Evaluation of Various Fishing Gear for Domestication of The Striped Barb (Desmopuntius gemellus)

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Abstract. The objective of this study was to analyze the best types of fishing gears for the domestication of striped barb (Desmopuntius gemellus). The research was conducted by purposive sampling method. The pole line, umbrella trap and portable lift net were used as fishing gear. The captured fish with length of 6.0±0.5 cm and weight of 2.0±0.5 g were acclimated for 7 days with stocking density of 2 fish L-1. During the acclimation process, the fish were fed silkworms and commercial pellets in a daily percentage ratio for 5 days. The results showed that the different fishing gears affected the quality and quantity of catch, blood glucose level, survival, absolute growth and feeding efficiency. The umbrella trap is the best fishing gear to support the domestication process of striped mullet.

Keyword: Evaluation, Fishing Gear, Domestication, Striped Barb

1. Introduction

Indonesia is one of the countries with the greatest diversity of fish species in the world. 4.743 species or about 13.5% of the world's fish species live in Indonesian waters [1]. In [2], it was found that Indonesia has a great biodiversity in the fisheries sector, but its exploitation still depends heavily on natural catches. According to [3] and [4], wild-caught fish are still the main choice of the population to meet their animal protein needs, so it is very important to take the efforts of sustainable domestication seriously. Fishing conducted by fishermen generally serves as a source of income for the family, so the fishing gear used is only focused on maximum catch and the quality of the fish caught is not a priority [5][6]. In [7] and [8] it is stated that in the initial stage of domestication efforts, fish originating from the wild must be able to adapt to a new controlled environment, so the selection and use of fishing gear is important to observe and evaluate its use. Gear used to catch fish must be appropriate and match the characteristics of the fish to support fish culture rules so that domestication efforts can be successful.

Domestication is an attempt to breed fish from wild habitats into new controlled habitats, paying attention to genetic potential, successful adaptation, growth, and reproduction in aquaculture tanks [3] [8]. The annual increase in human population certainly has a direct impact on the level of consumption and the area of building land. This statement is also supported by [9], who states that the population of the species Desmopuntius gemellus is

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threatened because its natural habitat has been degraded and converted to industrial oil palm plantations.

One of the fish species that need to be domesticated is the striped barb (Desmopuntius gemellus), which has economic potential as an edible and ornamental fish. Currently, the striped mullet is classified in the category of species of least concern (LC) or does not require special attention [9]. This is because its distribution is still quite large and tends to be stable. However, this status is not permanent and can change to extinct status (EX) at any time, as was the case with Chitala lopis, which was declared extinct due to slow domestication and conservation efforts [10].

In general, the domestication phase is divided into several stages, namely identification of genetic potential, adaptation to controlled containers, growth, and the ability to reproduce or spawn on culture media [3][8]. Considering the case of Chitala sp. declared extinct due to slow domestication and conservation efforts, and the prospect of a striped barb that can be used as an edible and ornamental fish. Therefore, it is necessary to conduct research on the domestication of the early stage of striped barb, from monitoring and evaluating the use of fishing gear to acclimation of striped barb in controlled culture tanks.

2. Materials and methods

2.1. Place and Time

The study was conducted in December 2021 to March 2022 in the retention pond of the Aquaculture Laboratory and Experimental Pond and the Basic Fisheries Laboratory of the Department of Aquaculture, Universitas Sriwijaya.

2.2. Fishing Equipment Preparation

Purposive sampling was used as the research method. The fishing gear used was a pole line with hook size 3, an umbrella trap with mesh size 12 mm, and a portable lift net with mesh size 12 mm. The fishing gear was used according to the habits of the fishermen. The purposive sampling method was chosen because there were differences in the way the fishing gear was used and in the number of fish caught.

2.3. Post-catch Fish Acclimatization

The caught fish were placed in a temporary storage container equipped with a portable aerator. After completion of the capture procedure, the fish were transported to the laboratory. The fish were placed in an aquarium coded according to the treatment of each gear with a stocking density of 2 fish L-1 [11], then the fish were acclimated for 7 days and fed silkworms and commercial pellets at a daily percentage ratio for 5 days until the fish were able to fully consume the commercial pellet feed. Comparison of the percentages of silk worm and commercial pellet diets should observe the ability of striped barb to transition from natural feed to commercial pellet.

2.4. Research Parameters

2.4.1. Physical Condition of Striped barb Shortly After Post-Catching

Tests were conducted to determine the physical condition of caught fish with various fishing gears. Observations were made by recording and describing the condition of the fish after capture and by visual documentation [12]. Classification of observations on the physical condition of fish after capture of striped barb included the number of caught fish , morphometric data (length and weight), fish behavior (response to food and swimming behavior after acclimation), and survival rate.

2.4.2. Blood Glucose Levels

The measurement of blood glucose levels of striped barb was carried out at the beginning and end of acclimatization on basal conditions using the Gluco Kit Test tool.

2.4.3. Survival Rate, Absolute Weight Growth, Absolute Length Growth and Feed Efficiency

Survival rate, absolute weight growth, and absolute length of growth calculated using the formula according to [13], while feed efficiency of striped barb was calculated based on [14].

2.4.4. Water Quality

In this study, water quality was measured: temperature, dissolved oxygen and pH. Water quality was measured in two phases, first at the capture site and then during the seven-day acclimation period of the striped barb.

2.5. Data Analysis

The data obtained during the study were analyzed descriptively.

3. Result and Discussion

3.1. Results

The data on the caught striped barb using different fishing gears were presented in Table 1. Fish that had been collected from each fishing gear were acclimatized for seven days in the aquarium.

Table 1. Data on fish caught using different fishing gear

Parameters	Catching tool		
	Pole line	Umbrella trap	Portable lift net
Size of caught fish (cm)	4-6 (75 fish) 6-8 (89 fish)	4-6 (240 fish) 6-8 (112 fish)	4-6 (77 fish) 6-8 (112 fish)

	>8 (4 fish)	>8 (8 fish)	>8 (2 fish)
Fish behavior	Normal swimming	Normal swimming	Normal swimming
Fish physical condition	There was a fishing hook wound in the mouth area	Normal without defects	Some fish are injured on the back scales
Survival rate (%)	86.90	96.11	95.83
By-catch of fish	Anabas testudineus, Channa striata and Rasbora sp.	Helostoma temminckii, Osteochilus vittatus, Trichogaster trichopterus, Belontia hasselti, Channa Lucius, Channa pleuropthalamus and Rasbora sp.	Betta bellica and Rasbora sp.

The blood glucose levels of striped barb during acclimatization were presented in Table 2, mean while survival rate of striped barb during acclimatization were listed in Figure 1.

Table 2. Blood glucose levels of striped barb at the beginning and the end of acclimatization for 7 days

Catching tool	Blood glucose levels (mg dL-1)	
	Early acclimatization	End of acclimatization
Pole line	247.67	134.00
Umbrella trap	120.00	80.00
Portable lift net	166.67	80.67

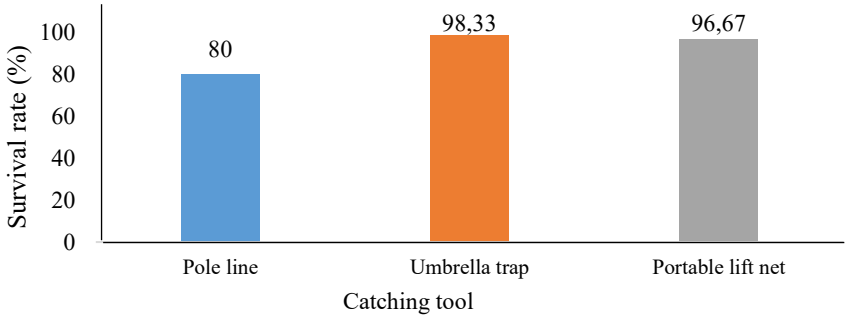

Figure 1. The survival of the striped barb (D. gemellus) during the seven-day acclimatization process

During the acclimation period, the fish were fed worms and commercial pellets, in a predetermined daily proportion. From the results of feeding, it appeared that the growth and feeding efficiency of striped barb were maintained. The data on growth and feeding efficiency of striped barb during acclimation were shown in Table 3.

Table 3. Absolute growth and feed efficiency during acclimatization of striped barb for 7 days

Catching tool	Absolute growth		Feed efficiency (%)
	Weight (g)	Length (cm)	
Pole line	0.09	0.07	11.94
Umbrella trap	0.29	0.15	16.77
Portable lift net	0.24	0.12	14.96

The water physical and chemical value during fishing and during acclimatization were presented in Table 4.

Table 4. The range value of water physical and chemical during catching and acclimatization of striped barb for 7 days

Treatment	Parameters		
	Temperature (oC)	Dissolved oxygen (mg L-1)	pH
*at the fishing ground	28.8 - 33.1	5.30 - 5.70	5.9 - 6.5
*at the acclimatization site			
Pole line	26.4 - 27.2	3.60 - 4.23	6.6 - 7.5
Umbrella trap	26.4 - 28.1	3.48 - 4.51	6.5 - 7.8
Portable lift net	26.0 - 27.6	3.42 - 4.35	6.5 - 7.5

3.2. Discussion

According to the results of the physical observations of the caught fish with the pole line (PL), the hooks always leave scars on the lips of the caught fish. Catching fish with the portable lift net (PLN) also leaves scars on the dorsal region of some fish due to entanglement in the mesh of the PLN net. In contrast, caught fish with the umbrella trap (UT) look normal and show no defects. During observations in the fishing areas, it was found that caught fish with UT had the highest survival rate and the largest number of individual catches compared to PLN and PL.

It was found that 360 fish were caught via UT, with a post-capture survival rate of 96.11%. These data were higher than the 191 caught fish using PLN with a post-capture survival rate of 95.83% and PL with 168 fish and a post-capture survival rate of 86.90%. Physical observation of the captured fish was to provide information on the effects of each gear. The result showed that the use of UT did not cause physical scars on the fish, unlike PLN and PL, which left physical scars on the captured fish.

[12] stated that wild fish are stressed when they have been physically injured or are in a new environment. This statement is consistent with the results of measuring the blood glucose level of the fish, which was quite high shortly after capture and differed between treatments. It was found that the highest blood glucose level was found in caught fish with PL, which was 247.67 mg dL-1. The lowest was found in caught fish with UT of 120.00 mg dL-1 and followed by caught fish with PLN of 166.67 mg dL-1. In [15] it was stated that blood glucose level is an indicator of stress in fish. [16] explained that the stress response stimulates the hypothalamus to release corticotrophin releasing factor (CRF) and this CRF stimulates the anterior pituitary to release adrenocorticotropin hormone (ACTH). ACTH then stimulates the cells of the adrenal glands (adrenal medulla) to produce cortisol and catecholamine hormones such as epinephrine. These hormones play a role in the process of gluconeogenesis, in which glycogen reserves are created in the liver and muscles to increase blood glucose levels. In [17], it was noted that striped barb is one of the species prone to stress and death. This is thought to be the reason for the death of striped barb shortly after capture.

During the acclimation period, the parameters of blood glucose level of the fish at the end of the acclimation period, survival, growth, feed efficiency and water quality were observed. From these observations, the survival rate of UT captured fish (98.33%) was higher than PLN (96.67%) and PL (80.00%). It was explained in [12] and [18] that stress conditions strongly

affect fish survival. At the end of the acclimation period, a decrease in the stress level of striped barb was observed in all treatments. It was found that the blood glucose level of UT captured fish was 80.00 mg dL-1, lower than the blood glucose level of PL (134.00 mg dL-1) and PLN (80.67 mg dL-1). Probably, the stress level of the fish was still quite high until the end of the acclimation period, which is the reason for the low survival rate. According to [19], the normal blood glucose level in fish is in the range of 40-90 mg dL-1.

Gear differences affect absolute growth of striped barb. Absolute growth in weight and length of caught fish with UT was higher than with PL and PLN. The absolute growth of weight and length was higher with PLN than with PL. According to [17], growth is influenced by the ability of fish to digest and absorb nutrients greater than the amount required for acclimation. It is believed that due to the wounds around the mouth caused by PL, the fish must prioritize the recovery process, which affects the low value of absolute weight and length growth of the fish. Water quality in the capture areas was still within the appropriate range for the genus Desmopuntius, i.e. temperature range of 28.8-33.1ºC, pH 5.9-6.5, dissolved oxygen 5.3-5.7 mg L-1 and ammonia 0.001-0.003 mg L-1 [20]. During the seven-day acclimation period of the striped barb, the temperature of the medium ranged from 26.0º to 28.1ºC, dissolved oxygen ranged from 3.42 to 4.51 mg L-1, and pH ranged from 6.5 to 7.8. The values for the physical and chemical of the water during acclimation were within a range that can be tolerated by the striped barb in nature [21].

4. Conclusion

The fishing gear that supports the process of domestication of striped barb is the umbrella trap. This fishing gear allows for higher absolute weight and length growth, higher feeding efficiency, higher survival, and lower stress levels of striped barb at the end of the acclimation period.

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