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Rediscovery and Redescription of *Mystus keletius* (Valenciennes, 1839)

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Abstract

Mystus keletius Valenciennes[31] has been placed in synonymy with *M. vittatus* (Bloch, 1794) and *M. armatus* Day[6]. An examination of Topotypic specimens of *M. keletius* shows however, that it exhibits many distinct differences from *Mystus vittatus* and *M. armatus*. *Mystus keletius* is taxonomically analyzed and resurrected from its synonymy with congeners.

Order Siluriformes is an unusually well-defined order comprising approximately 35 families, 437 genera and about 2734 species found in its entire range of distribution from South America, Africa, Europe, Asia to Japan[30]. Catfishes of family Bagridae are small to large sized, more or less elongate fishes with a compressed, naked body; teeth on pre maxillaries, mandible and vomer, nostrils widely separated, above angle of mouth; dorsal and pectoral fins with spines and lateral line generally complete[9,17]. *Mystus, Hemibagrus, Horabagrus, Batasio, Rita, Sperata, Rama,* and *Olyra* are the major bagrid fish genera distributed in aquatic bodies of India. Of this, *Mystus, Horabagrus, Hemibagrus,* and *Batasio* alone are residing in the freshwater bodies of Kerala.

Species of the genus *Mystus* are the common catfishes of Indian waters. *Mystus malabaricus, M. montanus, M. oculatus, M. armatus, M. canarensis, M. heoki, M. indicus, M. menoni, M. catapogon, M. keralai*. *M. vittatus* and *M. keletius* were originally described from freshwater bodies of south India. We have no report of *M. keletius* from Pondicherry, its type locality, after its original description by Valenciennes[31]. So many confusions existed in its identity; currently it is considered as a synonym of either *M. armatus* or *M. vittatus*[20]. It is an endeavor to redescribe *M. keletius* based on fresh specimens from its type locality.

Measurements were taken point to point using dial calipers and data recorded to tenths of a millimeter. Parts of head are measured as percentage of head length (HL); other body parts are presented as percentage of standard length (SL). Methods used are those of Jayaram[16]. For comparisons topotypic specimens are used; *Mystus keletius* specimens used for this study are now deposited in Zoological Survey of India museum at Port Blair, Andamans {ZSI/ANRC}. Congeners, which were used as comparative specimens for this study, are now deposited in various

ZSI Museums of India.

Mystus keletius (Valenciennes) *:*
Senior synonyms:

Bagrus keletius, Valenciennes, *Hist. Nat. Poiss*, 1839, 14: 411 (type locality: Pondicherry, south India).
Macrones keletius, Day. Fish India, 1878, 449, pl. 98, fig. 5 (locality: Madras to Pondicherry and inland to Coimbatore, Mysore and also Ceylon)
Aoria keletius Deraniyagala *Spolia zeylancia*, 1932, 16 (3): 284 (locality: South India, Ceylon}.
Mystus keletius, Hora, Rec. *Indian Museum*, 1942. 44: 197 (Mysore and adjoining hill ranges)
Junior synonyms:
Silurus vittatus, Bloch, *Ichthyol. Hist. Nat*. 1797, 11: 40. Pl, 371, fig. 2, (Type locality, Tranquebar, south India).
Bagrus vittatus, Valenciennes, *Hist, Nat. Poiss*. 1839. (Tranquebar, south India).
Macrones vittatus, Day, Fish. India, 1878. 448 (Assam, Burma, Siam & Ceylon)
Aoria vittatus, Deraniyagala, Spolia Zeylanica, 1932, 16, 30, 283 (Ceylon).
Mystus vittatus, Smith, J. Nat. Hist. Soc. Siam, 1932, 9,3, 294, 295(Bangpakong, Siam)
Hypselobarbus armatus, Day, *Proc. Zool. Soc. London*, 1865, 189 (Type locality: Cochin, Malabar)
Macrones armatus, Day, *Proc. Zool. Soc. London*, 1871, 706.
Aoria armatus, Hora, *Rec. Indian Mus*.1931. 33: 1. Kyenchong River in Cingona Reserve, Mergui district, Lower Burma.
Mystus armatus, Jayaram, *Rec. Indian Museum*, 1954, 51 4, 539.

Materials Examined: ZSI/ANRC/M/23594, 3, 80- 86 mm SL, coll. Mathews Plamoottil, Pondicherry, 18.12.2018.

Diagnosis: Cephalic groove moderately deep and its posterior fontanel small and reach a little behind orbit. Occipital process distinct and never reach to dorsal fin origin. Adipose fin inserted considerably behind the insertion of rayed dorsal fin, originates as a thin ridge and gradually increases in height; inter dorsal distance 1.0- 1.5 of orbit diameter. Anal papilla developed and prominent.

Description: Body elongate and compressed. Head length 27.2- 30.0 in percent of standard length; head width 69.4- 70.8 and snout length 27.1-34.7 in percent of head length. Body height at dorsal fin origin 22.5-24.4 in percent of standard length and 17.8-18.8 in percent of total length; Dorsal profile more convex than ventral profile; considerable rise from snout tip to rayed dorsal fin; post dorsal region gently sloping. Cephalic groove moderately deep and with double fontanels; posterior frontal very small and it reach a little behind orbit and never reach to occiput. Occipital process distinct and never reach to dorsal fin origin. Tiny grooves present on occipital process; mouth crescentic; orbits inserted considerably above and behind angle of jaws; Maxillary barbels reach to origin or middle of pelvic fin; inner mandibulars extend to origin of pectoral fin; outer mandibular barbels reach below the middle of pectoral fin; nasal barbels roughly reach to occiput.

Fig. 1. A fresh specimen of *Mystus keletius* from its type locality, ZSI/ANRC/M/23594

Dorsal fin with 1 spine and 7 branched rays and originates considerably behind and above pectoral fin front; its outer margin convex; spine ¾ length of the fin; spine's outer margin smooth; inner margin with 0-3 teeth. Last branched ray of dorsal fin not divided to root; adipose fin inserted considerably behind rayed dorsal fin; inter dorsal distance 11.6-15.0 in percent of standard length; adipose fin shorter and it originates as a thin ridge and gradually increases in height; Pectoral fin with 1 strong spine and 7-8 branched rays; pectoral fin

Fig. 2(a). Preserved specimen of *M. keletius*; 2(b). Dorsal view of head of *M. keletius*

tip reach behind and below the origin of dorsal fin and an eye diameter in front of ventral fin origin; its outer margin nearly straight. Pectoral spine strong and its inner margin serrated with 10- 13 teeth; outer margin smooth; ventral fin originates just behind and below the origin of dorsal fin; it just extends to anal papilla and never reach to anal fin origin; its outer margin convex; anal papilla developed and prominent and usually of ¾ of eye diameter. Ventral fin with one simple and 5 branched rays; its tip reach below the origin of adipose dorsal fin. Anal fin with 3 simple and 8 branched rays; it originates 1.5 times orbit diameter behind the insertion of adipose dorsal fin; posterior margin of anal fin nearly straight; Anal fin tip never reach to caudal fin. Caudal fin is deeply forked and with 14- 16 principal rays; its upper lobe considerably longer than lower one.

Fig. 3. A fresh specimen of *M. vittatus* from Tranquebar, ZSI/WRC/P/5538

Color: Flanks and dorsal sides brownish; ventral side yellow. Two yellowish white longitudinal lines runs from operculum to caudal fin base. Pectoral fin hyaline; remaining fins with a pale flesh tint.

Comparisons: The present study is based on collections of *Mystus keletius* from Pondicherry, its type locality. As *M. keletius* is currently a synonym of either *Mystus vittatus* or *M, armatus*[20], detailed examination of these are essential.

Fig. 4. A fresh specimen of *M. montanus* from its type locality ZSI FF 5096

M. keletius is currently a synonym of *Mystus vittatus* (Bloch[4]), detailed taxonomic analysis of its topotypic specimens was required. This author collected original *M. vittatus* from Tranquebar, its type locality. Examination of these topotypic specimens

revealed that Bloch's original *M. vittatus* is different from the '*M. vittatus*' recorded by many researchers from different parts of India and abroad. Different types of *M. vittatus* were recorded by different researchers; but none of them give account on *Mystus vittatus* from its type locality; it may be the reason for synonymizing *M. keletius* with *M. vittatus* In various descriptions on *M. vittatus*, depth of base of adipose fin and number of lateral color lines are differently explained. Jayaram and Sanyal[18] described it as having 7-10 anal fin rays and 8-9 soft pectoral fin rays. Their figure is also not matching with the original *M. vittatus*. Jayaram & Sanyal's[18] collections were from West Bengal, Kerala, Pondicherry and Thanjavur. Except the last two, all others cannot be considered as Bloch's species. The present examination of original *M. vittatus* from Tranquebar and its comparison with *Mystus keletius* proved the identity of the latter. *M. keletius* differs from *M. vittatus* in having a short occipital process which never reach (vs. reach in *M. vittatus*) to rayed dorsal front and lesser body height (22.5- 24.4 5% SL vs. 25.6- 29.7) and adipose fin height (2.4- 4.6 % SL vs.5.7- 8.1).

Fig. 5. A fresh specimen of *M. armatu*s from its type locality, ZSI FF 5095

M. armatus, another synonym of *M. keletius*, was originally described by Day[6] from Karavannoor River of Trichur, Kerala. It had been treated as a synonym of *M. oculatus* described by Valenciennes[31] from northern Kerala[11,12]. Plamoottil and Abraham[26] redescribed Day's *Mystus* and resurrected from its synonymy with the *Mystus oculatus* by collecting and examining fresh specimens of both from its type localities. Examination of specimens revealed that *Mystus keletius* is not a close relative species of *M. armatus*.

Mystus keletius differs from *M. armatus* in having a longer (27.2- 30.0 % SL vs. 25.5- 26.0 in *M. armatus*) head, greater inter dorsal distance (11.6-15.0 % SL vs. 6.9- 8.3), short based adipose fin (19.4- 21.4 %SL vs. 27.0- 28.9) and shorter maxillary (170.8- 198.0 % HL vs. 343.0- 367.0) and nasal (56.2- 67.3 % HL vs. 73.0- 77.0) barbels. Morphometric differences of *M. keletius* with *M. armatus*, *M. vittatus* and *M. montanus* are shown in Table-3. *Mystus keletius* differs from *M. tengara* Hamilton[14] in having a short cephalic groove which never reach {vs. reach in *M. tengara*} to occipital process and short occipital process which does not reach {vs. reach} to dorsal fin base**.** *Mystus keletius* differs from *M. carcio* Hamilton[14] in having a shorter cephalic groove which never reach {vs. reach} to occiput and long based adipose dorsal fin {19.4- 21.4 % SL vs. 8.5- 11.9}. *Mystus keletius* differs from *M. oculatus*[32] in having a short occipital process which never reach (vs. reach) to basal bone of dorsal fin, having (vs. lacking) longitudinal bands on lateral sides and in lacking (vs. having) any color spot on rayed dorsal fin front. *Mystus keletius* differs from *M. cavasius* {Hamilton[14]}, *M. seengete* (Valenciennes)[32], *M. keralai* Plamottil and Abraham[27] and *M. catapogon* Plamoottil[23] in having shorter maxillary barbels which reach only up to middle of pelvic fin (vs. reach to caudal base in *M. cavasius, M. seengete, M. keralai* and *M. catapogon*), cephalic groove does not reach (vs. reach) to occiput and the latter never reach (vs. reach) to front of rayed dorsal fin. Further, in *M. cavasius* and *M. seengete* no inter dorsal distance (vs. having greater inter dorsal distance in *M. keletius*). *Mystus keletius* differs from *M. malabaricus*[19], *M. heoki* Plamoottil and Abraham[24], *M. canarensis* Grant[11,12] in having (vs. lacking) two yellowish white longitudinal bands on lateral sides, longer head (27.2- 30.0 % SL vs. 18.9- 24.7) and deeper body (22.5- 24.4 vs.15.0- 20.8). *Mystus keletius* differs from *M. indicus* Plamoottil and Abraham[24] in lacking (vs. having) a thick layer of flesh on both sides of occipital process and at the base of rayed dorsal fin and in having (vs. lacking) lateral color bands on body. *Mystus keletius* differs from *M. menoni* Plamoottil and Abraham[25] in having two lateral color bands (vs. only one mid lateral band) on body and in having a short based adipose dorsal fin (19.4- 21.4 % SL vs. 27.3- 30.5).

Mystus keletius was originally described from Pondicherry as *Bagrus keletius*; it was by Valenciennes[32] based on the collections of Leschenault. Later in 1846 Bleeker described a fish under the same name based on his collections from west Bengal. He was unaware that the same species had already been described from south India. Gunther[13] called this species as *Macrones keletius.* Day[7] proved that Bleeker's[1] specimens are not *Mystus keletius* but distinct ones and named them as *Mystus bleekeri.* '*Mystus keletius*' specimens were again collected by Bleeker[2,3] and Day from west Bengal, Yamuna and Panjab respectively. They are not *M. keletius* of Valenciennes; may be *Mystus tengara* or *M. carcio* or *M. bleekeri* or sometimes may be a new species.

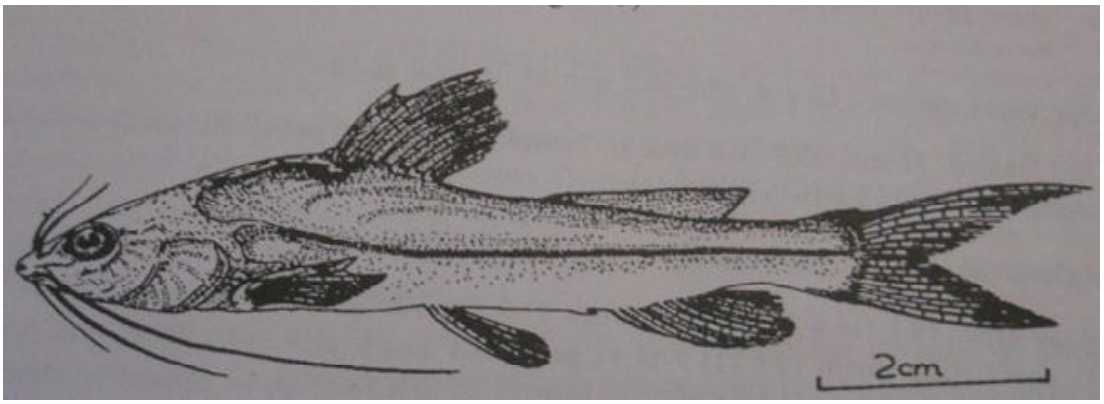

Fig. 6. *Mystus keletius* from Jayaram & Sanyal[18]

Jayaram and Sanyal[18] in their review of *Mystus* species presented an account on *M. keletius* {Fig. 6}. But unfortunately, their account was not based on fishes collected from the type locality, Pondicherry (now Puducherry); so it is not found to be reliable. They wrote that '*Mystus keletius* is distinctly characterized by slender body and narrow caudal peduncle.'. But by the present study based on specimens from the type locality, body of *Mytsus keletius* is not slender and caudal peduncle is not narrow. Jayaram and Sanyal[18] wrote that *M. keletius* is found at Madras, Coimbatore, Mysore, Thirunelveli and Sri lanka, other than its type locality. Jerdon[19] and Hora[15] extended its locality to Mysore; Day[8] Deraniyagala[5], Silas[28] and Pethiyagoda[21] mentioned that *M. keletius* is found in Sri Lanka. But this author considers that *Mystus keletius is* a catfish species restricted to inland water bodies of Pondicherry. After examining one lectotype (MNHNA-9011, 82.8 mm SL), Ng[20] suggested that *M. keletius* was a synonym of either *M. armatus* or *M. vittatus.* He could not find any stripes on the lectotype. Ferraris[10] and Pethiyagoda *et al*.[22] treated *M. keletius* as a synonym of *M. vittatus*. Sudasinghe *et al.*[29], while describing *Mystus nanus*, examined the lectotype of *M..keletius* and opined that identity of the latter is in doubt. Through this research work, *Mystus keletius* is redescribed from its type locality based on collection of fresh specimens. It is designated as the Neotype of *M. keletius.*

Comparative materials examined: *Mystus keletius:* ZSI/ANRC/M/23594, 3 specimens, 80- 86 mm SL, coll. Mathews Plamoottil, Pondicherry, 18.12.2018; *Mystus vittatus*: ZSI/WRC/P/5538, **2**, 79.0- 80.0 mm SL, Tranquebar, Tamil Nadu, coll. Mathews Plamoottil, 11.07.2019; *Mystus armatus*: ZSI FF 5095, 2 ex., 69.7- 84.8 mm SL, Arattupuzha, Karavannoor River, Trichur, coll. Mathews Plamoottil, 13.01. 2013; *Mystus malabaricus*: ZSI FF 4931, 5 ex, 71.5-102 mm SL, Kallodi, Mananthavady River, Wayanad, Kerala, collected by Mathews Plamoottil, 20.03.2013; *Mystus montanus*: ZSI FF 5096, 1 ex., 67.5 mm SL, Koodal kadavu, Mananthavady River,

Table-1. Morphometric characters of *M. keletius* (ZSI/ANRC/M/23594)

Sl. No	Characters	Range	Mean
1	Total Length	101.0- 111.5	105.8
2	Standard Length (mm)	80.0- 86.0	83.5
	Percentage of Standard Length		
3	Head Length	27.2- 30.0	28.6
4	Head Depth	17.4- 18.1	17.8
5	Head width	18.9- 21.2	20.0
6	Body depth at dorsal fin origin	22.5- 24.4	23.1
7	Body depth at anal fin	17.8- 18.8	18.4
8	Predorsal distance	38.5- 39.5	39.1
9	Post dorsal distance	62.5- 66.3	64.2
10	Pre pectoral distance	22.4- 26.3	24.8
11	Prepelvic distance	49.9- 52.3	51.5
12	Length of base of rayed dorsal	15.1- 18.7	16.6
13	Length of base of adipose fin	19.4- 21.4	20.7
14	Height of adipose fin	2.4- 4.6	3.3
15	Pre anal distance	68.8- 73.4	70.6
16	Distance from pectoral to pelvicfin	28.7- 29.1	28.9
17	Distance from pelvic to anal fin	19.2- 22.5	20.9
18	Distance from anal to caudal fin	28.6-31.2	30.2
19	Inter dorsal distance	11.6-15	13.2
20	Length of pectoral fin	17.5- 20.9	19.2
21	Length of pelvic fin	14.2- 16.3	15.2
22	Length of anal fin	14.4- 16.3	15.4
23	Length of caudal fin	26.3-29.6	27.7
24	Length of Pectoral spine	15.6- 17.2	16.4
25	Length of dorsal spine	11.3-12.8	1205
26	Length of base of rayed dorsal	15.1- 18.8	16.6
27	Length of base of anal fin	10.0- 13.9	11.7
28	Length of base of caudal fin	14.8- 16.3	15.6
29	Length of caudal peduncle	16.6- 18.6	17.6
30	Depth of caudal peduncle	11.8- 12.8	12.3

	Percentage of Head Length		
31	Head Depth	60.4- . 65.2	62.3
32	Head width	69.4- 70.8	69.9
33	Eye diameter	22.4-26.1	23.8
34	Inter orbital width	31.0-37.5	33.7
35	Inter narial width	16.3- 24.8	20.6
36	Snout Length	27.1-34.7	30.0
37	Width of gape of mouth	39.1-45.8	43.2
38	Pre occipital distance	79.2- 84.8	82.0
39	Distance from occiput to dorsal fin	48.0-48.9	48.5
40	Length of maxillary barbels	170.8- 198.0	181.0
41	Length of nasal barbels	56.2- 67.3	60.0
42	Length of outer mandibular barbels	100- 114.3	104.8
43	Length of inner mandibuklar barbels	61.7- 65.3	63.3

Table-2. Meristic counts of *Mystus keletius* and congeners

Sl. No	Meristic characters	*M. keletius* (ZSI/ANRC/M/ 23594)	*M. vittatus* (ZSI/WRC/P/ 5538)	*M. montanus* {ZSI FF 5096}	*M. armatus* {ZSI FF 5095}
1	Dorsal fin rays	I, 7	II, 7	I, 7	II, 7
2	Ventral Fin Rays	i, 5	i, 5	i, 5	i, 5
3	Pectoral fin Rays	I, 7, 8	I, 8	I, 6	I, 9
4	Anal Fin Rays	iii, 8	iii, 8	iii, 8	iii, 8
5	Caudal fin rays	14-16	16-17	15	19
6	Dorsal spine teeth	0-3	3-5	0	6
7	Pectoral spine teeth	10-13	15-16	8	10-14

Wayanad, coll. Mathews Plamoottil, 16.03.2013; *Mystus oculatus*: ZSI FF 4933, 5 ex, 85- 91 mm SL, Arattupuzha, Karavannoor River, Trichur, Kerala, collected by Mathews Plamoottil, 10.01.2013; *Mystus canarensis:* ZSI FF 4939, 1 ex, 88.5 mm SL, Manimala River at Mundakkayam, Kerala, coll. Mathews Plamoottil, 10.02.12; *Mystus indicus*: Holotype: ZSI/FF 4627, 100 mm SL, Kuttoor, Manimala River, Kerala, India; collected by Mathews Plamoottil, 17 February 2011. Paratypes, ZSI/ WGRC/2418, 7 specimens, 81-107 mm standard length, Kuttoor of Manimala River, Kerala, India; collected by Mathews Plamoottil, 07 March 2011.

Table-3. Comparison of *M. keletius* with its close congeners

Sl. No.	Characters	*M. keletius* (ZSI/ANRC/M/ 23594	*Mystus armatus* (ZSI FF 5095)	*M. vittatus* (ZSI/WRC/ P/5538	*Mystus montanus* (ZSI FF 5096)
1	Standard Length (mm)	80.0- 86.0	69.7- 84.8	79.0- 80.0	67.5
	% SL				
2	Head Length	27.2- 30.0	25.5- 26.0	26.8- 29.1	28.1
3	Head Depth	17.4- 18.1	16.0- 17.2	16.9- 20.2	17.0
4	Body depth at dorsal fin origin	22.5- 24.4	20.1- 22.4	25.6- 29.7	23.0
5	Predorsal distance	38.5- 39.5	36.0- 37.3	35.6- 39.8	40.0
6	Length of base of adipose fin	19.4- 21.4	27.0- 28.9	20.4- 22.5	21.5
7	Height of adipose fin	2.4- 4.6	4.7- 5.6	5.7- 8.1	6.0
8	Distance from pectoral to pelvic fin	28.7- 29.1	28.3- 30.1	31.8-33.8	28.1
9	Distance from pelvic to anal fin	19.2- 22.5	18.2- 18.7	16.3-20.4	22.2
10	Distance from anal fin to caudal fin	28.6-31.2	28.7- 30.7	15.6- 17.7	28.1
11	Interdorsal Distance	11.6-15.0	6.9- 8.3	14.0- 14.8	8.9
12	Length of pectoral fin	17.5- 20.9	20.0- 21.5	17.1- 18.7	17.8
13	Length of pelvic fin	14.2- 16.3	16.5- 18.3	13.9- 15.0	13.3
14	Length of anal fin	14.4- 16.3	17.2- 18.2	13.1- 15.2	15.6
15	Length of caudal peduncle	16.6- 18.6	18.9- 19.8	17.5- 18.9	14.8
16	Head Length (mm)	23.0- 24.5	14.2- 17.8	21.5- 23.0	19.0
	% HL				
17	Pre occipital distance	79.2-84.8	84.1- 85.8	78.3- 88.4	85.3
18	Distance from occiput to dorsal fin	48.0-48.9	52.6- 54.5	54.3- 55.8	52.6
19	Length of maxillary barbels	170.8-198	343.0-367.0	269.8-282.6	226.3
20	Length of nasal barbels	170.8-98	343-367	62.8-65.2	57.9
21	Length of outer mandibular barbels	100-114.3	132-136.8	93-113	100.0
22	Length of inner mandibuklar barbels	61.7-65.3	90-94.7	73.9-74.4	63.2

Mystus heoki: Holotype, ZSI/FF 4626, 137 mm SL, Elankadu, Manimala River, Kerala, India; collected by Mathews Plamoottil, 10 January 2011. Paratypes, ZSI/WGRC 2419, 5 specimens, 85.5- 120 mm standard length, Elankadu, Manimala River, Kerala, India; collected by Mathews Plamoottil, 10 January 2011. *Mystus menoni:* Holotype, ZSI/ FF 4628, 101.7 mm standard length, Manimala River at Elankadu, Kerala, India; collected by Mathews Plamoottil, 10 January 2011. Paratypes, ZSI/WGRC/IR/V 2417, 5 specimens,

96- 121 mm standard length; *Mystus keralai:* Holotype: ZSI FF 5091, 59.0 mm SL, India: Kerala, Manimala River at Chenappady, Mathews Plamoottil, 10 January 2011. Paratype: ZSI FF 5092, 1 specimen, 58.0 mm SL, India: Kerala, Manimala River at Chenappady, Mathews Plamoottil, 10 January 2011. *Mystus cavasius:* ZSI FF 4930, 5 ex, 96.5- 112.0 mm SL, Serrampore, Ganges River, West Bengal, collected by Mathews Plamoottil, 14.04.2012; *Mystus seengtee:* ZSI FF 4936, 4 ex, 120- 156.5 mm SL, Koodal kadavu, Mananthavady River, Wayanadu, Kerala, collected by Mathews Plamoottil, 20.03.2013; *Mystus catapogon:* Holotype: ZSI/ ANRC 12758, 73.0 mm SL, India: Kerala, small water stream at Mavelikkara, coll. Mathews Plamoottil, 17 August 2013. Paratypes: ZSI/ ANRC 12759, 4 specimens, 53.4- 66.0 mm SL, India: Kerala, small water stream at Mavelikkara, coll. Mathews Plamoottil, 17 August 2013.

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