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A NEW SPECIES OF MUDSKIPPER (GOBIIDAE: OXUDERCINAE) FROM SOUTHERN THAILAND

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ABSTRACT

A new species of mudskipper, *Periophthalmus walailakae* is described from the mangrove areas of Ranong and Phang-nga Provinces in Southern Thailand. It can be distinguished from other species of *Periophthalmus* in the combination of the following characters: pelvic fins with prominent frenum and completely joined to form a disk; first dorsal fin brownish red with a white margin, posterior edge of the fin rounded; trunk with dark brown and pale yellow spots. *Ps. walailakae* closely resembles *Periophthalmodon schlosseri* (Pallas) in appearance, but it differs in having only 1 row of teeth in the upper jaw.

INTRODUCTION

Mudskippers (Gobiidae: Oxudercinae) are widely distributed on mudflats, generally near or in mangrove areas in tropical and sub-tropical areas (Murdy, 1989). Co-existence of several genera and species of mudskippers in the same area is quite common. Their resource partitioning, particularly food resource partitioning, behaviour and ecology have been studied (*e.g.*, Macnae, 1968; Frank, 1971; Clayton, 1993; Darumas and Tantichodok, in prep.). While investigating how different species of mudskippers coexisted in particular mangrove forests in southern Thailand, we found a new species whose external appearance resembles that of *Periophthalmodon schlosseri* (Pallas), but it differs in having only one row of teeth in the upper jaw. This different feature is characteristic of the genus *Periophthalmus*. Dr. Monica Niklasson (formerly at Aarhus University, Denmark) has helped us run a preliminary gel electrophoresis using enzymes extracted from the eyeballs of these two specimens (the new species and *Periophthalmodon schlosseri*). The results suggested that they were two completely different species. Dr. Edward O. Murdy from National Science Foundation has since confirmed the existence of the new species.

The aim of this paper is to describe a new species of mudskipper, based on meristic and morphometric characters. This species is presently known from the Ranong Province and Phang-nga Province of southern Thailand.

MATERIALS AND METHODS

The type materials are deposited in the Reference Collection of Walailak University in southern Thailand (WURC), Phuket Marine Biological Center (PMBC), and the Zoological Reference Collection, Department of Zoology, National University of Singapore (ZRC).

Specimens of mudskippers were collected by hands in mangrove areas in Ranong and Phang-nga and preserved in 10 percent formalin solution. The classification, morphological counts and measurements of the specimens follow Murdy (1989). All measurements are straight-line distances made with vernier calipers and were taken to the nearest 0.1 mm. Proportional measurments in the text were rounded to the nearest 0.05. Measurements taken are shown on Fig 1.

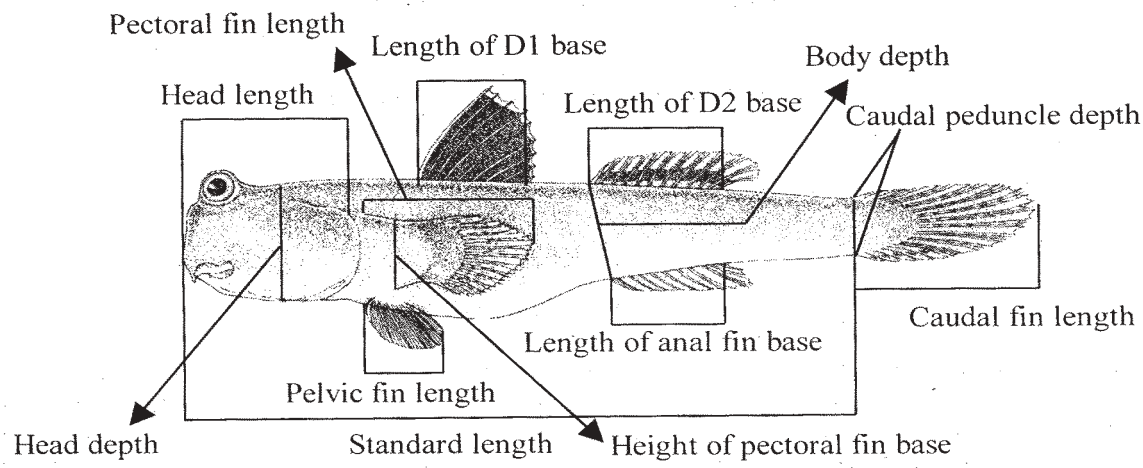

Figure 1 The schematic drawing of a mudskipper explains measurements.

For anal and second dorsal fins, the last two rays of each of the fins share the ultimate pterygiophore and were counted as a single element. Counts of pectoral fin rays including the upper most rudimentary rays were made on both sides of the fish. The counts of the longitudinal series of scales began at the dorso-posterior attachment of the opercular membrane, continued on a postero-ventral diagonal to the tip of the pectoral fin, and then in a straight line along the mid-line of the body to the posterior edge of the hypural plate. Transverse scale counts were taken from the second dorsal fin origin ventro-posteriorly to the anal fin base. Predorsal scales are those that extend from just anterior of the first dorsal spine to just posterior of the interorbital region. These were counted in a straight line.

***Periophthalmus walailakae*, new species**
Figs. 2–4, Table 1

Holotype: WURC 0321, male, 116 mm, caught in its burrow by hands, Ngo, Ranong Province, Southern Thailand, October 5, 1995 (Fig 2).
Paratypes: (six specimens) PMBC 19550, female, 110 mm, Ao Phang-nga, Phang-nga, southern Thailand; PMBC 19551, male, 100 mm, Ao Phang-nga, Phang-nga, southern Thailand; WURC 0322, female, 127 mm, Ao Phang-nga, Phang-nga, southern Thailand (Fig. 3); WURC 0323, male, 108 mm, Ao Phang-nga, Phang-nga, southern Thailand; ZRC 47241, male, 113.5 mm, Ao Phang-nga, Phang-nga, southern Thailand; ZRC 47242, male, 95.5 mm, Ngo, Ranong, collected with the holotype.
Diagnosis: A species of *Periophthalmus* with the following combination of characters: teeth in both jaws in a single row; snout, isthmus and interorbital region scaless; frenum strongly prominent; pelvic fins completely joined by membrane for entire length to form a disk; dorsal fins well separated; first dorsal fin brownish red with white margin, its margin rounded; second dorsal fin with a black stripe in middle of fin; dark brown and pale yellow spots on head and trunk.

Description: D1 with 8–9 spines (mean = 8.6); D2 elements I, 10; anal fin I, 8–10, total elements 9–11 (mean = 10); pectoral fin rays 14–15 (usually 15); longitudinal scales 56–69 (mean = 62.3); transverse scales 12–15 (mean = 13.7); predorsal scales 25–27 (mean = 26).

Body elongate, the depth 15.7–16.4% SL (mean = 16.0); head length 27.6–30.0% SL (mean

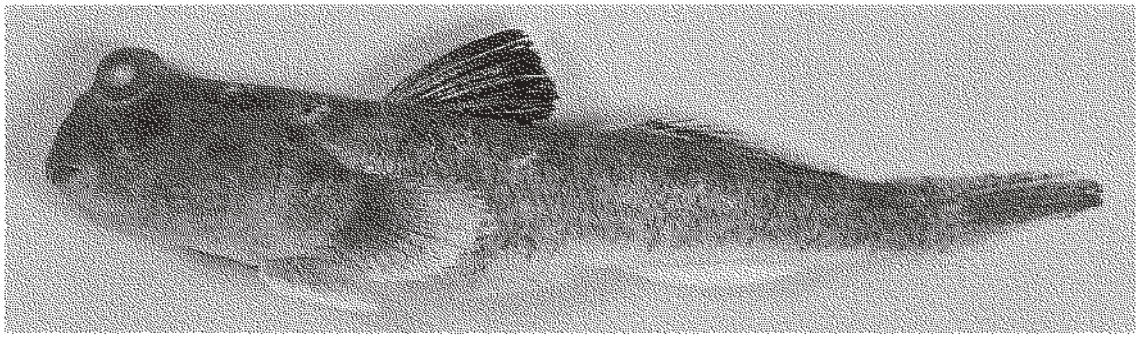

Figure 2 Holotype of *Periophthalmus walailakae*, WURC 0321, male, 116 mm SL.

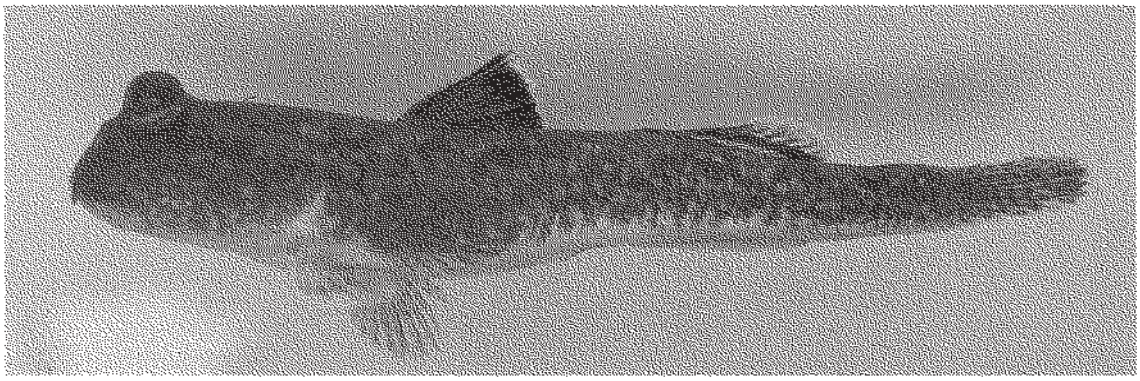

Figure 3 Photograph of freshly dead *Periophthalmus walailakae*, Paratype, WURC 0322, female, 127 mm SL.

= 28.8); head depth 19.4–21.0% SL (mean = 20.0); head width 18.9–23.3% SL (mean = 21.4); pectoral fin length 25.4–28.7% SL (mean = 26.9); height of pectoral fin base 9.5–13.2% SL (mean = 12.4); pelvic fin length 13.8–15.5% SL (mean = 14.4); D1 height (= length of longest spine) moderate, 17.3–22.0% SL (mean = 20.4), a little taller than head depth; D1 base length 13.4–18.2% SL (mean = 16.4); D2 base length 18.2–20.0% SL (mean = 19.5); anal fin base length 14.0–18.5% SL (mean = 15.7); caudal fin length 16.7–23.0% SL (mean = 20.0), asymmetrically rounded, the lower rays distally thickened; least depth of caudal peduncle 8.7–10.2% SL (mean = 9.5).

Frenum uniting pelvic spines strongly prominent; innermost pelvic fin rays connected by membrane to form a disk; dorsal fins not connected by membrane; first dorsal fin margin rounded; first ray of second dorsal fin spinous, the rest segmented and branched; scales cycloid, covering entire body except for snout, isthmus and interorbital region; eyes large and erectile, protruding over dorsal profile; snout blunt, dully produced anterior to eyes in midline; caninoid teeth in both jaws in a single row; upper lip expanded into a large fold posteriorly, joining a similar fold of lower lip at rictus; skin sheath overlying upper lip, bearing a pendulous flap, with anterior nostril

Table 1 Proportional measurements expressed as percentages of standard length and counts of *Periophthalmus walailakae* (n = 7).

	Holotype	Paratypes					
Items	WURC 0321	PMBC 19550	PMBC 19551	WURC 0322	WURC 0323	ZRC 47241	ZRC 47242
Body depth	16.4	16.4	16.0	15.75	16.2	15.9	15.7
Head length	27.6	30.0	28.0	29.9	28.7	29.1	28.3
Head depth	19.8	20.0	21.0	19.7	19.4	19.4	20.9
Head width	23.3	22.7	23.0	18.9	19.4	20.3	22.0
Height of pectoral fin base (left)	9.5	12.7	13.0	12.6	13.0	13.2	12.6
Length of Dl base	18.1	18.2	17.0	13.4	15.7	15.9	16.75
Length of D2 base	19.8	18.2	20.0	19.7	19.4	19.4	19.9
Length of anal fin base	15.5	16.4	14.0	14.2	18.5	16.7	14.7
Caudal fin length	20.7	19.1	23.0	20.9	18.5	16.7	20.9
Pectoral fin length	25.4	28.6	27.5	26.0	28.7	26.0	26.2
Pelvic fin length	13.8	14.55	15.5	14.6	14.0	14.1	14.1
Caudal peduncle depth	9.5	9.1	10.0	8.7	10.2	9.7	9.4
Pectoral fin rays (left/right)	15/15	15/15	15/15	15/14	15/15	15/14	14/15
Longitudinal scales	59	64	69	62	60	66	56
Transverse scales	14	15	12	13	14	14	14
Predorsal scales	25	**	**	**	**	**	27
First dorsal fin (D1)	IX	VIII	IX	IX	VIII	IX	VIII
Second dorsal fin (D2)	I, 10	I, 10	I, 10	I, 10	I, 10	I, 10	I, 10
Anal fin	I, 8	I, 9	I, 9	I, 8	I, 10	I, 10	I, 9
Standard length (mm)	116	110	100	127	108	113.5	95.5
Sex	M	F	M	F	M	M	M

** = No data because of scale loss.

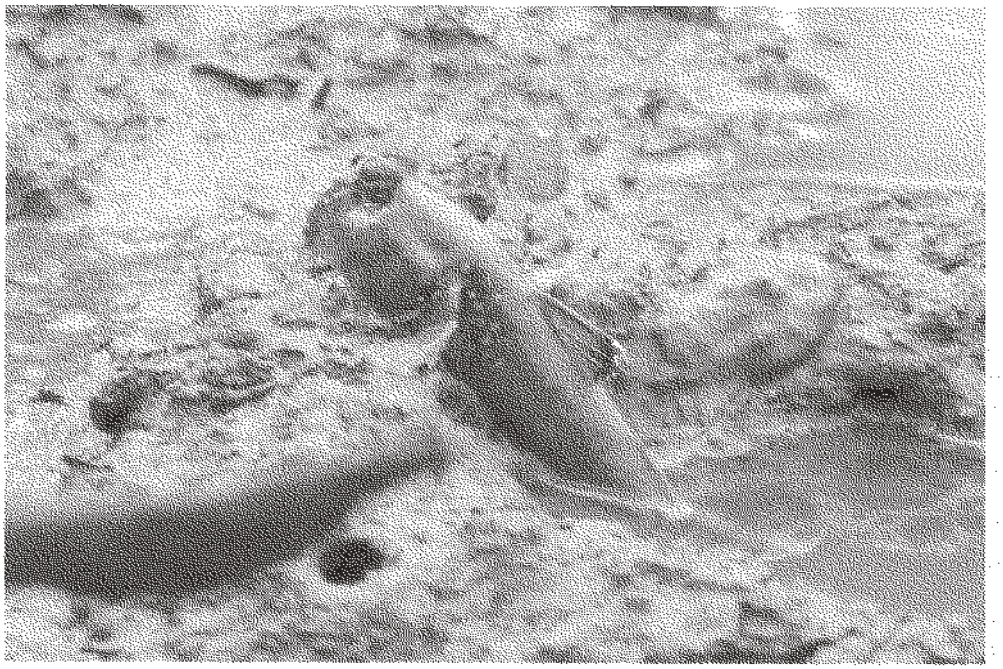

Figure 4 *Periophthalmus walailakae* emerging from its burrow.

at its tip, on each side of the sheath, and extending ventrally below lower jaw.

Coloration: (based on freshly dead specimens) background color brownish gray dorsolaterally; pale yellowish-gray on venter; numerous yellow or white spots on head and trunk dorsolaterally, dense on operculum ventrolaterally; five diagono-vertically black blotches on trunk dorsolaterally, first on head and pectoral fins, second at D1 base posteriorly, third at D2 base anteriorly, fourth posterior of D2 base, fifth at anterior-most of caudal fin; ground color of D1 brownish red with white margin; D2 margin pale red with a single black stripe mesially, a row of small red spots basally on fin; ground color of pelvic fins pale yellowish brown; pectoral fins and caudal fin with brown and black blotches or spots on rays; anal fin pale brown.

In preservative, head and trunk dark gray dorsolaterally, white on venter; numerous white spots on head and trunk dorsolaterally, dense on operculum ventrolaterally; ground color of D1 deep dark brown, darker dorsally, fin margin pale to whitish, first D1 spine whitish, D2 margin white with a single black stripe mesially.

Etymology: The specific epithet is named in commemoration of the tenth anniversary of the foundation of Walailak University.

Distribution: *Ps. walailakae* is presently known from mangroves in the provinces along the Andaman Sea coast of Southern Thailand. The distribution of this new species probably extends along the west coast of the Malay Peninsula.

DISCUSSION

Periophthalmus walailakae has a single row of teeth in the upper jaw, which is the most distinct character in differentiating the genus *Periophthalmus* from *Periophthalmodon*. It closely resembles *Periophthalmodon schlosseri* in appearance, but the latter fish consistently has two rows of teeth in its upper jaw. Furthermore, *Pn.*

schlosseri usually possesses a wide black stripe (brown in preservative) coursing posteriorly from eye and terminating near caudal peduncle (Murdy, 1989; this study). From our study in southern Thailand, we found these two species are geographically separated: *Periophthalmodon schlosseri* occurs in the Gulf of Thailand, while *Periophthalmus walailakae* inhabits the Andaman coast.

The pelvic fins of *Ps. walailakae* are completely joined to form a disk. The only species of *Periophthalmus* with joined pelvic fins is also *Ps. chrysospilos* Bleeker. However, *Ps. walailakae* differs from *Ps. chrysospilos* as the posterior edge of first dorsal fin of *Ps. walailakae* is rounded, while it is straight, as well as with elongation of the first two (in male) or only the first (in female) spines in *Ps. chrysospilos*. Furthermore, there are dark brown and pale yellow spots on the head and the trunk of *Ps. walailakae*, whereas these spots are pale gray and dark yellow or orange on the trunk of *Ps. chrysospilos*. Although both of these two species are present on the Andaman coast, they are never sympatric or co-occurring. Their habitat preference and behaviour are also different.

Ps. walailakae lives in mangrove forests and builds burrows that are about 9–13 cm wide and 100–120 cm deep, very similar to those of *Pn. schlosseri*. The fish create a turret by taking mud from the burrow in their mouths and blowing it out near the burrow opening. Both the male and female create their own turrets, though they sometimes stay in the same burrow. These fish are nocturnal, leaving the burrow to feed in the evening and returning in the morning. During the daytime, the fish hang on to the burrow turret or work on the burrow to make it deeper. In contrast, *Ps. chrysospilos*, during high tide, attach themselves to available substrates, such as plant roots, stems, poles or rocks. Most of these fish allow only their head to emerge from the water, though some come out of the water completely. Foraging activity is very rare during high tide. The fish instead forage by following the tidal level as it recedes. Although fish form themselves into groups, cooperative activity was never observed. In fact the behaviour appears to be competitive.

Comparative materials examined: *Periophthalmodon schlosseri*: WURC 0301–0302 (2 specimens), 212 and 202 mm SL, female and male, Ao Pattani, Pattani; WURC 0303–0304 (2 specimens), 213 and 223 mm SL, male and male, Ao Pak Pha-nang, Nakhon Si Thammarat; WURC 0305, 208 mm SL, female, Ao Ban Don Suratthani; WURC 0306, 195 mm, male, Ao Phanangtak, Chumphon. *Periophthalmus chrysospilos*: WURC 0290–0292 (3 specimens), 66, 87, and 78 mm SL, male, female, and female, Ao Pak Pha-nang, Nakhon Si Thammarat; WURC 0293–0295 (3 specimens), 76, 75, and 73 mm SL, female, female, and male, Ko Lanta, Krabi; WURC 0296–0297 (2 specimens), 77 and 78 mm SL, female and female, Laem Hin, Phuket.

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REFERENCES

Clayton, D.A. 1993. Mudskippers. Oceanography Marine Biological Annual Review **31**: 507–577.

Darumas, U. and P. Tantichodok. (in prep.). Ecology and niche overlap of coexisting mudskippers in southern Thailand.

Frank, S. 1971. The pictorial encyclopedia of fishes. Prague, Savoboda. pp. 496–499.

Macnae, W. 1968. A general account of the fauna and flora of mangrove swamps and forests in the Indo-West-Pacific Region. Advances in Marine Biology **6**: 73–270.

Murdy, E.O. 1989. A taxonomic revision and cladistic analysis of the oxudercine gobies (Gobiidae: Oxudercinae). Record of Australian Museum Supplement **11**: 1–93.

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