

NEW RECORDS OF ALLIGATOR GAR, *TRACTOSTEUS SPATULA* (ACTINOPTERYGII: LEPISTOSTEIFORMES: LEPISTOSTEIDAE) FROM BALI AND JAVA, INDONESIA

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Hasan V., Widodo M.S., Islamy R.A., Pebriani D.A.A. 2020. New records of alligator gar, *Atractosteus spatula* (Actinopterygii: Lepisosteiformes: Lepisosteidae) from Bali and Java, Indonesia. Acta Ichthyol. Piscat. 50 (2): 233–236.

Abstract. Alligator gar, *Atractosteus spatula* (Lacepède, 1803), is native to North America, with introductions reported from many countries. In 2019, two specimens of *A. spatula* were captured in Indonesia, one in the Nyanyi Estuary, a mangrove center in the south of Bali, and the other one in the Brantas River, the main river in the province of East Java. These records were among the first of this species from open waters in Bali Island and Java Island. A description of meristic and morphometric features of a specimen are provided.

Keywords: distribution, new record, freshwaters, non-native fish

INTRODUCTION

Alligator gar, *Atractosteus spatula* (Lacepède, 1803), is a predator fish native to North America, occurring from the Mississippi River basin, southwestern Ohio, southern Illinois, and the Gulf Mexico (Page and Burr 1991, Warren et al. 2000, Mendoza et al. 2002, Raz-Guzman et al. 2018) and now introduced to many countries worldwide as a consequence of the aquarium trade (Salnikov 2010). In Addition to North America, being its natural habitat, *A. spatula* was found in open waters such as Zrebar Lake, Iran (Esmaeili et al. 2017), Malay Peninsula, Malaysia (Chang et al 2017), and a coastal pond in Sumatra, Indonesia (Muchlisin 2012). *Atractosteus spatula* exhibits euryhaline, tolerance to new habitats, highly predatory habits, the eggs are poisonous, and the maximum recorded length was 305 cm (McClanes 1974). Because of this, *A. spatula* has the potential to become an invasive species (Mutlak et al. 2017).

Atractosteus spatula is commonly sold on the ornamental fish market (Raquel 1992, Cohen et al. 2007) and maintained in ponds for sport fishing (Mendoza Alfaro et al. 2008). Nyanyi Estuary is a mangrove center in the south of Bali, and the Brantas River is the main river in the province of East Java. No records of the aquarium trade and/or sport fishing, however, have been reported from those

two localities. The presently reported findings of *A. spatula* in Bali Island and Java Island constitute new records.

MATERIAL AND METHODS

We captured both specimens of the alligator gar using a cast net on 5 July 2019 in Nyanyi Estuary, south of Bali, and using landing net on 10 November 2019 in Brantas River, province of East Java. The fish were photographed and documented, although no voucher specimens were retained because the fish were too large to be stored and we did not have enough space in the laboratory. The determined meristic characters include the number of dorsal fin rays, pectoral fin rays, anal fin rays, ventral fin rays, and lateral line scales, while morphometric characters were: total length, standard length, head length, body depth, eye diameter, and snout length. The methodology followed Bigelow et al. (1963). The water quality parameters were determined directly at each location immediately after the capture.

RESULTS

New records (Fig. 1). Indonesia: Bali Island: Bali Province: Tabanan District: Nyanyi Estuary (8°37'42"S, 115°06'18"E), single specimen, total length 112 cm. Java Island: the province of East Java: Surabaya

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City: Brantas River: Jagir Sluice (7°18'15"S, 112°45'15"E), single specimen, total length 97 cm.

Identification. Specimens collected in Nyanyi Estuary and Brantas River were identified as *A. spatula*. *Atractosteus spatula* can be distinguished from the other members of the family Lepisosteidae in having a large size and broad, with an elongated and triangular short snout. Specific morphological characters are as follows: cylindrical body with an obvious rounded tail, light dorsal stripe, dark olivaceous brown above and white to yellowish beneath, dark brown blotches on all fins (Fig. 2). Meristic and morphometric characters of *A. spatula* are given in Table 1.

DISCUSSION

Atractosteus spatula feeds mainly on fishes, turtles, crabs, birds, and small mammals and it is a successful predator in its native environment (Etnier and Starnes 1993, Aguilera

et al. 2002). Additionally, *A. spatula* may damage fish nets throughout estuarine and freshwater habitats (O'Connell et al. 2007). Water conditions in the Nyanyi Estuary, namely salinity 7–19‰, temperature 26–28°C, depth 0.9–1.8 m, and current velocity 7.9–8.5 cm · s⁻¹, while water conditions in the Brantas River (Jagir Sluice), namely salinity 0.01–0.03‰, temperature 27–30°C, depth 1.4–2.2 m, and current velocity 6.8–7.7 cm · s⁻¹. Water conditions in both locations are ideal for *A. spatula* survival and growth (García de León 2001, Boschung and Mayden 2004).

We assumed that *A. spatula* was released by a fish owner, who frequently got rid of unwanted predator fish by releasing them into open water bodies. It was also likely that *A. spatula* were released because their excessive size and the owner was unable to maintain it (Boschung and Mayden 2004, Chang et al. 2019).

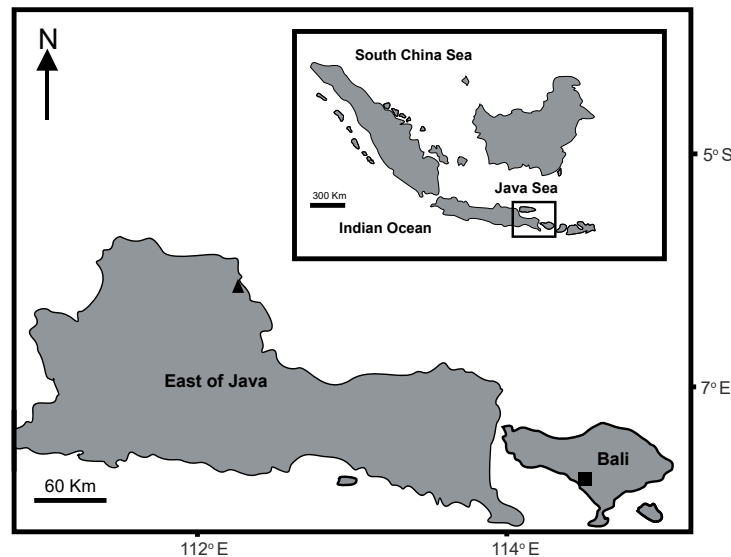


Fig. 1. Presently reported new records of alligator gar, *Atractosteus spatula*, from Indonesia; black triangle is the Brantas River, province of East Java, black square is Nyanyi Estuary, southern Bali (The map shows the province of East Java without Madura Island, which can be seen on the inset)

Table 1

Meristic and morphometric of two specimens alligator gar, *Atractosteus spatula*, from Bali and Java, Indonesia compared with North-American data

Character	Meristics (counts)			Morphometrics [cm]		
	Bali	Java	N. America	Bali	Java	N. America
Dorsal fin rays	7	7	7–10			
Pectoral fin rays	14	14	11–15			
Anal fin rays	7	7	7–10			
Ventral fin rays	7	7	—			
Lateral line scales	62	58	58–62			
Standard length				98.8	97.3	121.6
Total length				112.0	97.0	—
Head length				31.4	30.5	31.8
Body depth				14.4	13.1	—
Eye diameter				2.1	2.1	—
Snouth length				20.1	19.6	21.1

North American data were from Suttikus (1963) and McDonald et al. (2013).



Fig. 2. A specimen of alligator gar, *Atractosteus spatula*, from the Nyanyi Estuary, southern Bali, Indonesia; 112 cm TL; lateral view of body shape (A); a closer view of the head showing the mouth and snout pattern (B)

As the area does not have any aquarium trade and fishing sports pond, further investigation is warranted to determine the source of *A. spatula* in the Nyanyi Estuary and the Brantas River (Jagir Sluice). In the future, further introductions should be prevented to reduce the impact of invasive predator fish on the open waters on do not disturb on native aquatic ecosystems in Bali and Java (Speziale et al. 2017, Bize and Fernandez 2019, Hasan and Tamam 2019, Hasan et al. 2019). There are many native organisms in Nyanyi Estuary and Brantas River that can be affected by *A. spatula*, including through predation, so that the presence of *A. spatula* in both locations are danger alerts. *Atractosteus spatula* prey on almost all types of aquatic animals in the Nyanyi Estuary and Brantas River so that it can damage the food chain in these waters. If not captured, *A. spatula* can cause the loss of native aquatic animals.

ACKNOWLEDGMENTS

We thank the Zoology Division of Generasi Biologi Indonesia Foundation and a local fisherman, Mr. Asief Abdi as a field guide, and the Ministry of Finance of the Indonesian for funding of this study (No. 20160221035555).

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Received: 24 April 2020

Accepted: 15 May 2020

Published electronically: 1 June 2020