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THE BREEDING TECHNIQUE OF TAWES FISH (*Barbonymus gonionotus*) IN REGIONAL TECHNICAL IMPLEMENTATION UNIT (UPTD) FOR FRESHWATER AQUACULTURE IN JEMBER

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ABSTRACT

The tawes fish (Barbonymus gonionotus) is one of the natural aquatic wealth of Indonesia has thick meat and a high market price. It meat boasts a higher protein content of 18.43% compared to carp (16%) and tilapia (18.72%). Tawes fish has the characteristic of being economically valuable and has the potential to be cultivated because it does not require too much land and can be cultivated throughout the year. In order to obtain good quality fish seeds in large quantities, the operational activities of fish breeding must be carried out carefully and planned. The activities of fish breeding began with the preparation of the pond, the selection of broodstock, spawning, hatching, larval rearing, and harvesting. Some parameters that can be measured in hatchery activities include fecundity, fertilization rate (FR), hatching rate (HR), food conversion rate (FCR) and survival rate (SR). Data collection techniques conducting direct observation, interviews, or observations about Pond preparation, broodstock selection, spawning, larval rearing, feeding and harvesting with the parameters that were measured in fish breeding activities were fecundity, Fertilization Rate (FR), Hatching Rate (HR), Food Conversion Ratio (FCR), and Survival Rate (SR). Based on the results of this research the fecundity value obtained, FR was 54%, HR was 65%, FCR was 3.9, and SR 60%.

Keywords: Breeding technique, Larvae, Tawes Fish (Barbonymus gonionotus),

I. INTRODUCTION

Indonesia is home to many species of fish belonging to the Cyprinidae family, which are distributed in the waters of the islands of Java, Kalimantan, and Sumatra. One of these species is the tawes fish (*Barbonymus gonionotus*) or also known as the white tilapia (Ayyubi *et al.,* 2018). One of the freshwater fish that is increasingly becoming popular is the tawes fish. The tawes fish (*Barbonymus gonionotus*) is one of the natural aquatic wealth of Indonesia. Tawes fish are classified as fish that are easy to adapt, so it is easy for variations to occur (Pratiwi *et al.,* 2021).

Tawes fish is a valuable fish because it has thick flesh and a high market price (Yuaniarti *et al.,* 2021). It meat boasts a higher protein content of 18.43% compared to carp (16%) and tilapia (18.72%) (Subandiyono et al., 2018). Tawes fish is a native freshwater fish of Indonesia and is classified as a herbivorous fish, for example algae and other aquatic plants such as *Hydrilla verticillata*. It can be cultivated well with an optimum water temperature between 25-30°C. Tawes fish has the characteristic of being economically valuable and has the potential to be cultivated because it does not

require too much land and can be cultivated throughout the year (Ristyanadi *et al.,* 2022).

This has led fish farmers to increase the production of tawes fish through aquaculture activities and to support these activities, there must be a supply of fish seeds. Fish seeds are one of the determining factors in the effort to increase the production of aquaculture (Afriani, 2016). The characteristics of healthy fish seeds are that they swim actively, have a normal body shape, are of uniform size, and are free of disease (Usman *et al.,* 2022). To obtain good quality fish seeds in large quantities, the operational activities of fish breeding must be carried out carefully and planned. The activities of fish breeding began with the preparation of the pond, the selection of broodstock, spawning, hatching, larval rearing, and feeding. A previous study on the breeding techniques of tawes fish has been conducted by Ristyanadi *et al.,* (2022) located in Technical Implementation Unit for Fish and Environmental Health Laboratory in Umbulan Pasuruan, East Java. n this study, a different location was taken, located in Government Unit of Technical Impelementing Service of Freshwater Aquaculture in Jember. This study described the breeding techniques used in Jember and how the results of the parameters generated are in line with the good range for the life of tawes fish. Some parameters that can be measured in hatchery activities include fertilization rate (FR), hatching rate (HR), and survival rate (SR). In addition, water quality include temperature and pH are measured in this study.

II. RESEARCH METHODS

2.1 Time and Place of Research

This research was conducted from June to July 2022 at the Government Unit of Technical Impelementing Service of Freshwater Aquaculture in Jember.

2.2 Data Collection

Data collection techniques were carried out by conducting direct observation about Pond preparation, broodstock selection, spawning, larval rearing, feeding, water quality monitoring, and harvesting.

2.3 Pond Preparation

The pond used at the Government Unit of Technical Implementing Service of Freshwater Aquaculture in Jember is a concrete wall pond with a 30x32x1 m earthen bottom. The preparation of the pond began with the following steps: drying the soil, turning the soil, and to fill a pond with water to a height of 50 centimeters. Soil drying was carried out by draining the water, followed by drying for 2-3 days depending on the weather.

- Soil Tillage and leveling

The turning of the soil was carried out after the soil was dry with the aim of reducing the organic matter content at the bottom of the pond, as well as being able to raise the embankments and cover the embankment leaks. The leveling of the soil is carried out to close the holes that become the nests of tawes larvae.

- Water Filling

The pond was filled with water through an inlet pipe until the water level reaches 15-20 cm. Before introducing broodstock, the pond is refilled as a process of further water filling until the water level reaches 50 cm. After further water filling, it was expected that the environmental conditions would become stable and oxygen capacity would increase.

2.4 Selection of Broodfish

Broodstock selection was the process of selecting or separating broodstock that are already sexually mature or mature in eggs from those that are not. The purpose of this was to ensure that the female broodstock's gonads are fully mature and ready for ovulation. If the broodstock is not ready for

ovulation, the eggs that are released may not be fertilized by the male broodstock's sperm, which can lead to many eggs not hatching (Yulianti *et al.,* 2020). Before spawning, the broodstock is weighed first to determine the initial weight of the broodstock. Next, the broodstock that passed the selection was placed in a holding tank before being released into the spawning pond. Selecting broodstock that is not healthy can affect the quality of the eggs or sperm produced. Eggs from unhealthy broodstock were likely to have weak cell walls. As a result, they cannot accept male broodstock sperm well, which will have an impact on the low FR value (Mustamin *et al.,* 2018). Before spawning, the broodstock is weighed first to determine the initial weight of the broodstock. Next, the broodstock that passed the selection was placed in a holding tank before being released into the spawning pond.

2.5 Spawning

Natural spawning of tawes fish was done on a mass scale. The ratio of male and female broodstock that would be placed in the spawning pond is 2:1, with 150 male broodstock and 75 female broodstock. This is because it gives the male broodstock a greater chance of fertilizing the eggs, resulting in higher egg production. The tawes broodstock is introduced into the spawning pond at 10:00 AM, which coincides with the filling of water into the spawning pond. As evening approached or at 4:00 PM, the water inflow was increased to provide natural stimulation during the spawning process, resulting in a water depth of approximately 50 cm at the inlet and 70 cm at the outlet. At this time, the tawes broodstock typically began to chase each other, and occasionally a group of male tawes fish with female tawes fish appear at the surface of the pond. The tawes fish would begin spawning at 7:00 PM to 10:00 PM, which is marked by a buzzing sound or a sound like someone is grumbling. According to Ismail and Khumaidi (2018), the water temperature tends to be low at this time, and spawning occurs in the shallower parts of the pond near the inlet. This is triggered by the sound of the trickling water entering, which is a natural stimulus for fish to spawn. The tawes broodstock would spawn throughout the night until the belly of the female broodstock is completely empty in order to produce a high fecundity of eggs.

2.6 Larval Rearing and Feeding

Eggs that have hatched into larvae were not fed directly for 4 days because, at the time of hatching, the larvae still had food reserve in the form of yolk that can be utilized by the larvae for several days (Diana and Safutra, 2018). On days 5 to 9, the larvae are fed with wheat flour that has been dissolved in water. At the age of 10 days, the fry was fed with HI-PRO-VITE 781-2 pellets that had been ground using a milling machine. The protein content of the pellets ranges from 31 to 33%. This is appropriate because according to Hanief *et al.* (2014), the best artificial feed for optimal growth of tawes fish is a pellet with a protein content of 20-30%. In addition, the nutrient content of HI-PRO-VITE 781-2 feed includes fat 3-5%, fiber 4-6%, ash content 10-13%, and water content 11-13%. Feeding is done twice a day, at 08:00 AM in the morning and 03:00 PM in the afternoon. Then after the larvae are 10 days old, the feed that is given is HI-PRO-VITE 781-2 pellets with a size of 2.0-2.3 mm that have been ground. Feeding is done twice a day, at 08:00 AM in the morning and 03:00 PM in the afternoon. The feeding method used was the ad libitum method. Excessive feeding, or ad libitum, is one of the most common feeding methods used for larval fish up to the fry stage. At this stage, the feeding rate was still high. This is due to the limited capacity of the larval or fry fish's digestive system, the immature structure of the digestive organs, and the small mouth

opening of the larvae. By providing food ad libitum, where food is always available in

2.7 Main Parameters

a. Fertilization Rate (FR)

Fertilization Rate (FR) is the percentage of eggs that are fertilized from the total number of eggs released during spawning (Fani *et al.,* 2018).

$$FR = \frac{\text{number of fertilized eggs}}{\text{total number of eggs}} \text{x} 100\%$$

b. Hatching Rate (HR)

Hatching Rate (HR) is the ability of an egg to develop through the embryonic process until hatching (Marsela *et al.,* 2018). HR is taken at the first rearing stage, and the eggs will hatch within 24 hours after fertilization.

$$HR = \frac{\text{number of hatched eggs}}{\text{number of fertilized eggs}} \text{x} 100\%$$

c. Survival Rate (SR)

Survival Rate (SR) is the percentage of survival rate by comparing the final population with the initial population using the formula (Widyatmoko et al., 2019).

$$SR = \frac{\text{Nt}}{\text{No}} \text{x} 100\%$$

Specification :
SR = Survival Rate (%)
Nt = final/harvested fish count (tail)
No = initial/stocking fish count (tail)

III. RESULTS AND DISCUSSION

3.1 Larval Development Stages

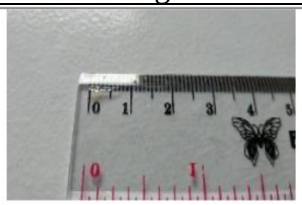
Larval development stages during the study shown in Table 1 below.

Living larvae are blackish transparent and actively swim to find food, while dead larvae are opaque white and float in the water pool or sink to the bottom of the pool. The death of tawes fish larvae is suspected to be due to changing weather conditions. This makes it difficult for larvae to adapt to environmental conditions, resulting in many dead fish larvae. In addition, the growth of fish larvae is also less than optimal due to these weather changes. Environmental conditions are one of the most important factors in larval maintenance because these organisms are still very vulnerable and do not yet have fully developed organs. In addition, the survival of an organism is also influenced by two factors, namely biotic factors consisting of competitors, population density, age, and the organism's ability to adapt to the environment. Abiotic factors, on the other hand, consist of temperature, dissolved oxygen, pH, and ammonia content (Ibrahim *et al.,* 2017).

3.2 Fertilization Rate (FR)

Fertilization Rate (FR) is the percentage of fertilized eggs from the total number of eggs released during spawning (Fani *et al.,* 2018). Fertility is calculated by taking 2 samples of water, each 200 ml, from each side of the pond. The fertilization rate (FR) obtained from the research was 54%. According to Yuniarti *et al.* (2018), the fertilization rate (FR) of tawes fish ranges from 51% to 84%. Therefore, it can be said that the FR of tawes fish was considered good. According to Cahyanti *et al.* (2020), the condition of the eggs and sperm that are ready are also determinants of the high value of the fertilization rate. The fertilization rate in fish is very determined by the quality of the eggs, spermatozoa, and also hormones. Fish eggs usually develop normally if the hatchery conditions, including oxygen, temperature, and pH, were met.

Table 1. Larval Development Stages

Ages	Sizes	Characteristics	Images
Day 7	0,7 cm	The body is still transparent, the caudal fin is still fused with the dorsal fin and anal fin.	
Day 14	1 cm	The body shape begins to form, the dorsal and anal fins begin to appear, the fin margins are black and the caudal fin is yellow.	
Day 21	2 cm	The mouth, eye, tail, and body shape are already distinct.	
Day 28	3 cm	The fins and tail have developed spines and the coloration resembles that of an adult fish.	

3.3 Hatching Rate (HR)

Hatching rate (HR) is the percentage of eggs that hatch or the number of larvae divided by the number of fertilized eggs multiplied by 100% (Marsela *et al.*, 2018). The number of eggs that hatch was obtained from the sampling of fertilized eggs. Of 83 fertilized eggs, 54 eggs hatched. According to Yulianti *et al.* (2020), the HR value for tawes fish breeding ranges from 37% to 71%. Therefore, the HR of tawes fish was considered good. The failure of eggs to hatch is likely due to shaking or friction with other objects due to the non-adhesive nature of the eggs, resulting in damage. The level of HR is also greatly determined by several factors, including fertilization rate, environmental factors, pests, and diseases, which are suspected to play a major role in determining HR (Yufika *et al.*, 2019).

3.4 Survival Rate (SR)

Survival Rate (SR) is the percentage of survival rate by comparing the final population with the initial population. Based on the research results, the survival rate was 60%. The survival of fish is influenced by various factors, including water quality, feed, fish age, and fish health (Adewolu *et al.*, 2008).

3.5 Water Quality

Water quality parameters such as temperature pH were measured. The water quality obtained in this study is presented in Table 2.

Table 2. Water quality measurement

No.	Parameter	Range Value	Standard	References
1	Temperature (^{0}C)	27,5-28,8	20-33	Moniruzzaman *et al.,* (2015)
2	pH	6,9-7,2	6,5-9	Sumardiyani *et al.,* (2020)

The results of water quality measurements showed that the water quality values during the study were still within a range that is suitable for use as a breeding medium for tawes fish based on the literature on optimum water quality conditions for tawes fish.

IV. CONCLUSION

Based on the results of this study, it can be concluded that tawes fish breeding at the Government Unit of Technical Implementing Service of Freshwater Aquaculture in Jember included pond preparation, broodstock selection, spawning, larval rearing and feeding. And based on main parameters of hatchery such as FR, HR and SR still within the acceptable range for tawes fish, as are the results of the water quality parameters, which are also within a good range for the life of tawes fish.

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