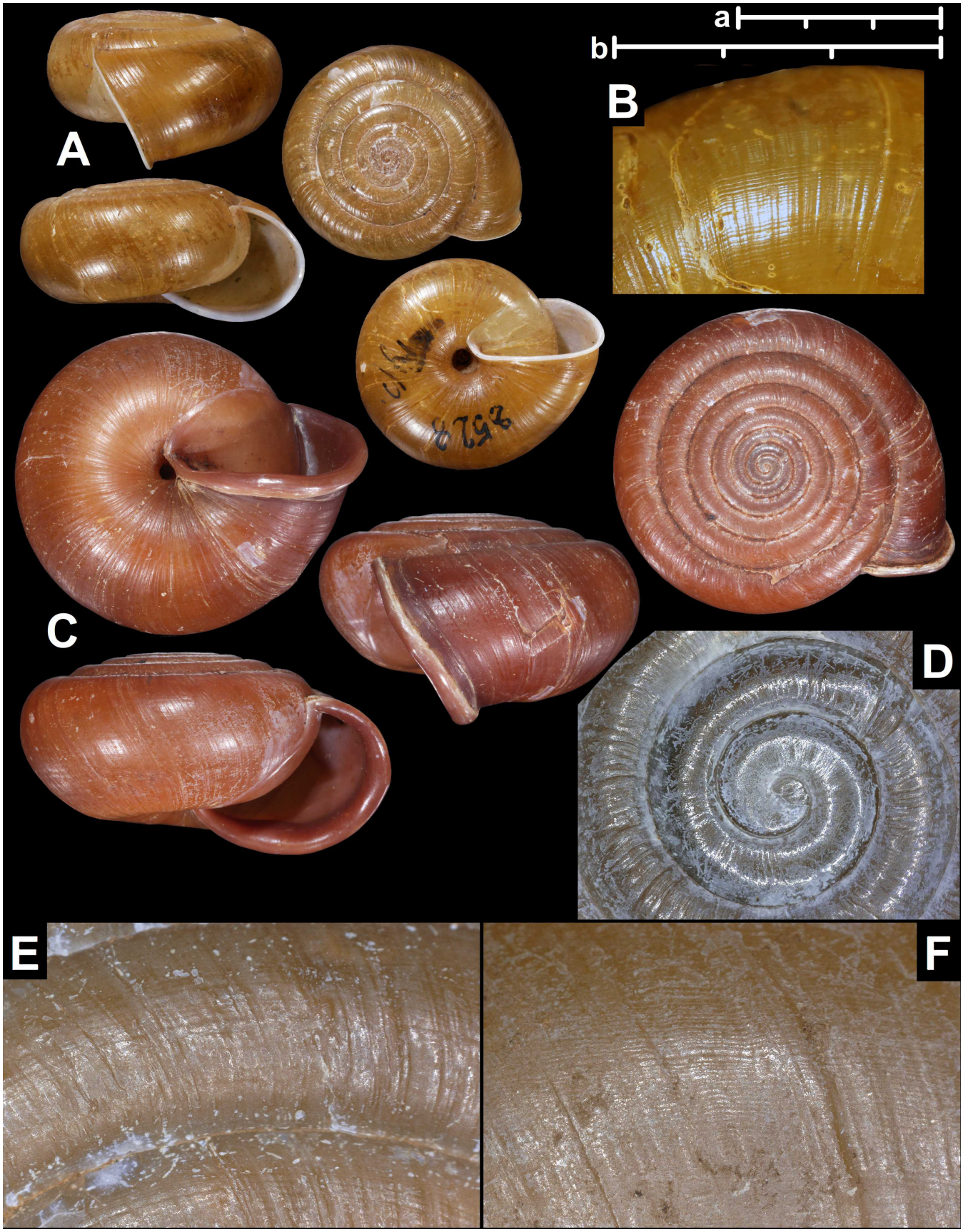

Fig. 1. Shells of *Entadella* Páll-Gergely & Hunyadi in Páll-Gergely et al., 2016, species. A, B, lectotype of *Entadella athrix* (Möllendorff, 1901) (SMF 8528); B, sculpture of the ventral side, not to scale; C–F, holotype of *Entadella kilchomani* Páll-Gergely, new species (NHMUK 20190591); D, protoconch; E, dorsal surface; F, ventral surface. Scale "a" represents 3 mm and refers to figs. D, E, and F; scale "b" represents 30 mm and refers to figs. A and C. Note that the close-up pictures were taken using different illumination; original colours are closer to the ones on the entire shell.

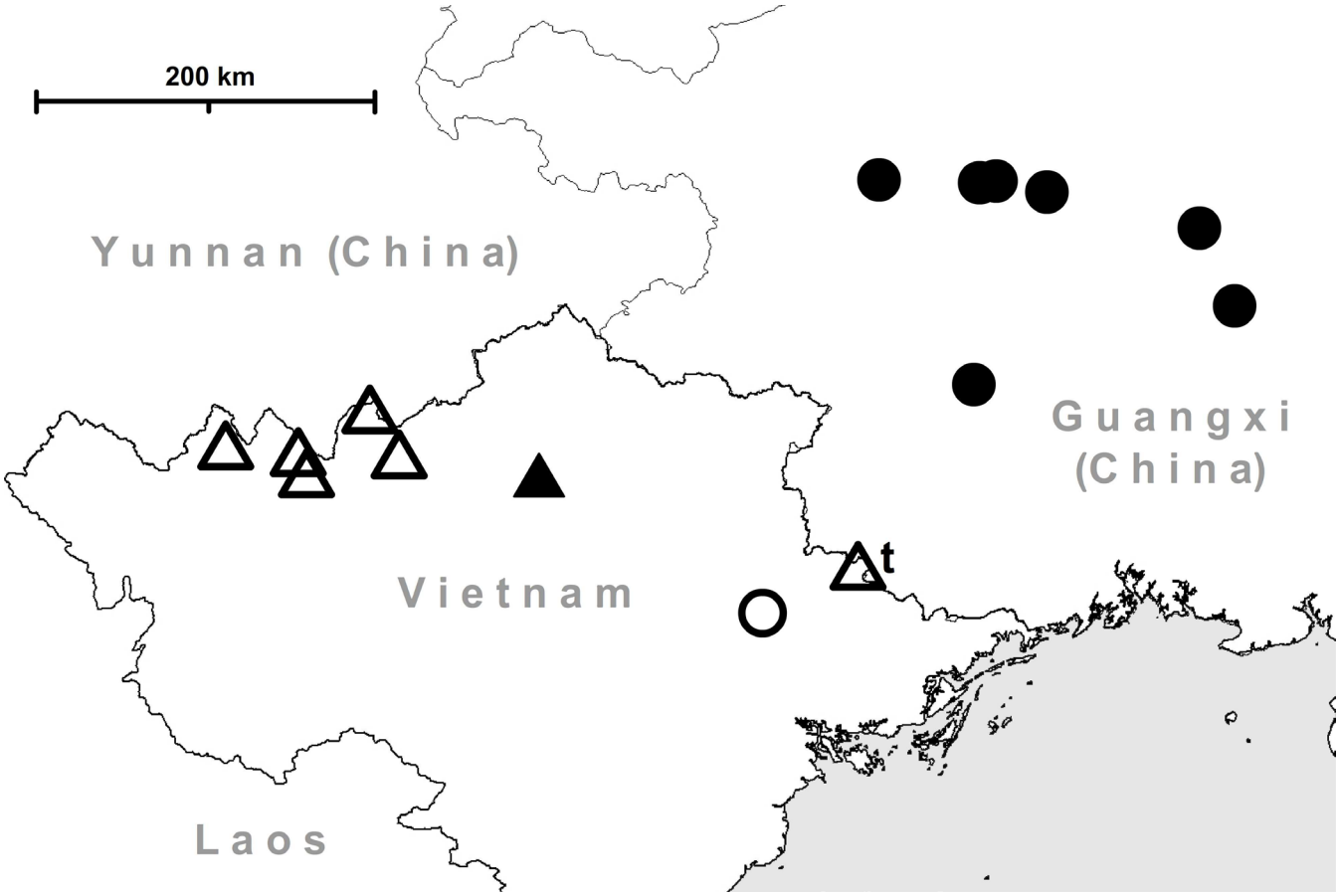

Fig. 2. Distribution of *Entadella* Páll-Gergely & Hunyadi in Páll-Gergely et al., 2016 species. Empty triangle: *E. athrix* (Möllendorff, 1901); empty triangle with a "t": type locality of *E. athrix*; filled circle: *Entadella entadiformis* Páll-Gergely & Hunyadi in Páll-Gergely et al., 2016; filled triangle: *E. concava*, new species; empty circle: *Entadella kilchomani* Páll-Gergely, new species.

Entadella athrix (Möllendorff, 1901)
(Fig. 1A, B)

Chloritis athrix Möllendorff, 1901: 73–74.
Chloritis (*Trichochloritis*) *athrix* — Zilch, 1966: 300, pl. 9, fig. 22.
Entadella athrix — Páll-Gergely et al., 2016: 171.

Remarks. In our previous paper about this genus (Páll-Gergely et al., 2016) we had no possibility to publish photographs of the type specimens. Here we include photos of the lectotype (Tonkin, Mansongebirge, coll. Möllendorff ex coll. Fruhstorfer, SMF 8528, fig. 1A).

The type locality of this species is "Mansongebirge" (Mount Mẫu Sơn) which is situated in Lạng Sơn Province, near the Chinese border in the eastern part of northern Vietnam. This site lies far from all other known localities in the northernmost region of the country (Páll-Gergely et al., 2016; Fig. 2). The type specimens from Mẫu Sơn and the ones from the northern border region agree in size, shape, and colour. However, the latter ones lack the dense spiral lines on the ventral side that are characteristic of the typical specimens. We provisionally classify them as a single species until ethanol-preserved specimens become available.

Entadella concava, new species
(Fig. 3)

Type material. Holotype (1 shell, D: 30.7 mm, H: 14.7 mm; Fig. 3A) (HNHM 104401), Vietnam, Tuyên Quang Province, Minh Quang, Làng Linh 2 km towards Thổ Bình, right side of road no. 188, 105 m a.s.l., 22°20.428′N, 105°10.703′E (locality code: 2012/52), coll. A. Hunyadi, 02 June 2012; 2 paratypes (HA; one figured as Fig. 3B), same data as holotype.

Non-type material. Figured juvenile shell (HNHM 104402; fig. 3C–D), same data as holotype; 1 juvenile shell (HA), same data as holotype.

Description of the shell. Shell medium-sized, dextral, relatively thin-walled. Original colour unknown because only weathered shells were available. Dorsal surface flat or only very slightly domed, but from the side/front view, the spire is sunken below the level of the penultimate whorl in all available (5) specimens. Shell outline rounded from dorsal view, whorls grow regularly. Body whorl rounded from ventrolateral direction. Whorls 6, separated by shallow suture, last whorl much wider than penultimate one resulting in a "nautiliform" shape from dorsal view. Protoconch (Fig. 3C) consisting of 2.25 whorls. First 1.5 whorls glossy, smooth, latter whorls becoming somewhat wrinkled with

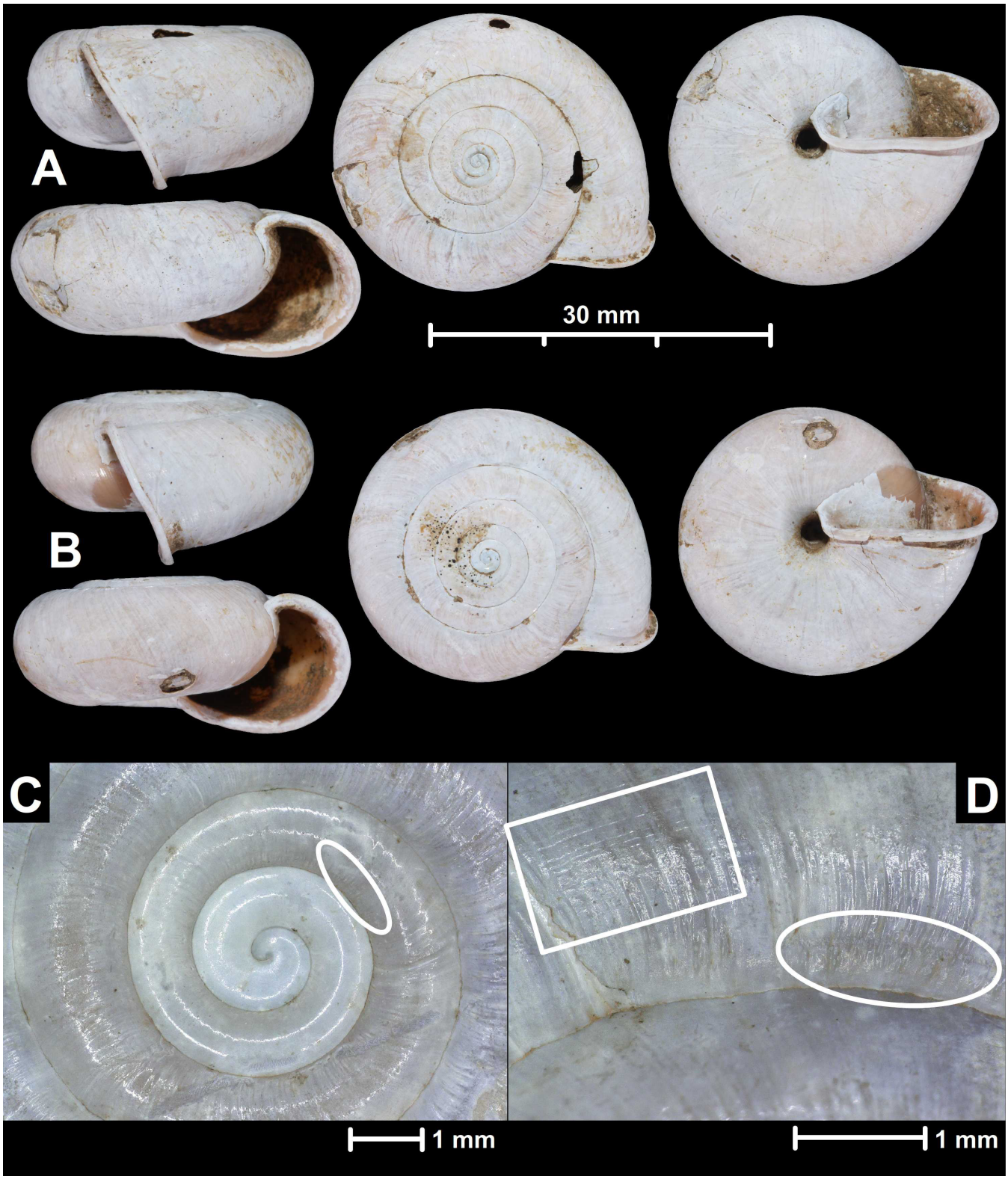

Fig. 3. *Entadella concava*, new species. A, holotype (HNHM 104401); B, paratype (coll. HA); C, protoconch of a juvenile shell (not paratype, HNHM 104402); D, teleoconch sculpture of the same shell. Oval area shows elongated tubercles along the suture on the protoconch (C) and on the teleoconch (D), rectangular area shows spiral striation.

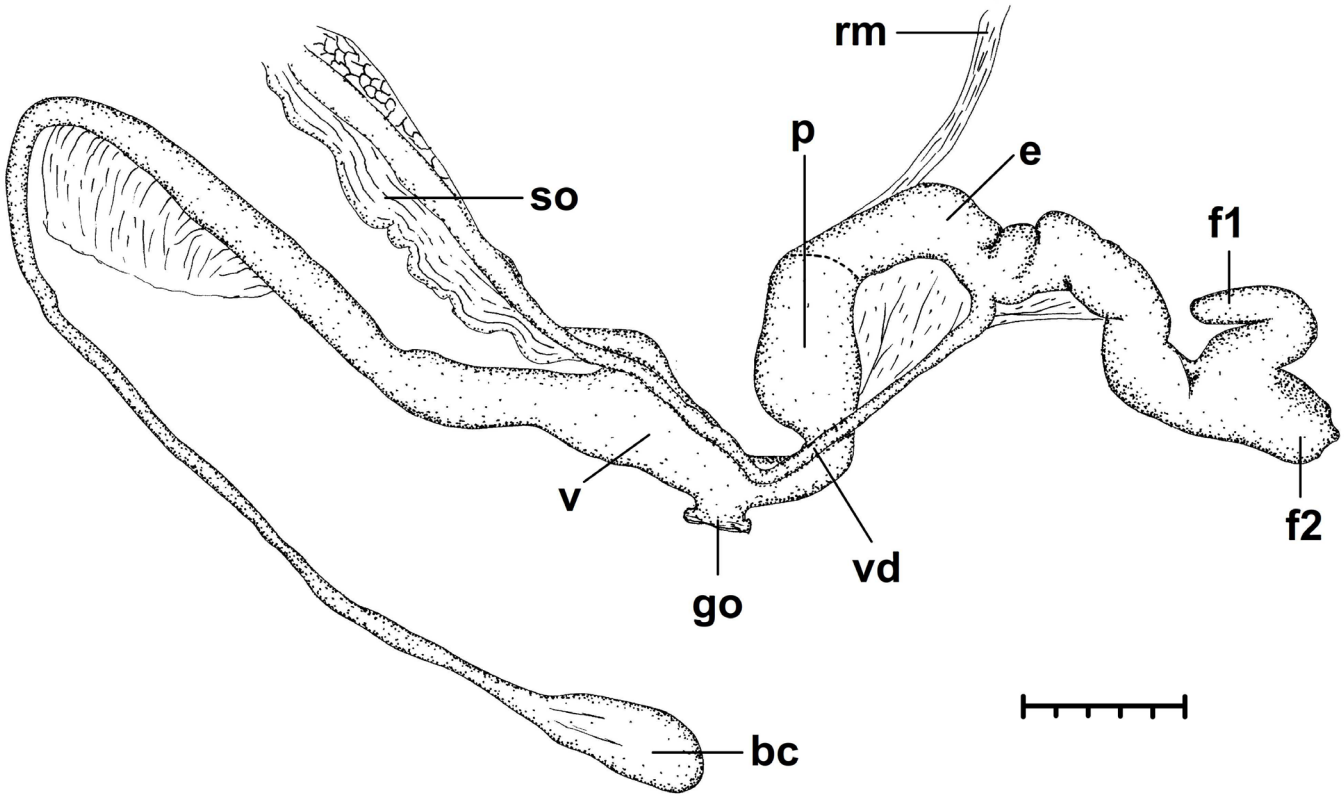

Fig. 4. Genitalia of *Entadella kilchomani* Páll-Gergely, new species. Abbreviations: bc, bursa copulatrix; e, epiphallus; f1, pointed part of penial caecum; f2, blunt part of penial caecum; go, genital opening; p, penis; rm, retractor muscle; so, spermoviduct; v, vagina; vd, vas deferens. Scale bar represents 5 mm.

some small tubercles near suture. Teleoconch sculpture (Fig. 3D) dominated by irregular growth wrinkles and dense, radial riblets near the suture, which are often broken off to single, elongated tubercles. Weak, dense spiral striation appears on the dorsal side after 3.5 whorls and remains equally strong until peristome. Spiral striation of similar density discernible on both ventral and dorsal sides. Umbilicus open but narrow, showing all whorls, its edge slightly covered by reflected peristome. Aperture semilunar, elongated in direction of umbilicus, slightly oblique to the shell axis from lateral view. Peristome slightly thickened and reflected. Parietal callus present only as fine calcium layer on the parietal shell wall, but its surface could not be examined due to corrosion.

Measurements. D = 29.6–30.7 mm, H = 14.6–14.9 mm (n = 3)

Differential diagnosis. *Entadella concava*, new species, differs from all other *Entadella* species by the sunken initial whorls and the less dense whorls. The geographically most adjacent *E. athrix* has a higher spire, thinner peristome, and its last whorl is not conspicuously wider than the penultimate one. The differences from *Entadella kilchomani* Páll-Gergely, new species, are given under that species.

Etymology. The specific epithet refers to the sunken initial whorls, which results in a concave dorsal surface.

***Entadella kilchomani* Páll-Gergely, new species**
(Figs. 1C–F, 4, 5)

Type material. Holotype (1 shell, D: 34.9 mm, H: 19.3 mm) (NHMUK 20190591), Vietnam, Huu Lien Natural RF, Site 32, coll. no. 408V, 21°39.569′N, 106°21.921′E, coll. NHM 2013 Vietnam Expedition, 18 September 2013; 1 ethanol-preserved paratype (broken shell, body, prepared genitalia) (NHMUK 20140589), same data as holotype.

Description. Shell large, dextral, thick-walled, light chocolate brown in colour (Fig. 1C). Shell rather flat with slightly elevated spire. Dorsal surface domed. Shell outline rounded from dorsal view, whorls grow regularly. Body whorl rounded, somewhat shouldered due to slight depression from ventrolateral direction. Whorls 6.75–7, convex, separated by moderately deep suture. Protoconch consisting of almost 2 whorls, smooth, with some slight indication of irregular growth lines (Fig. 1D). Teleoconch sculpture dominated by low, irregular growth wrinkles and slight spiral striation that appears on the dorsal side after 3.5 whorls (Fig. 1E, F), and remains equally strong until peristome. Spiral striae much denser on ventral than on dorsal side, radial growth wrinkles lower on ventral than on dorsal side. Umbilicus open but very narrow, point-like, shows all whorls. Its edge covered by reflected peristome. Aperture semilunar, slightly elongated in direction of umbilicus, slightly oblique to the shell axis from lateral view. Peristome similar to shell in colour, strongly thickened and reflected, with a slight thickening on basal part of the holotype (not visible on paratype, which is seemingly a less matured shell). Parietal callus present only

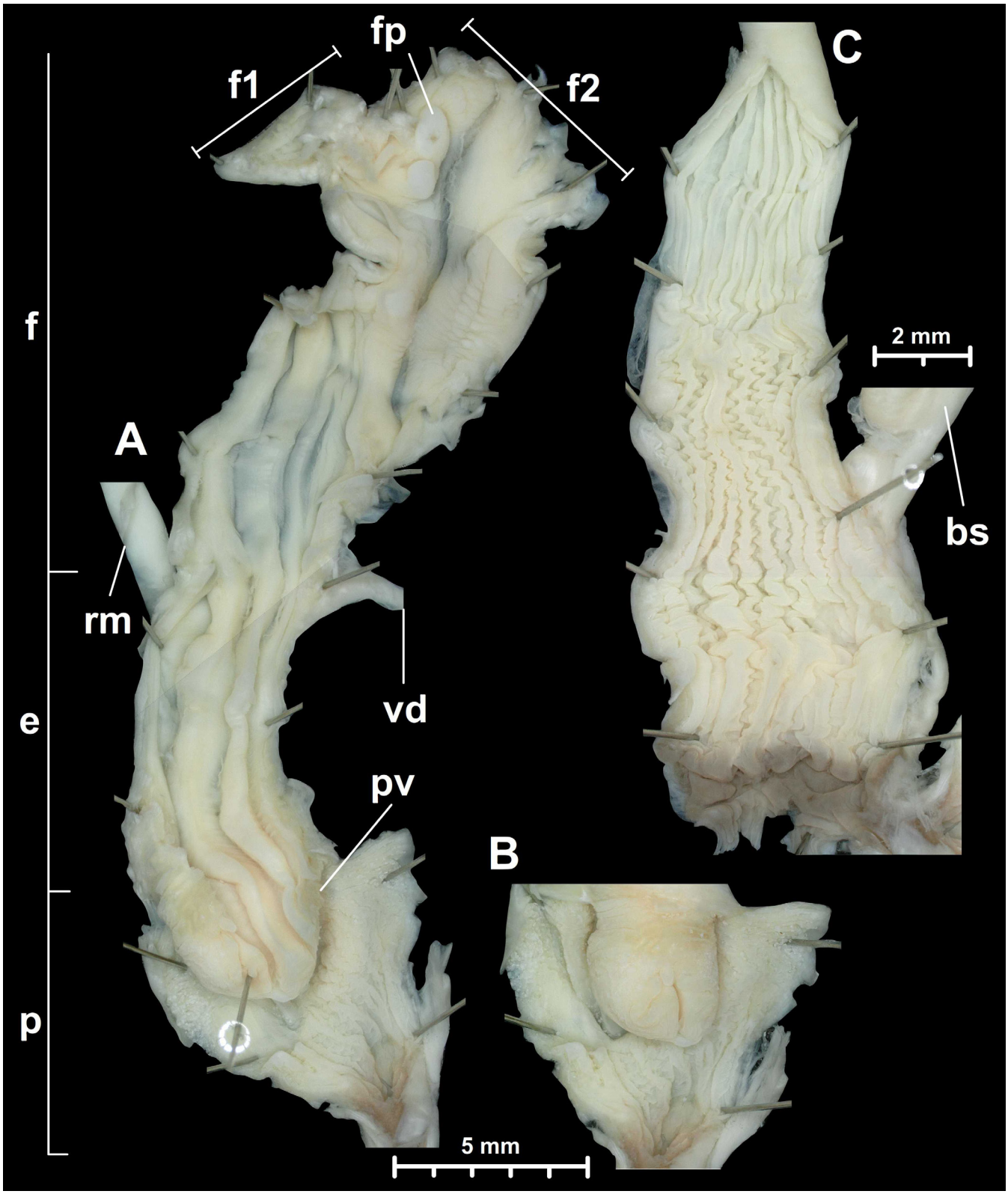

Fig. 5. Inner structure of genital organs of *Entadella kilchomani* Páll-Gergely, new species. A, penis, epiphallus and penial caecum (showed after opening the penial verge); B, intact penial verge; C, vagina. Abbreviations: bs, stalk of bursa copulatrix; e, epiphallus; f, flagellum; fp, flagellar papilla; f1, pointed part of flagellum; f2, blunt part of flagellum; p, penis; pv, penial verge; rm, retractor muscle; vd, vas deferens.

as transparent, fine calcium layer on the parietal shell wall, its surface is finely granulate, less glossy than rest of shell.

Measurements. D = 34.9 mm, H = 19.3 mm (holotype).

Description of the anatomy. Figs. 4, 5. Right ommatophoral retractor crosses penis and vagina. Atrium very short. Penis with a short, slender distal, and a slightly longer, much thicker proximal part. Inner penial wall with irregular, low, longitudinal folds having perpendicular projections resulting in a reticulated surface. Penial verge large, thickened, club-shaped, with a slit-like opening on the lateral side. Epiphallus thick, but thinner than proximal part of penis, slightly shorter than penis, internally with 3–4 elevated, longitudinal folds that are discernible inside penial verge as well. Retractor muscle inserts on distal part of epiphallus. Vas deferens normally developed. A thin membrane was found between vas deferens and penis-epiphallus, and vas deferens and distal end of flagellum. Flagellum strongly developed, approximately as long as penis and epiphallus combined, its end divided into a pointed and a blunter tip. Longitudinal folds of epiphallus continue into pointed end of flagellum, whereas the blunt flagellum tip seemingly forms an independent cavity with thick, transversely sculptured wall, and two small flagellar papillae. Vagina short, shorter than penis, internally with ca. 12 longitudinal, wavy folds, which continue inside stalk of bursa copulatrix for some distance (possibly the vagina and the distal end of bursa's stalk form a single functional unit). The wavy folds abruptly transform into straight folds inside lumen of bursa's stalk. Stalk of bursa very long, bursa oval, large. Spermoviduct normally developed. Albumen gland and talon were not examined.

Differential diagnosis. *Entadella kilchomani* Páll-Gergely, new species, differs from *Entadella entadiformis* by the more strongly built, less depressed shell having regularly shaped whorls, the lack of tubercles on the protoconch, the less elongated aperture, and the much stronger peristome. *Entadella athrix* is smaller (D: 24.6–26.7 mm, H: 13.8–15.1 mm, n = 4 [MNHN 2012-27112, MNHN 2012-27125]), has a wider umbilicus, and a much thinner peristome. *Entadella concava*, new species, is smaller than *Entadella kilchomani* Páll-Gergely, new species, more depressed, and has a slightly wider umbilicus and sunken initial whorls.

Etymology. *Entadella kilchomani* Páll-Gergely, new species, is named after Kilchoman Distillery, the favourite whisky distillery of the first author.

ACKNOWLEDGEMENTS

We are grateful to Jonathan Ablett (NHM) for loaning the *E. kilchomani* specimens to us, to Sigrid Hof and Ronald Janssen for granting access to the collection of the Senckenberg Museum. This study was supported by the MTA (Hungarian Academy of Sciences) Premium Post Doctorate Research Program for BPG.

LITERATURE CITED

Albers JC (1850) Die Heliceen nach natürlicher Verwandtschaft systematisch geordnet. Enslin, Berlin, 262 pp.

Bavay MA (1913) Description d'une Helix nouvelle du Sud de la Chine. Bulletin du Muséum national d'histoire naturelle, 19: 603–604.

Kerney MP & Cameron RAD (1979) A Field Guide to the Land Snails of Britain and North-west Europe. Collins, London, 288 pp.

Müller OF (1774) Vermium terrestrium et fluviatilium, seu animalium infusorium, Helminthicorum, et testaceorum, non marinorum, succincta historia. Volume 2. Heineck et Faber, ex officina Molleriana, Havniae [= Copenhagen] et Lipsiae [= Leipzig], I–XXXVI, 214 + 10 unnumbered pp.

Páll-Gergely B, Hunyadi A, Otani JU & Asami T (2016) An impressive new camaenid, *Entadella entadiformis* gen. & sp. n. from Guangxi, China (Gastropoda: Pulmonata). Journal of Conchology, 42(4): 167–179.

Pilsbry HA (1893–1895) Manual of conchology, structural and systematic, with illustrations of the species. Second series: Pulmonata. Vol. IX. Helicidae, Vol. 7. Guide to the study of Helices. Conchological Section, Academy of Natural Sciences, Philadelphia, 366 + 126 pp.

von Möllendorff O (1901) Diagnosen neuer von H. Fruhstorfer in Tongking gesammelter Landschnecken. Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft, 33(5/6): 65–81, 110–119.

Zilch A (1966) Die Typen und Typoide des Natur-Museums Senckenberg, 34: Mollusca, Camaenidae (4). Archiv für Molluskenkunde, 95(3/4): 197–223.