

Two New Species of Micro Land Snails from Two Islands in the Andaman Sea (Prosobranchia: Diplommatinidae; Pulmonata: Pupillidae)

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Abstract.— Two new species of pupillid and diplommatinid micro land snails from two islands in the Andaman sea are described. They are *Diplommatina insularis* n.sp. from Similan island and *Gyliotrachela phoca* n.sp. from Lanta Yai island. *Diplommatina insularis* n.sp., has fusiform, dextral, with about 5 $\frac{3}{4}$ angular whorls. Penultimate whorl is slightly larger in diameter than the body whorl. Shell sculpture has moderately spaced radial ribs and fine with moderately spaced spiral striation from the teleconch through the last whorl. Umbilicus is closed. Peristome is expanded and duplex. Aperture is round, with well-developed nodule columellar. *Gyliotrachela phoca* n.sp., has conical spire, a moderately long, upwardly directed tuba. The protoconch appears pitted and has spirally striated at the boundary with the teleconch. The shell is moderately umbilicate, its last whorl weakly radial riblets. There are five major apertural barriers (parietal, angular, columellar, upper and lower palatals), and additional numerous small lamellae and plicae: two infraparietal lamellae, two supracolumellar and two subcolumellar lamellae, two infrapalatal plicae, two interpalatals and four suprapalatal plicae. All of the apertural barriers have spinose surfaces.

KEY WORDS: Taxonomy; micro land snails; Pupillidae; Diplommatinidae; Andaman sea

INTRODUCTION

The micro land snail fauna of Thailand consists of mainly two families; Diplommatinidae and Pupillidae. The Diplommatinidae is a large family in the South, Southeast and East Asia containing numerous species. Two genera have been found in Thailand; *Diplommatina* and *Opisthostoma*. *Diplommatina* has a wide range over the whole tropical Asia, the Philippine Islands and Malaysia (Laidlaw, 1928, 1949). Eighteen species have been described by several authors; Möellendorff (1981), Möellendorff (1984), Panha (1996a,b), Panha and Burch (1996), Panha et al. (1998) and Panha and Burch (2001). In Thailand there are several records from many islands in the Gulf but not on the

islands in the Andaman Sea. The habitats of all recognized species are in the leaf litters or limestone walls covering with some micro flora such as mosses. These characteristics are often found in many islands in the gulf. Limestone forest is probably the specific habitats for diplommatinid and pupillids snails, and snails are adapted themselves for such unstable conditions since they started colonizing some million years ago as recorded and hypothesized previously (Thiele, 1931; Franzen and Leonard, 1947).

The previous taxonomic publications on the Pupillidae in Thailand have been compiled by Panha and Burch (2004) provided the first detailed description of all sixty three described species. There was an initial molecular phylogenetic analysis of pupillid micro land snails based on nuclear

(28S rDNA) and mitochondrial (16S rDNA) ribosomal gene fragments by Tongkerd et al. in 2004. The results showed the congruent use of apertural barriers as diagnostic generic characters but there was still an exception in the three genera; *Aulacospira*, *Gyliotrachela* and *Hypselostoma* indicating as a monophyletic group. However, shell micro-sculptures and striations of the teleconch seem to help distinguishing at species level within these groups (Burch et al., 2002).

The present study, described the two new species of the two families Diplommatinidae and Pupillidae from two islands in the

Andaman Sea. All of them are known only from their type localities.

MATERIALS AND METHODS

Field collectings have been carried out under the Plant Genetic Conservation Project initiated by Her Royal Highness Princess Maha Chakri Sirindhorn assisting by the Navy Special Warfare Unit of The Royal Thai Navy at Similan Islands in 2011 and Lanta Islands in 2013 (Fig. 1). Specimens were searched from two types of microhabitat; under leaf litters (Diplommatinidae) and on limestone

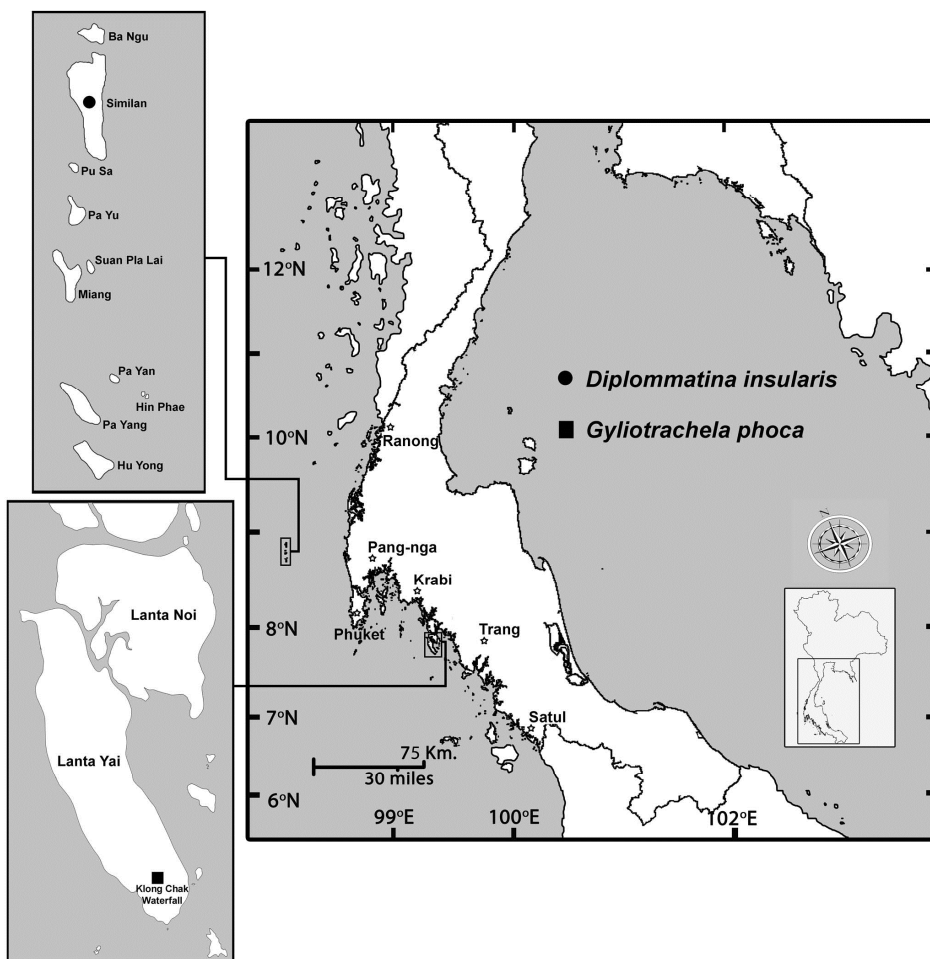


FIGURE 1. Map showing type localities of the two micro land snails described in this paper.

● *Diplommatina insularis* n.sp.; ■ *Gyliotrachela phoca* n.sp.

walls in front of the cave (Pupillidae). Collected specimens were preserved in 95 % ethanol for morphological studies and molecular analysis and photographed by using a microscope with an attached digital camera with cell*D software. Shell drawings were illustrated with the aid of camera lucida. The descriptions of the shells were examined by using a ZEISS Stemi DV4 stereoscopic light microscope, augmented by scanning electron microscope (SEM) pictures. Shell characters: shape, sculpture, striation, apertural barriers and embryonic shell morphology were described. Shell measurement of the holotype specimens were taken under the microscope following the criteria from Burch et al. (2002) and Panha and Burch (2004). Shell color was determined by making comparisons with a *Pantone® Process Color Imaging Guide*. The species identifications were based mainly on the following papers; Möllendorff (1894); Laidlaw (1928, 1949); Benthem Jutting (1949b); Panha (1997a,b); Panha and Burch (1998); Panha

and Burch (1999a,b; 2002); Burch and Panha (2000); Burch et al. (2002) and Panha and Burch (2004). The critical studies on the molecular analysis in Tongkerd et al. (2004) have been done prior to make the final identification and nomenclature. Specimens are deposited in the collection of the Chulalongkorn University Museum of Zoology, Bangkok, Thailand (CUMZ) and The Natural History Museum, London (NHM).

RESULTS AND DISCUSSION

Diplommatina insularis Tongkerd and Panha, n. sp. (Figs. 2-4)

Description of Holotype – Shell dextral (right handed coiling), ovate or broadly fusiform, with $5 \frac{3}{4}$ moderately convex whorls. Whisper white (Pantone, 11-0701 TCX) or Transparent Yellow (Pantone, 11-0617 TCX) in color, with 1.66 mm in length and 0.87 mm in width. Other shell measurements are given in Table 1. The

TABLE 1. Shell measurements of *Diplommatina insularis* n.sp., holotype specimens.

Character	Species (measurement in mm)
	<i>Diplommatina insularis</i>
shell height, including aperture lip	1.66
height of body whorl and spire	1.54
shell width, including aperture lip	0.87
width of body whorl	0.80
major diameter, including apertural lip	0.87
minor diameter	0.72
number of whorls	$5 \frac{3}{4}$
number of ribs per 0.5 mm at and near center of body whorl	6.2

penultimate whorl has the greatest diameter, with the body (ultimate) whorl being slightly smaller. Nuclear whorls are ca. $1\frac{3}{4}$. The protoconch appears pitted under a stereomicroscope. Teleconch begins with delicate costae and becomes stronger ribs, which emerge to the end of the body whorl. The sutures are deep. Shell sculpture consists of relatively stout, rather widely spaced radial ribs, which moderately spaced spiral striae

appear from teleconch through the ultimate whorl. The umbilicus is closed. Aperture is more or less round, except for its left, basal (anterior), somewhat round-pointed terminal (corner). The peristome is moderately expanded and duplex, which consists of well developed nodule columellar lamella, directed to the right.

Type locality – Similan island (Koh Pad), Similan Islands National Park, Phang-nga

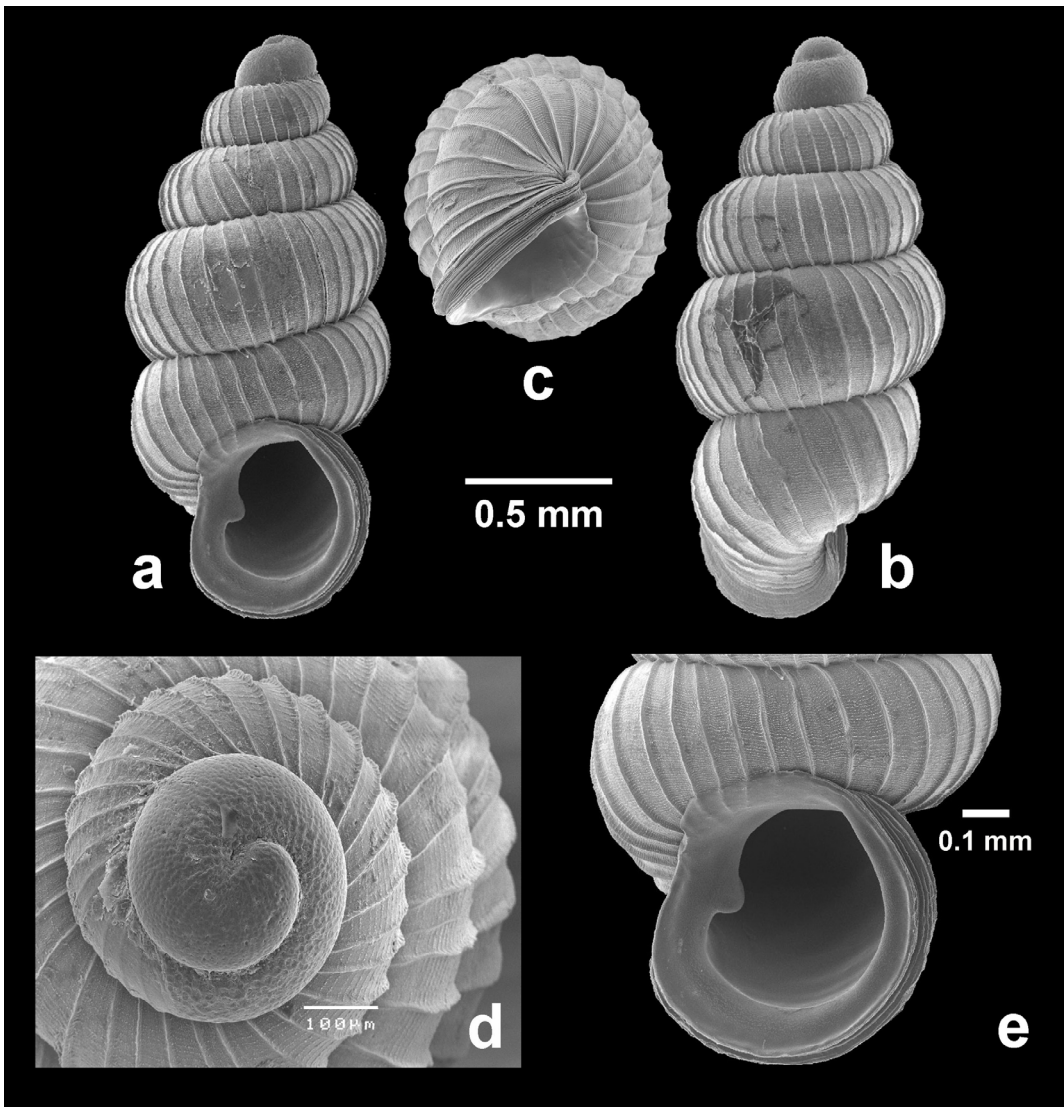


FIGURE 2. *Diplommatina insularis* n. sp., holotype. **a**, Apertural view; **b**, abapertural view; **c**, umbilical view; **d**, apical whorl; **e**, enlarge view of the aperture.

Province, 8° 39' 37.93" N 97° 38' 48.08" E, 15 meters elevation, Thailand.

Habitat – *Diplommatina insularis* was found in the grass and leaf litter, and also in the soil. The shells of *D. insularis* in nature are covered with mud and tiny sand grains.

Type material – The holotype (CUMZ, Dip 55625), deposited in the Chulalongkorn University Zoological Museum, together

with 25 paratype specimens (CUMZ, Dip 55626). Other 5 paratype specimens (CUMZ, Dip 55627) were deposited in The Natural History Museum, London (NHM), UK.

Etymology – The specific epithet *insularis* is a *Latin* word in apposition referring to an island or of an island, where the specimens were found.

Diagnosis – *Diplommatina insularis* n. sp.

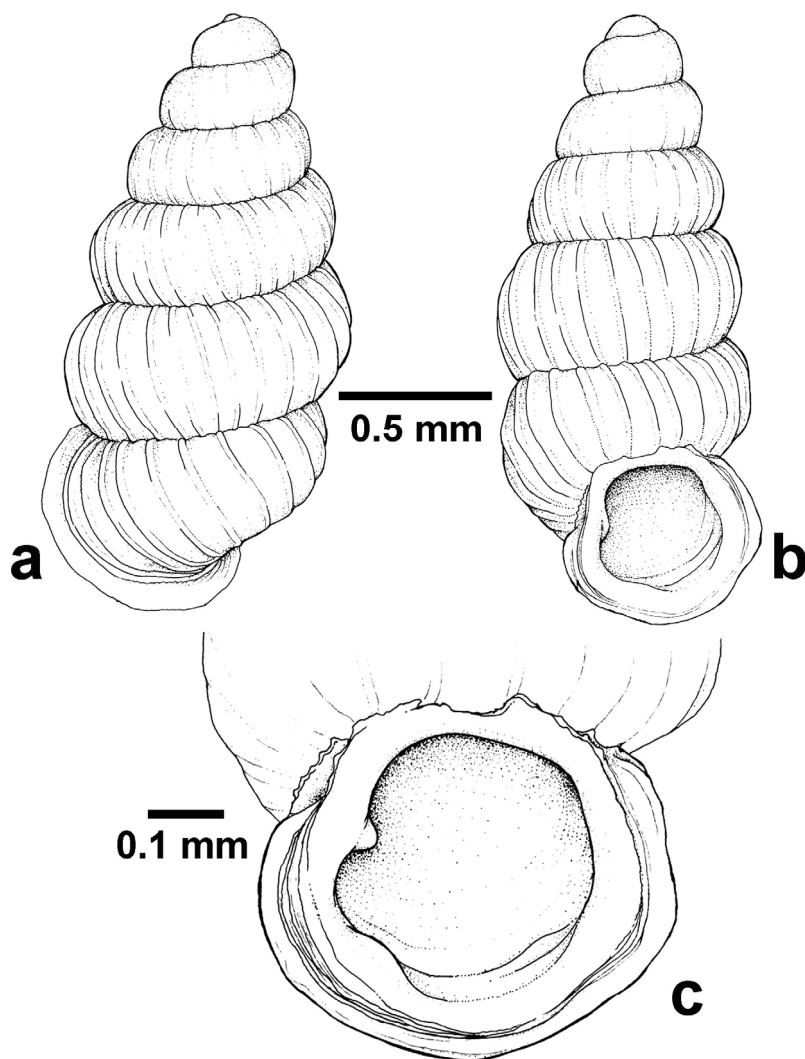


FIGURE 3. *Diplommatina insularis* n. sp., paratype. a, Abapertural view; b, apertural view; c, enlarge view of the aperture.

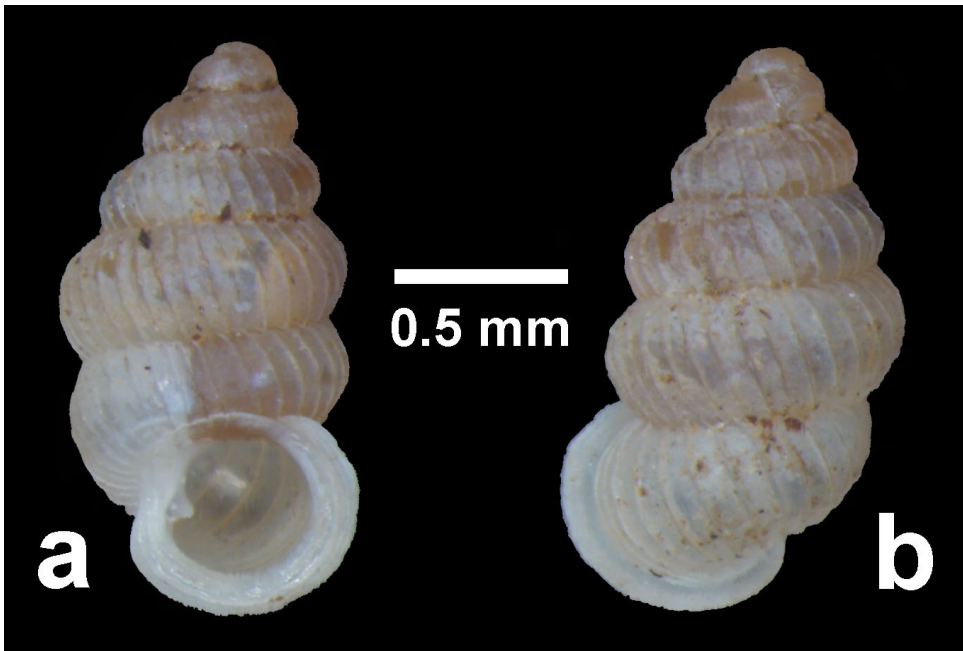


FIGURE 4. *Diplommatina insularis* n. sp., paratype. **a**, Apertural view; **b**, abapertural view.

is a minute diplommatinid prosobranch gastropod with elongated, spindle-shape or fusiform, dextral, with about $5 \frac{3}{4}$ angular whorls. Penultimate whorl is slightly larger in diameter than the body whorl. Shell sculpture has moderately spaced radial ribs and fine with moderately spaced spiral striate from the teleconch through the last whorl. Umbilicus is closed. Peristome is expanded and duplex. Aperture is round, with well-developed nodule columellar.

Remarks – *Diplommatina insularis* is similar in shell morphology to *D. samuiana* Möllendorff 1894 from Samui Island in the Gulf of Thailand. In comparison, *D. insularis* has fewer whorls, less radial rib and narrower upper spire. The penultimate and body whorls are almost the same size, while in *D. samuiana* are varied.

Dextral species from peninsular Malaysia that have similar shell to *Diplommatina insularis* are *D. demorgadi* Laidlaw 1949 and

D. manuana Laidlaw 1949. *Diplommatina manuana* from Gua Madu, Kalantan is most similar in size, nature of the ribs and characteristics of the columellaris. However, in *D. manuana* the numbers of whorl are more numerous, and the shape of aperture is wider. In *D. demorgadi* from Kota Gelanggi, Pahang, the ribs are closed each other with larger in number. *Diplommatina demorgadi* also has a broader spire and larger in shell diameter.

The Two thai previous described species, *Dipolmmatina krabiensis* Panha and Burch 1996 from mainland of Krabi Province and *D. naiyanetri* Panha 1997 from Trang Province are similar with *D. insularis*. *D. krabiensis* is most similar in shell morphology but exhibit left-handed coiling shell. *Dipolmmatina naiyanetri* is dextral, but numbers of whorl are more numerous with deeper suture.

***Gyliotrachela phoca* Tongkerd and Panha, n. sp. (Figs. 5-7)**

Description of Holotype – Shell has cone shape with conical spire and enlarged body with a moderately long whorl, slightly

ascending tuba. The tuba is obtuse triangle in cross-section. The shell is light brown (Pantone, 4505C) in color and has 4 ¼ whorls to where the tube begins. Shell measurements are given in Table 2. The body whorl is upwards at about 22 degree. The

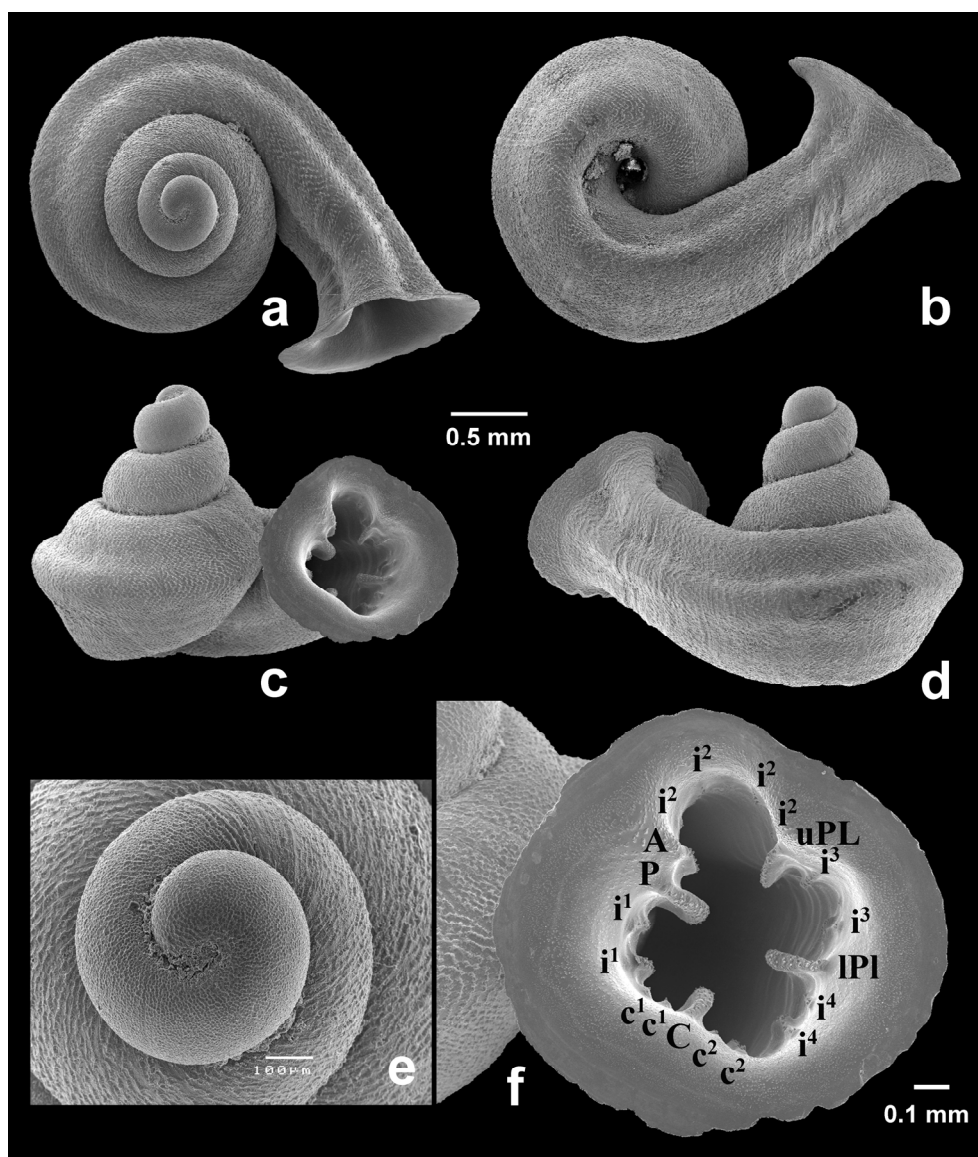


FIGURE 5. *Gyliotrachela phoca* n. sp., holotype. **a**, Apical (dorsal) view; **b**, umbilical view; **c**, side view; **d**, opposite side view; **e**, apical whorl; **f**, enlarge view of the aperture. A = angular; C = columellar; P = parietal; LPI = lower palatal; uPL = upper palatal; i¹ = infraparietal; i² = suprapalatal; i³ = interpalatal; i⁴ = infrapalatal plica; c¹ = supracolumellar; c² = subcolumellar.

TABLE 2. Shell measurements of *Gyliotrachela phoca* n.sp., holotype specimens.

Character	Species (measurement in mm)
	<i>Gyliotrachela phoca</i>
shell height, including aperture lip and tuba	1.75
height of body whorl and spire	1.75
shell width, including aperture lip and tuba	3.03
width of body whorl to where tuba begins	1.96
major diameter, including apertural lip, but not including tuba	2.03
minor diameter	1.65
length of tuba	0.96
number of whorls, excluding tuba	4 1/4
width of umbilicus	0.68
number of striae per 0.5 mm at and near center of body whorl	10

spire is slightly depressed, with disproportionately enlarged ultimate whorl. The first three whorls are quite slope and the suture are well impressed. The body whorl is slightly angulated and shouldered with other whorl rounded. The umbilicus is deep and moderately wide, measuring about 1/3 of the shell diameter. The nuclear whorl ca. 1 1/2; the protoconch sculptured with wrinkles, producing roundish shallow pits; a few spiral striae on the first 1 1/4 whorl, becoming more evident around the area between protoconch and teleconch. Teleconch has a few spirally striated, fine striatulate with minute granules through the body whorl. Well defined parietal groove appears along the body whorl and the tuba, to the expanded apertural lip. The upper palatal and columellar grooves are well defined while the lower palatal groove is hardly distinguishable. Aperture irregularly rounded, peristome free, continuous, boardly

flared-out. The apertural embayments are as follows: well-developed, ovate angulo-palatal, a semicircular columellar-parietal, a somewhat triangular basal and a more or less semicircular palatal embayment. There are 19 barriers in the specimens. The five major barriers are present; the parietal, angular, columellar, and the upper and lower palatal. The parietal and angular are close together. Parietal is long and thin while angular is short and both appear distally to the flexure of the peristome. On the parietal wall, there are two additional infraparietal lamellae. The two supracolumellar and two subcolumellar lamellae are observed. Two infrapalatal plicae, two interpalatals and four suprapalatal plicae are also recorded. All the barriers are spinose almost along the central line of the lamellae.

Type locality – Bat cave near Klong Chak Waterfall, Lanta Yai Island, Lanta Islands

National Park, Krabi Province, 7° 29' 53.82" N 99° 5' 29.13" E, 34 meters elevation, Thailand.

Habitat – *Gyliotrachela phoca* was found on a limestone wall in front of Bat cave near Klong Chak Waterfall. The prosobranch micro land snail genus *Georissa* is also found at this habitat.

Type material – The holotype (CUMZ, Ver 55628), deposited in the Chulalongkorn University Zoological Museum, together with 12 paratype specimens (CUMZ, Ver 55629). Other 5 paratype specimens (CUMZ, Ver 55630) were deposited in The Natural History Museum, London (NHM), UK.

Etymology – The specific epithet *phoca* is a *Latin* word meaning a marine mammal, “Seals”. This is the homonym of the acronym SEALs, “The Navy Special Warfare Unit of The Royal Thai Navy” (SEALs; this name was influenced by The United States Navy’s Sea, Air, Land Teams, commonly known as the Navy SEALs). The new species is name after this unit of The Royal Thai Navy which was providing the invaluable help and encouragement which made the fieldwork at Lanta Islands National Park possible.

Diagnosis – *Gyliotrachela phoca* is a minute pupillid pulmonate gastropod with

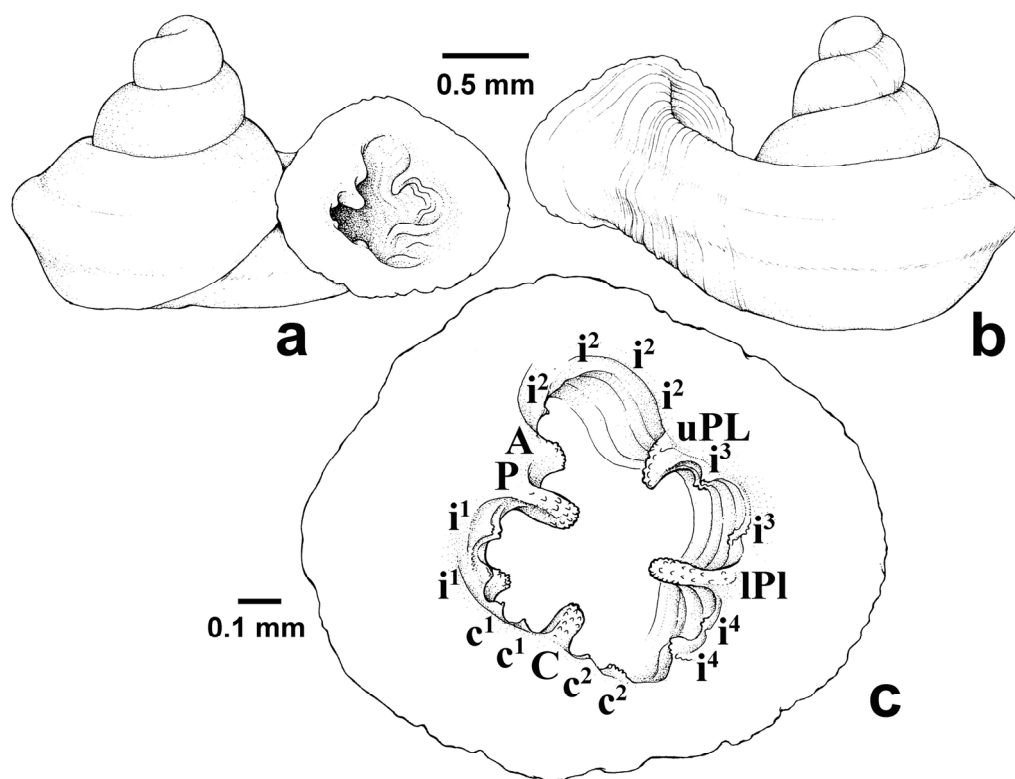


FIGURE 6. *Gyliotrachela phoca* n. sp., holotype. **a**, Side view; **b**, opposite side view; **c**, apertural barriers. Lamellae and plicae: A = angular; C = columellar; P = parietal; lPl = lower palatal; uPl = upper palatal; i^1 = infraparietal; i^2 = supraparietal; i^3 = interpalatal; i^4 = infrapalatal plica; c^1 = supracolumellar; c^2 = subcolumellar.

conical spire, a moderately long, upwardly directed tuba. The protoconch appears pitted and has spirally striated at the boundary with the teleconch. The shell is moderately umbilicate, its last whorl weakly radial riblets. In the shell aperture, there are five major barriers (parietal, angular, columellar, and upper and lower palatals), and additionally, numerous small accessory lamellae and plicae: two infraparietal lamellae, two supracolumellar and two subcolumellar lamellae, two infrapalatal plicae, two interpalatals and four suprapalatal plicae. All of the apertural barriers have

spinose surfaces.

Remarks – Burch et al. (2002) proposed that the genus *Gyliotrachela* should be divided into two major subgroups on the basis of their teleconch microsculpture; species with spiral cordlets, and other species that are decorated with minute granulations. *Gyliotrachela phoca* belongs to the granulated group. This character made the species differs from the rest of the previous described spirally striated species from Thailand and Malay-peninsular including *G. khaochongensis* Panha 1997 from the mainland of Trang province and *G. salpinx*

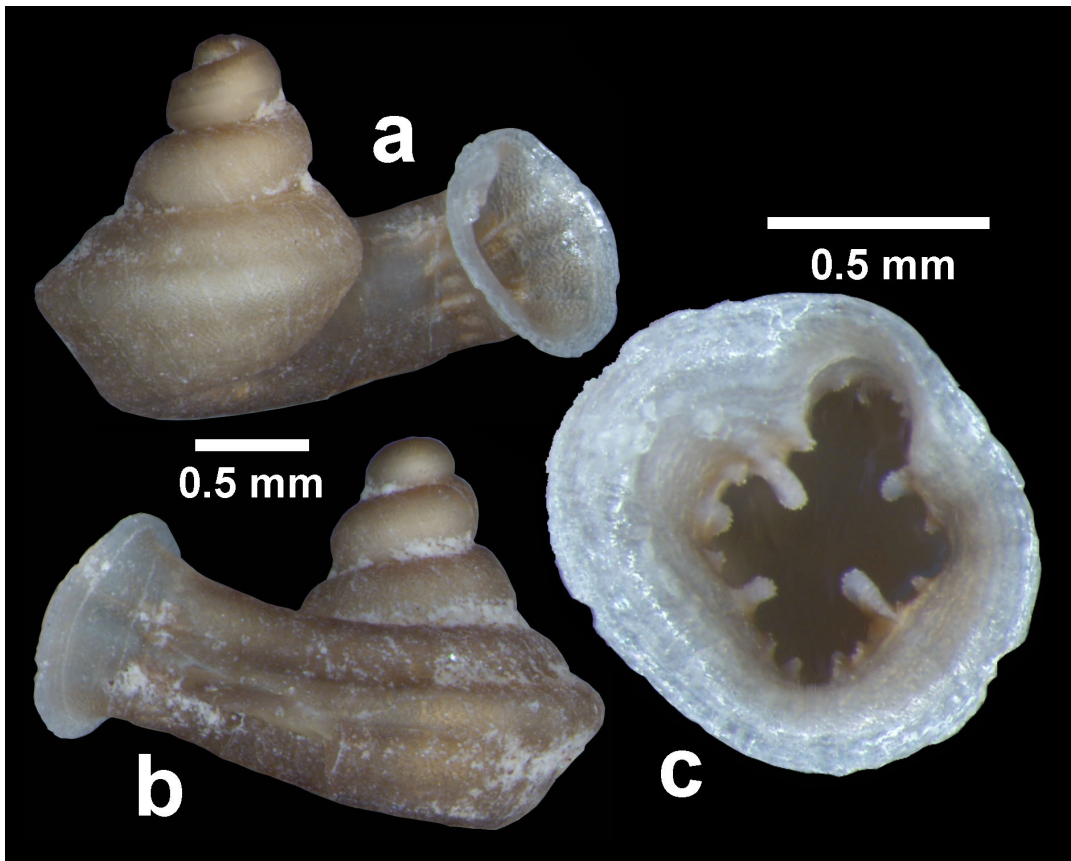


FIGURE 7. *Gyliotrachela phoca* n. sp., paratype. **a**, Side view; **b**, opposite side view; **c**, enlarge view of the aperture showing apertural barriers.

Bentham Jutting 1949 from Bukit Serdam, Pahang which are similar in upwardly directed tuba and the number of apertural barriers. Among the non-striated *Gyliotrachela* species, *G. phoca* is one of the four species distinguished by their angle of upwardly directed tubas. Compared to the other three species (*G. surakiti* Panha and Burch 2002 and two Malaysian species, *G. depressispira* Bentham Jutting 1949 and *G. luctans* Bentham Jutting 1949), *G. phoca* has the lowest angle. *Gyliotrachela surakiti* and *G. depressispira* are more depressed spire. Another clearly difference that distinguishes *G. phoca* from the other three species is the number of apertural barriers. *Gyliotrachela surakiti* is the much greater number of 24 dentitions follows with *G. phoca* (19 in holotype). *Gyliotrachela depressispira* consists of 17 (Bentham Jutting, 1949a) and *G. luctans* was reported to have only nine apertural barriers (Bentham Jutting, 1949c).

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