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R.P. BARMAN
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RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA OCCASIONAL PAPER

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INTRODUCTION

The polynemid fishes around the world are commonly known as threadfin fishes due to the presence of several free filaments on lower part of pectoral fin. These fishes can easily be distinguished from other fishes owing to its characteristic pectoral fin, which has a normal upper part and the lower part consisting of four to seven free filamentous rays (in Indian waters); two widely separated dorsal fins and a translucent conical snout that projects beyond the ventrally positioned mouth. Until recent review of these fishes around the world (Motomura, 2004), the identity of the members of this family in Indian literature basically revolved around the number of free pectoral filaments. Recent studies (Feltes, 1991; Motomura, 2004) show that the number of free filaments varies within the species itself. Further, unless differences between the genera *Filimanus* and *Polydactylus* are recognized, this will lead to more confusion in the identity of these species. Presence and absence of a black shoulder spot should be considered as species specific diagnostic character (Motomura and Iwatsuki, 2001a), but accepting both the characters in one species (as in Kagwade, 1970) lead to misidentification. Several life history studies made on Indian species remains questionable with regard to the correct species name (Feltes, 1991). Similar is the situation in fisheries sector and so, species specific catch data is not available.

The threadfin fishes occur in tropical and subtropical coastal waters and estuaries. There are also few freshwater species known to exist. They are mostly epibenthic forms found on sandy and muddy bottoms in depths less than 150 meters. These fishes generally feed on small fishes, crustaceans and some even depend on planktons. The pectoral filaments are most possibly helpful as a sense organ in search of food in muddy water. Hermaphrodites among threadfin fishes seem to be common since their sex change from male to female with growth. They probably breed in coastal waters and estuaries, while the Mango-fish of India (*Polynemus paradiseus* Linnaeus) is reported to ascend freshwater reaches of rivers for breeding purposes (David, 1954), *Polydactylus sexfilis* (Valenciennes) is known to occur near reef areas in vicinity of oceanic islands and so, seems to be not dependant on freshwater river inflow for breeding.

An attempt has been made to review the studies of polynemid fishes made in India along with examination of fresh and preserved specimens in order to avoid prevailing confusions, so that future workers will have proper guidance in the field of taxonomy as well as fisheries. Moreover, taxonomic confusions hinder collection of species specific distributional as well as fisheries data. These fishes are considered as most highly esteemed food fishes and mostly contribute to the fisheries of regional importance.

Threadfin fishes contribute nearly 10 million metric tonnes of global fish catch and about 0.5% of marine fish catch of India. For proper management of this edible fish resource correct specific identifications are necessary.

The current study of Polynemid fishes of India was greatly facilitated by significant works documented by Feltes (1991) and Motomura (2004). Specimens present in the collections of Zoological Survey of India were examined for the purpose of preparing this piece of work. This resulted in providing information on 11 species of threadfin fishes from India belonging to 5 genera, while 5 other species recorded earlier from India were found to be erroneous identification.

REVIEW OF INDIAN LITERATURE

Based on the figure and description of the "Mango-fish" of Edwards (1743-1751) from Bengal, Linnaeus (1758) described *Polynemus paradiseus*, the first ever polynemid species from India. *Polynemus sextarius* has been described by Bloch and Schneider (1801) from Tamil Nadu coast. Russell (1803) provided figures of "Maga Jellee" and "Maga Booshee", from Vizagapatnam, based on which *Polynemus tetradactylus* and *Polynemus indicus* were described by Shaw (1804). Hamilton (1822) described 5 species (*i.e.*, *P. teira*, *P. sele*, *P. aureus*, *P. risua* and *P. toposui*) from Gangetic estuaries referable to only three valid species of present day. Cuvier (1829) has described *P. longifilis* from Puduchery and the Ganges River, which has been relegated to synonymy of *P. paradiseus*. The new names suggested by Cuvier (1829) and McClelland (1843) for *P. indicus* Shaw and *P. sele* Hamilton respectively are not valid today. *Polynemus xanthonemus* was described by Valenciennes (1831) from Puduchery (= Pondicherry). In his monumental work Day (1876) reported eight species of threadfin fishes from India under one genus *Polynemus* Linnaeus, *viz.*, *P. paradiseus* Linnaeus, *P. heptadactylus* Cuvier, *P. xanthonemus* Valenciennes, *P. sextarius* Bloch and Schneider, *P. sexfilis* Valenciennes, *P. indicus* Shaw, *P. plebeius* Broussonet and *P. tetradactylus* Shaw.

Weber and de Beaufort (1922) dealt with 16 species under two genera and indicated availability of only 5 species along Indian coast. Hora (1926) recognized a new subspecies *Polynemus sextarius* var. *mullani* from Bombay, which is now considered as a distinct species, endemic to northern Arabian Sea. Rajapandian and Murthy (1966) were first to report *Polynemus microstomus* Bleeker from Indian waters. Hida (1967) gave an account of distribution and biology of 6 Indian species collected from trawling grounds. Kagwade (1970) reviewed "Polynemid fishes of India" and reported upon 9 species, wherein *Polydactylus mullani* was confused with *Filimanus heptadactyla*. Girija Kumari *et al.* (1985) recorded *Polynemus sheridani* Macleay from India, having 19 gill rakers and prolonged caudal fin lobes, which is supposed to be *Leptomelanosoma indicum* (Shaw) (Motomura, 2004). Talwar and Kacker (1984) and Talwar and Jhingran (1991) stated occurrence of *Polynemus dubius* Bleeker (as *Polynemus longipectoralis* Weber and de

Beaufort) from Hooghly estuary. But on re-examination, that was found to be a misidentification and the specimens were confirmed as *Polynemus paradiseus* Linnaeus (Mishra and Barman, 2010). Feltes (1991) examined several specimens from Pakistan, India, Sri Lanka and Thailand to describe *Filimanus similis* and distinguished it from *F. heptadactyla*, a species restricted to east coast of Malay Peninsula and Indonesia to Papua New Guinea. *Polydactylus konadaensis* described by Mishra and Krishnan (1993) from Andhra Pradesh is relegated to the synonymy of *Filimanus xanthonema* (Vanenciennes) (Motomura *et. al.*, 2001). *Filimanus perplexa* Feltes is recorded from Great Nicobar Island (Mishra and Barman, 2009). Report of *Polynemus melanochir* Valenciennes from Andaman and Nicobar Islands (Rao *et al.*, 2000) is based on misidentified *Filimanus perplexa* specimens (Mishra and Barman, 2010).

MATERIAL AND METHODS

All the specimens in the National Zoological Collection, Z.S.I., Kolkata, collections at Regional Centers of ZSI and from recent surveys were examined to study their identity and validity of earlier determinations. Counts and measurements were taken following Feltes (1991) and Motomura (2004). Fin rays were counted by passing light from below. Scales were counted with the help of reflected light. Gill rakers were counted under zoom stereoscopic microscope. Measurements were taken in mm with dial slide-caliper scale having 0.1 mm accuracy. Each species is described on the basis of the materials studied. The length of the specimens given under material examined is referable to standard length (SL). The original citation is followed by the type locality within parentheses. Synonyms were decided either on examination of specimen or on the basis of the descriptions provided by authors where specimens could not be examined. In Material Examined section, the sequence is number of examples, standard length, registration number, locality, date of collection and collector. The key to species provided hereunder is workable for Indian region only.

Family POLYNEMIDAE

Body moderately elongate or oval and compressed to some extent. Eyes covered with thick adipose tissue. Mouth subterminal to ventral in position. Snout conical, overhanging beyond mouth, transluscent. Teeth in villiform bands on jaws, palatines and ectopterygoids and in some species on vomer. Lower lip either absent or poorly developed. Maxilla long, extending beyond posterior border of eye. Posterior margin of preopercle serrated. Dorsal fins two, widely separated. First dorsal fin with 7 or 8 flexible spines. Second dorsal fin with one spine and 13 to 16 soft rays. Anal fin with 2 or 3 spines and 11 to 17 soft rays. Pectoral fin divided into normal upper part with 12 to 19 rays attached by membrane and lower part with 4 to 7 free filamentous unbranched rays of variable length, the longest in some reaching beyond caudal fin tips. Pelvic fins subabdominal, with 1 spine and 5 rays each. Caudal fin deeply forked. Scales small,

weakly ctenoid. Head fully covered with scales. Fins covered with small scales. Lateral line simple and complete, extending up to end of caudal fin. Body colour usually golden yellow to silvery or grey in some. Airbladder present, atrophied or absent. Vertebrae 24.

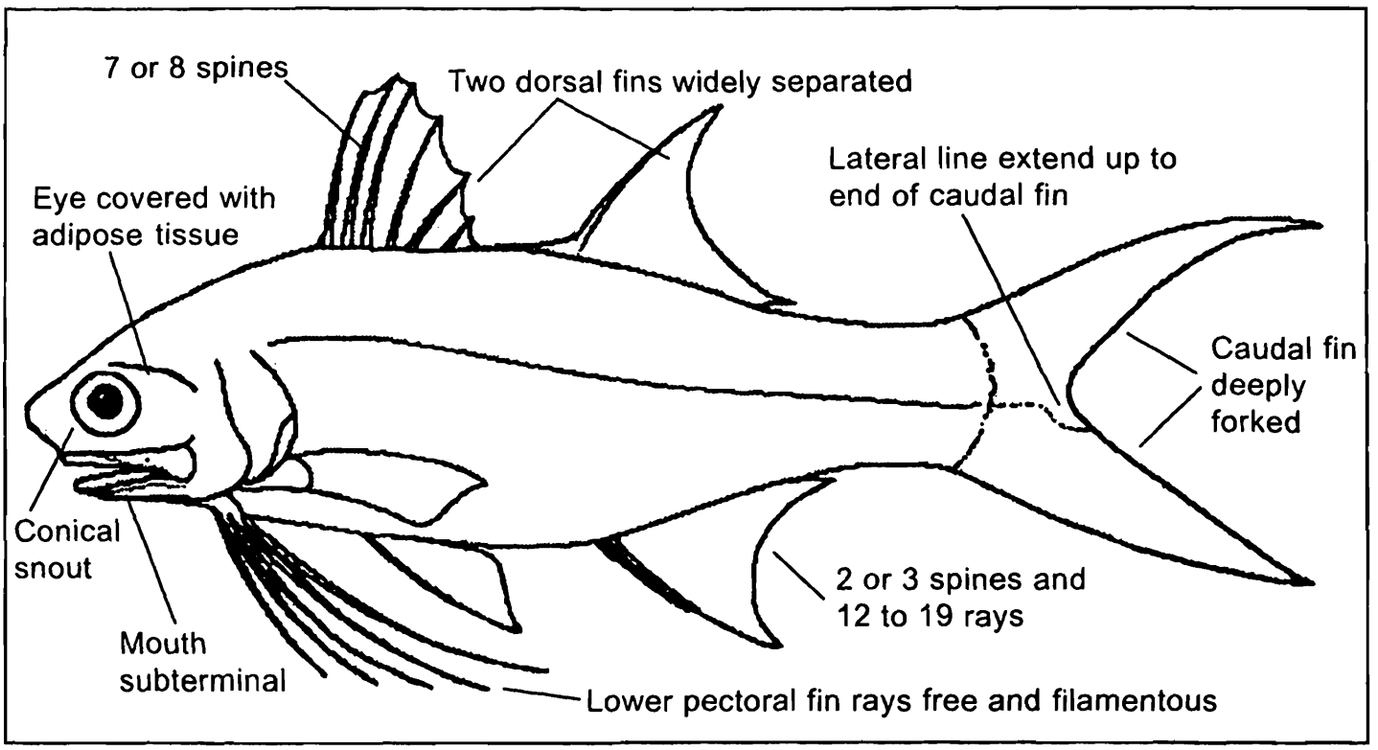

Figure 1 : Schematic diagram of a Polynemid fish

Till date, eight genera and 42 species and subspecies are known to comprise this family around the world (Motomura, 2004; Motomura and Tsukawaki, 2006). The monotypic genus *Galeoides* Gunther and *Pentanemus* Gunther are restricted to West coast of Africa and *Parapolynemus* Feltes is known from southern Papua New Guinea and northern Australia (Motomura, 2004). The present study confirms that in Indian waters, this family is represented by 11 species belonging to five genera, *viz.*, *Eleutheronema* Bleeker, *Filimanus* Myers, *Leptomelanosoma* Motomura and Iwatsuki, *Polydactylus* Lacepede and *Polynemus* Linnaeus.

Reports of *Filimanus heptadactyla* (Cuvier), *Polydactylus macrochir* (Gunther) (as *Polynemus sheridani* Macleay), *Polynemus dubius* Bleeker (as *Polynemus longipectoralis* Weber and de Beaufort) and *Polynemus melanochir* Valenciennes from Indian waters are found to be erroneous and are discussed under related species.

Species occuring in India :

1. *Eleutheronema tetradactylum* (Shaw)
2. *Filimanus perplexa* Feltes

3. *Filimanus similis* Feltes
4. *Filimanus xanthonema* (Valenciennes)
5. *Leptomelanosoma indicum* (Shaw)
6. *Polydactylus microstomus* (Bleeker)
7. *Polydactylus mullani* (Hora)
8. *Polydactylus plebeius* (Broussonet)
9. *Polydactylus sexfilis* (Valenciennes)
10. *Polydactylus sextarius* (Bloch and Schneider)
11. *Polynemus paradiseus* Linnaeus

KEY TO SPECIES

1a. Pectoral fin inserted high, near midline of body; eyes small, diameter 1.3 or more in snout length; free pectoral filaments usually 7 (*Polynemus*) ..... *P. paradiseus*

1b. Pectoral fin inserted low, well below midline or mostly on lower third of body; eyes larger, diameter 1.3 or less in snout length; free pectoral filaments 4 to 7 2

2a. Lip on lower jaw absent except at corner of mouth; small teeth extending onto lateral surface of jaws on anterior part; gill rakers 4 to 18 on first arch; free pectoral filaments 4 (*Eleutheronema*) ..... *E. tetradactylum*

2b. Lip on anterior part of lower jaw more or less developed; almost no teeth on exterior part of lower jaw; gill rakers more than 18 on first arch; free pectoral filaments 5 to 7 3

3a. Eyes small, about 7 times in head length; tips of caudal fin lobes prolonged; airbladder with many appendages; gill rakers 18 to 21 (*Leptomelanosoma*) ..... *L. indicum*

3b. Eyes larger, about 4 to 6 times in head length; tips of caudal fin not prolonged; airbladder, if present, simple, without appendages; gill rakers 24 to 49 4

4a. Premaxillary teeth bands narrow, separated by a wide space of 2 or more times width of each band at symphysis; gill rakers 36 to 49 on first arch (*Filimanus*) 5

4b. Premaxillary teeth bands broad, separated by a narrow space less than 2 times width of each band at symphysis; gill rakers 24 to 35 on first arch (*Polydactylus*) 7

5a. Anal fin with 13 to 15 soft rays; pectoral fin filaments extending beyond anal fin base; free pectoral filaments 7 ..... *F. perplexa*

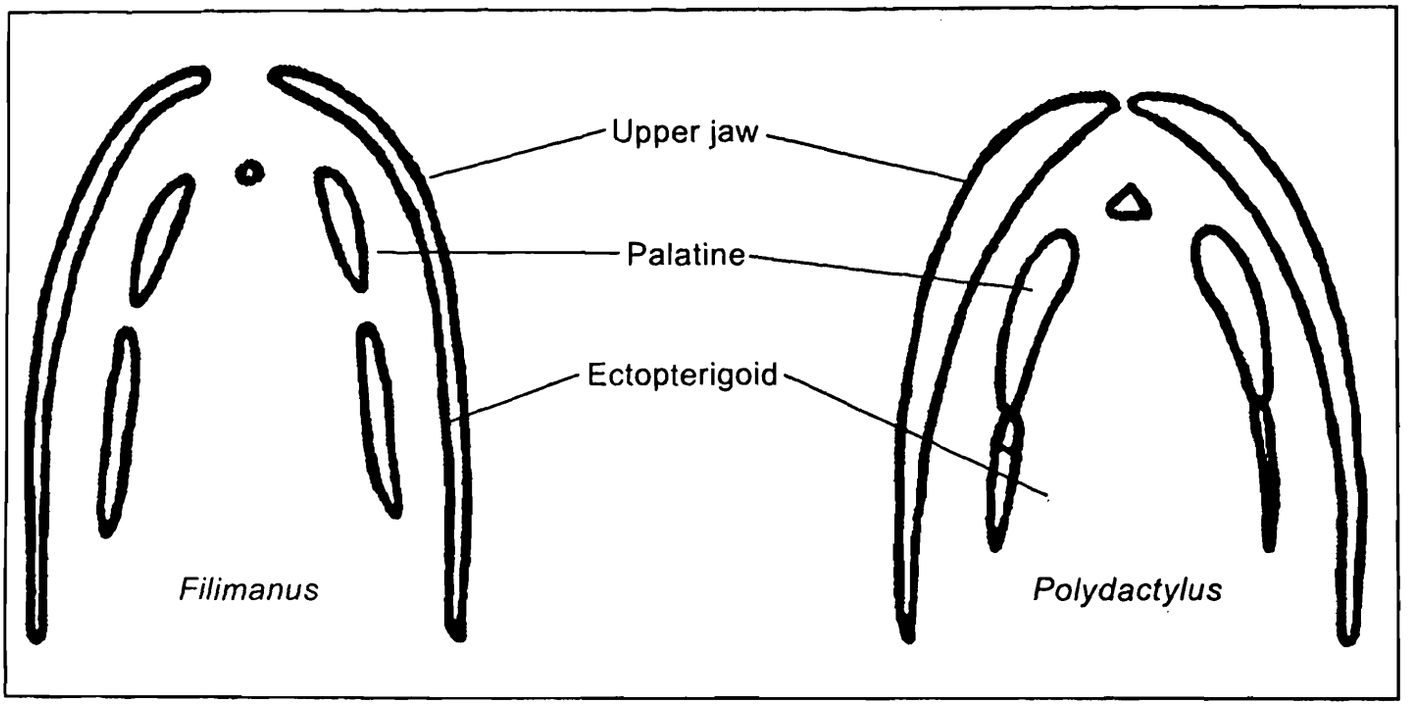

Figure 2 : Tooth bands on upper jaw and roof of mouth

5b. Anal fin with 10 to 12 soft rays; pectoral fin filaments not extending beyond middle of anal fin base; free pectoral filaments 5 to 7 6

6a. Free pectoral filaments 7; gill rakers 40 to 49 (mode 43); eyes large, 3.5 times in head length ..... *F. similis*

6b. Free pectoral filaments usually 6 (rarely 5), or asymmetrically 5 and 6, or 6 and 7; gill rakers 36 to 46 (mode 41); eyes small, 4.5 times in head length ..... *F. xanthonema*

7a. Lateral line scales 60 to 68; no black shoulder spot at beginning of lateral line; teeth on vomer present; upper pectoral fin rays all unbranched 8

7b. Lateral line scales 45 to 51; a black shoulder spot at beginning of lateral line; teeth on vomer absent; upper pectoral fin rays all branched except for upper 1 or 2 9

8a. Free pectoral filaments 5; upper pectoral fin rays 16 to 18; upper caudal fin lobe 2.4 to 3.0 times in standard length ..... *P. plebeius*

8b. Free pectoral filaments 6; upper pectoral fin rays 15 or 16; upper caudal fin lobe 2.1 to 2.5 times in standard length ..... *P. sexfilis*

9a. Eye equal to interorbital width or less; free pectoral filaments 5 ..... *P. microstomus*

9b. Eye larger than interorbital width; free pectoral filaments 6 or 7 10

10a. Total gill rakers on first arch 25 to 30; free pectoral filaments 6, longest filament short of pectoral fin tip; bases of all spines of first dorsal fin of similar thickness ..... *P. sextarius*

10b. Total gill rakers on first arch 31 to 35; free pectoral filaments 7 or asymmetrically 6 and 7, longest filament reaching beyond pectoral fin tip; base of second spine of first dorsal fin more robust than other spines .....*P. mullani*

SYSTEMATIC ACCOUNTS

Genus ***Eleutheronema*** Bleeker, 1862

1862. *Eleutheronema* Bleeker, *Versl. Meded. K. Acad. Wet. Amst.*, 14: 110 (type-species: *Polynemus tetradactylus* Shaw).

Diagnosis : Body slightly compressed, elongate with ventrally placed horizontal mouth. Snout conical, projecting beyond mouth. Eye diameter more than snout length. Lips usually absent, but the lower lip reduced to a small fold at corner of mouth. Teeth villiform, extending on exterior part of jaws. Gill rakers 4 to 18 on first arch. Pectoral fin inserted low on body, upper part of its base well below midline of body. A fold of skin from lower end of pectoral fin base covering bases of one or more pectoral filaments. Free pectoral filaments 3 or 4 in number. Lateral line nearly straight, extending to upper end of lower lobe of caudal fin or bifurcating on caudal fin base. Airbladder absent.

Three species recognized world over; only one known from India.

1. ***Eleutheronema tetradactylum*** (Shaw, 1804)

(Plate I, Figure 1)

1804. *Polynemus tetradactylus* Shaw, *General Zoology*, 5: 155 (Vizagapatnam, India, based on "Maga Jellee" of Russell, 1803: 67, fig. 183); Day, 1876, *Fish. India*, (2): 180; Day, 1889, *Fauna Br. India Fish*, 2: 106.

1822. *Polynemus teira* Hamilton, *Fishes of Ganges*: 224 (estuaries of Ganges River, India).

1922. *Eleutheronema tetradactylum*, Weber and Beaufort, *Fish. Indo-Aust. Archip.*, 4: 199; Kagwade, 1970, *Bull. Cent. Mar. Fish. Res. Inst.*, (18): 28; Talwar and Kacker, 1984, *Com. Sea Fish. India*: 745; Talwar and Jhingran, 1991, *Inland Fishes of India*, 2: 907; Motomura, 2004, *FAO Species Catalogue*, 3: 16.

Common Names : Fourfinger threadfin ... English; Rawas ... Gujarat; Rawas ... Maharastra; Vameenu ... Karnataka; Bameen ... Karala; Pozhakkala, Yerrakala ... Tamil Nadu; Maga ... Andhra Pradesh; Sahal ... Orissa; Guchhia, Sahal ... West Bengal; Tobrodah ... Andamans.

Type : Original type not known. Neotype (NSMT-P 60912, 189 mm) at National Science Museum, Tokyo is from Gariahat, Calcutta, India, designated by Motomura *et al.* (2002).

Material examined : 1 ex., 76 mm, MBS/ZSI F-1910, Cannanore, 01-ii-1989, M. Srinivasan & party; 1 ex., 92 mm, MBS/ZSI F-2163, Digha, 31-x-1992, J.T. Jothinayagam & party; 2 exs., 136-166 mm, MBS/ZSI F-2740 & 2741, Balugaon, 28-xi-1992, M. Srinivasan & party; 1 ex., 169 mm, EBS/ZSI F-970, Cholangi Channel mouth, 19-x-1992, C.A.N. Rao & party; 4 exs., 40-60 mm, EBS/ZSI F-987, Dariyaltippa, 18-x-1992, C.A.N. Rao & party; 5 exs., 51-69 mm, EBS/ZSI F-1038, Coringa, 24-xi-1992, T. Venkateswarlu & party; 2 exs., 63-66 mm, EBS/ZSI F-1056, Mundigattu, 23-xi-1992, T. Venkateswarlu & party; 3 exs., 56-70 mm, EBS/ZSI F-1065, B.V. Palem, 21-xi-1992, T. Venkateswarlu & party; 2 exs., 104-130 mm, EBS/ZSI F-1114, Bhairavapalem, 07-xii-1992, T. Venkateswarlu & party; 1 ex., 135 mm, EBS/ZSI F-1260, Coringa channel, 29-i-1995, C.A.N. Rao & party; 1 ex., 75 mm, EBS/ZSI F-1294, Antervadi, 15-ix-1993, C.A.N. Rao & party; 1 ex., 142 mm, EBS/ZSI F-2308, Pallithummulapalem, 12-x-1996, C.A.N. Rao & party; 1 ex., 115 mm, EBS/ZSI F-2377, Yesupuram, 16-ii-1997, S. Krishnan & party; 1 ex., 55 mm, EBS/ZSI F-2485, Edurumundi, 18-ix-1997, C.A.N. Rao & party; 1 ex., 94 mm, EBS/ZSI F-2503, Kannur bridge, 08-ix-1997, C.A.N. Rao & party; 1 ex., 155 mm, EBS/ZSI F-2643, Nagayalanka, 20-ii-1998, S. Krishnan & party; 1 ex., 173 mm, EBS/ZSI F-3003, Lankavenitippa, 25-ix-1998, C.A.N. Rao & party; 1 ex., 88 mm, EBS/ZSI F-3129, Krishna estuary Light House, 19-ii-1999, C.A.N. Rao & party; 1 ex., 155 mm, EBS/ZSI F-3272, Manganapudi, 08-i-2000, C.A.N.Rao & party; 1 ex., 141 mm, EBS/ZSI F-3368, Palakayatippa, 17-xii-2000, C.A.N. Rao & party; 1 ex., 170 mm, ZSI F-1991/1, Gopkuda Is., Chilka Lake, 7-15-viii-1907, Chilka Survey; 2 exs., 86-111 mm, ZSI F-4964/2, Hooghly R. nr. Barrackpur, Sept. 1954, Hooghly Survey party; 1 ex., 130 mm, ZSI F-6998/2, Goumati R., Yanam, 25-xi-1964, N.V. Subba Rao; 2 exs., 69-120 mm, ZSI F-9255/1 & 9256/1, Barkul, Chilka Lake, 16-ix-1914, Chilka Survey; 4 ex., 93-110 mm, ZSI F-9258-61/1, off mouth of Barkul Bay, 16-ix-1914, Chilka Survey; 1 ex., 68 mm, about 2 miles S.E. of Kaluparaghat, 16-ix-1914, Chilka Survey; 1 ex., 130 mm, ZSI F-8431/1, Balugaon, 31-vi-1913, N. Annandale; 1 ex., 135 mm, ZSI F-8432/1, Balugaon, 07-iv-1914, N. Annandale; 1 ex., 58 mm, ZSI F-9543/1, Chilka Lake, 07-iv-1914, Chilka Survey; 1 ex., 101 mm, ZSI F-4910/2, Balugaon, Chilka Lake, no date, H.C. Ray; 1 ex., 62 mm, ZSI F-5081/2, Hooghly R. nr. Chinsura, Sept. 1954, Hooghly Survey; 2 exs., 91-110 mm, ZSI F-4948/2, Hooghly R. nr. Nawadwipghat, Sept. 1954, Hooghly Survey; 5 exs., 73-210 mm, ZSI F-10671-75/1, Calcutta Bazar, no date, Asiatic Society of Bengal; 1 ex., 155 mm, ZSI F-905/2, 3 miles S. Of Kalidai Is., Lake Chilka, 02-ii-1954, K.S. Misra & M.A.S. Menon; 4 exs., 93-122 mm, ZSI F-4940/2, Hooghly R. nr. Tribeni, Sept. 1954, Hooghly Survey; 14 exs., 55-96 mm, Cat. 159 & 160, Calcutta, no date, Asiatic Society of Bengal; 3 exs., 122-186 mm, ZSI F-896/2, Sonora, Chilka Lake, 23-i-1954, K.S. Misra & M.A.S.

Menon; 1 ex., 132 mm, Chilka Lake, 1955, H.C. Ray; 1 ex., 132 mm, ZSI F-986/2, Chilka **Lake, 22-i-1954,** K.S. Misra; 2 exs., 135-140 mm, ZSI F-926/2, Chilka Lake, 04-ii-1954, **K.S. Misra;** 3 exs., 130-190 mm, ZSI F-899/2, Parikud, Chilka Lake, 20-i-1954, K.S. Misra **& M.A.S.** Menon; 1 ex., 157 mm, ZSI F-1001/2, Cheriyakuda Is., nr. Jaganathpatna, **Rambha,** Chilka Lake, 07-ii-1954, K.S. Misra; 1 ex., 232 mm, ZSI F-10502/2, no collection **data,** probably from Chilka Lake; 1 ex., 200 mm, ZSI F-10505/2, no collection data, **probably** from Chilka Lake; 1 ex., 103 mm, EBS/ZSI F-3765, Vamsadhara R. mouth, **Kalingapatnam,** 06-vii-2001, C.A.N. Rao & party.

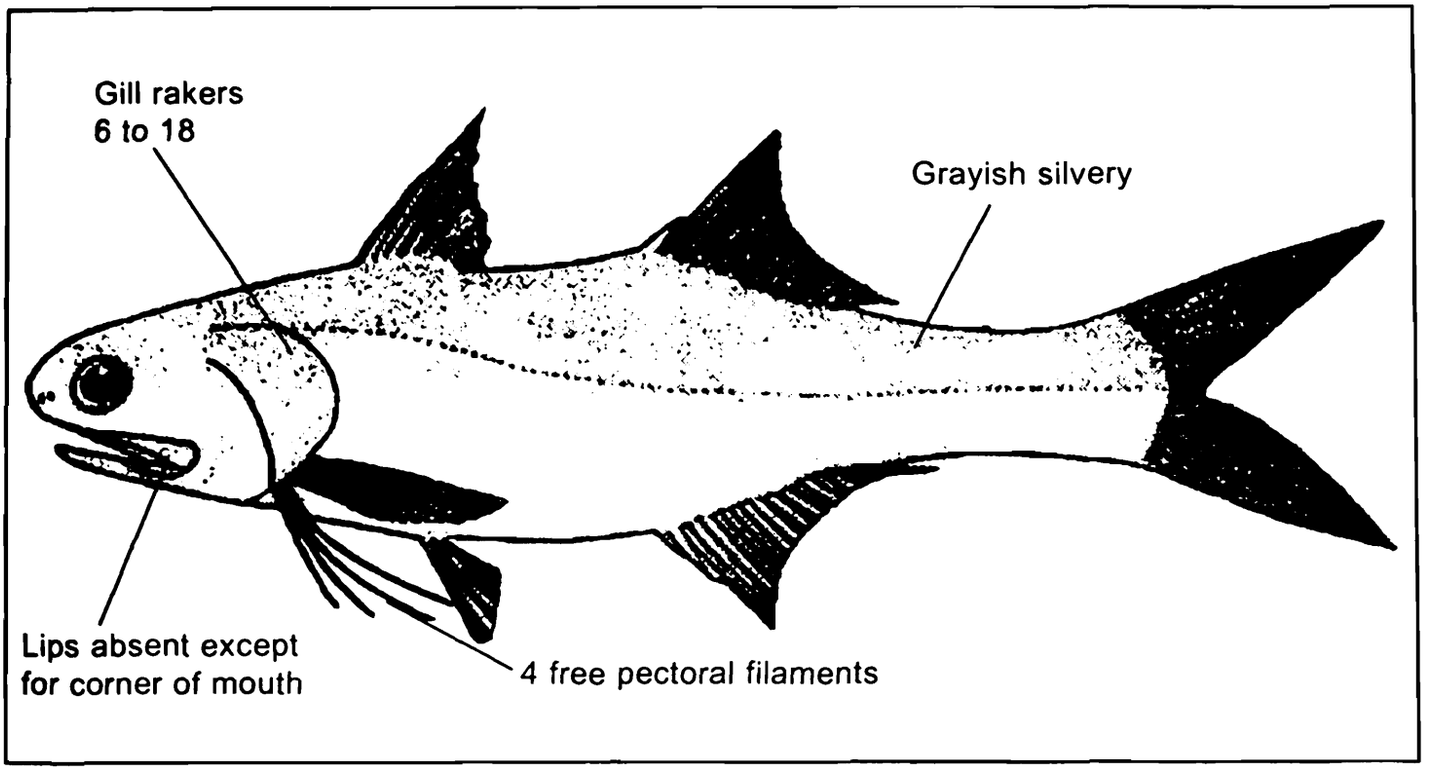

Figure 3 : *Eleutheronema tetradactylum* (Shaw)

Diagnostic characters: Body elongate; its depth at first dorsal fin origin 3.7 to 4.3 times in standard length. Eyes large; its diameter 1.3 or less in snout length. Anterior parts of lower jaw with small teeth extending onto lateral surface, adjacent portion of lip absent. Gill rakers 3 to 8 on upper limb plus 3 to 10 on lower limb, total 6 to 18 on first arch. Gill rakers on anterior parts replaced by tooth plates with villiform teeth with growth. First dorsal fin with 8 spines, bases of all spines of same thickness. Second dorsal fin with one spine and 13 to 15 rays. Anal fin with 3 spines and 14 to 16 rays. Anal fin base longer than second dorsal fin base. Pectoral fin insertion on lower third of body. Upper part of pectoral fin with 16 to 18 unbranched rays, extending almost to tip of pelvic fin. Lower part of pectoral fin with 4 filaments, longest filament not reaching to or extending slightly beyond level of tip of pectoral fin. Caudal fin deeply forked, but lobes not

filamentous. Lateral line with 71 to 80 pored scales, extending to upper end of lower caudal fin lobe, or sometimes bifurcating on caudal fin base and occasionally the lower branch also have a secondary bifurcation. Transverse scale rows 9 to 12 above and 13 to 15 below lateral line. Airbladder absent.

Colour : Dorsal surface of head and body grayish silver, lighter on sides and below. Anterior margins of dorsal fins dark. Pectoral fins yellowish and filaments white. Pelvic fins yellow anteriorly and white posteriorly. Anal fin with yellow tinge. Caudal fin yellow at base, dark on posterior part.

Size : It attains a maximum size of 200 cm in total length and weighs about 145 kg (Kailola and Stewart, 1993).

Distribution : Widely distributed in the Indo-West Pacific, from Persian Gulf to Papua New Guinea and northern Australia.

Habitat and Biology : Found in coastal waters with sandy and muddy bottom, frequently enters estuaries and brackish waters. Juveniles mainly feed on planktonic crustaceans and adult fish feed on small fish and prawns.

Fisheries : In India, it forms an economically important fisheries component. This species is mostly caught by gill nets and also by trawl nets. Trawling grounds of Mumbai coast, Chilka Lake in Orissa and Hooghly-Matla estuary of West Bengal have major contribution to fishery of this fish. They are usually caught during September to November months of the year in the west coast of India and are known to enter estuaries for breeding purpose.

Remarks : A photograph of a threadfin fish having only three free pectoral filaments have been received by the authors during study period. The specimen was said to be from Tamil Nadu coast. But without examining the voucher specimen its identity could not be ascertained. *Eleutheronema tridactylum* (Bleeker) is known to have 3 pectoral filaments along with a combination of characters such as vomer without tooth plates, second dorsal fin rays usually 13, gill rakers 4 to 10 on first arch and lateral line unbranched. Moreover, it is currently known from Thailand, Malaysia and Indonesia and its occurrence from Indian mainland coast was never reported. The only other species of genus *Eleutheronema* having 4 free pectoral filaments is *E. rhadinum* (Jordan and Evermann) that differs from its congener *E. tetradactylum* in lateral line scale count (82 to 95 pored scales) and is known from Japan, China and Viet Nam (Motomura *et al.*, 2002).

It is also interesting to note that one specimen (ZSI F-10505/2, 200 mm SL) is found to have asymmetrically 5 free pectoral filaments on left side and 4 on right side while all other characters go with *E. tetradactylum*. It is rare to get asymmetrically 4 and 5 free pectoral rays in *E. tetradactylum*, which it is known to have only 4 filaments on each

side. This condition may be attributed to abnormality and was probably also observed by Hora (1926).

Genus *Filimanus* Myers, 1936

1936. *Filimanus* Myers, *J. Wash. Acad. Sci.*, 26(9): 379 (type-species: *Polynemus melanochir* (not Valenciennes): Myers = *Filimanus perplexa* Feltes, 1991).

Diagnosis : Body compressed, oblong to moderately deep. Eyes larger than snout; adipose eyelid well developed. Lip on lower jaw well developed. Teeth not extending to sides of lower jaw. Teeth on jaws in narrow villifom band; space separating premaxillary teeth bands twice or more than width of band. Basisphenoid bone not in contact with prootic bone; sphenotics not visible dorsally between anterior margins of parietal and pterotic bones. Posterior margin of preopercle serrated. Total gill rakers 36 to 49 on first arch. Pectoral fin inserted well below midline of body, mostly on lower one-third. All rays of pectoral fin unbranched. Free pectoral filaments 5 to 7. Anal fin base less than head length. Lateral line pored scales 43 to 52.

Six species of this genus are recognized in the world; three species known from India.

2. *Filimanus perplexa* Feltes, 1991

(Plate II, Figure 1)

1991. *Filimanus perplexa* Feltes, *Copeia*, 1991 (2): 307, fig. 5 (northeast of Denpasar, Bali, Indonesia); Motomura, 2004, *FAO Species Catalogue*, 3: 25; Mishra and Barman, 2009, *Rec. zool. Surv. India*, 109: 53 (Great Nicobar).

2000. *Polynemus melanochir* (not Valenciennes): Rao *et. al.*, *Rec. zool. Surv. India, Occ. Paper,* No. 178: 259 (Nicobar gr. Is.).

Common Names: Splendid threadfin...English.

Type : Holotype (BMNH 1988.4.6.1, 148 mm), British Museum of Natural History, London.

Material examined : 2 exs., 73-99 mm, ANRS/ZSI 1546 (labeled as *P. melanochir*), Kamorta Is., 12-xi-1989, H.S. Mehta and party; 8 exs., 75-79 mm, ANRS/ZSI 1449 (labeled as *P. melanochir*), Campbell Bay (Great Nicobar), 23-xi-1989, H.S. Mehta and party; 2 exs., 108-114 mm, ZSI- F. 9998/2, Campbell Bay, Great Nicobar Is., 27-x-1992, Dhandapani and party.

Diagnostic characters : Body depth about equal to head length, 2.8 to 3.1 times in standard length. Snout blunt; head profile slightly concave at interorbital region. Maxilla extends beyond posterior margin of adipose eyelid. Lip on lower jaw well developed. Teeth villiform in narrow bands on jaws, palatine and ectopterygoids. Width of tooth

bands on upper and lower jaws less than space separating tooth bands at symphysis. Vomerine tooth patch inconspicuous. Upper jaw length about twice in head length, less than pectoral fin base (including base of free filaments). Total gill rakers 48 to 52 on first arch. First dorsal fin with 8 spines and the second with one spine and 11 rays. Anal fin with 3 spines and 14 or 15 rays. Pectoral fin insertion well below midline of body. Upper pectoral fin rays all unbranched, its tip just reaching to level of pelvic fin tip. Free pectoral filaments 7 (asymmetrically 6 and 7 in one specimen); first filament shortest, reaching to level of anal fin origin; third and fourth filaments longest, reaching beyond caudal fin base. Lateral line simple, extending to mid-distal margin of caudal fin, with 49 to 51 pored scales. Transverse scale rows 6 or 7 above and 9 or 10 below lateral line. Airbladder simple.

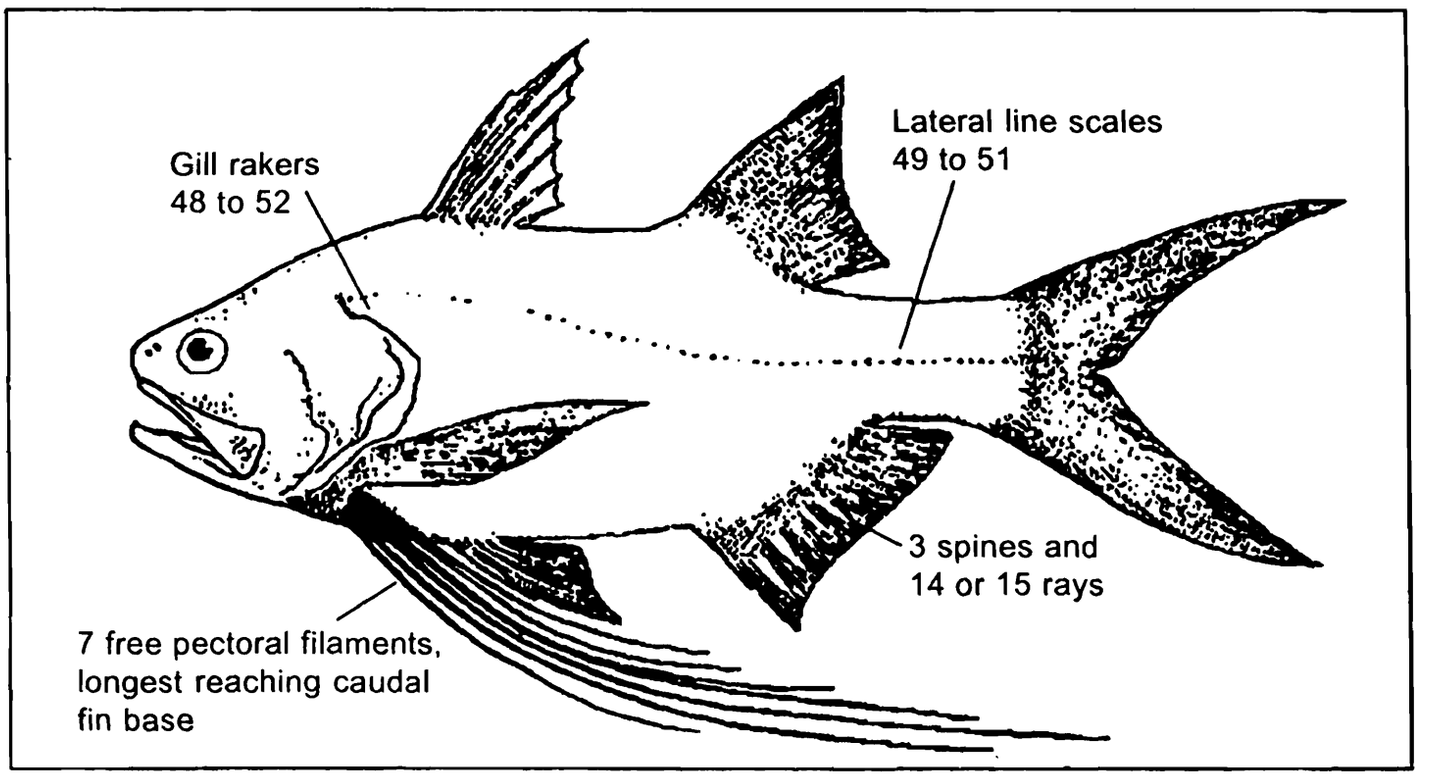

Figure 4 : *Filimanus perplexa* Feltes

Colour: Body and fins golden yellow; base of pectoral filaments white, light brown on posterior portion. Pectoral fin with scattered minute dots.

Size: It attains a maximum size of 16 cm in standard length (Feltes, 1991)

Distribution: Sumatra, Java, Bali, Indonesia, Thailand, and Nicobar group of Islands, India.

Habitat and Biology: Found in the shallow waters of reef islands.

Fisheries: Although, no fisheries information available, usually caught by cast netting in Nicobar.

Remarks: Myers (1936) described *Filimanus* as a new genus on the basis of a single specimen (USNM 72742, 114 mm SL), but had misidentified the species as *Polynemus melanochir* (non Valenciennes, 1831) (Feltes, 1991). Bleeker (1849) erroneously referred to this species as *P. melanochir* and this name has been used by subsequent authors including Weber and de Beaufort (1922). While recognizing only two genera, *Eleutheronema* Bleeker and *Polynemus* Linnaeus in the family, Weber and de Beaufort (1922) separated the genus *Polynemus* into four groups based on number of free pectoral fin filaments leading to such misidentification. Feltes (1991) recognized that the polynemid species commonly identified as *P. melanochir* was not true *P. melanochir*, but in fact represented a separate undescribed species, *i.e. Filimanus perplexa* Feltes. Rao *et al.* (2000) has followed Weber and de Beaufort (1922) to determine their specimens as *P. melanochir* which are not a *Polynemus* species but *Filimanus perplexa* Feltes (Mishra and Barman, 2010). *F. perplexa* has been reported only recently as a new distributional record from India based on samples from the Great Nicobar Island (Mishra and Barman, 2009).

3. ***Filimanus similis*** Feltes, 1991

(Plate II, Figure 2)

1876. *Polynemus heptadactylus* (not Cuvier), Day, *Fish. India*, (2): 177, pl. 42, fig. 5; Day, 1889, *Fauna Br. India Fish*, 2: 103.

1991. *Filimanus similis* Feltes, *Copeia*, 1991 (2): 318, fig. 12 (Beruwala, Sri Lanka); Motomura, 2004, *FAO Species Catalogue*, 3: 28.

Common Names : Indian sevenfinger threadfin ... English; Ma-kala ... Tamil Nadu;

Type : Holotype (USNM 304495, 99 mm) at Smithsonian Institute, National Museum of Natural History, Washington D.C.

Material examined : 2 exs., 80-155 mm, ANRS/ZSI 2353 (labeled as *P. heptadactylus*), Campbell Bay, 26-ix-1988, H.S. Mehta & party; 1 ex., 154 mm, ANRS/ ZSI 1431 (labeled as *P. heptadactylus*), Port Blair, 19-xi-1992, D.V. Rao & party; 1 ex., 145 mm, ANRS/ZSI 2341 (labeled as *P. heptadactylus*), Kamorta Is., 11-xi-1989, H.S. Mehta & party; 1 ex., 85 mm, ZSI F-1562/2 (labeled as *P. heptadactylus*), Santhrapally, Tranquebar, 04-ii-1958, A.G.K. Menon; 1 ex., 89 mm, R. No. 958 (labeled as *P. heptadactylus*), Madras, no date, F. Day; 2 exs., 63-71 mm, R. No. 956 & 957 (labeled as *P. heptadactylus*), Madras, no date, F. Day; 1 ex., 102 mm, R. No. 12129 (labeled as *P. heptadactylus*), Orissa coast, no date, Marine Survey; 1 ex., 104 mm, R. No. 12331 (labeled as P. heptadactylus), Orissa coast, no date, Marine Survey; 33 exs., 47-82 mm, ZSI F-10497/2, Karwar, 14-xii-2008, R.P. Barman & party.

Diagnostic characters : Body depth at first dorsal fin origin 3.0 to 3.3 times in standard length. Lip on lower jaw well developed. Teeth villiform in narrow bands on jaws, palatine and ectopterygoids. Width of tooth bands on upper and lower jaws less than space separating tooth bands at symphysis. Snout conical; head profile nearly straight. Maxilla extends beyond posterior margin of adipose eyelid. Upper jaw length about half of head length or less, less than pectoral fin base (including base of free filaments). Eyes about 3.5 times in head length. Total gill rakers 40 to 49 (usually 42 to 47) on first arch. First dorsal fin with 8 spines and the second with one spine and 11 to 13 rays. Anal fin with 3 spines and 10 to 12 rays. Pectoral fin inserted well below midline of body, on lower third. Upper pectoral fin rays all unbranched, its tip just reaching to level of pelvic fin tip. Free pectoral filaments 7; longest filament reaching anal fin origin. Caudal fin deeply forked; lobes pointed, but not filamentous. Lateral line simple, extending to mid-distal margin of caudal fin, and with 45 to 49 pored scales. Transverse scales 5 to 7 rows above and 9 to 11 rows below lateral line. Airbladder simple.

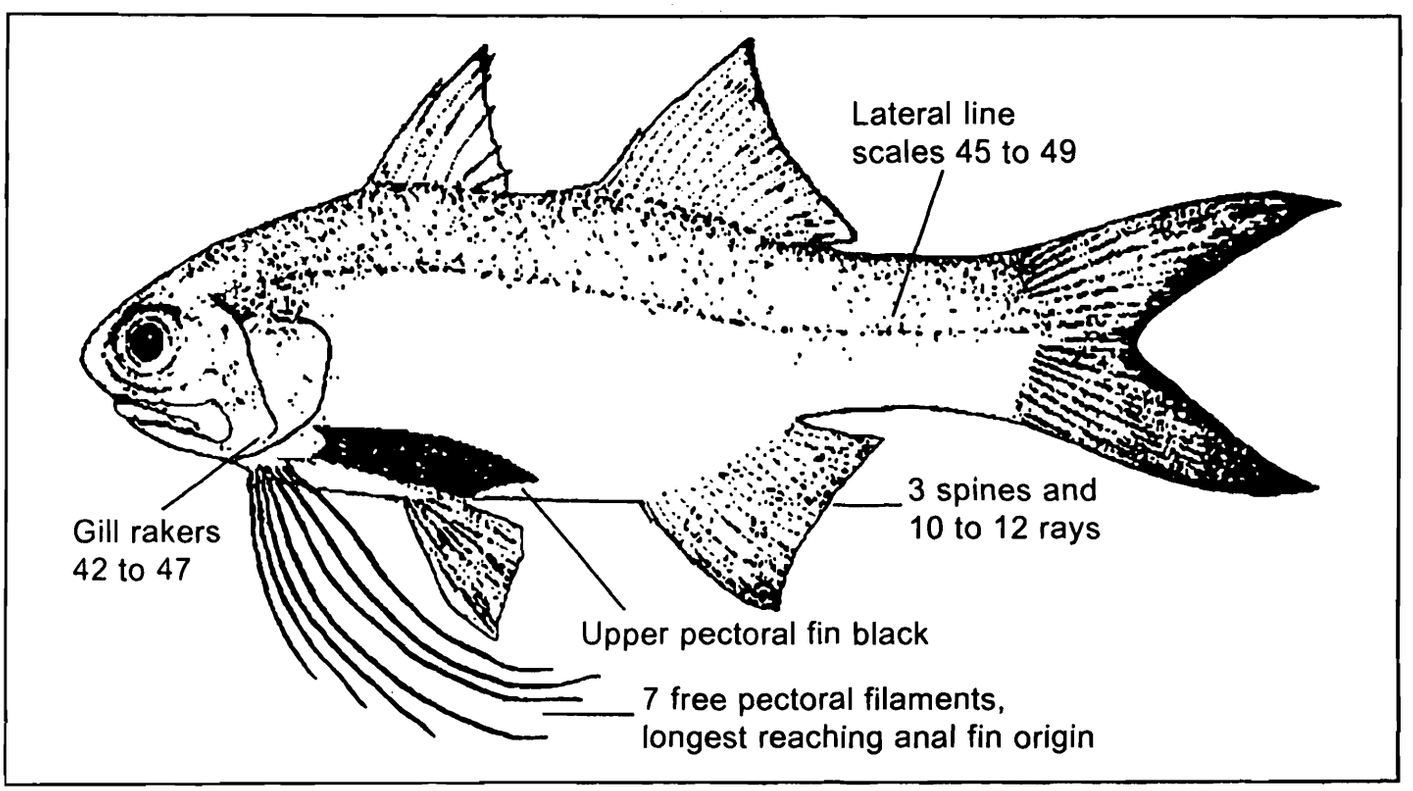

Figure 5 : *Filimanus similis* Feltes

Colour : Body golden with brown tinge dorsally. Median fins blackish at posterior margin. Pectoral fins deep black; free filaments white at base and yellowish white towards tip. Pelvic fins white at base.

Size : Attains a maximum of 13 cm in standard length (Feltes, 1991)

Distribution : Indian Ocean- from Pakistan to Andaman Sea (Thailand).

Habitat and Biology : Occur in sandy or muddy bottoms up to 80 m depth.

Fisheries : Of minor commercial importance as these are small sized fishes.

Remarks : *Filimanus similis* have been described from several specimens taken from Pakistan, India, Ceylon and Thailand. It is named so for having considerable similarity to *Filimanus heptadactyla* (Cuvier) (Feltes, 1991) which can only be differentiated on the basis of gill raker count. Earlier, starting from Day (1876) to Menon and Babu Rao (1984), seven filament threadfins of India with no black shoulder spot were determined as *Polynemus heptadactylus*. Works pertaining to *P. heptadactulus* included in Marathe and Bal (1958), Nayak (1959a) and Kagwade (1970, 1972, 1972a, 1973) represent a different species belongs to genus *Polydactylus*. The authors have examined several specimens, labeled as *P. heptadactylus* including the original of Day (1876: pl. 42, fig. 5) (R. No. 958, 89 mm) or even fresh ones from different parts of Indian coast to find out that they contain 42 to 45 gill rakers on first arch while *F. heptadactyla* is known to have only 35 to 41 gill rakers. Hence, while recognizing *F. similis* from Indian coast, it is concluded that *F. haptadactyla* does not occur in this region. Distribution of *F. heptadactyla* is confined to Western Pacific and it is replaced by *F. similis* in northern Indian Ocean.

4. *Filimanus xanthonema* (Valenciennes, 1831)

(Plate II, Figure 3)

1831. *Polynemus xanthonemus* Valenciennes *in* Cuvier and Valenciennes, *Hist. nat. Poiss.*, 7: 517 (Pondicherry, India); Hida, 1967. *J. mar. biol. Assoc. India*, 9 (2): 290; Kagwade, 1970, *Bull. Cent. Mar. Fish. Res. Inst.*, (18): 49;

1876. *Polynemus sexfilis* (not Valenciennes), Day, *Fish. India*, (2): 178, pl. 43, fig. 1; Day, 1889, *Fauna Br. India Fish*, 2: 105; Kagwade, 1970, *Bull. Cent. Mar. Fish. Res. Inst.*, (18): 50.

1993. *Polydactylus konadaensis* Mishra and Krishnan, *Rec. zool. Surv. India*, 92 (1-4): 285 (Konada, Andhra Pradesh, India);

1984. *Polydactylus kuru* (not Bleeker), Talwar and Kacker, *Com. Sea Fish. India*: 750.

2004. *Filimanus xanthonema*, Motomura, *FAO Species Catalogue*, 3: 29.

Common Names : Yellowthread threadfin ... English; Kala ... Tamil Nadu;

Type : Original type not known. Lectotype (MNHN A.3033, 109 mm) at Muséum National d'Histoire Naturelle, Paris, designated by Feltes (1991).

Material examined : 2 exs., 96-105 mm. MBS/ZSI F-631 & 632 (type specimens of *P. konadaensis*), Konada, 07-iii-1992, S. Krishnan & S.S. Mishra; 2 exs., 97-100 mm, MBS/ZSI F-3186 & 3187 (labeled as *P. sexfilis*), Paradeep, 30-xi-1992, M. Srinivasan &

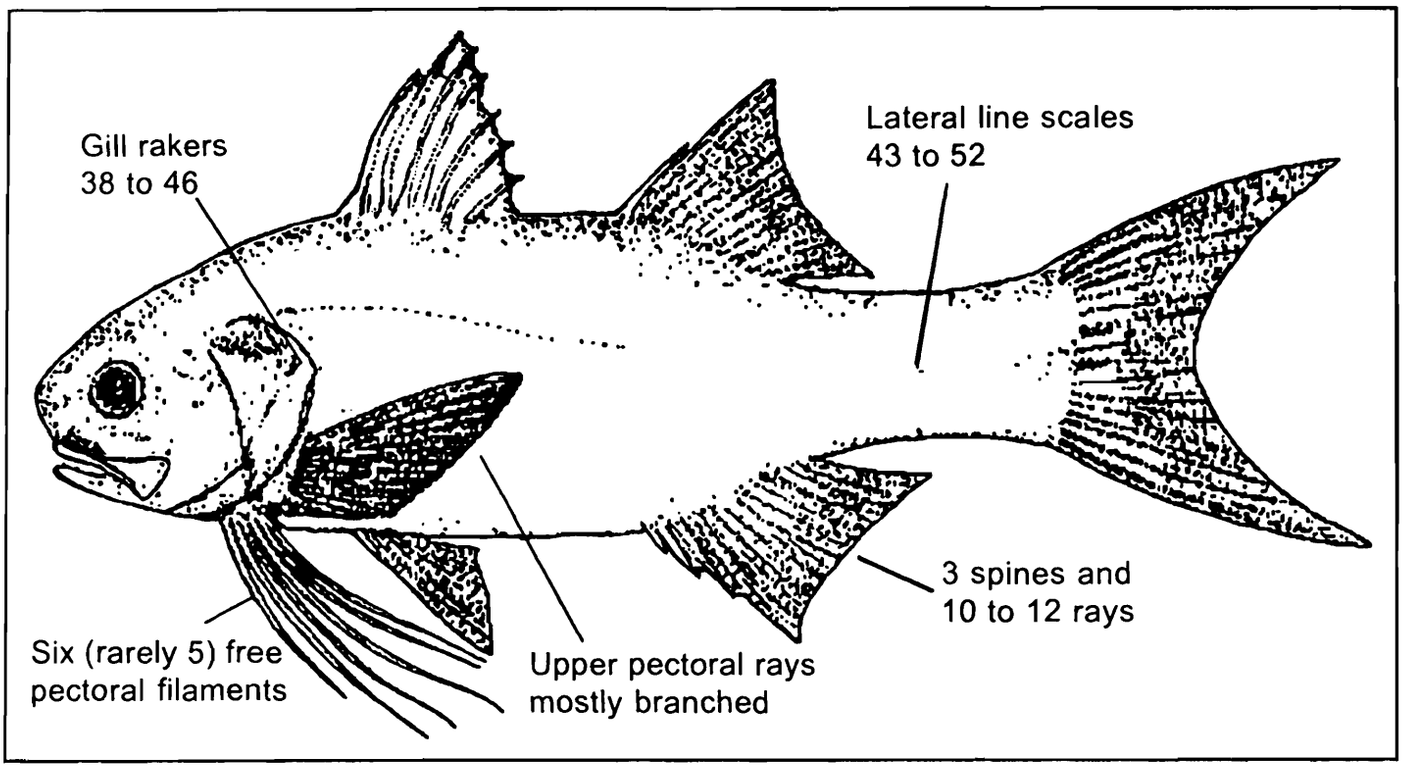

Figure 6 : *Filimanus xanthomema* (Valenciennes)

party; 1 ex., 81 mm, EBS/ZSI F-2907 (labeled as *P. sexfilis*), Pallithummulapalem, 19-ix-1998, C.A.N. Rao & party; 6 exs., 83-102 mm, Cat. 156, Madras, no date, Asiatic Society of Bengal; 2 exs., 82-105 mm, ZSI F-3617/1 (labeled as *P. sexfilis*), Gopalpur, Ganjam, 02-vi-1953, ST Golden Crown; 2 exs., 69-109 mm, EBS/ZSI F-5450, Nagavali (Langulya) estuary, 26-vi-2000, C.A.N. Rao & party.

Diagnostic characters : Body depth at first dorsal fin origin 2.9 to 3.7 times in standard length. Lip on lower jaw well developed. Teeth villiform in narrow bands on jaws, palatine and ectopterygoids. Width of tooth bands on upper and lower jaws less than space separating tooth bands at symphysis. Snout conical; head profile nearly straight. Maxilla extends beyond posterior margin of adipose eyelid. Upper jaw length about half of head length, less than pectoral fin base (including base of free filaments). Eyes about 4.5 times in head length. Total gill rakers 36 to 46 on first arch. First dorsal fin with 8 spines and the second with one spine and 11 to 13 rays. Anal fin with 3 spines and 10 to 12 rays. Pectoral fin inserted well below midline of body, on lower third. Upper pectoral fin rays all unbranched, its tip just reaching to level of pelvic fin tip. Free pectoral filaments usually 6 on each side or sometimes 5, or asymmetrically 5 and 6 or 6 and 7; longest filament reaching beyond tip of pelvic fin. Caudal fin deeply forked; lobes pointed, but not filamentous. Lateral line simple, extending to mid-distal margin of caudal fin, and with 43 to 52 pored scales. Transverse scales 5 to 8 rows above and 9 to 12 rows below lateral line. Airbladder simple and large.

Colour : Golden with brownish tinge dorsally. Rear edges of median fins blackish. Base of pectoral filaments white, yellow posteriorly. Base of pelvic fin white.

Size : Attains maximum 14 cm in standard length (Feltes, 1991).

Distribution : East coast of India, Bangla Desh, Myanmar, Thailand, Malaysia and Indonesia.

Habitat and Biology : Found in shallow waters up to 30 m depth with muddy substratum. Sex changes from male to female at 9 to 11 cm standard length, as hermaprodites are well reported at this size range (Hida, 1967). Feeds on planktonic crustaceans, mainly mysids.

Fisheries : No information available. Caught in trawl net along with other species.

Remarks : Day (1876) stated that he could not recognize this species in India, but included in his work as being reported from Puduchery (Pondicherry) by Valenciennes (1831). The description for *Polynemus xanthonemus* in Day (1876) seems to be erroneous (Feltes, 1991) and his specimens of *F. xanthonema* having 6 free pectoral filaments, have been mistaken for *Polynemus sexfilis*, as they were said to have 46 scales on lateral line and golden in colour. In contrast, Kagwade (1970) seems not to have examined any specimen but followed Day (1876) in describing *P. sexfilis*. Colour and lateral line scale counts of *P. sexfilis* may be noted, for it is more similar to *P. plebeius* than to this species. On the other hand, *F. xanthonema* closely resembles *F. similis*, except that the latter has 7 free pectoral filaments on each side. *Polydactylus konadaensis* described by Mishra and Krishnan (1993) from Andhra Pradesh coast, without taking generic characters of *Filimanus* into account, is considered to be a junior synonym of *F. xanthonema* (Vanenciennes) (Motomura *et. al.*, 2001). Two specimens from Nagavali estuary (EBS/ ZSI F-5450) were found to have 5 free pectoral rays on each side. Talwar and Kacker (1984) are erroneous in stating that the upper pectoral fin rays were mostly branched (key to species) in *P. xanthonemus*. They followed *P. sexfilis* of Day (1876) to describe *P. kuru* that has free pectoral fin rays extending beyond tip of pelvic fin, a character that is true with *F. xanthonema*, but not in *P. sexfilis*, whereas *P. sexfilis* Valenciennes is considered as a senior synonym of *P. kuru* (Bleeker) (Motomura, Iwatsuki and Kimura, 2001).

Genus ***Leptomelanosoma*** Motomura and Iwatsuki

2001. *Leptomelanosoma* Motomura and Iwatsuki, *Ichthyol. Res.*, 48(1): 13 (type species: *Polynemus indicus* Shaw, 1804)

Diagnosis : Body elongate, rounded and compressed. Eyes small, about 7 times in head. Adipose eyelid moderately developed. Teeth extending to sides of lower jaw only on anterior one-third portion. Lip on lower jaw poorly developed. Ethmoid bone not covered dorsally by frontals; sphenotics visible dorsally between anterior margins of

parietal and pterotic. Gill rakers 18 to 21 on first arch. Lobes of caudal fin elongate and filamentous. Upper pectoral fin rays branched except for upper 1 or 2; free pectoral filaments 5. Air bladder with many appendages inserted into lateral walls of abdominal cavity. Pored lateral line scales about 70. Greyish black in colour.

This is a monotypic genus, occurring in India.

5. ***Leptomelanosoma indicum*** (Shaw, 1804)

(Plate I, Figure 2)

1804. *Polynemus indicus* Shaw, *General Zoology*, 5: 155 (Vizagapatnam, India, based on "Maga Booshee" of Russell, 1803: 68, fig. 184); Day, 1876. *Fish. India*, (2): 179; Day, 1889, *Fauna Br. India*, 2: 105; Weber and Beaufort, 1922, *Fish. Indo-Aust. Archip.*, 4: 205; Kagwade, 1970, *Bull. Cent. Mar. Fish. Res. Inst.*, (18): 5.

1822. *Polynemus sele* Hamilton, *Fishes of Ganges*: 226 (estuaries of Ganges, India).

1829. *Polynemus uronemus* Cuvier, *Hist. nat. Poiss.*, 3: 155 (new name for *P. indicus* Shaw, 1804).

1843. *Polynemus gelatinosus* McClelland, *J. Nat. Hist. Calcutta*, 3: 181, pl. 6 (new name for *P. sele* Hamilton, 1822).

1985. *Polynemus sheridani* (not Macleay), Girija Kumari *et al.*, *Matsya*, 9-10: 196 (Bay of Bengal).

1984. *Polydactylus indicus*, Talwar and Kacker, *Com. Sea Fish. India*: 749.

2004. *Leptomelanosoma indicum*, Motomura, *FAO Species Catalogue*, 3: 33.

Common Names : Indian threadfin ... English; Dara, Dadha, Darha ... Gujarat; Dara, Chelna ... Maharastra; Ramas, Vahameenu ... Karnataka; Baameen, Thamuti, Yeta ... Kerala; Kathikalai, Thalunkala ... Tamil Nadu; Maaga-booshee, Podikimaga ... Andhra Pradesh.

Type : No types known (Motomura and Iwatsuki, 2001).

Material examined : 1 ex., 210 mm, ZSI F-965, Bombay, no date, purchased from F. Day; 1 ex., 87 mm, ZSI F-10496/2, Hooghly-Matlah, 16-xi-1909, no collector name; 1 ex., 127 mm, ZSI F-10500/2, Sandheads, no date, Lady Fraser; 1 ex., 200 mm, ZSI F-3450/1, Orissa coast, no date, S.T. Golden Crown; 1 ex., 217 mm, ZSI F-10678/1, Orissa coast, no date, S.T. Golden Crown; 1 ex., 240 mm, ZSI F-10503/2, no collection data, probably from Chilka Lake.

Diagnostic characters : Body elongate and rounded to some extent. Body depth at first dorsal fin origin 4.0 to 4.5 times in standard length. Eyes small, about 7 times in head length. Adipose eyelid moderately developed. Anterior one-third of lower jaw with small villiform teeth extending to lateral surface and lip on adjacent part poorly developed. Tooth bands on jaws broad; its width greater than the space separating them

on opposite premaxilla. Teeth villiform in broad bands on jaws, vomer, palatine and ectopterigoids. Posterior margin of preopercle serrated. Gill rakers on first arch 18 to 21. First dorsal fin with 8 spines and second dorsal fin with I spine and 12 or 13 rays. Anal fin with 3 spines and 10 or 11 rays. Anal fin base less than second dorsal fin base. Pectoral fin inserted well below midline of body. Upper pectoral fin with 12 to 14 rays, all rays branched except for upper 1 or 2; lower portion with 5 free filamentous rays, the longest

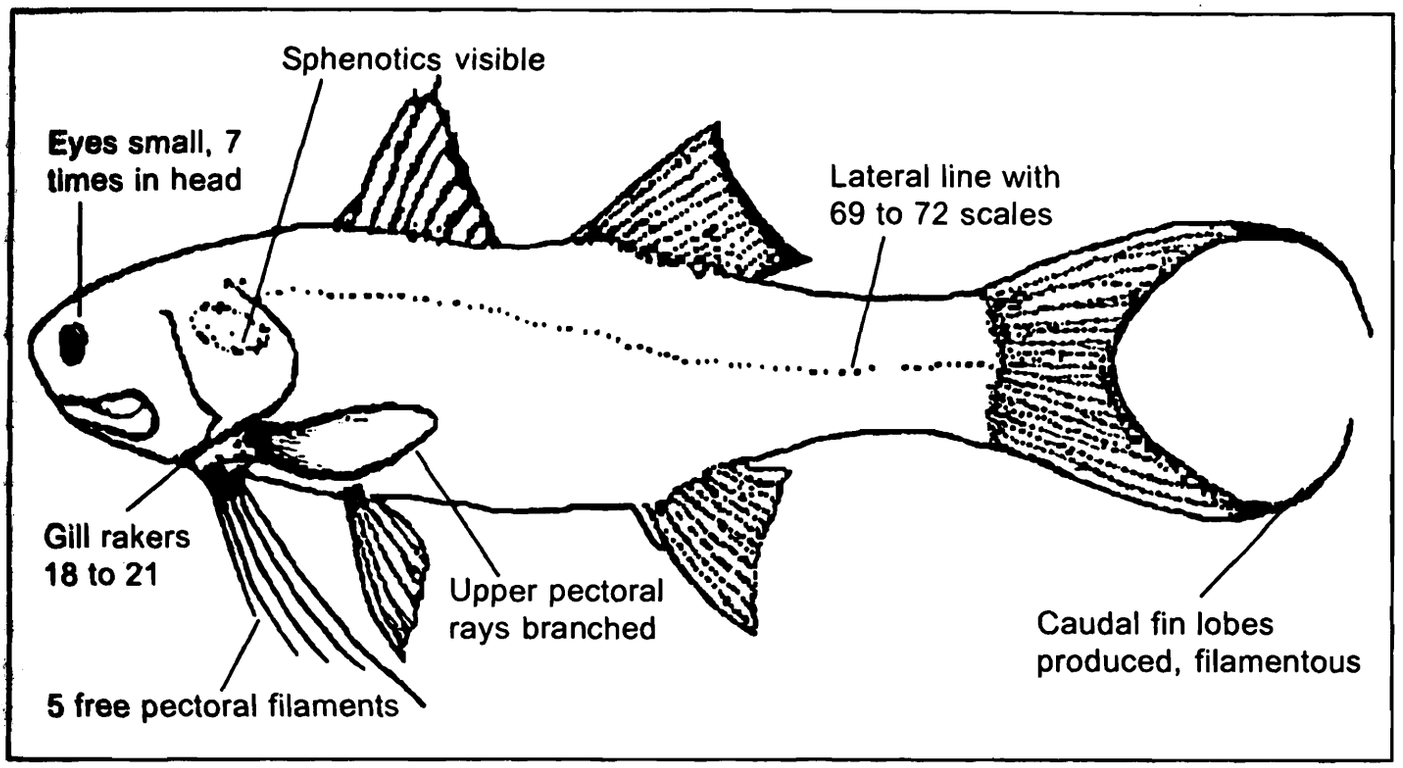

Figure 7 : *Leptomelanosoma indicum* (Shaw)

filament reaching beyond posterior tip of pelvic fin, but not extending to anal fin origin. Caudal fin deeply forked, lobes produced into filaments. Lateral line with 69 to 72 pored scales, extending to upper end of lower caudal fin lobe. Air bladder large, with several appendages entering into lateral wall of abdominal cavity.

Colour : Head and body grayish black or blackish brown. Distal part of dorsal and caudal fins black, Pectoral fins deep black, origin of pectoral filaments dusky yellowish but distally blackish.

Size : It attains a maximum size of about 1.4 m in total length (Kagwade, 1970).

Distribution : Indo-West Pacific, from Pakistan to Papúa New Guinea.

Habitat and Biology : Found near estuaries, also entering rivers. Mostly a coastal species and known to inhabit up to 100 m depth. First maturity size reported to be about

800 mm standard length (Karekar and Bal, 1960). Hermaphroditism seems to be common in this species (Kagwade, 1970). Two peak spawning periods for this species have been reported, during April to June and October to December, intensive spawning has been recorded during first period along north-west coast (Nayak, 1959) and during second period along south-east coast (Kuthalingam, 1960) of India. Young ones feed on small crustaceans and adults on fishes.

Fisheries : This is an important species in commercial fisheries sector of India. Most of *L. indicum* landings come from northern west coast of India.

Remarks : In current parlance of nomenclature, *Polynemus sheridani* Maclea is considered to be a junior synonym of *Polydactylus macrochir* (Gunther) (Motomura *et al.*, 2000). While reporting *Polynemus sheridani* from Bay of Bengal, India, Girija Kumari *et al.*, (1985) described it as having 19 gill rakers, filamentous cauda fin lobes and grayish in colour. These characters go close with that of *L. indicum* but not with *P. macrochir*, which has 32 to 35 gill rakers, caudal fin lobes not produced and having a golden tinge dorsally (Motomura, 2004). Hence, their specimens, described as *P. sheridani*, are considered as misidentified *L. indicum*. It is to be noted that the gill raker count in different genera of polynemid fishes of India with pectoral fin inserted low on body, vary distinctly (*Eleutheronema* is having 6 to 18; *Filimanus*, 36 to 55; *Leptomelanosoma*, 18 to 21 and *Polydactulus*, 24 to 35 gill rakers on first arch). Generic allocation followed here is in accordance to Motomura and Iwatsuki (2001) and Motomura (2004) considering the unique character of air bladder with several appendages entering into abdominal wall and visibility of sphenotics dorsally.

Genus ***Polydactylus*** Lacepede, 1803

1803. ***Polydactylus*** Lacepede, *Hist. nat. Poiss.*, 5: 491 (type-species: *Polydactylus plumierii* Lacepede = *Polynemus virginicus* Linnaeus).

Diagnosis : Body moderately deep, oblong. Adipose eyelid well developed. Snout conical. Eyes larger, its diameter about 4 times in head length. Lip on lower jaw well developed. Width of tooth band on jaws more than the space separating tooth bands on opposing premaxilla at symphysis. Posterior margin of preopercle serrated. Basisphenoid in contact with prootic; sphenotics not visible dorsally between anterior margins parietal and pterotics. Total gill rakers 22 to 35. Pectoral fin inserted below midline of body, on lower third. Free pectoral filaments 5 to 7. Caudal fin deeply forked, lobes not produced into filament. Lateral line with 45 to 94 pored scales. Air bladder present or absent. Usually golden in colour, some with a black shoulder spot.

Twenty species known around the world, only five species occurring in India.

6. ***Polydactylus microstomus*** (Bleeker, 1851)

(Plate III, Figure 1)

1851. ***Polynemus microstomus*** Bleeker, *Nat. Tijdschr. Ned.-Indie,* 2: 217 (Bulukumba, Sulawesi, Indonesia).

1966. ***Polynemus microstoma***, Rajapandian and Murthy, *J. mar. biol. Ass. India,* 8 (2): 365 (Gulf of Mannar); Kagwade, 1970, *Bull. Cent. Mar. Fish. Res. Inst.,* (18): 49.

1993. ***Polydactylus microstoma***, Dhandapani and Mishra, *J. Andaman Sci. Assoc.,* 9 (1 & 2): 61 (Great Nicobar).

2004. ***Polydactylus microstomus***, Motomura, *FAO Species Catalogue*, 3: 55.

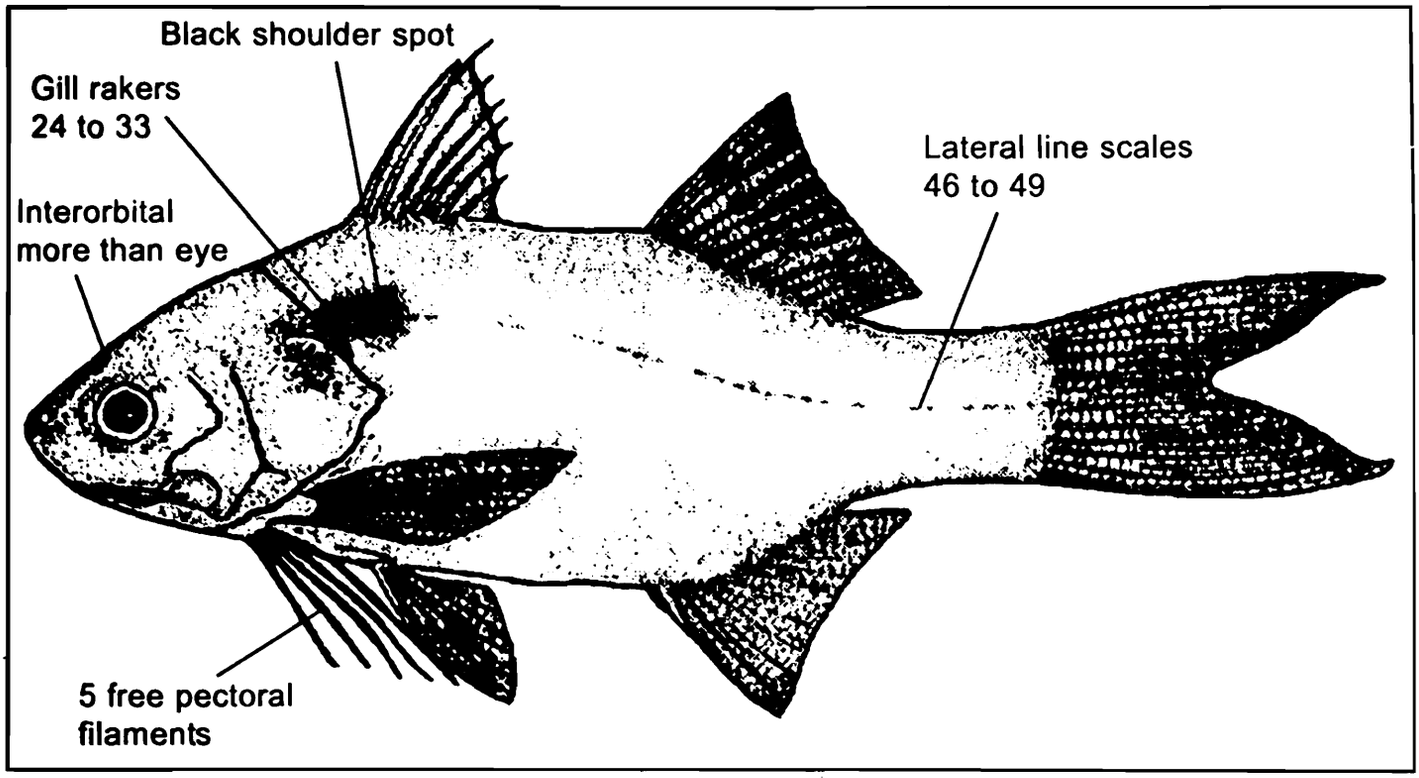

Figure 8 : *Polydactylus microstomus* (Bleeker)

Common Names : Smallmouth threadfin ... English.

Type : Holotype (RMNH 6044, 53 mm) determined from Bleeker's specimens by Motomura and Iwatsuki (2001a) at Rijks Museum van Natuurlijke Histoire, Leiden.

Material examined : 2 exs., 127-132 mm, MBS/ZSI F-888 & 889, Campbell Bay, 25-x-1992, Dhandapani & party; 1 ex., 120 mm, ZSI F-4934/2 (labeled as *P. plebeius*), Thangachimadam, 3 miles East of Pamban bridge, 14-iii-1955, M.A.S. Menon; 12 exs., 111-130 mm, ZSI F-10498/2, Cuddalore, 11-i-2008, R.P. Barman & party.

Diagnostic characters: Body oblong, moderately deep; its depth at first dorsal fin origin 2.8 to 3.8 times in standard length. Snout conical. Length of upper jaw less than half of head length. Lip on lower jaw well developed. Width of tooth band on jaws more than the space separating tooth bands on opposing premaxilla at symphysis. Eyes larger, about 6 times in head length. Interorbital space broad, about equal to eye diameter. Total gill rakers 24 to 33 on first arch. First dorsal fin with 8 spines, base of second spine slightly thicker or similar to others. Second dorsal fin with one spine and 12 to 14 rays. Anal fin with 3 spines and 11 or 12 rays. Pectoral fin inserted well below midline of body. Upper pectoral fin rays all branched except for upper 1 or 2; free filaments 5, the longest filament reaching short of pelvic fin tip. Caudal fin deeply forked; lobes not filamentous. Lateral line simple, extending to upper end of lower caudal lobe; contains 46 to 49 pored scales. Transverse scale rows 6 or 7 above and 9 or 10 below lateral line. Air bladder simple, well developed.

Colour: Body yellowish white. Pectoral fin yellowish; filaments faintly white. A large black shoulder spot anteriorly on lateral line behind head.

Size: Attains 16 cm in standard length (Motomura and Iwatsuki, 2001a)

Distribution: From south-east coast of India, Sri Lanka, Myanmar, Thailand in Indian Ocean to Indonesia, the Philippines, New Caledonia, and Taiwan in West Pacific.

Habitat and Biology: Known to inhabit turbid coastal waters, estuaries and mangrove lined creeks and rivers. No other data available.

Fisheries: No fisheries information available.

Remarks: Only 5 species of *Polydactylus*, with a black shoulder spot and most of the upper pectoral fin rays branched, are recognized all over world (Motomura and Iwatsuki, 2001a), all from Indian Ocean. Of them, only *P. microstomus* is known to have 5 free pectoral filaments and others are having 6 or 7. This has been earlier recorded from India by Rajapandian and Murthy (1966) and Dhandapani and Mishra (1993).

7. ***Polydactylus mullani*** (Hora, 1926)

(Plate III, Figure 2)

1926. *Polynemus sextarius mullani* Hora, *Rec. Indian Mus.*, 27(4): 453 (Bombay, India).

1970. *Polynemus heptadactylus*, Kagwade, *Bull. Cent. Mar. Fish. Res. Inst.*, (18): 19.

1984. *Polydactylus heptadactylus*, Talwar and Kacker, *Com. Sea Fish. India*: 747.

2004. *Polydactylus mullani*, Motomura, *FAO Species Catalogue*, 3: 57.

Common Names : Arabian blackspot threadfin ... English; Shiri ... Gujarat; Shende ... Maharashtra.

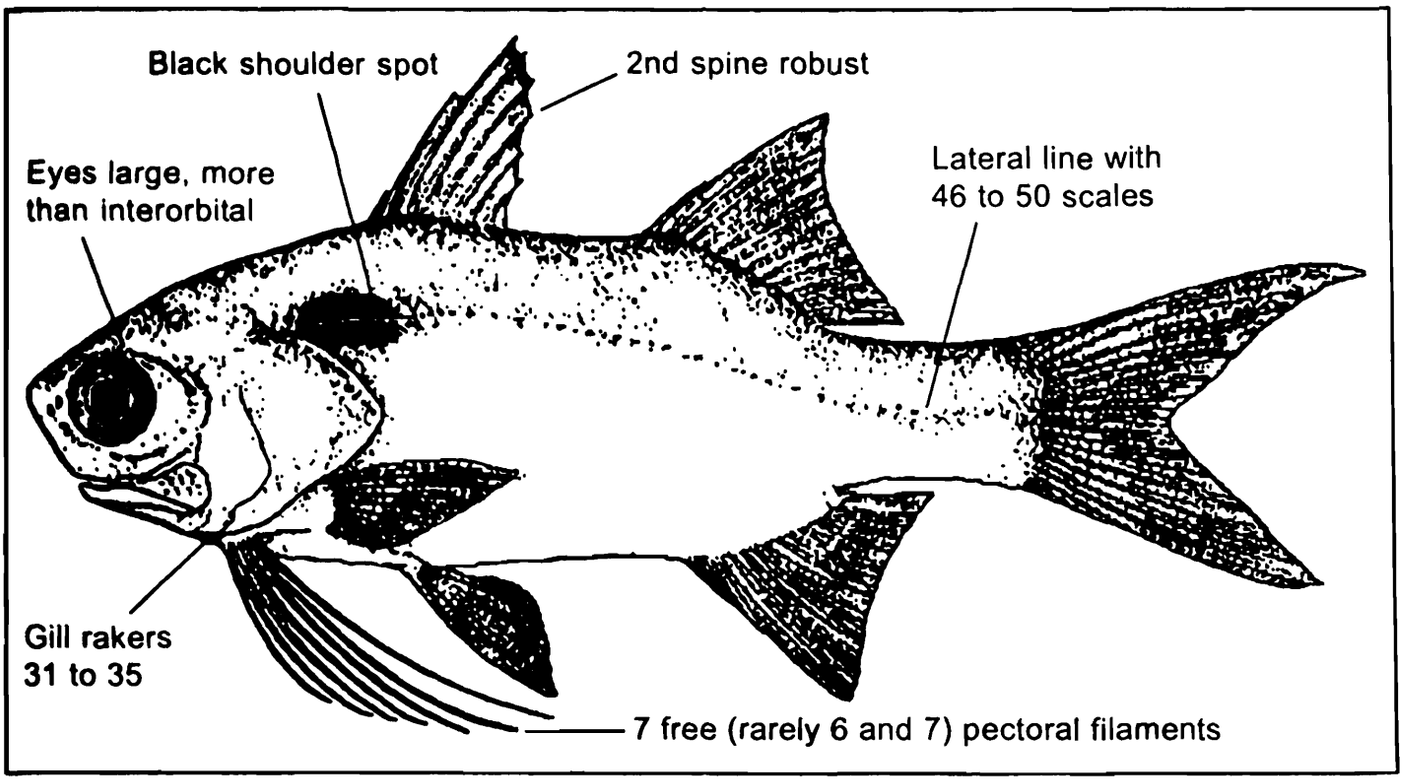

Figure 9 : *Polydactylus mullani* (Hora)

Type: Holotype (ZSI F-10747, 157 mm) at Zoological Survey of India, Kolkata.

Material examined : 1 ex, 157 mm, ZSI F-10747 (Holotype), Bombay (Mumbai), no date, Prof. J.P. Mullan; 1 ex., 106 mm, ZSI F-10748 (Paratype), Bombay, no date, Prof. J.P. Mullan; 1 ex., 97 mm, ZSI F-10749 (Paratype), Bombay, no date, Prof. J.P. Mullan; 1 ex., 92 mm, ZSI F-10750 (Paratype), Bombay, no date, Prof. J.P. Mullan; 10 exs., 131-143 mm, ZSI F-10499/2, Versova, Mumbai, Jan. 2009, S.K. Chakraborty.

Diagnostic characters : Body moderately deep, compressed. Its depth at first dorsal fin origin 2.9 to 3.6 in standard length. Snout conical, pointed. Length of upper jaw little less than half of head length. Lip on lower jaw well developed. Width of tooth band on jaws more than the space separating tooth bands on opposing premaxilla at symphysis. Eyes larger, about 4 times in head length. Interorbital space less than eye diameter. Total gill rakers 31 to 35 on first arch. First dorsal fin with 8 spines, base of second spine distinctly thicker than others. Second dorsal fin with one spine and 12 or 13 rays. Anal fin with 3 spines and 11 or 12 rays. Pectoral fin inserted well below midline of body. Upper pectoral fin rays all branched except for upper 1 or 2; free filaments usually 7 or sometimes asymmetrically 6 and 7, the longest filament reaching the level between tips of pectoral fin to anal fin origin. Caudal fin deeply forked; lobes not filamentous. Lateral line simple, extending to upper end of lower caudal lobe; contains 46 to 50 pored scales. Transverse scale rows 5 to 7 above and 9 or 10 below lateral line. Air bladder simple, well developed.

Colour : Body yellowish silver. A large black shoulder spot anteriorly on lateral line behind head. Posterior margins of median fins blackish. Pectoral fin with scattered melanophores; base of pectoral filaments white, darker posteriorly.

Size : Attains maximum 19 cm in standard length (Motomura and Iwatsuki, 2001a).

Distribution : Gujarat and Maharashtra coasts of India, and Pakistan.

Habitat and Biology : Inhabit costal waters up to 115 m depth. It feeds mainly on shrimps and small fishes. Hermaphrodites are common among the population.

Fisheries : Contribute considerably to fisheries along northern west coast of India (Ratnagiri-Saurastra coast). It is a common species in its range and found throughout the year from the trawling grounds. Fisheries data whatever available is not species specific, as the identification of this species is confused with *F. similis*.

Remarks : The species with 7 free pectoral filaments referred as *Polydactylus heptadactylus* in Talwar and Kacker (1984) is in fact not one but represent two distinct species, *viz., Filimanus similis* and *Polydactylus mullani*. As it has already been discussed earlier that *Filimanus heptadactyla* is not available along Indian coast, and the specimens, having a combination of characters of 7 free pectoral filaments, narrow tooth band on jaws with a wide gape (twice the width of tooth band) between the tooth bands at symphysis, usually 42 to 47 gill rakers and no black shoulder spot, are referable to *Filimanus similis*. *Polydactylus mullani* was originally suggested by Hora (1926) as a variety of *Polynemus sextarius* recognizing its similarity with the latter except for having 7 or asymmetrically 6 and 7 free pectoral fin rays. However, the description provided was inadequate. Kagwade (1970) recorded specimens with 7 free pectoral rays on each side and a large black shoulder spot as *Polynemus heptadactylus*, although he stated that it is different from the original description. Marathe and Bal (1958) studied the axial skeletons of polynemids from Bombay waters and found no difference between *P. heptadactylus*, *P. sextarius* and *P. sextarius* var. *mullani*. Obviously, *P. heptadactylus* of Marathe and Bal (1958) is referable to *Polydactylus* species, *i.e. P. mullani* but not to a *Filimanus* species, *i.e. F. heptadactyla*. Motomura and Iwatsuki (2001a) and Motomura (2002) recognize the validity of this species and distinguished it from other *Polydactylus* species having black shoulder spot and upper pectoral fin rays branched.

8. ***Polydactylus plebeius*** (Broussonet, 1782)

(Plate IV, Figure 1)

1782. *Polynemus plebeius* Broussonet, *Ichthyologia*: twenty-seventh page, eighth plate, seventh figure (no pagination) (Tahiti, Society Islands and Thana Island, New Hebrides Islands, Vanuatu); Day, 1876, *Fish. India*, (2): 179; Day, 1889, *Fauna Br. India Fish*, 2: 106; Kagwade, 1970, *Bull. Cent. Mar. Fish. Res. Inst.*, (18): 44.

1922. ***Polynemus plebejus***, Weber and Beaufort, *Fish. Indo-Aust. Archip.*, 4: 202 (possibly a typographical error in species name).

1984. ***Polydactylus plebeius***, Talwar and Kacker, *Com. Sea Fish. India*: 751; Motomura, 2004, *FAO Species Catalogue*, 3: 68.

Common Names : Striped threadfin ... English; Vahmeenu ... Karnataka; Mookan, Thamuthi ... Kerala; Pole Kala, Barmeen ... Tamil Nadu; Boddumaga ... Andhra Pradesh.

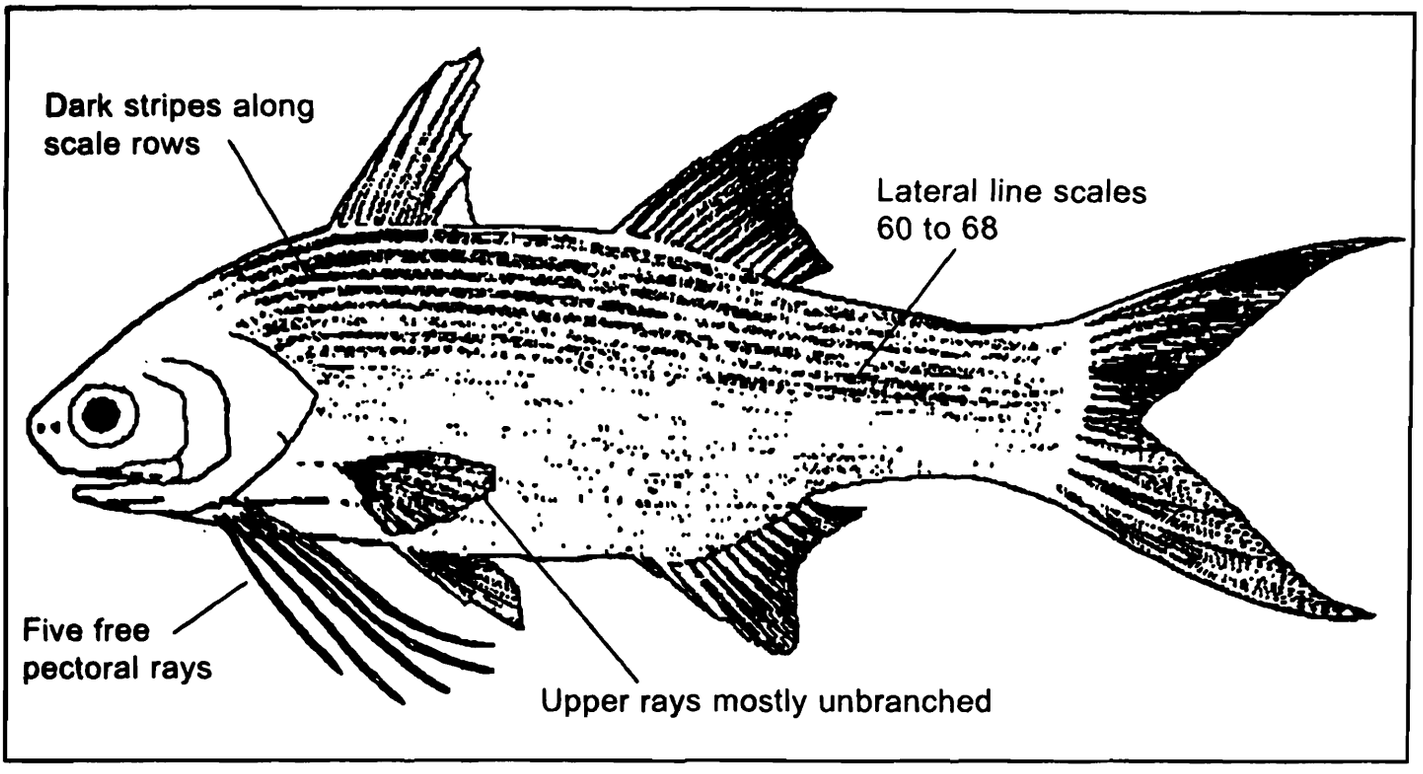

Figure 10 : *Polydactylus plebeius* (Broussonet)

Type : Original types not known. Neotype (FMNH 108655, 88 mm) at Field Museum of Natural History, Chicago is from Tahiti, Society Islands and designated by Motomura, Iwatsuki and Yoshino (2001).

Material examined : 2 exs., 169-171 mm, MBS/ZSI F-2647 & 2648, Paradeep, 30-xi-1992, M. Srinivasan & Party; 1 ex., 212 mm, MBS/ZSI F-2729, Chandrabhaga, 05-xii-1992, M. Srinivasan & party; 1 ex., 154 mm, ANRS/ZSI 1917, Car Nicobar Is., 19-ix-1988, H.S. Mehta & party; 1 ex., 143 mm, ANRS/ZSI 1437, Port Blair, 31-x-1989, H.S. Mehta & party; 1 ex., 215 mm, ANRS/ZSI 1916, Rangat Bay, 19-viii-1991, K. Chandra & party; 1 ex., 190 mm, ZSI F-1374/2 (labeled as *P. indicus*), Keechankuppam, nr. Nagapatinam, 08-ii-1957, A.G.K. Menon; 1 ex., 185 mm, ZSI F-2131/1, off Elephant point, Orissa coast, no date, S.T. Golden Crown; 2 exs., 86-93 mm, ZSI F-299/2, Puri, no date, B. Prasad; 1 ex., 177 mm, ZSI F-1359/2, Sonakuppam, Cuddalore, Jan. 1957, A.G.K. Menon.

Diagnostic characters : Body oblong, slightly compressed. Body depth at first dorsal fin origin 3.1 to 4.0 in standard length. Snout pointed. Upper jaw length about half of head. Lip on lower jaw well developed. Width of tooth band on jaws more than the space separating tooth bands on opposing premaxilla at symphysis. Eyes larger, about 5 times in head length. Posterior margin of preopercle serrated. Total gill rakers 24 to 32 on first arch. First dorsal fin with 8 spines, all spines of similar thickness. Second dorsal fin with one spine and 12 or 13 rays. Anal fin with 3 spines and 11 or 12 rays. Pectoral fin inserted well below midline of body. Upper pectoral fin rays all unbranched; free pectoral filaments 5, longest filament not extending to pelvic fin tip. Caudal fin deeply forked; lobes not filamentous. Lateral line simple, extending to upper end of lower caudal lobe; contains 60 to 68 pored scales. Transverse scale rows 8 or 9 above and 12 or 13 below lateral line. Air bladder simple, well developed.

Colour : Head and body grayish-silvery dorsally and lighter silvery on sides and white ventrally. Dorsal and caudal fins pale with blackish posterior margin. Pectoral fin blackish; free pectoral filaments white. Anal and pelvic fins white anteriorly and yellowish posteriorly. Body with prominent dark stripes along scale rows, prominent above lateral line.

Size : Grows to maximum 45 cm standard length (Feltes, 2001).

Distribution : Widely distributed in Indo-West Pacific, from South Africa in west to French Polynesia in east, Japan in north to New South Wales in south. Not recorded from Red Sea and Persian Gulf.

Habitat and Biology : Inhabit shallow coastal waters with sandy or muddy bottoms to 120 m depth off shore; enters estuaries. Juveniles commonly found near river mouths. It feeds on crustaceans and even small fishes.

Fisheries : One of the important commercial polynemid in Indian waters but does not contribute significantly to fisheries. Captured by trawls, gill nets, handlines and shore seines.

Remarks : The other species known to share the characters such as presence of 5 free pectoral filaments and several prominent dark stripes along longitudinal scale rows above and below lateral line are *P. bifurcus* described by Motomura, Kimura and Iwatsuki (2001) and *P. siamensis* described by Motomura, Iwatsuki and Yashino (2001). While *P. bifurcus* is having the lateral line bifurcated on caudal fin base and second spine of first dorsal fin more robust than other spines, *P. siamensis* resemble *P. plebeius* in many count but differs in having 54 to 58 lateral line scales, lateral transverse scales 7/10 or 11 and 22 to 24 gill rakers on first arch. *P. bifurcus* is reported from Indonesia and *P. siamensis* from Thailand, whereas *P. plebeius* is having a wider distribution (Motomura, 2004). This is also similar with *P. sexfilis* in almost all accounts except for 6 free pectoral filaments in the latter species. However, although counts and proportional

measurements are overlapping, Motomura, Iwatsuki and Kimura (2001) observed differences between these two species as given in the table below.

Table 1 : Comparison of overlapping characters of *P. plebeius* and *P. sexfilis.*

Characters	*P. plebeius*	*P. sexfilis*
Free pectoral filaments	5	6
Upper pectoral fin rays	16 to 18 (mode 17)	15 or 16 (mode 16)
Gill rakers on first arch	24 to 32 (mode 26)	27 to 31 (mode 30)
Second dorsal fin height / SL	19 to 28% (mean 22%)	21 to 30% (mean 26%)
Anal fin height / SL	17 to 23% (mean 19%)	20 to 26% (mean 23%)
Upper lobe of caudal fin / SL	33 to 44% (mean 39%)	39 to 48% (mean 44%)
Lower lobe of caudal fin / SL	30 to 41% (mean 36%)	37 to 46% (mean 41%)

9. ***Polydactylus sexfilis*** (Valenciennes, 1831)

(Plate IV, Figure 2)

1831. *Polynemus sexfilis* Valenciennes *in* Cuvier and Valenciennes, *Hist. nat. Poiss.*, 7: 515 (Mauritius).

1993. *Polydactylus kuru* (Bleeker), Dhandapani and Mishra, *J. Andaman Sci. Assoc.*, 9 (1 & 2): 61 (Great Nicobar).

2004. *Polydactylus sexfilis*, Motomura, *FAO Species Catalogue*, 3: 72.

Common Names : Pacific threadfin, Sixfinger threadfin ... English;

Type : Original type not known. Lectotype (MNHN 9731, 265 mm) at Muséum National d'Histoire Naturelle, Paris is designated by Motomura, Iwatsuki and Kimura (2001).

Material examined : 2 exs., 170-184 mm, MBS/ZSI F-787 & 788 (labeled as *P. kuru*), Campbell Bay, 23/29-x-1992, Dhandapani & party.

Diagnostic characters : Body oblong, slightly compressed. Body depth at first dorsal fin origin 3.1 to 3.8 in standard length. Snout pointed. Upper jaw length about half of head or less. Lip on lower jaw well developed. Width of tooth band on jaws more than the space separating tooth bands on opposing premaxilla at symphysis. Eyes larger, about 6 times in head length. Posterir margin of preopercle serrated. Total gill rakers 27 to 31 on first arch. First dorsal fin with 8 spines, all spines of similar thickness. Second dorsal fin with one spine and 12 or 13 rays. Anal fin with 3 spines and 11 or 12 rays. Pectoral fin inserted well below midline of body. Upper pectoral fin rays all unbranched; free pectoral

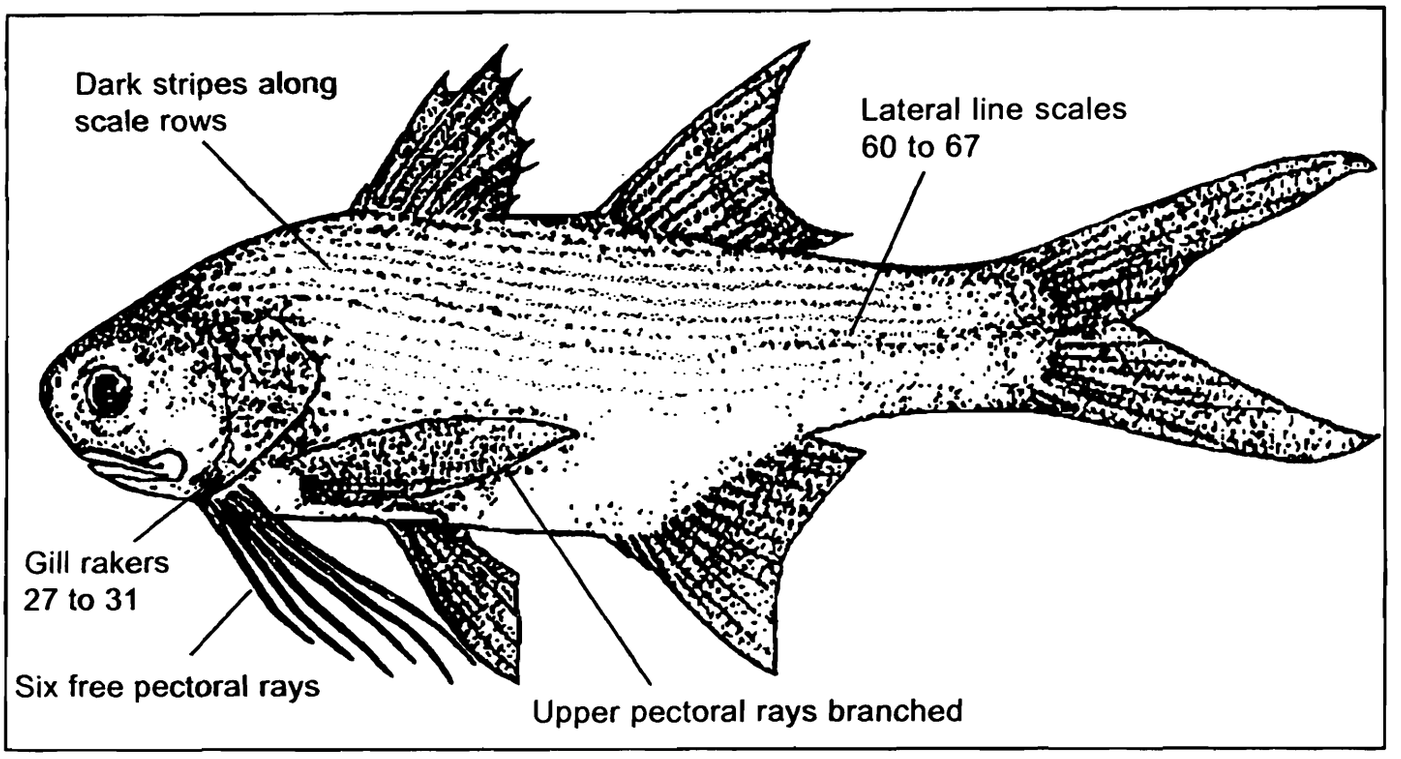

Figure 11 : *Polydactylus sexfilis* (Valenciennes)

filaments 6, longest filament not extending beyond pelvic fin tip. Caudal fin deeply forked; lobes not filamentous. Lateral line simple, extending to upper end of lower caudal lobe; contains 60 to 67 pored scales. Transverse scale rows 8 to 10 above and 12 to 14 below lateral line. Air bladder simple, well developed.

Colour : Head and body silvery brown dorsally and silvery ventrally. First dorsal fin grayish black; last ray of second dorsal fin white, anterior part grey. Pectoral fin grey at base, darker posteriorly; bases of free pectoral filaments white, grayish black posteriorly. Anal fin grey with the last ray white. Body with distinct dark stripes along scale rows, prominent above lateral line.

Size : Known to attain a maximum of 45 cm in standard length (Motomura and Senou, 2002).

Distribution : Widely distributed in Indo-Pacific, near oceanic islands.

Habitat and Biology : Inhabit shallow waters with sandy or rocky substratum, in lagoons and near reef areas in the vicinity of oceanic islands. Feeds on crustaceans and small fishes. Males known to mature at 20 to 25 cm fork length, transforming to functional female at 30 to 40 cm fork length, following a hermaphroditic stage.

Fisheries : A good potential species for commercial fishery, but no information from Indian waters.

Remarks : Day (1876) described *P. sexfilis* as having 46 lateral line scales and golden in colour, while stating not to have recognized *F. xanthonemus* in India but considered its availability as it has been described from Pondicherry, India. It seems he must have confused his 6 filamented specimens of *F. xanthonemus* for *P. sexfilis*, since no gillraker count was taken and all the specimens were treated under one genus. Menon and Babu Rao (1984) also have not dealt with *F. xanthonemus* and probably have mistaken all their *F. xanthonemus* specimens for *P. sexfilis*. Their work does not provide gill raker and lateral line scale counts. Talwar and Kacker (1984) described *Polydactylus kuru* (Bleeker), with *P. sexfilis* Day as its synonym ignoring lateral line scale counts, possibly without examining any specimen. Occurrence of this species along subcontinental coastal waters seems to be remote, since they usually inhabit reef areas in the vicinity of oceanic islands. However, a specimen at Museum National d'Histoire Naturelle, Paris (MNHN A-3023, 154 mm, collected by Leschenault) is stated to be from Pondicherry, India (Motomura, Iwâtsuki and Kimura, 2001) and two examples at Swedish Museum of Natural History Stockholm (NRM 24931) is from Colombo, Sri Lanka. We could only examine specimens from Great Nicobar Island to determine as the species from India and none from mainland coast. The only specimen of *P. sexfilis* (ZSI F-10495/2, 62 mm) in the National Zoological Collection, ZSI, Kolkata is from Fehendu Is., Maldives.

10. ***Polydactylus sextarius*** (Bloch and Schneider, 1801)

(Plate III, Figure 3)

1801. *Polynemus sextarius* Bloch and Schneider, *Syst. Ichth.*: 18, pl. 4 (Tranquebar, Tamil Nadu, India); Day, 1876, *Fish. India*, (2): 177; Day. 1889, *Fauna Br. India Fish*, 2: 104; Weber and Beaufort, 1922, *Fish. Indo-Aust. Archip.*, 4: 210; Kagwade, 1970, *Bull. Cent. Mar. Fish. Res. Inst.*, (18): 41.

1984. *Polydactylus sextarius*, Talwar and Kacker, *Com. Sea Fish. India*: 752; Talwar and Jhingran, 1991, *Inland Fishes of India*, 2: 910; Motomura, 2004, *FAO Species Catalogue*, 3: 74.

Common Names : Blackspot threadfin ... English; Kutli Kala ... Tamil Nadu;

Type : Holotype (ZMB 565, 125 mm) at Museum für Naturkunde, Berlin.

Material examined : 2 exs., 63-68 mm, MBS/ZSI F-2688 & 2689, False Point, 01-xii-92, M. Srinivasan & party; 1 ex., 75 mm, MBS/ZSI F-2967, Gopalpur, 24-xi-1992, M. Srinivasan & party; 2 exs., 120-121 mm, EBS/ZSI F-2787 & 2820, Jilagaladindi, 12-ii-1998, S. Krishnan & party; 1 ex., 98 mm, EBS/ZSI F-3273, Manganapudi, 08-i-2000, C.A.N. Rao & party; 1 ex., 120 mm, ZSI F-1368/2, Keechankuppam, 3 miles S. of Nagapatinam, 08-ii-1957, A.G.K. Menon; 1 ex., 140 mm, ZSI F-951, Madras, no date, purchased from F. Day; 1 ex., 106 mm, ZSI F-953, Madras, no date, purchased from F. Day; 1 ex., 122 mm, ZSI F-11590, Sandheads, no date, R.M. Daly; 1 ex., 116 mm, ZSI F-12145, Orissa coast, no date, Marine Survey; 1 ex., 115 mm, ZSI F-12213, Orissa

coast, no date, Marine Survey; 1 ex., 110 mm, ZSI F-12327, Orissa coast, no date, Marine Survey; 1 ex., 133 mm, ZSI F-12335, Orissa coast, no date, Marine Survey; 1 ex., 120 mm, ZSI F-10501/2, off Elephant point, Orissa coast, no date, S.T. Golden Crown; 2 exs., 123-135 mm, ZSI F-1544/2, Tranquebar, 03-iii-1958, A.G.K. Menon; 1 ex., 81 mm, ZSI F-950, Madras, no date, purchased from F. Day (original of pl. 42, fig. 6 of Day, 1876); 1 ex., 105 mm, ZSI F-1373/2, Veerampatnam, Pondychery, 22-xi-1956, A.G.K. Menon; 1 ex., 112 mm, ZSI F-1365/2, Kilingimedu, nr. Karaikal, 03-ii-1957, A.G.K. Menon & party; 5 exs., 90-125 mm, ZSI F-1366/2, Tranquebar, 30-i-1957, A.G.K. Menon & party.

Diagnostic characters : Body oblong, slightly compressed. Its depth at first dorsal fin origin 2.8 to 3.4 in standard length. Snout conical, pointed. Length of upper jaw little less than half of head length. Lip on lower jaw well developed. Width of tooth band on jaws more than the space separating tooth bands on opposing premaxilla at symphysis. Eyes

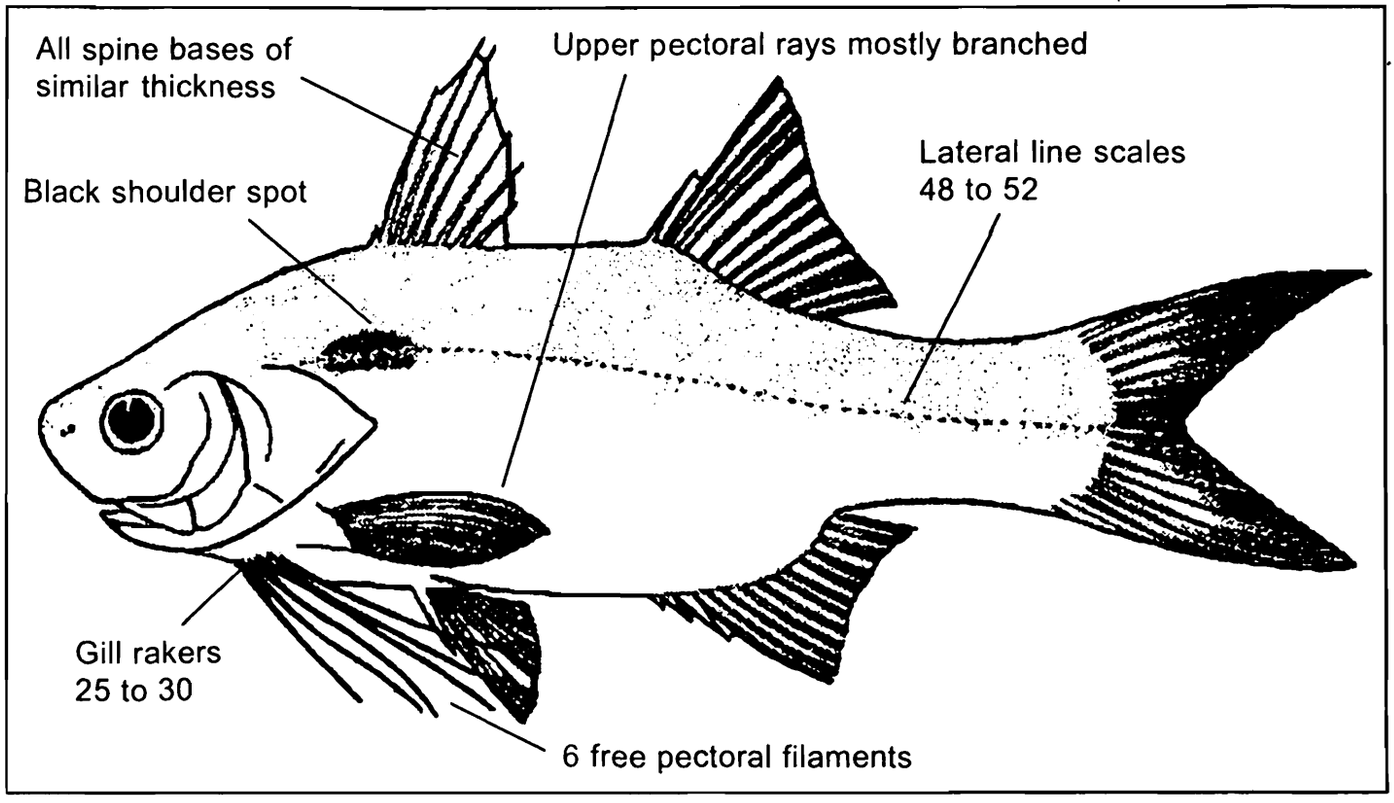

Figure 12 : *Polydcatylus sextarius* (Bloch & Schneider)

larger, about 5 times in head length. Interorbital space less than eye diameter. Total gill rakers 25 to 30 on first arch. First dorsal fin with 8 spines, base of all spines of similar thickness. Second dorsal fin with one spine and 12 or 13 rays. Anal fin with 3 spines and 11 to 13 rays. Pectoral fin inserted well below midline of body. Upper pectoral fin rays all branched except for upper 1 or 2; free filaments 6, the longest filament not reaching to posterior tip of upper pectoral fin. Caudal fin deeply forked; lobes not filamentous.

Lateral line simple, extending to upper end of lower caudal lobe; contains 45 to 51 pored **scales. Transverse scale rows** 5 or 6 above and 8 to 11 below lateral line. Air bladder small, **atrophied**.

Colour : Body yellowish silver. A distinct black shoulder spot anteriorly on lateral **line.** Posterior margin of dorsal and caudal fins blackish. Anal fin darker with a white **posterior tip.** Pectoral fin with scattered melanophores, free filaments whitish.

Size : Attains 17 cm in standard length (Motomuta and Iwatsuki, 2001a).

Distribution : South west coast of India to Papua New Guinea, and northward to Japan.

Habitat and Biology : Inhabit coastal waters with sandy or muddy bottoms up to **70 m depth.** Feeds on small crustaceans, small fishes and polychaetes. Hermaphrodites **are common** in a population.

Fisheries : An important constituent of polynemid fishery of Bay of Bengal.

Remarks : Talwar and Kacker (1984) are erroneous in placing *Polynemus sextarius mullani* Hora, a distinct species, as synonym of this species. Two other species recently described by Motomura and Iwatsuki (2001a), *P. malagasyensis* and *P. percicus*, closely resemble *P. sextarius* in having black shoulder spot anteriorly on lateral line and base of all spines of dorsal fin of similar thickness, but differs in higher gill raker count (29 to 35 gill rakers), longer second spine of dorsal fin (about 14 times in standard length vs about 17 times in *sextarius*) and in having well developed air bladder. Further, *P. malagasyensis* is known from east coast of Africa and Madagascar and *P. percicus*, from Persian Gulf.

Genus ***Polynemus*** Linnaeus, 1758

1758. *Polynemus* Linnaeus, *Systema Nature*, 1 (ed. 10): 217 (type-species: *Polynemus paradiseus* Linnaeus).

Diagnoses : Body elongate, compressed posteriorly. Eyes small, 1.3 times or more in snout. Adipose eyelid poorly developed. Snout conical. Lip on lower jaw well developed. Width of tooth bands on jaws more than the space separating them on opposing premaxilla. Posterior margin of preopercle serrated. Basisphenoid absent; sphenotics not visible dorsally between anterior margins of parietal and pterotic bones. Total gill rakers 23 to 34 (30 to 34 in Indian species) on first arch. Pectoral fin insertion near midline of body. Free pectoral filaments usually 7 (13 to 16 in two species, not found in India); very long, some extending beyond tip of caudal fin. Caudal fin deeply forked, lobes pointed but not filamentous. Pored lateral line scales 66 to 109. Air bladder absent (present in some). Body usually with typical yellowish colouration.

Nine species and subspecies are known around the world, only one species inhabit Indian waters. Report of *Polynemus dubius* (as *P. longipectoralis*) from India is erroneous.

11. ***Polynemus paradiseus*** Linnaeus, 1758

(Plate I, Figure 3)

1758. *Polynemus paradiseus* Linnaeus, *Systema Naturae*, 1 (ed. 10): 317 (Bengal, India, based on a figure and description of "Mango-fish" of Edwards, 1743-1751); Day, 1876, *Fish India*, (2): 176, pl. 42, fig. 4; Day, 1889, *Fauna Br. India*, 2: 102; Kagwade, 1970, *Bull. Cent. Mar. Fish. Res. Inst.*, (18): 35.

1822. *Polynemus risua* Hamilton, *Fish. Ganges*: 228, 381 (Lukhipur, India);

1822. *Polynemus toposui* Hamilton, *Fish. Ganges*: 232, 381 (estuary of Ganges river, West Bengal, India);

1822. *Polynemus aureus* Hamilton, *Fish. Ganges*: 232, 381 (Calcutta, West Bengal, India);

1829. *Polynemus longifilis* Cuvier *in* Cuvier and Valenciennes, *Hist. nat. Poiss.*, 3: 365 (Pondicherry and Ganges River, India; ? Manila, Philippines);

1991. *Polynemus longipectoralis* (not Weber and de Beaufort): Talwar and Jhingran, *Inland Fishes of India*, 2: 912 (Hooghly estuary).

Common Names: Paradise threadfin ... English; Topsya, Topsee ... West Bengal; Dodywa-rawas ... Maharastra.

Type: Original types not known. Neotype (NRM 47529, 198 mm) at Swedish Museum of Natural History, Stockholm is from Gariahat, Calcutta, designated by Motomura *et al.* (2002a).

Material examined: 2 exs., 115-142 mm, MBS/ZSI F-2154 & 2155, Digha, 31-x-1992, J.T. Jothinayagam & party; 3 exs., 95-100 mm, ZSI F-4695/2, Hooghly R. at Paranpur, 8 miles down Somai market, 06-xii-1953, Hooghly Survey; 7 exs., 51-137 mm, R. No. 943 to 949, Calcutta, no date, purchased from F. Day; 1 ex., 95 mm, ZSI F-4975/2, Hooghly R. nr. Uporhat, no other data; 2 exs., 101-103 mm, ZSI F-4680/2, Hooghly R. at Ramnagar, 09-xii-1953, Hooghly Survey; 1 ex., 153 mm, Cat. 155, Calcutta, no date, Asiatic Society of Bengal; 3 exs., 103-119 mm, ZSI F-4979/2, Frasergunj, 09-xii-1965, K.V. Surya Rao & S. Ahmed; 3 exs., 162-197 mm, ZSI F-6012 to 6014, off Gopalpur, 25-28 fathoms, 23-27-ix-1909, S.T. Golden Crown; 2 exs., 75-82 mm, ZSI F-4935/2, Hooghly R. nr. Nawadwipghat, Sept. 1954, Hooghly R. Survey party; 2 exs., 118-124 mm, ZSI F-7860/2 (labeled as *P. longipectoralis*), Bakkhali, Hooghly River, 30-i-1981, P. Mukherjee & T.K. Chatterjee; 15 exs., 82-120 mm, Unregistered, Hooghly estuary, no other data (labeled as *P. longipectoralis*).

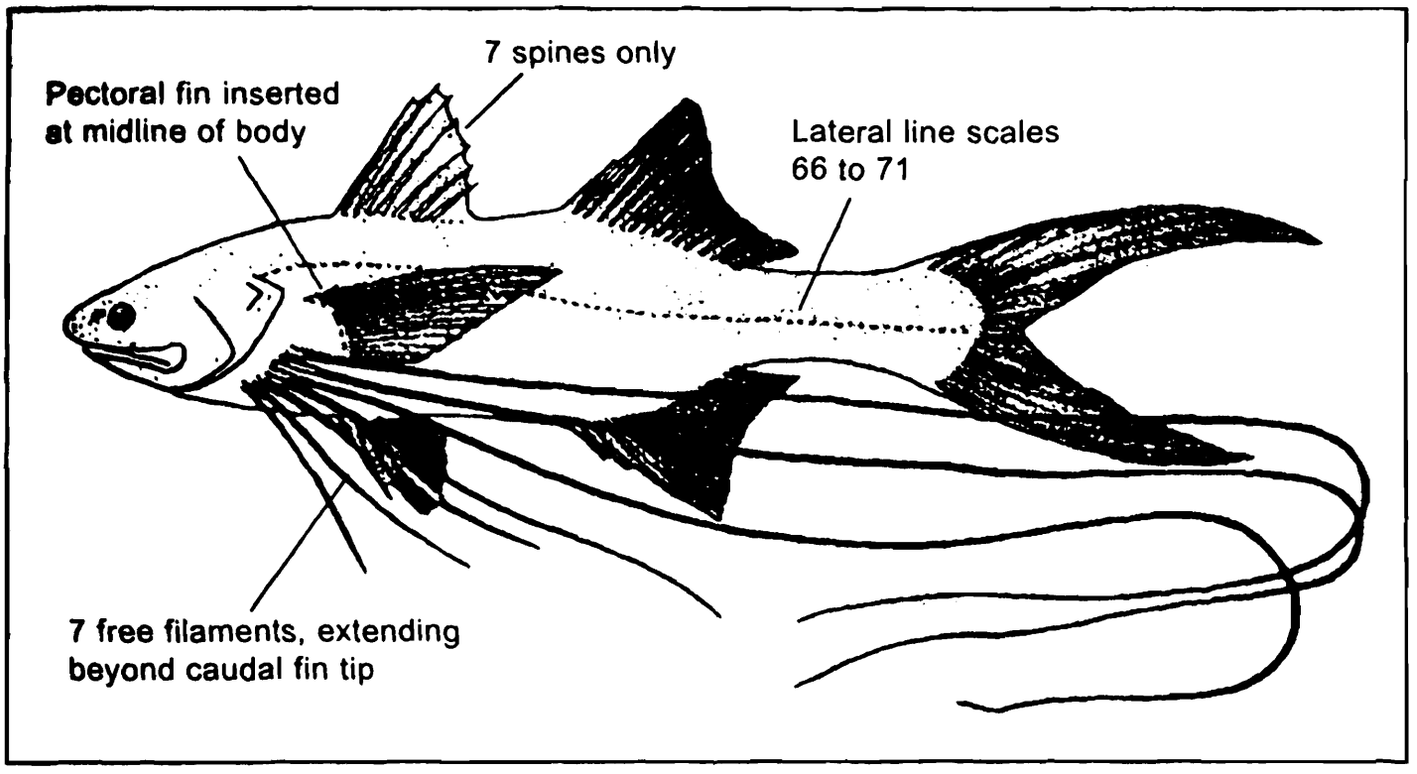

Figure 13 : *Polynemus paradiseus* Linnaeus

Diagnostic characters : Body elongate; its depth at first dorsal fin origin 3.5 to 5.0 times in standard length. Snout conical. Upper jaw length about half of head length, distinctly less than length of pectoral fin base including free filaments. Lower lip well developed. Tooth bands broad, its width in jaws more than the space separating them in opposing premaxilla at symphysis; vomer toothed. Posterior margin of preopercle serrated. Total gill rakers on first arch 30 to 34. First dorsal fin with 7 spines and second dorsal fin with one spine and 14 to 16 rays. Anal fin with 2 spines and 11 to 13 rays. Anal fin base less than second dorsal fin base. Pectoral fin inserted high, near midline of body. Pectoral fin with 15 to 18 unbranched upper rays and 7 free filaments. Pectoral filaments long, two or three of them extending beyond tips of caudal fin lobes. Caudal fin deeply forked; lobes not filamentous. Lateral line with 66 to 71 pored scales, extending to mid distal margin of caudal fin. Lateral transverse scales 6 or 7 rows above and 10 to 12 rows below lateral line. Air bladder absent.

Colour : Greyish-black dorsally on head and body; yellowish ventrally. Pectoral filaments vivid yellow at base and whitish yellow posteriorly. Fins yellowish.

Size : Attains maximum up to 23 cm standard length (Menon and Babu Rao, 1984).

Distribution : From west coast of India, Sri Lanka, Bangladesh, Myanmar, to Thailand.

Habitat and Biology : Inhabit estuaries and shallow inshore waters with sandy or muddy bottoms up to 27 m depth, enters fresh water for breeding (David, 1954). Feeds on crustaceans, small fishes and other benthic animals. Spawns during April to September months. Males mature at 11 cm and females at 12 cm total length (Mukhopadhyay *et al.*, 1995). Air bladder present in larval stage, but atrophying in juveniles (Jones and Menon, 1953).

Fisheries : Peak fishing period lies between May to October, but available throughout the year. Caught by trawl netting in shallow waters of continental shelf along West Bengal and Andhra coast.

Remarks : Motomura (2003) regarded *P. longipectoralis* as a junior synonym of *P. dubius* Bleeker after examining the holotype of the former. Talwar and Kacker (1984) reported the occurrence of *P. longipectoralis* Weber and Beaufort in the Hooghly estuary in the "key to species" based on an unpublished paper. Talwar and Jhingran (1991) provided the description of that species. The Indian record of *P. longipectoralis* (= *P. dubius*) is based on its distinction from *P. paradiseus* by the number of pectoral filaments (first two or three) extending beyond tip of caudal fin (Talwar and Kacker, 1984) following Fischer and Whitehead (1974). The fragile filaments may be broken before determination process started and so, that single character can not be considered as the only identifying feature. *P. dubius* is distinguished in having VIII spines in first dorsal fin, III spines in anal fin and about 75 pored lateral line scales (Motomura, 2004). Although Talwar and Jhingran (1991) mentioned VIII spines in first dorsal fin, may have not given importance to this character, but simply followed Weber and de Beaufort (1922) while giving the description. All the specimens, including several ones in fish market, examined by us were having VII spines in first dorsal fin; II spines in anal fin and about 70 pored lateral line scales and hence determined as *P. paradiseus* Linnaeus (Mishra and Barman, 2010). Motomura *et al.* (2002) discussed the synonyms in detail. So, *P. paradiseus* is the only species belonging to the genus *Polynemus* Linnaeus occurring along Indian coast.

A specimen with 8 free pectoral filaments on each side, as stated in Talwar and Kacker (1984) was traced in the National Zoological Collection, ZSI, Kolkata (ZSI F-2284/2, 99 mm) (Plate IV, Figure 3b). On examination, it was found to have 7 spines in first dorsal fin; 2 spines in anal fin; about 70 pored lateral line scales; 7 scale rows above and 11 scale rows below lateral line; 32 gill rakers on first arch and vomer with teeth in a crescentic patch. These characters are well within the ranges of *P. paradiseus*. Another specimen (FF-1103, 110 mm) is also having asymmetrically 9 free pectoral rays on left side and 8 rays on right side. We refrained from raising new taxon for it considering that as in *F. xanthonema*, it may be possible that *P. paradiseus* is also having an extra pectoral filament at times or this specimen may be an abnormal one. A similar asymmetrical free

pectoral fin ray count is also found in *E. tetradactylum* (Plate IV, Figure 3a). On the other hand, *P. plebeius* and *P. sexfilis* are apparently similar in several accounts and can only be differentiated by having 5 or 6 free pectoral filaments. A DNA mapping can provide further information towards clear distinction.

DISCUSSION

In the State of Art Report on fish faunal resources of India, Talwar (1991) stated that the family Polynemidae is represented by 12 species in Indian waters referring to Talwar and Kacker (1984). Those were namely *Eleutheronema tetradactylum* (Shaw), *Polydactylus heptadactylus* (Cuvier), *P. indicus* (Shaw), *P. microstoma* (Bleeker), *P. kuru* (Bleeker) (= *P. sexfilis* (Valenciennes)), *P. plebeius* (Broussonet), *P. sextarius* (Bloch and Schneider), *P. xanthonemus* (Valenciennes), *P. sheridani* (Macleay) (= *P. macrochir* (Guntheer)), *Polynemus longipectoralis* Weber and Beaufort (= *P. dubius* Bleeker), *P. paradiseus* Linnaeus and an unnamed *Polynemus* species with 8 free pectoral fin rays. Feltes (1991) described *Filimanus similis* from Indian waters and Mishra and Krishnan (1993) described *Polydactylus konadaensis* from Andhra Pradesh. Later, Rao *et al.* (2000) recorded *Polynemus melanochir* Valenciennes and Mishra and Barman[1] (in press) reported *Filimanus perplexa* Feltes from Nicobar Islands.

E. tetradactylum and the monotypic *L. indicum* (known as *P. indicus*) are two main polynemid fishes that are well distributed along Indian coast and considerably contribute to fisheries. The generic allocation of the latter species is following Motomura and Iwatsuki (2001) by differentiating it from other polynemid genera in having an air bladder with many appendages inserted into lateral walls of abdominal cavity, sphenotics visible dorsally between anterior edges of parietal and pterotic bones and caudal fin lobes produced into filaments.

Polynemus sheridani Macleay is considered as a junior synonym of *Polydactylus macrochir* (Gunther) (Motomura *et al.*, 2000) which have 32 to 35 gill rakers, caudal fin lobes not produced, body colour silvery with golden tinge dorsally and fins yellow and, it is also known to be restricted to northern coast of Australia and southern Papua New Guinea. But in the report of *P. sheridani* from the Bay of Bengal, Girija Kumari *et al.* (1985) described them having 19 gill rakers, filamentous caudal fin lobes and grayish body colour, which goes closer with *L. indicum* (Shaw) (Motomura, 2004). Hence, the possibility of occurrence of *P. macrochir* along Indian coast is ruled out.

Feltes (1991) reviewed the genus *Filimanus* Myers and got it differentiated from the genus *Polydactylus* Lacepede on the basis of dentary characters and position of basisphenoid and prootic bones. Teeth bands on jaws narrow in *Filimanus* with the space separating opposing premaxillary teeth bands at symphysis is twice or more in width of each band while *Polydactylus* have broader bands and very narrow space at symphysis.

Further, when Indian species are concerned, *Polydactylus* are having shorter free pectoral filaments, reaching up to tip of pelvic fin or short and lower gill rakers count, 22 to 35 on first arch, while *Filimanus* have longer free pectoral filaments, reaching almost anal fin origin or beyond and higher gill raker count, 36 to 49 on first arch.

With the above clear differences between *Filimanus* and *Polydactylus*, the records of *P. heptadactulus* from Indian waters were examined. The specimens of Maharastra-Gujarat coast as included in Kagwade (1970) and Talwar and Kacker (1984) with a black shoulder spot are referable to *Polydactylus mullani* (Hora), and in no way closer to any *Filimanus* species. But others, as described in Day (1876) and Menon and Babu Rao (1984) without black spot are referable to *Filimanus*. Feltes (1991) distinguished a new species, *F. similis*, from *F. heptadactyla* in having higher gill raker count (40 to 49 v/s 35 to 41). Several museum specimens labeled as *P. heptadactylus* and fresh specimens from both the coasts of India and from Andaman and Nicobar Islands were examined to find out that they contain 42 to 47 gill rakers, which led us to determine them as *F. similis* Feltes. Hence, it was concluded that *Filimanus heptadactyla* does not occur in Indian waters and our seven filament threadfin fishes are *Filimanus similis*.

Confusions prevailed in determination of *Filimanus xanthonema* Valenciennes in Indian region, for Day (1876) named them as *P. sexfilis* while including *P. xanthonemus* under an erroneous description (Feltes, 1991) and failed to recognize the latter in India. *F. xanthonema* has all upper pectoral fin rays unbranched and so, Talwar and Kacker (1984) were also erroneous in their identification. Based on this Mishra and Krishnan (1993) described *Polydactylus konadaensis*, without considering the differences between *Filimanus* and *Polydactylus*, comparing their specimens with *P. sexfilis* as described by Day (1876). Obviously, further studies by Motomura *et al.* (2001) concluded it to be a junior synonym of *F. xanthonema* (Valenciennes). Further, the description of *P. sexfilis* by Menon and Babu Rao (1984) is incomplete as it does not include necessary key characters. It was stated to have a golden body colour, probably following Day (1876), whereas *P. sexfilis* is similar to *P. plebeius* in colour, *i.e.*, have dusky stripes along scale rows.

Filimanus perplexa Feltes was only recently reported from Great Nicobar Island by Mishra and Barman, 2009. Further, examination of records of *Polynemus melanochir* Valenciennes from Andaman and Nicobar Islands (Rao *et al.*, 2000) found it to be misidentified *F. perplexa*, followed by Bleeker (1849) and Weber and Beaufort (1922) (Mishra and Barman, 2010). Therefore, it is concluded that the genus *Filimanus* Myers is represented by only 3 species, *viz.*, *F. perplexa*, *F. similis* and *F. xanthonema*, in Indian waters.

The genus *Polydactylus* Lacepede is represented by 5 species in Indian waters, three species with a black shoulder spot and branched upper pectoral fin rays, *viz.*,

P. microstomus (Bleeker), *P. mullani* (Hora) and *P. sextarius* (Bloch and Schneider) and two species without shoulder spot and unbranched upper pectoral fin rays, *viz.*, *P. plebeius* (Broussonet) and *P. sexfilis* (Valenciennes). Although, *P. sextarius* var. *mullani* was described by Hora (1926) it was later misidentified as *P. heptadactulus* by Kagwade (1970) and Talwar and Kacker (1984), but Motomura and Iwatsuki (2001a) recognized it as a distinct species. It is rather closer to *P. microstomus* in having thicker second spine of dorsal fin at base than *P. sextarius*, which has all spines of dorsal fin of similar thickness. *P. sexfilis* resemble *P. plebeius* in almost all respect except for differences in free pectoral filament count. Moreover, *P. plebeius* inhabit shallow coastal waters, while *P. sexfilis* is known to occur near reef areas in the vicinity of oceanic islands. As stated earlier, the records of *P. sexfilis* from India as well as *P. kuru* of Talwar and Kacker (1984) are referable to *F. xanthonema* and so, the possible reliable record of this species from India was by Dhandapani and Mishra (1993) from the Great Nicobar Island as *P. kuru* (Bleeker) although a specimen at Museum National d'Histoire Naturelle, Paris (MNHN A-3023) is stated to have been collected from Pondicherry, India. The Australian threadfin, *Polydactylus multiradiatus* (Gunther) have been reported from Godavari estuary (Anon, 2003). We could not examine any specimen of this species. Its occurrence along Indian coast is doubtful and pending verification it is not included here.

Mishra and Barman (2010) have discussed on the occurrence of two *Polynemus* species, *i.e.*, *P. longipectoralis* (= *P. dubius* Bleeker) and *P. melanochir*, the records of which were found to be misidentification. Only *P. paradiseus* Linnaeus is known to occur along Indian coast.

SUMMARY

A cursory survey of literature on polynemid fishes of India and examination of fresh and old specimens reveals that only 11 species belonging to 5 genera occur in Indian waters. The genus *Eleutheronema* Bleeker is represented by only one species *E. tetradactylum* (Shaw). Monotypic *Leptomelanosoma indicum* (Shaw) is well distributed along coasts of India and contribute considerably to polynemid fishery of India. Report of *Polydactylus macrochir* (Gunther) from India (as *Polynemus sheridani* Macleay) is based on misidentified *L. indicum* specimens. The genus *Polynemus* Linnaeus is represented by only one species, *P. paradiseus* Linnaeus. Report of *P. dubius* Bleeker (as *P. longipectoralis* Weber and Beaufort) is also a misidentification where length of the free pectoral filaments is considered as main identifying character. The reports of *Polynemus heptadactylus* Cuvier actually represent two different species, *Filimanus similis* Feltes and *Polydactylus mullani* (Hora). In fact, *Fillinamus heptadactyla* (Cuvier) does not occur in Indian waters. *Filimanus perplexa* Feltes was reported from Andaman and Nicobar Islands as *Polynemus melonochir* Valenciennes. Hence, only 3 species belonging to genus *Filimanus* Myers, *i.e.*, *F. perplexa* Feltes, *F. similis* Feltes and *F. xanthonema* (Valenciennes), do inhabit Indian coast. Most of the

descriptions on *F. xanthonema* in Indian literature were found erroneous and it was wrongly described as *P. sexfilis* (Valenciennes), a species rare in Indian subcontinental coastal waters. The genus *Polydactylus* Lacepede is represented by 5 species in Indian waters, *P. microstomus* (Bleeker), *P. mullani* (Hora) and *P. sextarius* (Bloch and Schneider) having a dark shoulder spot and *P. plebeius* (Broussonet) and *P. sexfilis* (Valenciennes) without shoulder spot.

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REFERENCES

*ANONYMOUS, 2003. Assessment of mangrove degradation and resilience in the Indian subcontinent: the cases of Godavari estuary and south-west Sri Lanka. Final Report ICO-DC : IC18-CT98-0295.

*BLEEKER, P., 1849. Bijdrage tot de kennis der percoiden van den Malayo-Molukschen Archipel. met beschrijying van 22 neiuwe soorten. *Verh. Batav. Genoot. Kunst. Wet.*, **22** : 1-64.

BLOCH, M.E. and Schneider, J.G., 1801. *Systema Ichthyologiae iconibus cx illustratum. Post obiyum auctoris opus incoatum absolvit, correxit, interpolavit J.G. Schneider. Saxo Berolini.* Berlin : ix + 584 pp.

CUVIER, G., 1829. Des Polynemes. *In* Cuvier, G. and Valenciennes, A. (eds.). *Histoire naturelle des Poissions*. F.G. Lavrault, Paris, **3** : 362-397.

DAVID, A., 1954. A preliminary survey of the fish and fisheries of a 5-mile stretch of the Hooghly River near Barrackpore. *Indian J. Fish.*, **1** : 231-250.

DAY, F., 1876. *The fishes of India, Being a Natural History of fishes known to inhabit the seas and freshwaters of India, Burma and Ceylon*. William Dawson & Sons Ltd., London (2) : 169-368.

DHANDAPANI, P. and Mishra, S.S., 1993. New records of marine fishes from Great Nicobar. *J. Andaman Sci. Assoc.*, **9(1 & 2)** : 58-62.

*EDWARDS, G., 1743-1751. *Natural history of uncommon birds, and some other rare and undescribed animals, quadrupeds, reptiles, fishes, insects, etc.*, parts 1-4. College of Physicians, London : 249 pp.

FELTES, R.M., 1991. Revision of the polynemid genus *Filimanus*, with the description of two new species. *Copeia*, **1991(2)** : 302-322.

FELTES, R.M., 2001. Polynemidae, Threadfins. *In*, K.E. Carpenter and V.H. Niem (eds). *FAO species identification guide for fishery purposes – the living marine resources of the western central Pacific.* FAO, Rome, **5** : 3090-3116.

FISCHER, W. and Whitehead, P.J.P., 1974. *FAO species identification sheets for fishery purposes. Eastern Indian Ocean (Fishing Area 57) and Western Central Pacific (Fishing Area 71).* FAO, Rome, vol. **3** : page var.

GIRIJA KUMARI, S., Ratnamala, B. and Seshagiri-Rao, B.V., 1985. A new record of threadfin, *Polynemus sheridani* Macleay from India. *Matsya*, **9-10** : 196-198.

HAMILTON, F., 1822. *An account of the fishes found in the River Ganges and its branches.* Archibald Constable and Co., London: vii + 405 pp.

HIDA, T.S., 1967. The distribution and biology of polynemids caught by bottom trawling in Indian Seas by the R/V Anton Bruun, 1963. *J. mar. biol. Assoc. India*, **9(2)** : 281-299.

HORA, S.L., 1926. Notes on the fishes in the Indian Museum. IX. On a new variety of *Polynemus sextarius* Bl. & Schneider. *Rec. Indian Mus.*, **27(4)** : 453-454.

JONES, S, and Menon, P.M.G., 1953. Notes on the breeding habits and developmental stages of some estuarine fishes. *J. Zool. Soc. India.*, **5(2)** : 255-267.

KAILOLA, P.J. and Stewart, P.C., 1993. Threadfin salmon. *In* Kailola, P.J., Williams, P.C., Stewart, P.C., Reicelt, R.E., McNee, A. and Grieves, C. (eds.). *Australian Fisheries Resources*, Canberra: 334-337.

KAGWADE, P.V., 1970. The polynemid fishes of India. *Bull. Cent. Mar. Fish. Res. Inst.*, (18) : 1-69.

KAGWADE, P.V., 1972. Food and feeding habits of *Polynemus heptadactylus* Cuv. & Val. *Indian J. Fish.*, **16** : 188-197.

KAGWADE, P.V., 1972a. Maturation and spawning in *Polynemus heptadactylus* Cuv. & Val. *Indian J. Fish.*, **17(1-2)** : 76-89.

KAGWADE, P.V., 1973. Age and growth of *Polynemus heptadactylus* Cuv. & Val. from the Bombay-Saurashtra region. *Indian J. Fish.*, **18** : 33-51.

KAREKAR, P.S. and Bal, D.V., 1960. A study on maturity and spawning of *Polydactylus indicus* (Shaw). *Indian J. Fish.*, **7(1)** : 147-164.

KUTHALINGAM, M.D.K., 1960. Studies on the life-history and feeding habits of the threadfin, *Polynemus indicus* (Shaw). *J. Zool. Soc. India,* **12(2)** : 191-200.

*LINNAEUS, C., 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis.* Laurentii Salvuii, Holmiae. (ed. 10) **1** : ii + 824 pp.

MARATHE, V.B. and Bal, D.V., 1958. A brief comparative account of the axial skeleton of 6 polynemids from Bombay waters. *J. Univ. Bombay,* **26(B)** : 139-151.

McCLELLAND, J., 1843. On East Indian Isinglass, its introduction to, and manufacture for, the European market. *J. Nat. Hist. Calcutta,* **3(10)** : 157-188.

MENON, A.G.K. and Babu Rao, M., 1984. Polynemidae. *In*, Fischer, W. and Bianchi, G. (eds.) *FAO species identification sheets for fishery purposes. Western Indian Ocean (Fishing Area 51).* FAO, Rome. **3** : pag. var.

MISHRA, S.S. and Barman, R.P., 2009. On a new record of a threadfin fish *Filimanus perplexa* Feltes (Pisces: Perciformes: Polynemidae) from India. *Rec. zool. Surv. India,* **109(4)** : 53-55.

MISHRA, S.S. and Barman, R.P., 2010. On the identity of two *Polynemus* sp. (Pisces: Perciformes: Polynemidae) reported from India. *Rec. zool. Surv. India,* **110(2)** : 35-38.

MISHRA, S.S. and Krishnan, S., 1993. *Polydactylus konadaensis* a new threadfin fish from India with a key to species of the Polynemidae of India. *Rec. zool. Surv. India,* **92(1-4)** : 285-291.

MOTOMURA, H., 2002. Revision of the Indo-Pacific threadfin genus *Polydactylus* (Perciformes: Polynemidae) with a key to the species. *Bull. Natl. Sci. Mus., Tokyo, Ser. A (Zool.),* **28(3)** : 171-194.

MOTOMURA, H., 2003. A new species of freshwater threadfin, *Polynemus aquilonaris,* from Indonesia, and redescription of *P. dubius* Bleeker, 1853, (Perciformes: Polynemidae). *Ichthyol. Res.,* **50(2)** : 154-163.

MOTOMURA, H., 2004. Threadfins of the world. An annotated and illustrated catalogue of polynemid species known to date. Family Polynemidae. *FAO Species Catalogue for Fishery Purposes.* No. 3. Rome, FAO: 1-117, figs. 151, pls. 6.

MOTOMURA, H. and 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(1)** : 13-21.

MOTOMURA, H. and Iwatsuki, Y., 2001a. Review of *Polydactylus* species (Perciformes: Polynemidae) characterized by a large black anterior lateral line spot, with descriptions of two new species. *Ichthyol. Res.*, **48(4)** : 337-354.

MOTOMURA, H. and Iwatsuki, Y. and Kimura, S., 2001. 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(1)** : 83-89.

MOTOMURA, H. and Iwatsuki, Y., Kimura, S. and Yoshino, T., 2000. Redescription of *Polydactylus macrochir* (Gunther, 1867), a senior synonym of *P. sheridani* (Macleay, 1884) (Perciformes: Polynemidae). *Ichthyol. Res.*, **47(4)** : 327-333.

MOTOMURA, H., Iwatsuki, Y., Kimura, S. and Yashino, T. 2002. Revision of the Indo-West Pacific polynemid fish genus *Eleutheronema* (Teleostei: Perciformes). *Ichthyol. Res.*, **49(1)** : 47-61.

MOTOMURA, H., Iwatsuki, Y. and Yashino, T., 2001. A new species, *Polydactylus siamensis*, from Thailand and redescription of *P. plebeius* (Broussonet, 1782) with designation of a neotype (Perciformes: Polynemidae). *Ichthyol. Res.*, **48(2)** : 117-126.

MOTOMURA, H., Kimura, S. and Iwatsuki, Y., 2001. *Polydactylus bifurcus*, a new species of threadfin from Lombok Island, Indonesia (Perciformes: Polynemidae). *Ichthyol. Res.*, **48(3)** : 299-305.

MOTOMURA, H., Kullander, S.O., Yoshino, T. and Iwatsuki, Y., 2002a. Review of seven-spined *Polynemus* species (perciformes: Polynemidae) with designation of a neotype for *P. paradiseus* Linnaeus, 1758. *Ichthyol. Res.*, **49(4)** : 307-317.

MOTOMURA, H. and Senou, H., 2002. Record of *Polydactylus sexfilis* (Perciformes: Polynemidae) from Hachijo-jima, Izu Islands, Japan with comments on morphological changes with growth and speciation of related species. *Bull. Kanagawa Pref. Mus.* (*Nat. Sci.*), (31) : 27-31.

MOTOMURA, H., Seshagiri-Rao, B.V., Ratnamala, B. and Iwatsuki, Y., 2001. *Polydactylus konadaensis* Mishra and Krishnan, 1993, a junior synonym of *Filimanus xanthonema* (Valenciennes *in* Cuvier and Valenciennes, 1831) (Perciformes: Polynemidae). *Ichthyol. Res.*, **48(2)** : 203-206.

MOTOMURA, H. and Tsukawaki, S., 2006. New species of the threadfin genus *Polynemus* (Teleostei: Polynemidae) from the Mekong River Basin, Vietnam, with comments on the Mekong species of *Polynemus*. *Raffles Bull. Zool.*, **54(2)** : 459-464.

MUKHOPADHYAY, M.K., Vass, K.K., Bagchi, M.M. and Mitra, P., 1995. Environmental impact on breeding biology and fisheries of *Polynemus paradiseus* in Hooghly-Matla estuarine system. *Envir. Ecol.*, **13(2)** : 395-399.

MYERS, G.S., 1936. A new polynemid fish collected in the Sadong River, Sarawak by Dr. William T. Hornaday. *J. Wash. Acad. Sci.*, **26(9)** : 376-382.

NAYAK, P.D., 1959. Some aspects of the fishery and biology of *Polydactylus indicus* Shaw. *Indian J. Fish.*, **6(2)** : 280-297.

NAYAK, P.D., 1959a. Occurrence of hermaphroditism in *Polynemus heptadactylus* Cuv. & Val. *J. mar. biol. Assoc. India*, **1** : 257-259.

RAJAPANDIAN, M.E. and Murthy, V.S., 1966. On the occurrence of the spotted threadfin, *Polynemus microstoma* Bleeker in the Gulf of Mannar. *J. mar. biol. Ass. India*, **8(2)** : 365-367.

RAO, D.V., Kamla Devi and Rajan, P.T., 2000. An account of ichthyofauna of Andaman and Nicobar Islands, Bay of Bengal. *Rec. zool. Surv. India, Occ. Paper,* No. 178: 434 pp.

RUSSELL, P., 1803. *Descriptions and figures of two hundred fishes; collected at Vizagapatnam on the coast of Coromandel.* W. Bulmer & Co., London. Vol. **2**: 85 pp.

SHAW, G., 1804. *General Zoology or Systematic Natural History.* Vol. 5, Part 2. Pisces, G. Kearsley, London: vi + 251-463.

TALWAR, P.K., 1991. Pisces. *In: Animal Resources of India,* Zool. Surv. India: 577-630.

TALWAR, P.K. and Jhingran, A.G., 1991. *Inland fishes of India and adjacent countries.* Oxford & IBH Publishing Co., New Delhi, vol. **1 & 2**: xvii + 1158 pp.

TALWAR, P.K. and Kacker, R.K., 1984. *The Commercial Sea Fishes of India.* Handbook (4). Zoological Survey of India, (4) : 997 p.

VALENCIENNES, A., 1831. Des Polynemes. *In* Cuvier, G. and Valenciennes, A., *Histoire naturelle des Poissions.* F.G. Lavrault, Paris. **7** : 512-519.

WEBER, M. and de Beaufort, L.F., 1922. *The fishes of the Indo-Australian Archipelago.* E.J. Brill Ltd., Leiden, **4** : xii + 410 pp.

* *Not seen in original.*

PLATE 1

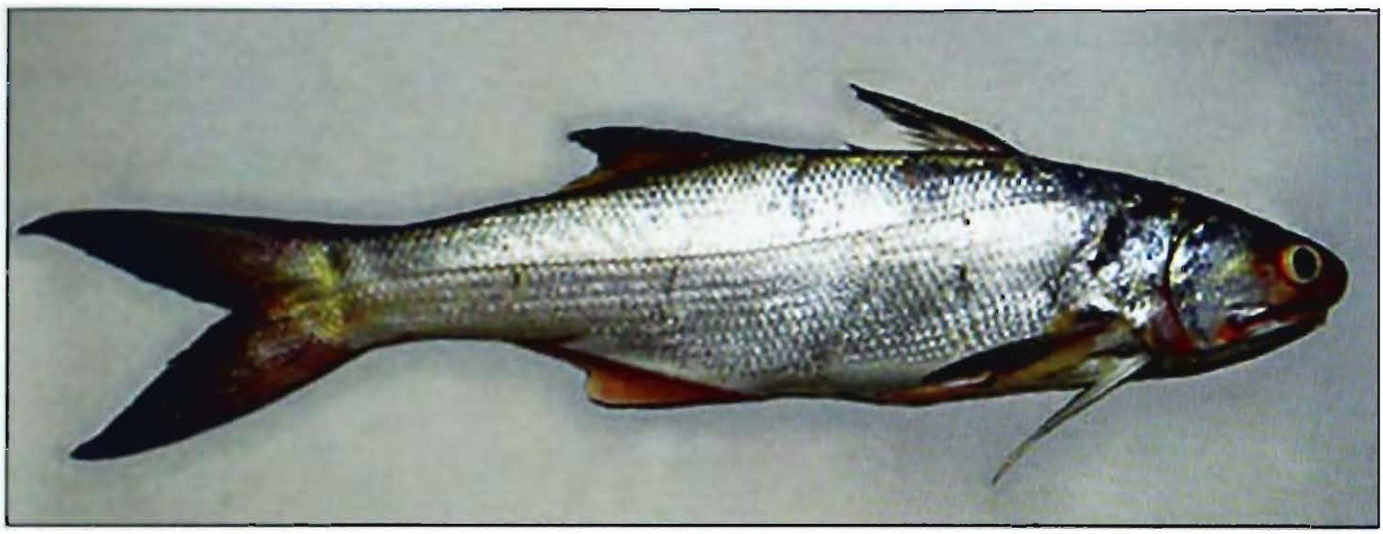

Figure 1 : *Eleutheronema tetradactylum* (Shaw)

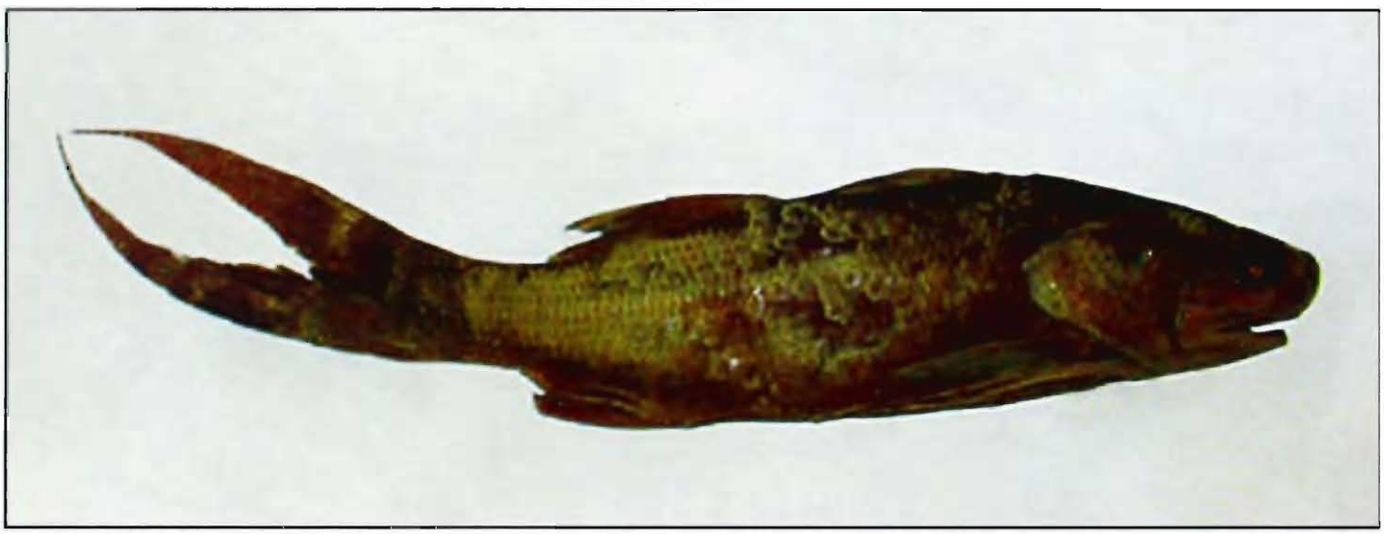

Figure 2 : *Leptomelanosoma indicum* (Shaw)

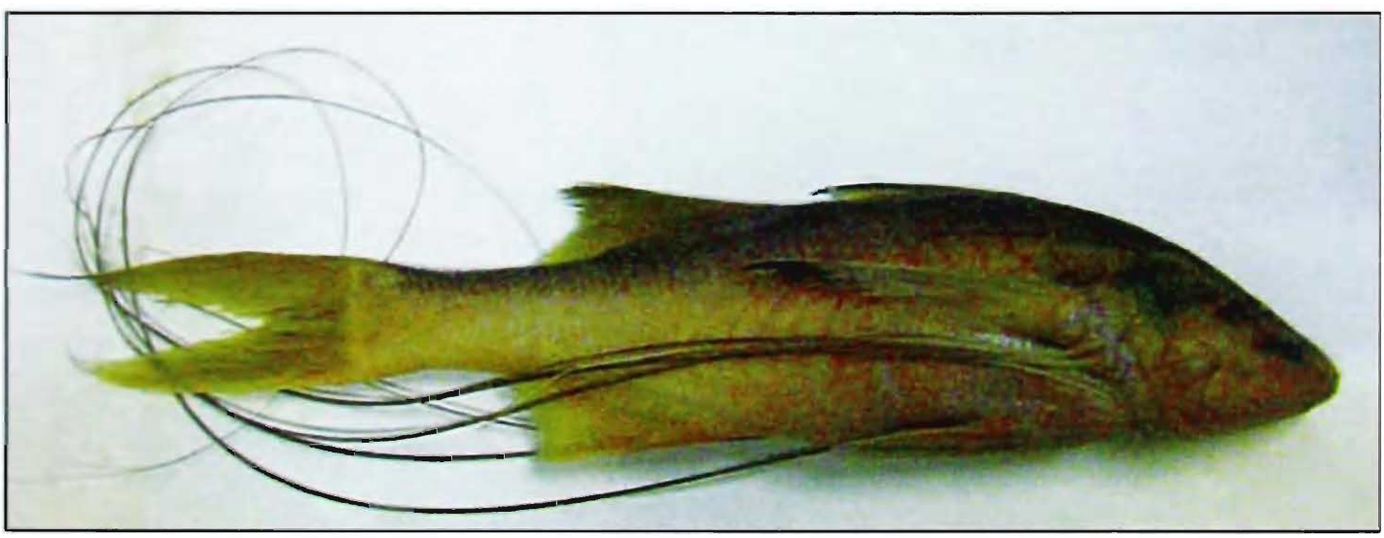

Figure 3 : *Polynemus paradiseus* Linnaeus

PLATE 2

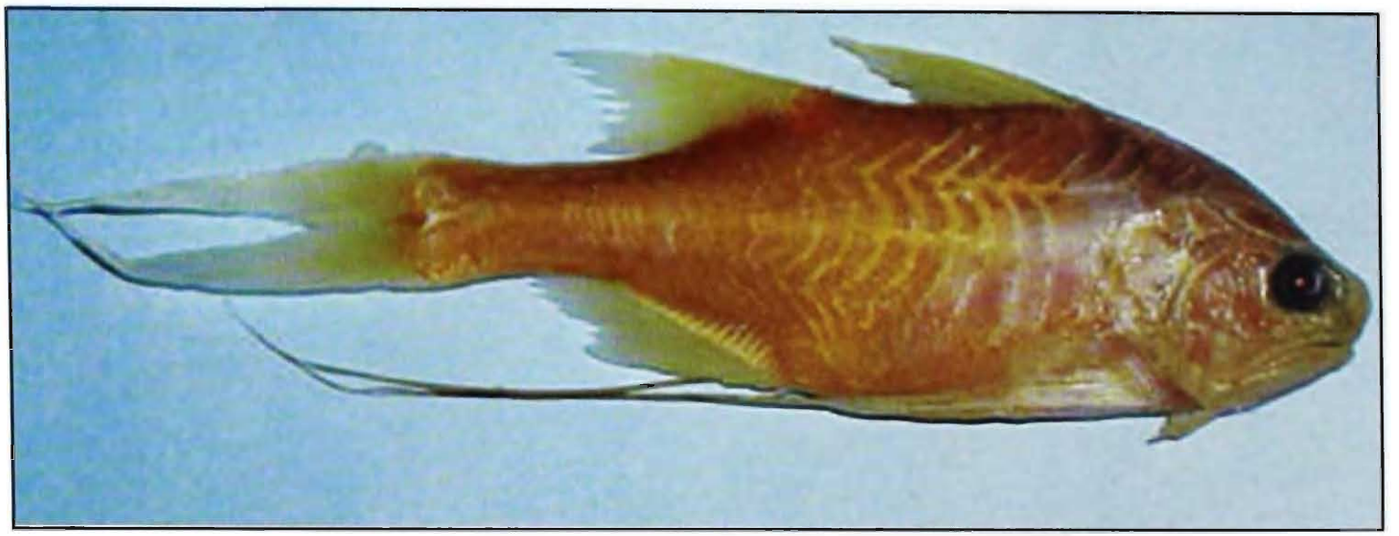

Figure 1 : *Filimanus perplexa* Feltes

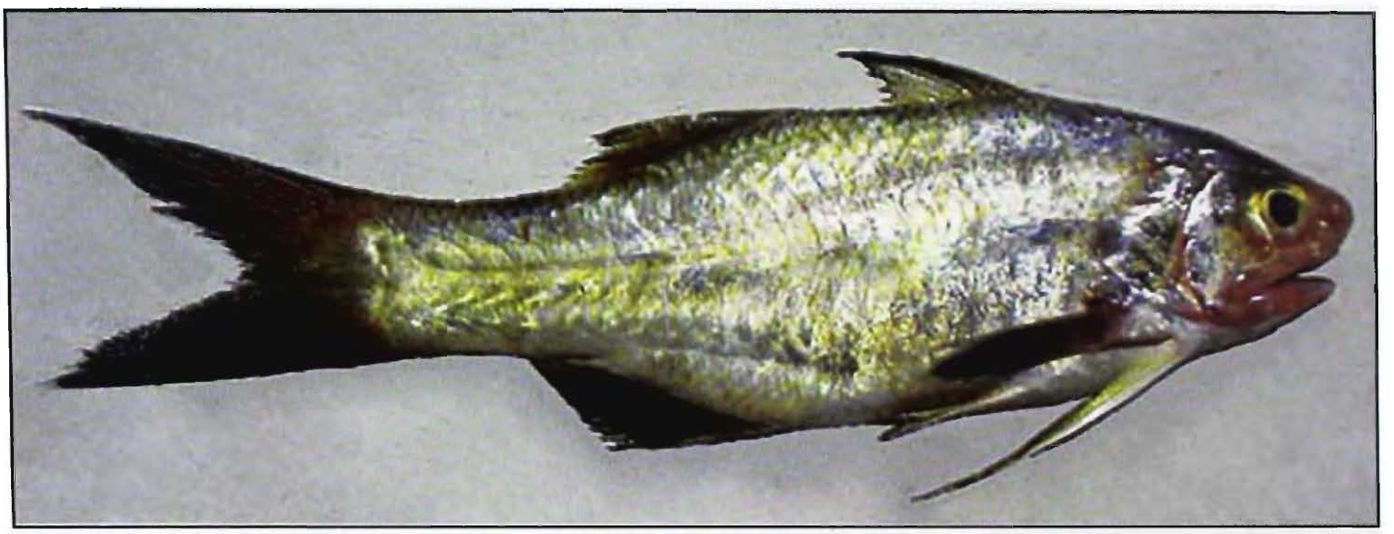

Figure 2 : *Filimanus similis* Feltes

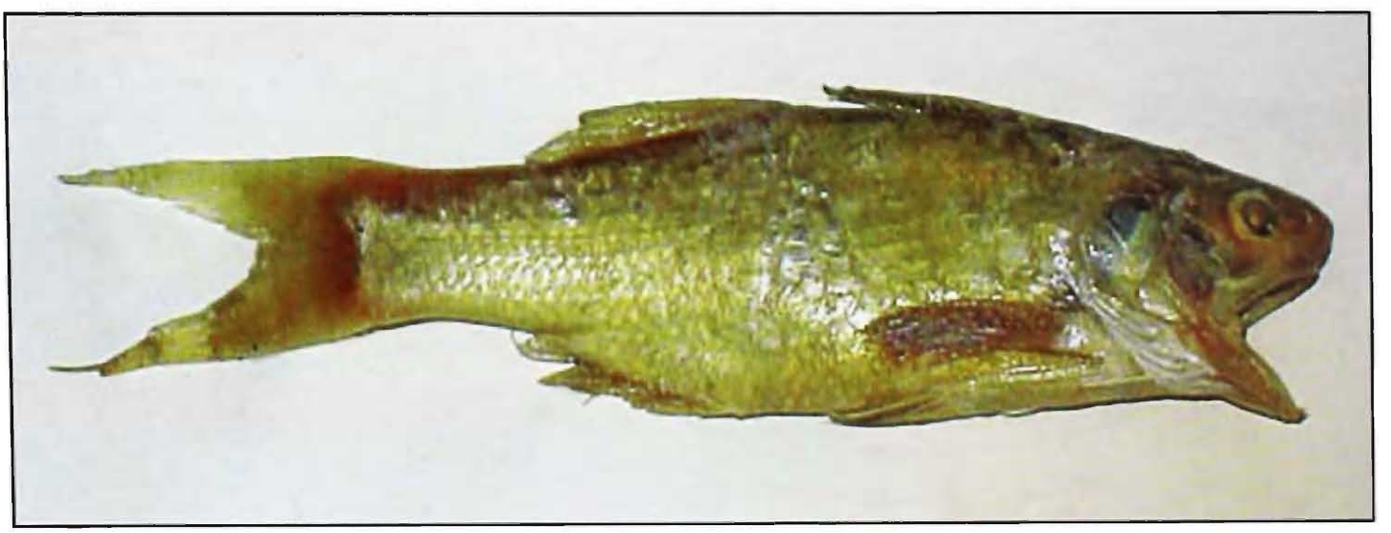

Figure 3 : *Filimanus xanthonema* (Valenciennes)

PLATE 3

Figure 1 : *Polydactylus microstoma* (Bleeker)

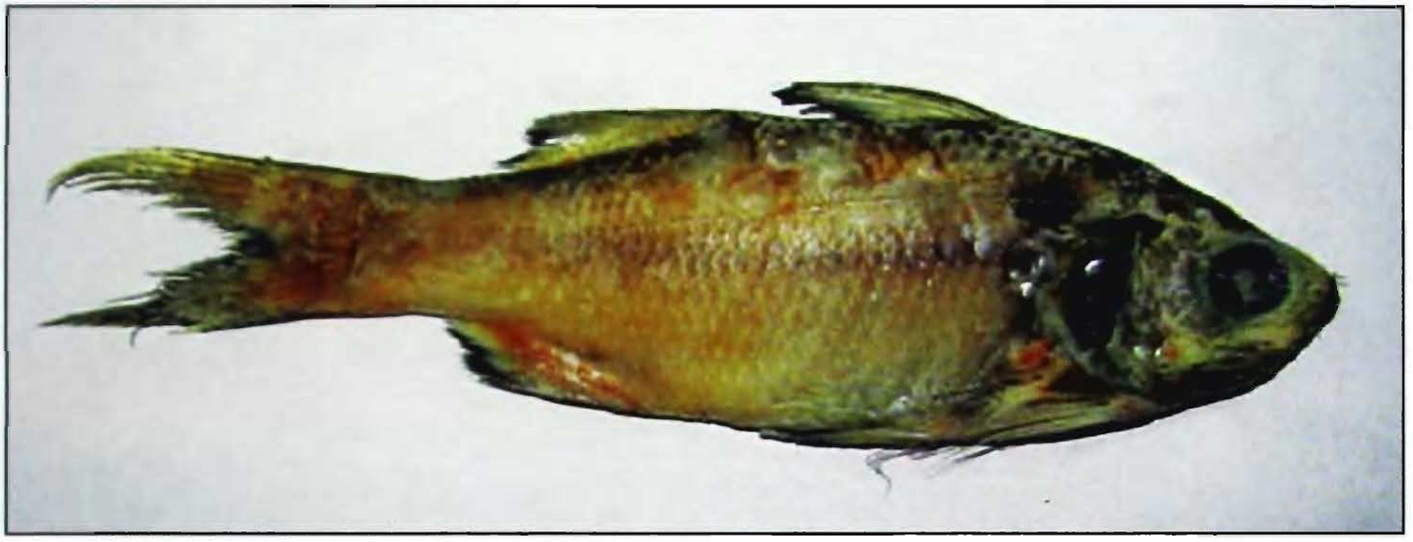

Figure 2 : *Polydactylus mullani* (Hora)

Figure 3 : *Polydactylus sextarius* (Bloch & Schneider)

PLATE 4

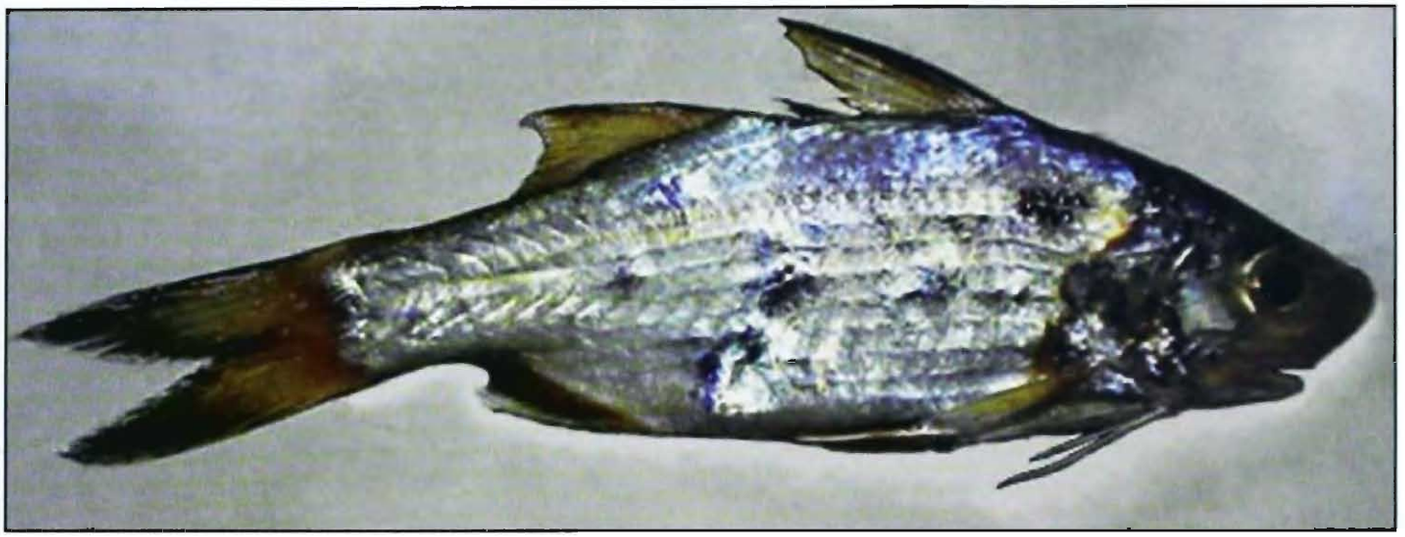

Figure 1 : *Polydactulus plebeius* (Broussonet)

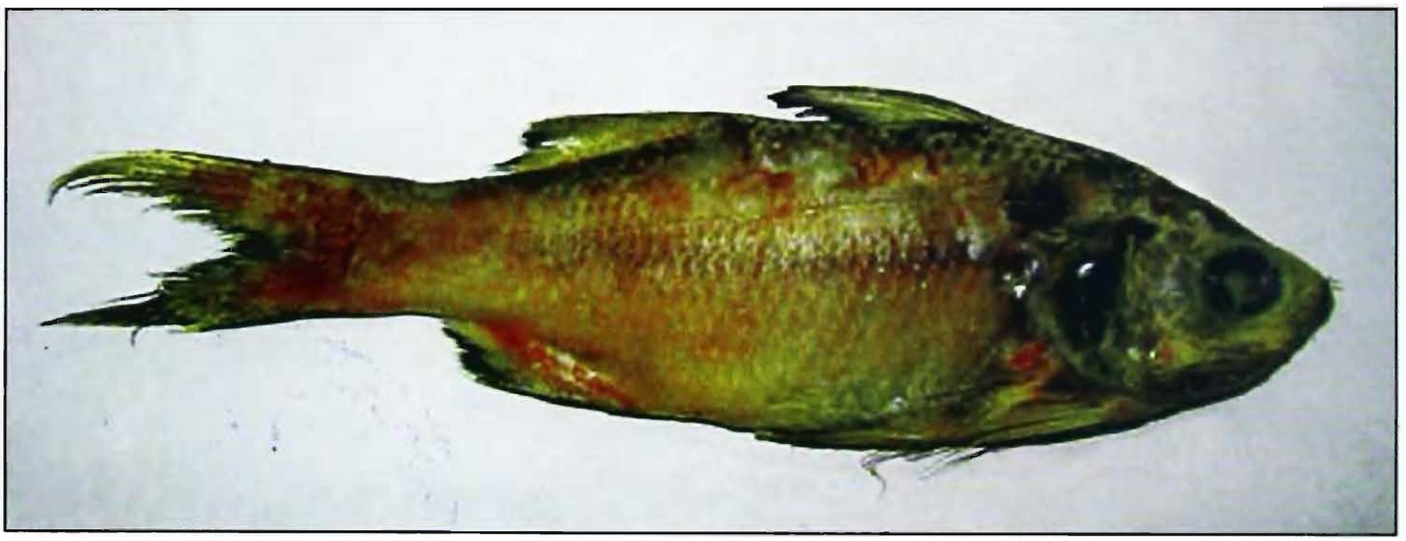

Figure 2 : *Polydactylus sexfilis* (Valenciennes)

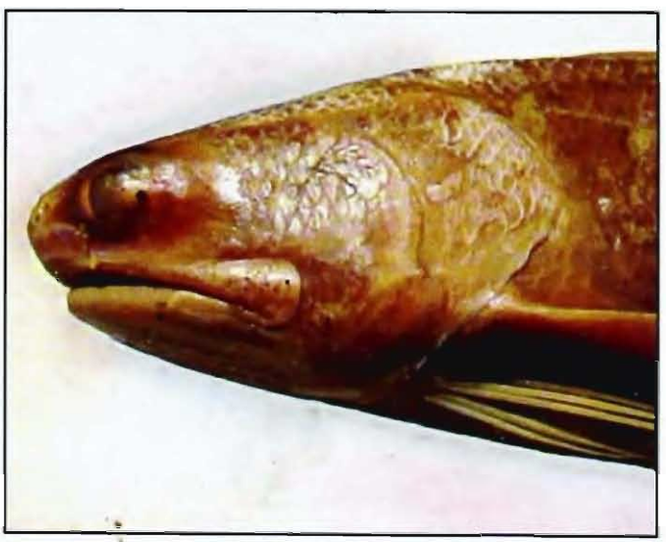

Figure 3a : *E. tetradactylum*, with 5 free pectoral rays

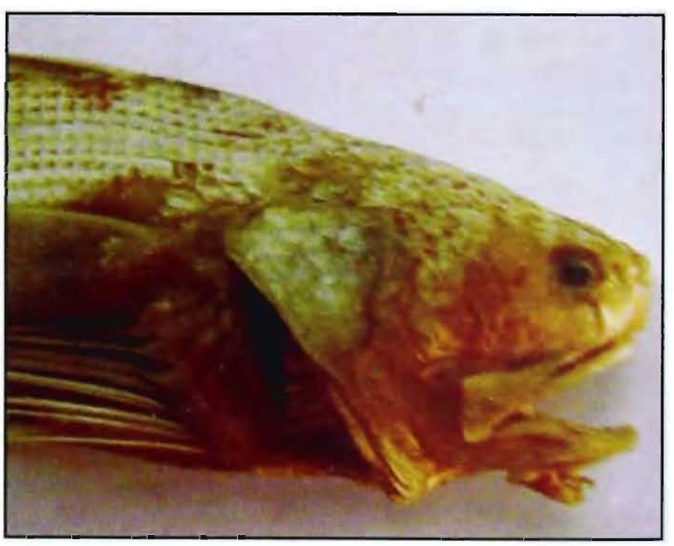

Figure 3b : *P. paradiseus*, with 8 free pectoral rays