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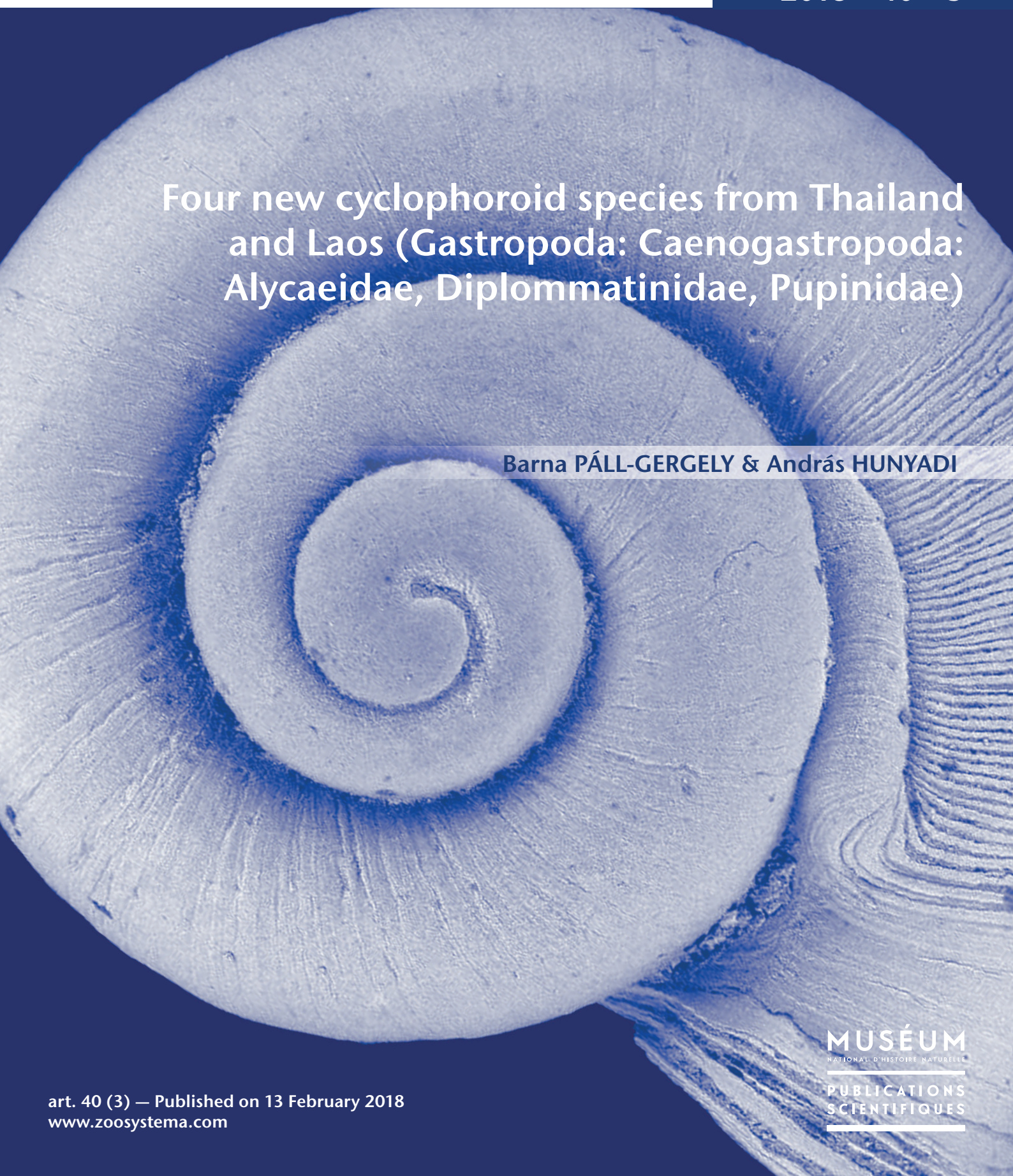

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Shells of *Dicharax caudapiscis* n. sp. (holotype).

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Four new cyclophoroid species from Thailand and Laos (Gastropoda: Caenogastropoda: Alycaeidae, Diplommatinidae, Pupinidae)

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ABSTRACT
This paper describes four new species, namely *Dicharax caudapiscis* n. sp., *Dicharax stuparum* n. sp. (both family Alycaeidae Blanford, 1864), *Pseudopomatias caligosus* n. sp. (family Pupinidae L. Pfeiffer, 1853) and *Arinia* (*Notharinia*) *boucheti* Páll-Gergely, n. sp. (family Diplommatinidae Benson, 1849). The first three were recently collected in northern Thailand, whereas the latter one was collected in Laos by Edmond Saurin, and later also found in the collection of the Muséum national d'Histoire naturelle, Paris.

KEY WORDS
Prosobranchia,
operculate land snails,
new species.

RÉSUMÉ
Quatre nouvelles espèces de cyclophoroides de Thailande et du Laos (Gastropoda: Caenogastropoda: Alycaeidae, Diplommatinidae, Pupinidae).
Cet article décrit quatre espèces nouvelles, *Dicharax caudapiscis* n. sp., *Dicharax stuparum* n. sp. (toutes deux issues de la famille Alycaeidae Blanford, 1864), *Pseudopomatias caligosus* n. sp. (famille Pupinidae L. Pfeiffer, 1853) and *Arinia* (*Notharinia*) *boucheti* Páll-Gergely, n. sp. (famille Diplommatinidae Benson, 1849). Les trois premières ont été récemment collectées au Nord de la Thailande, alors que la dernière fut collectée au Laos par Edmond Saurin, et retrouvée dans les collections du Muséum national d'Histoire naturelle, Paris.

MOTS CLÉS
Prosobranchia,
operculate land snails,
espèce nouvelle.

INTRODUCTION

Terrestrial molluscs are either pulmonate or operculate snails (former Prosobranchia). While the latter group is represented in the temperate region with few species compared to pulmonates, in the tropics they can attain up to 50% of land snail diversity (Neubert 2009). Operculate groups tend to have more highly fragmented population structures and consequently, a higher degree of endemism. Furthermore, operculate snails generally have a narrower ecological tolerance, which, together with their limited distributional areas, makes them more vulnerable to habitat destruction, than pulmonate snails (Schilthuizen *et al.* 2002). The land snail fauna of Southeast Asia has been most intensively studied at the end of the 19th, and the beginning of the 20th Century. Kobelt (1902) compiled all terrestrial operculate species known at that time, but since then, there has been no such attempt to collate all our knowledge into one place. Although recent investigations resulted in systematic revisions of some operculate genera (e.g., Kongim *et al.* 2013; Páll-Gergely *et al.* 2015, 2017), most species have not been mentioned in the scientific literature since those descriptions. Consequently, the majority of Southeast Asian terrestrial operculate snails are not sufficiently illustrated, and our knowledge on their intraspecific morphological variability, distribution, habitat preference, etc. is very limited. This results in difficulties in species identification, not to mention the proper description of new species.

In the present paper we describe four new species of terrestrial operculate snails from Thailand and Laos. Namely, an *Arinia* (*Notharinia*) Vermeulen, Phung & Truong, 2007, two *Dicharax* Kobelt & Möllendorff, 1900, and a *Pseudopomatias* Möllendorff, 1885. All species of the subgenus *Arinia* (*Notharinia*) have been described recently and illustrated sufficiently in the original descriptions (Vermeulen *et al.* 2007; Maassen 2008; Marzuki & Foon 2016). Thus, the specimens found in the Muséum national d'Histoire naturelle, Paris, can be properly distinguished from the already known congeners. The description of the new *Pseudopomatias* species is possible because the genus has recently been revised (Páll-Gergely *et al.* 2015), and additional information was published subsequently (Páll-Gergely 2016). Descriptions of the two new *Dicharax* species is possible because during the genus-level revision of the family, the vast majority of the types of the extant *c.* 360 alycaeid species were examined by us. Only a few species were similarly small in size to the two new species, and they differ from them in important conchological characters.

MATERIAL AND METHODS

The counting of the shell whorls (to the closest 0.25 whorl) follows Kerney & Cameron (1979: 13). The shells of *Pseudopomatias caligosus* n. sp. were measured using Vernier callipers, whereas the other shells were measured using digital SEM images. Buccal mass of *P. caligosus* n. sp. was removed and soaked in 2 M KOH solution for approximately five hours before extracting the radula, which was preserved in 70% ethanol. Shells and radula were directly observed without coating under a low vacuum SEM (Miniscope TM-1000, Hitachi High-Technologies, Tokyo). The nomenclature of the alycaeid shell follows Páll-Gergely *et al.* (2017; see figs 1A, B therein).

We used the following type specimens for comparisons: *Dicharax* (?) *ellipticus* Páll-Gergely, 2017: RMNH 5004014 (holotype); *Dicharax* (?) *abdoui* Páll-Gergely, 2017: MNHN-IM-2012-27329 (holotype); *Dicharax canaliculatus* (von Moellendorff, 1894): SMF 109468 (lectotype), SMF 109469 (paralectotypes); *Dicharax microdiscus* (Möllendorff, 1887): SMF 109496 (lectotype), SMF 109497 (paralectotypes); *Dicharax parvulus* (Möllendorff, 1887): SMF 109507 (lectotype), SMF 109508 (paralectotypes). Other *Dicharax* species are not similar to the new species, and therefore, no comparisons are necessary.

Abbreviations

Institutions

HNHM	Hungarian Natural History Museum, Budapest;
MNHN	Muséum national d'Histoire naturelle, Paris;
NHM	The Natural History Museum, London;
NHMUK	When citing NHM registered specimens;
RMNH	National Museum of Natural History Naturalis, Leiden;
SMF	Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt am Main.

Private collection

coll. HA	Collection András Hunyadi, Budapest;
coll. PGB	Collection Barna Páll-Gergely, Mosonmagyaróvár.

Measurements

D	shell diameter;
H	shell height.

SYSTEMATICS

Family Alycaeidae Blanford, 1864

Genus *Dicharax* Kobelt & Möllendorff, 1900

Dicharax Kobelt & Möllendorff, 1900: 186.

Type species. — *Alycæus hebes* Benson, 1857, by subsequent designation (Gude 1921).

Remarks

The genus *Dicharax* is characterized by a shell without spiral striation (both protoconch and teleoconch). Typical *Dicharax* species possess curved R2 ribs, but species with different rib morphology are also classified in this genus (Páll-Gergely *et al.* 2017).

Dicharax caudapiscis n. sp.
(Fig. 1A-E)

Type material. — **Thailand**. Chiang Rai Province, approx. 9 km south-southwest from Mae Sai, Wat Tham Pla, 400 m a.s.l., 20°19.723'N, 99°51.817'E, leg. Hunyadi A., 12.II.2015., HNHM 100177 (holotype, D = 1.92 mm, H = 0.98 mm).

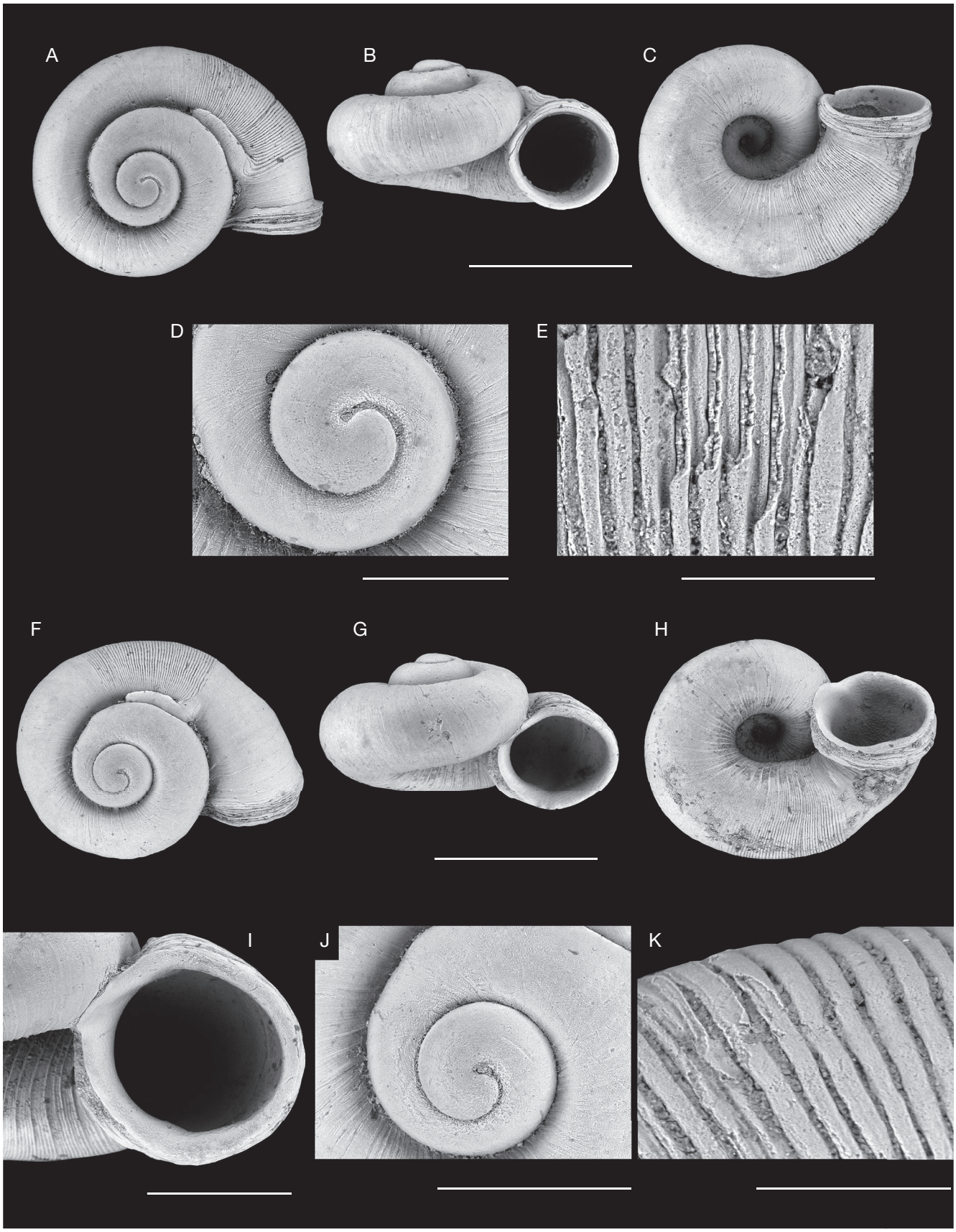

Fig. 1. — Shells of *Dicharax* Kobelt & Möllendorff, 1900 species: **A**-**E**, *Dicharax caudapiscis* n. sp. (holotype); **F**-**K**, *Dicharax stuparum* n. sp. (holotype). Photograph: Barna Páll-Gergely. Scale bars: A-C, F-H, 1 mm; D, 300 µm; E, K, 100 µm; I, J, 500 µm.

Etymology. — The specific epithet caudapiscis (Latin: fish tail) refers to the name of the cave in the type locality (Wat Tham Pla = Fish Tail Cave).

Type locality. — Thailand, Chiang Rai Province, approx. 9 km south-southwest from Mae Sai, Wat Tham Pla, 400 m a.s.l., 20°19.723'N, 99°51.817'E.

Diagnosis. — A very small species with nearly flat shell, smooth R1, normally long R2 with dense, curved ribs, and a very short R3.

Differential diagnosis. — The only such tiny alycaeid species in the neighbouring areas (Myanmar, Thailand, adjacent Chinese provinces and Laos) are *Dicharax* (?) *abdoui* and *Dicharax* (?) *ellipticus*. Those species, however, possess a long, bluntly thickened R3, and lack curved ribs on the R2. Some tiny new *Dicharax* species are known from Peninsular Malaysia, but they all have a ribbed R2 and a longer R3. *Dicharax caudapiscis* n. sp. differs from *D. stuparum* n. sp. by the less oblique aperture, weaker R1 sculpture, and the much shorter R3.

Distribution. — This species is known from the type locality only.

Description

Shell very small for the genus, off-white, nearly entirely flat, shell outline oval from standard dorsal view, body whorl rounded; protoconch with 1.5 whorls, glossy; R1 with *c.* 1.25 whorls, also glossy, with very fine, irregular growth lines (most prominent inside umbilicus); boundary between R1 and R2 clearly visible because R2 bears dense, curved ribs (*c.* 46 altogether); ribs curve posteriorly (= away from aperture) at proximal end of R2, whereas anteriorly (= towards aperture) at anterior end of R2; cross section of ribs and microtunnels could not be examined; R2 and R3 less than 90 degrees combined, R2 *c.* two times longer than R3; R2 and R3 separated by a shallow incision; R3 very short, without swelling; aperture rounded, only slightly oblique to shell axis; peristome thickened, reflected only in direction of umbilicus; inner peristome slightly protruding; boundary between inner and outer peristomes hardly visible. Operculum and soft anatomy unknown.

Measurements (in mm)
D = 1.92, H = 0.98.

Remarks

Although *Dicharax caudapiscis* n. sp. and *D. stuparum* n. sp. are similar in terms of shell size, and the geographic distance between them is small, they are clearly distinct species because of the strikingly different proportions of shell regions.

Dicharax stuparum n. sp.
(Fig. 1F-K)

Type material. — **Thailand**. Chiang Rai Province, Doi Tung, 50 m before Wat Phra That Doi Tung, around the car park, 1350 m a.s.l., 20°19.540'N, 99°49.987'E, leg. Hunyadi A., 12.II.2015., HNHM 100178 (holotype, D =1.87 mm, H = 0.95 mm), coll. HA (2 paratypes).

Etymology. — The specific epithet *stuparum* (Latin: of the two stupas) refers to the temple of the Mt. Doi Tung, which is known for its twin stupas.

Type locality. — Thailand, Chiang Rai Province, Doi Tung, 50 m before Wat Phra That Doi Tung, around the car park, 1350 m a.s.l., 20°19.540'N, 99°49.987'E.

Diagnosis. — A very small species with smooth R1, short R2 having dense, curved ribs, and a long R3 with a blunt thickening.

Differential diagnosis. — *Dicharax* (?) *abdoui*, which is known from Laos, has a more rounded shell outline from dorsal view, a more elevated protoconch, a shorter R2 with low riblets, and a less expanded outer peristome. The Vietnamese *Dicharax* (?) *ellipticus* also has a shorter R2 without elevated ribs. The Malaysian tiny *Dicharax* species (*D. canaliculatus*, *D. microdiscus* and *D. parvulus*; see photos in Páll-Gergely *et al.* 2017) all have a regularly ribbed R1. See also under *Dicharax caudapiscis* n. sp.

Distribution. — This species is known from the type locality only.

Description

Shell very small to the genus, off-white, depressed, shell outline oval from standard dorsal view, body whorl rounded; protoconch with 1.5 whorls, glossy; R1 with slightly more than one whorl, also glossy, with fine, irregular growth lines on the dorsal side and relatively strong ribs inside umbilicus; boundary between R1 and R2 clearly visible because R2 bears dense, curved ribs (*c.* 46-48 altogether); ribs curve posteriorly (= away from aperture) at proximal end of R2, whereas anteriorly (= towards aperture) at anterior part of R2; cross section of ribs and microtunnels could not be examined; R2 and R3 *c.* 100-110 degrees combined, R3 slightly longer than R2; boundary of R2 and R3 marked with a very slight constriction; R3 glossy, with low swelling; aperture rounded, oblique to shell axis; peristome thickened; outer peristome strongly expanded and reflected, especially in direction of umbilicus; inner peristome protruding; boundary between inner and outer peristomes clearly visible. Operculum and soft anatomy unknown.

Measurements (in mm)
D = 1.8-1.87, H = 0.92-0.95 (n = 2).

Remarks

See under *Dicharax caudapiscis* n. sp.

Family Diplommatinidae Benson, 1849

Genus *Arinia* Adams & Adams, 1856

Subgenus *Notharinia* Vermeulen, Phung & Truong, 2007

Notharinia Vermeulen, Phung & Truong, 2007: 83, 84.

Type species. — *Notharinia attenuata* Vermeulen, Phung & Truong, 2007, by original designation.

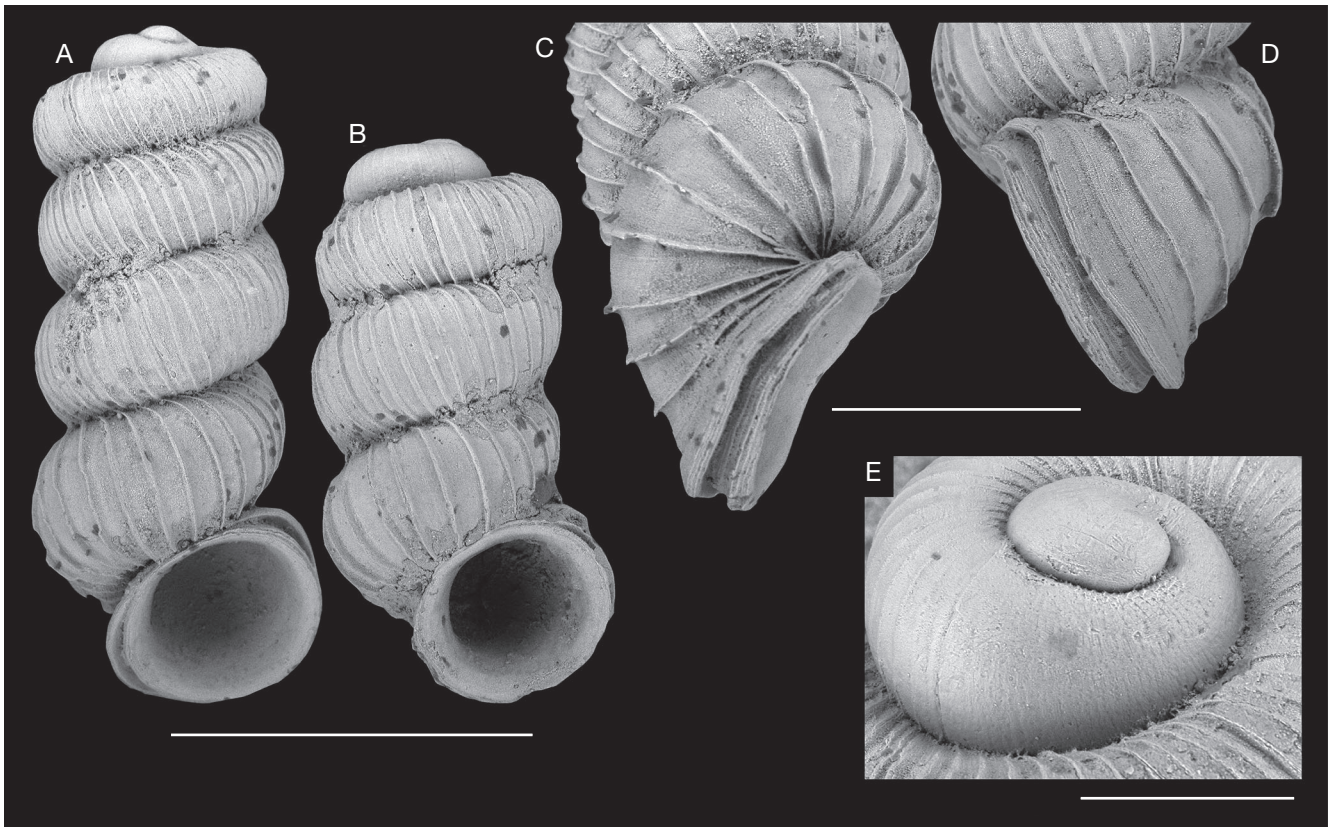

Fig. 2. — *Arinia* (*Notharinia*) *boucheti* Páll-Gergely, n. sp.: **A**, **C**, **D**, holotype; **B**, **E**, one of the paratypes. Photograph: Barna Páll-Gergely. Scale bars: A, B, 1 mm; C, D, 500 µm; E, 200 µm.

Remarks

Notharinia was described as an independent genus. Whether *Arinia* and *Notharinia* are independent genera, or the former is the subgenus of the latter, is beyond the scope of the present paper. Here we follow the latest publication (Marzuki & Foon 2016), and use *Notharinia* on the subgeneric level.

Arinia* (*Notharinia*) *boucheti
Páll-Gergely, n. sp.
(Fig. 2)

Type material. — **Northern Laos**. Phuom Laong, coll. Saurin, MNHN-IM-2014-6415 (holotype, H = 1.88 mm, D = 0.81 mm); same data, MNHN-IM-2014-6416 (2 paratypes).

Etymology. — This species is dedicated to and named after Prof. Philippe Bouchet to acknowledge that he tracked Edmond Saurin's (1904-1977) material in the late 1970's, and made it available for study.

Type locality. — Northern Laos, Phuom Laong.

Diagnosis. — A *Notharinia* species with strong, comparatively widely-spaced ribs, oblique aperture, and clearly separated inner and outer peristomes.

Differential diagnosis. — The most similar species in terms of shell size, shape, and rib density is *Arinia* (*Notharinia*) *crassilabris* Vermeulen, Phung & Truong, 2007. That species, however, differs from the new species in the following traits: aperture is less oblique to the shell axis; the boundary between the two peristomes is hardly visible; and the outer peristome is less reflected.

Distribution. — This species is known from the type locality only.

Description

Shell whitish, semitransparent, cylindrical, typical to *Notharinia*; constriction not observed; protoconch oblique, with 1-1.25 whorls, nearly smooth, extremely finely pitted; apex sunken; teleoconch rather regularly, strongly ribbed, rib density decreasing towards aperture; no spiral striation observed on entire shell; whorls 4.75-5.5; aperture rounded, strongly oblique to shell axis; peristome adnate to penultimate whorl; inner peristome protruding, outer peristome expanded but not reflected; boundary between two peristomes conspicuous; individual ribs elevated, slightly bent anteriorly; umbilicus closed. Operculum and soft anatomy unknown.

Measurements (in mm)

H = 1.57-1.88, D = 0.81 (n = 2).

Remarks

Currently five species of the subgenus *Notharinia* are known: *Arinia* (*Notharinia*) *attenuata* (Vermeulen, Phung & Truong, 2007), *A.* (*N.*) *brevior* (Vermeulen, Phung & Truong, 2007), *A.* (*N.*) *crassilabris*, *A.* (*N.*) *linnei* (Maassen, 2008), and *A.* (*N.*) *micro* Marzuki & Foon, 2016. The former three species were described from Southern Vietnam's Kien Giang Province, whereas the latter two species are known from the Malay Peninsula. Two further undescribed species (*Notharinia* sp. nov. 'Khoe La' and *Notharinia* sp. nov. 'Khoe La & Ong'), also from Kien Giang Province, were assessed using to IUCN criteria (Vermeulen & Anker 2016a, b). The type locality of *Arinia* (*Notharinia*) *boucheti* Páll-Gergely, n. sp. could not be located on the map, but it must be somewhere in Northern Laos. The occurrence of a *Notharinia* species in northern Laos considerably extends the distribution of the subgenus northwards.

There is an unusually large variation in terms of the number of whorls in *Arinia* (*Notharinia*) *boucheti* Páll-Gergely, n. sp. Similar observations were made by Marzuki & Foon (2016) in *A.* (*N.*) *micro*. We might assume that the high variability of whorl numbers is characteristic for this subgenus.

Family Pupinidae L. Pfeiffer, 1853
Genus *Pseudopomatias* Möllendorff, 1885

Pseudopomatias Möllendorff, 1885: 164.

Type species. — *Pseudopomatias amoenus* Möllendorff, 1885 by monotypy.

Pseudopomatias caligosus n. sp.
(Fig. 3)

Type material. — **Thailand**. Mae Hong Son Province, 9.1 km from Ban Soppong towards Mae Hong Son, left side of road # 1095, 785 m a.s.l., 19°33.123'N, 98°11.694'E, leg. Hunyadi A., 09.II.2015., HNHM 100176 (holotype), HNHM 100442 (figured paratype), coll. HA (17 paratypes + 9 juvenile shells [not paratypes]), coll. PGB, 2 paratypes.

Etymology. — The specific epithet *caligosus* (Latin: covered with mist) refers to the nickname of the Thai Province Mae Hong Son ("city of three mists").

Type locality. — Thailand, Mae Hong Son Province, 9.1 km from Ban Soppong towards Mae Hong Son, left side of road # 1095, 785 m a.s.l., 19°33.123'N, 98°11.694'E.

Diagnosis. — Shell medium sized to large for the genus, slender turriform with regular ribs, very fine spiral striation (mostly on the upper whorls), and a reflected peristome.

Differential diagnosis. — This new species is most similar to *P. peguensis* (Theobald, 1864) in terms of shell size and the bulging whorls, but differs from that species in the less glossy shell, the much stronger ribs, and the reflected peristome. *Pseudopomatias shanensis* Páll-Gergely, 2015 also has less bulging whorls, a more strongly expanded peristome and denser ribs with clearly visible spiral striation between them.

Distribution. — This species is known from the type locality only.

Description

Shell off-white to yellowish, all examined shells covered in reddish soil; shell very slender turriform, widest at its base; the 8.5-9.25 (n = 5), strongly bulging whorls separated by deep suture; protoconch with 2.5 whorls, first *c.* 0.75 whorl very finely granulated; remaining whorls very finely, regularly ribbed; teleoconch also finely, regularly ribbed; ribs rather strong, with triangular cross section; upper whorls with very fine spiral and radial lines, visible only under strong magnification (Fig. 3F); spiral lines getting weaker and less regular on last *c.* 2 whorls (here area between ribs dominated by very fine radial lines, Fig. 3G); aperture rounded with very slightly angled columellar-parietal transition and slightly more sharply angled parietal-palatal transition; peristome whitish, expanded and strongly reflected; inner peristome protruding in some specimens, but the boundary between inner and outer peristomes usually hardy visible.

Operculum

Proteinaceous ("horny"), thin, flat (not concave); outer surface multispiral without elevated lamina; inner surface glossy, with a small, but elevated ventral nipple.

Radula (Fig. 3F)

Radula taenioglossate. Radular teeth arranged in v-shaped rows, each transverse row with seven teeth (2-1-1-1-2). Central (rachidian) tooth not constricted at its middle, with well-developed, slender, pointed central cusp and one smaller, pointed lateral cusp on each side; inner marginal (= lateral) teeth with four cusps, all pointed, central cusp being the largest; two outer marginal teeth with 4-4 slender, pointed cusps (except for the outermost cusp of outer marginal tooth, which is rather blunt triangular).

Measurements (in mm)

H = 9.7-12, D = 3.8-4.4 (smallest and largest shells measured).

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Fig. 3. — *Pseudopomatias caligosus* n. sp.: **A**-**E**, photos of the holotype (HNHM 100176); **F**, radula of a paratype (HNHM 100442); **G**-**H**, outer (**G**) and inner (**H**) surface of the operculum of a paratype (HNHM 100442); **I**, SEM image of the 5th whorl (holotype); **J**, SEM image of the penultimate whorl (holotype). Photograph: Barna Páll-Gergely. Scale bars: A-E, 5 mm; F, 50 µm; G, H, 1 mm; I, J, 200 µm.

REFERENCES

Benson W. H. 1857. — Characters of *Streptaulus* a new genus and several species of the Cyclostomacea from Sikkim, the Khasi Hills Ava and Pegu. *The Annals and Magazine of Natural History, Series 2* 19: 201-211. https://doi.org/10.1080/00222935708681840

Gude G. K. 1921. — *The Fauna of British India including Ceylon and Burma. Mollusca.–III. Land operculates (Cyclophoridae, Truncatellidae, Assimineidae, Helicinidae)*. Taylor and Francis, London, 386 p. https://doi.org/10.5962/bhl.title.55244

Kerney M. P. & Cameron R. A. D. 1979. — *A Field Guide to the Land Snails of Britain and North-west Europe.* Collins, London, 288 p.

Kobelt W. 1902. — *Das Tierreich. Eine Zusammenstellung und Kennzeichnung der rezenten Tierformen. In Verbindung mit der Deutschen Zoologischen Gesellschaft herausgegeben von der Königlich Preussischen Akademie der Wissenschaften zu Berlin. Mollusca: Cyclophoridae.* R. Friedländer und Sohn, Berlin, 662 p.

Kobelt W. & Möllendorff O. von 1900. — Zur Systematik der Pneumonomen. *Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft* 32: 186.

Kongim B., Sutcharit C., Naggs F. & Panha S. 2013. — Taxonomic revision of the Elephant Pupinid snail genus *Pollicaria* Gould, 1856 (Prosobranchia, Pupinidae). *ZooKeys* 287: 19-40. https://doi.org/10.3897/zookeys.287.4617

Maassen W. J. M. 2008. — A new species of the genus *Notharinia* Vermeulen, Phung & Truong, 2007 from Peninsular Malaysia (Mollusca, Caenogastropoda, Pupinidae). *Zoologische Mededelingen* 82: 109-112.

Marzuki M. E. bin & Foon J. K. 2016. — A new land snail, *Arinia* (*Notharinia*) *micro* (Caenogastropoda: Cyclophoroidea: Diplommatinidae), from a limestone karst in Perak, Peninsular Malaysia. *Raffles Bulletin of Zoology* 64: 313-318.

Möllendorff O. F. von 1885. — Diagnoses specierum novarum sinensium. *Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft* 1885: 11-12, 161-170.

Neubert E. 2009. — The continental malacofauna of Arabia and adjacent areas. VI. Pomatiidae of Arabia, Socotra and Northeast Africa, with descriptions of new genera and species (Gastropoda: Caenogastropoda: Littorinoidea). *Fauna of Arabia* 24: 47-127.

Páll-Gergely B. 2016. — A new species of *Vargapupa* Páll-Gergely, 2015 and a new synonym of *Pseudopomatias* Möllendorff, 1885 (Gastropoda: Caenogastropoda: Pupinidae). *Zootaxa* 4139 (3): 431-434. https://doi.org/10.11646/zootaxa.4139.3.9

Páll-Gergely B., Fehér Z., Hunyadi A. & Asami T. 2015. — Revision of the genus *Pseudopomatias* and its relatives (Gastropoda: Cyclophoroidea: Pupinidae). *Zootaxa* 3937 (1): 1-49. https://doi.org/10.11646/zootaxa.3937.1.1

Páll-Gergely B., Hunyadi A., đỗ Đ. S., Naggs F. & Asami T. 2017. — Revision of the Alycaeidae of China, Laos and Vietnam (Gastropoda: Cyclophoroidea) I: The genera *Dicharax* and *Metalycaeus*. *Zootaxa* 4331 (1): 1-124. https://doi.org/10.11646/zootaxa.4331.1.1

Schilthuizen M., Teräväinen M. I. F., Tawith N. F. K., Ibrahim H., Chea S. M., Chuan Ch. P., Daim L. J., Jubaidi A., Madjapuni M. J., Sabeki M. & Moktar A. 2002. — Microsnails at microscales in Borneo: distributions of Prosobranchia versus Pulmonata. *Journal of Molluscan Studies* 68: 255-258. https://doi.org/10.1093/mollus/68.3.255

Theobald W. 1864. — Notes on the Variation of Some Indian and Burmese Helicidae, with an Attempt at their re-arrangement, Together with Descriptions of New Burmese Gasteropoda. *Journal of the Asiatic Society of Bengal* 33: 238-250.

Vermeulen J. J., Phung L. C. & Truong Q. T. 2007. — New species of terrestrial molluscs (Caenogastropoda, Pupinidae & Pulmonata, Vertiginidae) of the Hon Chong - Ha Tien limestone hills, Southern Vietnam. *Basteria* 71: 81-92.

Vermeulen J. J. & Anker K. 2016a. — *Notharinia* sp. nov. 'Khoe La & Ong'. The IUCN Red List of Threatened Species 2016: e.T89298258A89302570. Available from: https://doi.org/10.2305/IUCN.UK.2016-1.RLTS.T89298258A89302570.en (accessed 17 May 2017).

Vermeulen J. J. & Anker K. 2016b. — *Notharinia* sp. nov. 'Khoe La'. The IUCN Red List of Threatened Species 2016: e.T89298205A89302540. Available from: https://doi.org/10.2305/IUCN.UK.2016-1.RLTS.T89298205A89302540.en (accessed 17 May 2017).

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