



A review of the genus *Coccoglypta* Pilsbry, 1895
(Gastropoda: Pulmonata: Camaenidae)

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Potential members of the genus *Coccoglypta* Pilsbry, 1895.

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A review of the genus *Coccoglypta* Pilsbry, 1895 (Gastropoda: Pulmonata: Camaenidae)

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ABSTRACT

So far, the genus *Coccoglypta* Pilsbry, 1895 consisted of two species and two subspecies as follows: *C. pinchoniana* (Heude, 1886) type species of the genus, *C. scrobiculata scrobiculata* (Gredler, 1885) and *C. scrobiculata hupeiana* (Gredler, 1887). We examined shells and genitalia, and performed molecular analyses of *Coccoglypta* specimens from Sichuan Province, which have revealed the existence of a yet undescribed species (*Coccoglypta liui* Páll-Gergely, n. sp.). Based on conchological information, *Coccoglypta scrobiculata* does not belong to the Camaenidae Pilsbry, 1895 *s.l.*, but to the Ariophantidae Godwin-Austen, 1883. Since the systematics of Ariophantidae is not fully resolved yet, it is difficult to place this species in an appropriate genus. The conchologically most similar species is *Hemiplecta laotica* (Möllendorff, 1899), therefore *Coccoglypta scrobiculata* is transferred to the genus *Hemiplecta* Albers, 1850. *Eulota arbusticola chrysomphala* Möllendorff, 1899 is elevated to species level, and treated as “*Bradybaena*” *chrysomphala* (Möllendorff, 1899), because its shell differs considerably from that of *Bradybaena arbusticola* (Deshayes, 1870). *Bradybaena arbusticola*, *Satsuma leprosula* (Heude, 1885) and *Helix billiana* Heude, 1882 are assigned to *Coccoglypta* based on their mamillated sculpture.

KEY WORDS

Anatomy,
shell sculpture,
China,
new combinations,
new species.

RÉSUMÉ

Étude sur le genre Coccoglypta Pilsbry, 1895 (Gastropoda: Pulmonata: Camaenidae).

Jusqu'à présent, le genre *Coccoglypta* Pilsbry, 1895 comprenait deux espèces et deux sous-espèces : *C. pinchoniana* (Heude, 1886) espèce type du genre, *C. scrobiculata scrobiculata* (Gredler, 1885) et *C. scrobiculata hupeiana* (Gredler, 1887). Nous avons examiné les coquilles et les genitalia et effectué des analyses moléculaires des spécimens de *Coccoglypta* de la province du Sichuan, qui ont révélé l'existence d'une espèce encore non décrite (*Coccoglypta liui* Páll-Gergely, n. sp.). Sur la base d'informations conchologiques, *Coccoglypta scrobiculata* n'appartient pas aux Camaenidae Pilsbry, 1895 *s.l.*, mais aux Ariophantidae Godwin-Austen, 1883. La systématique des Ariophantidae n'étant pas encore entièrement résolue, il est difficile de placer cette espèce dans le genre approprié. Du point de vue des caractères conchologiques, l'espèce la plus similaire étant *Hemiplecta laotica* (Möllendorff, 1899), *Coccoglypta scrobiculata* est donc transférée au genre *Hemiplecta* Albers, 1850. *Eulota arbusticola chrysomphala* Möllendorff, 1899 est élevée au niveau espèce et traitée comme "*Bradybaena*" *chrysomphala* (Möllendorff, 1899), car sa coquille diffère considérablement de celle de *Bradybaena arbusticola* (Deshayes, 1870). *Bradybaena arbusticola*, *Satsuma leprosulula* (Heude, 1885) et *Helix billiana* Heude, 1882 sont affectés à *Coccoglypta* sur la base de leur sculpture mamillée.

MOTS CLÉS

Anatomie,
coquille sculpture,
Chine,
combinaisons nouvelles,
espèce nouvelle.

INTRODUCTION

So far, *Coccoglypta* Pilsbry, 1895 has been known as a group of middle-sized camaenids inhabiting China (Schileyko 2004). Yen (1939) recognised two species and two subspecies as members of this genus: *C. pinchoniana* (Heude, 1886) from Sichuan, *C. scrobiculata scrobiculata* (Gredler, 1885) from Hunan and *C. scrobiculata hupeiana* (Gredler, 1887) from Hubei.

We have examined shell and ethanol-preserved material of *Coccoglypta* from Qingcheng Shan and Qingcheng Houshan (Near Chengdu, Sichuan), which resulted in the recognition of two distinct species, one being *C. pinchoniana*, and the other being a species new to science. Examining shells of *Coccoglypta* species and those of *C. scrobiculata* also revealed that the latter species does not belong to the Camaenidae Pilsbry, 1895, but probably to the Ariophantidae Godwin-Austen, 1883, although its generic placement is challenging due to the poorly established classification of that family. Some camaenids are known from the geographic vicinity of the area of *Coccoglypta* that share the finely mamillated teleoconch sculpture of that genus. However, without knowing the reproductive anatomy we can only hypothesise that they are related to *Coccoglypta*.

The paper of Wu & Liu (2019) (published on 6 August 2019) transferred *Zonites scrobiculatus* Gredler, 1885 to the newly described *Sinoxychilus* Wu & Liu, 2019. The present manuscript was accepted on 8 April 2019 and published on 20 December 2019, and classifies that species in *Hemiplecta* Albers, 1850. Instead of rewriting our manuscript entirely, we decided to publish the accepted version, which was written without knowing the results of Wu & Liu (2019).

MATERIAL AND METHODS

Shell whorls (± 0.25) were counted according to Kerney & Cameron (1979: 13). Shells were measured using a vernier caliper. Ethanol-preserved specimens were dissected under a Leica stereo microscope with a camera attached to provide photographs of the external genital structure, from which

drawings were produced. Appendix 1 presents locality names cited verbatim from the specimen labels.

MOLECULAR ANALYSIS

Muscle tissue for DNA extraction was attained from each a specimen of *Coccoglypta liui* Páll-Gergely, n. sp. (A1, China, Sichuan Province, Qingcheng Houshan, c. 30°55'N, 103°29'40"E, Liu Zheng-Ping leg., 07.IV.2018, SYS m001013) and *Coccoglypta pinchoniana* (China, Sichuan Province, Chongzhou Shi, Jiezi Zhen, Fengqishan [风栖山], Liu Zheng-Ping leg., 13.I.2018, SYS m001014), and then preserved in 95% ethanol. Genomic DNA was extracted from muscular tissue by using a DNA extraction kit from Tiangen Biotech (Beijing) Co., Ltd. Two mitochondrial genes, partial 16S ribosomal RNA gene (16S) and partial cytochrome C oxidase 1 gene (CO1), were amplified. Primers used for 16S were 16SA (5'-CGGCCGCCTGTTTATCAAAAACAT-3') and 16SB (5'-GGAGCTCCGGTTTGAACCTCAGATC-3'), and for CO1 were co1F (5'-GGTCAACAAATCATAAAGATATTGG-3') and co1R (5'-TTAACTTCAGGGTGACCAAAAAATCA-3'). PCR amplifications were processed in a 20 μ l reaction volume with the cycling conditions of an initial denaturing step at 94°C for 2 min, 35 cycles of denaturing at 94°C for 30 s, annealing at 50°C for 30 s and extending at 72°C for 30s, and final extending step of 72°C for 10 min. PCR products were purified with spin columns. The purified products were sequenced by Beijing Genomics Institute. All sequences were deposited in GenBank (Table 1). In addition, 59 sequences from 36 known camaenid species were obtained from GenBank and incorporated into our dataset (Table 1).

DNA sequences of the two genes were aligned respectively by the Clustal W algorithm with default parameters (Thompson *et al.* 1997) in MEGA 6 (Tamura *et al.* 2013). The alignments were trimmed with allowing no gap positions and default parameters in Gblocks version 0.91b (Castresana 2000). The two genes, 402 base pairs (bp) of 16S and 655 bp of CO1, were concatenated into a 1068-bp sequence, which was further tested in jmodeltest v2.1.2 with Akaike and Bayesian information criteria, resulting in the best-fitting nucleotide substitution model of GTR + I + G. Sequenced data were analysed using Bayesian inference (BI) in MrBayes 3.2.4 (Ron-

quist *et al.* 2012). Three independent runs were conducted, each of which was performed for 8 000 000 generations and sampled every 1000 generations with the first 25% samples discarded as burn-in. Convergence of the Markov Chain Monte Carlo simulations was assessed using Tracer v1.5 (Rambaut & Drummond 2009), verifying that all ESS values exceeded 200. P-distance between taxa was calculated using MEGA 6.

ABBREVIATIONS

Private collection

Coll. HA collection András Hunyadi, Budapest.

Institutions

HBUMM Mollusc collection of the Museum of Hebei University, Baoding;
 HNHM Hungarian Natural History Museum, Budapest;
 MNHN Muséum national d'Histoire naturelle, Paris;
 MCZ Museum of Comparative Zoology, Massachusetts;
 SMF Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt am Main;
 SYS The Museum of Biology, Sun Yat-sen University, Guangzhou;
 UMZC University Museum of Zoology, Cambridge;
 USNM Smithsonian National Museum of Natural History, Washington.

RESULTS

The two *Coccoglypta* species form a clade with 100% posterior probability. No close relative was revealed by the phylogram, which is likely due to the limited sequences of this family deposited to GenBank. The two *Coccoglypta* species are separated by the genetic distances at 4.0% in the 16S gene and 10.6% in the COI.

Although their anatomy is unknown, based on the mamillated sculpture and geographic proximity, three species, namely *Helix arbusticola* Deshayes, 1870, *Helix billiana* Heude, 1882 and *Helix leprosa* Heude, 1885 are moved to *Coccoglypta*. However, we note that future revision of their evolutionary relationships based on genital anatomy and molecular phylogeny is necessary.

TAXONOMIC DESCRIPTIONS

Family CAMAENIDAE Pilsbry, 1895

Subfamily BRADYBAENINAE Pilsbry, 1934

REMARKS

Camaenidae and Bradybaenidae Pilsbry, 1934 are traditionally distinguished on the basis of the absence of the dart sac and mucous glands in the former and their presence in latter. The molecular phylogeny of Wade *et al.* (2006, 2007) showed that the dart sac was lost multiple times during the evolution of the Camaenidae. Camaenidae and Bradybaenidae form a single clade, but neither of them is monophyletic. Therefore Gittenberger *et al.* (2012) formally treated the Bradybaenidae as a junior synonym of Camaenidae. Bouchet *et al.* (2017) retained the subfamily Bradybaeninae Pilsbry, 1934 under Camaenidae. This system is followed here.

TABLE 1. — Samples and the GenBank ID used in this study.

ID	Species	GenBank ID	
		16S	COI
1	<i>Coccoglypta liui</i> Páll-Gergely, n. sp.	MK680922	MK680001
2	<i>Coccoglypta pinchoniana</i> (Heude, 1886)	MK680923	MK680002
3	<i>Acusta despecta</i> (Sowerby I, 1839)	LC168907	LC168926
4	<i>Aegista diversifamilia</i> Huang, Lee, Lin & Wu, 2014	KJ574303	KJ574343
5	<i>Aegista mackensii</i> (Adams & Reeve, 1850)	KJ574327	KJ574369
6	<i>Aegista subchinensis</i> (Möllendorff, 1884)	KJ574321	KJ574361
7	<i>Ainohelix editha</i> (A. Adams, 1868)	AB893656	LC168943
8	<i>Amphidromus adamsii</i> (Reeve, 1848)	AB112370	–
9	<i>Amphidromus perversus</i> (Linnaeus, 1758)	AB112375	–
10	<i>Amphidromus semitessellatus</i> (Morlet, 1885)	AB112379	–
11	<i>Amplirhagada burneriensis</i> (E. A. Smith, 1894)	HQ245372	KC703098
12	<i>Basedowena elfina</i> (Iredale, 1939)	KU519216	KU519137
13	<i>Bradybaena phaeogramma</i> (Ancey, 1888)	AF098714	–
14	<i>Bradybaena sequiniana</i> (Heude, 1885)	KR586458	KU586501
15	<i>Bradybaena similis</i> (Férussac, 1822)	HQ245444	–
16	<i>Camaena cicatricosa</i> (O. F. Müller, 1774)	KU586474	KU061276
17	<i>Camaena poyuensis</i> Zhou, Wang & Ding, 2016	KU586468	KU061273
18	<i>Dolichelota formosensis</i> (H. Adams, 1866)	KR338956	KR338956
19	<i>Euhadra amaliae</i> (Kobelt, 1875)	AF279274	–
20	<i>Euhadra peliomphala</i> (L. Pfeiffer, 1850)	AF104052	–
21	<i>Euhadra quaesita</i> (Deshayes, 1850)	AF213712	–
22	<i>Euhadra scaevola</i> (Martens, 1877)	AF279273	–
23	<i>Exiligada gregoriana</i> Criscione, Law & Köhler, 2012	JX393672	JX393761
24	<i>Ezohelix gainesi</i> (Pilsbry, 1900)	AB893736	LC168941
25	<i>Falspleuroxia overlandensis</i> Solem, 1997	KU519178	KU519261
26	<i>Mandarina anijimana</i> Chiba, 1996	AY829598	–
27	<i>Mandarina aureola</i> Chiba, 1989	AF095823	–
28	<i>Mandarina hirasei</i> Pilsbry, 1902	AF098693	–
29	<i>Mandarina mandarina</i> (Sowerby I, 1839)	AY829604	–
30	<i>Mastigeulota kiangsinensis</i> (Martens, 1875)	KM083123	KM083123
31	<i>Paraegista takahidei</i> Kuroda & Azuma, 1951	LC168923	LC168970
32	<i>Satsuma formosensis</i> (L. Pfeiffer, 1866)	EF204776	EF204813
33	<i>Satsuma phoenicis</i> Wu, Hwang & Lin, 2008	EF057350	EF057381
34	<i>Satsuma succincta rubrotincta</i> (Kuroda, 1941)	EF204804	EF204841
35	<i>Sinumelon vagente</i> Iredale, 1939	KJ189759	KJ189748
36	<i>Tatemelon musgum</i> (Iredale, 1937)	KU519194	KU519277
37	<i>Cornu aspersum</i> (O. F. Müller, 1774)	KU586459	KU586502

Genus *Coccoglypta* Pilsbry, 1895

Eulota (*Coccoglypta*) Pilsbry, 1895: 211.

Coccoglypta – Yen 1939: 153. — Schileyko 2004: 1678–1679, fig. 2164.

TYPE SPECIES. — *Helix pinchoniana* Heude, 1886, by monotypy.

DIAGNOSIS. — Shell dextral, depressed-conical, with 5–6 slightly convex whorls; body whorl rounded or slightly keeled; colour yellowish to greenish and light brown; protoconch without notable sculpture, seemingly smooth, or slightly pitted or “hammered”; teleoconch with irregular, rough wrinkles and strong tubercles, occasionally with fine spiral grooves; sculpture on ventral surface sometimes weaker than on dorsal side; aperture rounded to suboval, strongly oblique to shell axis; peristome expanded but not reflected; parietal callus weak, only indicated by fine whitish calcareous layer; umbilicus open, moderately wide to rather narrow, shows all whorls. Penis cylindrical or flattened, moderately long, internally with fine longitudinal pilasters or reticulated sculpture; no epiphallus observed; vas deferens slender, retractor muscle attached on the junction of penis and vas deferens; vagina short, internally with widely-spaced, sometimes converging longitudinal folds; stylophore of moderate size, accessory sac of about same size and shape, each of two alveolar; mucus glands large, distinct or forming a single gland mass, entering accessory sac independently; spermathecal stalk extremely long, bursa oval, small.

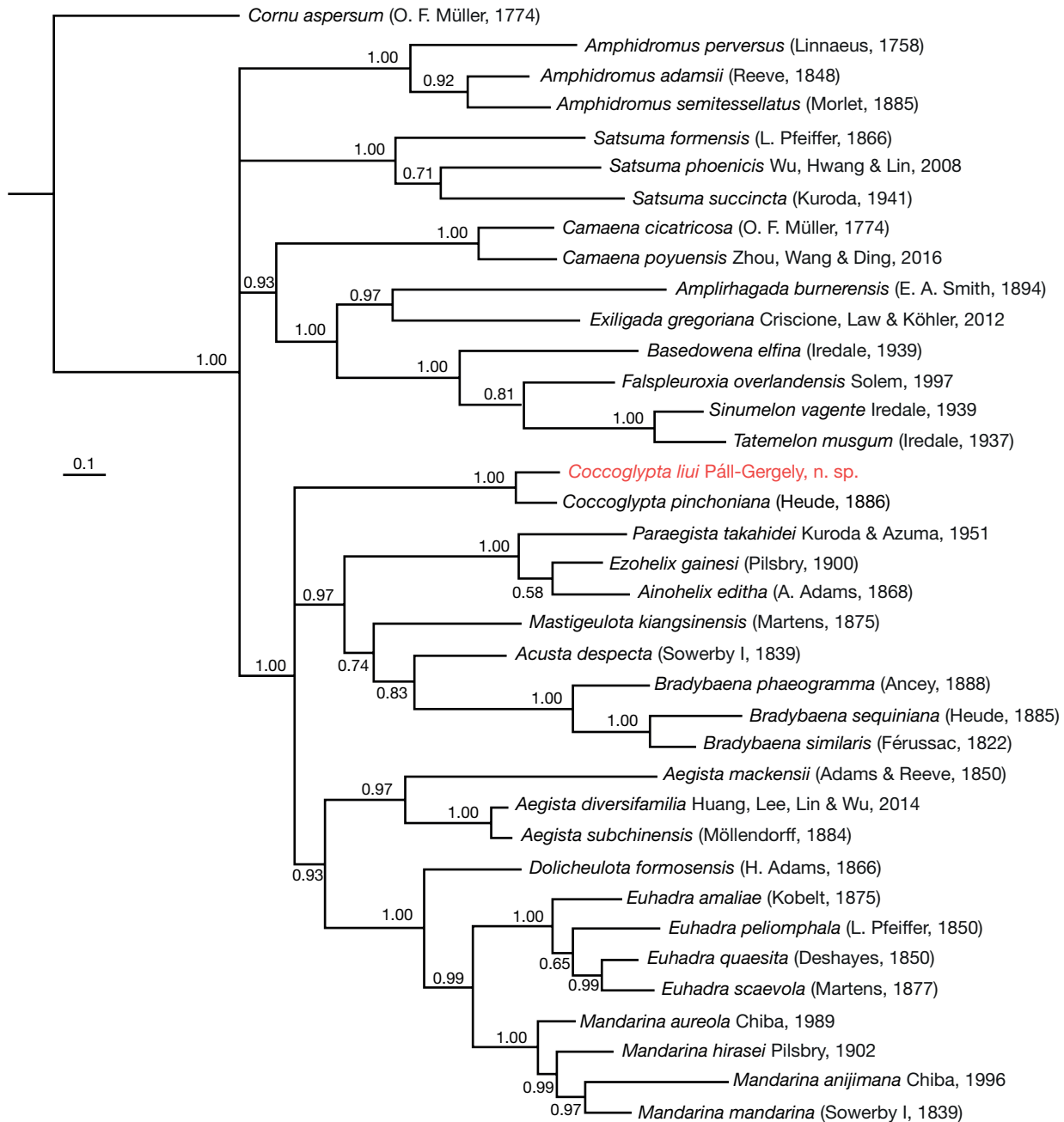


FIG. 1. — Phylogenetic tree using Bayesian inference with mitochondrial 16S and CO1 genes. Numbers above or below branches indicate Bayesian posterior probabilities.

REMARKS

Coccoglypta was erected as a section of *Eulota* W. Hartmann, 1841 for two species, namely “*Helix dimidiata* Heude” and “*Helix pinchoniana* Heude”. Pilsbry (1895) designated the former species as the type species. Heude, however, has never described a species with the name *dimidiata* (see Johnson 1973). Yen (1939) and Zilch (1959-1960) corrected this mistake and clarified type species of *Coccoglypta* as *Helix pinchoniana* Heude, 1886.

Coccoglypta liui Páll-Gergely, n. sp.
(Figs 2A-D; 3, 4)

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TYPE MATERIAL. — **Holotype**. China, Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Houshan; 1200 m a.s.l.; Okubo leg.; 27.X.2014; HNHM 103475; D = 32.9 mm, H = 20.6 mm (Fig. 2A-D).

Paratypes. 2015/50; China, Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Shan, Buyun Cableway upper station – Shangqing-



FIG. 2. — Shells of *Coccoglypta* Pilsbry, 1895 species: **A-D**, *Coccoglypta liui* Páll-Gergely, n. sp. (holotype); **E-F**, syntype of *Coccoglypta pinchoniana* (USNM 472156); **I-L**, *Coccoglypta* cf. *pinchoniana* from Emei Shan (SMF 42574); **M**, second specimen of *Coccoglypta* cf. *pinchoniana* from the same sample as previous; **N**, protoconch of the same shell as I-L. Scale bar: 30 mm; N, not to scale.

gong; 1150 m a.s.l.; 30°54.783'N, 103°33.714'E; A. Hunyadi leg.; 06.VI.2015; coll. HA/1 paratype. — 2015/45; Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Houshan, Taian Zhen, Baiyun Cun, Jiusegong; 1530 m a.s.l.; 30°56.786'N, 103°28.587'E; A.

Hunyadi leg.; 04.VI.2015; coll. HA/1 adult paratype. — A1; China, Sichuan Province, Qingcheng Houshan; c. 30°55'N, 103°29'40"E; Liu Zheng-Ping leg.; 07.IV.2018; SYS m001013 (paratype used for molecular study). — Qingcheng Houshan, Shuijing Dong

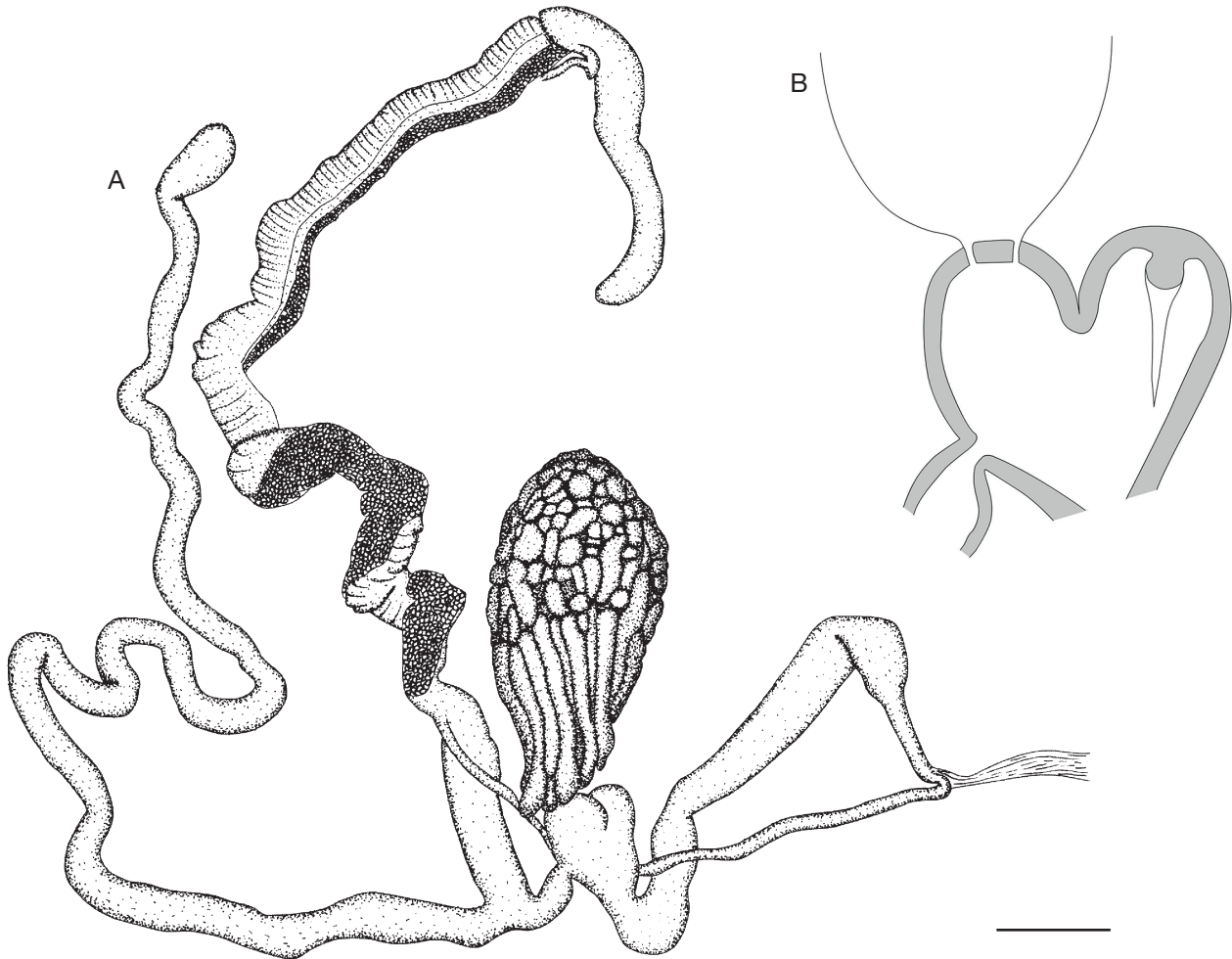


FIG. 3. — Reproductive anatomy of *Coccoglypta liui* Páll-Gergely, n. sp. (holotype, HNHM 103475): **A**, entire genitalia; **B**, schematic drawing of the inner structure of the dart sac. Scale bar: A, 5 mm.

[水晶洞], 2016; Liu Zheng-Ping leg.; HBUMM10005; empty shell.

OTHER MATERIAL EXAMINED. — 2015/50; China, Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Shan, Buyun Cableway upper station – Shangqinggong; 1150 m a.s.l.; 30°54.783'N, 103°33.714'E; A. Hunyadi leg.; 06.VI.2015; coll. HA/ 7 juvenile/broken shells. — 2015/45; Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Houshan, Taian Zhen, Baiyun Cun, Jiusengdong; 1530 m a.s.l.; 30°56.786'N, 103°28.587'E; A. Hunyadi leg.; 04.VI.2015; coll. HA/ 2 juveniles.

ETYMOLOGY. — This new species is named after Liu Zheng-Ping, who has made important contributions to the discovery of this new species.

TYPE LOCALITY. — China, Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Houshan, 1200 m a.s.l.

DIAGNOSIS. — A *Coccoglypta* species with a rounded body whorl, greenish to yellowish colour and weak sculpture on the ventral shell surface.

DESCRIPTION

Shell dextral, rather large, light brown (dorsal surface) to greenish or yellowish (ventral surface, and dorsal side behind

the aperture); colour changing below keel, and some light colouration indicating some growth lines; shell depressed globular, body whorl rounded or with very slightly marked keel (if present, mostly visible from ventral view of the body whorl); entire shell consisting of 5.25-5.75 whorls, separated by rather shallow suture, sometimes indicated by a whitish line; protoconch consisting of 1.5-1.75 whorls, matt, rather smooth, dorsal side of teleoconch dominated by irregular, rather rough wrinkles and tubercles (tubercles appearing after the first 1.5 whorls of teleoconch); some fine spiral grooves also visible; ventral surface without or with much less prominent tubercles, rather “hammered”, irregularly wrinkled and spirally grooved; aperture strongly oblique to shell axis, white; peristome expanded (mostly in basal and umbilical direction) but not reflected; parietal callus weak, only indicated by fine whitish calcareous layer, which is transparent in fresh shells; umbilicus open, moderately wide, showing all whorls.

Measurements

D = 29.1-32.9 mm, H = 16.1-20.6 mm (n = 3).

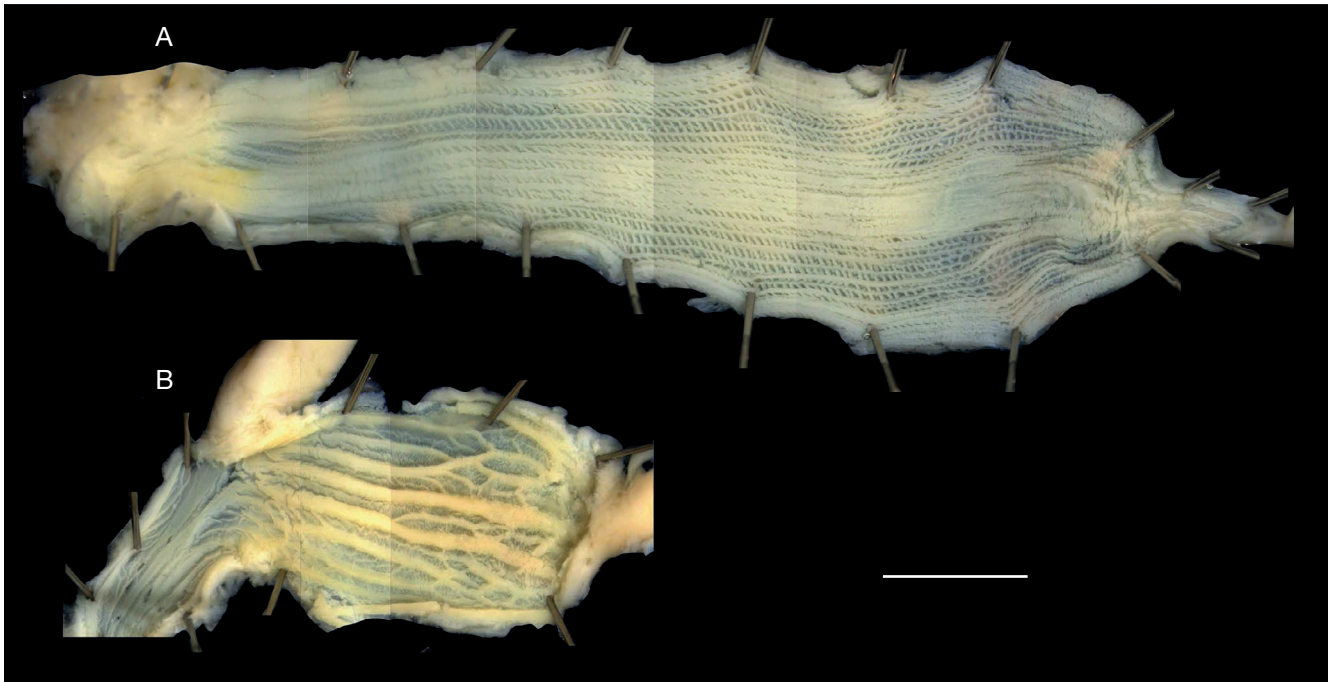


FIG. 4. — Inner structure of the genitalia of *Coccoglypta liui* Páll-Gergely, n. sp. (holotype, HNHM 103475): **A**, penis; **B**, vagina. Genital atrium situated leftwards in both images. Scale bar: 5 mm.

Remarks on the genitalia

From a single specimen anatomically examined from Qingcheng Houshan (Figs 3-4). Right ommatophoral retractor crossed vagina and penis. Inner wall of the penis finely reticulated (Fig. 4A), produced by the perpendicular projections of the slender longitudinal folds. Inner wall of vagina with widely spaced, sometimes converging longitudinal folds (Fig. 4B).

DIFFERENTIAL DIAGNOSIS. — *Coccoglypta liui* Páll-Gergely, n. sp. differs from *C. pinchoniana*, which also occurs sympatrically, by the usually narrower umbilicus, weaker sculpture of the ventral surface, the lighter colour, and the less keeled body whorl. The ventral side of *C. pinchoniana* is dominated by ribs and tubercles, but also has fine spiral grooves. However, the ventral shell surface of *Coccoglypta liui* Páll-Gergely, n. sp. has much less prominent tubercles and is dominated by spiral grooves.

DISTRIBUTION. — So far this species is known only from Qingcheng Houshan and Qingcheng Shan in Sichuan Province, China (Fig. 5).

REMARKS

Our observations on the genitalia generally match with those of Schileyko (2004), based on a *C. pinchoniana* specimen collected in Emei Shan. The notable differences are the following: 1) the mucus glands form a single oval mass, not separated clearly as on Schileyko's (2004) drawing; 2) we have not found a twisted part of the spermathecal stalk in a capsule; and 3) the bursa copulatrix is smaller and more elongated than the specimen examined by Schileyko (2004). It is yet unclear which of these differences represents species-specific traits.

Coccoglypta pinchoniana (Heude, 1886)

(Fig. 2E-N)

Helix pinchoniana Heude, 1886: 213.

Coccoglypta pinchoniana — Yen 1936: 335-336; 1939: 153, pl. 15, fig. 64. — Zilch 1960: 640-641, fig. 2242. — Chen & Gao 1987: 158-159, fig. 204. — Schileyko 2004: 1678-1679, fig. 2164. — Chen & Zhang 2004: 371-372, fig. 370.

TYPE MATERIAL EXAMINED. — **Syntypes.** USNM 472156 and MCZ 167190.

ADDITIONAL MATERIAL EXAMINED. — “Berg Omi, Sytchuan”; Schmacker leg. 1893; SMF 42574/2. — 2015/50; China, Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Shan, Buyun Cableway felső állomás – Shangqinggong; 1150 m a.s.l.; 30°54.783'N, 103°33.714'E; A. Hunyadi leg.; 06.VI.2015, coll. HA/1. — 2015/51a; China, Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Shan, Chaoyangdong 50 m towards Shangqinggong; A. Hunyadi leg.; 06.VI.2015; coll. HA/2. — 2015/55; China, Sichuan, Chengdu Shi, Dujiangyan Shi, Qingcheng Shan, Jinbian Yan; 940 m a.s.l.; 30°53.733'N, 103°33.087'E; A. Hunyadi leg.; 07.VI.2015; coll. HA/1. — China, Sichuan Province, Chongzhou Shi, Jiezi Zhen, Fengqishan; Liu Zheng-Ping leg.; 13.I.2018; SYS m001014 (specimen used for molecular study).

TYPE LOCALITY. — Tchen-tou-fou (Chengdu city, Sichuan Province).

DIAGNOSIS. — A *Coccoglypta* species with a keeled body whorl, light brown, greenish to greyish colour and strong sculpture on the ventral shell surface.

DISTRIBUTION. — This species is more widely distributed than *C. liui* Páll-Gergely, n. sp. Namely, it was collected on the Emei Shan, the Qingcheng Shan and Fengqishan.

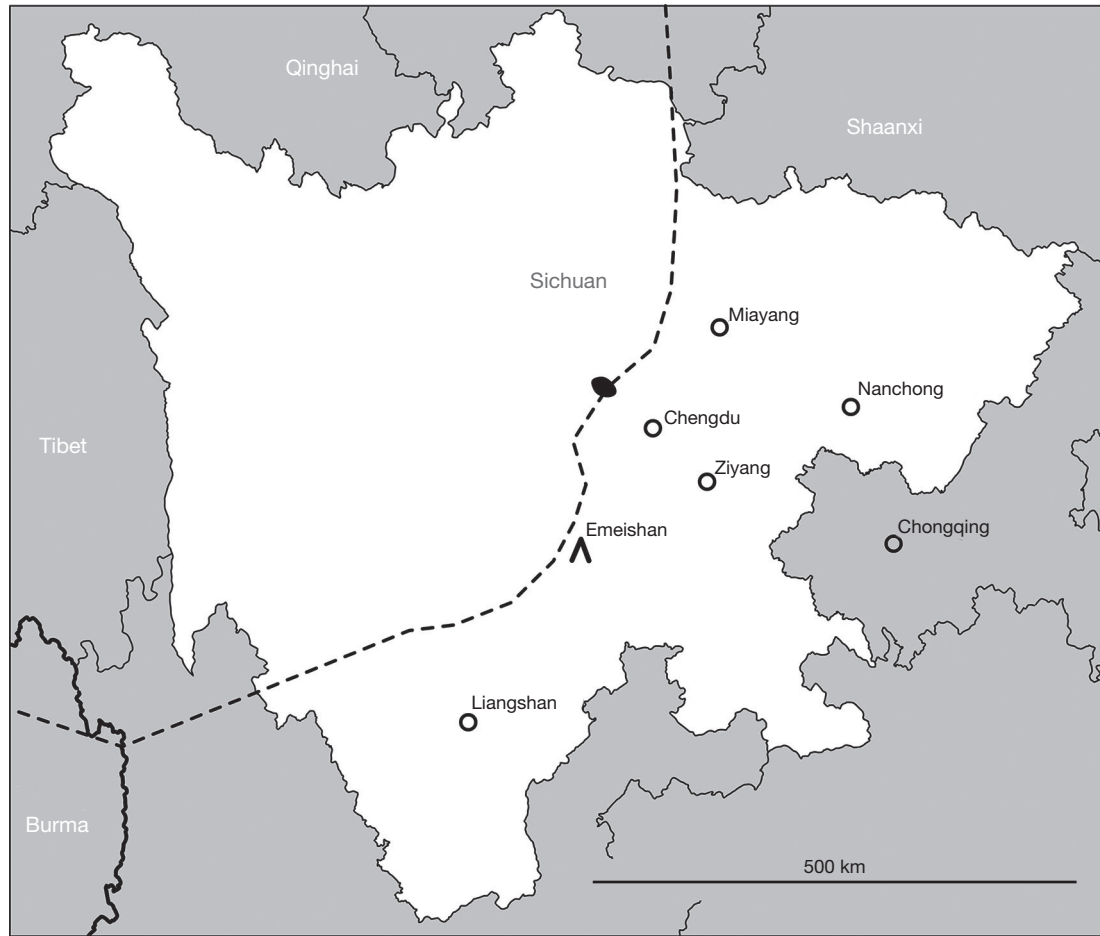


FIG. 5. — Map of Sichuan showing the localities of *Coccoglypta* Pilsbry, 1895 species. Dashed line shows the edge of the Tibetan Plateau. *Coccoglypta pinchonia* (Heude, 1886) was described from Chengdu, and it was known from the Emeishan, and a fossil record from Chongqing. Now we report this species and *C. liui* Páll-Gergely, n. sp. from Qingcheng Shan and Qingcheng Houshan (black area).

COMPLEMENT OF DESCRIPTION

Shell dextral, rather large, light brown, greenish to greyish, dorsal and ventral surface of similar colour; shell depressed globular or conical, body whorl slightly or prominently keeled; entire shell consists of 5.25-5.75 whorls, separated by rather shallow suture; protoconch consisting of 1.5-1.75 whorls, matt, rather smooth, dorsal side of teleoconch dominated by irregular, very rough wrinkles and strong tubercles (tubercles appearing after the first 1.5 whorls of teleoconch); some fine spiral grooves also visible, especially close to the suture; ventral surface similar to dorsal, although with slightly weaker sculpture; aperture strongly oblique to shell axis, white; peristome expanded (mostly in basal and umbilical direction) but not reflected; parietal callus weak, only indicated by fine whitish calcareous layer, which is transparent in fresh shells; umbilicus open, moderately wide to rather narrow, showing all whorls.

Measurements

D = 25.7-31.9 mm, H = 15.0-17.5 mm (n = 6).

REMARKS

This species was originally described from Chengdu city, Sichuan Province (Heude, 1886). It is known as a subfossil record from Chongqing town (Yen 1936). This species is considered a vulnerable species (Wang & Xie 2005).

Coccoglypta arbusticola (Deshayes, 1870) n. comb.
(Fig. 6A-D)

Helix arbusticola Deshayes, 1870: 20.

non *Bradybaena arbusticola arbusticola* – Yen 1939: 135, pl. 14, fig. 2.

non *Coccoglypta arbusticola* – Chen & Zhang 2004: 155-156, fig. 123.

TYPE MATERIAL EXAMINED. — China. Moupin [Muping Zhen, Sichuan], l'Abbé David, 1869, syntype, MNHN-IM-2000-34192.

TYPE LOCALITY. — “Principauté de Moupin, Thibet oriental” (from title).



FIG. 6. — Potential members of the genus *Coccoglypta* Pilsbry, 1895: **A-D**, syntype of *Coccoglypta arbusticola* (Deshayes, 1870) n. comb. (MNHN-IM-2000-34192); **E-H**, “*Bradybaena*” *chrysomphala* (Möllendorff, 1899), SMF 9159 (lectotype); **I-L**, *Coccoglypta* cf. *leprosula* n. comb. (Heude, 1885) from the Guanwushan Forest Farm. Scale bar: 30 mm.

REMARKS

This species has previously been assigned to the genus *Bradybaena*, however it surely does not belong to that genus in its present concept. The type species of *Bradybaena*, *B. similis* (Rang, 1831), has a small (*c.* 1 cm), fragile shell without any distinctive sculpture. However, *C. arbusticola* n. comb. is larger (shell diameter of syntype: 24.5 mm), and has a thick, finely mamillated shell, reminiscent of those of *Coccoglypta*.

We have examined the lectotype of *Eulota arbusticola chrysomphala* Möllendorff, 1899 (see Möllendorff, 1899: 70 and Yen, 1939: 135) in the Senckenberg Museum (China: W. Sy-tshuan, Fu-bien-ho, SMF 9159, figs 6E-H). It had a light brown, very finely wrinkled and extremely finely spirally grooved shell, without any signs of mamillae. The aperture is also comparatively much larger in *chrysomphala* than in *arbusticola*. Thus, “*Bradybaena*” *chrysomphala* and *Coccoglypta arbusticola* n. comb. cannot be subspecies of the same species and must be considered as two distinct species.

The single shell in the Senckenberg Museum identified as *B. arbusticola* and figured by Yen (1939) has a narrower umbilicus and more rapidly growing whorls than the type, and there are also no signs of a mamillated sculpture. Therefore, we here exclude it from the present species. Its true identity remains unknown. Furthermore, the shell figured in Chen & Zhang (2004) also belong to another species, because it has a narrower umbilicus, a dark spiral band, and a more strongly expanded peristome.

Coccoglypta billiana (Heude, 1882) n. comb.

Helix billiana Heude, 1882: 25, pl. 14, fig. 3.

TYPE LOCALITY. — “In montosis Kiun-tcheou, ditionis fluvii Han” (= in the mountain regions of Kiun-tcheou, the area of the Han River).

REMARKS

As for the previous species, Johnson (1973) did not mention type specimens in American museums, and we could not examine the types probably deposited in Beijing. Since the sculpture is also mamillated, the species also potentially belongs to *Coccoglypta*.

Coccoglypta leprosula (Heude, 1885) n. comb.
(Fig. 6I-L)

Helix leprosa Heude, 1885a: 106, pl. 27, fig. 15.

Helix leprosula Heude, 1885b: 43.

Helix (Satsuma) leprosula – Tryon 1887: 220, pl. 51, figs 80-82.

MATERIAL EXAMINED. — **China**. Sichuan, Mianyang Shi, Jiangyou Shi, Wudu Zhen, Guanwushan Forest Farm; 31°56'38.8"N, 104°44'1.1"E; 1590 m; A. Hunyadi & M. Szekeres leg.; 21-22. VI.2015; coll. HA; 1 adult + 2 juvenile shells (*Coccoglypta* cf. *leprosula* n. comb., Figures 6I-L).

TYPE LOCALITY. — “Tchen K'ou” (Chengkou, Chongqing Province).

REMARKS

Johnson (1973) did not mention type specimens in American museums, and we could not contact the Beijing Natural History Museum, where some of Heude's types are deposited. Therefore, we rely on the original description only. Accordingly, the shell is 26 mm wide, narrowly umbilicated, and the sculpture is finely tuberculated, as in *Coccoglypta*.

The specimen we examined matches the original description, but the identification is certainly doubtful. It was collected *c.* 370 km west from the type locality of “*Satsuma*” *leprosula*. However, it must be kept in mind that the type locality is just a rough estimate, Heude received specimens from other missionaries who collected shells during their travels across large geographic areas.

Family ARIOPHANTIDAE Godwin-Austen, 1883

Genus *Hemiplecta* Albers, 1850

TYPE SPECIES. — *Helix humphreysiana* I. Lea, 1841, by subsequent designation (Martens in Albers 1860).

Hemiplecta (?) *scrobiculata scrobiculata* (Gredler, 1885)
(Fig. 7E-I)

Zonites scrobiculatus Gredler, 1885: 220-221, pl. 6, fig. 2. — Bachmann & Gredler 1894: 416.

Coccoglypta scrobiculata scrobiculata – Yen 1939: 153, pl. 15, fig. 62.

Coccoglypta scrobiculata – Chen & Zhang 2004: 370, fig. 368 (treating *hupeina* as a junior synonym).

MATERIAL EXAMINED. — **China**. Hunan, Heng-san-hsien, coll. O. v. Möllendorff, SMF 42575/3.

TYPE LOCALITY. — “Hen-san, im Districte von Hen-kiou-fu in Hunan”.

DESCRIPTION

Shell dextral, medium-sized, dark yellowish-slightly greenish on both ventral and dorsal sides; shell depressed globular-conical with a rounded body whorl; entire shell consisting of 4.75-5 whorls, separated by rather shallow suture; protoconch consisting of 1.75-2 whorls, very finely mamillated with recognisable spiral striation; dorsal side of teleoconch dominated by irregular, wavy ribs (waviness seemingly caused by spiral lines occurring only at back of ribs); area between middle line of body whorl (from apertural view) and ventral side (except for umbilicus region) glossy, with much weaker sculpture than on dorsal side or inside umbilicus; aperture oblique to shell axis, whitish in one specimen, but yellow in the other two; peristome not expanded; parietal callus weak, only indicated by fine whitish calcareous transparent layer; umbilicus open, rather narrow, deep, showing all whorls.

Measurements

D = 18.4-19.9 mm, H = 10.7-12.0 mm (n = 3).

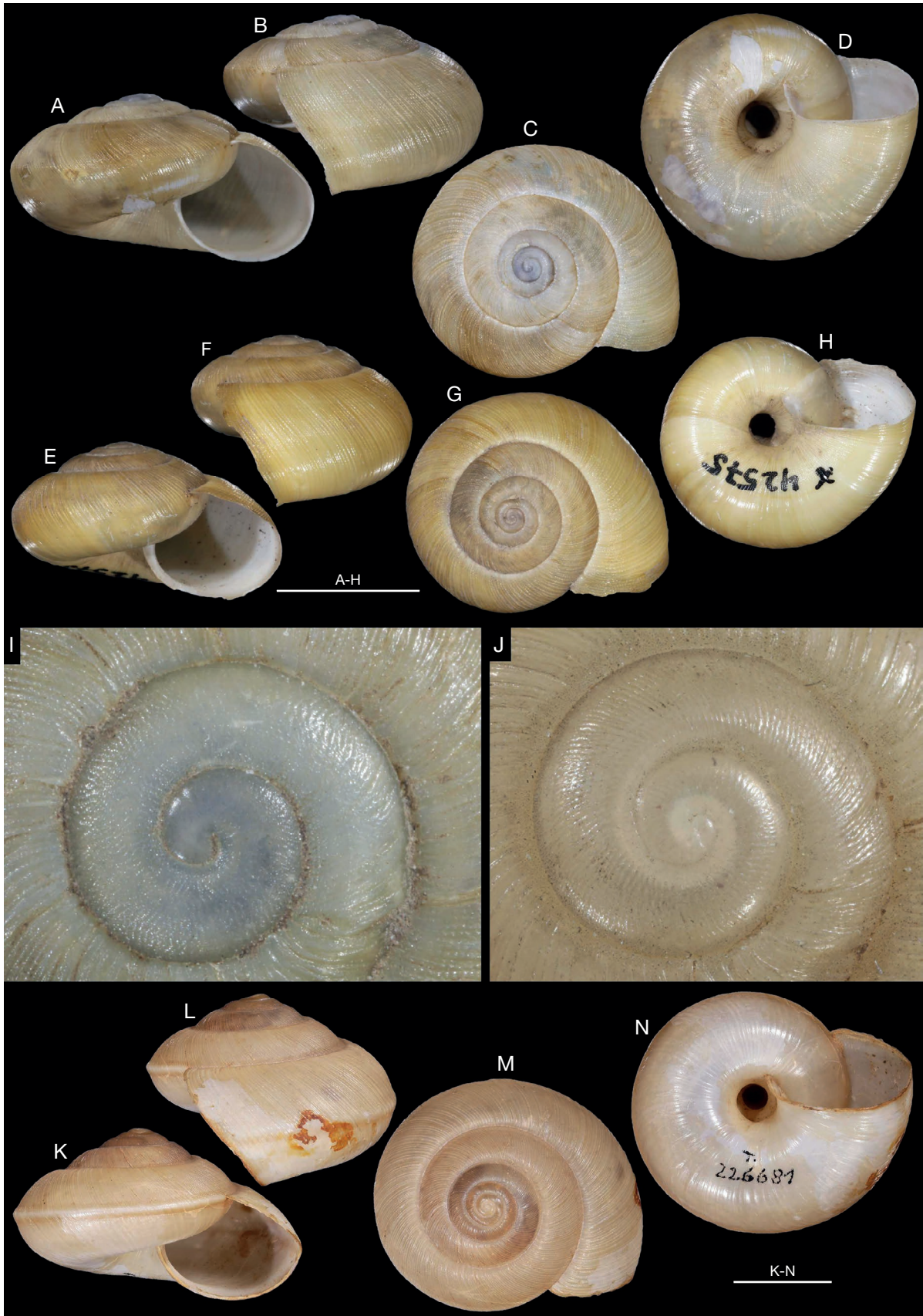


FIG. 7. — Shells of “*Hemiplecta*” species: **A-D**, *Hemiplecta scrobiculata hupeiana* (Gredler, 1887) (syntype, SMF 44672); **E-I**, *Hemiplecta scrobiculata scrobiculata* (Gredler, 1885), SMF 42575; **J-H**, *Hemiplecta laotica* (Möllendorff, 1899) (holotype, SMF 226681). Scale bars: 10 mm; I-J not to scale.

REMARKS

Zilch (1974) found a single syntype in Bolzano in Gredler's collection.

Hemiplecta (?) *scrobiculata hupeiana* (Gredler, 1887)
(Fig. 7A-D)

Zonites (*Nanina*?) *scrobiculatus* var. *hupeiana* Gredler, 1887: 344-345.

Coccolypta scrobiculata hupeina – Yen 1939: 153, pl. 15, fig. 63. — Chen & Gao 1987: 159, fig. 205.

TYPE MATERIAL EXAMINED. — **China.** Hu-bei (Hupei), coll. O. v. Möllendorff, ex coll. Gredler, SMF 42576/2 syntypes. — Hupé (Hupei), coll. G. Naegle, ex coll. Gredler, SMF 50091/1 syntype; China: Hubei (Hupei), coll. O. Boettger, ex coll. Gredler 1888, SMF 44672/1 syntype.

ADDITIONAL MATERIAL EXAMINED. — **China.** Hubei, Enshi Tujiazou Miaozu Zizhizhou, Enshi Shi, Mufucun SW 3 km, Enshi Daxiagu, Mother-child Affection; 30°26.029'N, 109°10.260'E; A. Hunyadi leg.; 05.XI.2010; coll. HA/10 shells.

TYPE LOCALITY. — “Hupé”.

DIFFERENTIAL DIAGNOSIS. — *Hemiplecta scrobiculata hupeiana* differs from the nominotypical subspecies by the larger, slightly keeled shell.

MEASUREMENTS. — D: 20.1-23.3 mm, H: 10.9-12.4 mm (n = 4).

REMARKS

The examined syntypes were taken from Gredler's collection to the Senckenberg Museum by Adolf Zilch (Zilch 1974).

DISCUSSION

Several hundreds of Asian camaenids have been described in the last two centuries, most intensively at the end of the 19th and the beginning of the 20th centuries. However, the reproductive anatomy, which would allow more precise generic placements, is known from a small fraction of species only. Therefore, the species exclusively known from their shells are traditionally placed into “dustbin” genera. Furthermore, shells of Camaenidae (including Bradybaeninae) and Ariophantidae (including similar families such as Helicarionidae) can be both “helicoid”, and thus, strikingly similar in appearance. As a result, reliably distinguishing between the two groups without knowing the reproductive anatomy may sometimes be difficult. *Hemiplecta scrobiculata* was originally placed in the genus *Nanina* Sowerby, 1842, which is now placed in the Ariophantidae (Schileyko 2002), and was later moved to *Coccolypta* (Yen 1939). Although the teleoconch sculpture of *C. scrobiculata* is indeed strikingly similar to that of *Coccolypta*, the different protoconch sculpture (*Coccolypta*: practically smooth; *Hemiplecta scrobiculata*: finely reticulated) immediately tells that the two groups might not be closely related. Furthermore, the sharp (not expanded or thickened) peristome of *Hemiplecta scrobiculata* speaks against its affinity with the Camaenidae. Similarly, *Chalepotaxis infantilis* (Gredler, 1881), which looks like a bradybaenid with a sharp

peristome, was placed in the Bradybaenidae by some, and in Helicarionidae by other authors; membership in the latter family being recently confirmed by Páll-Gergely *et al.* (2016).

We can find numerous ariophantid groups with a sculpture similar to that of *Hemiplecta scrobiculata* (dashed ribs on the teleoconch). However, the generic placement of *Hemiplecta scrobiculata* is difficult for to the unresolved genus-level classification of the Ariophantidae. The genus *Elaphroconcha* Gude, 1911, which inhabits the Indonesian islands, and *Cryptozona* Mörch, 1872 (treated as a subgenus of *Ariophanta* by Schileyko [2002]), which is widely distributed in Southeast Asia, have a finely tuberculated teleoconch, similar to that of *Hemiplecta scrobiculata* (Schileyko 2003). However, both genera have dot-like, narrow, sometimes even closed umbilici. The protoconch and teleoconch sculpture as well as the narrow, but open umbilicus of *H. scrobiculata* is reminiscent of *Hemiplecta laotica* (Möllendorff, 1899) (examined specimens: holotype: SMF 226681 [Fig. 7J-H], and three paratypes: SMF 226682). That species has recently been placed in *Ariophanta* Des Moulins, 1829 (Inkhavilay *et al.* 2019) and in *Hemiplecta* (Páll-Gergely 2019). It probably does not belong to *Ariophanta*, because the type species, *Ariophanta laevipes*, is known from southern India, and looks quite different (sinistral, banded, with very narrow umbilicus). The genus *Oxytes* (the subgenus where *H. laotica* has been originally placed to) also does not suit *H. laotica*, because its type species (*Helix oxytes* Benson, 1836) has irregular, but not dashed growth wrinkles on both protoconch and teleoconch (examined specimen: UMZC I.102145, probably syntype). The genus *Phuphania* Tumpeesuwan, Naggs & Panha, 2007 has a narrow umbilicus, but similar sculpture to that of *Hemiplecta scrobiculata* (Tumpeesuwan *et al.* 2007, Tumpeesuwan & Tumpeesuwan 2014). Ultimately *Hemiplecta scrobiculata* might deserve to be placed in its own genus, although we refrain from describing it without knowing the reproductive organs.

Acknowledgements

We are grateful to Sigrid Hof and Ronald Janssen for granting access to the collection of the SMF, to Richard Preece and Tom S. White for sending photos of the syntype of *Helix oxytes*, to Nicolas Raymond for taking photos of the syntype of *Coccolypta pinchoniana*, to Liu Zheng-Ping and Kanji Okubo for providing specimens and to two reviewers for their comments on the manuscript. This study was supported by the MTA (Hungarian Academy of Sciences) Premium Post Doctorate Research Program to Barna Páll-Gergely.

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APPENDIX

Appendix 1. — Locality names mention in this manuscript.

Pinyin	Chinese
Baiyun Cableway	白云索道
Baiyun Cun	白云村
Chaoyangdong	朝阳洞
Chengdu Shi	成都市
Chengkou	城口县
Chongqing Shi	重庆市
Chongzhou Shi	崇州市
Dujiangyan Shi	都江堰市
Fengqishan	风栖山
Fu-bien-ho	抚边河
Gansu	甘肃省
Guanwushan Forest Farm	观雾山林场
Heng-san-hsien	衡山县
Hen-kiou-fu	衡州府
Hen-san	衡山
Hubei	湖北省
Hu-bei	湖北省
Hunan	湖南省
Hupé (Hubei)	湖北省
Hupei (Hubei)	湖北省
Jiangyou Shi	江油市
Jiezi Zhen	街子镇
Jinbian Yan	金鞭岩
Jiusengdong	九僧洞
Kiun-tcheou	均州(=丹江口市)
Mianyang Shi	绵阳市
Moupin	穆坪(镇)
Muping Zhen	穆坪镇
Qingchenghoushan	青城后山
Qingchengshan	青城山
Shangqinggong	上清宫
Shuijingdong	水晶洞
Sichuan	四川省
Sy-tshuan (Sichuan)	四川省
Taian Zhen	泰安镇
Tchen K'cou (Chengkou)	城口县
Wudu Zhen	武都镇