Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 16 (2): 317–322
https://doi.org/10.15560/16.2.317

PENSOFT

Species and geographic distribution of *Mylossoma* Eigenmann & Kennedy, 1903 from Ecuador

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Abstract
A review of the species of the genus *Mylossoma* Eigenmann & Kennedy, 1903 found in the Ecuadorian Cis-Andean region was conducted. Two species were recognized: *M. albiscopum* (Cope, 1872) from the Putumayo, Napo, and Tigre river basins and *M. aureum* (Agassiz, 1829) from the Napo river basin. A map of geographical distribution and radiographs for both species are provided. Historical records of *M. duriventre* (Cuvier, 1818) were not confirmed in this geographical distribution.

Keywords
Amazonian basin, ichthyofauna, Neotropical fauna, Serrasalmidae

Academic editor: Gabriela Echevarría | Received 17 December 2019 | Accepted 9 March 2020 | Published 3 April 2020

Citation: Valdiviezo-Rivera J, Carrillo-Moreno C, Koch C (2020) Species and geographic distribution of *Mylossoma* Eigenmann & Kennedy, 1903 from Ecuador. Check List 16 (2): 317–322. https://doi.org/10.15560/16.2.317

Introduction

The genus *Mylossoma* Eigenmann & Kennedy, 1903 belongs to the family Serrasalmidae in the order Characiformes. Currently, *Mylossoma* consists of five valid species distributed over a wide geographical range in South America, from Venezuela to Argentina (Mateussi et al. 2018; Fricke et al. 2020). Historically, *Mylossoma aureum* and *M. duriventre* have been reported from Ecuador in the Napo and Pastaza river basins (Ovchynnyk 1968; Stewart et al. 1987; Barriga 1994; Galacatos et al. 2004; Barriga 2012). In their recent review of the Cis-Andean species of *Mylossoma*, Mateussi et al. (2018) showed that *M. albiscopum* and *M. aureum* occur in the Amazon and Orinoco river basins; *M. duriventre* is found in Paraguay River, lower part of the Paraná River, and tributaries of Uruguay river basin; and *M. unimaculatum* is an endemic species of the Tocantins–Araguaia system. Additionally, *M. acanthogaster* is present in the basin of Lake Maracaibo (Fricke et al. 2020). No material from Ecuador was incorporated in the aforementioned study, which leaves uncertainty about the geographic distribution of these species in the upper Amazon basin. The objective of this note is to document the presence of the genus *Mylossoma* with several distribution records in the Ecuadorian Cis-Andean region.

Methods

Specimens of the genus *Mylossoma* captured in Ecuador were identified from five natural history collections in Ecuador and the United States. Distribution data from the literature were also taken into account when mentioning specific localities. We conducted an exhaustive search of scientific literature using physical and/or

digital copies of publications. We also include a map of the sampling localities of *Mylossoma* (Fig. 1).

Morphometric and meristic measurements were taken with digital calipers (accuracy ± 0.02 mm). Measurements followed Mateussi et al. (2018), expressed as percentages of standard length (SL) and head length (HL). Radiographs (rd) were taken with a Faxitron MX-60 digital X-ray system.

Abbreviations of ichthyological collections are: ANSP = The Academy of Natural Sciences of Drexel University, Philadelphia, PA, USA; DP-MECN = Colección Ictiológica del Instituto Nacional de Biodiversidad, Quito, Ecuador; MEPN = Museo de la Escuela Politécnica Nacional, Quito, Ecuador; FMNH = Field Museum, Chicago, IL, USA; MCZ = Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA.

Results

***Mylossoma albiscopum* (Cope, 1872)**
Figures 1, 2, Table 1

Material examined. ECUADOR • Sucumbios Province • Simanwe River, Putumayo river basin (00°12′08.14″N, 076°16′47.93″W; 247 m a.s.l.), J. Valdiviezo-Rivera, 11 Jun. 2010 (1 specimen, 147 mm SL, MECN-DP 1914) • Small lagoon west of the Cuyabeno River, Aguarico river sub-basin, Napo river basin (00°13′02″S, 075°56′03″W; 218 m a.s.l.), D. Stewart, R. Barriga, & M. Ibarra, 20 Oct. 1983 (1 specimen, 122.4 mm SL, MEPN 17833). Orellana Province • Jatuncocha Lagoon, 2 km downstream Jatuncocha River, Yasuni river sub-basin, Napo river basin (00°59′01″S, 075°25′06″W; 210 m a.s.l.), D. Stewart & R. Barriga, 23 Oct. 1981 (3 specimens, 105.1–169.1 mm SL, MEPN 11090) • Jatuncocha Lagoon, Yasuni river sub-basin, Napo river basin (01°00′00″S, 075°29′00″W; 210 m a.s.l.), R. Barriga, D. Stewart & M. Ibarra, 25 Oct. 1981 (1 specimen, 155 mm SL, MEPN 1121) • Garzacocha Lagoon, headwaters of the Yasuni River, downstream Kawimeno, Yasuni river sub-basin, Napo river basin (01°03′22″S, 075°29′23″W; 184 m a.s.l.), R. Barriga, 13 Feb. 1991 (1 specimen, 207.3 mm SL, MEPN 15964). Pastaza Province • Yanayacu-Chunda Muyuna Lagoon, Tigre river basin (02°01′01.84″S, 076°05′10.33″W; 187 m a.s.l.), L. Guarderas, 2003 (1 specimen, 126.7 mm SL, MECN-DP 3519).

Occurrence records (literature data). ECUADOR • Sucumbios Province • Tiputini River, near mouth of Napo River and Quebradas, Napo river basin (00°49′00.12″S, 075°31′00.12″W; 199 m a.s.l.), D. Stewart, M. Ibarra, R. Barriga & C. Uquillas, 30 Oct. 1981 (2 specimens, FMNH 97983) • Near mouth of Panayacu River, Napo river basin (00°25′59.89″S, 076°06′35.60″W; 236 m a.s.l.), M. Olalla (5 specimens, ANSP 137648). Orellana Province • Outflow of Jatuncocha Lagoon, Napo river

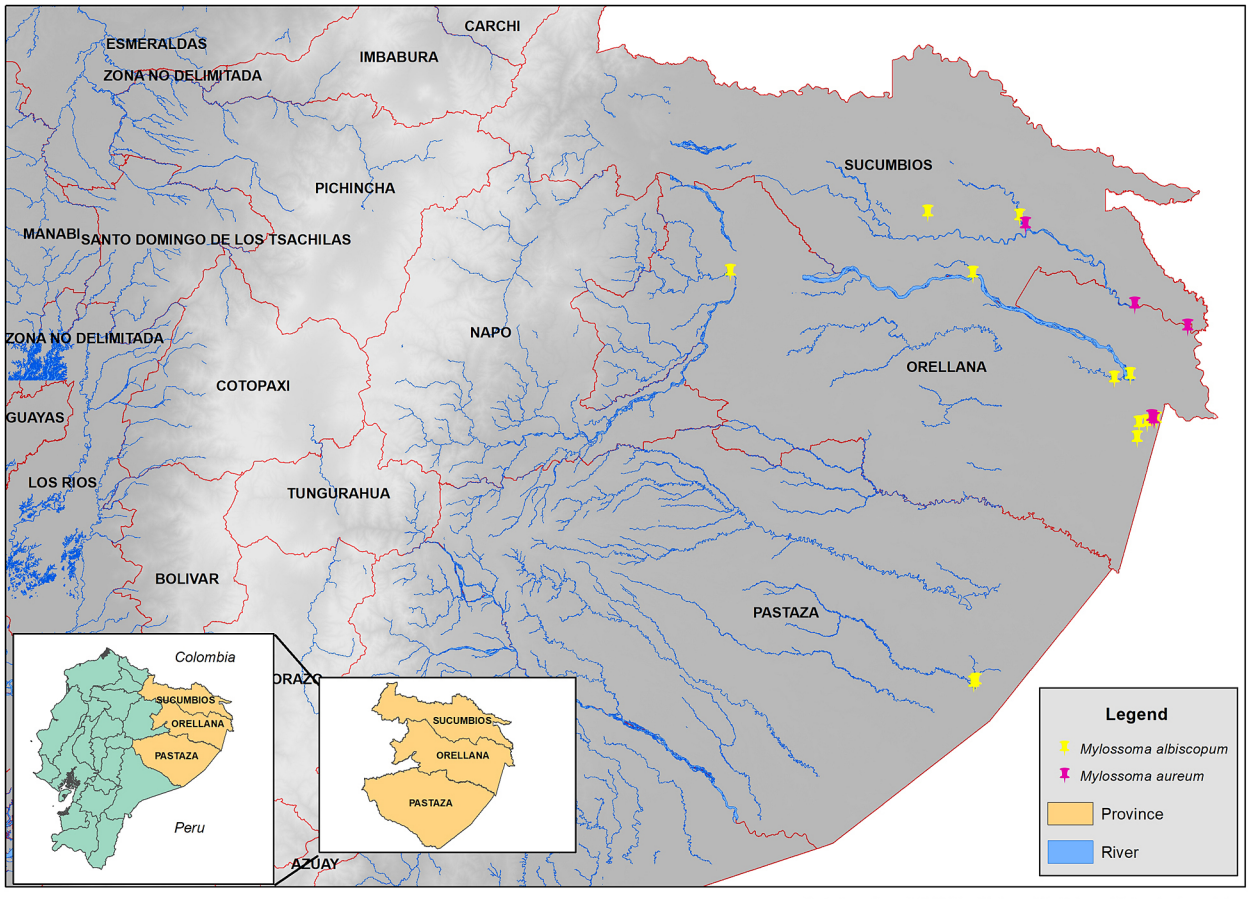

Figure 1. Distribution of *Mylossoma albiscopum* (yellow mark) and *Mylossoma aureum* (fuchsia mark) examined in the present study.

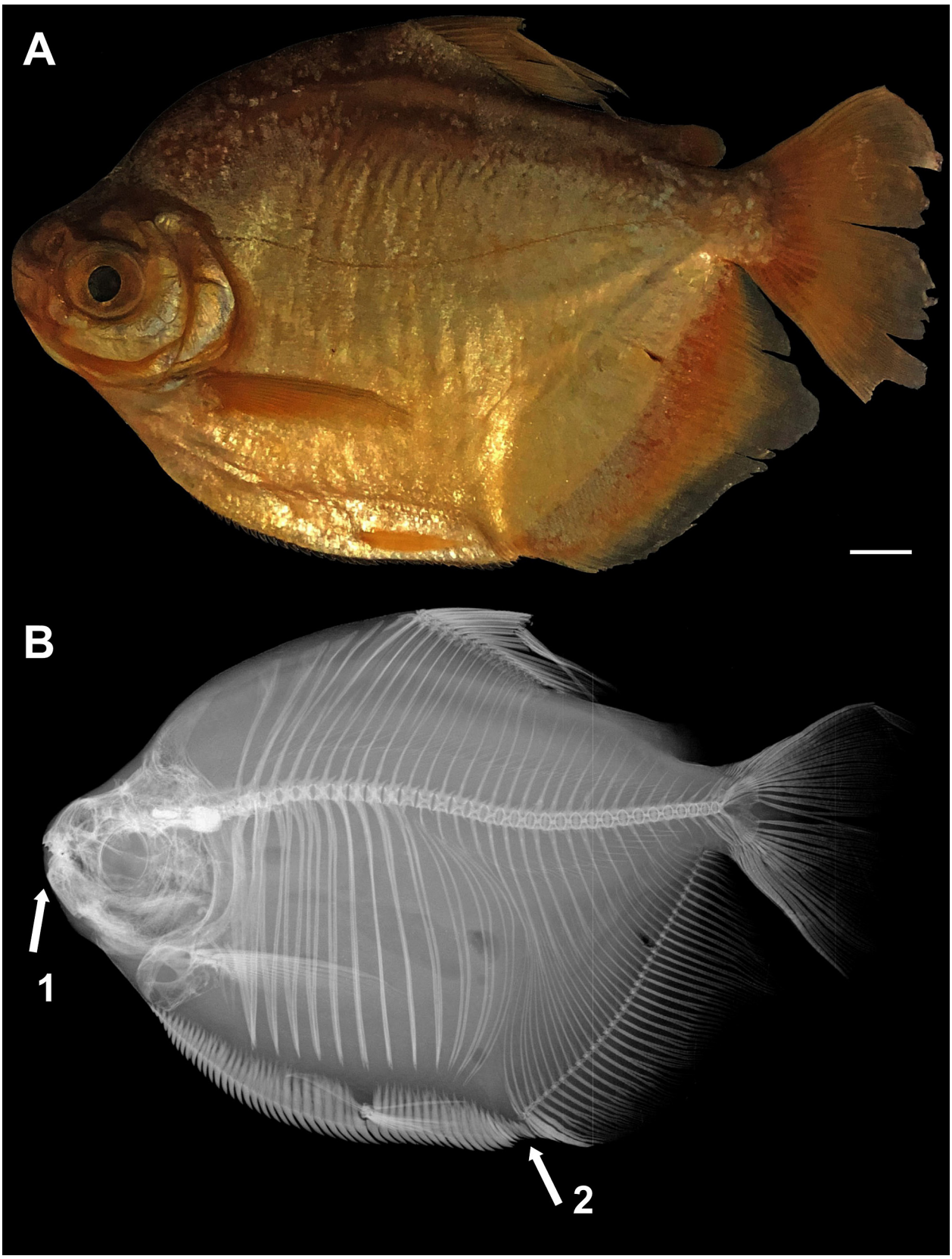

Figure 2. *Mylossoma albiscopum* (MECN-DP 3519, 126.7 mm SL). **A.** Lateral view. **B.** Lateral view radiograph. **1.** Premaxilla forward projected. **2.** Last ventral spines attached or almost attached to the origin of the anal fin. Scale bar = 10 mm.

basin (00°59′42.00″S, 075°27′11.88″W; 195 m a.s.l.), D. Stewart, M. Ibarra, R. Barriga & C. Uquillas, 23 Oct. 1981 (2 specimens, FMNH 97984) • Yasuni River, 1–2 km downstream from confluence with Jatuncocha River, Napo river basin (00°59′06.00″S, 075°25′36.12″W; 197 m a.s.l.), D. Stewart, M. Ibarra, R. Barriga & C. Uquillas, 24 Oct. 1981 (6 specimens, FMNH 97986) • Yasuni River, Salado River, ca 100 m upstream from mouth, Napo river basin (00°58′36.12″S, 075°26′06.00″W; 197 m a.s.l.), D. Stewart, M. Ibarra, R. Barriga & C. Uquillas,

Table 1. Measurements of specimens of *Mylossoma albiscopum* (*N* = 8) from Ecuador.

Characters	*N*	Min.	Max.	Mean	± SD
Standard Length (mm)	8	105.1	207.3	143.8	33.3
Percentages of standard length					
Body depth	8	55.0	118.6	87.7	20.5
Caudal-peduncle depth	8	99.7	116.0	107.4	5.5
Adipose-fin base length	8	49.0	71.0	59.7	7.7
Anal-fin base length	8	211.7	494.1	406.6	87.5
Dorsal-fin base length	8	190.1	254.1	215.1	21.5
Dorsal-fin to hypural plate distance	8	299.1	366.1	337.2	20.4
Snout to dorsal-fin distance	8	596.1	654.2	627.9	19.6
Head length	8	232.5	344.4	305.6	32.7
Dorsal-fin length	8	254.8	332.3	289.7	28.0
Pelvic-fin length	8	101.2	173.6	129.6	23.1
Pectoral-fin length	8	159.9	344.1	242.6	53.2
Percentages of head length					
Snout length	8	91.7	255.6	193.3	53.9
Maxilla length	8	55.3	145.8	104.7	25.8
Orbital diameter	8	250.0	348.8	281.1	33.9

27 Oct. 1981 (1 specimen, FMNH 97988) • Outflow of Jatuncocha Lagoon, Napo river basin (00°59′42.00″S, 075°27′11.88″W; 195 m a.s.l.), D. Stewart, M. Ibarra, R. Barriga & C. Uquillas, 23 Oct. 1981 (1 specimen, FMNH 97991) • Yasuni River, 1–2 km downstream from confluence with Jatuncocha River, Napo river basin (00°59′6.00″S, 075°25′36.12″W; 197 m a.s.l.), D. Stewart, M. Ibarra, R. Barriga & C. Uquillas, 24 Oct. 1981 (3 specimens, FMNH 97992).

***Mylossoma aureum* (Agassiz, 1829)**
Figures 1, 3

Material examined. ECUADOR • Sucumbios Province • Pañacocha, Napo river basin (00°14′49.65″S, 075° 54′42.09″W; 250 m a.s.l.), M. Buenaño, 10 Apr. 2011 (1 specimen, 99.3 mm SL, MECN-DP 2488). Pastaza Province • Amarun Cocha Lagoon, Curaray river sub-basin, Napo river basin (01°37′41.36″S, 076°11′49.38″W; 214 m a.s.l.), L. Guarderas, 2005 (1 specimen, 134.5 mm SL, MECN-DP 3727).

Occurrence records (literature data). ECUADOR • Sucumbios Province • Aguarico River about 1 km upstream from Destacamento Lagartococha, Napo river basin (00°37′59.88″S, 075°17′60.00″W; 200 m a.s.l.), D. Stewart, M. Ibarra & R. Barriga, 01 Nov. 1983 (1 specimen, FMNH 97980) • Aguarico River at Destacamento Zancudo and mouth of Quebrada Zancudococha, Napo river basin (00°33′S, 075°30′W; 217 m a.s.l.), D. Stewart, M. Ibarra & R. Barriga, 26 Oct. 1983 (1 specimen, FMNH 97985). Orellana Province • Yasuni River, 1–2 km downstream from confluence with Jatuncocha River, Napo river basin (00°59′6.00″S, 075°25′36.12″W; 197 m a.s.l.), D. Stewart, M. Ibarra, R. Barriga & C. Uquillas, 24 Oct. 1981 (7 specimens, FMNH 97987) • Yasuni River, Salado River, ca 100 m upstream from mouth, Napo river basin (00°58′36.12″S, 075°26′06.00″W; 197 m a.s.l.), D. Stewart, M. Ibarra, R. Barriga & C. Uquillas, 27 Oct. 1981 (1 specimen, FMNH 97990) • Payamino River and small tributary about 3–4 miles upriver from the mouth of Payamino River into Coca River, Napo river basin (00°58′11.82″S, 077°01′26.30″W; 248 m a.s.l.), T. R. Roberts, 20 Nov. 1971 (1 specimen, MCZ 64942).

Distribution in Ecuador. Both species are distributed in the Ecuadorian Amazon region in the provinces of Sucumbios, Orellana, and Pastaza. A wider distribution was identified for *M. albiscopum* compared to *M. aureum*. The location of *M. aureum* was concentrated in the so-called Ecuadorian "lower Amazon" in the far eastern part of the country. In the following, the hydrographic basins for each species are detailed. *Mylossoma albiscopum*: distributed in Putumayo river basin, Napo river basin (including Tiputini, Yasuni, and Aguarico river sub-basins), and Tigre river basin. *Mylossoma aureum*: was reported in Napo river basin, including Coca, Yasuni, Aguarico, and Curaray river sub-basins.

Identification. *Mylossoma albiscopum* differs from *M. aureum* in having the last ventral spines attached or almost attached to the origin of the anal fin (versus ventral spines clearly separated from the origin of the anal fin) (Figs 2, 3). In addition, the following characters coincide between *M. albiscopum* and *M. aureum*: body deep, laterally compressed; dorsal shape concave in the posterior region of the head and convex between the head and the dorsal fin; premaxilla forward projected. *Mylossoma albiscopum* differs from *M. duriventre* by presenting 31–38 branched rays on the anal fin (vs 26–32).

Morphometric measurements of *M. albiscopum* are presented in Table 1.

Discussion

Traditionally, two species of *Mylossoma* are cited in Cis-Andean region of Ecuador: *M. duriventre* and *M. aureum*. After reviewing collections, we were unable to confirm the presence of *M. duriventre* in Ecuadorian tributaries, which is in accordance with Mateussi et al. (2018), who concluded that the distribution of *M. duriventre* is restricted to the La Plata river basin.

The first documented records of the geographic distribution of *M. albiscopum* in Ecuador are presented, from the basins of the Putumayo, Napo, and Tigre rivers. The distribution of *M. aureum* is confirmed for the Napo river basin (Jégu 2003; Barriga 2012). Finally, these findings update the geographic distribution of the genus *Mylossoma* in Ecuador, composed of *M. albiscopum* and *M. aureum*.

There are few records of species of the genus *Mylossoma* from this geographic region in natural history collections, which implies that there is no precise information on the conservation status of these species, and both *M. albiscopum* and *M. aureum* have yet to be assessed by the International Union for the Conservation of Nature (IUCN 2019). "*Mylossoma duriventre*" is

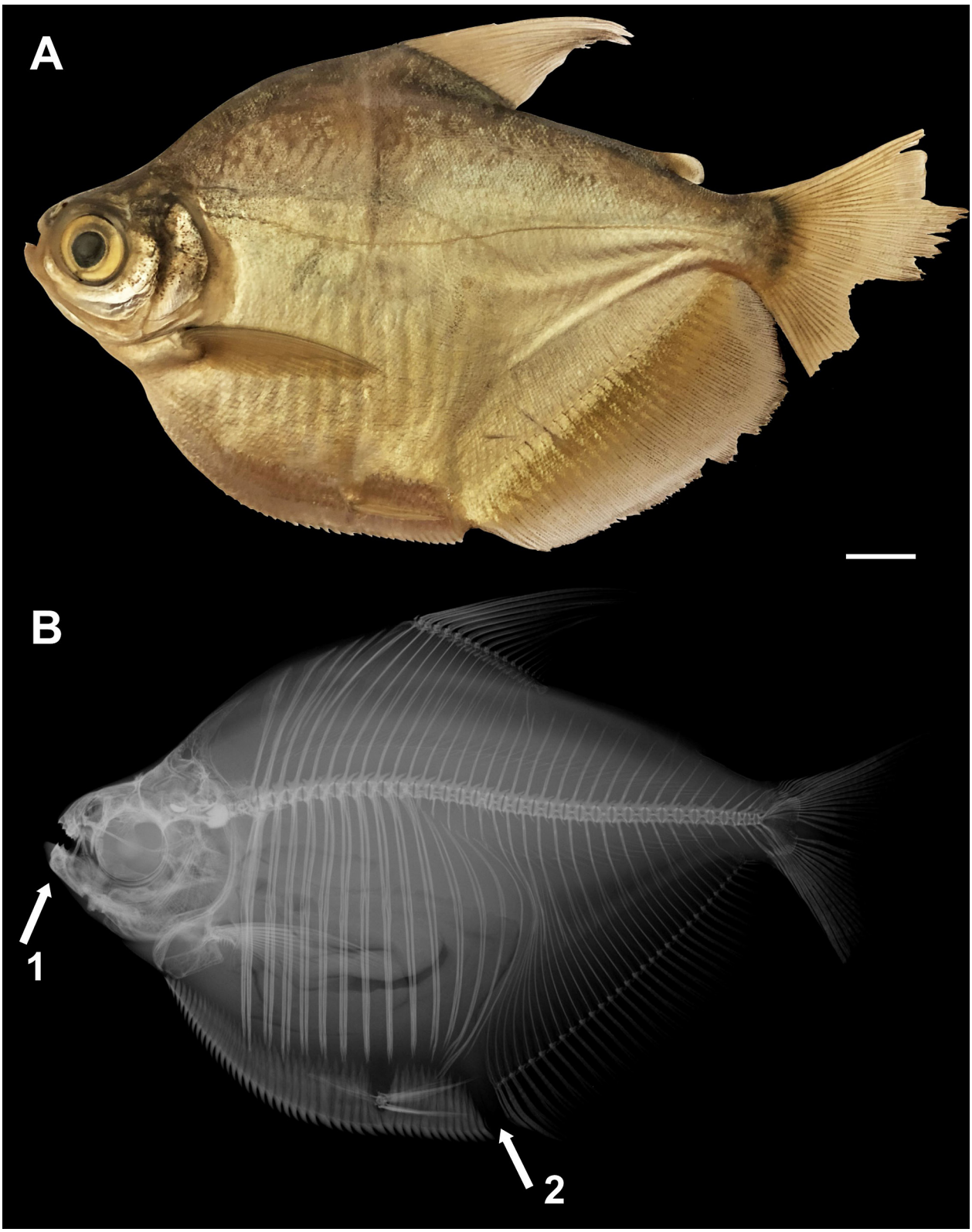

Figure 3. *Mylossoma aureum* (MECN-DP 2488, 99.3 mm SL). **A.** Lateral view. **B.** Lateral view radiograph. **1.** Premaxilla forward projected. **2.** Ventral spines separated from the origin of the anal fin. Scale bar = 10 mm.

categorized as Near Threatened in the Ecuador Red List (Anaguano-Yancha and Burgos-Morán 2019), a species that we now identify as *M. albiscopum*.

There are major threats to the country's aquatic ecosystems, especially in the northern region of the Ecuadorian Amazon, which has been most severely affected by oil extraction activities. In addition, both *M. albiscopum* and *M. aureum* are part of the human diet of Amazonian indigenous communities (Guarderas Flores and Jácome-Negrete 2013). Hence, there is an imminent need to develop diverse initiatives that focus on the evaluation of the population status and categorization of threats to these species, with applications at different scales and interests.

Acknowledgements

We acknowledge Instituto Nacional de Biodiversidad and the Museo de la Escuela Politécnica Nacional for allowing us to access their ichthyological collections. We also thank the Ichthyology Department of the Zoologisches Forschungsmuseum Alexander Koenig for the digital radiographs. We are grateful to Angélica Vaca of the Centro de Investigación para el Territorio y el Hábitat Sostenible, Universidad Tecnológica Indoamérica (Figure 1). Francisco Provenzano read the manuscript and made suggestions for its improvement. We thank the reviewers, Donald Taphorn and Antonio Machado-Allison, and the editor, Gabriela Echevarría, for their valuable suggestions and observations on the manuscript.

Authors' Contributions

JV, CC, and CK reviewed the fish specimens, made the data analysis, wrote the text, and made the corrections.

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