



# *Mystus celator*, a new species of catfish from northern Myanmar (Actinopterygii: Siluriformes: Bagridae)

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## Abstract

*Mystus celator* **sp. nov.** is described from the Irrawaddy River drainage in northern Myanmar. It can be distinguished from congeners in having a combination of: three equally dark longitudinal stripes separated by two pale interspaces on sides of body; round, dark tympanic spot; ovoid, dark spot on caudal peduncle; length of adipose-fin base 18.0–23.3% SL; angle of predorsal profile 21–24°; posterior cranial fontanelle not reaching base of supraoccipital process; 25–30 rakers on the first branchial arch; and 35–36 vertebrae. The identity of *Mystus pulcher* is fixed with the designation of a lectotype.

## Key words

Freshwater fishes, Irrawaddy River, Teleostei

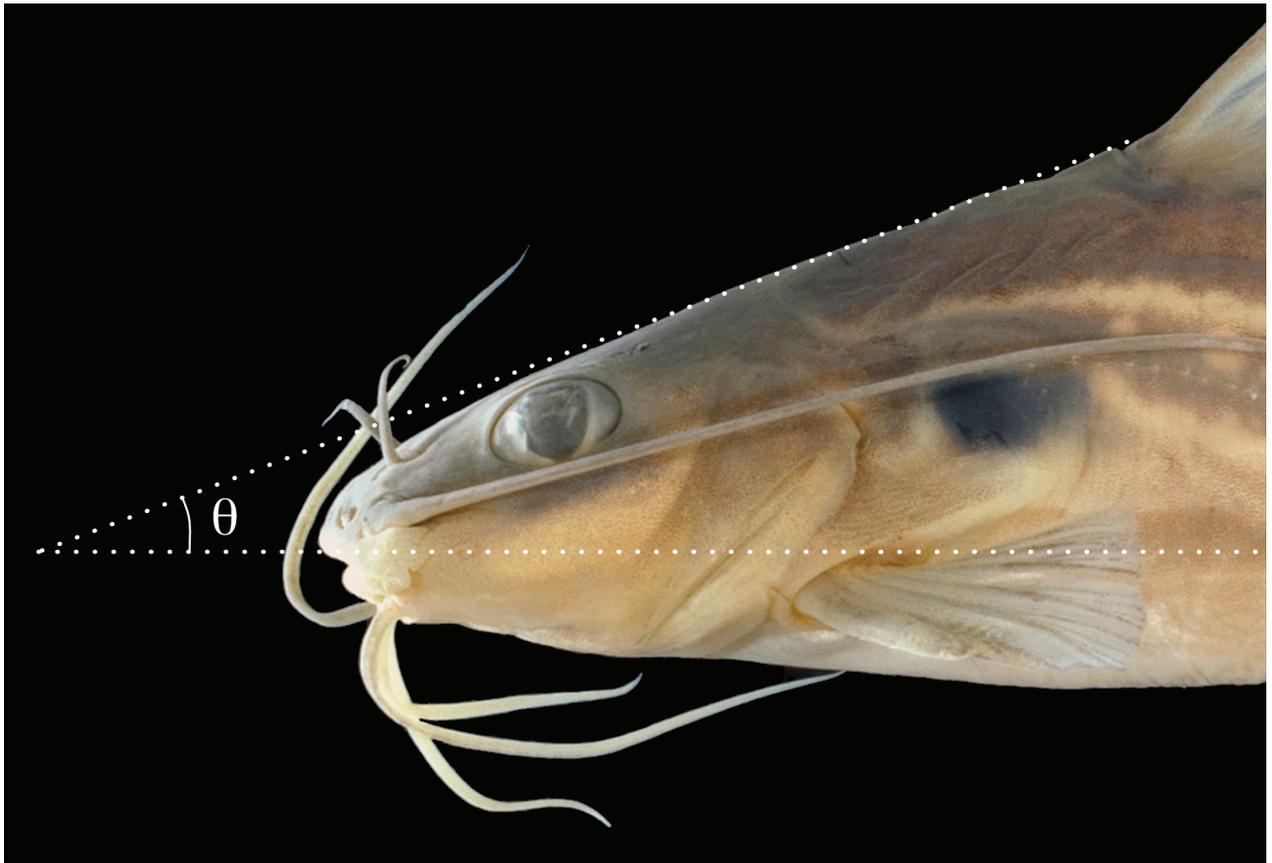
## Introduction

The bagrid catfish genus *Mystus* Scopoli, 1777 consists of nearly 50 species (Ferraris 2007; pers. obs.) found in demersal freshwater and estuarine habitats covering a broad southern arc of the Asian continent, from the Euphrates River drainage in southern Turkey eastwards to the Dong Nai River drainage in southern Vietnam and southwards to the Indian subcontinent and the Greater Sunda Islands. Sixteen species are known from Indochina (continental Southeast Asia from the Irrawaddy River drainage eastwards to the Red River drainage and southwards to the Malay Peninsula; Kottelat 2013; Ng and Kottelat 2023). *Mystus* remains poorly diagnosed, being identified by only two synapomorphies: the first infraorbital slender and lacking extensions, and a thickened, trapezoidal metapterygoid loosely attached to the quadrate (Mo 1991). While identifying fish specimens collected from the Irrawaddy

and Bago River drainages in Myanmar, we observed differences amongst those putatively identified as *Mystus pulcher* Chaudhuri, 1911. Closer examination revealed the presence of two species amongst both this material and the syntypes of *M. pulcher*. This study thus describes one of these species as *Mystus celator* **sp. nov.** and fixes the identity of *M. pulcher* through the designation of a lectotype.

## Materials and methods

Measurements were made point to point with digital calipers and data recorded to tenths of a millimeter. Counts and measurements were made on the left side of spec-



**Figure 1.** Measurement of the angle of the predorsal profile ( $\theta$ ), defined as the angle the tangent to the predorsal profile originating from the base of the dorsal-fin spine makes with the horizontal.

imens whenever possible, following Ng and Kottelat (2013). The angle of the predorsal profile was measured from photographs of lateral views of specimens, and is defined as the angle between longitudinal axis and the tangent to the predorsal profile originating from the base of the dorsal-fin spine (Fig. 1). Subunits of the head are presented as proportions of head length (HL). Head length and measurements of body parts are given as proportions of standard length (SL). Unpaired fin-ray and vertebral counts were made from radiographs, with the latter counted following the method of Roberts (1994), i.e. with the first rib-bearing vertebra considered the sixth and the counts presented as abdominal (with hemal spines anterior to first anal-fin pterygiophore)+caudal (with hemal spines posterior to first anal-fin pterygiophore)=total vertebrae. Asterisks after a meristic value indicate the condition for the holotype. Material examined in this study is deposited in the following institutions: CAS (California Academy of Sciences, San Francisco, USA); CMK (Collection Maurice Kottelat, Delémont, Switzerland); MHNG (Muséum d'histoire naturelle de la Ville de Genève, Geneva, Switzerland); NRM (Naturhistoriska Riksmuseet, Stockholm, Sweden); UMMZ (University of Michigan Museum of Zoology, Ann Arbor, USA); USNM (National Museum of Natural History, Washington DC, USA); ZRC (Lee Kong Chian Natural History Museum, Singapore); and ZSI (Zoological Survey of India, Kolkata, India)

## Results

### *Mystus celator* sp. nov.

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Figure 2

**Chresonymy.** *Mystus pulcher* (in part) – Chaudhuri (1911: 20).

**Holotype.** MHNG 2790.082, 80.6 mm SL; Myanmar: Kachin State: Thein Lin Chaung at Thein Lin village, E of Bhamo, 24°11'1"N 97°15'30"E; M. Kottelat and Nyein Chan, 24 June 2017.

**Paratypes.** CMK 26781 (1), 62.4 mm SL; Myanmar: Kachin State: Moe Sit Chaung, a small stream entering Irrawaddy River from the N opposite Shwegu, about 35 km downstream of Bhamo, about 1.5 km from mouth, ca. 100 masl, 24°12'35"N 96°50'5"E; Nyein Chan, 9 February 2017. CMK 26981 (1), 77.3 mm SL; ZRC 64887 (1), 74.5 mm SL; Myanmar: Kachin State: Nant Sa Ri Chaung at Kaung Jar Xan village, E of Bhamo, 24°12'33"N 97°15'35"E; M. Kottelat and Nyein Chan, 24 June 2017.

**Table 1.** Features of color pattern in striped *Mystus* species.

	Dark longitudinal stripes on body of equal intensity	Dark tympanic spot	Dark spot at extremity of caudal peduncle
<i>M. albolineatus</i>	+	—	+
<i>M. atrifasciatus</i>	+	—	+
<i>M. bleekeri</i>	+	+	—
<i>M. carcio</i>	+	+	—
<i>M. celator sp. nov.</i>	+	+	+
<i>M. cyrusi</i>	+	—	—
<i>M. dibrugarensis</i>	—	+	+
<i>M. multiradiatus</i>	+	+	—
<i>M. mysticetus</i>	+	+	—
<i>M. nanus</i>	+	—	+
<i>M. ngasep</i>	+	+	—
<i>M. pelusius</i>	+	—	—
<i>M. pulcher</i>	+	+	+
<i>M. prabini</i>	—	+	+
<i>M. rhegma</i>	+	—	—
<i>M. rufescens</i>	+	+	+
<i>M. tengara</i>	+	+	—
<i>M. vittatus</i>	+	+	—

**Table 2.** Morphometric data for *Mystus celator sp. nov.* (n=4).

	Holotype MHNG 2790.082	Paratypes			Range
		CMK 26781	ZRC 64887	CMK 26981	
Standard length (mm)	80.5	62.4	74.5	77.3	62.4–80.5
% SL					
Predorsal length	40.4	41.2	39.1	39.6	39.1–41.2
Preanal length	71.1	71.3	70.9	71.7	70.9–71.7
Prepelvic length	55.2	55.4	58.4	57.2	55.2–58.4
Prepectoral length	25.2	26.1	26.7	26.1	25.2–26.7
Length of dorsal-fin base	17.3	18.9	15.4	15.7	15.4–18.9
Length of dorsal spine	11.9	16.7	12.2	12.8	11.9–16.7
Length of anal-fin base	11.1	13.5	12.8	13.5	11.1–13.5
Pelvic-fin length	16.4	16.8	16.2	16.8	16.2–16.8
Pectoral-fin length	19.3	23.1	20.0	19.4	19.3–23.1
Pectoral-spine length	17.6	20.4	18.7	16.2	16.2–20.4
Caudal-fin length	30.4	28.7	26.0	26.9	26.0–30.4
Length of adipose-fin base	20.9	20.3	22.8	23.3	20.3–23.3
Dorsal to adipose distance	12.5	8.5	10.6	8.9	8.5–12.5
Post-adipose distance	14.2	14.7	14.1	15.3	14.1–15.3
Length of caudal peduncle	18.4	16.1	16.9	17.5	16.1–18.4
Depth of caudal peduncle	11.1	9.9	10.2	9.8	9.8–11.1
Body depth at anus	20.7	21.5	23.1	21.0	20.7–23.1
Head length	27.8	31.6	29.3	28.5	27.8–31.6
Head width	20.1	19.4	20.7	19.7	19.4–20.7
Head depth	18.9	19.7	19.3	19.8	18.9–19.8
% HL					
Snout length	35	33	34	37	33–37
Interorbital distance	42	37	35	36	35–42
Eye diameter	17	24	20	20	17–24
Nasal barbel length	68	55	66	77	55–77
Maxillary barbel length	261	290	273	295	261–295
Inner mandibular barbel length	104	83	96	98	83–104
Outer mandibular barbel length	150	189	136	144	136–189



**Figure 2.** *Mystus celator* sp. nov., MHNG 2790.082, holotype, 80.6 mm SL; Myanmar: Thein Lin Chaung at Thein Lin village. Dorsal, lateral and ventral views.

**Additional Material.** ZSI F4718/1 (1), 51.5 mm SL; ZSI F4719/1 (1), 51.4 mm SL; Myanmar: Bhamo; J. Coggin-Brown, 1909–1910 (photographs examined).

**Diagnosis.** *Mystus celator* sp. nov. is distinguished from congeners except for *M. pulcher* and *M. rufescens* in hav-

ing a combination of three equally dark longitudinal stripes separated by pale interspaces on the sides of the body, a round, dark tympanic spot, and an ovoid, dark spot on the caudal peduncle (vs. at least one of these three features absent; Table 1). It differs from *M. pulcher* and *M. rufescens* in having a shorter adipose-fin base (18.0–23.3% SL vs.

27.5–49.1), with the following combination of characters further distinguishing it from congeners: angle between body axis and predorsal profile 21–24°, posterior cranial fontanel not reaching base of supraoccipital process, 25–30 rakers on the first branchial arch, and 35–36 vertebrae.

**Description.** Biometric data in Table 2. Head depressed; predorsal profile slightly convex and making angle of 21–24° with body axis, ventral profile almost straight; snout acutely rounded when viewed dorsally. Bony elements of dorsal surface of head covered with thin skin; bones readily visible, especially on posterior half of neurocranium, and ornamented with numerous fine, radial grooves. Midline of cranium with elongate fontanel extending from behind snout to just beyond level of posterior orbit margin. Supraoccipital process elongate, with gently converging sides and pointed tip; extending to anterior nuchal plate. Eye ovoid, horizontal axis longest, with free margin; located entirely in dorsal half of head. Gill openings wide, extending from posttemporal to beyond isthmus. Gill membranes free from isthmus, with 8 (4) branchiostegal rays.

Mouth subterminal, fleshy upper lip extending anteriorly beyond upper jaw. Oral teeth small and villiform, in irregular rows on all tooth-bearing surfaces. Premaxillary tooth band curved, of equal width throughout. Dentary tooth band much narrower than premaxillary tooth band at symphysis, tapering laterally. Vomerine tooth band unpaired, continuous across midline; smoothly arched along anterior margin; band width narrower than premaxillary band at midline, widening laterally and then tapering to a sharp point posterolaterally.

Barbels in four pairs. Maxillary barbel long and slender, extending to vertical through middle of anal-fin base. Nasal barbel slender, extending to midway between posterior orbital margin and dorsalmost point of gill opening. Inner mandibular-barbel origin close to midline; barbel thicker and longer than nasal barbel and extending beyond level of last pectoral-fin ray base. Outer mandibular barbel originating posterolateral of inner mandibular barbel, extending to two-thirds of distance between base of last pectoral-fin ray and pelvic-fin origin.

Body subterete, slightly compressed, becoming more so toward caudal peduncle. Dorsal profile rising evenly, not steeply, from tip of snout to origin of dorsal fin, sloping gently ventrad from origin of dorsal fin to end of caudal peduncle. Ventral profile slightly convex to anal-fin base, then sloping slightly dorsally to end of caudal peduncle. Skin smooth. Lateral line complete, midlateral in position. Vertebrae 19+16=35\* (2) or 19+17=36 (2).

Dorsal fin with spinelet, spine, and 7 (4) rays. Origin of dorsal fin at about one-third of body. Dorsal-fin margin convex, with anterior branch of fin rays longer than other branches. Dorsal-fin spine moderately long, straight, slender, posterior edge with 4\*–5 retrorse serrae. Nuchal plate triangular and narrow.

Pectoral fin with stout spine, sharply pointed at tip, and I,7\* (2) or I,8 (2) rays. Anterior margin of spine smooth; posterior margin of spine with 11–15\* large, retrorse serrae along entire length. Pectoral-fin margin straight an-

teriorly, convex posteriorly. Cleithral process in form of narrow triangle with concave dorsal margin and extending for half of pectoral-spine length.

Pelvic-fin origin at vertical through posterior end of dorsal-fin base, with i,5 (4) rays, its distal margin slightly convex; tip of adpressed fin just reaching anal-fin origin. Anus located at vertical through middle of adpressed pelvic fin; urogenital opening located immediately anterior to base of first anal-fin ray, at vertical through posterior quarter of adpressed pelvic fin. Males with an elongate conical genital papilla.

Adipose fin with convex margin for entire length, with deeply-incised posterior portion; adipose-fin base moderate, spanning nearly half of postdorsal distance. Anal-fin origin posterior to vertical through origin of adipose fin; anal fin with iii,5,i (1), iii,7\* (1), iii,8,i (1), or iv,6,i (1) rays and convex distal margin.

Caudal peduncle moderately deep. Caudal fin deeply forked, with i,7,8,i (4) principal rays; both lobes acutely rounded, upper lobe more slender and longer than lower. Procurrent rays extending anterior to caudal-fin base.

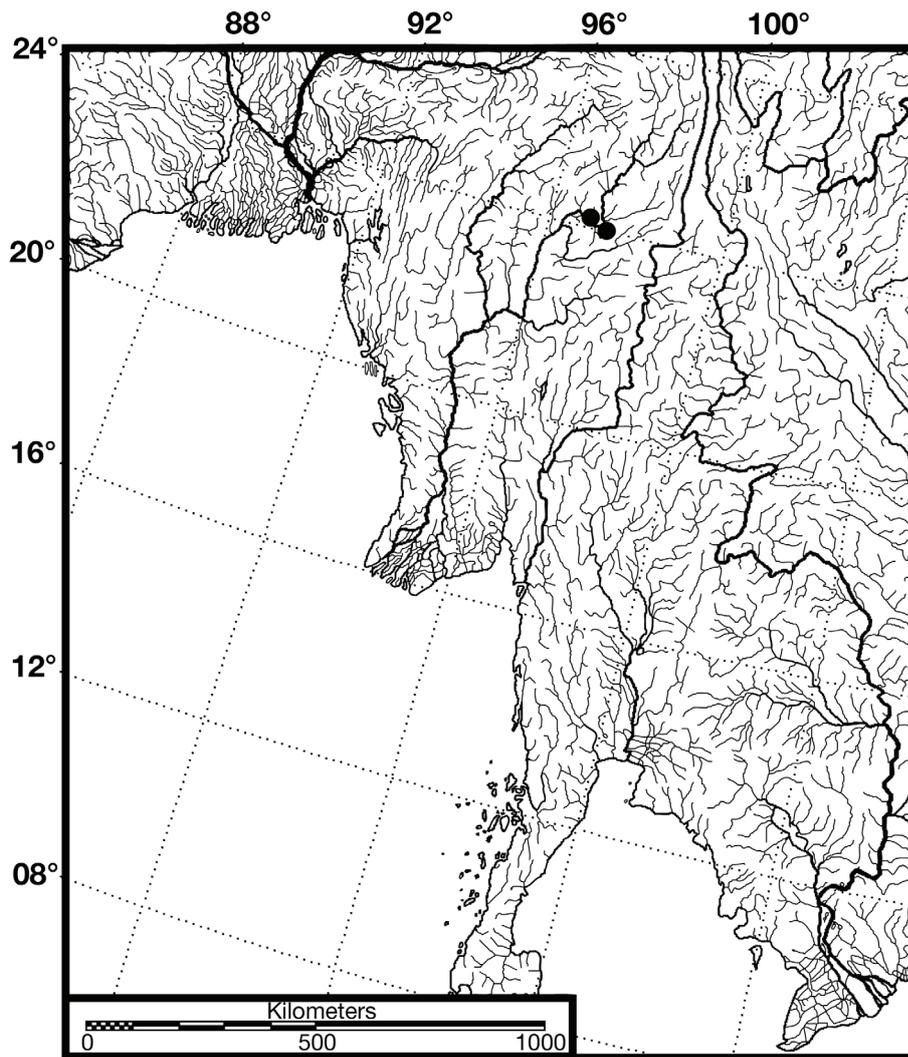
**Coloration.** Fixed in formalin, stored in 70% ethanol: Dorsal and lateral surfaces of head brown, fading to cream ventrally. Body predominantly brown on dorsal and lateral surfaces, fading to cream ventrally. Three brown longitudinal stripes on dorsal and lateral surfaces of body: dorsal stripe originating from supraoccipital and epiotic area, middle stripe originating from posterolateral corner of head, and ventral stripe originating from tip of cleithral process. All three stripes extending posteriorly to caudal-fin origin and separated by narrow, pale interspaces. Dark gray to black, round tympanic spot on body above cleithral process. Dark gray to black ovoid spot, about eye size, at mid-height of posterior extremity of caudal peduncle. Adipose fin largely hyaline, with brown melanophores scattered along base. All fins with hyaline interradiar membranes and dusting of brown melanophores along fin rays. Nasal and maxillary barbels brown dorsally, cream ventrally. Mandibular barbels cream.

**Distribution.** Known from the middle Irrawaddy River drainage in Myanmar, upstream of Mandalay (Fig. 3).

**Etymology.** The specific name comes from the Latin noun *celator*, meaning a concealer or hider, and is used in allusion to its close similarity to (and misidentification with) *M. pulcher*.

## Discussion

*Mystus pulcher* was described from four syntypes collected from “...the district of Bhamo close to the Yunnan border” in the middle Irrawaddy River drainage (Chaudhuri 1911). We have examined photographs of all four syntypes, and conclude that they represent two distinct species (each represented by two specimens): one with a



**Figure 3.** Map showing collection localities for *Mystus celator* **sp. nov.** Each point may represent more than one collection locality.

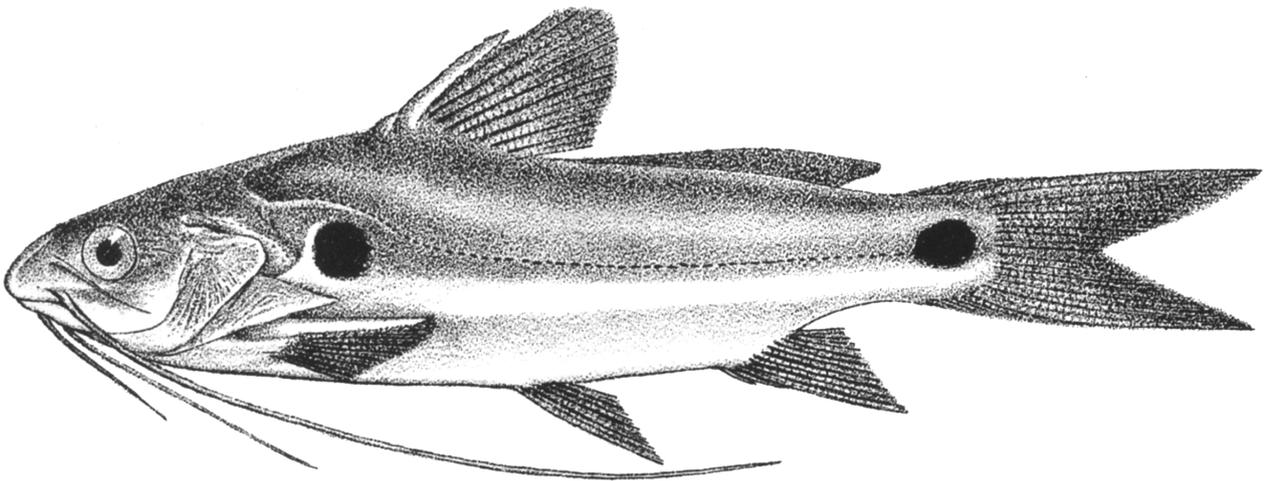
shorter adipose-fin base (18.0–18.4% SL vs. 28.2–29.3) and a more steeply-sloping dorsal profile (angle of the tangent to the predorsal profile 21–22° vs. 13–19°) than the other. Because of the presence of two species amongst the syntypes, it is necessary to designate a lectotype to fix the identity of *M. pulcher* following Article 74 of the International Code of Zoological Nomenclature. As first revisers, we designate one of the two specimens with the longer adipose-fin base and more gently sloping predorsal profile (ZSI F4716/1, 52.8 mm SL; Fig. 4) as the lectotype of *M. pulcher* (ZSI F4717/1, 51.7 mm SL is therefore a paralectotype of *M. pulcher*). The morphology of adipose fin and the predorsal profile in the lectotype agrees with that of the specimen illustrated in the original description (Chaudhuri, 1911: pl. I fig. 4; reproduced here as Fig. 5), although we were unable to determine with certainty if the illustration is that of ZSI F4716/1. Our choice of ZSI F4716/1 as the lectotype stems from the fact that it is the better preserved of the two specimens (ZSI F4717/1 has a large, open gash in the abdomen). Our designation of a lectotype for *M. pulcher* leaves the specimens with the shorter adipose-fin base and steeper predorsal profile (ZSI F4718/1, 51.5 mm SL; ZSI F4719/1, 51.4 mm SL; Fig. 6) without a name; they belong to *M. celator* **sp. nov.**, described above.

Two congeners found sympatrically with *M. celator* **sp. nov.** in the Irrawaddy River drainage share with it a color pattern consisting of three equally dark longitudinal stripes separated by pale interspaces, a round dark tympanic spot and an ovoid, dark spot at the posterior extremity of the caudal peduncle: *M. pulcher* (Fig. 7b) and *M. rufescens* (Fig. 7c). As mentioned in the diagnosis, *M. celator* **sp. nov.** differs from both species in having a shorter adipose-fin base (18.0–23.3% SL vs. 27.5–29.9 in *M. pulcher* and 41.0–49.1 in *M. rufescens*). *Mystus celator* **sp. nov.** further differs from *M. pulcher* in having a more steeply-sloping predorsal profile (angle of the predorsal profile 21–24° vs. 13–19; Fig. 6), and from *M. rufescens* in having a shorter posterior cranial fontanel (not reaching vs. reaching base of supra-occipital process), fewer vertebrae (35–36 vs. 39–43), and more rakers in the first branchial arch (25–30 vs. 13–20).

*Mystus ngasep* (also from the Irrawaddy River drainage) also possesses three equally dark longitudinal stripes separated by two pale interspace stripes and a dark tympanic spot like *M. celator* **sp. nov.**, but lacks the dark peduncular spot. It is additionally distinguished from *M. celator* **sp. nov.** in having a longer posterior cranial fontanel (reaching vs. not reaching base of supra-



**Figure 4.** *Mystus pulcher*, ZSI F4716/1, lectotype, 52.8 mm SL; Myanmar: Bhamo. Photograph courtesy of Zoological Survey of India.



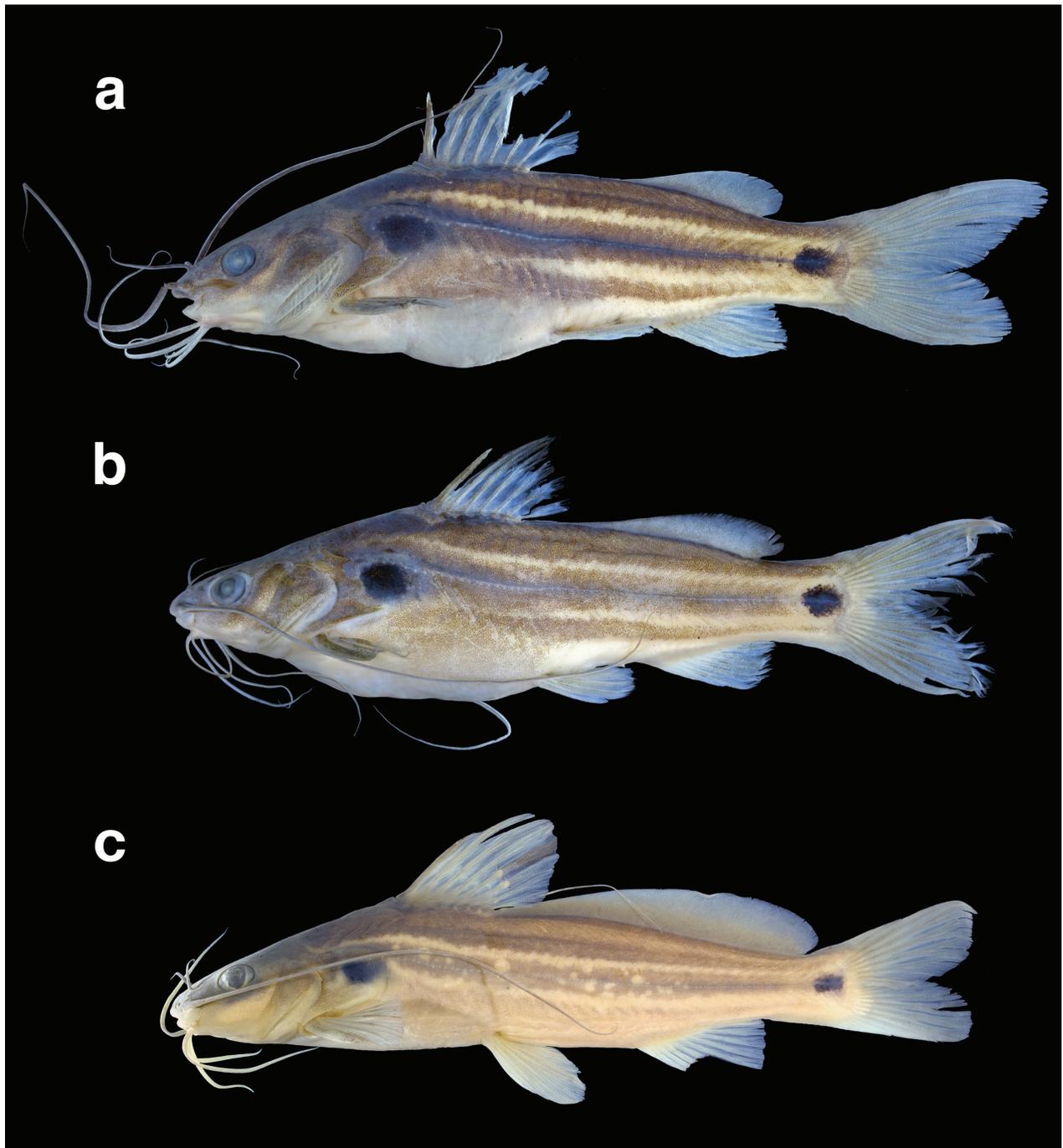
**Figure 5.** Illustration of *Mystus pulcher* from Chaudhuri (1911: Pl. I fig. 4).



**Figure 6.** *Mystus celator* sp. nov., ZSI F4719/1, 51.4 mm SL; Myanmar: Bhamo. Photograph courtesy of Zoological Survey of India.

occipital process) and adipose-fin base (37.1–44.5% SL vs. 20.3–23.3), more vertebrae (40–41 vs. 35–36), and fewer rakers in the first branchial arch (16–19 vs. 25–30).

Among the four remaining congeners known from the Irrawaddy River drainage (*M. cineraceus*, *M. falcarius*, *M. gulio*, and *M. leucophasis*), *M. celator* sp. nov. differs



**Figure 7.** Lateral views of: **a** *Mystus celator* **sp. nov.**, MHNG 2790.082, holotype, 80.6 mm SL; Myanmar: Irrawaddy River drainage, Thein Lin Chaung; **b** *M. pulcher*, CMK 28190, 79.0 mm SL; Myanmar: Irrawaddy River drainage, Watt Kya Chaung; **c** *M. rufescens*, CMK 17783, 89.0 mm SL; Myanmar: Ataran River drainage. Note difference in predorsal profiles and lengths of adipose-fin bases. Images not to scale.

from all of them in having a color pattern of dark longitudinal stripes on the sides of the body separated by pale interspaces (vs. dark or silvery bodies without stripes) and a dark ovoid spot at the base of the caudal fin (vs. absent).

Two other congeners from the Brahmaputra River drainage (*M. dibrugarensis* and *M. prabini*) also possess dark longitudinal stripes as well as dark tympanic and peduncular spots. However, the color pattern of both *M. dibrugarensis* and *M. prabini* differ markedly from that of *M. celator* **sp. nov.** in having a middle stripe that is

distinctly darker than the upper and lower stripes (vs. all three stripes of equal intensity). *Mystus celator* **sp. nov.** further differs from *M. prabini* in having a shorter adipose fin that does not contact (vs. contacting) the base of the last dorsal-fin ray (length of adipose-fin base 18.0–23.3% SL vs. 38.1–45.1), fewer vertebrae (35–36 vs. 39–40) and more rakers on the first branchial arch (25–30 vs. 10–12).

Although the distributions of *M. celator* **sp. nov.** and *M. pulcher* overlap, they have not been observed together at a single site. No habitat differences were observed.

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- Mystus dibrugarensis*: Data from Darshan et al. (2019).
- Mystus falcarius*: CAS 89001, holotype, 170.2 mm SL; Myanmar: Kachin State, Myitkyina market. BMNH 1891.11.30.210–219 (13 paratypes), 96.0–139.6 mm SL; Myanmar: Sittaung River and adjacent streams from Taungoo to about 240 km S. CAS 79033 (2 paratypes), 118.8–124.8 mm SL; Myanmar: Yangon market. CAS 89000 (4 paratypes), 92.2–125.8 mm SL; USNM 344668 (6 paratypes), 74.8–99.0 mm SL; Myanmar: Sagaing Division, Pinda River in vicinity of Pinda Village, 23°10'59"N 94°5'37"E. CAS 92932 (1 paratype), 101.6 mm SL; Myanmar: Taninthayi Division, Tenasserim River backwater, midway between Htee-tah and Baowashung. CAS 96569 (1 paratype), 190.4 mm SL; Myanmar: Taninthayi Division, Tenasserim River and tributaries midway between Htee-tah and Baowashung. USNM 343550 (1 paratype), 80.1 mm SL; Myanmar: Bago Division, Sittaung River at Taungoo. NRM 53823 (1), 144.9 mm SL; Myanmar: Yangon, Insein market.
- Mystus gulio*: CAS 88628 (12), 74.5–111.3 mm SL; Myanmar: Bago Division, Bago market. USNM 343552 (5), 78.0–104.5 mm SL; Myanmar: Yangon Region, Thanlyin market, most probably from Bago River.
- Mystus leucophasis*: USNM 44752 (1), 158.2 mm SL; USNM 44798 (1), 83.6 mm SL; Myanmar: Mandalay. USNM 34469 (2), 149.7–174.6 mm SL; Myanmar: Sagaing Division, Kalemmyo fish markets.
- Mystus ngasep*: Data from Darshan et al. (2011).
- Mystus prabini*: Data from Darshan et al. (2019).
- Mystus pulcher*: ZSI F4716/1, lectotype, 52.8 mm SL; ZSI F4717/1, paralectotype, 51.7 mm SL; Myanmar: Bhamo. CMK 26828 (3), 52.0–62.8 mm SL; Myanmar: Sagaing Division, oxbow lake of Irrawaddy River, about 37 km downriver of Shwegu, 24°17'11"N 96°28'30"E. CMK 27151 (1), 57.7 mm SL; Myanmar: Sagaing Division, Irrawaddy River upstream of Hti Chaint, Sa Khan Kyaut Maw Inn, 23°46'23"N 96°10'22"E. CMK 27210 (5), 29.6–69.9 mm SL; Myanmar: Sagaing Division, Irrawaddy River near Hti Kone village, about 55 km N of Mandalay, newly flooded side arm, 22°26'41"N 96°0'18"E. CMK 26894 (4), 34.9–49.3 mm SL; Myanmar: Sagaing Division, Irrawaddy River at Pha Ya Kyun village, opposite Mandalay, 21°56'24"N 96°2'4"E. CMK 28190 (4), 56.6–79.0 mm SL; Myanmar: Bago Division, Bago Division, Watt Kya Chaung at Watt Kya Village, small tributary of Bago River, 17°37'18"N 96°14'45"E. USNM 343556 (11), 55.6–61.1 mm SL; Myanmar: Yangon Region, Thanlyin market, most probably from Bago River.
- Mystus rufescens*: USNM 344671 (2), 73.3–85.0 mm SL; Myanmar: Kachin State, Nan Kwe stream, approximately 10 miles SW of Myitkyina along main N–S road at town of Nan Kwe. CAS 81544 (9), 90.5–123.0 mm SL; CAS 88608 (2), 67.0–85.9 mm SL; ZRC 50646 (1), 70.7 mm SL; Myanmar: Mandalay market. USNM 346162 (1), 121.5 mm SL; Myanmar: Sagaing Division, Kanbalu town-

## Appendix 1

### Comparative material

ship, Chatthin Wildlife Sanctuary, Kye-In (lake). CAS 88616 (1), 79.0 mm SL; Myanmar: Bago division, Bago market. CMK 17783 (4), 65.2–89.0 mm SL; Myanmar: Kayin State, stream “Chon Son” between Kyondaw and Phadaw, about 20 km NW of Payathouzu (at border with Thailand), 15°25'N 98°15'E. NRM 39913 (1), 104.6 mm SL; Myanmar: Pagan market.