鹿児島大学リポジトリ
Kagoshima University
Repository

"Redescription of a rare threadfin (Perciformes: Polynemidae), Polydactylus macrophthalmus (Bleeker, 1858), with designation of a lectotype and notes on distributional implications"

著者	"MOTOMURA Hiroyuki, VAN OIJEN Martien J. P., ISBRUCKER Isaac J. H."
journal or publication title	Ichthyological research
volume	48
number	3
page range	289-294
URL	http://hdl.handle.net/10232/21807

Redescription of a rare threadfin (Perciformes: Polynemidae), *Polydactylus macrophthalmus* (Bleeker, 1858), with designation of a lectotype and notes on distributional implications

Hiroyuki Motomura[1]✉, Martien J. P. van Oijen[2], Isaäc J. H. Isbrücker[3], and Yukio Iwatsuki[4]

[1] *Miyazaki University, The United Graduate School of Agricultural Sciences, Kagoshima University, 1-1 Gakuen-kibanadai-nishi, Miyazaki 889-2192, Japan (e-mail: a02113u@cc.miyazaki-u.ac.jp)*
[2] *National Museum of Natural History, P.O. Box 9517, 2300 RA Leiden, The Netherlands (e-mail: oijen@naturalis.nnm.nl)*
[3] *Zoölogisch Museum Amsterdam, Universiteit van Amsterdam, P.O. Box 94766, 1090 GT Amsterdam, The Netherlands (e-mail: isbruecker@science.uva.nl)*
[4] *Division of Fisheries Sciences, Faculty of Agriculture, Miyazaki University, 1-1 Gakuen-kibanadai-nishi, Miyazaki 889-2192, Japan (e-mail: yuk@cc.miyazaki-u.ac.jp)*

Received: November 1, 2000 / Revised: March 2, 2001 / Accepted: March 15, 2001

Ichthyological Research

©The Ichthyological Society of Japan 2001

Ichthyol Res (2001) 48: 289–294

Abstract A rare threadfin, *Polydactylus macrophthalmus* (Bleeker, 1858), having long been included in the genus *Polynemus*, is redescribed on the basis of 9 specimens and a lectotype designated. *Polydactylus macrophthalmus* is characterized by the following combination of characters: 7 pectoral filaments, upper 3 filaments extending beyond posterior margin of hypural; 13 or 14 pectoral fin rays; 87–94 pored lateral line scales; 11 scales above lateral line, 15 or 16 below; 10–12 upper series gill rakers, 15 or 16 lower, 26 or 27 total; occipital profile concave in adults; second spine of first dorsal fin very strong; pectoral fin rays long (mean 24% [range 24–26%] of SL). The presently known distribution of the species, including the Kapuas River, Kalimantan, and the Musi and Batanghari Rivers, Sumatra, Indonesia, apparently reflects the ancient Central or North Sunda River during the last period of lowered sea levels, ca. 12 000 years ago.

Key words Polynemidae · Redescription · *Polydactylus macrophthalmus* · Distribution

To date, eight genera of the worldwide family Polynemidae have been recognized, including *Eleutheronema* Bleeker, *Filimanus* Myers, *Galeoides* Günther, *Pentanemus* Günther, *Parapolynemus* Feltes, *Polydactylus* Lacepède, *Polynemus* Linnaeus (Feltes, 1993) and *Leptomelanosoma* Motomura and Iwatsuki, recently proposed for a polynemid fish previously known as *Polydactylus indicus* (Shaw) (Motomura and Iwatsuki, 2001).

The rare threadfin, *Polynemus macrophthalmus* Bleeker, 1858, was originally described on the basis of 2 specimens from Palembang, the Musi River, Sumatra, Indonesia. Although the species had been treated as a member of *Polynemus* since its original description (e.g., Weber and de Beaufort, 1922; Myers, 1936; Kottelat et al., 1993), Feltes (1993) included it in *Polydactylus* (name only), but gave neither reasons nor an indication of materials examined. Nine examples of the species, including all those recorded from museum collections plus a live specimen, clearly exhibited the diagnostic characters of *Polydactylus*, given by Feltes (1993) and Motomura and Iwatsuki (2001); e.g., large eye, pectoral fin base shorter than upper jaw length, the basisphenoid in contact with the prootic and a simple swimbladder.

The species is herein redescribed in detail, including internal characters and photographs, as a member of *Polydactylus*, and a lectotype designated. Distributional implications of the species are also discussed and some habitat notes included.

Methods

Counts and measurements generally follow Hubbs and Lagler (1947) and Feltes (1991), with some modifications following Motomura et al. (2000). Standard length and total length are expressed as SL and TL, respectively. Terminology of the supraneural and epineural bones follows Mabee (1988) and Patterson and Johnson (1995), respectively. The formula for configuration of the supraneural bones, anterior neural spines and anterior dorsal fin pterygiophores follows Ahlstrom et al. (1976).

Fig. 1. Lectotype of *Polynemus macrophthalmus* Bleeker, 1858, RMNH 6015, 129 mm SL, Palembang, Musi River, Sumatra, Indonesia

The osteological characters were confirmed from X-ray photos taken of all specimens. The swimbladder was confirmed from MNHN 1891-571, ZMA 114.431 (215 mm SL, 1 of 3 specimens) and ZMA 114.432, abdomens of these being already dissected. Institutional codes follow Leviton et al. (1985), with an additional institutional abbreviation as follows: Division of Fisheries Sciences, Miyazaki University, Japan (MUFS).

Polydactylus macrophthalmus (Bleeker, 1858)

(English name: river threadfin)
(Figs. 1, 2)

Polynemus macrophthalmus Bleeker, 1858a: 10 (type locality: Palembang, Musi River, Sumatra, Indonesia).
Polynemus borneensis (not of Bleeker): Vaillant, 1893: 109 (Kapuas River, Kalimantan, Indonesia).

Lectotype. RMNH 6015, 129 mm SL, Palembang, Musi River, Sumatra, Indonesia, collected by J. T. van Bloemen Waanders.

Paralectotype. RMNH 33967, 117 mm SL, same data as lectotype.

Other material (*n* = 7, 88–344 mm SL, all from Indonesia). MNHN 1891-571, 344 mm SL, Kapuas River, Kalimantan (identified as *Polynemus borneensis* by Vaillant, 1893); MUFS 18293, 88 mm SL, correct locality unknown, but most likely Kapuas River, Kalimantan (purchased from aquarium fish shop); UMMZ 171714, 184 mm SL, Palembang, Musi River, Sumatra; ZMA 114.431, 3 specimens, 141–221 mm SL, Jambi, Batanghari River, Sumatra; ZMA 114.432, 166 mm SL, Kapuas River, Kalimantan.

Diagnosis. A species of *Polydactylus* with the following combination of characters: 7 pectoral filaments, upper 3 filaments extending beyond caudal fin base; 13 or

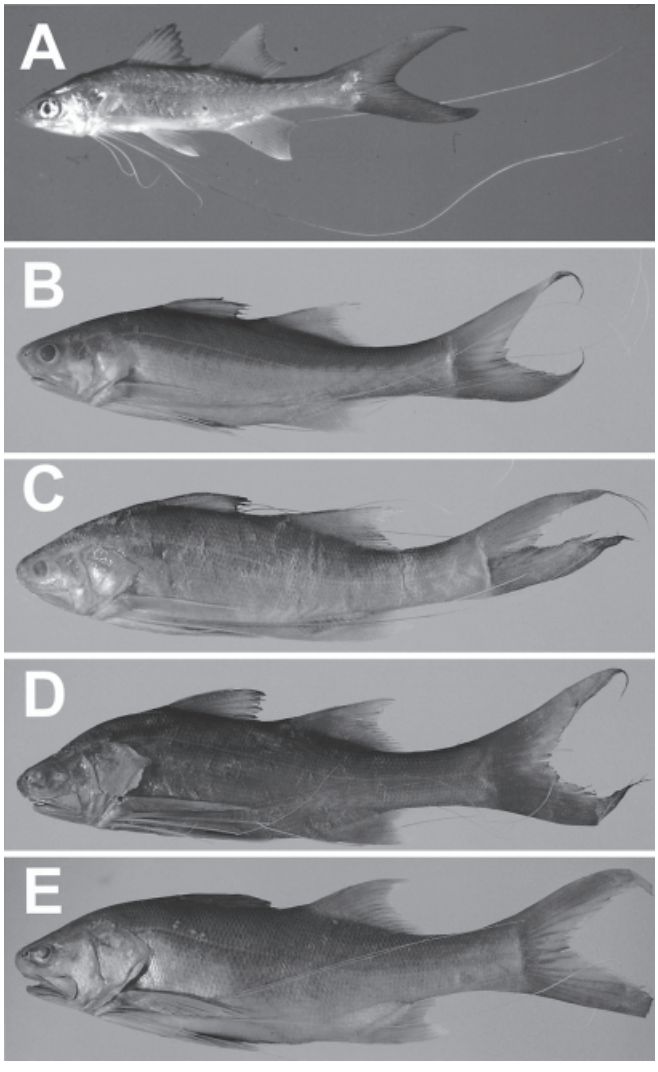

Fig. 2. Life stages of *Polydactylus macrophthalmus*. **A** MUFS 18293, 88 mm SL. **B** ZMA 114.431, 1 of 3 specimens, 141 mm SL. **C** ZMA 114.432, 166 mm SL. **D** UMMZ 171714, 184 mm SL. **E** MNHN 1891-571, 344 mm SL

Table 1. Counts and measurements of *Polydactylus macrophthalmus*, including the lectotype, paralectotype, and non-type specimens

	Lectotype of *Polynemus macrophthalmus* RMNH 6015	Paralectotype of *Polynemus macrophthalmus* RMNH 33967	Non-type specimens of *Polydactylus macrophthalmus* (n = 7)
Standard length (mm)	129	117	88–344
Counts (modes)			
Dorsal fin rays	VIII-I, 14	VIII-I, 14	VIII-I, 13–14 (14)
Anal fin rays	III, 11	III, 11	III, 11
Pectoral fin rays	14	13	13–14 (14)
Pectoral filaments	7	7	7
Pelvic fin rays	I, 5	I, 5	I, 5
Pored lateral line scales	88	88	87–94 (88)
Scales above/below lateral line	11/16	−16	11/15–16 (16)
Gill rakers	11 + 16 = 27	11 + 16 = 27	10–12 (11) + 15–16 (16) = 26–27 (27)
Measurements (means)			
Head length	31	30	29–33 (31)
Body depth	22	22	22–28 (25)
Second body depth	24	24	22–28 (25)
Body width at pectoral fin base	9	9	9–16 (12)
Snout length	5	5	5–7 (5)
Dermal eye opening	6	5	4–6 (5)
Orbit diameter	7	7	5–8 (7)
Interorbital width	6	6	5–6 (6)
Postorbital length	19	19	18–21 (19)
Upper jaw length	14	13	13–15 (14)
Pre-1st dorsal fin length	36	35	34–38 (36)
Pre-2nd dorsal fin length	61	60	60–65 (61)
Preanal fin length	66	63	63–67 (65)
First dorsal fin origin to anal fin origin	41	39	38–45 (41)
Pelvic fin origin to anal fin origin	30	29	26–34 (29)
Second dorsal fin base length	16	16	15–18 (16)
Anal fin base length	13	13	13–14 (13)
Longest pectoral fin length	19[a]	24	24–26 (24)
Longest pectoral filament length (3rd)	Broken	Broken	161–192 (176)
Pectoral fin base	10	10	10–11 (10)
Longest pelvic fin ray length (1st)	15[a]	16[a]	18–20 (19)
Longest 1st dorsal fin spine length (3rd)	19	19	18–21 (19)
Second dorsal fin spine length	9	10	9–10 (10)
Longest 2nd dorsal fin ray length (2nd)	20	19	19–23 (21)
Longest anal fin spine length (3rd)	10	11	9–11 (10)
Longest anal fin ray length (2nd)	17	Broken	19–21 (20)
Caudal peduncle length	27	26	25–27 (26)
Caudal peduncle depth	11	11	9–12 (11)
Upper caudal fin lobe length	36[a]	39	38–46 (42)
Lower caudal fin lobe length	Broken	Broken	36–40 (32)

Data are expressed as percentages of standard length; modes and means in parentheses, including data of type specimens
[a] Slightly damaged at tip

14 pectoral fin rays; 87–94 pored lateral line scales; 11 scales above lateral line, 15 or 16 below; 10–12 upper series gill rakers, 15 or 16 lower, 26 or 27 total; occipital profile concave in adults; second spine of first dorsal fin very strong; pectoral fin rays long (mean 24% [range 24–26%] of SL).

Description. Counts and proportional measurements as percentages of SL of the lectotype, paralectotype and other material of *Polydactylus macrophthalmus* are given in Table 1. Characters given in the diagnosis are not repeated. Data for the lectotype are presented first, followed by other specimen data (if different) in parentheses.

Body oblong, compressed; maxilla covered with scales; orbit diameter greater than snout length; lower lip well-developed; posterior margin of maxilla extending be-

yond level of posterior margin of adipose eyelid; depth of posterior portion of maxilla shorter than dermal eye opening; villiform teeth in broad bands on vomer, palatines and ectopterygoids; all pectoral fin rays unbranched; (third pectoral filament longest, extending beyond posterior tips of caudal fin lobes); (fourth pectoral filament extending slightly beyond anal fin origin); second dorsal fin base longer than anal fin base; distance between pelvic and anal fin origins less than (or approximately equal to) head length; caudal peduncle depth 2.4 (2.1–2.9) in caudal peduncle length; lateral line simple, extending from upper end of gill opening to upper end of lower caudal fin lobe; (swimbladder well-developed); lower tip of seventh proximal pterygiophore of first dorsal fin directed forward; 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; 6 epineurals.

Life color notes.—Based on a color transparency of MUFS 18293, 88 mm SL: upper sides of head and trunk tinged silvery-blue, becoming more silver on lower sides; posterior margins of first dorsal, second dorsal and caudal fins grayish-black, other parts hyaline; tips of pelvic and anal fins white, other parts transparent; pectoral fin hyaline; pectoral filaments white.

Color of preserved specimens.—Head and body light yellow dorsally, pale yellow ventrally (grayish in type specimens); posterior margin of first dorsal, second dorsal and caudal fins grayish-black, other parts pale yellow; pelvic and anal fins and pectoral filaments pale yellow; pectoral fin transparent.

Distribution and habitat. *Polydactylus macrophthalmus* is currently known only from three rivers on two Indonesian islands: Kapuas River, Kalimantan, and Musi and Batanghari Rivers, Sumatra (Fig. 3). These rivers were part of a single large river, the ancient Central or North Sunda River, on the Sundaland during the Pleistocene, the last cold period being about 12 000 years ago (see Morley and Flenley, 1987, Fig. 5.5; Fig. 3, dotted lines). Geographic evidence indicates that the species was well adapted to the freshwater basins in this extensive Pleistocene river, whereas other *Polydactylus* species are generally found in saltwater habitats (e.g., Motomura et al., 2000, 2001a,b). The Sundaland presently being submerged to a depth of ca. 100 m (Morley and Flenley, 1987), *P. macrophthalmus* is now restricted to the three presently known localities in the South China Sea (Fig. 3). According to Roberts (1989), the similar distributions are exhibited by ca. 12 freshwater species (e.g., *Arius melanochir* Bleeker, *Channa melanoptera* Bleeker and *Osteochilus borneensis* Bleeker).

The species has much longer pectoral filaments and a more slender body than other *Polydactylus* species,

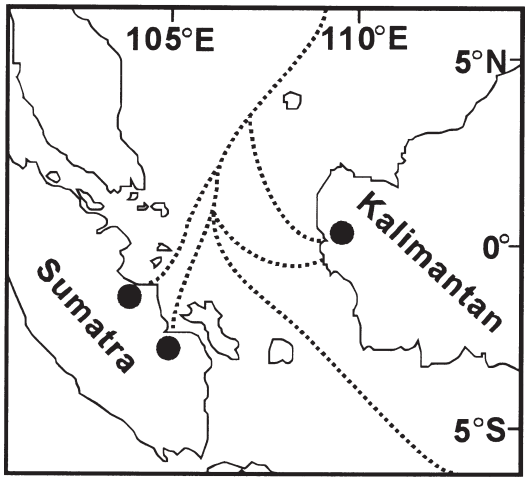

Fig. 3. Distributional records (*dots*) for *Polydactylus macrophthalmus* and outline of the ancient Central or North Sunda River, ca. 12 000 years ago (*dotted lines*)

which generally inhabit marine waters. Such morphological characters have been considered as an adaptation to a freshwater existence, owing to their occurrence in *Polynemus* species restricted to freshwater or estuarine habitats (e.g., Talwar and Jhingran, 1992; Rainboth, 1996). The character of the long pectoral filaments has been considered to be useful as a sense organ to search for food in muddy waters (first author, personal observation, aquarium of Kasetsart University, Thailand). Furthermore, data of specimens examined in this study indicated that they had been collected from Jambi and Palembang, located ca. 75 km up the Batanghari and Musi Rivers, respectively (i.e., completely freshwater basins). Accordingly, *Polydactylus macrophthalmus* is considered to be more heavily dependent on a freshwater habitat than other congeners. Accordingly, because of the marine barriers to further dispersal, the species is believed to have the most restricted distribution in the family.

Remarks. The date of publication of the original description of *Polynemus macrophthalmus* has almost always been treated as 1858–1859 (Weber and de Beaufort, 1922; Roberts, 1989; Eschmeyer, 1998), because the exact publication date was omitted from the reprint and Bleeker (1878: 116) himself subsequently referred to that article as having been published in 1858–1859. Bleeker customarily indicated the time of completion of each manuscript in the concluding sentence at the end and often referred to such dates in subsequent bibliographies. In this case, the date indicated on the reprint by Bleeker was December 1857. In Bleeker's (1878) posthumously published bibliography, his papers were listed in chronological order, 42 papers comprising numbers 175–216,

inclusive, having been published in 1858. The first paper published in 1859, number 217, was written in October 1858. Furthermore, 4 papers (numbers 176–179, inclusive) were cited as having been included in Volume 5 of Acta Societatis Regiae Scientiarum Indo-Néêrlandicae (Bleeker, 1863 [in Bleeker, 1862], 1878). Following Articles 21.3 and 21.6 of the International Code of Zoological Nomenclature (ICZN, 1999), Bleeker's paper number 176, including the original description of *Polynemus macrophthalmus*, is herein considered as having been published in 1858. Moreover, Bleeker (1858b, published in August) already included a full reference to this paper.

Bleeker (1858a) described *Polynemus macrophthalmus* as a new species on the basis of 2 syntypes, 168 and 182 mm TL. Subsequently, Hubrecht (1879) reported 2 examples (group A, 2 specimens) of that species, which were registered as RMNH 6015. Bleeker's (1983) figure of *Polynemus macrophthalmus* (as *Trichidion macrophthalmus*) is here considered to have been based on the larger of the two syntypes, owing to Bleeker's habit of reproducing figures at life size in the "Atlas." According to Article 72.5.6 of the International Code of Zoological Nomenclature (ICZN, 1999), we herein designate RMNH 6015 (129 mm SL, 182 mm TL) as the lectotype of *Polynemus macrophthalmus*, the other specimen being a paralectotype (reregistered as RMNH 33967, 117 mm SL, 168 mm TL).

Polydactylus macrophthalmus has long been treated as a member of *Polynemus* since its original description (Weber and de Beaufort, 1922; Myers, 1936; Roberts, 1989; Kottelat et al., 1993). However, examination of the nine specimens available to this study, including the newly-designated lectotype and paralectotype, showed that they differed from *Polynemus* species in having a large eye (orbit diameter greater than snout length vs. less than snout length in *Polynemus*), the pectoral fin insertion well below the midline on the lateral body (vs. near midline), a basisphenoid present (vs. absent) and 24 vertebrae (vs. 25) (Feltes, 1993). Furthermore, the specimens clearly conformed to the following diagnostic characters of *Polydactylus*, given by Feltes (1993) and Motomura and Iwatsuki (2001): tooth plate on vomer simple; width of tooth band on upper and lower jaws wider than space separating tooth bands on opposing premaxilla; basisphenoid in contact with prootic; pectoral fin base including base of pectoral filaments less than upper jaw length; swimbladder simple, not extending beyond anal fin origin. Accordingly, the species is here included in the genus *Polydactylus*.

Comparisons. *Polydactylus macrophthalmus* can be easily distinguished from other congeners by the very long upper 3 pectoral filaments, extending beyond the caudal fin base (vs. not reaching caudal fin base in other congeners). *Polydactylus* species are known to have variously 4–10 pectoral filaments (Feltes, 1993); those with 7 pectoral filaments include only 3 species, viz. *P. macrophthalmus* (Bleeker, 1858), *P. multiradiatus* (Günther, 1860), and *P. sextarius mullani* (Hora, 1925), all from the Indo-Pacific region.

In addition to the difference in pectoral filament length, *Polydactylus macrophthalmus* differs from *P. multiradiatus* in having lower anal fin ray counts (11 vs. 17–18 in the latter; Marshall, 1964), higher pored lateral line scale counts (87–94 vs. 58–59; Marshall, 1964) and a concave occipital profile in adults (vs. nearly straight; this study). Furthermore, *P. macrophthalmus* is clearly distinguished from *P. sextarius mullani* by the higher counts of pored lateral line scales, and scales above and below the lateral line (87–94 and 11/15 or 16, respectively, vs. 46–50 and 6 or 7/9 or 10, respectively, in the latter), lower gill raker counts (26 or 27 vs. 32–35), a concave occipital profile in adults (vs. nearly straight), vomerine tooth present (vs. absent) and a large black spot absent anteriorly on the lateral line (vs. present).

Polydactylus macrophthalmus is similar to *P. macrochir*, endemic to northern Australia and southern New Guinea (Motomura et al., 2000), in having a concave occipital profile in adults (see Motomura et al., 2000, fig. 2C; Fig. 2C–E) and the second spine of the first dorsal fin more robust than other spines of the first dorsal fin (Motomura et al., 2000). However, *P. macrophthalmus* differs from the latter in having higher counts of pectoral filaments (7 vs. 5 in the latter) and pored lateral line scales (87–94 vs. 70–76), and lower gill raker counts (26–27 vs. 32–35) (Motomura et al., 2000).

Comparative material examined. *Polydactylus macrochir* (Günther, 1860): 41 specimens, including the holotype, were examined for comparative purposes. The collection data for 36 of these were given by Motomura et al. (2000), with remaining specimen data as follows: CSIRO 4583-03, 92 mm SL, Poriri Island, Irian Jaya, Indonesia; CSIRO 5245-01, 106 mm SL, mouth of Ajkwa River, Irian Jaya, Indonesia; RMNH 24526, 2 specimens, 147–149 mm SL, Merauke River, Irian Jaya, Indonesia; RMNH 25085, 126 mm SL, Merauke River, Irian Jaya, Indonesia. *Polydactylus multiradiatus* (Günther, 1860): FMNH 63917, 177 mm SL, Brisbane River, Queensland, Australia; FRLM 23414-23417, 4 specimens, 130–144 mm SL, Rumahtiga fish market, Poka, Ambon, Indonesia; FRLM 23471-23474, 4 specimens, 136–141 mm SL, Passo fish market, Ambon, Indonesia. *Polydactylus sextarius mullani* (Hora, 1925): ANSP 77129, 2 specimens, 52–82 mm SL, off Mumbai, India; ANSP 77527, 4 specimens, 49–94 mm SL, off Mumbai, India; ANSP 105539, 151 mm SL, Mumbai, India; USNM 358690, 4 specimens, 42–117 mm SL, off Kathiawar Peninsula, India; ZSI-F 10747 (holotype of *Polynemus sextarius mullani*), 157 mm SL, Mumbai, India; ZSI-F 10748-10750 (3

paratypes of *Polynemus sextarius mullani*), 92–106 mm SL, Mumbai, India.

Acknowledgments We are most grateful to M. Sabaj (ANSP), A. Graham (CSIRO), S. Kimura (FRLM), G. Duhamel, J.-C. Hureau, and P. Pruvost (MNHN), D.W. Nelson (UMMZ), S.L. Jewett, L. Palmer, S.J. Raredon, and J.T. Williams (USNM) and A.K. Karmakar (ZSI-F) for specimen loans and opportunities to examine specimens. We are also grateful to S. Kimura (FRLM), T. Yoshino (URM-P) and Y. Motomura (Miyazaki, Japan) for their assistance. We thank K. Sasaki (BSKU) for kindly providing a reference and T. Onishi (Marine World Uminonakamichi Aquarium, Fukuoka, Japan) for his help with acquisition of a live specimen. Lastly, we thank 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.

Literature Cited

Ahlstrom EH, Butler JL, Sumida BY (1976) Pelagic stromateoid fishes (Pisces, Perciformes) of the eastern Pacific: kinds, distributions, and early life histories and observations on five of these from the northwest Atlantic. Bull Mar Sci 26:285–402

Bleeker P (1858a) Zevende bijdrage tot de kennis der vischfauna van Sumatra. Visschen van Palembang. Acta Soc Sci Indo-Néêrl 5:1–12

Bleeker P (1858b) Ichthyologiae archipelagi Indici prodromus. I. Siluri. De visschen van den Indischen Archipel beschreven en toegelicht. I. Siluri. Acta Scocietatis Regiae Scientiarum Indo-Néêrlandicae, of Verhandelingen der Natuurkundige Vereeniging in Nederlandsch-Indië 4:v–viii, 1–353; Naschrift 354–370

Bleeker P (1862) Atlas ichthyologique des Indes Orientales Néêrlandaises, publié sous les auspices du Gouvernement colonial nérlandais. Tome I. Scaro'des et Labro'des. F. Muller, Amsterdam

Bleeker P (1878) Levensbericht van Pieter Bleeker, door hemzelven. Overgedrukt uit het Jaarboek der Koninklijke Academie ven Wetenschappen 1877:11–159

Bleeker P (1983) Atlas ichthyologique des Indes Orientales Néêrlandaises. Plates for planned tomes 11–14. Smithsonian Institution Press, Washington, DC

Eschmeyer WN (ed) (1998) Catalog of fishes, vol 3. Genera of fishes, species and genera in a classification, literature cited and appendices. California Academy of Sciences, San Francisco

Feltes RM (1991) Revision of the polynemid fish genus *Filimanus*, with the description of two new species. Copeia 1991:302–322

Feltes RM (1993) *Parapolynemus*, a new genus for the polynemid fish previously known as *Polynemus verekeri*. Copeia 1993:207–215

Hubbs CL, Lagler KF (1947) Fishes of the Great Lakes region. Bull Cranbrook Inst Sci (26):i–xi + 1–186

Hubrecht AA (1879) Catalogue des collections formées et laissées par M.-P. Bleeker. De Breuk & Smits, Leiden

ICZN (International Commission on Zoological Nomenclature) (1999) International Code of Zoological Nomenclature, 4th edn. Adopted by the General Assembly of the International Union of Biological Sciences. International Trust for Zoological Nomenclature, London

Kottelat M, Whitten AJ, Kartikasari SN, Wirjoatmodjo S (1993) Freshwater fishes of western Indonesia and Sulawesi. Periplus, Jakarta

Leviton AE, Gibbs RH Jr, Heal E, Dawson CE (1985) Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. Copeia 1985:802–832

Mabee PM (1988) Supraneural and predorsal bones in fishes: development and homologies. Copeia 1988:827–838

Marshall TC (1964) Fishes of the Great Barrier Reef and coastal waters of Queensland. Angus and Robertson, Sydney

Morley RJ, Flenley JR (1987) Late Cainozoic vegetational and environmental changes in the Malay Archipelago. In: Whitmore TC (ed) Biogeographical evolution of the Malay Archipelago. Clarendon Press, Oxford, pp 50–59

Motomura H, Iwatsuki Y (2001) A new genus, *Leptomelanosoma*, for the polynemid fish previously known as *Polydactylus indicus* (Shaw, 1804) and a redescription of the species. Ichthyol Res 48:13–21

Motomura H, Iwatsuki Y, Kimura S, Yoshino T (2000) Redescription of *Polydactylus macrochir* (Günther, 1867), a senior synonym of *P. sheridani* (Macleay, 1884) (Perciformes: Polynemidae). Ichthyol Res 47:327–333

Motomura H, Iwatsuki Y, Kimura S (2001a) Redescription of *Polydactylus sexfilis* (Valenciennes *in* Cuvier and Valenciennes, 1831), a senior synonym of *P. kuru* (Bleeker, 1853) with designation of a lectotype (Perciformes: Polynemidae). Ichthyol Res 48:83–89

Motomura H, Iwatsuki Y, Yoshino T (2001b) A new species, *Polydactylus siamensis*, from Thailand and redescription of *P. plebeius* (Broussonet, 1782) with designation of a neotype (Perciformes: Polynemidae). Ichthyol Res 48:117–126

Myers GS (1936) A new polynemid fish collected in the Sadong River, Sarawak by Dr. William T. Hornaday. J Wash Acad Sci 26:376–382

Patterson C, Johnson GD (1995) The intermuscular bones and ligaments of teleostean fishes. Smithson Contrib Zool 559:1–83

Rainboth WJ (1996) Fishes of the Cambodian Mekong. FAO species identification field guide for fishery purposes. FAO, Rome

Roberts TR (1989) The freshwater fishes of western Borneo (Kalimantan Barat, Indonesia). Mem Calif Acad Sci 14:i–xii + 1–210

Talwar PK, Jhingran AG (1992) Inland fishes of India and adjacent countries, vol 2. Balkema, Rotterdam

Vaillant ML (1893) Contribution a l'étude de la fauna ichthyologique de Bornéo. Nouv Arch Mus Hist Nat 5:1–112

Weber M, de Beaufort LF (1922) The fishes of the Indo-Australian Archipelago, vol 4. Heteromi, Solenichthyes, Synentognathi, Percesoces, Labyrinthici, Microcyprini. Brill, Leiden