Performance analysis of white snapper (*Lates calcarifer*) nursery at BBPBAP Jepara

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Abstract. White snapper (*Lates calcarifer*) is a fish with high economic value that can meet domestic and foreign needs. Its aquaculture activity has become a commercial business. The growth of white snapper is relatively fast and has high body resistance to environmental changes. BBPBAP plays a role in the fulfillment of superior seeds through nursery activities for white snapper. This study aimed to identify and analyze the performance of white snapper nursery activity in BBPBAP Jepara. Nursery techniques for white snapper included pond preparation, seed stocking, grading, feed management, water quality management, pest and disease control, and seed harvesting. Nursery of white snapper was carried out in concrete ponds with stocking densities ranging from 1000-1500 fish/pond. The percentage of white snapper nursery in the form of seed survival rate at harvest was 80%, feed conversion ratio was 1.51. The average results of water quality parameters in white snapper fish rearing ponds included salinity ranging from 30-35 ppt, DO ranging from 3.2-3.8 mg/L, and water temperature ranging from 28.6-32.6 °C.

1. Introduction
White snapper (*Lates calcarifer*) has high economic value, both to meet domestic and foreign consumption needs. As an export commodity, the demand for this type of fish is quite high in foreign markets. White snapper cultivation has become a commercial business to be developed [1]. Because of its relatively fast growth, easy maintenance and high tolerance for environmental changes, white snapper is suitable for small and large scale aquaculture in freshwater or marine ponds [1]. In the cultivation stage there are several activities including: seeding, nursery, and enlargement. Follow-up activities from hatchery activities are nursery. Nursery is an activity where fish larvae that have been spawned will be separated from the broodstock. The purpose of this activity is to prepare them to become large enough saplings known as seeds. Nursery needs to be done in order to get good quality seeds before stocking them in rearing ponds in order to reduce the mortality rate and get seeds of uniform size [2]. The Center for Brackish Water Cultivation Fisheries or BBPBAP Jepara is a Technical Implementation Unit (UPT) of the Directorate General of Aquaculture, the Ministry of Marine Affairs and Fisheries. This study aimed to determine the performance of white snapper aquaculture in that location.
2. Materials and methods

2.1. Research design

The working method used in this study was descriptive method by utilizing primary and secondary data [3]. The white snapper used was 1000-1500 fish originating from BBPBAP Jepara with a length of 5-6 cm and a weight of 3-4 g.

2.2. Research parameter calculation

The parameters tested in this study were growth (length and weight), FCR (Feed Conversion Rate) and SR (Survival Rate). Absolute weight growth could be seen in the following formula [4]:

\[ W = W_t - W_0 \]

- \( W \): Weight growth (g)
- \( W_t \): Final average weight (g)
- \( W_0 \): Initial average weight (g)

Absolute length measurements were carried out every 10 days. The absolute length growth according to previous study formula was as follows [4]:

\[ P = P_t - P_0 \]

- \( P \): Absolute length growth (cm)
- \( P_t \): Final length (cm)
- \( P_0 \): Initial length (cm)

The number of dead fish was counted every day until the end of the study. According to previous study the survival rate of fish was calculated using the formula [5]:

\[ SR = \frac{N_t}{N_0} \times 100\% \]

- \( SR \): Survival rate (%)
- \( N_t \): Final number of fish (fishes)
- \( N_0 \): Initial number of fish (fishes)

FCR was calculated by using the formula [6]:

\[ FCR = \frac{F}{(W_t + W_d) - W_0} \]

- \( FCR \) = Feed Conversion Ratio
- \( F \) = Amount of feed given (g)
- \( W_0 \) = Initial weight (g)
- \( W_t \) = Final weight (g)
- \( W_d \) = Weight of death fish (g)

The water parameter quality measured in this study were salinity, temperature and DO (Dissolved Oxygen). Temperature and DO measurements use a DO meter, while salinity measurements use a refractometer.

3. Results and discussion

The growth of weight and length in the nursery of white snapper at BBPBAP Jepara showed in Figures 1 and 2. The weight measurement of white snapper in this study was carried out for 30 days. The results
of the measurement of the weight and length showed an average weight of 3.3 g and a length of 5.7 cm in the first week. In the second week of sampling, the average weight was 5.9 g and the average length was 7.5 cm. In the third week of sampling, the average weight was 8.3 g and the average length was 8.6 cm. and on the 4th week of sampling, it was found 11.3 g and 9.7 cm.

**Figure 1.** White snapper length growth chart in this study

This increase in growth was due to good water quality management. Water changes were carried out in the siphoning process with a running water system. Siphoning was carried out regularly in the morning and evening to ensure the water was clean and free of germs and diseases that enter so that it could cause mass death in fish. Water quality had an important role to support the life and growth of white snapper fish seeds [7].

**Figure 2.** Graph of white snapper weight growth in this study

FCR is the ratio of the ability of a species to convert feed into meat weight gain, FCR is related to the digestibility of fish to a food ingredient [8]. The FCR result obtained was 1.51. Feed conversion wass the ratio between the amount of feed given to the total weight of the fish produced. Previous study showed that the results obtained 2.95 on feed with feeding treatment of 5% of the biomass [9]. From the
literature, it could be indicated that the FCR result at BBPBAP Jepara was better because the FCR obtained was 1.51.

The smaller the feed conversion value means the efficiency level of feed utilization is better, on the contrary if the feed conversion is large, the feed utilization efficiency value is not good. The feed conversion value shows how much feed is consumed into fish body biomass. According to Haetami (2005), various fish species with a strategy of reducing or limiting the amount of feed can be used to stimulate compensatory growth. FCR on fish growth is a factor in the transformation of food into body tissue. Fish such as the amount of feed consumed, the digestibility of food, the rate of digestion, the frequency of feeding, the absorption of nutrients, as well as the efficiency and rate of feed conversion. (Cahyanti dkk.,2015).

Survival rate is the percentage of the number of white snapper fish that are still alive, after being fed. To determine the percentage of white snapper survival and survival rate this is also one of the determining factors for success in fish farming activities. In this study, the result was quite good with the value of 80%. From these data, it was in accordance with SNI which stated that the survival rate of white snapper fish was 60-70%. Factors that affect the level of survival are abiotic and biotic factors, which include competitors, population density, age and the ability of organisms to adapt to the environment [12].

The feed given to white snapper during nursery is adequate and controlled to prevent cannibalism in fish that can cause death in the fish that are kept. This is in accordance with previous study that the different growth rates of white snapper fry in the same age cause the fish fry to be able to eat other fish, namely smaller fish [13]. Larger fish have a high level of aggressiveness compared to smaller fish, so when energy needs are not met or in conditions of food shortage, larger fish will eat smaller fish. Cannibalism has a significant impact on fish numbers where the larger fish are able to eat at least two smaller fish.

**Table 1. Water quality parameter on white snapper in this study**

| No. | Parameter      | Value       | Standard1 |
|-----|----------------|-------------|-----------|
|     |                | Week 1      | Week 2    | Week 3    | Week 4    |           |
| 1.  | Salinitas (ppt)| 35          | 33        | 30        | 34        | 15-25     |
| 2.  | Suhu (°C)     | 30.4-32     | 30.6-31.6 | 28.6-309  | 30.1-32.6 | 26-32     |
| 3.  | DO (ppm)      | 3.3-3.8     | 3.28-3.57 | 3.37-3.61 | 3.2-3.64  | >3        |

In this study, the results of temperature measurements in the nursery tank of white snapper fish was obtained at 28.6-30.9°C. This temperature was included in the optimum temperature in cultivation based on SNI. The DO measurement ranged from 3.2 to 3.8 mg/L. This data was in accordance with SNI which stated that the appropriate ecological parameters for the growth of white snapper were temperatures of 26-32°C and DO exceed 3 mg/L. In the measurement of salinity, the measurement results were obtained that ranged from 30-35 ppt. In the salinity measurement data, the salinity used for maintenance did not match the literature. White snapper was a fish that has a fairly large tolerance for salt so that it could be cultivated in floating net cages, ponds, and freshwater ponds [15].

**4. Conclusion**

It could be concluded the white snapper nursery in BBPBAP Jepara showed good results. The percentage of white snapper nursery in the form of seed survival rate at harvest was 80%, feed conversion ratio was 1.51. The average results of water quality parameters in white snapper fish rearing ponds included salinity ranging from 30-35 ppt, DO ranging from 3.2-3.8 mg/L, and water temperature ranging from 28.6-32.6 °C.
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