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**INTERNATIONAL CONFERENCE ON  
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# e-Proceeding International Conference on Fisheries and Animal Science 2022

*"People, Planet, and Profit"*

**21 – 24 SEPTEMBER 2022,  
THE WATERFRONT HOTEL KUCHING, SARAWAK, MALAYSIA**

**Editors:**

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Dayang Shobiha Abang Abai**

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## Preface

The International Conference on Fisheries and Animal Sciences 2022 (FISAS2022) is one of the conferences under one umbrella of the Congress on Sustainable Agriculture and Food Security 2022 (COSAFS2022). The FISAS2022 was held to support efforts on the agricultural sustainability and food security agendas by gathering current knowledge and updates from diverse scientists, policymakers, and industry on fisheries and livestock. The information obtained is crucial to setting up new plans and hoping for a brighter, more sustainable future.

Sustainable fisheries and livestock have a crucial role in nutrition, food, and livelihood security. Collecting ideas and recommendations from FISAS2022 is essential to kickstarting new strategies that empower innovations for the industry.

Moreover, the innovative and transformative value chains will benefit farmers, breeders, fishermen, and many others. Empowering farmer communities, strengthening participatory approaches, building capacity among all stakeholders, promoting decent work and socio-economic measures, and addressing climate impacts. These efforts will help them stay relevant in ever-changing environments.

FISAS2022 garnered four main tracks: diversity and conservation, animal health and production, feed nutrition, and sustainable production. All topics of various organisms, from crustaceans, fishes, and poultry to ruminants, were highly anticipated and essential for understanding the industry's current state.

To all presenters, writers, participants, and editors: Your efforts to make it a success are greatly appreciated, and we can meet and work together again one day. Our efforts have been successful with the appearance of this electronic proceeding, which can serve as a research reference for all those involved in the fisheries and livestock sectors in their efforts to empower sustainable fish and livestock production.

To the Ministry of Food Industry, Commodity and Regional Development Sarawak (M-FICORD), thanks and appreciation for all the invaluable support given to ensure the success of FISAS2022.

Thank you.

**Dr. Masnindah Malahubban**

Head of Scientific Committee

The International Conference on Fisheries and Animal Sciences 2022 (FISAS2022)



# DIVERSITY AND DISTRIBUTION OF INDIGENOUS BETTA FISH IN SARAWAK

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## Introduction

The genus *Betta*, locally known as *ikan laga*, consists of small freshwater fighting fish that belongs to the Osphronemidae family. They are native to Southeast Asia and are found within various types of water bodies, thus leading to their diversity. There are currently 27 *Betta* species documented in Malaysia, with seven species originating from Sarawak (Tan and Ng, 2005; Schindler and Schmidt, 2008; Tan, 2009; Tan and Ahmad, 2018; Kamal et al., 2020). *Betta* fish are potential ornamental fish with economic and ecological importance (DoF, 2018). They are usually caught by traders or hobbyists. However, the population of these Sarawak *Betta* fish are currently being threatened by various factors (Giam et al., 2012). Furthermore, two of these indigenous species are listed as “Data Deficient” under the IUCN Red List (Low, 2019a; Low, 2019b).

Therefore, the objectives of this study are (1) to determine the diverse *Betta* species of Sarawak and their distribution, as well as (2) to assess their current habitat. This information is crucial for the documentation of Sarawak ichthyofauna and to plan a better conservation strategy in the future.

## Materials and Methods

### Field sampling

The survey was conducted from March 31<sup>st</sup> 2022 until July 24<sup>th</sup> 2022 within Sarawak, namely Matang, Lundu, Sematan and Serian. The fish sample were collected using either the scoop nets or the fishing rods, depending on the species and habitat. The samples were then temporarily kept in labelled plastic bags and transported back to the laboratory in the Faculty of Resource Science and Technology, UNIMAS.

The water quality parameters recorded during this study include temperature (°C), pH value, dissolved oxygen (mg/L) and turbidity (NTU) using suitable equipments. The general habitat of the sites was observed and recorded. The location was also photographed and videographed for future reference.

## Fish identification

Fish identification followed Tan and Ng (2005) and Kamal et al., (2020). The total length was measured using the measuring board and a ruler to the nearest 0.1 cm. The samples were also weighed with an electronic balance (add brand).

## Results and Discussion

A total of six species of wild *Betta* were collected in this study (Table 1). However, Tan (2005; 2009) recorded seven species in Sarawak. His finding includes *B. akarensis* and *B. macrostoma*, but these species has not yet been sampled in the current study.

Table 1. The diversity of *Betta*, locality and brief description of their habitats.

Species	Locality	Brief Description Of Habitat
<i>B. ibanorum</i> <i>B. brownorum</i>	Matang	The waters are brownish cloudy with muddy substrates
<i>B. lehi</i>	Lundu	The waters are clear with muddy substrates
<i>B. midas</i> <i>B. rutilans</i>	Sematan	The waters are brownish cloudy with gravel substrates
<i>B. taeniata</i>	Serian	The waters are clear with gravel substrates

In this study, two samples of *B. rutilans* were discovered in Sematan. *B. rutilans* has only been previously studied as an indigenous species to Kalimantan Barat (Kottelat, 1991). However, this is not the first record of this species in Sarawak because *Betta* hobbyists have found *B. rutilans* within Sarawak throughout the past decade and has since shared their discovery online.

Table 2. The ranges of temperature (°C), pH value, dissolved oxygen (mg/L) and turbidity (NTU) of the respective *Betta* habitats.

Species / Parameters	<i>B. ibanorum</i> <i>B. brownorum</i>	<i>B. lehi</i>	<i>B. midas</i> <i>B. rutilans</i>	<i>B. taeniata</i>
Temperature (°C)	26.37±0.37 (25.9 – 27.1)	27.5±0.61 (26.5 – 28.6)	27.7±0.36 (27.2 – 28.4)	25.57±0.18 (25.0 – 26.3)
pH Value	5.30±0.02 (5.27 – 5.34)	6.03±0.27 (5.71 – 6.56)	5.37±0.01 (5.36 – 5.39)	7.74±0.04 (7.59 – 7.87)
Dissolved Oxygen (mg/L)	6.20±0.21 (5.8 – 6.5)	3.6±0.40 (2.8 – 3.9)	1.0±1.52 (0.8 – 1.0)	6.65±0.07 (6.4 – 6.9)
Turbidity (NTU)	16.30±6.84 (7.49 – 29.77)	3.35±0.39 (2.84 – 4.12)	45.90±5.47 (39.77 – 56.83)	6.71±0.40 (5.92 – 7.23)

*B. taeniata* lives in flowing water (lotic), whereas the other five species were in relatively stagnant waters (lentic). These waters were found to range from slightly acidic to neutral

(Table 2). Aquatic vegetation was also plenty, added with the coverage from the forest canopy. *B. ibanorum* and *B. brownorum* were both found within the same habitat, similarly to *B. midas* and *B. rutilans*. This is in contrast with a study by Nur et al. (2022), where the *Betta* species exhibited territorial behaviour leading to no two species living in the same habitat.

In this study, *B. brownorum* had the shortest total length while the longest total length goes to *B. ibanorum*. This is also true for their body weight, with *B. brownorum* being the lightest while *B. ibanorum* was the heaviest. Out of the 37 total sample collected, *B. lehi* was most predominant (29.73%) and the least being *B. rutilans* (5.41%).

Table 3. The ranges, average total length and body weight of wild *Betta* caught. NA – Not available.

Species	Total Length (cm)	Body Weight (g)	Total Sample
<i>B. ibanorum</i>	9.44±0.97 (5.6 – 10.8)	8.20±1.72 (1.61 – 11.74)	5
<i>B. brownorum</i>	3.04±0.10 (2.8 – 3.4)	0.28±0.03 (0.22 – 0.37)	5
<i>B. lehi</i>	7.10±0.26 (5.8 – 8.6)	4.24±0.41 (2.69 – 6.53)	11
<i>B. midas</i>	7.68±0.52 (6.7 – 9.0)	5.81±1.40 (3.26 – 8.90)	4
<i>B. taeniata</i>	6.26±0.15 (5.4 – 6.9)	2.53±0.15 (1.69 – 3.36)	10
<i>B. rutilans</i>	NA	NA	2

The low number of *Betta* sample collected could possibly be attributed to the presence of anthropogenic activities close to their habitats (Giam et al., 2012). For instance, the Pan-Borneo Highway project under construction was within reach of the site where *B. lehi* was found. Besides that, *B. taeniata* was found within a stream, not far from a nearby settlement. Furthermore, the habitat of *B. ibanorum* and *B. brownorum* was only adjacent to a durian plantation. As in the case of *B. midas* and *B. rutilans*, a fish trap was already set up at the site before we arrived.

## Conclusion

There were six indigenous *Betta* species found, namely *B. ibanorum*, *B. brownorum*, *B. lehi*, *B. midas*, *B. rutilans* and *B. taeniata*. The discovery of *B. rutilans* requires further study and documentation. More samplings will be done in the future to update the checklist of *Betta* species in Sarawak. The findings in this study will aid relevant agencies in conservation efforts for these *Betta* species.

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