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# WHITE SNAPTER LATES CALCARIFER HATCHERY TECHNIQUES AT BRACKISHWATER CULTIVATION FISHERIES CENTER (BPBAP) SITUBONDO, EAST JAVA

## Teknik Pembenihan Ikan Kakap Putih (*Lates Calcarifer*) Di Balai Perikanan Budidaya Air Payau Situbondo, Jawa Timur

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## ABSTRAK

Kegiatan pembenihan ikan memiliki beberapa tahapan, dimulai dari manajemen induk, penyiapan wadah larva, seleksi induk, pemijahan induk, penanganan telur, pemeliharaan larva, manajemen pemberian pakan, manajemen kualitas air dan pemanenan. Tujuan dari penelitian ini adalah untuk mengetahui pengetahuan tentang teknik pembenihan ikan kakap putih (Lates calcarifer) di Balai Perikanan Budidaya Air Payau (BPBAP) Situbondo Jawa Timur. Metode penelitian yang digunakan adalah metode deskriptif. Hasil penelitian menunjukkan jumlah induk yang digunakan dalam proses pemijahan alami sebanyak 84 ekor dengan perbandingan 1:2, dilakukan dua kali pada bulan gelap dan terang pada malam hari. Telur yang dipanen ditebar dalam bak beton berbentuk persegi panjang selama 17-18 jam dan dihitung HR (Hatching Rate) dengan rendemen sebesar 96%. Pemberian pakan larva D2-D30 diberikan 2 kali sehari dengan jenis pakan berupa pakan alami dan pakan buatan, pakan larva D23-D35 diberikan setiap 2 jam sekali berupa pakan buatan. Hasil pengukuran parameter kualitas air yaitu nilai pH 7,75, nilai salinitas 30 ppt, nilai suhu 31oC, nilai oksigen terlarut 6,12 mg/L dan nilai amonia 0,085 mg/L. Pengelolaan air dilakukan dengan cara siphoning dan penggantian air sesuai dengan umur larva. Pemanenan larva dilakukan setelah dilakukan grading ukuran dan cacat kemudian dihitung nilai SR (Survival Rate) yang didapat sebesar 30%.

## ABSTRACT

Hatchery activities have several stages, starting with broodstock management, preparation of larval containers, broodstock selection, brood spawning, egg handling, larval rearing, feeding management, water quality management and harvesting. The aim is to find out knowledge about white snapper (*Lates calcarifer*) hatchery techniques at the Brackish Water Aquaculture Center (BPBAP) Situbondo, East Java. The research method used is the descriptive method. The research results showed that the number of broodstock used in the natural spawning process was 84 with a ratio of 1:2, carried out twice during the dark and bright months at night. The harvested eggs were spread in rectangular concrete tanks for 17-18 hours and the HR (Hatching Rate) was calculated

with a yield of 96%. Feeding D2-D30 larvae is given 2 times a day with types of feed in the form of natural and artificial feed, D23-D35 larvae feed is given once every 2 hours in the form of artificial feed. The results of measuring water quality parameters were a pH value of 7.75, a salinity value of 30 ppt, a temperature value of 31$^{o}$C, a dissolved oxygen value of 6.12 mg/L and an ammonia value of 0.085 mg/L. Water management is carried out by siphoning and changing the water according to the age of the larvae. Harvesting of larvae is carried out after grading size and defects and then calculating the SR (Survival Rate) value which is found to be 30%.

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|---|---|
| **Kata Kunci** | *Pemijahan, Pakam, Kualitas Air, HR(Hatching Rate), SR (Survival Rate)* |
| **Keywords** | *Spawning, Feed, Water Quality, HR (Hatching Rate), SR (Survival Rate)* |
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## INTRODUCTION

White snapper (*Lates calcarifer*), also known as barramundi or giant sea bass, is one of the leading commodities in Indonesia and internationally because of its rapid growth, high environmental tolerance, and high economic value (Ulfani *et al.,* 2018). White snapper (*Lates calcarifer*) is a fish that carries the hermaphrodite protandric trait that changes from male to female. White snapper has the advantage of relatively rapid growth and very high tolerance to water salinity, easily adapting to its living environment. White snapper lives in areas with muddy, sandy bottoms and in mangrove ecosystems. The existence of prospects and having high economic value results in white snapper being caught and exploited, so that the availability of white snapper in nature has decreased (Kusumanti *et al.,* 2022).

Based on statistical data from the Ministry of Maritime Affairs and Fisheries, white snapper has the highest demand, which is 30 thousand tons. In 2017, the production volume reached 25,051 tons and increased fivefold from the previous year's production figure of around 5,544 tons. The production of white snapper is obtained from marine capture and still a little is produced from cultivation (KKP, 2017). Seeing the potential produced by white snapper, it is necessary to carry out seeding activities that provide seeds and eggs with good quality and quantity. Provision of seeds and eggs is carried out in seeding activities. Judging from the vast waters of Indonesia, it can open up opportunities to increase production to meet needs (Supryady *et al.,* 2021).

Key factors for the success of seeding techniques are the quality of the broodstock and the correct grading process. Astuti *et al.* (2023), reported that the fertilization rate and hatching rate each reached 79–50%, but the seed survival rate was low (22%) due to late grading and suboptimal water quality management. Meanwhile, broodstock maintenance practices at BPBAP Situbondo succeeded in producing a hatching rate of 90%, but spawning was temporarily halted due to weather fluctuations.

To meet this demand, it is necessary to provide sufficient seeds. Therefore, intensive white snapper seeding needs to be developed, in order to meet adequate market needs and demand. Based on this background, this study aims to systematically document white snapper seeding techniques at BPBAP Situbondo, identify operational obstacles such as

grading and feed quality, and formulate recommendations for technical and management improvements based on literature and internal institute data.

## METHODS

### Time and Place

This research was conducted at the Situbondo Brackish Water Aquaculture Center (BPBAP), located in Situbondo Regency, East Java Province. This location was chosen because it is one of the white snapper fish seed centers that has representative facilities and technology. Observation activities were carried out during the period March - May 2024.

### Method of collecting data

This study uses a descriptive method with a case study approach. Data were collected through three main techniques:

- Direct observation of the seeding process including parent maintenance, spawning, egg hatching, larval maintenance, and seed care.
- Structured interviews with technical officers and researchers at BPBAP Situbondo to obtain detailed information on technical procedures, environmental parameters, and obstacles faced.
- Documentation study, namely the collection of secondary data in the form of seeding activity reports, technical protocols, and internal publications of the center.

### Data Analysis

Data obtained from observations and interviews were analyzed descriptively and presented in narrative form. The main parameters observed include:

- Broodstock selection
- Hatching Rate
- Feeding
- Water quality during maintenance
- Survival Rate

## RESULT

### Selection of White Snapper Broodstock

Table 1. White snapper broodstock data

| No | Gender | Weight | Length | Number |
|---|---|---|---|---|
| 1. | Male | 2-3,5 kg | 50-58cm | 28 |
| 2. | Female | 4-8 kg | 70-78cm | 56 |

### Hatching Rate

Table 2. Hatching Rate Results

| No | Date | Number of spreads | HR | Number of Larvae | Tank |
|---|---|---|---|---|---|
| 1. | 8 – May- 2024 | 200.000 | 96% | 193,488 | 3 |

**Feeding**

Table 3. Larvae feeding schedule

| No | Feeding | Age of Larva | Frequency/Day | Dose |
|---|---|---|---|---|
| 1. | *Chlorella* sp | D2 - D30 | 1 time a day | 100.000-500.000 sel/ml |
| 2. | Rotifera | D2 - D45 | 2 times morning and evening | 10-20 ml/indv |
| 3. | Liquid Feed | D4 - D12 | 2 times morning and afternoon | 5ml/5L |
| 4. | Artemia | D12 - D30 | 2 times morning and evening | 1-3 ml/indv |
| 5. | Artificial Feed | D7 - panen | 3-6 times a day | 5-15 grm |

**Water Quality**

Table 4. Water Quality Results

| No | Parameters | Measurement Results | Optimum Range |
|---|---|---|---|
| 1. | pH | 7,75 | 7,6 – 8,5 (SNI 6145.3:2014) |
| 2. | Salinity | 30 ppt | 28 – 35 ppt (SNI 6145.3:2014) |
| 3. | Temperature | 31$^{o}$C | 28 – 32 $^{o}$C (SNI 6145.3:2014) |
| 4. | Dissolved Oxygen | 6,12 mg/L | $\geq$ 4 (SNI 6145.3:2014) |
| 5. | Ammonia | 0,0085 mg/L | >0,01 mg/l (Kusumanti *et al*, 2022). |

**Water Management**

Table 5. Water Change Data for Larva Maintenance

| No | Larvae Age | Water Change |
|---|---|---|
| 1. | D8 – D17 | 10% |
| 2. | D18 – D25 | 20% |
| 3. | D26 – D35 | 50% |
| 4. | D50 – D60 | 75-100% |

**Survival Rate**

Table 6. Survival Rate Results

| No | Date | Number of spreads | HR | Number of Larvae | | Tank |
|---|---|---|---|---|---|---|
| 1. | 8 – Mei- 2024 | 200.000 | 96% | 193,488 | 30% | 3 |

## DISCUSSION

The activity carried out before spawning is selecting broodstock that are ready to spawn. Broodstock selection is carried out by looking at the level of gonad maturity in the

white snapper broodstock whether it is ready to spawn or not. The broodstock used amounted to 84, 28 male broodstock and 56 female broodstock. Male broodstock of white snapper that is mature has the characteristic of bright body color, when striped it releases white fluid (sperm), while female broodstock of white snapper is characterized by dark body color, enlarged stomach with chewy texture and reddish genital hole (Astuti *et al.,* 2023). The broodstock selection method carried out at BPBAP Situbondo is mass and observed in terms of physical condition, namely fish in healthy condition, complete body parts, no defects, agile movements and in accordance with the standard weight of fish ready to spawn. Male broodstock of white snapper has a weight of 2-3.5 kg with a length of 56 cm and a female weight of 4-8 kg with a length of 78 cm. This is in accordance with the statement of Adnan *et al*. (2022) that good white snapper broodstock is from the original habitat with a total length of male broodstock of 40-50 cm for female broodstock more than 55 cm. The weight of male fish is more than 1.5 kg and female fish more than 3 kg.

Spawning is done naturally twice a month during the dark moon and the bright moon. The natural spawning process of white snapper broodstock is carried out en masse in a spawning container, containing 84 white snapper broodstock with a ratio of 1:2. Spawning uses environmental manipulation methods such as temperature and water ebb and flow. One of the factors that affects gonad maturity and fish spawning is temperature. According to Masruroh *et al.* (2014), because an increase in temperature in the cultivation pond will affect the metabolic rate of the fish. Environmental manipulation is carried out by lowering the water in the spawning container in the morning to a height of 40-50 cm so that the temperature increases to 30-32$^{o}$C, then at noon around 14.00 WIB the water is refilled to return the temperature to 27-28$^{o}$C. During the spawning process, the surrounding environment is in a dark condition, this aims to avoid stress levels in white snapper broodstock resulting in failure in spawning. Generally, spawning is carried out at night or at dusk. Spawning of white snapper is allowed to spawn naturally by manipulating the environment, occurring at night from 7.00-9.00 pm (Prajayanti *et al.,* 2023).

Eggs from white snapper spawning in the egg collector are harvested in the morning and selected first. Egg handling is carried out by moving the eggs into a glass aquarium measuring 50 cm x 50 cm x 50 cm equipped with aeration as a temporary place before being spread. Eggs will hatch within 17-18 hours after spreading in the maintenance container. Fertilized eggs are indicated by eggs floating on the surface of the water and are clear or transparent in color, while unfertilized eggs will settle at the bottom of the egg collector. Fertilized eggs will float and be clear in color while unfertilized eggs will settle at the bottom of the tank (Prajayanti *et al.,* 2023).

Egg spreading is done in a larval maintenance container in the form of a rectangular concrete tub. After spreading the eggs, elbasin is given at a dose of 5 gr / 5L of water. Giving elbasin after spreading aims to kill bacteria and diseases that come from outside. Eggs that have been spread after 17-18 hours then sampling larvae using a PVC pipe dipped into the tub then the top of the pipe is closed using hands and the pipe is lifted slowly and ensure that the bottom of the other side of the pipe is on the edge of the beaker glass as a container for egg samples.

Based on table 2 above, the results of the Hatching Rate calculation obtained a value of 96%. The HR (Hatting Rate) results obtained are included in the good value. This is in accordance with the statement of Halim *et al.* (2022) that the value of the degree of hatching of eggs HR (Hatting Rate) above 70% can be categorized as very good.

Feeding larvae is something that needs to be considered, this can affect the growth and development of larvae. Feeding is done when larvae aged D2 have food reserves in the form of egg yolk that has run out. Larvae aged D1 are given *Chlorella* sp and larvae aged D2 - D30 are given natural rotifer feed. Larvae aged D13 are given artemia feed until the age of D30. The frequency of feeding rotifers and artemia is done 2 times a day, while for larvae aged D23 - D35, artificial feed in the form of pellets is given with feeding every 2 hours starting from 08.00 - 15.00 WIB. The feeding given to white snapper larvae is given based on the opening of the larva's mouth and the level of digestibility of the larvae. The feed given is adjusted to the development of the organs and physiology of the larva's body, mouth opening and the level of digestibility of the larvae (Rasdi, 2022). Based on table 3 above, the type of feed consists of 2 with different frequencies and doses for each age of white snapper larvae.

White snapper larvae in BPBAP Situbondo implement water management with the Green Water System principle. The Green Water System is the addition of phytoplankton to the larval maintenance media in the form of *Chlorella* sp as natural food that can be utilized by fish. Based on Rusman *et al.* (2023) that, the use of green microalgae as a Green Water System is able to provide quite high protein and fat as a source of nutrients for natural food so the Green Water System is a fish maintenance system that utilizes green microalgae as a food source and oxygen supply so that a good environment is created for fish to grow and develop.

Water quality management used in larval maintenance includes water sterilization, water changes and siphoning. Water sterilization is carried out every 2 days before use. Water changes and siphoning are carried out in the morning after feeding the larvae in the morning, aiming to reduce undigested feed residues and feces that can reduce the quality of maintenance water. Water quality parameters are divided into physical, chemical and biological water quality. There are several water quality parameters that need to be monitored once a week. Among them are pH, Dissolved Oxygen (DO), ammonia, salinity and temperature. Water quality is one of the factors that needs to be considered because it plays an important role in fish farming activities. The suitability of a water area for use as a habitat for fish (Kulla *et al.,* 2020).

Water quality testing was carried out at the Fish and Environmental Health Laboratory. Water samples were taken using bottles in the morning before water changes were carried out. From the results of the water quality check, the ammonia value was 0.0085 mg/l. Based on Kusumanti *et al.* (2022) that, the tolerable ammonia level in fish maintenance is <0.01 mg/l, if it is more than that it will be toxic to fish. The DO value obtained was at 6.12 mg/l, this value exceeds the optimal DO level in larval maintenance. Based on Kusumanti *et al.* (2022) that, the higher the dissolved oxygen value contained, it can indicate that the water quality will be better. The optimal oxygen level for white snapper maintenance ranges from 4-6 mg/l. The results of the temperature, salinity and pH parameters are relatively stable and in accordance with the quality standards (SNI6145.3:2014) temperature values for fish farming maintenance. The pH value ranges from 7.75 -8.23 with a quality standard of 7.6-8.5 which meets the criteria for optimal water quality. The salinity value of 30 ppt is included in the appropriate quality value, the same as the statement of Kusumanti et al. (2022) that the optimum salinity for white snapper is 34 ppt. The temperature value is 31$^{o}$C according to the quality standard (SNI6145.3:2014), in accordance with the statement of Kusumanti *et al.* (2022) that the optimal temperature for white snapper is between 28-32$^{o}$C.

The water circulation process is carried out every day during larval maintenance, the first water change is carried out when the larvae reach the age of D8,

the water change is adjusted to the age of the larvae starting from D8 - D60. The larval tank is siphoned at the age of D15, using a hose connected to a pipe with a sponge at the end. Water changes are carried out by sucking out water from the outlet channel using a 3/4 inch spiral hose, after the water has reduced by 10% then it is refilled using seawater through the inlet using a filter bag. This is in accordance with the statement of Halim *et al.* (2022) that water quality management is carried out by monitoring every day/week, changing water every day, siphoning, adding aeration, and installing filter bags when filling water. Based on table 5 above, water changes are adjusted to the age of the larvae.

Grading activities are carried out before harvest. Grading is the separation of something from weight, size and quality. Grading of white snapper larvae carried out at BPBAP Situbondo consists of two methods, grading of D20 age fish larvae with a size of 0.8 - 1.5 cm, carried out using pupan and a filter that has been perforated according to the size of the fish. And grading of fish seeds with sizes ranging from 2-4 cm. Before grading, the water is lowered by 15-20 cm in the maintenance tank. Fish are caught using a serving hood and put into a bucket filled with running water. Furthermore, the fish are graded according to size and separating fish that have physical defects from healthy fish. After separating the disabled and healthy fish, a calculation is made to determine the number of fish that are still alive in the tank (Adi *et al.,* 2024). Based on table 6 above, the SR (Survival Rate) results obtained are 30%. Based on Nurmasyitah *et al.* (2018) that white snapper larvae with very low survival rates can only reach 30%. The low SR (Survival Rate) value of white snapper obtained is not only due to the provision of feed containing high protein but also influenced by external factors, namely the environment. The growth and survival rate of white snapper are influenced by external and internal factors. Internal factors include genetics, age and type. While external factors are mostly influenced by the environment/water quality and density. Water quality affects survival, reproduction, growth and production (Nurmasyitah *et al.,* 2018).

## CONCLUSION

The stages of seeding activities begin with, Selection of broodstock, spawning of broodstock, handling of eggs, maintenance of larvae, management of feeding, management of water quality and harvesting. During maintenance, the HR (Hacting Rate) value was 96% and SR (Survival Rate) was 30%. The water quality data obtained were pH value 7.75, salinity value 30 ppt, temperature value 31oC, Dissolved oxygen value 6.12 mg/L and ammonia value 0.085 mg/L.


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