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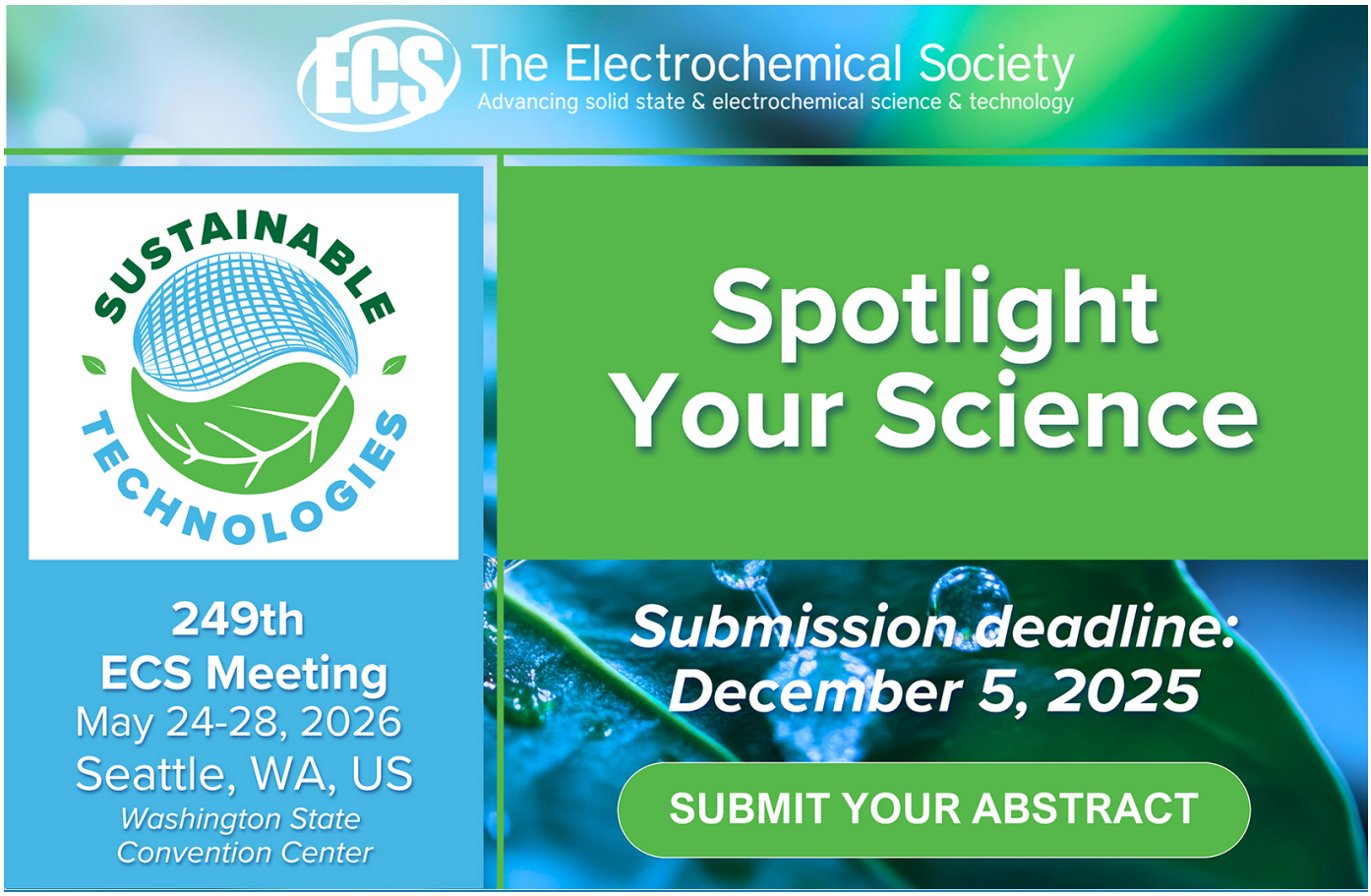

Range expansion of Red devil cichlid *Amphylopus labiatus*, (Günther, 1864) (Actinopterygii: Cichlidae) in Bangka Island, Indonesia

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Abstract. Red devil cichlid *Amphylopus labiatus* is the most successful invasive species in worldwide including Indonesia. This species is originally to Lake Managua, Nicaragua Central America. In Indonesia, The Red devil cichlid was widely introduced by the ornamental fish trade around 1990. Now, the population of The Red Devil on the mainland has extremely increased, and is known as an Invasive fish. An invasive species literally have a negative impact on aquatic communities disturbing the native and dominating the ecosystem because an invasive species has great adaptability and is able to reproduce quickly to make a giant population in an ecosystem. In this research, we present the range expansion of an invasive Red devil cichlid *A. labiatus* to Bangka Island, Indonesia. Through this research, we will provide knowledge about the extent of the Red devil cichlid invasion and its impact on local species.

1 Introduction

There are several freshwater fishes in Indonesia that list the occurrence be invasive freshwater fishes currently existing in the country. At least, there are approximately 54 introduced freshwater fish species in Indonesia, 14 of which are invasive species and 4 are potentially invasive species [1] The invasive species that exist in Indonesia are dominated by the Cichlidae family, such as *Aequidens pulcher, Amphilophus alfari, Astronotus ocellatus, Hermichromis elongatus, Parachromis managuensis, Oreochromis niloticus,* and *Amphilophus labiatus.* In particular, *Amphilopus labiatus* is dominant in some lakes and rivers. Invasive fish are introduced as non-native fish that have a negative impact on aquatic communities [2].

Red devil cichlid (*Amphylopus labiatus*, Günther, 1864) is a freshwater species from the Cichlidae family which is originally to Lake Managua, Nicaragua Central America [3]. This species is one of the most successful invasive species in worldwide. In Indonesia, The Red devil cichlid was widely introduced probably all by the ornamental fish trade around 1990 and now the number of The Red Devil in some reservoirs of Indonesia was extremely increasing which almost 40-60% of the population dominated by red devil [4]. The presence of *A. labiatus*, as an invasive species will disturb the native and dominate the ecosystem. Generally, an invasive species had great adaptability and was able to reproduce quickly to make a giant population in the ecosystem [5,6].

In this paper, we report the first record of Red devil cichlid (*A. labiatus*) for Bangka Island Indonesia where the previous existence of red devil fish was only known on the island of Java and several lakes in Sumatra. Until now there has never been a report on the existence of this species for the Bangka Islands. A new record of fishes will contribute to understanding species range expansion, especially an invasive species [7,8].

2 Material and Methods

The study was conducted from January to February 2023 in Kolong Parit 5, Belinyu Bangka Induk Regency, Bangka Island, Indonesia. A total of fifty (50) specimens were caught using a cast net and fish trap during fieldwork. Two (2) specimens were fixed in 10% formalin [9]and deposited at the Laboratory of Universitas Bangka Belitung, Indonesia. Two (2) specimen was preserved in 96% ethanol All acquired species are not returned to the waters since doing so would harm the local fish habitat. The morphological features analysis of *A. labiatus*, was carried out based on Allen [10] by measuring the meristic analysis, specific character, and body shape.

3 Result and Discussion

3.1 New Record

Indonesia - Bangka Island - Bangka Induk Regency - Kolong Parit 5, Belinyu; 1°59'45"S, 105°73'53"E; D. Ramadhanu; caught with a fish trap; live speciemen (Figure 1) Fish were identified based on Allen (1991) [24]

Figure 1. Specimen of Red devil cichlid *A. labiatus*, from Bangka Island, Indonesia.

3.2 Habitat and Distribution

The discovery of *A. labiatus* in the Kolong Parit 5, Belinyu (Figure 2), Bangka Induk Regency, was the first official record for Bangka Island, Indonesia. New records of freshwater fish are essential

contributions to the natural sciences and distribution [11,12], especially the presence of non-native species [13,14].

Figure 2. Habitat of Red devil cichlid *A. labiatus*,in Bangka Island, Indonesia.

However, the previous existence of red devil fish in Indonesia was only known on the island of Java and several lakes in Sumatra, and in this reseacrh, we found a new record of *A. labiatus* in the Kolong Parit 5, Belinyu, Bangka Island, Indonesia (Figure 3). Understanding the new distribution of species is necessary to support appropriate conservation-related decisions and environmental impact assessments sustainable due to the invasion of a non-native species. Moreover, the presence of foreign fish is very dangerous for the existence of local fish and endemic fish. The direct impacts were competition for resources, predation, transmission of diseases (infection or parasitism), habitat modification, and genetic effects [15–18].

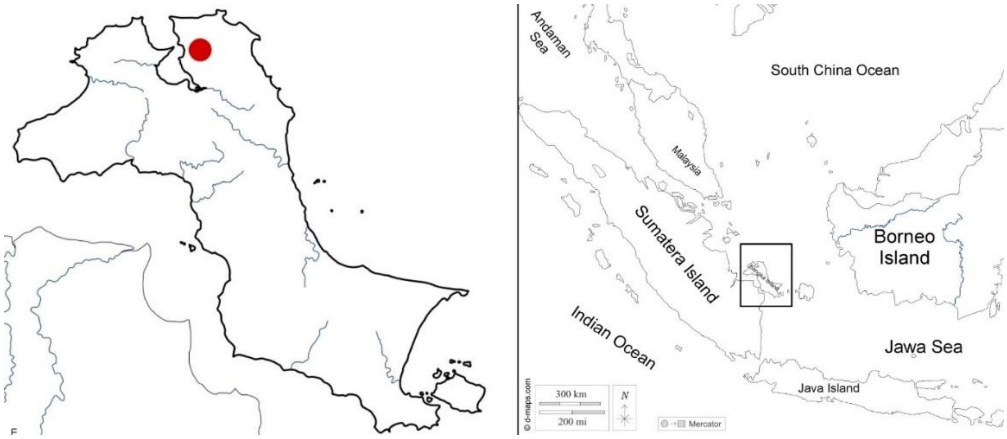

Figure 3. Presence of Red devil cichlid *A. labiatus* in Bangka Island, Indonesia.

In total, Five *A. labiatus* specimens of different sizes “80-120 mm” of Total length were collected including immature, mature, and a spawning pair of the species. The collected specimens were characterized by a uniform red or red with irregular black marbling, and lips hypertrophied. Sexual dimorphism is clear in adult specimens as males tend to be larger than females and develop longer dorsal

and anal fins, and a more spectacular nuchal hump. These humps only develop during the breeding season in nature, but in aquaria, many specimens possess enormous, permanent humps.

A. labiatus is a member of the Midas cichlid species assemblage (Amphilophus spp.), have a closely related *Amphilophus citronella* (Midas Cichlid) is often confused and quite likely hybridized. *Amphilophus labiatus* is one of the most downright aggressive cichlids, inhabits lakes and rarely enters rivers. This species feeds on small fish, snails, insect larvae, worms, and other bottom-dwelling organisms. Red devil cichlid *A. labiatus* has been reported to have "some adverse ecological effects". This species is highly territorial and grows large and dominant. The presence of this species is very dangerous for the existence of local fish and endemic fish [19,20]. Hence, these fish are referred to as invasive fish that have a negative impact on aquatic communities [21]. The direct impacts of the invasive species on native fish were competition for resources, predation, the transmission of diseases (infection or parasitism), habitat modification, and genetic effects especially for freshwater species of Bangka Island where the main habitat for fish has also been damaged [22,23].

4. Conclusion

The discovery of *A. labiatus* in the Kolong Parit 5, Belinyu , Bangka Induk Regency, was the first official record for Bangka Island, Indonesia and represents a new record for the country and expands the known invasion range of the species. The identification of Fifty specimens in different sizes and their characteristic features confirms their classification as *A. labiatus.* Finding other fish species in the same habitat further contributes to understanding species diversity, expansion, and biogeography in the region. This information is crucial for the classification and conservation of rivers, as well as for planning efforts to protect ecosystems, especially from non-native species that potentially are invasive species. *A. labiatus* are dominant species and plays a role in the ecosystem through resource competition, predation, hybridization, habitat alteration, disease transfer (infection or parasitism), and genetic repercussions. As well as this species can breed quickly and grow to have giant numbers and become more invasive.

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