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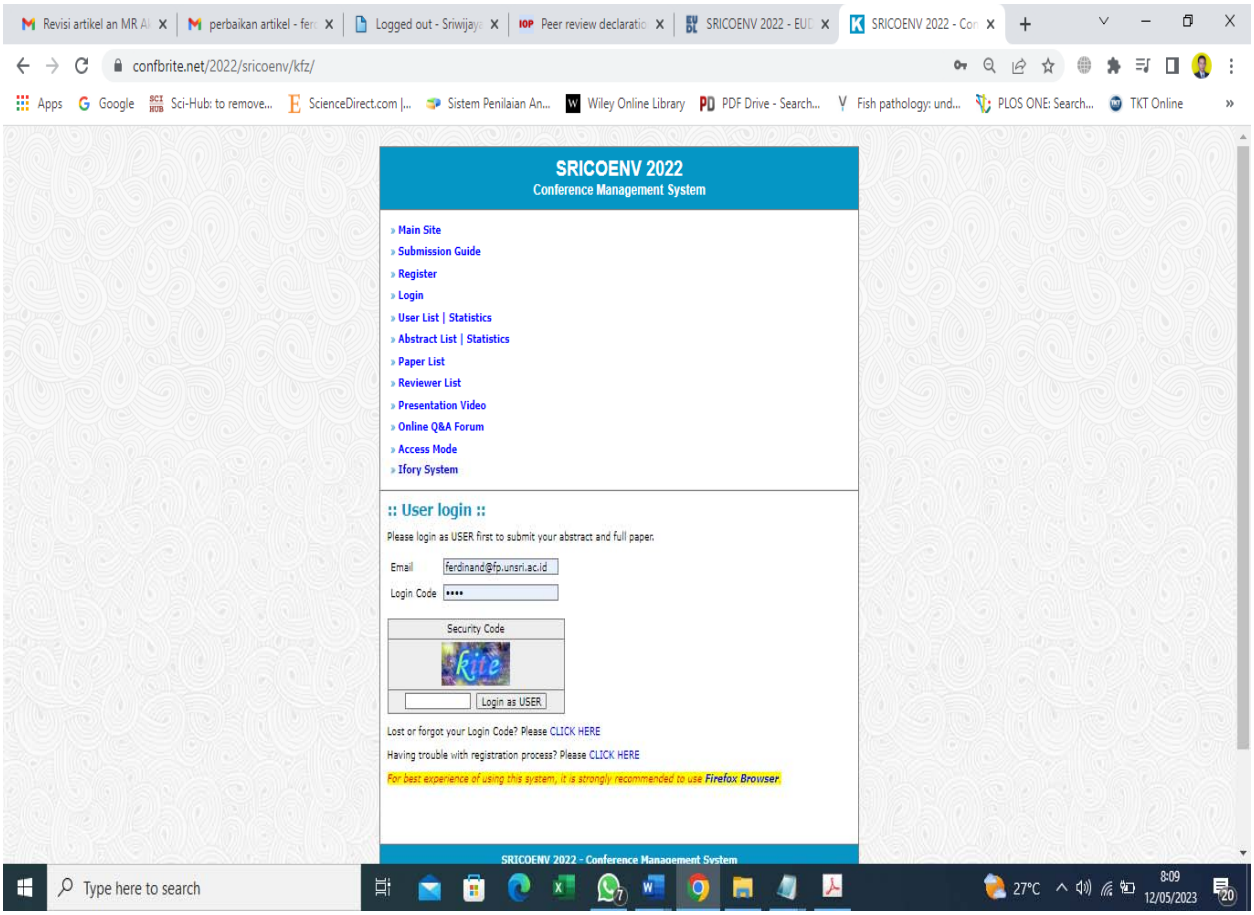

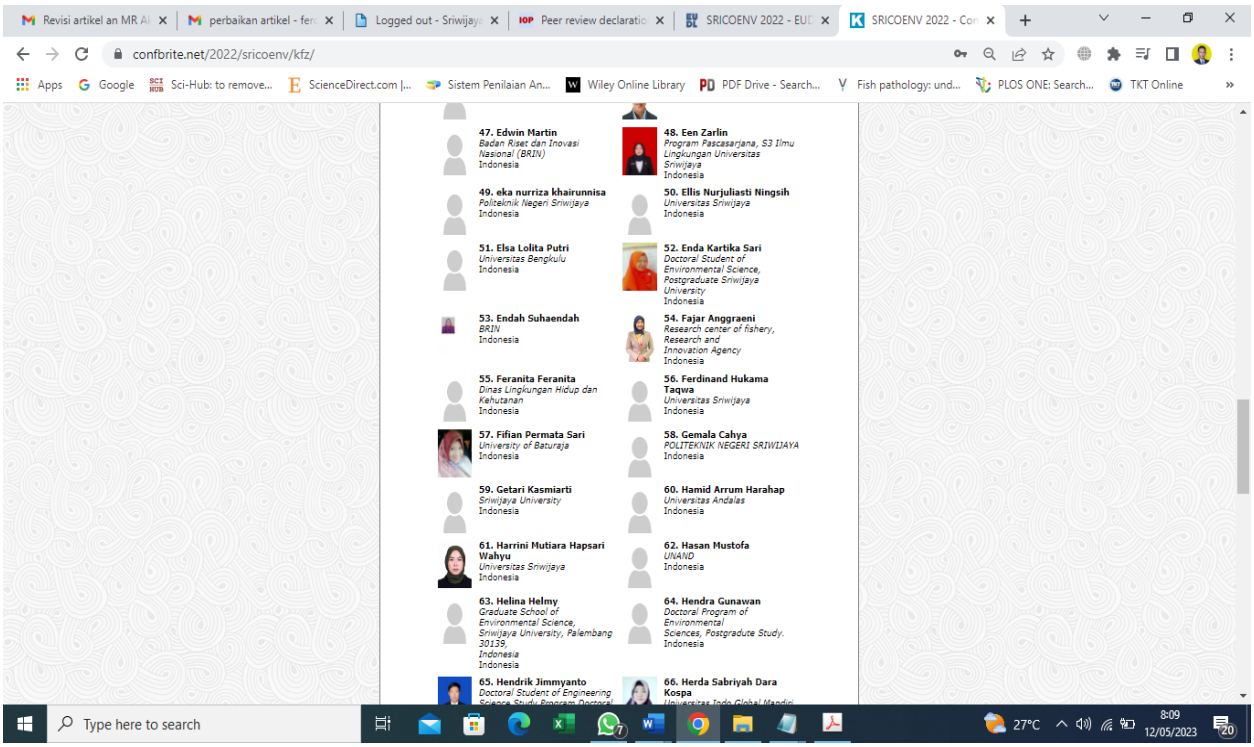

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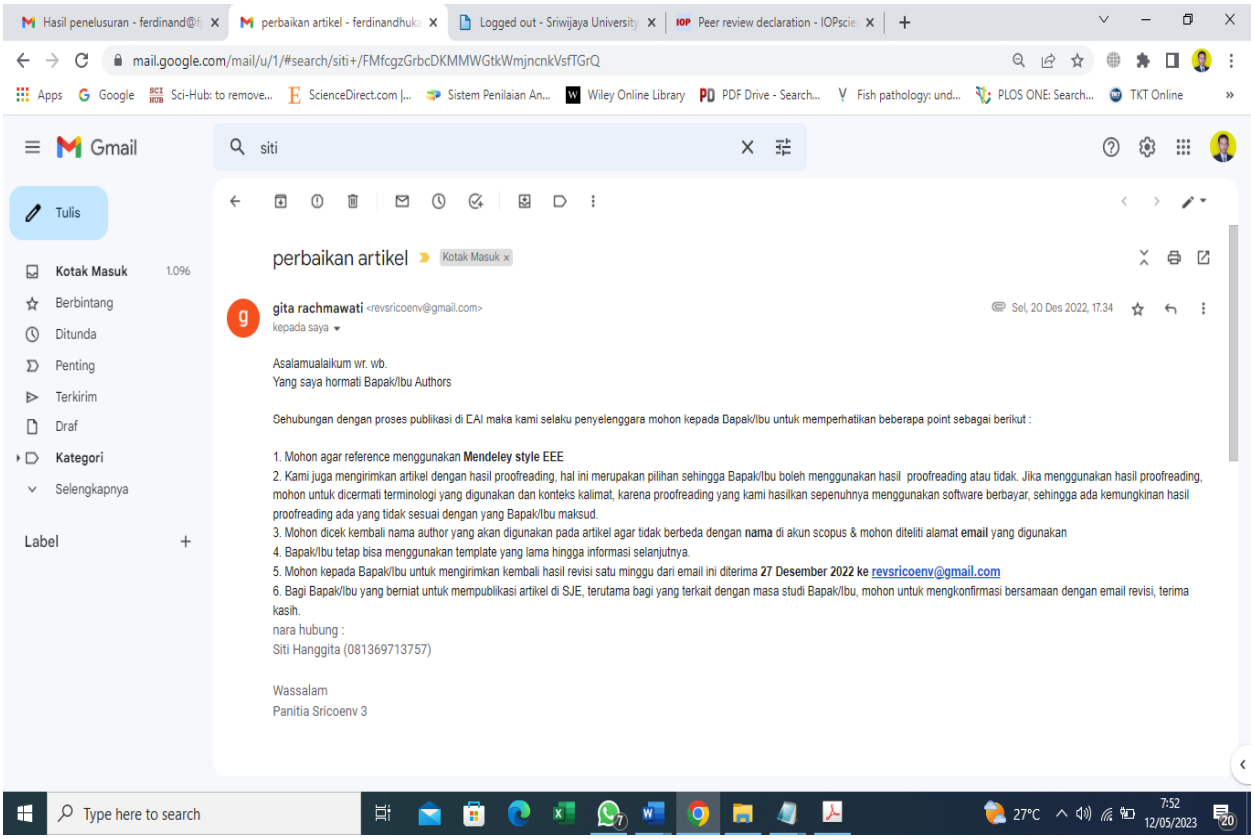

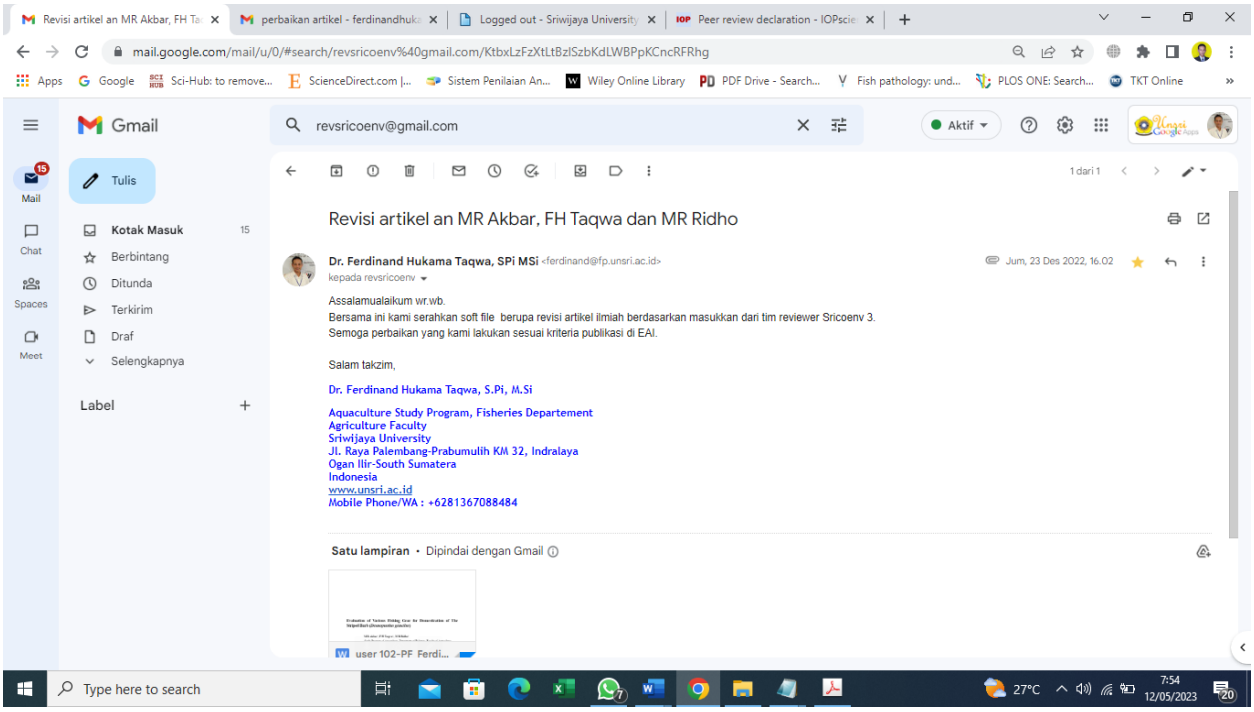
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Letter of Acepptance
No. : 020/UN9.2/LL/IS/2022

Dear Authors,

We are very pleasured to inform you that your paper:

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

Authors: M R Akbar, F H Taqwa, M R Ridho

has been accepted for presentation as a supporting speaker at the 3rd Sriwijaya International Conference of Environmental issues (3rdSricoenv), which will take place in Palembang, Indonesia on October 5-6, 2022.

Thank you for participating at Sricoenv 2022.
For all information regarding the conference, please kindly visit the conference website http://sricoenv.conf.unsri.ac.id.

Please do not hesitate to contact us also if you require further information at sricoenv@pps.unsri.ac.id.

We look forward to seeing you at the conference.

Best regards,

General Chair of SRICOENV,

Dr. Ferdinand Hutama Taqwa, S.Pi., M.Si.

Revisi Artikel

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

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~~**Abstract.** This study aimed to analyze the best types of fishing gear for domestication of striped barb (*Desmopuntius gemellus*). The research was conducted by purposive sampling method. The fishing gear used in the form of pole line, umbrella trap and portable lift net. The caught fish with a length of 6.0±0.5 cm and a weight of 2.0±0.5 g were acclimatized for 7 with a stocking density of 2 fish L^{-1}. During the acclimatization process, the fish were fed with silk worms and commercial pellets with a daily percentage ratio for 5 days. The result showed that differences in fishing gear affected the quality and quantity of the catch, blood glucose, survival, absolute growth and feed efficiency. Umbrella trap fishing gear is the best fishing gear for supporting the domestication process of striped barb.~~

Summary. The objective of this study was to analyze the best types of fishing gears for the domestication of striped barb ~~barbel~~ (*Desmopuntius gemellus*). The research was conducted by purposive sampling method. The pole ~~Fishing~~ line, umbrella trap and portable lift~~ing~~ 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 ~~years~~ 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.

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1. Introduction

~~Indonesia is one of the countries that has the largest fish biodiversity in the world, as many as 4,743 species or around 13.5% of the world's fish species inhabit Indonesian waters [1]. [2] stated that Indonesia has abundant biodiversity in the fisheries sector, but its utilization is still very dependent on natural catches. According to [3] and [4], caught fish in nature are still the community's main choice in meeting animal protein needs, therefore it is very important to take domestication efforts seriously and sustainably. Fishing carried out by fishermen is generally used as a source of family income, so that the fishing gear used is only focused on producing the maximum quantity of catch and does not prioritize the quality of the caught fish [5] [6]. [7] and [8] stated that in the early stage of domestication efforts, fish originating from the wild must be able to adapt to a new controlled environment, so that the selection and use of fishing gear is important to observe and evaluate its use. The fishing gear used in catching~~

~~fish must be appropriate and in accordance with the characteristics of the fish in order to support the rules of fish breeding so that domestication efforts can be successful.~~

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]~~[1]~~. ~~I~~In [2]~~[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] ~~[3]~~ and [4]~~[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]~~[5][6]~~. ~~I~~In [7]~~[7]~~ and [8]~~[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 effort to cultivate fish from wild habitats to new controlled habitats with orientation to genetic potential, successful adaptation, growth and reproduction in aquaculture containers [3] [8]. The increase in the number of human population every year will certainly have a direct impact on the level of consumption and the area of development land. This statement is also supported by [9] which stated that the population of the *Desmopuntius gemellus* species is threatened, because its natural habitat has been degraded and converted into industrial oil palm plantations.~~

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]~~[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]~~[9]~~, who states that the population of the species *Desmopuntius gemellus* is threatened because its natural habitat has been degraded and converted to industrial oil palm plantations.

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

One of the fish species that need to be domesticated is the striped barb ~~mullet~~ (*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]~~[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]~~[10]~~.

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~~Generally, the domestication stage is divided into several stages, namely, identification of genetic potential, adaptation to controlled containers, growing and being able to reproduce or spawn on cultivation media [3] [8]. Reflecting on the case of *Chitala* sp. which has been declared extinct due to the slow pace of domestication and conservation efforts, as well as looking at the prospect of striped barb that can be used as consumption fish and ornamental fish. Therefore, it is necessary to conduct research on the domestication of the early stage of striped barb, starting from observing and evaluating the use of fishing gear to acclimatization of striped barb in controlled culture containers.~~

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]~~[3][8]~~. Considering the case of *Chitala* sp. declared extinct due to slow domestication and

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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 barbel, from monitoring and evaluating the use of fishing gear to acclimation of striped barbel in controlled culture tanks.

2. Materials and methods

2.1. Place and Time

The research was carried out in the retention pond of the Aquaculture Laboratory and Experimental Pond, and the Basic Fisheries Laboratory, Department of Aquaculture, Universitas Sriwijaya in December 2021 - March 2022.

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

The research method used was purposive sampling. The fishing gear used was a pole line with hook size 3, umbrella trap mesh size 12 mm and portable lift net mesh size 12 mm. The fishing gear was operated according to the fishermen's habits. Considerations using the purposive sampling method because there were differences in the type and method of operation of fishing gear, as well as the number of caught fish.

Purposive sampling was used as the research method. The fishing gear used was a pole fishing line with hook size 3, an umbrella trap with mesh size 12 mm, and a portable lifting 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 put into a temporary storage container that has been equipped with a portable aerator. After completion of the fishing process, the fish were transported to the laboratory. The fish were placed in an aquarium that had been coded according to the treatment of each fishing gear with a stocking density of 2 fish L^{-1} [11], then the fish were acclimatized for 7 days and fed with silk worms and commercial pellets with a daily percentage ratio for 5 days until the fish are able to fully consume commercial pellet feed. Comparison of the percentage of feed from silk worms to commercial pellets aims to observe the ability of the striped barb to adapt from natural feed to commercial feed.

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][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 barbel to transition from natural feed diets to commercial pellet diets.

2.4. Research Parameters

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

Physical condition tests were conducted to determine the physical condition of caught fish with different fishing gear. Observations were made by recording and describing the condition of the fish after the catch and visual documentation [12]. The classification of observations on the physical condition of the fish after catching striped barb were quantity caught fish, morphometric (length and weight), fish behavior (respons to feed and swimming behavior when acclimatized) and survival rate.

Tests were conducted to determine the physical condition of caught fish caught with various fishing gears. Observations were made by recording and describing the condition of the fish after capture and by visual documentation [12][12]. Classification of observations on the physical condition of fish after capture of striped barbel included the number of caught fish caught, morphometric data

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(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] [13], while feed efficiency of striped barb was calculated based on [14] [14].

2.4.4. Water Quality

~~The water quality measured in this study were temperature, dissolved oxygen (DO), and pH. Measurement of water quality is carried out in two stages, namely, first carried out at the fishing location, the second was carried out at the time of acclimatization of striped barb for seven days.~~

In this study, water quality was measured: ~~T~~temperature, dissolved oxygen ~~(DO)~~ 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 ~~mullet~~.

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) >8 (4 fish)	4-6 (240 fish) 6-8 (112 fish) >8 (8 fish)	4-6 (77 fish) 6-8 (112 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

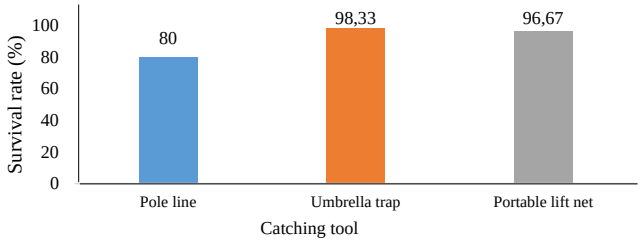

Figure 1. The survival of the striped barb (*D.~~esmopuntius~~ gemellus*) during the seven-day acclimatization process

~~During acclimatization period, fish were fed with worms and commercial pellets according to a predetermined daily percentage. From the results of the feeding, it was found that the growth and feed efficiency of striped barb were obtained. Data on growth and feed efficiency of stingray fish during acclimatization were presented in Table 3.~~

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~~el~~ were maintained. The data on growth and feeding efficiency of striped barb~~el~~ during acclimation were ~~are~~ 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

~~Based on the results of the physical observations of caught fish using pole line (PL) always leave hook scars on the lips of the caught fish. The catch using the portable lift net (PLN) also gives scars on the back area of the fish in some of the catch due to being entangled in the mesh size of the PLN net. Meanwhile, fish caught using umbrella trap (UT) tend to look normal without any defects. From observations at the fishing grounds, it was found that caught fish using UT had the highest survival value and the largest number of individual catches compared to PLN and PL.~~

According to the results of the physical observations of the caught fish with the ~~fishing~~ pole line (PL), the hooks always leave scars on the lips of the caught fish. Catching fish with the portable lift ~~set~~ 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 ~~caught~~ with the umbrella trap (UT) look normal and show no defects. During observations in the fishing areas, it was found that caught fish ~~caught~~ with UT had the highest survival rate ~~value~~ and the largest number of individual catches compared to PLN and PL.

~~It was recorded that 360 caught fish by UT with a post-catch survival value of 96.11%. This data was higher than the catch using PLN, which was 191 fish with a post-catch survival value of 95.83% and PL was 168 fish with a post-catch survival rate of 86.90%. Physical observation of the caught fish aimed to provide information about the effects of each fishing gear. The result showed that the use of UT does not cause physical scars on fish, contrast to PLN and PL which left physical scars on the caught fish.~~

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 ~~caught~~ 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 will be stressed when they were physically injured or when they were in a new environment. This statement was in line with the results of the measurement of blood glucose levels of fish which were quite high shortly after the catch and different between treatments. It was known that the highest blood glucose value was found in caught fish using PL, which was 247.67 mg dL^{-1}. The lowest was found in caught caught using PL. UT of 120.00 mg dL^{-1} and followed by caught fish by PLN of 166.67 mg dL^{-1}. [15] stated that blood glucose levels was an indicator of stress in fish. [16] explained that the stress response will stimulate the hypothalamus to release corticotrophin releasing factor (CRF), and this CRF will stimulate the anterior pituitary gland to release adrenocorticotropin hormone (ACTH). Then ACTH will stimulate interrenal cells (adrenal medulla) to produce cortisol and catecholamine hormones, such as epinephrine. These hormones play a role in the process of gluconeogenesis which will deposit glycogen reserves in the liver and muscles to increase blood glucose levels. [17] stated that striped barb is one of the species that is prone to stress and death. This was thought to be the basis for the death of the striped barb shortly after being caught.~~

[12]~~[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 ~~caught~~ with PL, which was 247.67 mg dL^{-1}. The

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lowest was found in caught fish ~~caught~~ with ~~PL.~~ UT of 120.00 mg dL^{-1} and followed by caught ~~-~~fish ~~caught~~ with PLN of 166.67 mg dL^{-1}. ~~I~~in [15] ~~[15]~~ it was stated that blood glucose level is an indicator of stress in fish. [16]~~[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. ~~I~~in [17]~~[17]~~, it was noted that striped barb ~~mullet~~ is one of the species prone to stress and death. This is thought to be the reason for the death of striped barb ~~mullet~~ shortly after capture.

~~During the acclimatization period, observations were made on the parameters of fish blood glucose levels at the end of acclimatization, survival, growth, feed efficiency and water quality. From these observations, it was found that the survival value of UT caught fish (98.33%) was higher than PLN (96.67%) and PL (80.00%). [12] and [18] explained that stress conditions greatly affect the survival of fish. At the end of the acclimatization period, there was a decrease in stress levels of striped barb in all treatments. It was recorded that the blood glucose level of UT caught fish was 80.00 mg dL^{-1}, lower than the blood glucose value of PL (134.00 mg dL^{-1}) and PLN (80.67 mg dL^{-1}). Allegedly, the stress level of fish was still quite high until the end of the acclimatization period is the cause of the low survival rate. According to [19], normal blood glucose levels for fish were ranging from 40-90 mg dL^{-1}.~~

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 ~~value~~ of UT captured fish (98.33%) was higher than PLN (96.67%) and PL (80.00%). ~~I~~it was explained in [12]~~[12]~~ and [18]~~[18]~~ that stress conditions strongly affect fish survival. At the end of the acclimation period, a decrease in the stress level of striped barb~~el~~ 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]~~[19]~~, the normal blood glucose level in fish is in the range of 40-90 mg dL^{-1}.

~~Differences in fishing gear have an effect on the absolute growth of striped barb. The absolute growth of weight and length of caught fish by UT were higher than by PL and PLN. The absolute growth of weight and length of PLN was higher than PL. According to [17], growth was influenced by the ability to digest and absorb nutrients by fish greater than the amount required for acclimatization of the body. Allegedly, due to the presence of wounds around the mouth of the fish produced by PL, the fish must prioritize the recovery process, so it has an impact on the low value of absolute weight and length growth in fish. Water quality at the fishing grounds was still in the appropriate range value of *Desmopuntius* genus, i.e. temperature range of 28.8-33.1°C, 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 acclimatization period of striped barb for seven days, the media temperature ranged from 26.0-28.1°C, dissolved oxygen ranged from 3.42-4.51 mg L^{-1} and pH ranged from 6.5-7.8. The range value of water physical and chemical during acclimatization was in the range that can be tolerated by striped barb in nature [21].~~

Gear differences affect absolute growth of striped barb~~el~~. Absolute growth in weight and length of caught fish ~~caught~~ 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]~~[17]~~, growth is influenced by the ability

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of fish to digest and absorb nutrients greater than the amount required for ~~body~~ 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 28.8-33.1°~~o~~C, pH 5.9-6.5, dissolved oxygen 5.3-5.7 mg L^{-1} and ammonia 0.001-0.003 mg L^{-1} [20]~~[20]~~. During the seven-day acclimation period of the striped barb, the temperature of the medium ranged from 26.0° to 28.1°~~o~~C, 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 ~~properties~~ of the water during acclimation were within a range that can be tolerated by the striped barb in nature [21]~~[21]~~.

4. Conclusion

~~Fishing gear that supporting better domestication process of striped barb is umbrella trap. That fishing gear is able to produce higher absolute weight and length growth, feed efficiency, survival rate, and lower stress level of striped barb at the end of acclimatization period.~~

The fishing gear that supports the process of domestication of striped barb~~el~~ 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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