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Gymnodoris pattani, a new dorid nudibranch from Pattani Bay, Gulf of Thailand (Gastropoda, Nudibranchia)

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KEYWORDS: Mollusca, Nudibranchia, Polyceridae, *Gymnodoris*, Thailand.

ABSTRACT

Several specimens of a new dorid nudibranch have been found in Yaring River, Pattani Province in southern Thailand. The species clearly belongs to the genus *Gymnodoris*, and is described and named *G. pattani*. It can be distinguished from all other species described in the genus by its translucently greenish colour, lack of notable colour markings, smooth skin, low number of about 3 lamellae on the rhinophores, a cirlet of about 20 simple gill leaflets, its broad foot, and its brackish water habitat.

INTRODUCTION

On 26 March 1995, nine specimens of a peculiar, soft bodied dorid nudibranch were collected in Yaring River, a shallow river near the inner part of Pattani Bay, within Pattani Province, along the southwest coast of the Gulf of Thailand, (06°53'27"N, 101°22'E according to recording of the Global Position System). The temperature of the water was 31.5°C, and the salinity 22‰.

The slugs were crawling in the bright sun at a depth of about 0.30 m on a submerged mat of green algae, which resembled a fine *Enteromorpha* species. The length of the living animals varied between 17 and 23 mm. They were found together with several specimens of an unidentified bubble shell (Cephalaspidae). Egg strings of molluscs were also present on the algae. The gelatinous strings were colourless and contained a coiled chain of yellowish eggs. Similar strings were deposited in the bottle in which the nudibranchs and the bubble shells were transported to a laboratory; it remained unclear which species had reproduced.

The nudibranchs, green algae and bubble shells were kept together for a few days in a glass beaker. The nudibranchs were very active. Coming near each other, they bulged out the buccal mass during which the long radular teeth became visible. They showed no cannibalism, did not eat the green algae, bubble shells or fresh shrimp meat, so

their food remains unknown.

The species belongs to the genus *Gymnodoris* (Nudibranchia, Anadoroidea). Since it could not be identified as an already described species, it is described as a new species, *Gymnodoris pattani*.

The species is named after Pattani, the name of the town and the province, near and in which the slugs were discovered (Fig. 1). The description is based on seven specimens, of which the holotype (ZMA Moll.3.96) and 3 paratypes (ZMA Moll.3.96) were deposited in the Zoological Museum Amsterdam, and 3 paratypes in the Zoological Reference Collection of the National University of Singapore.

Gymnodoris pattani nov. spec. (Fig. 2, A-H)

DESCRIPTION

The living slugs are soft, limaciform, and very agile. The animals are semi-transparent greenish. Heart, parts of the gut, buccal mass, digestive gland, and reproductive organs are visible in the living animal. The skin is smooth. The mantle bears no rim, cephalic hood, pallial ridge, tubercles, or other special processes. Some thin, opaque white or yellowish, branched veins are visible along the sides of the

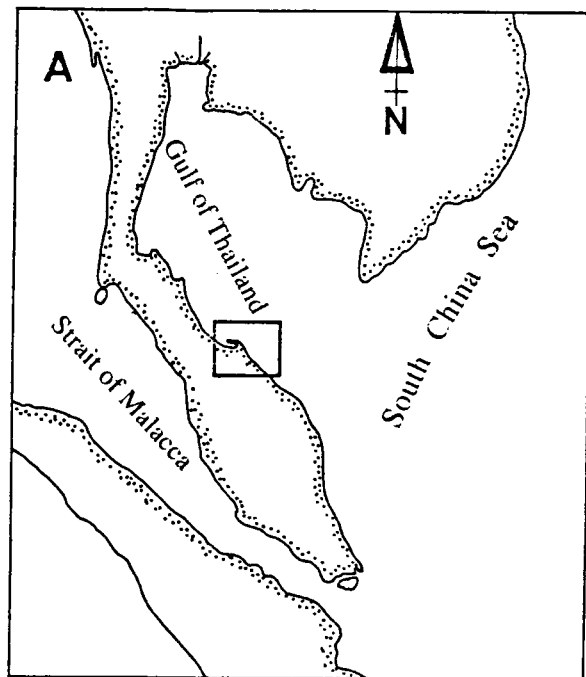
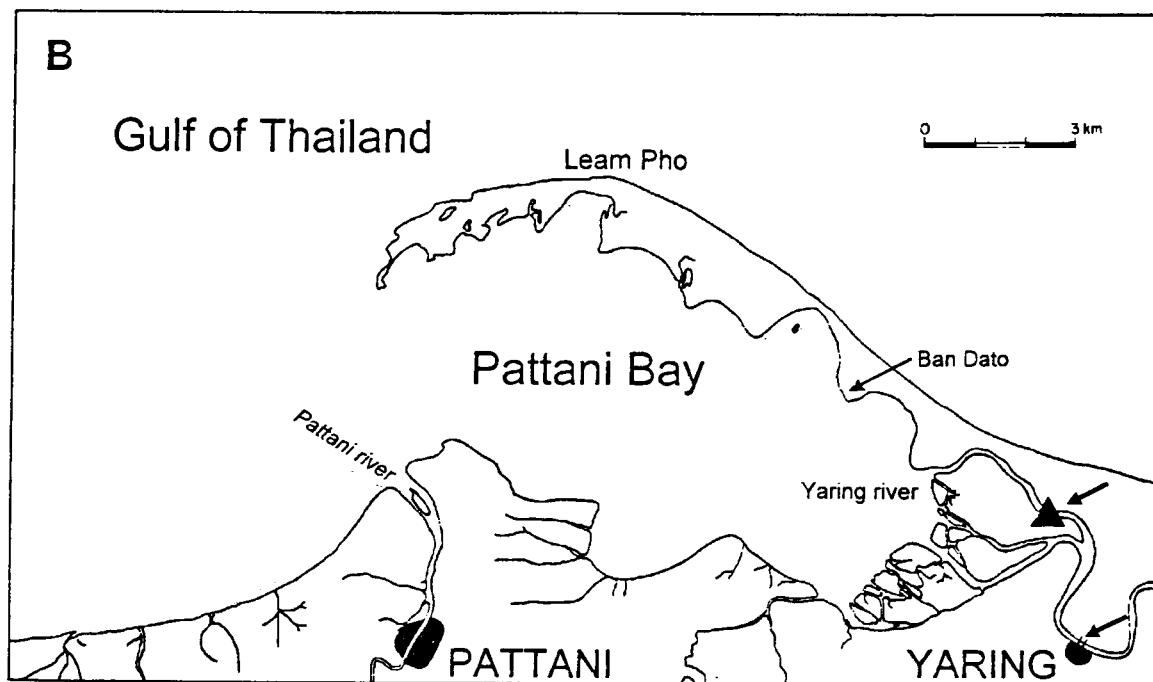


Fig. 1. A. Part of SE Asia showing the position of Pattani Bay in the Gulf of Thailand. B. Pattani Bay with Yaring River. The locality where the specimens of *G. pattani* were found is indicated by a triangle.



posterior part and on the central line of the tail. The one up to the tip of the tail is very thin and hardly visible.

A cirlet of about 20 gill leaflets is present around the anus at about or shortly behind the central part of the back. The cirlet seems to be closed, except in some animals where a small space without leaflets is shown on the medio-posterior side. The narrow outward edges of the leaflets are strengthened (Fig. 2 D). The leaflets are contractible, and vary in size. Small, median and larger leaflets more or less alternate. A few of the larger ones bear one or two small lateral flaps of similar structure on

each side. Two leaflets may be placed on the same base, but most are single and simple (Fig. 2 D).

The highest part of the body is in the center above the heart bulb and anterior part of the gill cirlet (Fig. 2 A, C). A dark spotted organ in the body is visible in front of the translucent prominence of the heart. The frontal border of the head is usually rounded, but may become pointed. Oral tentacles are lacking. The non-retractable rhinophores taper into a blunt end and bear two or three lamellae on the mid-posterior part (Fig. 2 A). The small black eyes are clearly visible through the transparent skin

behind the rhinophores. The foot is wider than the body. The frontal part is grooved and has broad rounded lobes (Fig. 2 B, C), the hind part tapers into a blunt point.

The animals were anaesthetized with $MgSO_4$. Most of them had the large oral canal extremely inverted when preserved in formalin (Fig. 2 E). The length of the inverted organ is up to one third of total length because the body is strongly contracted in most individuals, especially the part behind the branchiae. The inverted pharynx is opaque whitish, the esophageal parts semi-transparent whitish, and the radula yellowish. Body, foot, gills and rhinophores are semi-transparent greyish in preserved specimens. In the skin, minute dark spots are visible under magnification. A net of fibers and randomly distributed short strings of dark cells can be seen in the skin under a microscope, but no hard spiculae. More "veins" are found under the skin than the opaque ones that are visible in the living animal.

The buccal mass possesses no jaws, but the entrance of the bulb is lined with a cuticle. The radula has no rachis, the lateral tooth is small and has a single short denticle. The marginals are much larger, about 0.3 mm, and are smooth, long, stiletto-like denticles. The outer ones are thinner and slightly shorter than the more inner ones (Fig. 2 F). The formula is approximately $12 \times 15-17 \cdot 1 \cdot 0 \cdot 1 \cdot 15-17$.

The genital system (Fig. 2 G) has two separate, compact gonads (ovotestis) with yellowish-white vesicles. One is located in the left part of the body in front of the digestive gland. The other is on the right side in front and partly above the anterior part of the digestive gland. Both globoid gonads are widely separated and are not connected to the digestive gland. Their thin and pale gonoducts join into a single duct, which swells into the ampulla at double distance from the bifurcation. The ampulla is pale pinkish. Ampulla and accessory female glands (the white and compact albumen -or capsule- gland, and the mucus gland) are closely fixed together and could not be separated. The end part of the oviduct is short and solid. The vas deferens splits off before the ampulla enters the accessory female glands, closely followed by the vaginal duct. The vaginal duct has a short bifurcation to the small, opaque yellowish white, spherical receptaculum seminis and another to the large hyaline bursa. Soon after the bifurcation, the first half of the vas deferens widens into a large semi-transparent prostata, which covers bursa and receptaculum seminis. The second half of the vas deferens is a smooth, opaque whitish, convolute ductus ejaculatorius. The ductus ends in a small greyish penis, which has 18-24 rows of small, 10 μ long, recurved hooks (Fig. 2 H).

DISCUSSION

Characters such as the middorsal anus, tuft of non-retractile branchiae, limaciform, soft body, radula without rachidian, and especially gonads distinct from the digestive gland, indicate that the species belongs to the Gymnodoridinae s.s., as defined by Burn (1967).

The Gymnodoridinae s.l., a subfamily of the Polyceridae, which Odhner (1941) upgraded to the family Gymno-

dorididae (see Macnae, 1958), has been split by Burn (1967) into Gymnodoridinae s.s. and a new subfamily, Nembrothinae. The latter comprises the genera *Nembrotha* Bergh, 1877, *Roboastra* Bergh, 1877, and *Tambja* Burn, 1962. They have relatively stiff bodies, a radula with a rachidian and the gonad spread over the liver mass. The Gymnodoridinae s.s. includes the genera *Gymnodoris* Stimpson, 1855 (= *Trevelyana* Kelaart, 1858), *Analogium* Risbec, 1928, *Angasiella* Crosse, 1804, *Lecithophorus* Macnae, 1958, and *Paliolla* Burn, 1958. They are characterized by a soft body without labial armature, a little differentiated or degenerated radula without rachidian, and discrete ovitests. Their distribution is limited to the Indian Ocean and West-Pacific from Africa to Hawaii and from Japan to Australia.

Four of the five genera in the subfamily are poor in species. They are: *Analogium* with branchiae consisting of parallel plates with lamellar pinnae, and inner rows of radular teeth bicuspid. Only one species: *A. striata* (Eliot, 1908) with bright orange, elevated ridges on the back. *Angasiella* Crosse, 1864 with few (3) bipinnate gills in front of anus. One species, the red-brown and villous *A. edwardsi* (Angas, 1864). *Lecithophorus*, characterized by a radula without teeth. Only the translucent white *L. capensis* Macnae, 1958. *Paliolla*, characterized by its specialized radula with few but extremely long teeth. Only the red-dotted orange coloured *P. cooki* (Angas, 1864). None of these genera fit with the slugs from Pattani. They seem to be extremes derived from the large genus *Gymnodoris*. Gymnodorids mainly differ in radula, surface of the skin, colour, the presence or absence of a cephalic hood, number of lamellae on the rhinophores, number of gills, ordering of the gills, and branching of the gills.

Baba (1937) divided the Japanese *Gymnodoris* species into two groups. Those with the innermost tooth larger and those with this tooth smaller than the succeeding teeth. A larger inner tooth has been described in *G. bicolor* (Alder & Hancock, 1864), *G. ceylonica* (Kelaart, 1858), syn. *G. zeylanica* (Kelaart, 1858), *G. coccinea* (Eliot, 1904), *G. citrina* (Bergh, 1877), *G. japonica* (Baba, 1930), *G. marginata* (Odhner, 1917), *G. perlucens* (Risbec, 1928), *G. subflava* Baba, 1949 and *G. spec.* vide Baba & Noda (1993). All also differ from the Pattani slug in colour and some other characteristics.

The species described with inner tooth smaller than succeeding ones are *G. crocea* (Bergh, 1889), which is transparent bright yellow or orange, has rhinophores with about 10 lamellae, about 34 bipinnate gills and two inner teeth bicuspid. For the last characteristic the subgenus *Rhodingina* Bergh, 1889 has been erected. *Gymnodoris kouaoua* (Risbec, 1928), which has the tooth only slightly smaller, red dots on the body and 10 tripinnate gills. *G. nigricolor* Baba, 1960 with a broad and tricuspid lateral tooth, and a uniformly bluish black body colour, and *G. okinawae* Baba, 1936, which has a cephalic hood, 7-12 tripinnate gills and rhinophores with 15 to 20 lamellae. None of them is similar to *G. pattani*.

The teeth of the other species are insufficiently de-

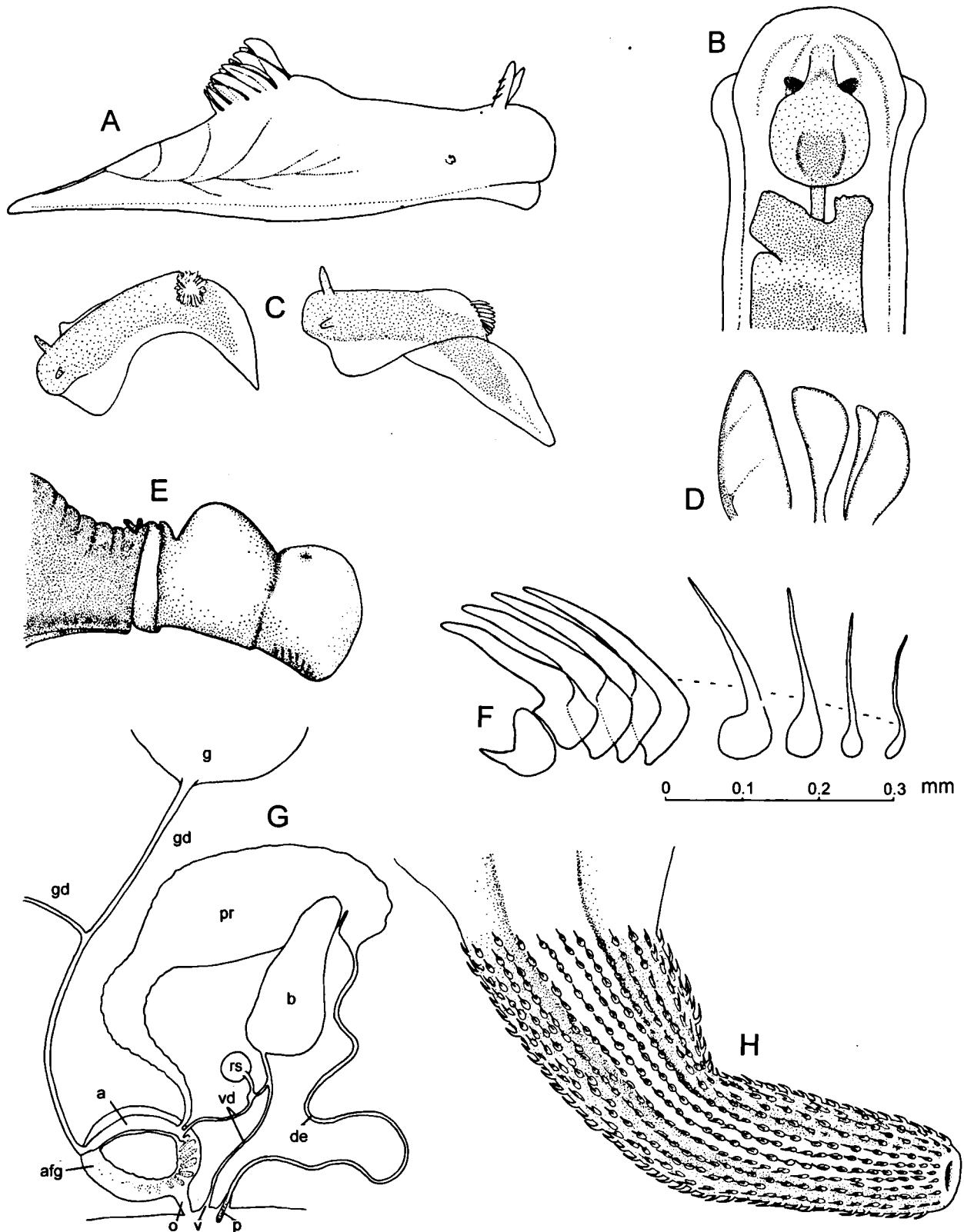


Fig. 2, A-H. *Gymnodoris pattani* nov. spec. A. Lateral view of living specimen; B. Dorsal view of frontal part of living specimen; C. Actively crawling specimens showing their wide foot; D. Gill leaflets; E. Lateral view of frontal part of preserved specimen with everted oral canal; F. Half row of radula of 17 mm long specimen; G. Schematic dorso-lateral view of genital complex. ; H. Penis. a - ampulla; afg - accessory female glands; b - bursa; de - ductus ejaculatorius; g - gonad; gd - gonoduct (hermaphroditic duct); o - oviduct; p - penis; pr - prostata; rs - receptaculum seminis; v - vagina; vd - vaginal duct; pr+de - vas deferens. Schmekel (1970) has been followed for the nomenclature of the genital organs.

scribed, but they differ in various other characteristics from the slugs of Pattani. *G. affinis* (Eliot, 1904) has oral tentacles, flaps on the gills, and is black with yellow dots. *G. alba* (Bergh, 1877) is white with orange spots, has a cephalic hood, gills placed in a horseshoe, and rhinophores with 10 lamellae. *G. concinna* (Abraham, 1876) has 14 to 16 bipinnate branchiae in a horseshoe, and rhinophores with several rather upright lamellae. *Trevelyana (?) defensa* Bergh, 1905 is yellow with red and has a large papilla on the back posterior of the gill circlet. *Gymnodoris felis* (Collingwood, 1881) is scarlet, has no gills, and the rhinophores possess no lamellae. *G. inornata* (Bergh, 1880) is pale translucent orange or yellow with a red border along the frontal lobe, has a complete circle of 8 to 12 bipinnate gills, and rhinophores with 15 lamellae. *G. impudica* (Rüppel & Leuckart, 1831) has dorsal tubercles. *G. maculata* Stimpson, 1855, the type species of the genus, is translucent, pale brownish, spotted with bright yellow. It has a ring of flake-white around the base of the branchiae. The branchiae consist of nine slender, transparent, unbranched leaflets, with blunt, rounded, bright yellow extremities. The rhinophores bear eight dark brown lamellae. *G. picta* (Pease, 1871) has red tubercles on the body, an orange border to the foot, and rhinophores with 12 lamellae. *G. plebeia* (Bergh, 1877) is yellow with orange-red spots, has four to six pinnate or bipinnate gills and rhinophores with seven lamellae. *G. sp.1* Gosliner, 1987 is white with orange spots. *G. sp.2* Gosliner, 1987 is yellowish white with orange dots, has a blunt head with poorly developed oral tentacles. *G. rubra* (Bergh, 1905) is yellow and clear red, has rhinophores with 10 lamellae, and 3 ovitests. *G. rubromaculata* (Bergh, 1905) is yellow with red warts, and has rhinophores with 30 lamellae. *G. rubropapulosa* (Bergh, 1905) is bright yellow with red warts. *G. subornata* Baba, 1960 is orange-red, has tubercles on the body, a cephalic hood and the radula is small, more or less rudimentary. *G. suggens* (Risbec, 1928) is transparent, whitish-yellow with yellow spots and yellow on the tips of rhinophores and gills. *Trevelyana cristata* Bergh, 1874, *T. morosa* Bergh, 1873 and *T. nigerrima* Bergh, 1873 do not belong to *Gymnodoris* but to *Nembrotha* according to Bergh (1877). Several of the above names may be synonyms for identical species (Baba, 1937; Risbec, 1953; Macnae, 1958). However, none of the descriptions fit with *G. pattani*.

Gymnodoris species are usually reported from stable marine habitats, living under stones, between corals or seagrasses. *G. pattani* deviates by flourishing on a muddy substrate in the brackish water of a mangrove-bordered lowland river.

Prince of Songkla University Pattani Campus (unpublished) has conducted measurements over a series of years in Yaring River at Yaring Bridge and in the eastern part of Pattani Bay off Ban Dato at about 2.5 km up-stream and about 3.6 km down-stream, respectively, from the spot where *G. pattani* was discovered. The median values and ranges for salinity on both sites are 7‰ (1-21 ‰) and 20‰ (9-33‰), indicating that the species can probably

endure even lower salinities than 20‰ in which it was found. The same study showed water temperatures at both sites of 30°C (27-31°) and 29° C (24-36°), and secchi values of 0.95 m (0.36-1.53 m) and 0.49 m (0.15-0.90 m).

Nearly all described *Gymnodoris* species are more or less transparent, having bright white, yellow, or red body colours with superficial red, orange or yellow dots or lines. *G. pattani* has no vivid colouration, but is transparent greenish without decorations. This and the broad foot, the short gills, and the few small lamellae on the rhinophores may be considered as adaptations for living in a shallow, muddy environment.

The radula with large spiny teeth of *G. pattani* seems to be adapted for grasping large prey. The method of feeding of some *Gymnodoris* species has been described by Hughes (1983). They are preying upon other Opisthobranchia either Cephalaspidea, Aplysiomorpha, Sacoglossa or Nudibranchia, including conspecifics, with which they copulate while, at the same time, consuming them as prey (Johnson & Boucher, 1983). That gymnodorids have adopted a suctorial diet, and that *G. citrina* grazes upon polyzoans, as stated by Morton & Morton (1983), must be based upon a misconception.

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REFERENCES

- Baba, K., 1937. Opisthobranchia of Japan 2. Journ. Dept. Agric. Kyushu Imp. Univ. 5: 289-344.
- Baba, K. & H. Noda, 1993. A rare collection of a small species of *Gymnodoris* (Nudibranchia: Polyceridae) held alive by the cheliped of the crab, *Lybia hatagumoana* (Brachyura: Xanthidae), from the bottom of Kynayama Bay, Kii, Japan. *Venus* 52: 283-289.
- Bergh, R., 1877. Malacologische Untersuchungen. In: C. Semper, ed. *Reisen im Archipel der Philippinen Sect.2*, 2 (11): 429-494.
- Burn, R., 1967. Notes on an overlooked nudibranch genus *Roboastra* Bergh, 1877 and two allied genera (Mollusca: Gastropoda). *Australian Zoologist* 14: 212-221.
- Gosliner, T., 1987. *Nudibranchs of Southern Africa*. E. J. Brill, Leiden. 1-136.
- Hughes, H. P. I., 1983. Feeding in *Gymnodoris inornata* (Bergh) and *Gymnodoris alba* (Bergh) (Opisthobranchia). In: B. Morton & D. Dudgeon, *The malacofauna of Hong Kong and southern China II*. (2): 627-633. Hong Kong Univ. Press.

- Johnson, S. & Boucher, L. M., 1983. Notes on some Opisthobranchia (Mollusca: Gastropoda) from the Marshall Islands, including 57 new records. *Pacific Science* 37: 251-291.
- Macnae, W., 1958. The families Polyceridae and Goniodoridae (Mollusca, Nudibranchiata) in Southern Africa. *Trans. Roy. Soc. South Africa* 35: 341-372.
- Morton, B. & J. Morton, 1983. The sea shore ecology of Hong Kong. Hong Kong University Press, 1-350.
- Odhner, N. H., 1941. New polycerid nudibranchiate mollusca and remarks on this family. *Meded. Göteborgs Mus. Zool.* 91: 1-20.
- Risbec, J., 1953. Mollusques nudibranches de la Nouvelle-Calédonie. *Faune Union Française Paris, Libraire Laross* 15: 1-189.
- Schmekel, L., 1970. Anatomie der Genitalorgane von Nudibranchier (Gastropoda Euthyneura). *Pubbl. Staz. Zool. Napoli* 38: 120-217.

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