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First records of two siluriform fishes: *Bagrichthys micranodus* (Actinopterygii: Siluriformes: Bagridae) and *Pangasianodon hypophthalmus* (Pangasiidae) from Sumatra, Indonesia

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Abstract

A bagrid catfish, *Bagrichthys micranodus* Roberts, 1989, has been reliably reported only from Borneo Island, whereas a pangasiid catfish, *Pangasianodon hypophthalmus* (Sauvage, 1878), originally from the Mekong and Chao Phraya rivers, has been widely introduced for aquaculture throughout southeast Asia. However, an ichthyofaunal survey of Cala Lake, South Sumatra, disclosed significant distribution extensions for both species, that of *B. micranodus* being the first from a land mass other than Borneo Island. Additionally, *P. hypophthalmus* was recorded from a natural freshwater habitat, outside the controlled environments of aquaculture facilities. The specimens are described in detail and comparisons are made with closely related species.

Keywords

distribution, fish fauna, introduced species, morphology, new record

Introduction

Bagrichthys, a bagrid catfish genus, characterized by an elongated and compressed caudal peduncle, dorsally-directed serrae on the posterior margin of the dorsal-fin spine, gill membranes united but not joined to the isthmus, and a long adipose fin without a free posterior margin (Roberts 1989; Ng 2000, 2002), comprises seven valid species, five of which have been recorded from inland Indonesian freshwater bodies, viz. *Bagrichthys hypselopterus* (Bleeker, 1852), *Bagrichthys macropterus* (Bleeker, 1854), *Bagrichthys macracanthus* (Bleeker, 1854), *Bagrichthys micranodus* Roberts, 1989, and *Bagrichthys vaillantii* (Popta, 1906) (see Kottelat et al. 1993; Ng 2000, 2002). Among these, *B. micranodus* and *B. vaillantii* have both been reliably reported only from Borneo Island (Kottelat et al. 1993; Ng 2002; Kottelat 2013).

Pangasianodon, a pangasiid catfish genus, characterized by a terminal mouth, posterior nostril located close behind the anterior nostril, and pelvic fins with 8 or 9 rays, includes the endemic Mekong River and Chao Phraya basin species *Pangasianodon gigas* Chevey, 1931 and *Pangasianodon hypophthalmus* (Sauvage, 1878) (see Rainboth 1996; Kottelat 2001; Gustiano 2009; Gustiano unpublished*). The latter species, originating from Thailand, has been subsequently introduced elsewhere for aquacultural purposes (Froese and Pauly 2023; Secretariat GBIF 2023; Gustiano unpublished).

During an ichthyofaunal survey conducted at Cala Lake, Musi River, South Sumatra, a single specimen of *B. micranodus* and two of *P. hypophthalmus* were successfully collected, being the first documented specimen of *B. micranodus* from other than Borneo Island, and the first record of *P. hypophthalmus* from a natural freshwater habitat, outside the controlled environments of aquaculture facilities.

Materials and methods

The specimens were collected during the dry season (August 2023) from Cala Lake, Musi Banyuasin Regency, South Sumatra, Indonesia. The lake, positioned between 02°56′–02°57′S and 103°58′–104°00′E, is an oxbow lake formed by the meandering central zone of the Musi River. Spanning an area of approximately 120 hectares with a maximum depth reaching 13 meters, the lake undergoes seasonal transformations, including elevated water levels during the rainy season, when a connection with the Musi River facilitates fish migration between the two water bodies, and isolation from the Musi River during the dry season, resulting in distinctly different ecological conditions.

Counts and measurements were made on the left side of the specimens whenever possible, generally following Ng (2000) and Hubbs and Lagler (2004), with the following exception and additional characters: humeral process length follows Roberts (1989); dorsal and pectoral fin and spine lengths were measured from the origins to the tips; and head width and depth were measured at the posterior margin of the eyes. Standard and head lengths are abbreviated as SL and HL, respectively. The morphological descriptions are based only on specimens collected from Cala Lake. Curatorial procedures for the specimens, deposited at the Museum Zoologicum Bogoriense, Indonesia (MZB), followed Motomura and Ishikawa (2013).

Comparative material. *Bagrichthys micranodus*, MZB.3578, holotype, 122.9 mm SL, Kapuas River, Western Kalimantan, Indonesia; *Bagrichthys macropterus*, MZB.3575, non-type, 124.7 mm SL, Kapuas River, Western Kalimantan.

Results

Family Bagridae Bleeker, 1858
Bagrichthys Bleeker, 1857

Bagrichthys micranodus Roberts, 1989

Figs. 1A, 2; Table 1

Material examined. MZB.26910, 179.1 mm SL, Cala Lake, Musi Banyuasin, South Sumatra, Indonesia, 8 August 2023, collected by K. Wibowo, R.V. Kusumah, A. Priyadi, and L. Lukman.

Description. Measurements shown in Table 1. Head small, short and bulbous with short blunt snout (lateral view). Body elongated, compressed, with long caudal peduncle. Head and body covered by smooth skin. Eye oval, with free margin, situated entirely on dorsal half of head. Mouth small, inferior; lips with papillae; jaws without teeth; palate with few teeth covered by soft membrane. Gill openings wide; gill membranes broadly joined, not bound to isthmus. Lateral line complete, midlateral, posterior end slightly curved to upper lobe of caudal fin. Anus and urogenital openings situated midway between pelvic and anal fins. Four pairs of barbels present. Maxillary barbel longest, extending almost to vertical level of posterior edge of opercle. Nasal barbel slender, its length more than twice eye diameter. Inner mandibular barbel shortest, thickened, strongly crenulated. Outer mandibular barbel simple, without crenulations, its length less than that of nasal barbel. Dorsal fin with 2 spines; first very small, hidden under skin; second long, compressed, robust, sharply pointed, shorter than two anterior branched rays, posterior margin with 16 upwardly directed serrae. Adipose fin long, broad, with convex edge, originating from posterior end of dorsal fin to middle of posterior half of caudal peduncle. Pectoral fin with 1 spine and 9 rays; spine larger than second dorsal fin spine, robust, sharply pointed, posterior margin with 23 serrae; spine shorter than two anterior branched rays; origin of pectoral fin about level with posteriormost margin of opercular membrane. Pelvic fin with 6 rays; origin slightly posterior to posterior end of dorsal fin base; tip of adpressed fin not reaching origin of anal fin. Anal fin with 15 rays, positioned below midpoint of adipose fin. Caudal fin with 8 + 9 principal rays, deeply forked; upper and lower lobes pointed, outermost principal fin-rays extended as filaments; dorsal and ventral procurrent rays asymmetric, origins of dorsal lobe rays slightly anterior to that of ventral lobe rays.

Fresh specimen coloration. (Fig. 1A). Head dark brown dorsally, pale whitish ventrally. Body dark brown with two whitish vertical markings; first oblique, extending from origin of adipose fin to anterior part of anal fin base, second behind anal fin. Dorsal fin blackish dorsally, whitish ventrally. Adipose fin grey-greenish, white-edged posteriorly. Pectoral, pelvic, and anal fins black with broad hyaline bases. Caudal fin uniformly whitish.

* Gustiano R (2003) Taxonomy and phylogeny of Pangasiidae catfishes from Asia (Ostariophysi, Siluriformes). PhD Dissertation, Katholieke Universiteit Leuven, Belgium, 296 pp.

Table 1. Measurements (expressed as percentages of standard and head lengths) of *Bagrichthys micranodus* and *Pangasianodon hypophthalmus* examined in this study.

Character	*Bagrichthys micranodus*		*Pangasianodon hypophthalmus*	
	Non-type MZB.26910	Holotype MZB.3578	Non-type MZB.26911	Non type MZB.26912
Absolute value [mm]				
Standard length (SL)	179.1	122.9	202.9	206.0
Head length (HL)	33.3	25.9	53.3	54.8
Relative value [%SL]				
Head length	18.6	21.1	26.3	26.6
Body depth at dorsal fin origin	21.7	22.2	24.3	24.7
Body depth at anal fin origin	17.4	15.5	22.4	21.9
Body width at widest point of humeral process	15.8	17.0	16.7	17.1
Predorsal fin length	34.1	36.5	40.9	40.6
Preisthmus length	12.2	14.6	11.6	12.1
Prepectoral fin length	18.2	19.4	21.9	22.3
Prepelvic fin length	43.8	45.2	43.7	43.9
Preanal fin length	61.3	61.3	54.9	55.6
Dorsal-fin spine length	18.1	19.6	19.1	19.1
Dorsal-fin length	22.2	24.6	24.0	23.2
Dorsal-fin base length	10.1	11.7	7.8	7.6
Pectoral-fin spine length	19.7	21.4	18.0	17.6
Pectoral fin length	22.7	—	19.8	19.6
Pelvic fin length	14.6	15.6	14.5	13.6
Anal-fin length	18.4	21.5	13.2	—
Anal-fin base length	12.0	11.6	32.5	30.7
Caudal peduncle length	27.6	28.8	15.6	16.2
Caudal peduncle depth	6.5	6.3	8.2	7.9
Relative value [%HL]				
Head width	53.9	51.8	50.3	49.8
Head depth	52.9	51.0	38.5	37.8
Eye diameter	18.7	14.6	15.9	16.4
Snout length	31.4	29.5	34.3	35.5
Distance between anterior nostrils	10.3	11.9	24.9	25.4
Distance between posterior nostrils	—	—	30.7	31.9
Nasal barbel length	46.8	85.2	—	—
Maxillary barbel length	83.2	111.2	52.3	59.2
Outer mandibular barbel length	34.5	65.7	6.2	30.8
Inner mandibular barbel length	16.5	24.3	—	—
Humeral process length	52.9	53.8	31.0	30.9

Family Pangasiidae Bleeker, 1858
Pangasianodon Chevey, 1931

Pangasianodon hypophthalmus (Sauvage, 1878)

Fig. 1B, 1C; Table 1

Material examined. MZB.26911, 202.9 mm SL, MZB.26912, 206.0 mm SL, Cala Lake, Musi Banyuasin, South Sumatra, Indonesia, 10 August 2023, collected by K. Wibowo, R. V. Kusumah, A. Priyadi, and L. Lukman.

Description. Measurements shown in Table 1. Head somewhat depressed, with pointed snout (lateral view). Body elongated, compressed. Head and body covered by smooth skin. Eye oval, situated slightly below horizontal axis of body. Mouth wide, terminal; upper and lower jaws nearly equal, with a band of villiform teeth; upper jaw teeth entirely covered by lower jaw when mouth closed; vomer with narrow, elongated tooth bands. Gill openings wide; gill membranes free, not bound to isthmus or to each other. Lateral line complete, midlateral. Anus and urogenital openings situated closer to anal-fin base than to pelvic fin. Two pairs of barbels present. Maxillary barbel simple, longer than mandibular barbel; maxillary barbel beyond margin of opercle but not reaching pelvic fin base; mandibular barbel simple, its length less than eye diameter in MZB.26911, about twice eye diameter in MZB.26912. Dorsal fin with 2 spines and 7 rays; first very small, hidden under skin; second long, compressed, robust, shorter than two anterior branched rays; posterior margin with several tiny serrae; origin of dorsal fin above level of pectoral fin spine tip. Adipose fin small, positioned closer to caudal fin base than to dorsal fin. Pectoral fin with 1 spine and 10 rays; spine robust, posterior margin with 24 or 25 serrae, spine shorter than two anterior branched rays; tip of adpressed fin not reaching pelvic-fin origin; dorsal edge of pectoral-fin base about level with ventral margin of orbit. Pelvic fin with 8 rays; fin origin level with midpoint of dorsal-fin base; tip of adpressed fin reaching base of fifth or sixth anal-fin ray. Anal fin with 34 rays; fin base long, equal to about one third standard length; branched rays progres-

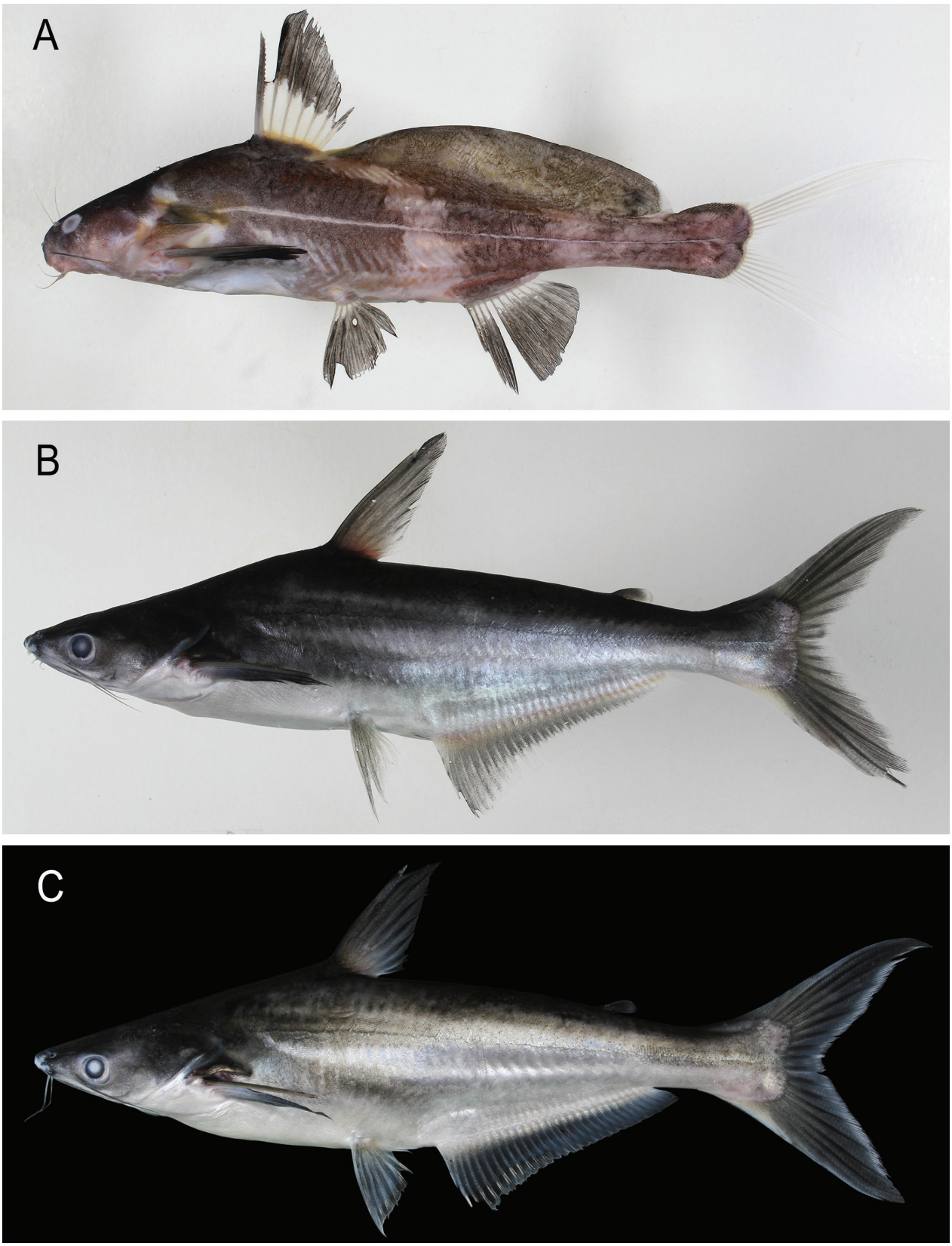

Figure 1. Photographs of fresh specimens of (**A**) *Bagrichthys micranodus*, MZB.26910, 179.1 mm SL, (**B**) *Pangasianodon hypophthalmus*, MZB.26911, 202.9 mm SL, and (**C**) *P. hypophthalmus*, MZB.26912, 206.0 mm SL, collected from Cala Lake, South Sumatra.

sively shorter posteriorly. Caudal fin with 8 + 9 principal rays, deeply forked; upper and lower lobes pointed.

Fresh specimen coloration. (Fig. 1B, 1C). Head and body black dorsally; lateral and ventral surfaces of body pale whitish or silvery; two black lateral stripes joining anteriorly above pectoral fin base. All fins blackish; middle of anal fin with darker stripe; upper and lower caudal fin lobes each with dark grey stripe.

Discussion

The morphology of the bagrid catfish specimen (Fig. 1A) from Cala Lake was very consistent with the morphology of the holotype of *Bagrichthys micranodus* and diagnostic characters of the species given by Roberts (1989) and Kottelat et al. (1993), e.g., mouth small and narrow; oral dentition extremely reduced, only a few scattered teeth covered by soft tissue at palate; posterior margin of second dorsal fin spine with 16 serrae; inner mandibular barbel strongly crenulated; outer mandibular barbel simple; color of fresh specimen dark brown with light whitish areas. The minor difference in the number of serrae on the posterior margin of the second dorsal fin spine in this study (16 serrae; Fig. 2A) compared to previous studies (Roberts 1989; Kottelat et al. 1993; Ng 1999) (15 serrae or fewer) is considered as intraspecific variation.

Bagrichthys micranodus closely resembles the widely distributed Sundaland species *B. macropterus* and Indochinese species *B. obscurus*, particularly in mouth condition, oral dentition, and dorsal fin spine length. However, the former is readily distinguished from both of the latter, having crenulated inner mandibular barbels and simple outer barbels (Fig. 2B), compared with both inner and outer barbels being strongly crenulated in the latter (Roberts 1989; Kottelat et al. 1993; Ng 1999; this study). Additionally, the fresh specimens of *B. micranodus* exhibited dark brown coloration with light whitish areas, contrasting with the pale brown or tan coloration and light creamy areas observed in *B. macropterus*, and uniformly brown coloration (without cream or whitish areas) of *B. obscurus* (see Ng 1999).

Since the Roberts original description in 1989, the known distribution of *B. micranodus* has been restricted to the type locality (Kapuas River, West Kalimantan). Therefore, the Sumatran specimen examined herein represents the first record of *B. micranodus* beyond the confines of Borneo Island (Fig. 3).

Species belonging to the genus *Bagrichthys* are known to reproduce in flooded riparian forests during the rainy season (Rainboth 1996). Kottelat and Widjanarti (2005) reported abundant *B. micranodus* in the Kapuas River during the rainy season, but much reduced numbers during the dry season. However, local fishermen advised that *B. micranodus* was relatively rare in Cala Lake, during both the dry and rainy seasons, the species apparently not entering the lake in large numbers, although relatively abundant in the associated Musi River. This aligns with the report of Kottelat and Widjanarti (2005), which stated that in West Kalimantan, the species was more commonly found in the main river (Kapuas River), compared with lakes.

The pangasiid catfish specimen from Cala Lake closely conformed to the diagnostic characteristics of *Pangasianodon hypophthalmus* provided by Roberts and Vidthayanon (1991), Kottelat (2001), and Gustiano (unpublished*), e.g., head length 26.3%–26.6% of SL, distance between anterior nostrils 24.9%–25.4% of HL, prepectoral length 19.6%–19.8% of SL, anal-fin base length 30.7%–32.5% of SL, preisthmus length 44.3%–45.6% of HL, two blackish strips on the body lateral surface, a dark grey stripe in the middle of the anal fin, and faint dark grey stripes on each caudal fin lobe.

Pangasianodon hypophthalmus has been reported to reach sizes of up to 1300 mm SL (Kottelat 2001), the specimens (202.9–205.96 mm SL) in this study both being considered as juveniles. Such fish (less than 400 mm SL) are characterized by dark well-defined midlateral and abdominal stripes that converge anteriorly above the pectoral fin base (Roberts and Vidthayanon 1991: fig. 9; Rainboth 1996: 153; Kottelat 2001; Fig. 1B, 1C), and the presence of a pair of narrow vomerine tooth bands (Roberts and Vidthayanon 1991: fig. 2e; Kottelat 2001: fig. 55c; Gustiano unpublished: fig. 22c). In larger specimens, the coloration is less distinctive, and the tooth bands are progressively lost.

Native to the Mekong, Chao Phraya, and Maeklong water systems, *P. hypophthalmus* has been introduced to additional river catchments for aquaculture purposes (Froese and Pauly 2023). In fact, the species has been documented as introduced into 11 countries (Secretariat GBIF 2023), following its importation from Thailand to Indonesia in 1972. So far, the fish has been successfully cultivated in several regions of Indonesia, including Sumatera Island (Jambi, Riau, South Sumatra, Lampung), Java Island (Bogor, Sukabumi, Subang), and Borneo Island (South Kalimantan, West Kalimantan) (Solaiman and Sugihartono 2017; Wahyudewantoro and Herawati 2020; Fig. 3). Its discovery in Cala Lake indicates that the species has also been introduced into public waterways, and it is likely that other such occurrences have taken place elsewhere.

The introduction of *P. hypophthalmus* into new environments poses potential risks to native fish populations and the aquatic ecosystem, raising concerns regarding competition for resources, predation on native species, habitat alteration, and the potential spread of diseases. Addressing these potential impacts necessitates the implementation of monitoring programs, ecological assessments, and, if necessary, the application of management strategies. Such strategies may include control measures to limit exotic species' population growth, ecological restoration efforts, and ongoing monitoring programs to assess and adapt management strategies based on evolving ecological dynamics.

The conservation status of *B. micranodus* in The IUCN Red List of Threatened Species is currently listed as Data Deficient (Ng 2019). Although *P. hypophthalmus* has been successfully cultivated in several countries, including Myanmar, Malaysia, and Indonesia, its IUCN status is currently classified as Endangered, due to a significant decline in populations of wild adults in their native habitats due to overfishing (Vidthayanon and Hogan 2011).

* Gustiano R (2003) Taxonomy and phylogeny of Pangasiidae catfishes from Asia (Ostariophysi, Siluriformes). PhD Dissertation, Katholieke Universiteit Leuven, Belgium, 296 pp.

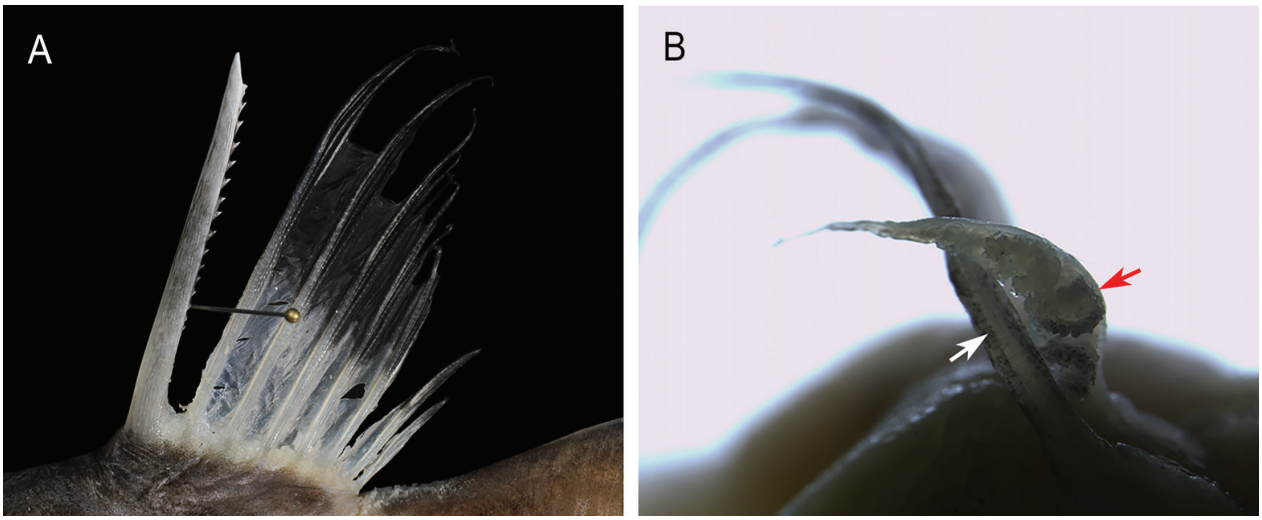

Figure 2. Dorsal fin (**A**) and mandibular barbels (**B**) of *Bagrichthys micranodus*. White and red arrows indicate simple outer and crenulated inner mandibular barbels, respectively.

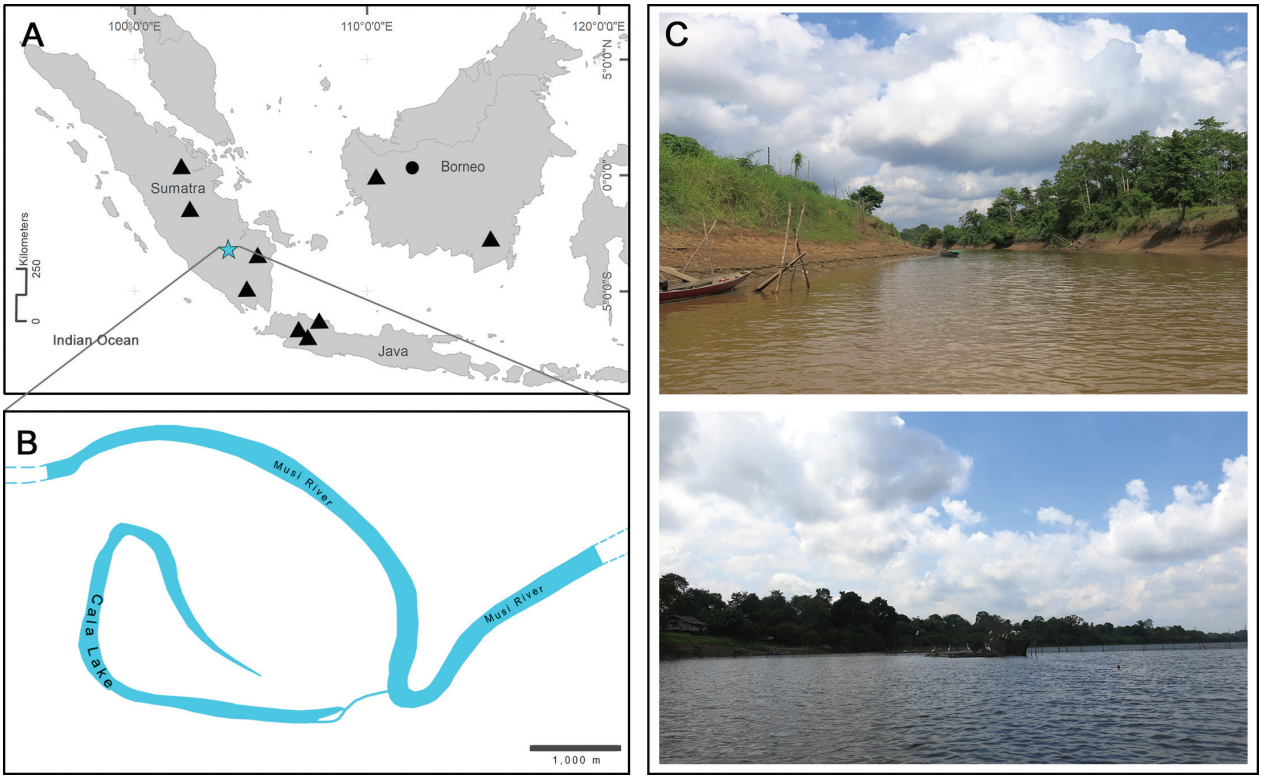

Figure 3. (**A**) Distribution map of *Bagrichthys micranodus* and *Pangasianodon hypophthalmus* in Indonesia; star indicates presently reported specimens of the two species in Cala Lake, South Sumatra; circle and triangles indicate previously reported studies (Roberts 1989; Solaiman and Sugihartono 2017) of *B. micranodus* and *P. hypophthalmus*, respectively. (**B, C**) collection sites of *B. micranodus* and *P. hypophthalmus* from Cala Lake, South Sumatra, examined in this study.

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