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Survival and Growth of Sumatran Featherback (*Chitala hypselonotus*, Bleeker 1852) Reared on Net Cages

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Abstract

The Sumatran featherback (*Chitala hypselonotus*, Bleeker 1852) is a high-value freshwater fish species in South Sumatra. The local name for this species is belida or belido. In its natural habitat, the population of this species has declined. The objective of this study was to evaluate the survival, growth, and feed efficiency of *C. hypselonotus* reared in net cages. This study was conducted from July to August of 2024 in Putak River, Putak Village, Gelumbang District, Muara Enim Regency. *C. hypselonotus* was reared in net cages (1 x 1 x 1 m^3) for 30 days and fed with live shrimp (*Caridina* sp.). The experimental method utilizes a comparative study approach. The present study compared two distinct treatments, each with a feeding rate of 3% and 5%, respectively. The results demonstrated that the survival rate of *C. hypselonotus* was 100% for both treatments. Growth in body weight and total length in the 5% treatment was superior to that of the 3% treatment; however, the t-test results were not significant ($P < 0.05$). The results of this study provide a starting point for future investigations.

Keywords: domestication of fish, endemic species, endangered species, indigenous species.

I. INTRODUCTION

The Sumatran featherback (*Chitala hypselonotus*, Bleeker 1852), a member of the Notopteridae family, is an example of an ichthyofauna found in Southeast Asia (Kottelat *et al*., 1993; Kottelat, 2013). In Indonesia, fish species belonging to the Notopteridae family are collectively referred to as belida fish. The belida fish is a species of commercial importance in South Sumatra (Muslim *et al*., 2023; 2024; 2025). This fish is of commercial importance in the food, sport, aquarium, and cultivable fish industries, and it is highly priced (Mitra *et al*., 2018). This fish plays a social, cultural, and economic role for the people of South Sumatra, particularly in terms of its role in maintaining cultural heritage and supporting economic activity (Muslim *et al*., 2025). The *C. hypselonotus* or belida fish has been designated as the mascot of South Sumatra Province in recognition of its significance within the province's social and cultural contexts. From an economic perspective, the fish under consideration serves as a fundamental raw material for the production of several processed products that are characteristic of South Sumatra (Muslim *et al*., 2023; 2025). These include pempek and kerupuk-kemplang, both of which are notable culinary items in the region. The distribution area of *C. hypselonotus* encompasses Indonesia (Sumatra and Kalimantan) and Malaysia (Ng, 2020). In Sumatra, belida fish have been documented in the Musi River (Iqbal *et al*., 2018), Lake Gegas (Harmoko

et al., 2022), Kampar River (Prianto *et al*., 2024), and Kelekar River (Muslim & Syaifudin, 2022; Muslim *et al*., 2024; 2025). The belida fish is a member of the predatory fish group. According to He *et al*. (2022), piscivorous fish have been observed to consume a variety of species, including fish, shrimp, and crabs. The results of research by Wibowo *et al*. (2017) demonstrate that the primary food source for belida fish is small fish, with a percentage of 83.25%, observed in both male and female fish.

Natural feed constitutes a category of live food endowed with a specific protein content, which is calibrated to the mouth opening, given its optimal digestibility and its capacity to promote growth (Diana & Safutra, 2018). The allocation of fish feed can be calculated according to the biomass of the fish population. The feeding rate is defined as the quantity of feed administered daily to fish, calculated based on their biomass (Savitri *et al*., 2015). It is imperative to establish feeding rates that are commensurate with the objective of promoting optimal growth. The success of fish farming is contingent upon numerous factors, including the adequate and meticulous regulation of feeding rates. Inadequate nutrition results in stunted growth and heightened competition among fish for sustenance. Excessive feeding is inefficient and will pollute the environment (Hermawan, 2015).

To date, no studies have been conducted on the rearing of *C. hypselonotus* in net cages with different amounts of *Caridina* sp. The objective of this study was to compare survival and growth of *C. hypselonotus* fed with 3% and 5% *Caridina* sp. per biomass. The findings of this study are intended to provide information on the growth and survival of *C. hypselonotus.*

II. MATERIALS AND METHODS

2.1. Location and Time

This study was conducted in Putak River, Putak Village, Gelumbang Sub-district, Muara Enim Regency, South Sumatra (-3.1540467,104.4012619) (Figure 1), from July to August 2024.

2.2. Net Cages Setup

The experimental apparatus comprised six net cage units, each measuring 1 x 1 x 1 m^3. The net cage was installed on the bank of the Putak River. Wooden poles were driven into the bottom of the water. Each

Figure 1. Map of the location of this study

corner of the net cage was affixed with a pole. The net cages were affixed to the poles using nylon rope. Each corner of the net cage was weighted with bricks.

2.3. Fish Rearing

A total of six *C. hypselonotus* (with a total length of 20±0.5 cm and a body weight of 20±0.5 g) were used in this study (Figure 2). The fish were reared for 30 days in individual net cages. During rearing, the fish were fed with shrimp (*Caridina* sp.). The amount of *Caridina* sp. given to the test fish was adjusted to the treatment of 3% and 5% per biomass (Muslim *et al*., 2023; Muslimin *et al*., 2023). Each treatment was repeated for three times. *Caridina* sp. given to the test fish were alive and healthy. Feeding is done daily, with a frequency of once. Feeding was carried out at 16.00-17.00 WIB (afternoon) with the consideration that *C. hypselonotus* is actively looking for food in the afternoon and evening (personal communication with the fishermen).

2.4. Calculation of Survival

The survival of the reared fish was monitored on a daily basis. Monitoring was conducted three times a day in the morning, afternoon, and evening. The survival rate of fish was calculated according to formula:

$$SR\ (\%) = Nt/No \times 100$$

Figure 2. The Sumatran featherback (*Chitala hypselonotus*) used in this study.

where SR is survival rate (%), Nt is number of fish that survive until the end of rearing (fish) and No is number of fish at the start of rearing (fish)

2.5. Calculation of Growth in Weight and Length

Body weight and total length of *C. hypselonotus* were measured at the beginning and end of rearing. Body weight was measured using a balance with an accuracy of 0.01 g. Total length was measured using a ruler with an accuracy of 0.1 cm. Growth of *C. hypselonotus* in terms of body weight was calculated using the following formula (1) and growth in total length was calculated using the following formula (2):

Formula 1: GBW= BWt – BW0

where GBW is growth in the body weight of fish (g), Wt is body weight of fish at the end of rearing (g) and W0 is body weight of fish at the start of rearing (g)

Formula 2: GTL= TLt – TL0

where GTL is growth in the total length of fish (cm), TLt is total length of fish at the end of rearing (cm) and TL0 is total length of fish at the start of rearing (cm)

2.6. Water Quality

Water quality parameters measured in this study include temperature and pH using a thermometer and pH meter. Measurements were taken three times a day. These were in the morning, afternoon, and evening. This was to determine daily fluctuations.

2.7. Data Analysis

Data on survival, body weight, and total length were tabulated using Microsoft Excel 2020. Data were analyzed using a t-test and presented in a table. Data on water quality were analyzed descriptively.

III. RESULT

The results showed that the growth performance of *C. hypselonotus* fed 5% of their biomass was better than those fed 3%. However, the t-test results were not significant (P<0.05). The water quality parameters were conducive to the survival and growth of *C. hypselonotus*. The results of this study are presented in Table 1 and Table 2.

IV. DISCUSION

Fish growth refers to an increase in body size, including length and weight, over time. This increase is caused by the proliferation of muscle and bone cells. It is influenced by internal factors, such as genetics, age, and sex, as well as external factors, such as feed quality and quantity, water quality, and the rearing environment (Abd El-Hack *et al*., 2022; Sayouh *et al*., 2024). In this study, the experimental factor was the quantity of Caradina sp. fed to *C. hypselonotus*, which varied between 5% and 7% of the biomass.

Table 1. Growth performance of *Chitala hypselonotus* in this study

Parameters	AVG± SD		t-test result
	FR 5%	FR 7%	
Growth in total length (cm)	0.30±0.2	0.50±0.3	NS
Growth in body weight (g)	1.23±1.2	2.46±3.1	NS
Survival (%)	100±0.0	100±0.0	NS

AVG (average), SD (standard deviation), FR (feeding rate), NS (not significant)

The age and sex of the *C. hypselonotus* used in this study are currently unclear, and further research is necessary to ascertain these details. The environmental factors, encompassing both water quantity and quality, remained constant due to the consistent installation of the net cages in the same location.

In order to thrive, fish require a diverse array of nutrients. These include, but are not limited to, protein, fat, carbohydrates, vitamins, and minerals (Jones *et al*., 2021; Hardy & Kaushik, 2021). A significant challenge in the field of fish nutrition concerns the variability in nutritional requirements among different species. The nutritional requirements of each species are unique and are influenced by physiological, metabolic, and natural dietary factors (Hancs, 2020; Robenso *et al*., 2022). In this study, *C. hypselonotus*'s nutritional needs were met through the utilization of *Caridina* sp. shrimp as the nutrient source. The protein content of *Caridina* sp. has been determined to be 30.21% (Muslim & Simanjuntak, 2023). As stated by Sumokwo *et al*. (2018), the nutritional composition of *Caridina nilotica*

Table 2. Water quality parameters of *C. hypselonotus* rearing media

Water Quality	Range		Reference
	FR 5%	FR 7%	
Temperature (°C)	26-29.2	26-29.3	27-28.6[a]; 27-29.7[b]
pH (unit)	5.5-6.4	5.5-6.6	5.3-6.3[a]; 6.6-8.0[b]

[a]Muslim & Simanjuntak (2023); [b]Muslim *et al*., (2023)

is as follows: protein 53.63%, fat 4.46%, ash 15.2%, and fiber 0.8%. According to Gupta *et al*. (2021), the Notopteridae family of fish, including *C. hypselonotus*, has been classified as carnivorous. According to Sousa *et al*. (2020), the nutritional requirements of carnivorous fish necessitate the inclusion of diets with elevated protein levels to facilitate optimal growth. In this study, it is hypothesized that the quantity of *Caridina* sp. provided was inadequate to satisfy the nutritional requirements of *C. hypselonotus*. Consequently, there is a necessity to augment the quantity of the aforementioned substance.

The test fish utilized in this study were wild and undomesticated. This study represents a preliminary stage in the process of *C. hypselonotus* domestication. Teletchea and Fontaine (2014) and Teletchea (2017) classification system delineates five distinct levels of domestication for fish species, ranging from wild fish to farmed fish. This study represents the initial stage in the process of fish domestication, which is the adaptation of wild species into a cultured environment. Further studies into the next level of domestication are highly recommended, as are further studies into the subsequent levels of domestication.

V. CONCLUSION

The findings of this study demonstrated that *C. hypselonotus* survived and exhibited growth in a controlled environment (net cage). The growth performance of *C. hypselonotus* fed with *Caridina* sp. at 5% per biomass was superior to 3%. Further studies are required to determine the optimal feeding levels of *Caridina* sp. for individuals exceeding 5%. Furthermore, research is required on various types of feed to improve the growth of *C. hypselonotus*. This study constitutes an inaugural domestication of *C. hypselonotus*.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest in this study.

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