



***Andinoacara rivulatus* (Perciformes: Cichlidae), an introduced exotic fish in the upstream of Brantas River, Indonesia**

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Abstract. The presence of non-native fish, especially types of predators was a real threat to freshwater ecosystems in Indonesia, peculiarly for native fish which were unable to compete. The entry of invasive fish had the potential as a disease vector, uncontrolled hybridization, and damaging food webs that would have a systemic impact on the ecosystem. This study discussed the first record of the existence of Green terror, *Andinoacara rivulatus* from South America in the freshwater waters of East Java, Indonesia, precisely in the upstream of Brantas River. A description of morphological characters of a specimen is provided.

Key Words: biodiversity, freshwater fish, alien fish, gold saum, non-native.

Introduction. The loss of freshwater biodiversity could be triggered by environmental changes both naturally and due to human intervention (Colautti & McIsaac 2014; Copp et al 2005). Fish that did not survive with these conditions could experience a decline in population and even extinction (Dudgeon et al 2006). The issue that was currently developing in Indonesia was the reduction of some native fish species due to the introduction of non-native species (Webb 2007; Muchlisin 2012).

The entry of foreign fish into Indonesia was basically aiming to increase aquaculture production such as Tilapia (Ishikawa et al 2012; Hasan & Tamam 2019; Hasan et al 2019a), Common carp (Weber et al 2016) and African catfish (Vitule et al 2006), but in subsequent developments, the ornamental fish from South America, especially from Peru and Ecuador (Musilova et al 2009; Wijkmark et al 2012) enter Indonesia due to market demand. One of the ornamental fish from South America that was currently circulating in the Indonesian local market was Green terror (*Andinoacara rivulatus*).

A. rivulatus exhibits highly predatory habits and tolerance to new habitats. Because of this, *A. rivulatus* has the potential to become an invasive fish and can have negative impacts on aquatic communities through competition for food, predation and other resources (Moyle & Light 1996; Sanders et al 2014). *A. rivulatus* is generally sold in

the aquarium trade as ornamental fish and it has not been cultured openly. The aim of this paper was report the first occurrence of *A. rivulatus* in upstream of Brantas River, East Java.

Material and Method. Nineteen specimens of *A. rivulatus* were sampled on 15 October 2018 and 28 December 2019 from upstream of Brantas River, East Java, Indonesia (Figure 1), on the coordinates 8°00'44.3"S and 112°20'03.5"E (Figure 1). The fishing gear used was a small hook with bottom and as bait worms were used (Stein et al 2012). Collected specimens were fixed in 10% formalin solution (Hasan et al 2019b) and deposited at the Zoology Laboratory, Generasi Biologi Indonesia, Gresik, Indonesia (GBI0023). The diagnostic of the morphological characters of the specimens were analyzed following Wijkmark et al (2012).



Figure 1. Upstream of Brantas River, East Java, the location where *A. rivulatus* was collected (original).

Results. The specimens of *A. rivulatus* collected from the upstream of Brantas River had total length between 88.1-28.7 cm (Figure 2) and weight between 944.1-340.5 g. The sample included nine females, four males and six unsex. The specific morphological characters were the follows: compressed body, short head, medium snout, dorsal fin base slightly curved, prepelvic contour straight curved, terminal mouth, scales on gill cover, cheek and prepelvic area cycloid, rounded caudal fin. Colour pattern in fresh specimens: snout and front dorsally greyish or brownish. Sides of head with 2 narrow dark lines from orbital margin to mouth. Dark spots scattered over gill cover. Dorsal, pelvic and anal fins brownish. Pectoral fin hyaline. Caudal fin dark brown mouth.



Figure 2. Male specimen of *Andinoacara rivulatus* GBI0023 captured in December 2019 from upstream of Brantas River, East Java, Indonesia (original).

The existence of *A. rivulatus* in the upstream of Brantas River is the new record of this species from East Java (Figure 3). This fact is a warning to other streams that have many native freshwater fish in such as midstream and downstream to prevent the entry of *A. rivulatus* into river basin. Water conditions in the upstream of Brantas River, (DO 7.3-9.6, temperature 22–24°C, depth 0.4–3.2, pH 7.1-7.7) are ideal for *A. rivulatus* reproduction and survival (Riehl & Baensch 1991). The size of sampled specimens, ranging from sub-adults to adults, suggest that *A. rivulatus* are able to adapt well in the upstream of Brantas River, and can possibly establish a viable population there.



Figure 3. The red square marks the location of Brantas River upstream.

There are many native aquatic organisms in the upstream of Brantas River, mostly fish (Cyprinidae, Synbranchidae, Bagridae, Sisoridae and Clariidae), that can be affected by *A. rivulatus*, including through competition for niche and predation, so that the presence of *A. rivulatus* is a danger alert.

In Indonesia, *A. rivulatus* is included in the invasive fish category, according to the Ministry of Maritime Affairs and Fisheries Regulation Number 41/2014. This information should be immediately mediatized to the local community and ornamental fish hobbyist then immediately enforced, subject to a punishment for these violators. The way to overcome alien fish that has already entered is by catching it, making it fish meal as fish feed or community food. This habit can suppress *A. rivulatus* populations so that the population is not massive.

Conclusions. The results of the identification of the morphology of alien fish in the upstream of Brantas River are *A. rivulatus*, predatory fish from South America. The existence of *A. rivulatus* in Indonesia can disturb native fish population. Cooperation between the government and the public are needed so that *A. rivulatus* to not spread to other freshwaters.

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