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Range expansion of *Oreochromis niloticus* (Linnaeus, 1758) (Perciformes, Chichlidae) in Java Sea and first record for Masalembo Island

A Wijayanti^{1,3}, V Hasan^{2,4,6}, M B Tamam^{2,5}

¹Generasi Biologi Indonesia, Ecology Division, Gresik 61171, East Java, Indonesia

²Generasi Biologi Indonesia, Zoology Division, Gresik 61171, East Java, Indonesia

³Department of Ecology and Evolutionary Biology, University of California Santa Cruz, Santa Cruz, 95064, USA

⁴Faculty of Fisheries and Marine, Department of Fish Health Management and Aquaculture, Universitas Airlangga, Surabaya, East Java 60115, Indonesia

⁵Department of Biology, Universitas Muhammadiyah, Lamongan, East Java 62218, Indonesia

⁶Corresponding author: veryl.hasan@fpk.unair.ac.id

Abstract. *Oreochromis niloticus* (Linnaeus, 1758) is native to Africa, with introductions reported from Bawean Island and Kangean Island, Java Sea (Indonesia). In 2019, four specimens of *O. niloticus* were captured from an estuary (conservation area) on Masalembo Island. This record is among the first of this species from the middle of the Java Sea. A description of morphological characters of the specimens are provided.

1. Introduction

Nile tilapia *Oreochromis niloticus* Linnaeus, 1758 is a tilapia native to the Nile (Africa), ranging from the upper Nile River south of the equator and west of the Atlantic coast and now introduced to many countries worldwide for aquaculture [1]. *Oreochromis niloticus* exhibits highly omnivory habits, tolerance to new habitats and salinity. Because of its adaptability, *O. niloticus* has the potential to become an invasive species [2].

In Indonesia, *O. niloticus* is generally spread in mainland waters where aquaculture activities have been underway for some time [3]. In Java Sea, *O. niloticus* was described from freshwaters in the Danau Kastoba, Bawean Island [4] and Batu Estuary, Kangean Island [5]. Masalembo Island, a small, isolated island in middle of Java Sea, is a conservation area, but there is no record of culturing tilapia there. The presence of *O. niloticus* on Masalembo Island constitutes a new record.

2. Materials and methods

We collected fishes using a landing net on 2 June 2019 in an estuary (Fig 1). Collected specimens were labelled and fixed in 5% formalin solution and deposited at the Zoology Laboratory, Generasi Biologi Indonesia, Gresik Regency, Indonesia (GBI.III.VI.2019). Administratively, the site is located in Masalima Village, Sumenep Regency, East Java Province, Indonesia (Fig.1). Diagnostic morphological characters of the specimens were analyzed following Trewavas [1].





Figure 1. Estuary, location where *Oreochromis niloticus* was collected in Masalembo Island

3. Results and discussion

New records. (Figs. 1 & 3). Indonesia: Java Sea: Masalembo: estuary (5°32'46"S; 114°24'50"E), 2 June 2019, collected by V. Hasan (four specimens, total length 9.1–14.1 cm, photographed).

3.1 Identification

Several specimens collected in Masalembo Island were identified as *Oreochromis niloticus*. Specific morphological characters are as follows: scales cycloid; 3 rows of scales on the cheek; gill rakers short; teeth widened; maxilla and lower jaw equal; pectoral fin pointed; dorsal, pectoral and anal fins blunt; caudal scaly. Coloration of fresh specimen: upper margin of dorsal fin black or grey, the melanin sometimes slightly mixed with red, not orange or vermilion even in breeding males. Head and trunk of breeding male suffused with red; in some localities, lower jaw, pelvis and anterior part of anal fin black; caudal fin covered with narrow vertical stripes; anal fin faintly barred; about 9 narrow dark bars on sides body; dark blotch at corner of operculum (Fig. 2). Morphometric and meristic characters of *O. niloticus* are given in (Table 1).



Figure 2. Specimen of *Oreochromis niloticus* GBI.On.III.2019 captured on 2 June 2019 from Masalembo Island

Table 1. Morphometric and meristic of *Oreochromis niloticus* specimen from Masalembo Island ($n = 4$ specimens)

		Character
Morphometric (mm)	Total length	124
	Standard length	100
	Head length	32
	Body depth	71
	Eye diameter	8
	Snout length	72
Meristic	Dorsal Fin	XV+10

Pectoral fin	11
Anal fin	VIII+10
Pelvic fin	1+5
Lateral line scales	30

3.2 Distribution

Oreochromis niloticus has been introduced to more than 90 countries around the world for both brackish and fresh water aquaculture [6]. This species is one of the top 10 introduced species of animals in the world [7]. The presence of invasive fish in conservation areas is dangerous and has had a negative impact on 30% of native fish in their habitat [8].

Indonesia is the second largest producer of *O. niloticus* in the world after China [9]. Due to intensive aquaculture, *O. niloticus* now occurs in all brackish and fresh waters of mainland Indonesia. Its presence in the Masalembo Island, in the middle of Java Sea, 260 km from Bawean Islands and 179 km from Kangean Island, is a new record (**Fig.3**). However, in addition to Masalembo Island, *O. niloticus* could be located on other islands too, at a further distance such as Karimunjawa, Sapudi and Raas Island.

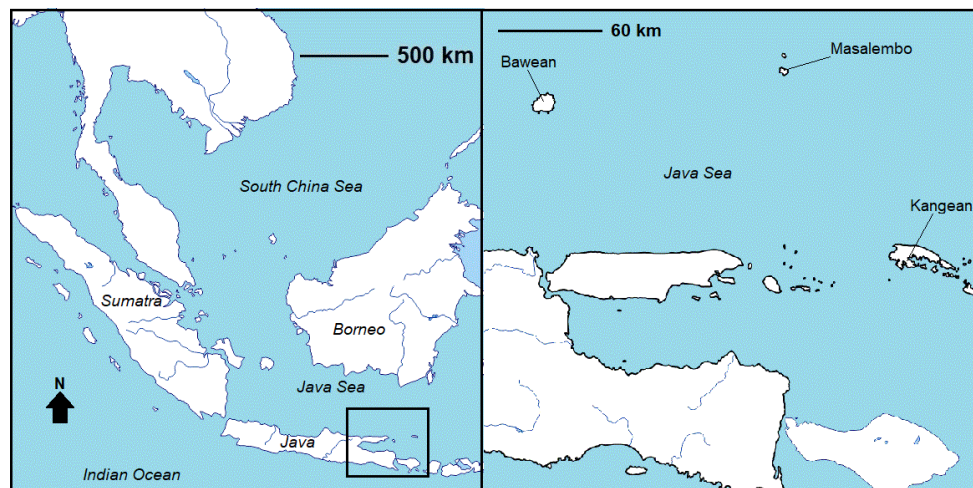


Figure 3. Range expansion of *Oreochromis niloticus* in Java Sea. Bawean and Kangean Island are the previous records and Masalembo Island is the recent record.

Although tolerant to salinity, it is difficult for *O. niloticus* to migrate through the sea and survive on several islands. We speculate that *O. niloticus* was released into the estuary in Masalembo Island by local people and the purpose is not clear. As the island does not have an aquaculture industry, further investigation is warranted to determine the source of *O. niloticus* in Masalembo Island [10,11,12]. The control and prevention of further introductions is needed so that *O. niloticus* does not disturb the aquatic ecosystem [13,14,15].

4. Conclusion

Oreochromis niloticus is a native to the Nile (Africa), ranging from the upper Nile River south of the equator and west of the Atlantic coast. This fish exhibits high adaptability and has the potential to become an invasive species. The presence of *Oreochromis niloticus* in a non-aquaculture industry, especially an island of a conservation area, need to be further investigate. Due to how dangerous and negative the impact could be for the native fish in its habitat, their introduction need to be prevent.

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