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journal or publication title	Ichthyological research
volume	48
number	4
page range	337-354
URL	<a href="http://hdl.handle.net/10232/21808">http://hdl.handle.net/10232/21808</a>

# Review of *Polydactylus* species (Perciformes: Polynemidae) characterized by a large black anterior lateral line spot, with descriptions of two new species

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Received: February 5, 2001 / Revised: April 29, 2001 / Accepted: May 1, 2001

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## Ichthyological Research

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Ichthyol Res (2001) 48: 337–354

**Abstract** Nominal *Polydactylus* species characterized by a large black spot anteriorly on the lateral line, *P. microstomus* (Bleeker), *P. sextarius mullani* (Hora), *P. sextarius sextarius* (Bloch and Schneider), and *P. zophomus* Jordan and McGregor, are reviewed. *Polydactylus zophomus*, with 5 pectoral filaments, is synonymized under *P. microstomus*, and *P. sextarius mullani*, with 7 pectoral filaments, is elevated to species level (as *P. mullani*). *Polydactylus microstomus* and *P. mullani* together with *P. sextarius* (characterized by 6 pectoral filaments) are considered as valid species and redescribed accordingly. Two new species, *P. malagasyensis* and *P. persicus*, each with 6 pectoral filaments, collected from the east coast of Africa, including Madagascar and the Persian Gulf, are also described. *Polydactylus sextarius* and the 2 new species are characterized by 6 pectoral filaments. However, *P. sextarius* is distinguished from the latter by having lower gill raker counts (mode 28 vs. 31 in the latter) and an atrophied swimbladder (vs. well-developed). *Polydactylus malagasyensis* differs from *P. persicus* in having higher pectoral fin ray counts (14 vs. mode 12 in the latter), the palatines inwardly turned anteriorly (vs. straight), and a longer pectoral fin (mean 24% of standard length vs. 19%).

**Key words** *Polydactylus malagasyensis* sp. nov. · *Polydactylus microstomus* · *Polydactylus mullani* · *Polydactylus persicus* sp. nov. · *Polydactylus sextarius*

Although the body of *Polydactylus* species is generally tinged with silvery or golden coloration (Motomura and Iwatsuki, 2001), sometimes with several dark stripes along the longitudinal scale rows above and below the lateral line (Motomura et al., 2001a,c), 4 nominal species, *P. microstomus* (Bleeker, 1851), *P. sextarius mullani* (Hora, 1926), *P. sextarius sextarius* (Bloch and Schneider, 1801), and *P. zophomus* Jordan and McGregor in Jordan and Seale, 1907, have a large black spot anteriorly on the lateral line. These species are further characterized by having all the pectoral fin rays branched except the uppermost 1 or 2 and the vomer without teeth.

Apart from numerous brief treatments in general classifications and regional faunal studies, *Polydactylus* species with a large black lateral line spot have at no time been reviewed on the basis of type and non-type materials representing wide distributional ranges. Thus, considerable taxonomic confusion has resulted. Accordingly, the present review of the group has been made on an Indo-West Pacific basis.

*Polydactylus microstomus*, originally described from Bulukumba, Sulawesi, Indonesia, has been recognized as a valid species characterized by 5 pectoral filaments (Weber and de Beaufort, 1922; Menon and Babu Rao, 1984). *Polydactylus zophomus*, originally described from Cavite, Luzon Island, Philippines, has also been frequently regarded as a valid species (Jordan and Richardson, 1908; Seale, 1910), although type specimens of the latter have apparently never been compared directly with those of the former. During the present study, examination of the holotypes of *P. zophomus* and *P. microstomus*, and paratype of the former showed that they represented a single species. Accordingly, *P. zophomus* is herein regarded as a junior synonym of *P. microstomus*.

The subspecies, *P. sextarius mullani*, originally described from Mumbai (= Bombay), India, has often been misidentified as *Polynemus* (or *Polydactylus*) *heptadactylus* Cuvier in Cuvier and Valenciennes, 1829 (now recognized as *Filimanus heptadactyla*) by subsequent researchers (Kagwade, 1970; Talwar and Kacker, 1984). However, the subspecies, characterized by 7 pectoral fila-

ments, is herein regarded as valid and raised to full specific status because it is easily distinguished from other congeners, including *P. sextarius sextarius*, by the number of pectoral filaments and gill rakers and by swimbladder condition.

*Polydactylus sextarius*, originally described from Tranquebar, India, and characterized by 6 pectoral filaments, has been considered to be widely distributed in the Indo-West Pacific (Menon, 1974; Menon and Babu Rao, 1984). However, specimens collected from the east coast of Africa, including Madagascar and the Persian Gulf, previously identified as *P. sextarius*, are here considered to represent 2 undescribed species of *Polydactylus*.

This article includes redescriptions of *P. microstomus* (a senior synonym of *P. zophomus*), *P. mullani*, and *P. sextarius*, and descriptions of 2 new species, on the basis of a large number of specimens, including types, from a wide geographic range in the Indo-West Pacific.

### Methods

Counts and measurements generally followed Hubbs and Lagler (1947) and Feltes (1991), with modifications following Motomura et al. (2000). Standard length and total length are expressed as SL and TL, respectively. Terminology of the supraneural bones follows Mabee (1988), and the formula for configuration of the supraneural bones, anterior neural spines, and anterior dorsal fin pterygiophores follows Ahlstrom et al. (1976). The configuration of the supraneural bones and vertebral counts were confirmed from radiographs. Institutional codes follow Leviton et al. (1985), with additional institutional abbreviations as follows: Division of Fisheries Sciences, Miyazaki University, Japan (MUFS); Phuket Marine Biological Center, Thailand (PMBC); Shanghai Fisheries University, China (SFU).

### Key to the species of *Polydactylus* characterized by a large black anterior lateral line spot

- 1a. Pectoral filaments 5; body and fins tinged with yellowish-silver (India to New Caledonia) ..... *P. microstomus*
- 1b. Pectoral filaments 6 or 7; body and fins tinged with silver ..... 2
- 2a. Pectoral filaments 7; second spine of first dorsal fin more robust than other dorsal fin spines (northern Arabian Sea) ..... *P. mullani*

- 2b. Pectoral filaments 6; all first dorsal fin spines similar ..... 3
- 3a. Gill rakers 25–30 (mode 28); second dorsal fin spine short (mean 6% of SL); swimbladder atrophied (India to New Guinea) ..... *P. sextarius*
- 3b. Gill rakers 29–35 (mode 31); second dorsal fin spine long (mean 7% of SL); swimbladder well-developed ..... 4
- 4a. Pectoral fin rays 14; scales below lateral line 10 (rarely 9); palatines inwardly turned anteriorly; pectoral fin long (mean 24% of SL); pectoral filaments short (mean 29% of SL) (east coast of Africa and Madagascar) ..... *P. malagasyensis* sp. nov.
- 4b. Pectoral fin rays 12–14 (mode 12); scales below lateral line 9 (rarely 8); palatines straight anteriorly; pectoral fin short (mean 19% of SL); pectoral filaments long (mean 32% of SL) (Persian Gulf) ..... *P. persicus* sp. nov.

### *Polydactylus malagasyensis* sp. nov.

(New English name: African blackspot threadfin)  
(Fig. 1)

**Holotype.** AMNH 88029, 125 mm SL, estuary of Mananjary River (ca. 100m from sea), Mananjary, eastern Madagascar (21°05' S, 48°27' E), 30 June 1988, collected by M.L.J. Stiassny and P.N. Reinthal.

**Paratypes.** 35 specimens (59–149 mm SL), all from east coast of Africa and Madagascar. AMNH 231222 (3 specimens), 95–141 mm SL, same data as holotype; AMS I. 28114009 (2), 102–104 mm SL, northwest of Madagascar; ANSP 54807, 59 mm SL, Durban, Natal, South Africa; ANSP 77390, 127 mm SL, Tugela River, Natal, South Africa; ANSP 86372 (2), 94–136 mm SL, Delagoa Bay, Mozambique; CAS 66577 (3), 99–117 mm SL, off Nosy Be, northern Madagascar; CAS 131390 (2), 144–148 mm SL, Natal, South Africa; MUFS 20381, 104 mm SL, same data as holotype; NRM 10479 (3), 135–149 mm SL, Majunga, Madagascar; NRM 10480 (4), 74–87 mm SL, Majunga, Madagascar; USNM 171045, 126 mm SL, Madagascar; USNM 278209, 113 mm SL, Malindi, Kenya; USNM 301505, 125 mm SL, same data as holotype; USNM 307631, 129 mm SL, Pebane, Mozambique; USNM 358684 (3), 124–139 mm SL, Mozambique Channel (16°11' S, 43°53' E); USNM 363484 (3), 63–126 mm SL, northwestern coast of Madagascar (13°24' S, 48°42' E); SAM 34057 (3), 121–134 mm SL, off Mozambique (17°56' S, 37°42' E).

**Diagnosis.** A species of *Polydactylus* with the following combination of characters: 6 pectoral filaments, uppermost not reaching to (or extending slightly beyond) posterior tip of pectoral fin; 14 pectoral fin rays; 46–51 (mode 47) pored lateral line scales; 10 (rarely 9, 1 of 21 specimens) scales below lateral line; 29–34 (31) gill rakers; pectoral fin rays long [mean 24% (range 21–26%) of SL]; pectoral fin base long [12% (10–12%) of SL];



**Fig. 1.** Holotype of *Polydactylus malagasyensis* sp. nov., AMNH 88029, 125 mm SL, estuary of Mananjary River (ca. 100 m from sea), Mananjary, eastern Madagascar

second dorsal fin spine long [7% (7–9%) of SL]; all pectoral fin rays branched, except uppermost 1 or 2; vomer without teeth; palatines inwardly turned anteriorly; swimbladder well-developed; a large black spot anteriorly on lateral line.

**Description.** Counts and proportional measurements as percentages of SL of the holotype and paratypes of *Polydactylus malagasyensis* sp. nov. are given in Table 1. Characters given in the diagnosis are not repeated here. Data for the holotype are presented first, followed by paratype data (if different) in parentheses.

Body oblong, compressed; maxilla covered with scales; posterior margin of preopercle serrated; lower lip well-developed; posterior margin of maxilla extending slightly beyond (same, or reaching) level of posterior margin of adipose eyelid; depth of posterior portion of maxilla less than dermal eye opening; teeth villiform, in broad bands on palatines and ectopterygoids; thickness of base of second spine of first dorsal fin slightly more robust than other first dorsal fin spines (same, or all first dorsal fin spines similar); lateral line simple, extending from upper end of gill opening to upper end of lower caudal fin lobe; formula for configuration of supraneural bones, anterior neural spines and anterior dorsal pterygiophores 0/0/0 + 2/1 + 1/1/1/1/1; vertebrae 10 + 14.

*Color of preserved specimens.*—Head and body brown dorsally, pale yellow ventrally; posterior margins of first and second dorsal fins grayish-black, other parts pale yellow; pelvic fin and pectoral filaments pale yellow; density of pectoral fin pigmentation highly variable; base of anal fin surrounded by scattered melanophores; a large black spot anteriorly on lateral line.

**Distribution and habitat.** *Polydactylus malagasyensis* is currently known only from Kenya, Mozambique,

South Africa, and Madagascar (Fig. 2). The species is likely to be distributed over a wider area, including Tanzania and Somalia, east coast of Africa. The collection data available for the species indicated that specimens had been collected from both estuaries (less than 5.5 m) and offshore (16–62 m).

**Etymology.** The name “*malagasyensis*” is based on Malagasy, the old name for Madagascar, in reference to the holotype locality.

**Remarks.** *Polydactylus malagasyensis* sp. nov., previously identified as *P. sextarius* (Smith, 1986; Menon and Babu Rao, 1984), is herein regarded as representing a new species on the basis of its unique combination of morphological characteristics (see Discussion).

### *Polydactylus microstomus* (Bleeker, 1851)

(English name: small-mouthed threadfin)

(Fig. 3)

*Polynemus microstoma* Bleeker, 1851: 217 (type locality: Bulukumba, Sulawesi, Indonesia).

*Polydactylus zophomus* Jordan and McGregor in Jordan and Seale, 1907: 11, Fig. 4 (type locality: Cavite, Luzon Island, Philippines).

**Holotype.** RMNH 6044, 53 mm SL, Bulukumba, Sulawesi, Indonesia.

**Other material.** 50 specimens (51–158 mm SL), all from eastern Indian and western Pacific Oceans. AMS I. 10471, 158 mm SL, Manila, Luzon Island, Philippines; CAS 120111 (formerly SU 20111, non-type specimen of *P. zophomus* Jordan and McGregor, 1907), 140 mm SL, Cavite Province, Manila Bay, Luzon Island, Philippines; CAS 120113 (formerly SU 20113, holotype of *P. zophomus* Jordan and McGregor, 1907), 138 mm SL, Cavite Province, Manila Bay, Luzon Island, Philippines;

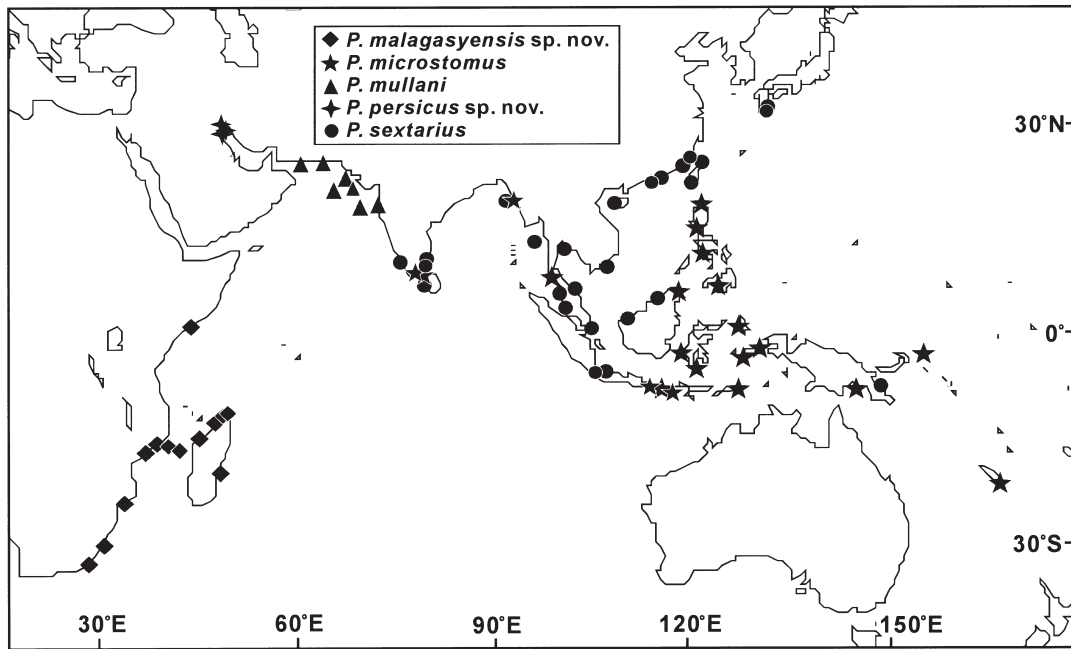


Fig. 2. Distributional records for *Polydactylus* species with a large anterior lateral line spot

CAS 127663 (2 specimens), 80–83 mm SL, Cotabato, Mindanao Island, Philippines; FMNH 40769, 121 mm SL, Iloilo, Panay Island, Philippines; FMNH 47393, 80 mm SL, Manila Bay, Luzon Island, Philippines; FMNH 47411 (2), 79–80 mm SL, Iloilo, Panay Island, Philippines; FMNH 90792 (2), 96–102 mm SL, 12.8 km offshore of Mandapam, Tamil Nadu, India; FMNH 91310, 84 mm SL, 12.8 km offshore of Mandapam, Tamil Nadu, India; FRLM 15773, 91 mm SL, Kuta, Lombok Island, Indonesia; FRLM 23518, 116 mm SL, Passo, Baguala Bay, Ambon, Indonesia; FRLM 23520, 101 mm SL, Passo, Baguala Bay, Ambon, Indonesia; FSKU 20101, 96 mm SL, Nuguria Island, Papua New Guinea; MUFS 14159, 154 mm SL, mouth of Ouenghi River, New Caledonia; MUFS 18543, 78 mm SL, Makassar (=Ujung Pandang), Indonesia; NTM S. 14607-009, 140 mm SL, Pasar Oeba, Kupang, Timor, Indonesia; PMBC uncatalogued, 81 mm SL, Bangrong, eastern Phuket Island, Thailand; RMNH 33552 (8), 76–132 mm SL, Bali, Sumbawa, Sulawesi, Ambon and Seram, Indonesia and New Guinea; USNM 55598 (2 specimens including a paratype of *P. zophomus* Jordan and McGregor, 1907), 137–151 mm SL, Cavite Province, Manila Bay, Luzon Island, Philippines; USNM 113209, 148 mm SL, Manila, Luzon Island, Philippines; USNM 113210 (4), 78–148 mm SL, mouth of Santiago River, Pagapas Bay, Luzon Island, Philippines; USNM 113211, 51 mm SL, Sandakan Bay, Sabah, Malaysia, Kalimantan; USNM 278196, 148 mm SL, Kampung Loleba, Halmahera Island, Indonesia; USNM 278211 (10), 115–131 mm SL, Talemaninar, Gulf of Mannar, Sri Lanka; USNM 300898, 132 mm SL, off Myanmar, northern Bay of Bengal (19°32' N, 92°52' E); ZMH 13649, 128 mm SL, New Guinea; ZMH 13650, 88 mm SL, Manila Bay, Luzon Island, Philippines.

**Diagnosis.** A species of *Polydactylus* with the following combination of characters: 5 (rarely asymmetrically

5 and 6, 1 of 51 specimens) pectoral filaments, uppermost not reaching to (or extending slightly beyond) posterior tip of pectoral fin; 13 or 14 (mode 13; rarely 12 or 15, 2 of 51 specimens) pectoral fin rays; 46–49 (47) pored lateral line scales; 9 or 10 (10; rarely 8, 1 of 36 specimens) scales below lateral line; 24–33 (29) gill rakers; pectoral fin rays short [mean 18% (range 17–20%) of SL]; all pectoral fin rays branched, except uppermost 1 or 2; vomer without teeth; swimbladder well-developed; a large black spot anteriorly on lateral line.

**Description.** Counts and proportional measurements as percentages of SL of the holotype and other specimens of *Polydactylus microstomus* are given in Table 2. Characters given in the diagnosis are not repeated here. Data for the holotype are presented first, followed by other specimen data (if different) in parentheses.

Body oblong, compressed; maxilla covered with scales; posterior margin of preopercle serrated; lower lip well-developed; posterior margin of maxilla reaching to (same, or slightly short of) level of posterior margin of adipose eyelid; depth of posterior portion of maxilla less than dermal eye opening; teeth villiform, in broad bands on palatines and ectopterygoids; palatines inwardly turned anteriorly; thickness of base of all first dorsal fin spines similar (same, or second spine of first dorsal fin slightly more robust than others); lateral line simple, extending from upper end of gill opening to upper end of lower caudal fin lobe; [formula for configuration of supraneural bones, anterior neural spines, and anterior

**Table 1.** Counts and measurements of the holotype and paratypes of *Polydactylus malagasyensis* sp. nov., expressed as percentages of standard length

	Holotype of <i>Polydactylus malagasyensis</i> AMNH 88029	Paratypes of <i>Polydactylus malagasyensis</i> ( <i>n</i> = 35)
Standard length (mm)	125	59–149
Counts		
Dorsal fin rays	VIII-I, 13	VIII-I, 12–13 (usually 13)
Anal fin rays	III, 12	III, 12
Pectoral fin rays	14	14
Pectoral filaments	6	6
Pelvic fin rays	I, 5	I, 5
Pored lateral line scales	47	46–51
Scales above/below lateral line	6/10	5–6/9–10
Gill rakers	13 + 18 = 31	12–16 + 17–19 = 29–34
Measurements		
Head length	34	31–35 (33)
Body depth	35	31–35 (34)
Second body depth	35	32–36 (34)
Body width at pectoral fin base	16	11–17 (14)
Snout length	6	5–7 (6)
Dermal eye opening	8	7–9 (8)
Orbit diameter	9	8–11 (9)
Interorbital width	8	7–10 (8)
Postorbital length	19	18–20 (19)
Upper jaw length	14	13–14 (13)
Pre-1st dorsal fin length	40	36–41 (39)
Pre-2nd dorsal fin length	64	61–65 (64)
Preanal fin length	65	63–68 (66)
First dorsal fin origin to anal fin origin	48	45–48 (46)
Pelvic fin origin to anal fin origin	26	25–31 (27)
Second dorsal fin base length	17	16–19 (17)
Anal fin base length	18	16–19 (18)
Longest pectoral fin length	26	21–26 (24)
Longest pectoral filament length (6th)	28	27–31 (29)
Pectoral fin base length	12	10–12 (12)
Longest pelvic fin ray length (1st)	17	14–19 (17)
Longest 1st dorsal fin spine length (3rd)	24	22–25 (23)
Second dorsal fin spine length	7	7–9 (8)
Longest 2nd dorsal fin ray length (2nd)	22	20–24 (21)
Longest anal fin spine length (3rd)	8	7–11 (9)
Longest anal fin ray length (2nd)	21	18–22 (19)
Caudal peduncle length	21	19–23 (21)
Caudal peduncle depth	15	14–16 (15)
Upper caudal fin lobe length	39	35–40 (39)
Lower caudal fin lobe length	38	34–38 (36)

Means in parentheses include holotype data

dorsal pterygiophores usually 0/0/0 + 2/1 + 1/1/1/1/1/, rarely 0/0/0 + 2/1 + 1/1/1 + 1/1/1/ (1 of 46 specimens confirmed, probably a malformation)]; (vertebrae 10 + 14).

*Color in fresh.*—Based on color transparencies of FRLM 15773, 23518, 23520, and MUFS 14159 (4 specimens, 91–154 mm SL): head and upper sides of trunk tinged yellowish-silver, becoming lighter silver on lower sides; snout semitranslucent; posterior margins of first and second dorsal fins and caudal fin slightly blackish,

remaining parts translucent yellowish-white; pectoral fin membrane yellowish; pectoral filaments faintly white; anterior margins and origins of pelvic and anal fins faintly white, remaining parts yellow; a large black spot anteriorly on lateral line.

*Color of preserved specimens.*—Head and body brown dorsally, pale yellow ventrally; posterior margins of first dorsal fin grayish-black, other parts with scattered melanophores; posteriormost portions of second dorsal, anal, and caudal fins blackish, other parts translucent;



**Fig. 3.** *Polydactylus microstomus* (Bleeker, 1851). **A** Holotype of *Polynemus microstomus* Bleeker, 1851, RMNH 6044, 53 mm SL, Bulukumba, Sulawesi, Indonesia. **B** *Polydactylus microstomus*, MUFS 14159, 154 mm SL, mouth of Ouenghi River, New Caledonia

pelvic fin and pectoral filaments pale yellow; density of pigmentation of pectoral fin highly variable; a large black spot anteriorly on lateral line.

**Distribution and habitat.** *Polydactylus microstomus* is currently known from the Indian Ocean, where it ranges from Tamil Nadu, east of the southernmost tip of India, Sri Lanka, Myanmar, and Phuket Island, Thailand, to the West Pacific where it ranges from Taiwan (Shen, 1984, 1993) to New Caledonia, being relatively common in the eastern part of Indonesia and Philippines (see Fig. 2). However, examples of *P. microstomus* have at no time (apparently) been collected from Australian waters.

The species inhabits turbid coastal waters, estuaries, and mangrove creeks as well as mangrove-lined rivers. Most of the collection data available indicated the specimens were taken from depths of less than 2 m. However,

Schroeder (1980) reported the species in depths of less than 20 m in the Philippines. Furthermore, a specimen (USNM 300898, 132 mm SL) from Myanmar was purportedly collected from a depth of 55 m.

**Remarks.** Bleeker (1851) described *Polynemus microstoma* on the basis of a single specimen, 74 mm TL, but subsequently (Bleeker, 1878) referred to 13 specimens (74–190 mm TL) in his *Trichidion microstoma* (group A, 10 specimens; group B, 1 specimen; group C, 1 specimen; group D, 1 specimen) (Hubrecht, 1879). Nine Bleeker specimens are presently held at RMNH, all registered as RMNH 6044; 53 mm SL (caudal fin broken but ca. 73 mm TL), 76 mm SL (100 mm TL), 77 mm SL (100 mm TL), 79 mm SL (101 mm TL), 81 mm SL (107 mm TL), 89 mm SL (122 mm TL), 91 mm SL (125 mm TL), 106 mm SL (143 mm TL), and 132 mm

**Table 2.** Counts and measurements of the holotype of *Polynemus microstomus*, holotype, paratype, and non-type specimen of *Polydactylus zophomus*, and non-type specimens of *Polydactylus microstomus*, expressed as percentages of standard length

	Holotype of <i>Polynemus</i> <i>microstomus</i> RMNH 6044	Holotype of <i>Polydactylus</i> <i>zophomus</i> CAS 120113	Paratype and non-type specimen of <i>Polydactylus zophomus</i> USNM 55598 ( <i>n</i> = 2)	Non-type specimens of <i>Polydactylus</i> <i>microstomus</i> ( <i>n</i> = 47)
Standard length (mm)	53	138	137–151	51–158
Counts				
Dorsal fin rays	VIII-I, 13	VIII-I, 13	VIII-I, 12–13	VIII-I, 12–14 (usually 13)
Anal fin rays	III, 12	III, 12	III, 12	III, 11–12 (usually 12)
Pectoral fin rays	14	14	13–14	12–15
Pectoral filaments	5	5	5	5
Pelvic fin rays	I, 5	I, 5	I, 5	I, 5
Pored lateral line scales	—	47	48–49	46–49
Scales above/below lateral line	—/—	—/—	—/9	6–7/8–10
Gill rakers	12 + 16 = 28	13 + 16 = 29	12–13 + 16–18 = 28–31	10–14 + 13–18 = 24–33
Measurements				
Head length	31	34	33–34	29–36 (33)
Body depth	27	30	29–32	26–36 (32)
Second body depth	28	32	30–32	30–37 (34)
Body width at pectoral fin base	8	17	15–17	11–15 (13)
Snout length	—	6	6	5–7 (6)
Dermal eye opening	—	8	8–9	7–10 (8)
Orbit diameter	—	10	9	8–11 (10)
Interorbital width	—	9	9	8–10 (9)
Postorbital length	18	19	19–20	17–22 (19)
Upper jaw length	—	13	13–14	12–14 (13)
Pre-1st dorsal fin length	35	39	37–39	35–41 (39)
Pre-2nd dorsal fin length	61	64	62–63	59–67 (64)
Preanal fin length	64	68	67–68	62–71 (68)
First dorsal fin origin to anal fin origin	40	46	45–46	45–51 (47)
Pelvic fin origin to anal fin origin	29	29	29	25–32 (30)
Second dorsal fin base length	16	18	15–17	15–18 (17)
Anal fin base length	15	17	17	14–19 (17)
Longest pectoral fin length	—	20	19–20	17–20 (18)
Longest pectoral filament length (5th)	—	27	26–28	21–30 (26)
Pectoral fin base length	10	11	11	10–12 (11)
Longest pelvic fin ray length (1st)	—	19	19	16–20 (18)
Longest 1st dorsal fin spine length (3rd)	21	25	23–24	21–26 (24)
Second dorsal fin spine length	—	7	8	6–10 (8)
Longest 2nd dorsal fin ray length (2nd)	17	22	21–22	17–24 (21)
Longest anal fin spine length (3rd)	10	8	8	7–11 (9)
Longest anal fin ray length (2nd)	16	20	18–19	16–21 (19)
Caudal peduncle length	25	20	20–21	18–22 (21)
Caudal peduncle depth	11	13	13–14	13–15 (14)
Upper caudal fin lobe length	—	33	36–37	31–41 (36)
Lower caudal fin lobe length	—	—	29–36	31–39 (35)

Means in parentheses include data from type specimens

SL (178 mm TL). Although the caudal fin was broken in the smallest specimen, the total length of the latter was estimated from the measurements of 30 undamaged specimens (76–154 mm SL) of *Polydactylus microstomus* examined during this study, the total length being 1.37 times as long as standard length. The estimated total

length (ca. 73 mm TL) of the smallest specimen of RMNH 6044 is closest to that (74 mm TL) given by Bleeker. Accordingly, we recognized this specimen as the holotype of *Polynemus microstoma*, the remaining 8 being reregistered (RMNH 33552) as nontype Bleeker specimens.



*Polydactylus zophomus* was described as a new species, on the basis of 2 specimens, by Jordan and McGregor (*in* Jordan and Seale, 1907). Although the authors referred to 4 examples of the species, they clearly indicated a "Type" (=holotype) and "Co-type" (single specimen only), being registered as USNM 55598 and SU 20113, respectively. The 2 remaining specimens, therefore, cannot be considered as having any type status.

Notwithstanding, Böhlke (1953) listed a holotype and 2 paratypes, being registered as USNM 55598 (1 specimen), SU 20111 (1 specimen), and SU 20113 (1 specimen), respectively, in the type catalogue of the Natural History Museum, Stanford. However, in actual fact USNM 55598 and CAS 12011 (formerly SU 20111) each included 2 specimens. Examination of these specimens during the present study showed 3 of them to be *P. zophomus*, whereas the fourth (included in CAS 120111) was a sciaenid fish, *Dendrophysa russelli* (Cuvier, 1830), characterized by a single tapering mental barbel on the lower jaw, uniform teeth on the lower jaw, and a strong second anal fin spine (14.3% of SL) (Trewavas, 1977; K. Sasaki, personal communication). The sciaenid specimen has been reregistered as CAS-SU 69833 and is considered as having no type status and no relevance to the description of *P. zophomus*.

Of the remaining specimens, therefore, CAS 120113 (1 specimen) is the only unequivocal type specimen of *P. zophomus*, being the most likely holotype. Although the figure of the "Type" in the original description did not indicate the size of the specimen, CAS 120113 was found to have a label with the inscription "drawn," attached to the abdomen on the right side. Therefore, we believe that this specimen is the true holotype of the species, despite the (presumably erroneous) reference to USNM 55598 as "Type" in the original description.

Regarding the remaining specimens, CAS 120111 clearly has no type status, there being no labels or registration evidence suggesting otherwise. On the other hand, the 2 specimens included in USNM 55598 constitute a single paratype and another non-type specimen. In the absence of any documented evidence enabling identification of the paratype, which of the two specimens is in fact the latter must for the meantime remain unresolved.

The holotype, paratype, and 2 non-type specimens of *P. zophomus* were all found to be conspecific, being the same species as the specimens considered here as *P. microstomus*. Their meristic and morphological characters are included in Table 2.

Günther (1860) described 2 specimens with 5 pectoral filaments and a black blotch on the lateral line near its origin as *Polynemus plebejus*, but the specimens were clearly *Polydactylus microstomus*. Incidentally, the spe-

cies name, *microstoma*, given by Bleeker (1851), is changed to *microstomus* in accordance with the masculine gender of the genus name.

### *Polydactylus mullani* (Hora, 1926)

(New English name: Arabian blackspot threadfin)

(Fig. 4)

*Polynemus sextarius mullani* Hora, 1926: 453 (type locality: Mumbai [=Bombay], India).

**Holotype.** ZSI-F 10747, 157 mm SL, Mumbai, Maharashtra, India.

**Paratypes.** 3 specimens (92–106 mm SL). ZSI-F 10748–10750 (3 specimens), 92–106 mm SL, same data as holotype.

**Other material.** 41 specimens (42–188 mm SL), all from the northern Arabian Sea. ANSP 77129 (2), 52–82 mm SL, off Mumbai, Maharashtra, India; ANSP 77527 (4), 49–94 mm SL, off Mumbai, Maharashtra, India; ANSP 105539, 151 mm SL, Mumbai, Maharashtra, India; MUFS 19110–19113, 19127, 19534, 19550 (7), 116–188 mm SL, Mumbai, Maharashtra, India; USNM 278229 (2), 105–125 mm SL, off Gavater, Pakistan (24°54' N, 61°54' E); USNM 357760 (3), 42–172 mm SL, off Gulf of Kutch, Gujarat, India (22°45' N, 68°24' E); USNM 358687 (2 of 22), 132–175 mm SL, off Kathiawar Peninsula, Gujarat, India (20°10' N, 65°50' E); USNM 358688 (16), 123–148 mm SL, Pakistan (24°54' N, 63°52' E); USNM 358690 (4), 42–117 mm SL, off Kathiawar Peninsula, Gujarat, India.

**Diagnosis.** A species of *Polydactylus* with the following combination of characters: 7 (rarely asymmetrically 6 and 7, 1 of 45 specimens) pectoral filaments, uppermost extending well beyond posterior tip of pectoral fin; 13 or 14 (mode 13) pectoral fin rays; 46–50 (48) pored lateral line scales; 9 or 10 (10) scales below lateral line; 31–35 (32) gill rakers; pectoral fin rays moderate [mean 20% (range 19–22%) of SL]; all pectoral fin rays branched, except uppermost 1 or 2; vomer without teeth; swim-bladder well-developed; a large black spot anteriorly on lateral line.

**Description.** Counts and proportional measurements as percentages of SL of the holotype, paratypes, and other specimens of *Polydactylus mullani* are given in Table 3. Characters given in the diagnosis are not repeated here. Data for the holotype are presented first, followed by paratype and other specimen data (if different) in parentheses.

Body oblong, compressed; maxilla covered with scales; posterior margin of preopercle serrated; lower lip well-developed; posterior margin of maxilla reaching to (just reaching in adults; extending well beyond in young) level of posterior margin of adipose eyelid; depth of posterior portion of maxilla less than dermal eye opening; teeth villiform, in broad bands on palatines and ectopterygoids; palatines inwardly turned anteriorly; thickness of base of second spine of first dorsal fin more robust than



**Fig. 4.** *Polydactylus mullani* (Hora, 1926). **A** Holotype of *Polynemus sextarius mullani* Hora, 1926, ZSI-F 10747, 157 mm SL, Mumbai, India. **B** *Polydactylus mullani*, MUFS 19127, 169 mm SL, Mumbai, India

other first dorsal fin spines; lateral line simple, extending from upper end of gill opening to upper end of lower caudal fin lobe; (formula for configuration of supraneural bones, anterior neural spines, and anterior dorsal pterygiophores usually 0/0/0 + 2/1 + 1/1/1/1/1/1); (vertebrae 10 + 14).

*Color in fresh.*—Based on color transparencies of MUFS 19110-19113 (4 specimens, 130–167 mm SL): head and upper sides of trunk tinged darkly silver, becoming lighter silver on lower sides; snout semitranslucent; anterior and posterior margins of first and second dorsal, anal, and caudal fins slightly blackish, other parts gray; pectoral fin membrane gray with scattered melanophores; base of pectoral filaments white, becoming dark posteriorly; anterior margin and lower tip of pelvic fin gray, other parts white; a large black spot anteriorly on lateral line.

*Color of preserved specimens.*—Head and body brown dorsally, silver ventrally; anterior and posterior margins

of first and second dorsal, anal, and caudal fins black, other parts yellowish-white; pectoral fin membrane pale white with scattered melanophores; base of pectoral filaments white, becoming dark posteriorly; lower tip of pelvic fin black, other parts white; a large black spot anteriorly on lateral line.

**Distribution and habitat.** *Polydactylus mullani* is currently known only from the northern Arabian Sea (see Fig. 2), the species being relatively common in that area. The collection data available indicated the specimens as having been taken from depths of 14–115 m.

**Remarks.** *Polynemus sextarius mullani* was originally described as a new subspecies by Hora (1926) on the basis of 4 specimens (holotype and 3 paratypes) (Menon and Yazdani, 1968). Although the 3 paratypes each have a preliminary label, 167, 197, and 210, respectively, attached to the body, 3 collection registration labels (ZSI-F 10748-10750) had simply been assigned to the lot as a whole,

**Table 3.** Counts and measurements of the holotype and paratypes of *Polynemus sextarius mullani* and non-type specimens of *Polydactylus mullani*, expressed as percentages of standard length

	Holotype of <i>Polynemus sextarius mullani</i> ZSI-F 10747	Paratypes of <i>Polynemus sextarius mullani</i> ZSI-F 10748-10750 (n = 3)	Non-type specimens of <i>Polydactylus mullani</i> (n = 41)
Standard length (mm)	157	92–106	42–188
<b>Counts</b>			
Dorsal fin rays	VIII-I, 13	VIII-I, 12–13	VIII-I, 12–13 (usually 13)
Anal fin rays	III, 12	III, 11–12	III, 11–12 (usually 12)
Pectoral fin rays	14	14	13–14
Pectoral filaments	7	6–7	7
Pelvic fin rays	I, 5	I, 5	I, 5
Pored lateral line scales	49	47–48	46–50
Scales above/below lateral line	6/10	6/9–10	5–7/9–10
Gill rakers	16 + 19 = 35	14–15 + 18–20 = 33–34	13–16 + 18–21 = 31–35
<b>Measurements</b>			
Head length	34	33–34	33–37 (35)
Body depth	33	31–34	28–35 (33)
Second body depth	32	30–34	26–35 (32)
Body width at pectoral fin base	13	14–15	12–17 (14)
Snout length	6	6	4–7 (5)
Dermal eye opening	6	8	5–9 (8)
Orbit diameter	9	9	9–11 (10)
Interorbital width	9	9–10	8–10 (9)
Postorbital length	21	17–20	19–22 (21)
Upper jaw length	16	14–15	14–17 (15)
Pre-1st dorsal fin length	40	36–40	37–41 (39)
Pre-2nd dorsal fin length	63	61–64	61–67 (64)
Preanal fin length	70	64–67	65–72 (68)
First dorsal fin origin to anal fin origin	48	43–48	38–50 (46)
Pelvic fin origin to anal fin origin	32	27–29	26–32 (29)
Second dorsal fin base length	17	17–19	15–18 (17)
Anal fin base length	16	16	14–17 (16)
Longest pectoral fin length	21	19–21	19–22 (20)
Longest pectoral filament length (7th)	36	26–32	28–45 (33)
Pectoral fin base length	11	10–11	11–12 (11)
Longest pelvic fin ray length (1st)	18	16–18	16–20 (18)
Longest 1st dorsal fin spine length (3rd)	—	20–25	21–27 (23)
Second dorsal fin spine length	—	8–9	7–12 (8)
Longest 2nd dorsal fin ray length (2nd)	20	17–23	19–25 (22)
Longest anal fin spine length (3rd)	9	8–9	7–13 (9)
Longest anal fin ray length (2nd)	19	17–21	18–24 (20)
Caudal peduncle length	20	21–22	18–25 (21)
Caudal peduncle depth	13	13–14	10–14 (13)
Upper caudal fin lobe length	—	32–40	32–52 (39)
Lower caudal fin lobe length	—	39	32–50 (38)

Means in parentheses include data from type specimens

without allocation to individual specimens. Accordingly, we arbitrarily refer the registration numbers ZSI-F 10748, -10749, and -10750 to specimens 167 (106 mm SL), 197 (97 mm SL), and 210 (92 mm SL), respectively.

*Polydactylus sextarius mullani* is herein raised to specific status (as *P. mullani*), because the species can be easily distinguished from other congeners, including *P. sextarius sextarius*. *Polydactylus mullani* has been fre-

quently misidentified as *Filimanus heptadactyla* (Cuvier in Cuvier and Valenciennes, 1829) (Kagwade, 1970, as *Polynemus heptadactylus*; Talwar and Kacker, 1984, as *Polydactylus heptadactylus*). However, *P. mullani* differs from the latter in having wider teeth bands on the upper and lower jaws (compared with the space separating the teeth bands on opposing premaxilla vs. narrower teeth bands on the upper and lower jaws in the latter), the



**Fig. 5.** Holotype of *Polydactylus persicus* sp. nov., MCZ 60001, 121 mm SL, Kuwait Bay, Kuwait, Persian Gulf

basisphenoid in contact with the prootic (vs. not in contact), lower gill raker counts (31–35 vs. 35–41), and a large black spot present anteriorly on the lateral line (vs. absent; Feltes, 1991; this study, see Comparative material examined). Furthermore, whereas *P. mullani* is currently known only from the northern Arabian Sea in the Indian Ocean, *F. heptadactyla* is distributed in the western Pacific Ocean (Feltes, 1991; this study).

The body appearance of *P. mullani* varies remarkably with overall fish growth, compared with that of the other 4 species with a large black anterior lateral line spot. The uppermost pectoral filament and posterior margin of the maxilla in young specimens (less than ca. 60 mm SL) of *P. mullani* reach (vs. not reaching in adults) the anal fin origin and extend well beyond (vs. just reaching or not reaching) the posterior margin of the adipose eyelid, respectively. Furthermore, the upper and lower caudal fin lobes of young specimens (less than ca. 60 mm SL) of *P. mullani* are extremely long [mean 51% (range 50–52%) of SL and 47% (43–50%) of SL, respectively vs. 38% (32–42%) of SL and 36% (32–39%) of SL, respectively, in adults]. These growth-related features are not found in the other 4 species.

### *Polydactylus persicus* sp. nov.

(New English name: Persian blackspot threadfin)  
(Fig. 5)

**Holotype.** MCZ 60001, 121 mm SL, Kuwait Bay, Kuwait, Persian Gulf (29°30' N, 47°50' E), July 1982, collected by R.G. Arndt.

**Paratypes.** 12 specimens (48–124 mm SL), all from the Persian Gulf. AMS I. 40432-001, 103 mm SL, same data as holotype; BMNH 2000.9.25.1, 93 mm SL, same data as holotype; KU 10528, 112 mm SL, Al Faw, Iraq; MCZ 59251 (5 specimens, including 1, 63 mm SL, cleared and stained), 48–80 mm SL, mouth of Qasr River, Kuwait Bay, Kuwait, Persian Gulf (29°30' N, 48°15' E); MCZ 158350 (2), 92–121 mm SL, same data as holotype; MUFS 20410, 124 mm SL, same data as MCZ 59251; USNM 363075, 96 mm SL, same data as holotype.

**Diagnosis.** A species of *Polydactylus* with the following combination of characters: 6 pectoral filaments, uppermost extending well beyond posterior tip of pectoral fin; 12 or 13 (mode 12; rarely 14, 1 of 12 specimens) pectoral fin rays; 46–49 (48) pored lateral line scales; 9 (rarely 8, 1 of 12 specimens) scales below lateral line; 29–35 (31) gill rakers; pectoral fin rays short [mean 19% (range 18–20%) of SL]; pectoral fin base short [10% (10–11%) of SL]; second dorsal fin spine long [7% (6–9%) of SL]; all pectoral fin rays branched, except uppermost 1 or 2; vomer without teeth; palatines straight anteriorly; swimbladder well-developed; a large black spot anteriorly on lateral line.

**Description.** Counts and proportional measurements as percentages of SL of the holotype and paratypes of *Polydactylus persicus* sp. nov. are given in Table 4. Characters given in the diagnosis are not repeated here.

Body oblong, compressed; maxilla covered with scales; posterior margin of preopercle serrated; lower lip well-developed; posterior margin of maxilla not reaching to level of posterior margin of adipose eyelid; depth of posterior portion of maxilla less than dermal eye opening; teeth villiform, in broad bands on palatines and

**Table 4.** Counts and measurements of the holotype and paratypes of *Polydactylus persicus* sp. nov., expressed as percentages of standard length

	Holotype of <i>Polydactylus persicus</i> MCZ 60001	Paratypes of <i>Polydactylus persicus</i> ( <i>n</i> = 12)
Standard length (mm)	121	48–124
Counts		
Dorsal fin rays	VIII-I, 13	VIII-I, 12–13 (usually 13)
Anal fin rays	III, 12	III, 12
Pectoral fin rays	13	12–13
Pectoral filaments	6	6
Pelvic fin rays	I, 5	I, 5
Pored lateral line scales	48	46–49
Scales above/below lateral line	5/9	5–6/8–9
Gill rakers	15 + 20 = 35	12–16 + 17–20 = 29–35
Measurements		
Head length	31	31–34 (33)
Body depth	33	33–35 (34)
Second body depth	33	32–35 (33)
Body width at pectoral fin base	14	13–15 (14)
Snout length	4	4–5 (5)
Dermal eye opening	8	7–8 (8)
Orbit diameter	9	8–10 (9)
Interorbital width	8	7–9 (8)
Postorbital length	19	18–20 (19)
Upper jaw length	13	13–15 (14)
Pre-1st dorsal fin length	36	35–38 (37)
Pre-2nd dorsal fin length	63	60–64 (62)
Preanal fin length	66	64–68 (67)
First dorsal fin origin to anal fin origin	46	42–48 (46)
Pelvic fin origin to anal fin origin	28	26–28 (27)
Second dorsal fin base length	17	16–19 (17)
Anal fin base length	17	16–18 (17)
Longest pectoral fin length	19	18–20 (19)
Longest pectoral filament length (6th)	29	26–36 (32)
Pectoral fin base length	11	10–11 (10)
Longest pelvic fin ray length (1st)	17	16–18 (17)
Longest 1st dorsal fin spine length (3rd)	22	22–24 (23)
Second dorsal fin spine length	7	6–9 (7)
Longest 2nd dorsal fin ray length (2nd)	18	18–22 (21)
Longest anal fin spine length (3rd)	8	7–9 (8)
Longest anal fin ray length (2nd)	20	16–21 (20)
Caudal peduncle length	21	19–23 (21)
Caudal peduncle depth	14	13–15 (14)
Upper caudal fin lobe length	35	35–40 (38)
Lower caudal fin lobe length	33	34–44 (37)

Means in parentheses include holotype data

ectopterygoids; thickness of base of second spine of first dorsal fin slightly more robust than other first dorsal fin spines; lateral line simple, extending from upper end of gill opening to upper end of lower caudal fin lobe; formula for configuration of supraneural bones, anterior neural spines, and anterior dorsal pterygiophores 0/0/0+2/1+1/1/1/1/1/1; vertebrae 10 + 14.

*Color in fresh.*—Based on color transparencies of a specimen that was not retained and Randall (1995, fig. 607): head and upper sides of trunk with slightly darkish

silver tinge, becoming lighter on lower sides; snout semitranslucent; posterior margin of first and second dorsal fins and caudal fin indistinctly blackish, other parts translucent; pectoral fin membrane white with scattered melanophores; pectoral filaments whitish, becoming blackish on posterior tips; pelvic fin whitish; a large black spot anteriorly on lateral line.

*Color of preserved specimens.*—Head and body brown dorsally, pale yellow ventrally; posterior margins of first dorsal fin grayish-black, other parts translucent; poster-

ior most portions of second dorsal, anal, and caudal fins blackish, other parts translucent; pelvic fin and pectoral filaments pale yellow; density of pectoral fin pigmentation highly variable; a large black spot anteriorly on lateral line.

**Distribution and habitat.** *Polydactylus persicus* sp. nov. is currently known only from the Persian Gulf (see Fig. 2).

**Etymology.** The name “*persicus*” is based on the Persian Gulf in reference to the holotype locality.

**Remarks.** *Polydactylus persicus* sp. nov., previously identified as *P. sextarius* (Kuronuma and Abe, 1972; Randall, 1995), is regarded here as representing a new species on the basis of its unique combination of morphological characteristics (see Discussion).

### *Polydactylus sextarius* (Bloch and Schneider, 1801)

(English name: blackspot threadfin)

(Japanese name: kataguro-agonashi)

(Fig. 6)

*Polynemus sextarius* Bloch and Schneider, 1801: 18, pl. 4 (type locality: Tranquebar, Tamil Nadu, India).

**Holotype.** ZMB 565, 125 mm SL, Tranquebar, Tamil Nadu, India.

**Other material.** 47 specimens (57–168 mm SL), all from eastern Indian and western Pacific Oceans. ANSP 52870, 135 mm SL, Hong Kong, China; ANSP 163038, 89 mm SL, Santu, Fuzhou, China; BMNH 1889.2.1.3072, 73 mm SL, Cochin, Kerala, India; BMNH 1984.1.18.245-246 (2 specimens), 81–82 mm SL, Singapore; CSIRO C. 1002, 157 mm SL, Mambare Bay, Papua New Guinea; FMNH 58981, 120 mm SL, Colombo, Sri Lanka; FMNH 90768 (2), 120–121 mm SL, Rameswaram fish market, Palk Bay, Tamil Nadu, India; FMNH 91309 (2), 125–132 mm SL, Rameswaram fish market, Palk Bay, Tamil Nadu, India; FSKU-P 4095, 115 mm SL, Kuala Kedah fish market, Malaysia; FSKU-P 4108, 111 mm SL, Hong Kong, China; FSKU-P 4125, 57 mm SL, Kalangatu fish market, Serang, Java, Indonesia; MUFS 3390, 93 mm SL, Pinang Island, Malaysia; MUFS 14501, 105 mm SL, Songkhla, Thailand; MUFS 15628-15630 (3), 128–145 mm SL, Oshima, Meitsu, Nango, Miyazaki, Japan; MUFS 16643-16647 (5), 151–168 mm SL, Kushima, Miyazaki, Japan; MUFS 16819-16821 (3), 120–140 mm SL, Shanmugam fish market, Chennai (=Madras), Tamil Nadu, India; MUFS 18287, 123 mm SL, Sarawak, Kalimantan, Malaysia; NTM S. 14784-006 (3), 111–120 mm SL, Gadong, Ikan Pasar, Brunei; SFU 1669, 126 mm SL, Hainan Island, China; SFU 3833-3834 (2), 98–124 mm SL, Hong Kong, China; SFU 3835, 139 mm SL, Guangzhou, China; SFU 3871, 127 mm SL, Dongshan, Fuzhou, China; SFU A006560, 113 mm SL, Dongshan, Fuzhou, China; UMMZ 196223, 124 mm SL, Jakarta, Java, Indonesia; UMMZ 219965, 142 mm SL, mouth of Mekong River, Vietnam; URM-P 12993, 157 mm SL, Samyan market, Thailand; URM-P 33101, 132 mm SL, Taiwan; USNM 358683, 124 mm SL, off Myanmar, northern Andaman Sea; USNM 363486, 121 mm SL, off Myanmar, northern Bay of Bengal

(19°50' N, 92°55' E); YCM-P 6200, 104 mm SL, Taiwan; ZMH 13665, 86 mm SL, Java, Indonesia; ZMH 13666 (2), 67–78 mm SL, China.

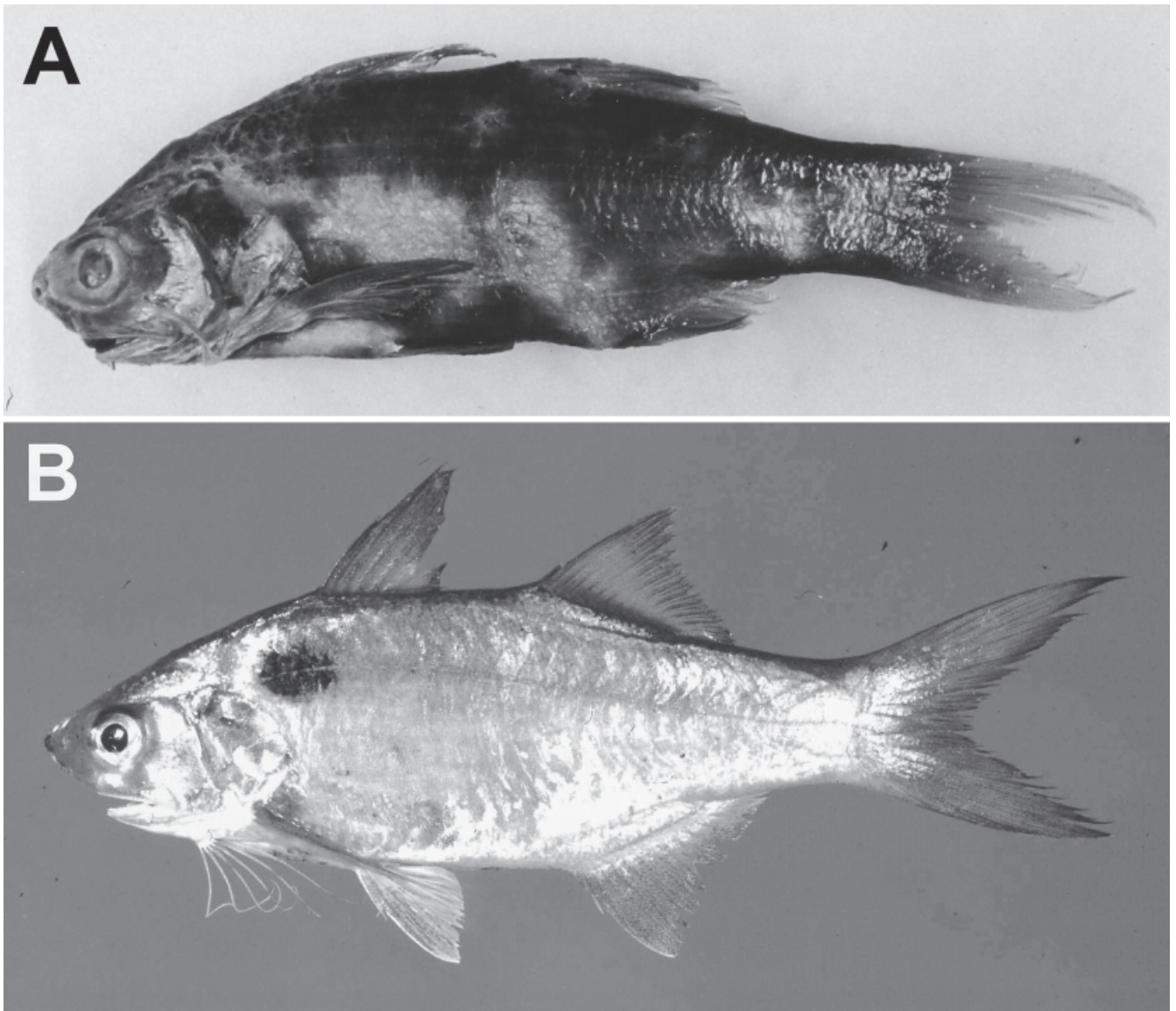
**Diagnosis.** A species of *Polydactylus* with the following combination of characters: 6 pectoral filaments, uppermost not reaching to posterior tip of pectoral fin; 13–15 (mode 14) pectoral fin rays; 45–51 (46) pored lateral line scales; 8–11 (11) scales below lateral line; 25–30 (28) gill rakers; pectoral fin rays moderate [mean 22% (range 19–25%) of SL]; second dorsal fin spine short [6% (5–8%) of SL]; all pectoral fin rays branched, except uppermost 1 or 2; vomer without teeth; swimbladder atrophied, like a fine string; a large black spot anteriorly on lateral line.

**Description.** Counts and proportional measurements as percentages of SL of the holotype and other specimens of *Polydactylus sextarius* are given in Table 5. Characters given in the diagnosis are not repeated here. Data for the holotype are presented first, followed by other specimen data (if different) in parentheses.

Body oblong, compressed; maxilla covered with scales; posterior margin of preopercle serrated; lower lip well-developed; posterior margin of maxilla extending slightly beyond (same, or not reaching) level of posterior margin of adipose eyelid; depth of posterior portion of maxilla less than dermal eye opening; teeth villiform, in broad bands on palatines and ectopterygoids; palatines inwardly turned anteriorly; thickness of base of all first dorsal fin similar; lateral line simple, extending from upper end of gill opening to upper end of lower caudal fin lobe; (formula for configuration of supraneural bones, anterior neural spines, and anterior dorsal pterygiophores 0/0/0+2/1+1/1/1/1/); (vertebrae 10 + 14).

**Color in fresh.**—Based on color transparencies of MUFS 15628–15630, 16643–16647 (8 specimens, 128–168 mm SL): head and upper sides of trunk with slightly darkish silver tinge, becoming lighter on lower sides; snout semitranslucent; posterior margin of first and second dorsal fins and caudal fin slightly blackish, other parts translucent; posterior tip of anal fin whitish, other parts blackish; pectoral fin membrane white with scattered melanophores; pectoral filaments whitish; anterior parts of pelvic fin slightly yellowish-white, other parts whitish; a large black spot anteriorly on lateral line.

**Color of preserved specimens.**—Head and body brown dorsally, pale yellowish-silver ventrally; posterior margins of first dorsal fin black, other parts with scattered melanophores; posterior parts of second dorsal, anal, and caudal fins grayish-black, other parts pale yellow with scattered melanophores; anterior parts of pelvic fin with scattered melanophores, other parts without melanophores; pectoral filaments pale yellow; density of pecto-



**Fig. 6.** *Polydactylus sextarius* (Bloch and Schneider, 1801). **A** Holotype of *Polynemus sextarius* Bloch and Schneider, 1801, ZMB 565, 125 mm SL, Tranquebar, Tamil Nadu, India. **B** *Polydactylus sextarius*, MUFS 16643, 164 mm SL, Kushima, Miyazaki, Japan

ral fin pigmentation highly variable; a large black spot anteriorly on lateral line.

**Distribution and habitat.** *Polydactylus sextarius* is known from the eastern Indian Ocean to western Pacific Ocean where it ranges from southwestern India to Papua New Guinea, and Miyazaki, Kyushu Island, Japan (see Fig. 2). Although Munro (1967) reported a single example (examined herein; CSIRO C. 1002, 157 mm SL) of the species collected from Papua New Guinea, *P. sextarius* is considered to occur rarely west of Huxley's line (sensu Whitmore, 1981), that is, in the Philippines, eastern Indonesia, including the Lesser Sunda Islands, Sulawesi Island, Moluccas, and Irian Jaya, and Papua New Guinea, within the limits of this investigation (see Fig. 2).

The collection data available for the species indicated that specimens had been taken from depths of 16–62 m. Randall (1995) and Motomura et al. (1999) reported specimens taken as deep as 60 m in trawls in the Bay of Bengal and from depths of less than 50 m off Miyazaki, Kyushu Island, southern Japan, respectively.

**Remarks.** Fricke (1999) synonymized *Polynemus sexfilis* Valenciennes in Cuvier and Valenciennes, 1831 and *P. astrolabi* Sauvage, 1881 under *Polydactylus sextarius*. However, *Polydactylus* (= *Polynemus*) *sexfilis* is now recognized as a valid species (Motomura et al., 2001a), and *Polynemus astrolabi* was synonymized with *Galeoides decadactylus* (Bloch, 1795) (Motomura et al., 2001b).

**Table 5.** Counts and measurements of the holotype of *Polynemus sextarius* and non-type specimens of *Polydactylus sextarius*, expressed as percentages of standard length

	Holotype of <i>Polynemus sextarius</i> ZMB 565	Non-type specimens of <i>Polydactylus sextarius</i> (n = 47)
Standard length (mm)	125	57–168
Counts		
Dorsal fin rays	VIII-I, 13	VIII-I, 12–13 (usually 13)
Anal fin rays	III, 12	III, 11–13 (usually 12)
Pectoral fin rays	13	13–15
Pectoral filaments	6	6
Pelvic fin rays	I, 5	I, 5
Pored lateral line scales	45	45–51
Scales above/below lateral line	6/8	5–6/8–11
Gill rakers	11 + 17 = 28	10–14 + 14–18 = 25–30
Measurements		
Head length	30	30–35 (33)
Body depth	33	29–36 (32)
Second body depth	33	31–37 (34)
Body width at pectoral fin base	14	10–16 (14)
Snout length	4	4–7 (6)
Dermal eye opening	8	7–9 (8)
Orbit diameter	9	8–10 (9)
Interorbital width	7	7–10 (8)
Postorbital length	17	17–21 (19)
Upper jaw length	12	12–14 (13)
Pre-1st dorsal fin length	39	36–41 (39)
Pre-2nd dorsal fin length	62	59–66 (63)
Preanal fin length	68	61–68 (64)
First dorsal fin origin to anal fin origin	46	42–49 (45)
Pelvic fin origin to anal fin origin	26	22–29 (26)
Second dorsal fin base length	21	15–21 (18)
Anal fin base length	17	16–23 (18)
Longest pectoral fin length	22	19–25 (22)
Longest pectoral filament length (6th)	24	20–29 (25)
Pectoral fin base length	12	10–13 (12)
Longest pelvic fin ray length (1st)	14	14–18 (17)
Longest 1st dorsal fin spine length (3rd)	22	21–26 (23)
Second dorsal fin spine length	8	5–8 (6)
Longest 2nd dorsal fin ray length (2nd)	19	16–23 (19)
Longest anal fin spine length (3rd)	7	6–9 (8)
Longest anal fin ray length (2nd)	15	15–21 (17)
Caudal peduncle length	18	18–24 (22)
Caudal peduncle depth	18	14–18 (15)
Upper caudal fin lobe length	34	33–41 (36)
Lower caudal fin lobe length	33	31–41 (34)

Means in parentheses include holotype data

## Discussion

Five *Polydactylus* species, *P. malagasyensis* sp. nov., *P. microstomus*, *P. mullani*, *P. persicus* sp. nov., and *P. sextarius*, are characterized by having all pectoral fin rays branched, except the uppermost 1 or 2, the vomer without teeth, and a large black spot anteriorly on the lateral line. Characters of the pectoral fin and coloration of this group are unique among the family Polynemidae. In

addition to the group, only a single species, *P. nigripinnis* Munro, 1964, has the vomer without teeth in the genus (Motomura et al., 2001a).

The above 5 species are similar to each other in overall body appearance (see Figs. 1, 3–6). However, *P. microstomus* and *P. mullani* can be easily distinguished from the other 3 species by the number of pectoral filaments [5 (rarely asymmetrically 5 and 6) and 7 (rarely asymmetrically 6 and 7), respectively, vs. 6 in the latter; Table 6].



**Table 6.** Frequency comparison of the numbers of pectoral fin rays and pectoral filaments in *Polydactylus* species with a large anterior lateral line spot

		Pectoral fin rays				Pectoral filaments				
		12	13	14	15	5 on each side	Asymmetrically 5 and 6	6 on each side	Asymmetrically 6 and 7	7 on each side
<i>P. malagasyensis</i> sp. nov.	<i>n</i> = 36	—	—	36 <sup>a</sup>	—	—	—	36 <sup>a</sup>	—	—
<i>P. microstomus</i>	<i>n</i> = 51	1	30	19 <sup>a</sup>	1	50 <sup>a</sup>	1	—	—	—
<i>P. mullani</i>	<i>n</i> = 45	—	33	12 <sup>a</sup>	—	—	—	—	1	44 <sup>a</sup>
<i>P. persicus</i> sp. nov.	<i>n</i> = 12	7	4 <sup>a</sup>	1	—	—	—	12 <sup>a</sup>	—	—
<i>P. sextarius</i>	<i>n</i> = 45	—	8 <sup>a</sup>	34	3	—	—	45 <sup>a</sup>	—	—

<sup>a</sup>Includes holotype**Table 7.** Frequency comparison of the numbers of gill rakers in *Polydactylus* species with a large anterior lateral line spot

		Gill rakers											
		24	25	26	27	28	29	30	31	32	33	34	35
<i>P. malagasyensis</i> sp. nov.	<i>n</i> = 35	—	—	—	—	—	1	6	12 <sup>a</sup>	9	6	1	—
<i>P. microstomus</i>	<i>n</i> = 51	2	4	6	6	5 <sup>a</sup>	14	9	3	1	1	—	—
<i>P. mullani</i>	<i>n</i> = 44	—	—	—	—	—	—	—	1	15	10	12	6 <sup>a</sup>
<i>P. persicus</i> sp. nov.	<i>n</i> = 12	—	—	—	—	—	2	—	4	3	1	—	2 <sup>a</sup>
<i>P. sextarius</i>	<i>n</i> = 45	—	2	9	13	15 <sup>a</sup>	3	3	—	—	—	—	—

<sup>a</sup>Includes holotype**Table 8.** Frequency comparison of the numbers of pored lateral line scales and scales above and below the lateral line in *Polydactylus* species with a large anterior lateral line spot

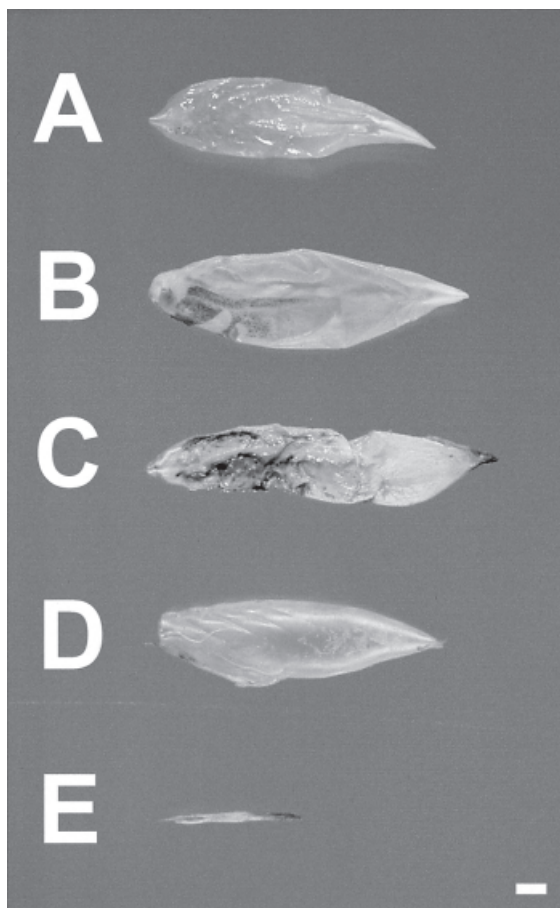
		Pored lateral line scales							Scales above/below lateral line							
		45	46	47	48	49	50	51	5	6	7	/	8	9	10	11
<i>P. malagasyensis</i> sp. nov.	<i>n</i> = 21	—	4	7 <sup>a</sup>	5	3	1	1	<i>n</i> = 21	3	18 <sup>a</sup>	—	—	1	20 <sup>a</sup>	—
<i>P. microstomus</i>	<i>n</i> = 39	—	8	20	8	3	—	—	<i>n</i> = 36	—	34	2	1	16	19	—
<i>P. mullani</i>	<i>n</i> = 30	—	8	8	11	2 <sup>a</sup>	1	—	<i>n</i> = 32	5	25 <sup>a</sup>	2	—	10	22 <sup>a</sup>	—
<i>P. persicus</i> sp. nov.	<i>n</i> = 12	—	3	3	5 <sup>a</sup>	1	—	—	<i>n</i> = 12	4 <sup>a</sup>	8	—	1	11 <sup>a</sup>	—	—
<i>P. sextarius</i>	<i>n</i> = 28	3 <sup>a</sup>	9	7	6	1	1	1	<i>n</i> = 26	9	17 <sup>a</sup>	—	3 <sup>a</sup>	4	8	11

<sup>a</sup>Includes holotype

The remaining 3 species, having 6 pectoral filaments, *P. malagasyensis* sp. nov., *P. persicus* sp. nov., and *P. sextarius*, have to date been considered as conspecific (Menon, 1974; Menon and Babu Rao, 1984). However, *P. sextarius* differs from the other 2 species in having an atrophied, stringlike swimbladder (length ca. 20% of SL vs. well-developed, ca. 40–45% of SL in the latter; Fig. 7) and lower counts of gill rakers [mode 28 (range 25–30) vs. 31 (29–34) in *P. malagasyensis* and 31 (29–35) in *P. persicus*; Table 7]. Furthermore, the second dorsal fin spine length in *P. sextarius* [mean 6% (range 5–8%) of SL; Table 5] is significantly ( $P < 0.01$ ) shorter than

that of the other 2 species [7% (7–9%) of SL in *P. malagasyensis*; Table 1, and 7% (6–9%) of SL in *P. persicus*; Table 4].

*Polydactylus malagasyensis* differs from *P. persicus* in having higher counts of pectoral fin rays [14 vs. mode 12 (range 12–14) in the latter; Table 6] and scales below the lateral line [10 (9–10) vs. 9 (8–9); Table 8], in addition to the palatine being inwardly turned anteriorly (vs. straight; Fig. 8). The posterior tip of the uppermost pectoral filament of *P. malagasyensis* extends slightly beyond or does not reach to the posterior tip of the pectoral fin, whereas that of *P. persicus* extends well beyond the latter,

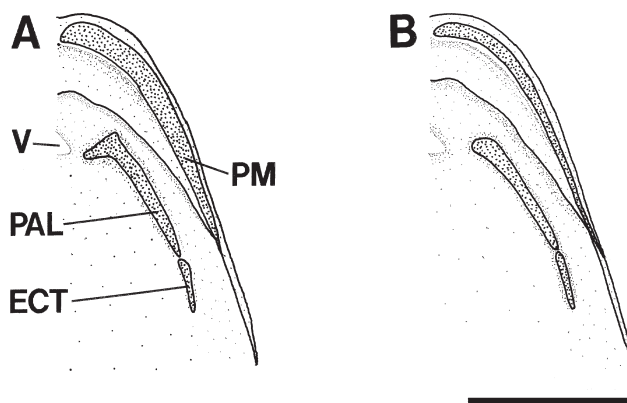


**Fig. 7.** Swimbladders of *Polydactylus* species with a large anterior lateral line spot. **A** *P. malagasyensis* sp. nov., MUFS 20381 (paratype), 104 mm SL; **B** *P. microstomus*, FRLM 23518, 116 mm SL; **C** *P. mullani*, MUFS 19550, 116 mm SL; **D** *P. persicus* sp. nov. (anteriormost tip missing), AMS I. 40432-001 (paratype), 103 mm SL; **E** *P. sextarius*, MUFS 14501, 105 mm SL. Anterior to left in each case. Bar 5 mm

because *P. malagasyensis* has both a longer pectoral fin [mean 24% (range 21–26%) of SL; Table 1 vs. 19% (18–20%) of SL in *P. persicus*; Table 4] and shorter pectoral filaments [29% (27–31%) of SL; Table 1 vs. 32% (26–36%) of SL; Table 4]. Furthermore, the pectoral fin base length, including the pectoral filament base, of *P. malagasyensis* [mean 12% (range 10–12%) of SL; Table 1] is significantly ( $P < 0.01$ ) greater than that of *P. persicus* [10% (10–11%) of SL; Table 4].

**Comparative material examined.** *Filimanus heptadactyla*: FSKU-P 19771 (2 specimens), 89–90 mm SL, Mukah fish market, Sarawak, Malaysia; NTM S. 14784-007 (2), 112–113 mm SL, Gadong Ikan Pasar, Brunei, Kalimantan; UMMZ 213333 (2), 99–106 mm SL, Pasan Ikan fish market, Jakarta, Java, Indonesia; USNM 72741, 52 mm SL, Java, Indonesia.

**Acknowledgments** We greatly appreciate the following persons and institutions for specimen loans: B. Brown and X.



**Fig. 8.** Ventral view of left side of oral cavity. **A** *Polydactylus malagasyensis* sp. nov., SAM 34057 (paratype), 121 mm SL. **B** *P. persicus* sp. nov., MCZ 60001 (holotype), 121 mm SL. ECT, ectopterygoid; PAL, palatine; PM, premaxilla; V, vomer. Bar 5 mm

Freilich (AMNH); M. McGrouther and K. Parkinson (AMS); M. Sabaj, M. Littmann, and D.D. Dagit (ANSP); J. Maclaine (BMNH); M.A. Rogers and K. Swagel (FMNH); S. Kimura (FRLM); H. Ida and M. Okamoto (FSKU-P); K. Rhode and A. Bentley (KU); K.E. Hartel (MCZ); S.O. Kullander (NRM); H.K. Larson, B.C. Russell, G. Dally, and S. Gregg (NTM); U. Satapoomin (PMBC); M.J.P. van Oijen and J. van Egmond (RMNH); L. Hoenson (SAM); H.-L. Wu (SFU); D.W. Nelson (UMMZ); T. Yoshino (URM-P); S.L. Jewett, L. Palmer, S.J. Raredon, and J.T. Williams (USNM); M. Hayashi (YCM); H. Wilkens (ZMH). We are most grateful to H.-J. Paepke (ZMB) for his provision of type data and a photograph of *Polynemus sextarius*, W.N. Eschmeyer, T. Iwamoto, D. Catania, and J. Fong (CAS) and S.L. Jewett, L. Palmer, S.J. Raredon, and S. Smith (USNM) for the loans of the types of *Polydactylus zophomus*, M.J.P. van Oijen and J. van Egmond (RMNH) for opportunities to examine the holotype of *Polynemus microstomus*, A.K. Karmakar (ZSI-F) for opportunities to examine the types of *Polynemus sextarius mullani*, K. Sasaki (BSKU) for identification of *Dendrophysa russelli*, and Y. Fukuyo (Asian Natural Environmental Science Center, the University of Tokyo) for providing color photographs of *Polydactylus persicus*. We thank V. Lheknim and P. Pholpunthin (Faculty of Science, Prince of Songkhla University, Thailand), M.N. Venugopal and A. Chakraborty (Department of Fishery Biology, College of Fisheries, India), B.V. Seshagiri Rao (Department of Zoology, D.N.R. College, India), M.I. Djawad (Faculty of Marine and Fishery Sciences, Hasanuddin University, Indonesia), and A.I. Burhanuddin (MUFS) for their assistance in field work at various times. We thank Y. Motomura (Miyazaki, Japan) for her assistance and G.S. Hardy (Thames, New Zealand), who read the initial manuscript and offered helpful comments. This study was supported in part by a grant awarded to the first author by Research Fellowships of the Japan Society for the Promotion of Science for Young Scientists (Tokyo, Japan).

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