

**NEW SPECIES OF THE THREADFIN GENUS *POLYNEMUS*  
(TELEOSTEI: POLYNEMIDAE) FROM THE MEKONG RIVER BASIN, VIETNAM,  
WITH COMMENTS ON THE MEKONG SPECIES OF *POLYNEMUS***

**Hiroyuki Motomura**

*The Kagoshima University Museum, 1-21-30 Korimoto, Kagoshima 890-0065, Japan*

*E-mail: motomura@kaum.kagoshima-u.ac.jp*

**Shinji Tsukawaki**

*Division of Eco-Technology, Institute of Nature and Environmental Technology,*

*Kanazawa University, Kakuma-machi, Kanazawa 920-1192, Japan*

**ABSTRACT.** – A new species of freshwater threadfin, *Polynemus bidentatus*, is described on the basis of a single specimen (153.4 mm standard length) collected from Cho Gao Canal, Mekong River drainage, My Tho Province, Vietnam. The new species can be distinguished from all other species of *Polynemus* by having vomerine teeth separate at the midline, forming two toothed patches (vs. single vomerine patch). Detailed comparisons are made with all species of *Polynemus*. A review of *Polynemus* resulted in the recognition of four species and subspecies of the genus occurring in the Mekong River basin, viz. *P. aquilonaris*, *P. bidentatus*, *P. melanochir dulcis*, and *P. m. melanochir*.

**KEY WORDS.** – Polynemidae, *Polynemus bidentatus*, new species, Mekong River.

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## INTRODUCTION

The family Polynemidae (threadfins) comprises of eight genera with 41 species and subspecies in the world (Motomura, 2004a). Although the family contains primarily marine species, all species in the genus *Polynemus* Linnaeus (except for *P. paradiseus* Linnaeus, which is known to enter freshwater at spawning season only; David, 1954; Motomura et al., 2002b), live in freshwater rivers and lakes throughout their entire life cycle (Motomura, 2004b). Detailed taxonomic studies that give emphasis to species groups of the genus *Polynemus* have been separately published by the author and colleagues (e.g. Motomura et al., 2002b; Motomura & Sabaj, 2002; Motomura, 2003; Motomura & van Oijen, 2003). These studies have resulted in eight of the 17 available nominal species being regarded as valid (Motomura, 2004b: 95–96).

Recently, a single specimen of threadfin, collected from the Mekong River drainage in My Tho Province of Vietnam, was found in the collection of the Museum of Zoology, University of Michigan, USA. This specimen was readily identified as belonging to the genus *Polynemus*, which was defined by the pectoral-fin insertion near the midline of the lateral surface of the body, eye diameter 1.3 or more in snout length, and the preopercular margin serrated (Motomura, 2002, 2004b). However, the specimen differed from all other species of *Polynemus* in several aspects, including the shape of vomerine

tooth patch, absence of swimbladder, and several meristic and morphometric characters. Thus, the specimen is described herein as a new species. In addition, comments are made on the species of *Polynemus* occurring in the Mekong River basin.

## MATERIALS AND METHODS

Counts and measurements follow Hubbs & Lagler (1947), Motomura et al. (2002a) and Motomura (2004b). Counts of pectoral-fin filaments begin with the anterior (ventralmost) element. Standard length is expressed as SL. Terminology of supraneural bones follows Mabee (1988); formula for configuration of supraneural bones, anterior neural spines and anterior dorsal fin pterygiophores follows Ahlstrom et al. (1976). Osteological characters were confirmed from a radiograph taken of the holotype of *P. bidentatus*. The absence of swimbladder and the sex of the specimen were confirmed by dissection of the abdomen on the right side. The following institutional abbreviations are used in the text: AMS – Ichthyology, Australian Museum, Sydney; ANSP – Department of Ichthyology, Academy of Natural Sciences, Philadelphia; CAS – Department of Ichthyology, California Academy of Sciences, San Francisco; NRM – Department of Vertebrate Zoology, Swedish Museum of Natural History Stockholm; NSMT – Fish Division, National Science

Museum, Tokyo; RMNH – the Naturalis (ex-Rijksmuseum van Natuurlijke Historie), Leiden; UMMZ – Division of Fishes, Museum of Zoology, University of Michigan, Michigan; URM – Department of Marine Sciences, Faculty of Science, University of the Ryukyus, Okinawa; USNM – Division of Fishes, Department of Vertebrate Zoology, Smithsonian Institute, National Museum of Natural History, Washington DC; and ZRC – Zoological Reference Collection, Raffles Museum of Biodiversity Research, Department of Biological Sciences, National University of Singapore, Singapore. Comparative material examined during this study was listed in Motomura & Sabaj (2002), Motomura et al. (2002b), Motomura (2003) and Motomura & van Oijen (2003). Additional material examined are as follows: *Polynemus aquilonaris*: AMS I. 485063, 2 specimens, 130.2–167.0 mm SL, Tonle Sap River (12°15'N, 104°45'E), Cambodia, coll. by H. Motomura, dai net (set net), 22–23 Jan. 2004; AMS I. 43486039, 3 specimens, 75.1–101.4 mm SL, northern Lake Tonle Sap, near Siem Reap, Cambodia, coll. by H. Motomura, 25–27 Jan. 2004; NSMT-P 64693, 12 specimens, 100.8–134.1 mm SL, northern Lake Tonle Sap, near Siem Reap, Cambodia, coll. by H. Motomura, 11–13 May 2002.

## TAXONOMY

### *Polynemus bidentatus*, new species

(Figs. 1, 2B)

**Material examined.** – Holotype. UMMZ 213346, male, 153.4 mm SL; Vietnam: My Tho Province: Cho Gao Canal in Mekong River drainage; Mekong research team; otter trawl; 20 Jun. 1974.

**Diagnosis.** – A species of *Polynemus* with the following combination of characters: 8 spines in first dorsal fin; 16 soft dorsal-fin rays; 7 pectoral-fin filaments (sixth filament longest); 17 pectoral-fin rays; 3 anal-fin spines; 70 pored lateral-line scales; 32 gill rakers; vomerine teeth separated at midline, forming two toothed patches; swimbladder absent; depth at posterior margin of maxilla greater than orbit diameter; relatively long snout length (6.8% of SL), upper-jaw length (13.8% of SL), first pelvic-fin soft ray length (17.2% of SL), and upper caudal-fin lobe length (38.1% of SL); relatively short pectoral-fin length (32.6% of SL), longest

pectoral-fin filament length (158.7% of SL), and third anal-fin soft ray length (15.8% of SL); relatively small orbit diameter (2.2% of SL); ventroposterior portion of the pectoral fin black.

**Description.** – First dorsal fin with 8 spines. Second dorsal fin with 1 spine and 16 soft rays. Anal fin with 3 spines and 12 soft rays. Pectoral fin (exclusive of filaments) with 17 rays on each side of body. Pectoral-fin filaments 7 on each side of body. Pelvic fin with 1 spine and 5 soft rays. Pored lateral-line scales (exclusive of scales on caudal fin) 70. Scales rows above lateral line 6; scales below lateral line 13. Upper limb gill rakers 13; lower limb 19; total 32. Formula for configuration of supraneural bones, anterior neural spines and anterior dorsal pterygiophores /0/0+2/1+1/1/1/1/. Vertebrae 10 + 15. Swimbladder absent.

Morphometrics expressed as percentage of SL, followed in parentheses by times in SL: head length 26.7% (3.7); body depth at first dorsal-fin origin 22.0 (4.6); body depth at second dorsal-fin origin 22.7 (4.4); body width at pectoral-fin base 13.9 (7.2); snout length 6.8 (14.6); eye diameter 2.1 (47.9); orbit diameter 2.2 (45.1); interorbital width 7.9 (12.7); postorbital length 18.0 (5.6); upper-jaw length 13.8 (7.3); depth at posterior margin of maxilla 4.3 (23.2); pre-first dorsal-fin length 33.3 (3.0); pre-second dorsal-fin length 56.8 (1.8); pre-anal-fin length 58.3 (1.7); direct distance from pelvic-fin origin to anal-fin origin 26.9 (3.7); second dorsal-fin base length 20.2 (4.9); anal-fin base length 15.6 (6.4); pectoral-fin length 32.6 (3.1); pectoral-fin base, including pectoral-fin filaments base 13.0 (7.7); longest pectoral-fin filament (sixth) length 158.7 (0.6); longest pelvic-fin ray (first) length 17.2 (5.8); longest first dorsal-fin spine (third) length 18.2 (5.5); second dorsal-fin spine length 8.0 (12.5); longest second dorsal-fin ray (third) length 16.9 (5.9); longest anal-fin spine (third) length 8.7 (11.5); longest anal-fin ray (second) length 15.8 (6.3); caudal-peduncle length 26.1 (3.8); caudal-peduncle depth 10.3 (9.7); upper caudal-fin lobe length 38.1 (2.6); lower caudal-fin lobe length 33.6 (3.0).

Body oblong, moderately compressed anteriorly, progressively more compressed posteriorly. Nape and anterior body not highly arched, body depth shallow. Head large, length slightly greater than body depth. Scales covering entire body and head, except for lips and adipose eyelid, and body;



Fig. 1. *Polynemus bidentatus*, UMMZ 213346, holotype, 153.4 mm SL, My Tho Province, Vietnam.

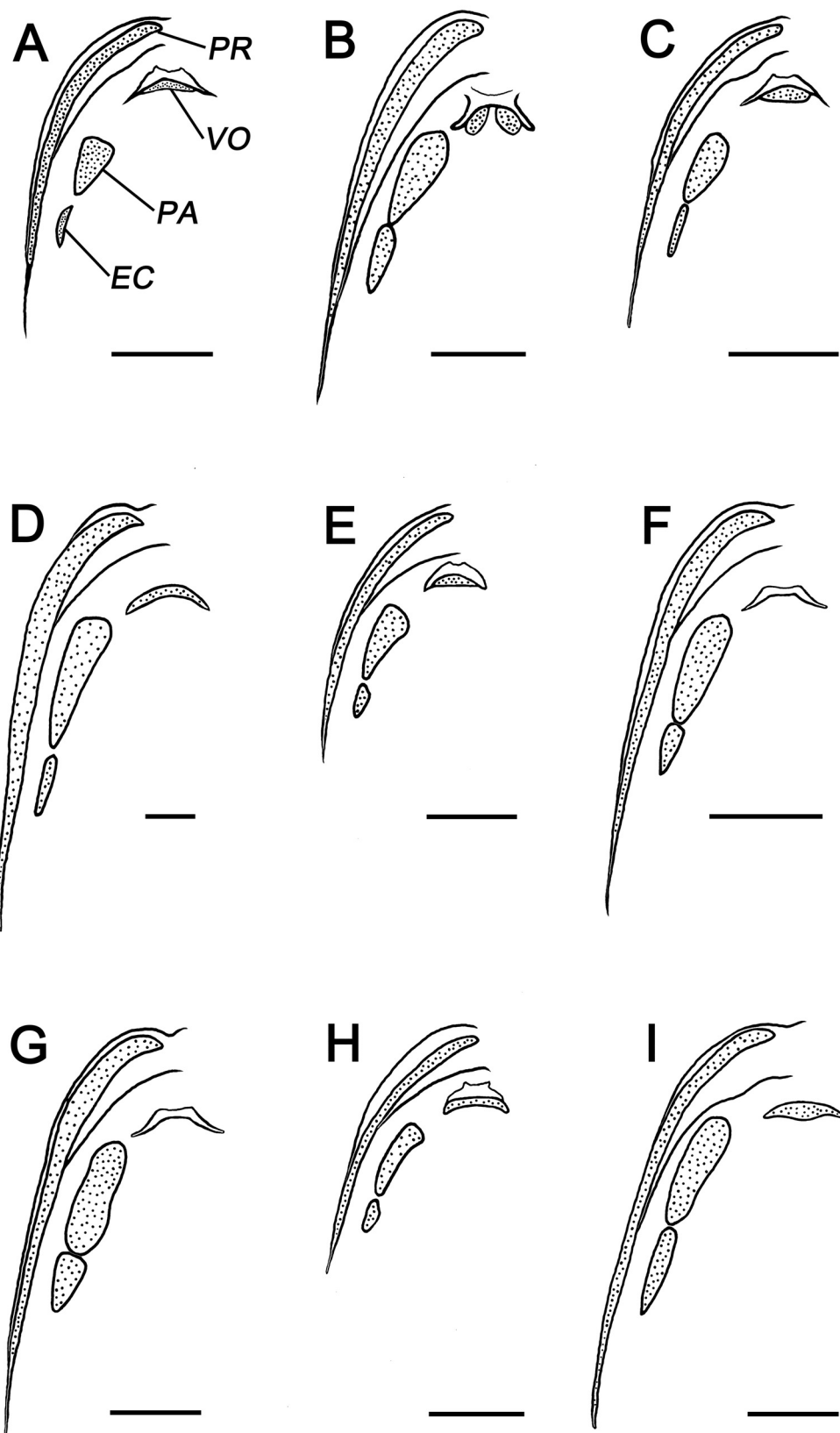


Fig. 2. Ventral view of dentition of premaxilla and roof of oral cavity in species of *Polynemus*. **A**, *P. aquilonaris*, URM-P 13930, holotype, 136.1 mm SL, Thailand; **B**, *P. bidentatus*, UMMZ 213346, holotype, 153.4 mm SL, Vietnam; **C**, *P. dubius*, RMNH 6014, lectotype, 125.8 mm SL, Indonesia; **D**, *P. hornadayi*, USNM 100632, holotype, 193.1 mm SL, Malaysia; **E**, *P. kapuasensis*, CAS 47198, holotype, 151.1 mm SL, Indonesia; **F**, *P. melanochir dulcis*, ANSP 178011, holotype, 134.6 mm SL, Cambodia; **G**, *P. melanochir melanochir*, ZRC 37829, neotype, 178.5 mm SL, Malaysia; **H**, *P. multifilis*, RMNH 436, holotype, 136.1 mm SL, Indonesia; **I**, *P. paradiseus*, NRM 47529, neotype, 197.8 mm SL, India. *EC*, ectopterygoid; *PA*, palatine; *PR*, premaxilla; *VO*, vomer. Small dots indicate villiform teeth. Scale bars = 5 mm.

body scales extending onto rays and membranes of all fins. Lateral line simple, extending from upper end of gill opening to mid-distal margin of caudal-fin membrane. Eye very small, orbit diameter 12.1 in head length, covered with thick adipose eyelid; longitudinal length of adipose eyelid slightly longer than depth of posterior margin of maxilla. Anterior nostril much smaller than posterior nostril; posterior margin of posterior nostril in contact with anterior margin of adipose eyelid. Lateral surface of maxilla covered with scales; posterior margin of maxilla extending well beyond eye. Mouth inferior, large, nearly horizontal, forming an angle of about 10 degrees to horizontal axis of head and body. Upper lip poorly developed; lower lip well developed posteriorly; anterior portion of lower jaw with small teeth extending onto lateral surface, adjacent portion of lip poorly developed. Villiform teeth in broad bands on premaxilla, dentary, vomer, palatines and ectopterygoids; tooth band of upper jaw wider than that of lower jaw; tooth band of upper jaw approximately equal to width of space separating tooth bands on opposing premaxilla; length of palatine plate longer than that of ectopterygoid plate; vomerine teeth separated at midline, forming 2 tooth patches. Posterior margin of preopercle serrated.

First spine of first dorsal fin tiny, its length less than anterior nostril diameter; second spine strong, about 1.5 times as width as third spine; bases of other spines with similar thickness; posterior tip of depressed first dorsal fin not reaching second dorsal-fin origin. Second dorsal-fin base length much longer than first dorsal-fin base length; length of longest second dorsal-fin ray slightly shorter than that of longest first dorsal-fin spine; origin of second dorsal fin anterior to that of anal fin. All pectoral-fin rays unbranched; fin inserted near midline of body; posterior tip of pectoral fin just reaching a vertical at anal-fin origin; second pectoral-fin ray longest, third to seventeenth rays progressively shorter. First pectoral filament shortest; first and second filament tips not reaching posterior tip of depressed pelvic fin; third filament tip not reaching anal-fin origin; fourth filament tip extending slightly beyond middle of anal-fin base; fifth filament tip extending slightly beyond caudal-fin base; sixth filament longest, longer than seventh filament; sixth and seventh filament tips extending well beyond posterior tips of caudal-fin lobes (filament tips being easily damaged). Posterior tip of depressed pelvic fin extending well beyond anus. First anal-fin spine tiny, mostly embedded; length of second spine more than half length of third spine; length of longest anal-fin soft ray slightly shorter than that of longest dorsal-fin soft ray. All soft rays, except for pectoral-fin rays, branched.

**Colour of preserved specimen.** – Head and body blackish dorsally, brownish ventrally. Adipose eyelid translucent white. Opercle brown with a poorly defined blackish blotch centrally. Pectoral fin brown with melanophores scattered on posteroventral part of fin. First and second dorsal, pelvic, anal and caudal fins brown without distinct melanophores. Base of pectoral filaments whitish, becoming brownish posteriorly. Life colour unknown.

**Distribution.** – Currently known only from the type locality (Mekong River basin, My Tho Province, Vietnam).

**Etymology.** – The name *bidentatus* is derived from a combination of the Latin *bis* (two) and *dentatus* (toothed) in allusion to the two tooth patches on the vomer. Suggested English name: Toothy Blackhand Paradise Fish.

**Comparisons.** – The genus *Polynemus*, distributed only in South and Southeast Asia, consists of the following eight taxa (viz. Motomura & van Oijen, 2003; Motomura, 2004b): *P. aquilonaris* Motomura, *P. dubius* Bleeker, *P. hornadayi* Myers, *P. kapuasensis* Motomura & van Oijen, *P. melanochir dulcis* Motomura & Sabaj, *P. melanochir melanochir* Valenciennes, *P. multifilis* Temminck & Schlegel, and *P. paradiseus* Linnaeus. *Polynemus bidentatus* can be readily distinguished from these congeners by having vomerine teeth separate at the midline, forming two toothed patches (vs. a single toothed patch in *P. aquilonaris*, *P. dubius*, *P. hornadayi*, *P. kapuasensis*, *P. multifilis*, and *P. paradiseus* or teeth absent from the vomer in *P. melanochir dulcis* and *P. melanochir melanochir*; see Fig. 2). *Polynemus bidentatus* is thus the only species in the family Polynemidae that has separate vomerine tooth patches (Motomura, 2004b).

In addition to the different vomer morphology, *P. bidentatus* differs from *P. kapuasensis* (distributed in the Kapuas River, western Kalimantan) and *P. multifilis* (Thailand and Indonesia) in having fewer pectoral-fin filament counts (seven vs. 13–16 in the latter; Motomura & van Oijen, 2003) but shares with other congeners in having fewer filaments. *Polynemus bidentatus* differs from *P. hornadayi* (western Sarawak, Kalimantan, Malaysia) and *P. paradiseus* (India to Thailand) in having eight spines in the first dorsal fin (vs. seven spines in the latter two species), three anal-fin spines (vs. two in *P. paradiseus*), 70 pored lateral-line scales (vs. 90–103 in *P. hornadayi*), and 32 gill rakers (vs. 26–28 in *P. hornadayi*), and lacking a swimbladder (vs. present in *P. hornadayi*). Data for *P. hornadayi* and *P. paradiseus* are based on 26 specimens (including holotype and nine paratypes) and 42 specimens (including neotype), respectively (listed in Motomura et al., 2002a, b).

Depth at the posterior margin of the maxilla (4.3% SL) in *P. bidentatus* is significantly greater than orbit diameter (2.2% SL), whereas the depths of the posterior margin of the maxilla in *P. aquilonaris* (2.5–3.2%, mean 2.8%) and *P. dubius* (2.3–3.8%, mean 3.2%) are less than orbit diameter (3.5–4.3%, mean 4.0% and 3.3–4.5%, mean 3.8%, respectively). In addition, pectoral-fin (32.6%) and longest pectoral-fin filament (158.7% SL) lengths in *P. bidentatus* are relatively shorter than those in *P. aquilonaris* (34.1–40.8%, mean 36.9% and 265.9–371.3%, mean 308.2%, respectively) and *P. dubius* (34.2–40.2%, mean 37.3% and 263.9–312.3%, mean 293.0%, respectively). Conversely, upper-jaw length (13.8% SL) in the former is relatively longer than that in *P. aquilonaris* (10.1–11.8%, mean 10.8%) and *P. dubius* (9.7–13.1%, mean 11.4%). Moreover, *P. bidentatus* differs from *P. aquilonaris* in having lower counts of pored lateral-line scales (70 vs.

80–86 in the latter) and higher counts of gill rakers (32 vs. 25–29). Data for *P. aquilonaris* and *P. dubius* are based on 45 specimens (including holotype and 12 paratypes) and 15 specimens (including lectotype and seven paralectotypes), respectively (listed in Motomura, 2003, and listed in Materials and methods earlier).

*Polynemus bidentatus* is similar to *P. melanochir dulcis* (Lake Tonle Sap) and *P. m. melanochir* (Mekong River basin and Kalimantan) in overall body appearance (see Motomura & Sabaj, 2002: Figs. 1, 3). In addition, they share an unusual character for *Polynemus*, i.e. black ventroposterior portion of the pectoral fin (no melanophores in other congeners, except for *P. paradiseus* which is occasionally tinged with black), and their meristic characters completely overlap (see Motomura & Sabaj, 2002: table 3). However, in addition to the shape of the vomerine patch, *P. bidentatus* differs from the latter two subspecies in having teeth on the vomer (vs. teeth absent from the vomer in the latter two subspecies), longer snout length (6.8% SL vs. 5.2–6.0% SL, mean 5.8% SL in *P. m. melanochir*), first pelvic-fin soft ray length (17.2% SL vs. 13.5–16.9% SL, mean 15.9% SL in *P. m. melanochir*), and upper caudal-fin lobe length (38.1% SL vs. 34.0–35.3% SL, mean 34.8% SL in *P. m. dulcis*), shorter third anal-fin soft ray length (15.8% SL vs. 17.1–19.5% SL, mean 18.3% SL in *P. m. dulcis*), and smaller orbit diameter (2.2% SL vs. 3.2–3.6% SL, mean 3.3% SL in *P. m. dulcis*). Data for *P. m. dulcis* and *P. m. melanochir* are based on 3 specimens (including holotype and two paratypes) and 40 specimens (including neotype), respectively (listed in Motomura & Sabaj, 2002).

#### **Comments on species of *Polynemus* in Mekong River basin.**

– In his review of Cambodian Mekong fishes, Rainboth (1996: 187–188) wrote that five species of *Polynemus* were found in the lower Mekong River and estuary, and described four of them, i.e. *P. borneensis* Bleeker, *P. dubius*, *P. longipectoralis* Weber & de Beaufort, and *P. multifilis*, with colour photographs of *P. borneensis* (Pl. 24 Fig. 190) and *P. longipectoralis* (Pl. 24 Fig. 191). *Polynemus borneensis*, previously regarded as valid species (e.g. Weber & de Beaufort, 1922; Kottelat et al., 1993), has recently been synonymized with *P. melanochir melanochir* by Motomura & Sabaj (2002). Rainboth's (1996) *P. borneensis* could also be identified as *P. m. melanochir*, judging from the colour photograph of the species which had a black pectoral-fin filaments and short snout. Clarification of its identity can only be further ascertained when the specimens are re-examined.

Rainboth (1996) regarded *P. dubius* and *P. longipectoralis* both as valid species, and distinguished between the two nominal species by the number of lateral-line scales (65–67 in *P. dubius* vs. 80–85 in *P. longipectoralis*). However, his *P. longipectoralis* was in fact *P. aquilonaris*, judging by his photograph of the species and the number of lateral-line scales (see Motomura, 2003). *Polynemus longipectoralis*, reported by Kottelat (2001: 150–151, Fig. 429) from the Mekong River below the Khone waterfalls, Laos, is re-identified as *P. aquilonaris*, based on examination of the voucher specimen (NRM 24267, 103.9 mm SL; Motomura, 2003). Motomura

(2003) regarded *P. longipectoralis* as a junior synonym of *P. dubius* which is distributed in Malay Peninsula, Sumatra, and Kalimantan (not occurring in the Mekong River basin).

Although Rainboth (1996) wrote that *P. multifilis* occurs in the Mekong delta and probably also in Cambodia, Motomura & van Oijen (2003) disagreed with his opinion on the basis of examination of numerous museum specimens of *Polynemus* from the Mekong River basin and reliable literature reports of the genus from the area. Furthermore, although we have made many surveys of Cambodian ichthyofauna from 2001, no specimens of *P. multifilis* has been collected or observed from the area. Thus, we believe that *P. multifilis* does not occur in the Mekong River basin. Kottelat (1989: 18) correctly indicated that *P. multifilis* occurs in the Chao Phraya River basin but does not occur in the Mekong River basin.

Kottelat (1985: 273) listed *P. paradiseus* from the Tonle Sap River, Cambodia and Kottelat (1989: 18) also listed it from the Mekong River basin. However, *P. paradiseus* is an Indian Ocean species that rarely occurs inshore in the Gulf of Thailand (Motomura et al., 2002b). Kottelat's (1985, 1989) records of *P. paradiseus* are most probably *P. aquilonaris* which is similar to the former in overall appearance and is abundant in the Lake Tonle Sap and Tonle Sap River throughout the year (Motomura, pers. obs.). In conclusion, the following four species and subspecies of *Polynemus* are confirmed to occur in the Mekong River basin on the basis of collected specimens: *P. aquilonaris*, *P. bidentatus*, *P. melanochir dulcis*, and *P. m. melanochir*. A key to all species of *Polynemus* (except for the present new species, *P. bidentatus*) was published in Motomura (2004b: 79–80).

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