

Discovery of a New *Discartemon* Species (Eupulmonata: Streptaxidae) from Peninsular Thailand

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ABSTRACT.— *Discartemon sirindhornae* Artsamart & Siriboon, sp. nov. is described and illustrated based on specimens collected from Chumphon Province in Peninsular Thailand. The new species possesses a flattened shell with a slightly convex spire, a weakly angular last whorl, and an intermediately expanded whorl. The apertural dentition consists of one parietal lamella, one ridge-like and one small lower palatal, one small basal, and one small columellar lamella. The penis is long, slender and twisted distally, with penial hooks separated by elevated longitudinal folds. The current study advances knowledge of the streptaxid land snail species in Thailand and emphasizes the value of limestone habitats for preserving biodiversity.

KEYWORDS: carnivorous snail, systematics, genitalia, limestone, endemic species

INTRODUCTION

The family Streptaxidae Gray, 1860 is a group of carnivorous land snails with diverse shell morphology from eccentric, distorted to cylindrical forms, and with or without many dentitions (Gray, 1860; Zilch, 1960; van Bruggen, 1967; Schileyko, 2000). The living snails often exhibit brightly colored bodies and the genitalia typically possess penial hooks (Blanford and Godwin-Austen, 1908; van Benthem Jutting, 1954; Berry, 1963; Schileyko, 2000; Siriboon et al., 2013, 2014a, 2014b). The streptaxid snails have widely distributed across the tropical and subtropical regions of South America, Africa, and Asia (van Bruggen, 1967; Schileyko, 2000; Sutcharit et al., 2010; Rowson et al., 2010). Around 150 nominal species belonging to eleven genera have been recognised from Southeast Asia (Tryon, 1885; Blanford and Godwin-Austen, 1908; van Bruggen, 1972; Richardson, 1988; Schileyko, 2000; Maassen, 2001; Siriboon et al. 2013, 2014a, 2014b; Páll-Gergely et al., 2015; Inkhavilay et al., 2016; Man et al., 2022; Chunkhajorn et al., 2023; Sutcharit et al., 2025). In Thailand, 34 valid species across seven genera have been recorded, including three species for each of *Carinartemis* Siriboon & Panha, 2014, *Haploptychius* Kobelt, 1905, *Indoartemon* Forcart, 1946 and *Perrotetia* Kobelt, 1905; five species of *Oophana* Ancey, 1884; two species of *Panhartemis* Siriboon, 2023 (Gude, 1903; Blanford and Godwin-Austen, 1908; van Bruggen, 1972; Richardson, 1988; Schileyko, 2000; Siriboon et al., 2013, 2014a, 2014b; Chunkhajorn et al., 2023).

Discartemon, a streptaxid genus comprising of 32 recognised species, is notably highly diverse in Thai-

land where 15 species have been reported so far (van Benthem Jutting, 1954, 1959; van Bruggen, 1967, 1972; Richardson, 1988; Siriboon et al., 2014b; Man et al., 2022; Sutcharit et al., 2025). This genus is widely distributed and extending from the Isthmus of Kra to Peninsular Malaysia, with additional records from Vietnam, Cambodia, Laos, and Myanmar in Indochina, as well as two species from Sumatra and one species from Sulawesi (van Benthem Jutting, 1954, 1959; Siriboon et al., 2014b). *Discartemon* species typically exhibit a flattened to subglobose-heliciform shell that is either slightly or not axially deflected, with or without apertural dentition, and with a widely opened umbilicus (Kobelt, 1905–1906; van Benthem Jutting, 1954; Zilch, 1960; Richardson, 1988; Schileyko, 2000; Siriboon et al. 2014b; Man et al., 2022; Sutcharit et al., 2025). Currently, *Discartemon* was subject to taxonomic revision in Siriboon et al. (2014b), in which the result indicated that the shell morphology, genitalia and penial hook morphology are significantly discriminating features at both generic and specific levels. Furthermore, a recent phylogenetic study showed that *Discartemon* is not strictly monophyletic, with all examined species divided into Southern and Isthmus clades, the latter also including *Oophana depressa* (Möllerndorff, 1894) from Surat Thani Province. Although *O. depressa* possesses typical *Oophana* traits, its genital morphology resembles that of Isthmus clade *Discartemon*. These results suggest that some streptaxid genera may not be strictly monophyletic, but they also highlight the continued importance of shell and genital characters for species delimitation (Siriboon et al., 2020).

It is generally accepted that limestone karsts are critical biodiversity hotspots, providing distinctive

habitats that support numerous endemic species (Clement et al., 2006; Siriboon et al., 2013; Pholyotha et al., 2020; Sutcharit et al., 2025). In this study, we describe a previously unrecorded species of *Discartemon* from limestone hills, part of the Tenasserim Range in Chumphon Province. The new species is described based on the newly collected specimens, including living snails, and detailed morphology of genitalia and radula. This discovery contributes to our understanding of the Streptaxidae and forms part of an ongoing comprehensive revision of the streptaxid snails in Thailand.

MATERIALS AND METHODS

The specimens were collected from the limestone hills in Chumphon Province, western part of the Tenasserim Range, Peninsular Thailand since 2017. The coordinates of collecting sites were recorded using GPS and approximate collection localities are presented in Figure 1A.

Living specimens were photographed, euthanized following guidelines by the American Veterinary Medical Association (2020), then preserved in 70% ethanol (v/v) for anatomical studies. The identifications were made based on Kobelt (1905–1906), van Benthem Jutting (1954, 1959), Siriboon et al. (2014b), and Sutcharit et al. (2020, 2025). Shell height, shell width and whorl count were measured, and the height/width ratio was calculated following Siriboon et al. (2013). The empty shells were examined and photographed; one ethanol preserved specimen was dissected and the genitalia was carefully examined under stereomicroscope. A representative specimen was illustrated with the aid of a camera lucida. The buccal mass was removed, and the radulae was soaked in 10% NaOH, then cleaned in distilled water. Radula and internal wall sculpture of genitalia (hooks) were examined and photographed under scanning electron microscopy (JEOL, JSM-5410 LV).

Anatomical abbreviations.— **ag**, albumen gland; **at**, atrium; **fo**, free oviduct; **gd**, gametolytic duct; **gs**, gametolytic sac; **hd**, hermaphroditic duct; **ov**, oviduct; **p**, penis; **pr**, penial retractor muscle; **ps**, penial sheath; **psr**, penial sheath retractor muscle; **sv**, seminal vesicle; **ta**, talon; **v**, vagina; **vd**, vas deferens (Siriboon et al., 2013, 2014a, 2014b).

Institutional abbreviations.— Materials examined in this study were deposited in the following institutions:

CUMZ Chulalongkorn University Museum of Zoology, Bangkok, Thailand

SWUMZ Srinakharinwirot University Museum of Zoology, Bangkok, Thailand

RESULTS

Systematics

Family Streptaxidae Gray, 1860

Genus *Discartemon* Pfeiffer, 1856

Discartemon Pfeiffer, 1856: 173. Ancey 1884: 399. Tryon, 1885: 58. van Benthem Jutting, 1954: 71–94. Zilch, 1960: 560, 561. Zilch, 1961: 79–120. Richardson, 1988: 182. Schileyko, 2000: 784. Siriboon et al., 2014b: 48, 49. Man et al., 2022: 44. Sutcharit et al., 2025: 4.

Odontartemon (*Discartemon*)—Kobelt, 1905[1906]: 91, 96.

Type species.— *Streptaxis discus* Pfeiffer, 1851, by subsequent designation by Ancey (1884: 399).

Discartemon sirindhornae Artsamart & Siriboon, sp. nov.

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Figs 1–4

Type material.— Holotype CUMZ 14132 (Fig. 2A; height 7.1 mm, width 14.9 mm, 6½ whorls). Paratype: CUMZ 14133 (1 shell; Fig. 2B; height 5.9 mm, width 14.7 mm, 6½ whorls) from the type locality (ranges and mean ± S.D. of the holotype and paratype: shell height 5.9–7.1 mm, 6.51±0.84, shell width 14.7–14.9 mm, 14.80±0.14, H/W ratio 0.40–0.47, 0.44±0.05).

Paratypes: CUMZ 14067 (2 shells; first: height 6.7 mm, width 14.8 mm, 6½ whorls; Fig. 2B; second: height 6.8 mm, width 14.0 mm, 6½ whorls), SWUMZ 1028 (1 shell; height 7.8 mm, width 13.6 mm, 6½ whorls) from Wat Tam Sanook, Mueang District, Chumphon (10°28'52.5"N, 99°04'27.8"E) (ranges and mean ± S.D. of the paratypes: shell height 6.7–7.8 mm, 7.10±0.07, shell width 13.6–14.8 mm, 14.13±0.56, H/W ratio 0.45–0.5, 0.50±0.10).

Paratypes: CUMZ 14199 (1 shell; height 6.3 mm, width 12.7 mm, 6½ whorls, CUMZ 14128 (1 specimen in ethanol; Figs 3A, B, 4A–G; height 6.5 mm, width 11.2 mm, 6½ whorls), SWUMZ 1029 (2 shells; first: height 6.3 mm, width 11.6 mm, 6½ whorls; Fig. 3B; second: height 6.0 mm, width 12.2 mm, 6½ whorls) from Tam Namlod Thepnimit, Sawi District, Chumphon (10°22'40.1"N, 99°00'39.4"E) (ranges and mean

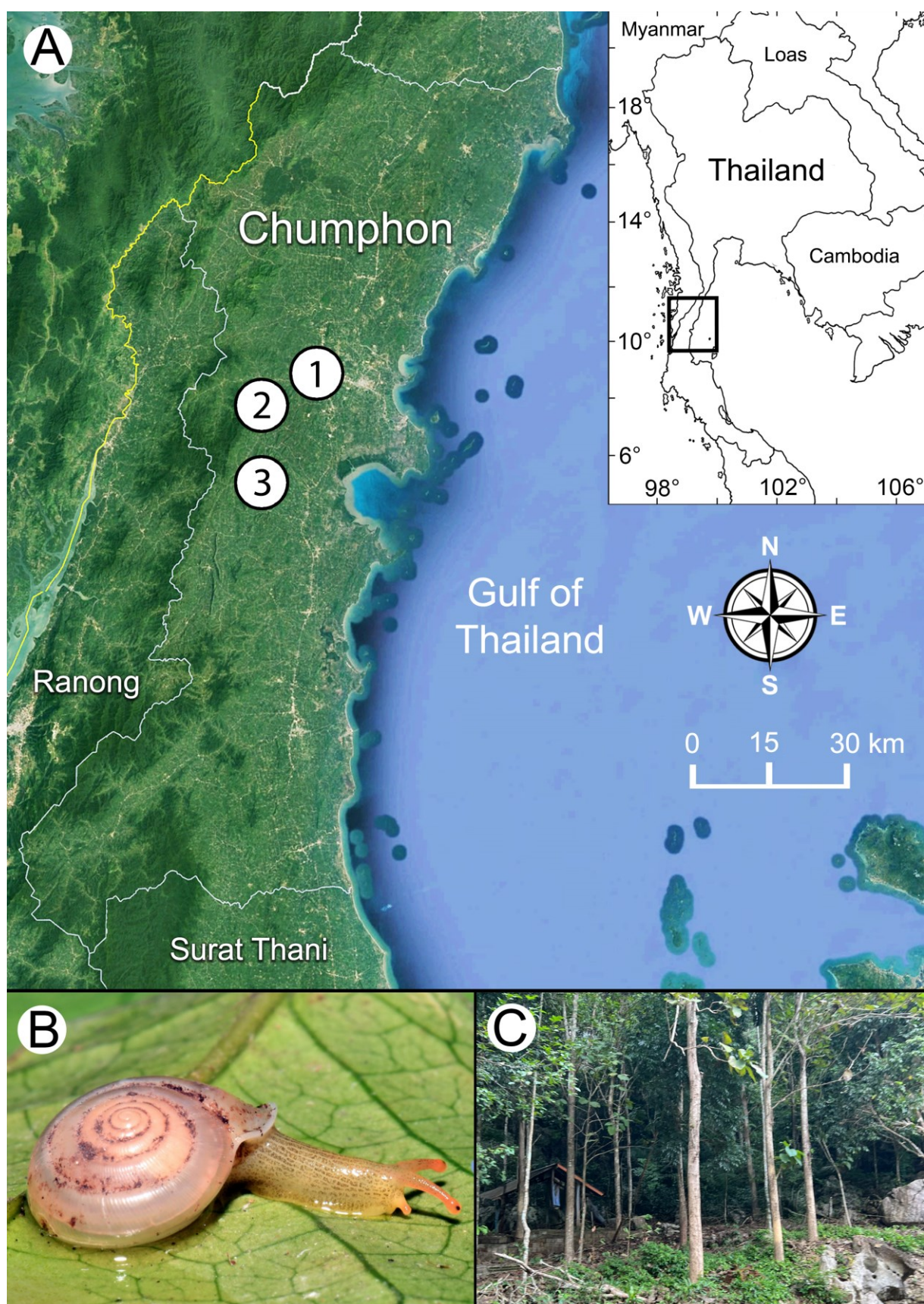


FIGURE 1. **A.** Approximate collecting sites of *Discartemon sirindhornae* nov. sp. in Chumphon Province: (1) Wat Tam Sanook, (2) Tam Chang Phuak (type locality) and (3) Tam Namlod Thepnimit. **B.** Living snail from Tam Namlod Thepnimit (shell width about 11 mm). **C.** Limestone forest at the type locality Tam Chang Phuak.

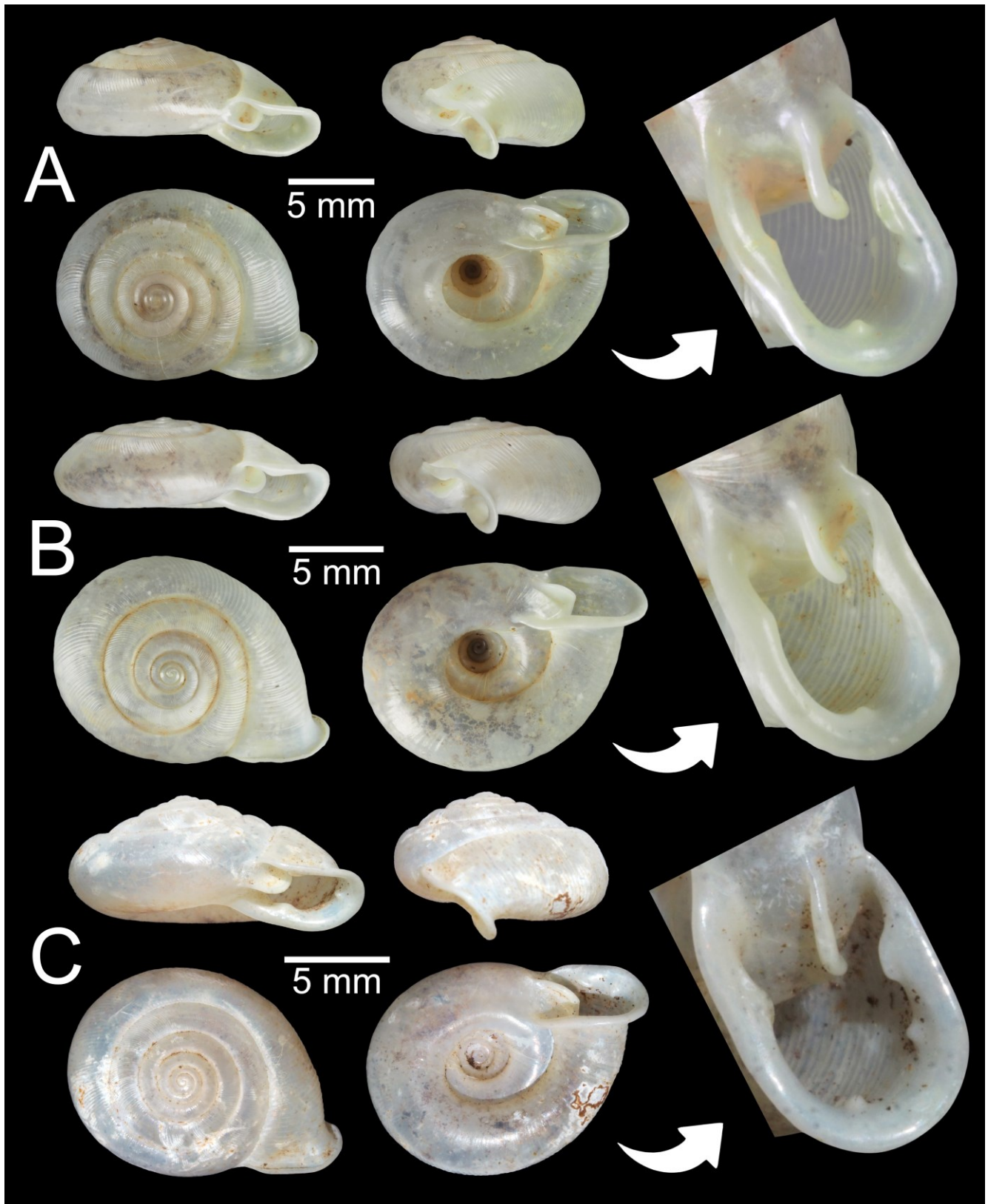


FIGURE 2. *Discartemon sirindhornae* sp. nov. **A, B** from the type locality, **(A)** holotype CUMZ 14132 with enlarged aperture and **(B)** paratype CUMZ 14133 with enlarged aperture. **C.** Paratype CUMZ 14067 with enlarged aperture; from Wat Tam Sanook.

± S.D. of the paratypes: shell height 6.0–6.5 mm, 6.27 ± 0.21 , shell width 11.2–12.7 mm, 11.92 ± 0.66 , H/W ratio 0.49–0.58, 0.53 ± 0.04).

Type locality.— Tam Chang Phuak (Cave), Mueang Chumphon, Chumphon Province ($10^\circ 26' 49.35''$ N, $99^\circ 2' 5.93''$ E; Fig. 1), 20 m a.s.l.

Etymology.— The specific epithet “*sirindhornae*” is honoured to Her Royal Highness Princess Maha Chakri Sirindhorn of Thailand, who is interested in the biodiversity of Thailand.

Differential diagnosis.— *Discartemon sirindhornae* sp. nov. closely resembles *D. discadentus* Siriboon & Panha, 2014 and *D. discamaximus* Siriboon & Panha, 2014, both from southern Thailand, and *D. discus* (Pfeiffer, 1853) from Vietnam in having a large and flattened shell, and an angular last whorl. However, it differs from *D. discamaximus* by having prominent transverse ridges, a slightly convex spire, and with four or five apertural dentitions (parietal, palatal, lower palatal, basal and columellar), while *D. discamaximus* possesses transverse ridges only near suture, a lower spire, and one apertural dentition (parietal) (Siriboon et al., 2014b; Sutcharit et al., 2020).

The new species differs from *D. discus* by having prominent transverse ridges, a low convex spire and four or five apertural dentitions (parietal, palatal, lower palatal, basal and columellar), whereas *D. discus* has an entirely smooth shell surface, a lower spire, and one apertural dentition (parietal) (Siriboon et al., 2014b; Sutcharit et al., 2020). For the genital characters, *D. sirindhornae* sp. nov. possesses a short vagina about $\frac{1}{2}$ of penis length, a penial sheath extending nearly an entire penis length, and vas deferens passing through about $\frac{1}{4}$ of the penial sheath. In contrast, *D. discus* possesses a long vagina about $\frac{2}{3}$ of penis length, a penial sheath extending about $\frac{3}{4}$ of penis length, and vas deferens shortly passing through the penial sheath (Siriboon et al., 2014b).

Discartemon sirindhornae sp. nov. can be distinguished from *D. discadentus* by having a low convex spire, a weak columellar lamella and without supracolumellar lamella, whereas *D. discadentus* has a slightly elevated spire, and a strong columellar and supracolumellar lamellae. Regarding the genital morphology, *D. sirindhornae* sp. nov. has a vagina longer than the free oviduct and the vagina's length about $\frac{1}{2}$ of the penis length, whereas *D. discadentus* has a vagina shorter than the free oviduct and the vagina's length about $\frac{1}{3}$ of the penis length.

Furthermore, *D. sirindhornae* sp. nov. shares certain similarities with *D. hypocrites* Benthem Jutting, 1954

and *D. platymorphus* Benthem Jutting, 1954 from Malaysia. It differs from *D. hypocrites* and *D. leptoglyphus* in having a larger, more flattened shell with 6–6½ whorls, whereas the latter two possess a smaller, depressed-heliciform shell with only 5–5½ whorls. In addition, *D. sirindhornae* sp. nov. has a semi-ovate aperture with five apertural dentitions (parietal, palatal, lower palatal, basal, and columellar). By contrast, *D. hypocrites* bears a triangular aperture with four dentitions (sinuous parietal, palatal, columellar, and supracolumellar), while *D. leptoglyphus* shows a triangular to sometimes semi-ovate aperture but with only two dentitions (parietal and palatal). The genitalia of *D. sirindhornae* sp. nov. also differ markedly from the two Malaysian congeners. The new species lacks a penial appendix and has a vagina about seven times longer than the free oviduct. In contrast, both *D. hypocrites* and *D. leptoglyphus* possess a penial appendix and have a vagina shorter than the free oviduct, reaching only about half its length. In *D. sirindhornae* sp. nov., the penial wall has light brown hooks on laterally flattened papillae separated by elevated or wide longitudinal folds, and the vaginal wall with reticulated and deeply crenulated longitudinal folds. By contrast, *D. hypocrites* shows hooks on laterally flattened papillae divided by thin reticulated folds, whereas *D. leptoglyphus* is characterized by translucent hooks on ovate papillae and a vaginal wall that is generally smooth.

Description.— Shell flattened, white, and translucent; whorls 6–6½; spire low convex, sometimes flattened, with distinct suture. Shell surface glossy, with prominent transverse ridges that diminish below periphery; varices present. Embryonic shell large, about 2½ whorls, with smooth surface; following whorls regularly coiled. Last whorl broadly angular to nearly rounded, intermediately expanded. Aperture semi-ovate; peristome discontinuous, expanded, and slightly reflected. Apertural dentition: parietal lamella strong and blunt ridge; palatal lamella low ridge-like; lower palatal lamella low knob shape or sometime absent; basal lamella weak knob shape; columellar lamella very low ridge. Umbilicus very wide about one-third of shell width and showing all preceding whorls.

Living snail has a semi-transparent yellowish body covered with reticulated skin and with brownish spots. Tentacular retractor muscles bright orange visible through semi-transparent body (Fig. 1B).

Genital organs.— Atrium (at) short; penis (p) very long, slender and twisted distally. Penial sheath (ps) thin and extended nearly entire penis length; penial sheath retractor muscle very thin (psr), originating near

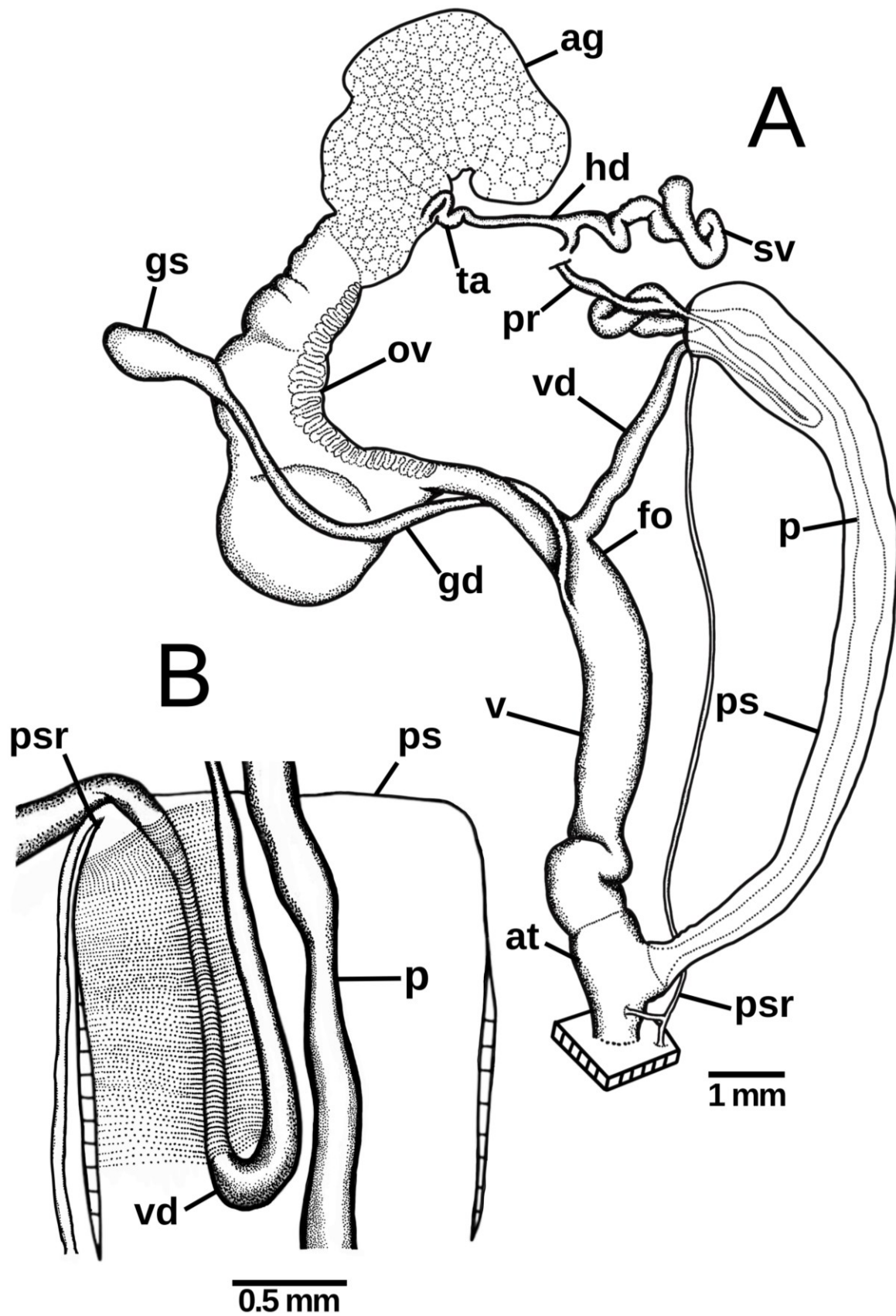


FIGURE 3. Genital anatomy of *Discartemon sirindhornae* sp. nov., paratype CUMZ 14128 from Tam Namlod Thepnimit. **A.** Reproductive system. **B.** Insertion of vas deferens into penial sheath.

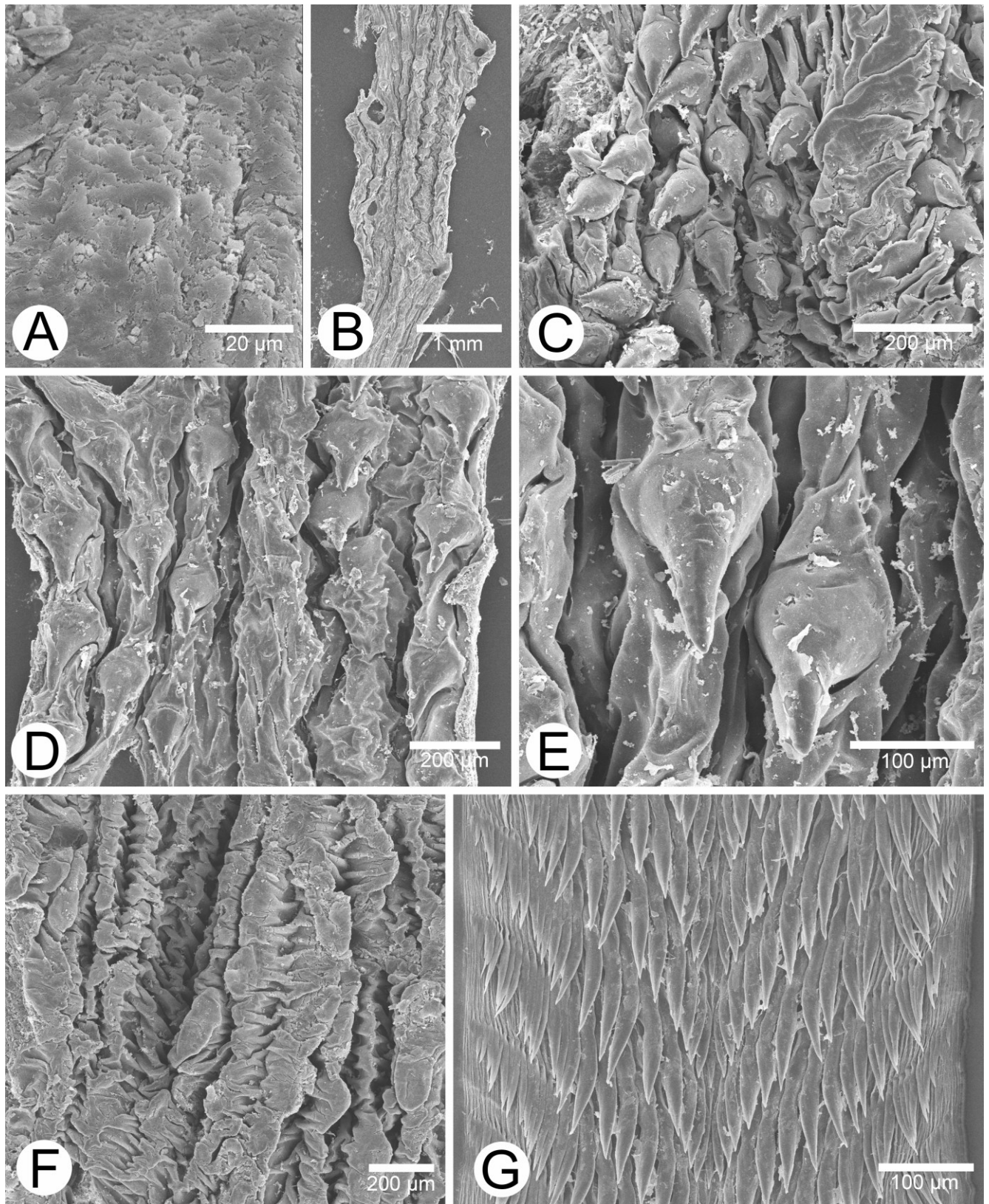


FIGURE 4. Internal sculpture of genitalia and radular of *Discartemon sirindhornae* sp. nov., paratype CUMZ 14128 from Tam Namlod Thepnimit. **A.** Atrium surface. **B.** Overview of internal penial wall. **C.** Penial hooks on proximal part of penis. **D.** Penial hooks on middle part of penis. **E.** Enlarged at top view of penial hooks. **F.** Arrangement of longitudinal corrugated vaginal folds. **G.** Radular.

genital orifice, attached to atrium with short and thin connective tissue, and inserting distally of penial sheath (Fig. 3A). Vas deferens (vd) inserted about $\frac{1}{2}$ through penial sheath before entering into penis distally (Fig. 3B). Penial retractor muscle (pr) thin, long, and inserting at penis and vas deferens junction.

Internal wall of atrium with corrugated surface and sparse atrial pores (Fig. 4A). Proximal penial wall with dense and light brownish penial hooks, about 4 hooks/ $200\ \mu\text{m}^2$; hooks located on laterally flattened penial papillae and separated by elevated longitudinal folds (Fig. 4B, C). Middle and distal penial wall with scattered and light brown penial hooks, about 2 hooks/ $200\ \mu\text{m}^2$; hooks located on laterally flattened penial papillae and separated by wide longitudinal folds (Fig. 4B, D). Overall penial hook small ($< 0.02\ \text{mm}$ in length), expanded at base, tip pointed and curved towards genital orifice (Fig. 4C, E).

Vagina (v) long, cylindrical and about half of total penis length. Gametolytic duct (gd) long tube extending as far as albumin gland; gametolytic sac ovate (gs). Free oviduct (fo) short about $\frac{1}{2}$ of vaginal length; oviduct (ov) enlarged and folded. Prostate gland inconspicuous and bound to oviduct.

Talon (ta) small, short and club shaped. Hermaphroditic duct (hd) bearing long seminal vesicle (sv) about two times longer than the length from talon to branching point of seminal vesicle.

Vaginal wall with reticulated and deep crenulated longitudinal vaginal folds (Fig. 4F), and vaginal hook absent.

Radula.—Teeth uniform monocuspid and lanceolate shape. Each row contains about 45–49 teeth with formula $(22-24)-1-(22-24)$. Central tooth small and pointed cusp. Latero-marginal teeth undifferentiated; inner teeth large and little curved then gradually reducing in size to much smaller and shorter in outer teeth (Fig. 4G).

Distribution.—This new species is found exclusively from three localities from limestone hill in Chumphon Province, Peninsular Thailand (Fig. 1A). The snails were found hiding under the leaf litters with deciduous limestone forest.

Remarks.—*Discartemon sirindhornae* sp. nov. has a nearly flattened shell and a very wide umbilicus which are considered to belong to *Discartemon discus* species group. This species group contains 13 species, including a new species described herein (Siriboon et al., 2014b; Sutcharit et al., 2025).

DISCUSSION

The distribution of the *D. sirindhornae* sp. nov. across three limestone localities reveals interesting patterns of coexistence. At the type locality, it occurs in sympatry with *D. flavacandida* Siriboon & Panha, 2014. In contrast, at the other two collecting sites, Wat Tam Sanook and Tam Namlod Thepnimit, this new species coexists with *D. afthonodontia* Siriboon & Panha, 2014, a species previously reported only from Chumphon and Prachuap Khirikhan provinces (Siriboon et al., 2014b; Siriboon et al., 2020). These new records therefore represent additional localities within Chumphon Province. Notably, at Wat Tam Sanook, *D. sirindhornae* sp. nov. also occurred in sympatry with *Atopos sarasini* Collinge, 1902, a carnivorous species from another genus. The new species clearly differs from the two species by its flattened shell and the presence of a single parietal lamella. In addition, it can be distinguished from *D. afthonodontia* by its larger shell size, while both *D. flavacandida* and *D. afthonodontia* possess a depressed-heliciform shell with two parietal lamellae (see Siriboon et al. (2014b) for more detailed comparison). Sympatric occurrences have been documented between *D. collingei* (Sykes, 1902) and *D. platymorphus* van Benthem Jutting, 1954 in Malaysia. Further examples include the sympatry between *D. feuangensis* Sutcharit & Inkhavilay, 2025 and *Haploptychius pellucens* (Pfeiffer, 1863) in Laos, as well as between *D. tonywhitteni* Sutcharit et al., 2020 and *Panhartemis mouhoti* (Pfeiffer, 1863) in Tanintharyi, Myanmar (van Benthem Jutting, 1954; Inkhavilay et al., 2016; Man et al., 2022; Sutcharit et al., 2020, 2025).

Discartemon sirindhornae sp. nov. possesses a large shell (width 11.2–14.9 mm; mean 13.2 mm; average H/W ratio about 0.49), a flattened shell, and a very wide umbilicus, which are characteristics suggesting that this new species belongs to the *D. discus* species group. This species group consists of 13 species and can be subdivided into two subgroups: a large-shell subgroup, which includes this new species, *D. discus*, *D. khaosokensis* Panha & Burch, 2002, *D. discadentus* and *D. discamaximus*; and a small-shell subgroup, which contains the remaining species. Generally, species in the large-shell subgroup have a shell width greater than 10 mm, whereas the small-shell subgroup contains species typically less than 10 mm in width. However, anatomical studies have been conducted only on three species in the large-shell subgroup, *D. discadentus*, *D. discus* and *D. sirindhornae* sp. nov. They share several genital characteristics, including a short atrium (less than $\frac{1}{2}$ of the penis length), a long penis (nearly equal in length to the distance from the atrium

to the distal oviduct), a penial sheath extending more than $\frac{2}{3}$ of the penis length, and large and slender penial hooks with pointed and curved tips (Siriboon et al., 2014b).

In comparison, few data have been reported from the small-shell subgroup, characterised by a shell width of less than 10 mm. At present, genitalia details are available only for *D. nummus* (Laidlaw, 1929). Species in this group tend to have a longer atrium (about $\frac{1}{2}$ of the length of the penis), a shorter penis (less than $\frac{1}{2}$ of the length from the atrium to the distal oviduct), a shorter penial sheath extending only about $\frac{2}{3}$ of the penis length, and smaller penial hooks with an obtuse tip (Siriboon et al., 2014b). This subdivision provides a practical criterion for distinguishing closely related species within the genus.

Further surveys incorporating both genital morphology and molecular evidence are crucial for refining species identification and confirming potential relationships. Such data will significantly contribute to the taxonomy of streptaxid snails, enhancing the accuracy and efficiency of species identification based on morphological characters. Moreover, the discovery of *Discartemon sirindhornae* sp. nov. from limestone forests emphasizes the ecological importance of these karst habitats, which serve as refuges for narrowly distributed endemic species and highlight their role in preserving regional biodiversity.

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