Fisheries Journal, 14(3), 1118-1129 (2024)
http://doi.org/10.29303/jp.v14i3.869

CLOWN FISH Amphiprion sp. CULTIVATION TECHNOLOGY IN MAIN ASSOCIATION OF MARINE CULTIVATED FISHERY (BBPBL), LAMPUNG

Teknologi Budidaya Ikan Badut *Amphiprion* Sp. Di Balai Besar Perikanan Budidaya Laut (Bbpbl), Lampung

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(Received May 24th 2024; Accepted August 28th 2024)

ABSTRACT

Clownfish Amphiprion sp., have a relatively wide distribution area, especially in Indo-Pacific waters. In nature these fish live in small groups in one anemone and consist of one pair of parents, the others are usually smaller in size which are still in the male sex. If one of the parent pairs dies, the position will be replaced by the largest in the group, especially the female. This condition is usually called sequential hermaphrodite. The purpose of this study was to gather information on the techniques for fish hatchery clownfish to produce quality fish. Clownfish spawn with a sex ratio of 1:1, with an average spawning frequency of 2 times a month. Clown fish can produce eggs with an average of 419 eggs, fertilization rate (FR) 76,37%, hatching rate (HR) 75,27%, and survival rate (SR) 58,35%. For one year, the total number of fish hatchery that can be produced is 108.911. Payback period of 8,2 years, break event point (unit) of 73.859 fish/year, break event point (rupiah) of Rp. 369.292.918, and cost of production of Rp. 3.817/fish

Key words: Amphiprion sp., clownfish, sequential hermaphroditism, ornamental fish

ABSTRAK

Ikan badut *Amphiprion* sp., memiliki daerah sebaran yang relatif luas, terutama di perairan Indo-Pasifik. Di alam ikan ini hidup berkelompok kecil dalam satu anemon dan terdiri dari sepasang induk, yang lainnya biasanya berukuran lebih kecil yang masih berjenis kelamin jantan. Jika salah satu pasangan induk mati, maka posisinya akan digantikan oleh yang terbesar dalam kelompoknya, terutama yang betina. Kondisi ini biasanya disebut hermaphroditism (perubahan kelamin secara berurutan). Tujuan dilaksanakannya studi ini untuk mengkaji dan menerapkan teknis budidaya ikan badut disertai analisa kelayakan usahanya agar informasi yang diperoleh dapat dimanfaatkan oleh masyarakat untuk meningkatkan pengetahuan dan kemampuan dalam pengelolaan budidaya ikan badut. Ikan badut memijah dengan

perbandingan jenis kelamin 1:1, dengan frekuensi pemijahan rata-rata 2 kali dalam sebulan. Ikan badut dapat menghasilkan telur dengan rata-rata 419 telur, *fertilization rate* (FR) 76,37%, *hatching rate* (HR) 75,27%, dan *survival rate* (SR) 58,35%. Selama satu tahun, jumlah benih yang dapat dihasilkan sebanyak 108.911. *Payback period* 8,2 tahun, *break event point* (unit) sebesar 73.859 ekor/tahun, *break event point* (rupiah) sebesar Rp. 369.292.918, dan harga pokok produksi (HPP) sebesar Rp. 3.817/ekor

Kata Kunci: *Amphiprion* sp., ikan badut, hermaproditisme berurutan, ikan hias

INTRODUCTION

Clown fish is an ornamental fish commodity that has great potential both in the national and international markets. Clownfish are part of the Pomacentridae family, which is widely distributed in tropical and subtropical seas. Allen (1991) stated that this family has 29 genera with 350 species under four sub-families, further stating that there are 29 species of clownfish with two generic hybrids between Amphiprion and Premnas (Allen et al., 2008).

In its natural habitat, the clownfish Amphiprion sp. live at a depth of 1-12 m in tropical waters and generally live with anemones (fish-eating animals that resemble flowers under the sea and have hundreds of poisonous tentacles). These fish live in small groups consisting of one parent pair in one anemone. Male fish are smaller than female fish. The social hierarchy in clownfish, according to Sahusilawane (2023), is that if one of the parent pairs dies, the position will be replaced by the largest in the group, especially female fish, this condition is usually called sequential hermaphroditism (sequential sex changes).

According to Setiawati et al., (2012), the morphology of clownfish is characterized by the presence of three white lines on the head, middle of the body and base of the tail and has black circles on the fins. Apart from that, the body color of this fish is dominated by bright orange, thus adding The exotic impression of clown fish as an ornamental fish is much sought after by marine ornamental fish hobbyists (Figure 1).

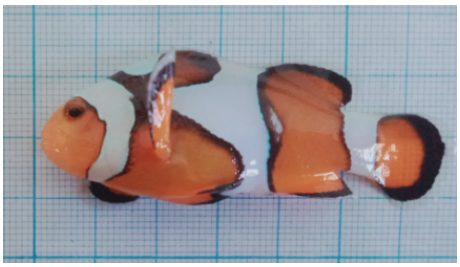

Fig 1. Clownfish morphology *Amphiprion* sp.

The clownfish spawning pattern is to spawn throughout the season with an average time interval of around ten days or three times a month for productive broodstock (Oktavianti et al., 2021). When spawning, clownfish will lay their eggs on the substrate near the anemone or house and incubate them until they hatch (Setiawan, 2022; Sahusilawane and Soelistyowati, 2023).

Indonesia is the fifth largest exporter of ornamental fish in the world, capable of capturing up to 7.13% of the market (KKP, 2017). According to data from the statistics and information center of the Secretariat General of the Ministry of Maritime Affairs and Fisheries, the number of seawater ornamental fish exported in the 2007–2011 range increased by 0.26% (KKP, 2017). The highest ornamental fish export value was USD 27.61 million in 2017 (KKP, 2018).

The production of cultivated ornamental fish in Lampung in 2017 was 429,923 fish, while the number of ornamental fish caught in this region reached 5,587,514,341 fish (DPJB, 2017). Based on the data above, Simbolon et al., (2019) stated that clown fish are part of the

marine ornamental fish commodity which has a fairly high level of demand, especially for Australia, Japan, Germany and France. It was further stated that this high demand has spurred exporters to exploit natural resources in an effort to meet the demand for clownfish, because most of the clownfish commodities currently sold on the market still come from catches which of course will have an impact on reducing the existing clownfish population. in nature. Currently clownfish are categorized as biota included in List/Appendix I, highly protected or on list number 1 protected by the state (CITES, 2010).

In order to overcome the problem of decreasing clownfish populations due to exploitation in nature, efforts are needed to develop the cultivation of this fish for business and conservation purposes. Based on this, this study was carried out to examine and apply the technicalities of clownfish cultivation along with an analysis of the feasibility of the business so that the information obtained can be utilized by the community to increase knowledge and abilities in managing clownfish cultivation.

METHODS

Time and Place

The location of the clownfish cultivation study activities was carried out at the Lampung Center for Marine Cultivation Fisheries (BBPBL), Jalan Yos Sudarso, Hanura Village, Teluk Pandan District, Pesawaran Regency, Lampung Province. This study was carried out for 35 days, starting from February 20 2023 to March 26 2023.

The work method used is a descriptive method by describing and concluding the condition of the object according to what it is (Iskandar, 2020). Data was collected primary and secondary. Primary data is obtained directly from original sources, through interviews, observation, and active participation or using specific measurement instruments according to the objectives, while secondary data comes from documents that have been processed to support the study through other parties who have relationships with analysis (Dwiyana, 2019).

RESULT

Seeding Activities

Parent Maintenance

Parent maintenance is very important because parents are the main component in hatchery activities, without parents activities cannot run optimally. If parent maintenance is carried out well, it will produce superior parent quality and affect the quality of the seeds that will be produced. At the study location, prospective clownfish parents were kept in aquariums measuring 40 cm × 30 cm × 40 cm and in fiber tanks measuring 200 cm × 100 cm × 50 cm.

The average length of prospective clownfish parents used is 4–6 cm/fish, with an average weight of 2–4 g/fish and is over 8 months old. Prospective clown fish broodstock come from natural catches around Lampung Bay which have been adapted to the rearing environmental conditions and type of food at the study location. During the rearing process, parent clownfish are given food in the form of pellets and blood worms. The frequency of feeding is 4-5 times a day, with the method used being at satiation (as much as possible).

Main maintenance media water quality management activities carried out include monitoring water discharge as well as controlling inlet water channels and siphoning. Silphoning is carried out once a day at 11.00 WIB, which aims to remove dirt or fine sand that has settled at the bottom of the maintenance media container. Measurement of water quality parameters in broodstock rearing containers is carried out in situ, including measurements of

temperature, pH, salinity and dissolved oxygen (DO). The results of water quality measurements during broodstock rearing and spawning are presented in Table 1.

Table 1 Results of water quality measurements in rearing and spawning containers for parent clownfish *Amphiprion* sp.

Parameter	Result		Quality standards Ministerial Decree LH No. 51/2004
	Morning	Afternoon	
Temperature (°C)	26-29	28-29	Natural
pH	7,4-8,0	6,9-8,1	7,0-8,5
Salinity (g/L)	30	30	30-34
DO (mg/L)	5,2	5,1	>4,0

Parent Spawning

Spawning is the process of releasing egg cells by the female parent and sperm cells by the male parent which occurs outside the fish's body. In this study, the clownfish spawning process was carried out naturally without using external hormone induction stimulation to speed up the gonad maturity process. Parent spawning is carried out in a container in the form of an aquarium measuring 60 cm × 40 cm × 45 cm, which has been equipped with substrate and anemone plants. The ratio between male parents and female parents (sex ratio) used in clownfish spawning is 1:1. Before the spawning process, pairing is carried out by uniting two clownfish in one container. As the pairing process progresses, physical changes will slowly occur in one of the clownfish, indicating that the fish has turned into a female fish.

Approaching the spawning period, the female clown fish experiences a change in body shape, especially in the abdominal area, which becomes increasingly bulging. This indicates that the mother's stomach already contains eggs, while the male parent will show more aggressive behavior in chasing the female parent. In their natural habitat, spawning of parent clownfish can occur throughout the year, so that in one month the fish can spawn 2-3 times. Based on observations, the clownfish spawning process occurs from 12.00-16.00 WIB with the number of eggs produced being 300-700 eggs/spawning.

Egg Hatching

Hatching of eggs and rearing of larvae is carried out in a container in the form of a round fiber tub with a diameter of 1 m and a height of 1 m. Before use, the container is disinfected using a chlorine solution at a dose of 100 g/ton. The disinfection process is carried out by soaking water containing chlorine in a container for 12 hours, then the inside of the container is cleaned using a cloth and rinsed using running water.

The series of egg hatching activities consists of placing fertilized eggs in egg incubation containers, measuring water quality, calculating the percentage of fertilization rate (FR) and hatching rate (HR). Fertilization rate (FR) is the percentage of fertilized eggs from the number of eggs released during the spawning process, while hatching rate (HR) is the percentage of eggs that hatch from the number of fertilized eggs. Under normal conditions, clownfish eggs will hatch within 7-8 days after being fertilized and this fish is a type of fish that is classified as a parental care parent (a parent who looks after the eggs), so that in the egg hatching process, the parent and the egg are not separated.

During the study, eggs that have been fertilized with sperm will be left for 5-6 days in the spawning container, and on the 7th day the eggs that have hatched into larvae will then be transferred to the larval rearing container. Data from observations of spawning (number of eggs and larvae) of clownfish during the study process are presented in Table 2.

Tabel 2 Data hasil pengamatan telur dan larva ikan badut *Amphiprion* sp.

Parameter	Unit	Result
Average spawning frequency	Kali	2
Average number of eggs	Butir	419
Average fertilization percentage	%	76,37
Average percentage of hatchability	%	75,27
Average larval survival	%	58,35

Larval Rearing

Larvae rearing is carried out in the same container as the egg hatching process. The larvae are reared for 20-25 days with the food provided in the form of natural rotifer type food, Artemia sp. naupli, and other additional natural food such as Diaphanosoma sp.. Feeding for the larvae is done using the ad libithum method (still available in the rearing container) , and larval feeding management are presented in Table 3.

Table 3. Feeding management of clownfish larvae *Amphiprion* sp.

Jenis Pakan	Hari ke-
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Nannochlorpsis sp.	
Brachionus plicatilis	
Artemia sp.	
Diaphanosoma sp.	

The larval growth process was observed visually and through sampling by measuring growth in length every week. The results of observations of larval growth every week are presented in Figure 2.

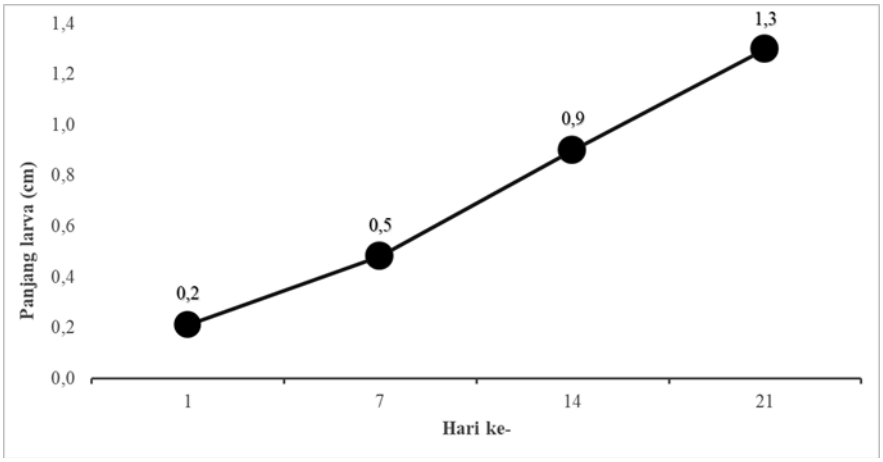

Fig 2. Graph of length growth of clownfish larvae *Amphiprion* sp.

Just like the brood rearing media, water quality management is carried out by means of siphoning, food management, and measuring water quality parameters, to monitor the water condition of the rearing media. Data from water quality measurements during larval rearing activities can be seen in Table 4.

Table 4. Results of water quality measurements in egg hatching containers and rearing of Amphiprion sp clownfish larvae.

Parameter	Result		Quality standards Minister of Environment Decree No. 51/2004
	Morning	Afternoon	
Temperature (°C)	29–31	29–30	Natural
pH	7,4–8,0	6,9–8,1	7,0–8,5
Salinity (g L^{-1})	30	30	30–34
DO (mg L^{-1})	5,6	5,5	>4,0

Seed Care and Harvesting

Seed rearing activities aim to raise clownfish until they reach a certain size. The fry that are kept are fish that are 25 days old with a size of 1-1.5 cm/fish in a container in the form of an aquarium measuring 40 cm × 30 cm × 40 cm, with a water level in the container of around 35 cm. The seed stocking density at this stage is 4 individuals/L. Feeding is carried out using the at satiation method, with a frequency of administration 4-5 times a day, namely at 07.00, 09.00, 11.00, 13.00 and 15.00 WIB.

The water quality in the seed rearing container is managed by siphoning, cleaning the container, cleaning the filter and measuring water quality. So that the water temperature in the seed rearing container is in a stable condition, the inside of the container is equipped with a water heater, and the water temperature is adjusted to 30°C. The irrigation of water as a seed maintenance medium is carried out on the 3rd day after the seeds are spread, taking into account that at this stage, the seeds already have a response to current.

The reared fry are kept for 65-70 days until they reach a size of 2.5-3 cm/head. At this stage of rearing stage, it is indicated that there are parasites attached to the fins of clownfish fry. The parasite found was Larnea sp. (Figure 3a) and Cryptocaryon irritans (Figure 3b). The treatment used to overcome this parasite attack is by providing a soaking treatment using fresh water for 2-5 minutes, or by soaking using a 37% formalin solution at a dose of 30 mL/ton.

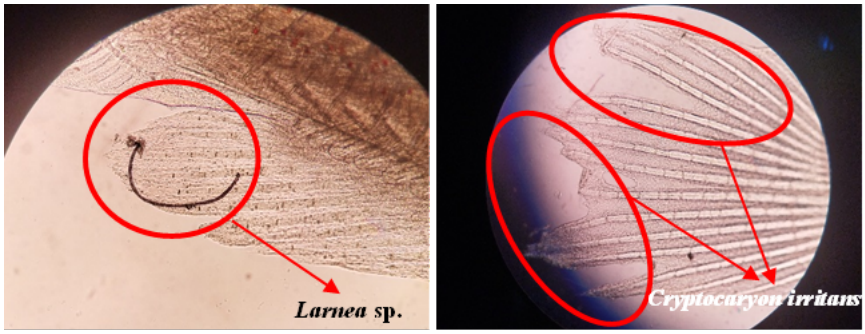

Fig 3. Results of microscopic observations of parasites: a) *Larnea* sp. b) Symptoms of *Cryptocaryon irritans*

Sorting and grading begins when the seeds are to be harvested and are 60 days old with an average size of 2-2.5 cm/head. Seed harvesting is done in the morning or evening, because at that time environmental conditions are more stable, thereby reducing the stress level of the seeds when harvested. The harvesting process is carried out by scooping out the seeds using a fine diameter serger, then the seeds are put into a basket, then transferred to a container box for counting the number, sorting and grading the seeds.

Seed Transportation

The main obstacle to seed supply in order to meet cultivation needs is that markets or consumers are far from the seed source, so an appropriate transportation process is needed to assist seed marketing efforts and guarantee that cultivators as consumers can get the seeds they want (Crammer et al., 2001) .

The process of transporting clownfish seeds uses a closed transportation system. Before being sent to consumers, seeds that have been sorted and graded are dry/fasted for at least 12 hours. In the closed system transportation process, the material used is polyethylene (PE) plastic measuring 85 cm x 50 cm with a thickness of 0.3 mm. The plastic is folded in half and the ends of the two plastics are then tied together using rubber and the outer part is turned inside out, so that there are no folds or dead corners at the bottom of the plastic container. Water is then added into the plastic with a ratio of water to oxygen of 2:3. The density of seeds in a plastic bag is adjusted to the size of the fish, the distance traveled and the length of time during delivery. The plastic containing the fish is then put into a styrofoam box. (Figure 4). During the transportation process, the media temperature can be maintained in the range of 24-25°C, so to maintain this temperature stability, ice cubes or dry ice are added to the styrofoam box..

Fig 4. Seed packaging uses Styrofoam boxes

At the study location, the provisions for the density of fish in plastic packaging during the closed transportation process are presented in Table 5.

Table 3. Fish transport density Amphiprion sp. in a packaging bag in a closed system

Size (cm)	Fish density (ekor/L)			
	4 hours	8 hours	12 hours	24 hours
M 1,7–2,7	45–50	35–40	30–35	25–30
L 3,5–4,5	35–40	30–35	25–30	15–20

Natural Feed Culture

The types of natural food used in raising clownfish consist of Nannochloropsis sp., Branchionus plicatilis, Diaphanosoma sp., and Artemia sp. Culture of Nannochloropsis sp. carried out en masse in containers with a capacity of 30 tons. Culture activities begin with sterilizing the tub and equipment to be used. The sterilization agent is 100 g/ton chlorine. Fertilization into the culture container is carried out simultaneously with the introduction of phytoplankton seeds as much as 10–20% of the tank capacity. The fertilizer used consists of urea 30 g/ton, Za 20 g/ton, and TSP 10 g/ton.

Mass culture of Brachionus plicatilis begins by filling the container with 30% sea water and Nannochloropsis sp phytoplankton inoculant. as much as 20%. Rotifer seeds were then spread at a density of 40–50 ind/mL. On the first to fourth days, 20% phytoplankton was added. This is done to prevent the growth of Branchionus plicatilis from being hampered due to the intensity of sunlight entering the tub. Branchionus plicatilis can be harvested at the age of 5 days as much as 40–60% of the total tank capacity with a density of 150–200 ind/mL.

Culture of Diaphanosoma sp. carried out on an intermediate scale in a container with a capacity of 100 L. The culture container is filled with inoculant as much as 50% of the capacity with a stocking density of 100 ind/L. The next step is Nannochloropsis sp. given as much as 40%, then harvesting Diaphanosoma sp. done in total.

Culture of Artemia sp. carried out using a container with a capacity of 20 L, the artemia hatching container was filled with 6 L of sea water and the artemia system used was 20 g. Artemia sp. cultured for 24 hours, then the artemia that has been cultured and hatched, is put into a container for raising clownfish larvae.

Business Analysis

Business analysis is an analysis in the form of planning, research, predicting and evaluating business activities, this aims to ensure that there is no large investment in unprofitable businesses. Business analysis variables include total costs, revenues, profits, R/C ratio, payback period (PP), cost of production (HPP), BEP (units) and BEP (Rp).

DISCUSSION

The parent stock used in production is parent stock originating from natural catches that have been adjusted to the environment at the study location. The types of clownfish in the study location include Amphiprion ocellaris, Amphiprion percula, Amphiprion clarkii, Amphiprion sandarcinos, Amphiprion melanopus, and Premnas biaculeatus. Gustiano (2011) stated that the diversity of intraspecific and interspecific morphological characteristics is influenced by genetic factors and interactions with the environment, making it possible for clownfish to be hybridized to have a diversity of variations. Currently, at the study location there are hybrid (cross-breeding) clownfish that produce more attractive colors such as Platinum, Picasso, Lighting maroon, Premium lighting maroon, Snowflakes, forceblack, and Blackphantom.

During the study, feeding of clownfish broodstock was carried out at satation using commercial feed in the form of pellets in the form of granules with a size of 1.1–1.3 mm. The nutritional content of the commercial feed provided consists of 54% protein, 12% fat, 17% ash content and 7% crude fiber. Another type of food given to parent clownfish is also natural food, namely blood worms. According to Setiawati et al., (2008) the effect of feeding a mixture of commercial feed and blood worms can increase egg production and accelerate clownfish gonad maturation.

Observation results show that female clownfish will usually experience changes in body shape, especially in the abdominal area, which becomes increasingly bulging. This is in line with Bailey (1999) who reported that adult female clownfish have a large, round body size and a light pink belly. It was further stated that parents who are ready to spawn are characterized by changes in behavior, active swimming, and both parents cleaning the substrate at the potential spawning site. In contrast to grouper fish which undergo a sex change from female to male/protogyny (Carman et al., 2023), clownfish are a type of protandrous hemaphrodite fish (sex change from male to female). The spawning process is marked by the female parent starting to arrange the eggs neatly on the substrate, followed by the male parent fertilizing the eggs.

Water quality management in clownfish rearing and spawning media is carried out by siphoning, changing the water and to monitor the quality, water quality measurements are carried out. Silphonation is carried out to remove leftover feed and metabolic waste substances. The siphoning process is carried out periodically to keep the water quality stable, and after this process, the wasted water is replaced with new sea water which has better quality. Based on the measurement results, the water quality of the brood rearing media is still within the normal range (Table 1). The temperature of the maintenance media water fluctuates between 26-290C. The temperature fluctuations that occurred during the study were thought to be influenced by

unstable weather conditions, however these conditions were still considered feasible as in research by Zulfikar et al., (2018). The pH parameters of the maintenance media range between 6.9-8.1. According to Akbar et al., (2013), this pH range is still relatively safe for the life and growth of clownfish and the results of measuring the salinity of the rearing media are in the range of 30 ppt, with these results the water salinity during the study can be classified as optimal. (Simbolon et al., 2019).

In the activity of incubating spawning eggs that have been fertilized by male clownfish sperm, the initial stage of preparing the incubation tank which is also used as a larval rearing tank before use is carrying out a disinfection process with a chlorine solution, which is then wiped with a cloth and rinsed with running water. Iskandar et al., (2023) stated that the aim of administering chlorine is to disinfect containers where there are concerns that there may be germs of disease such as bacteria and viruses in the maintenance container. Furthermore, rinsing using running water after administering chlorine aims to remove any remaining residue from the chlorine solution (Iskandar et al. 2022). The container that has been disinfected is then filled with water that has been filtered using a filter bag and then given Nannochlropsis sp. and rotifers as starter food for the larvae before they hatch.

Based on the results presented in Table 2, the clownfish parents that were spawned during the study period were still in the productive phase, because the females that were spawned produced an average of 300–700 eggs in each spawning (Allen, 1991). The number of eggs produced by a female clownfish is closely related to the body size of the parent. In their research, Dhaneesh et al., (2009) stated that the number of eggs produced is usually determined by the body size of the female fish. The larger the body size, the greater the number of eggs produced. Observations show that at the beginning of spawning, the number of eggs produced small but will increase with age (Sahusilawane et al., 2019).

Egg hatching is the change in the embryo inside the egg until it hatches, with the aim of producing a new individual. The hatchability percentage of eggs produced during the study was around 75.27%. This result is classified as normal although it is still below the results obtained by Oktavianti et al., (2021). According to Susanti and Mukti (2020), the success of high egg hatchability can be influenced by several factors including egg quality, water quality and handling during hatching.

During the incubation and maintenance period of the early stages of clownfish larvae, the phytoplankton type Nannochloropsis sp is added to the rearing media water. According to Minjoyo et al. (2020) giving Nannochloropsis sp., apart from being a natural food for rotifers which is used as initial food for clownfish larvae, this type has a function as a green water system which is useful for reducing stress levels in larvae that come from exposure to light, apart from that it is also useful for stabilize water quality and increase dissolved oxygen. Another type of plankton that is given after the larvae hatch from the age of D1 to D10 is Branchionus plicatilis, then on the 11th day an overlapping new type of natural food is carried out in the form of Artemia sp.. During this process, phytoplankton is still given so that natural food can meet needs. Brachionus plicatilis remains available in the larval rearing container.

Growth monitoring was carried out by observing starting when the larvae were D1–D21 (Figure 2). The initial sampling results for D1 maintenance showed an average length of 0.2 cm and an average final length of 1.3 cm. Growth is the process of changing size (length or weight) over a certain period of time, however, growth is part of a complex biological process with many factors that influence it (Effendi, 2009).

The number of seeds to be stocked is 199 individuals with the density used being 4 individuals/L. Clownfish stocking density under optimum conditions is 2–4 fish/L (Minjoyo et al., 2020). Larvae rearing is carried out for 65–70 days until the seed size reaches 3 cm. Feeding for seeds is carried out using the at satiation method using commercial feed in the form of granules. The nutritional content of the feed consists of max 48% protein, 10% fat, 5%

crude fiber and 20% ash content. Apart from that, the seeds are still given additional feed in the form of artemia naupli.

Water quality management carried out is siphoning, cleaning containers, cleaning filters and measuring water quality. This is done to maintain stable water quality. Minjoyo et al., (2020) stated that leftover feed that accumulates in the rearing container will have a direct impact on the survival rate of the fish so that regular siphoning is necessary. Cleaning containers and filters aims to ensure that sea water dirt can be filtered properly and does not enter the maintenance media. The water sterilization process consists of sand, coral, biofoam and ultra violet lamps. In their research, Minjoyo et al., (2020) stated that sterilization of rearing media water should use a filtration system rather than sterilization of media water using chemicals because it has a better safety risk, especially in the larval stage.

When rearing seeds, there are parasites that attack the clownfish's fins. The parasite found was Larnea sp. and Cryptocaryon irritans. Larnea sp. or anchor worms that attack clownfish are very rare because the habitat of these parasites tends to live in fresh water. Fish that are attacked by the Cryptocaryon irritans type parasite have symptoms of white spots on the fish's body, fins and eyes. If the fins infected with this parasite are observed using a microscope, they will show quite severe damage (crunching), making the fish swim unstable and easily stressed. The use of formalin solution as an effort to overcome ectoparasite attacks was also carried out by Nurhayati et al., (2020) who stated that formalin is very effective in eradicating ectoparasites on the skin and gills of fish, but in the process, the use of formalin must be done carefully and carefully. the right concentration, this is because formalin contains aldehyde elements which are easy to react, formalin will bind protein elements from the surface until it continues to seep into the body of organisms affected by the formalin solution.

Sorting and grading is carried out on handlebar seeds that are 60 days old with the aim of adjusting the size, type and presence of abnormalities. In general, the size of clown fish that is often requested by the ornamental fish market is 3 cm, this is because at this size the fry easily adapt to new environments, thereby reducing the risk of death. In the process of packaging seeds to be sent to consumer locations, the seed density is set at 50 seeds/package. This is adjusted to the size of the seeds which have only reached 3 cm. According to Minjoyo et al., (2020) the density of seeds in packaging bags to be sent in closed transportation is determined by the size and duration of transportation.

The types of natural feed used at the study location are Nannochloropsis sp., Branchionus plicatilis, Diaphanosoma sp., and Artemia sp.. The content of Nannochloropsis sp. consisting of 60.12% protein, 0.45% fat, and 3.94% carbohydrates (Murwani et al., 2017), and harvesting Nannochloropsis sp. carried out after a density of 4–5 x 106 ind/mL. The rotifer B. plicatilis has a nutrient content of 36.76% protein, 7.33% fat, 12.06% crude fiber, and 36.76% ash content (Sari et al., 2019), and harvesting is carried out after a density of 164 ind. /mL. Nutritional content of Diaphanosoma sp. consisting of 42.92% protein, 3.59% fat, 4.66% crude fiber, and 34.33% ash content (Wina et al. 2013), while the nutrient content of Artemia sp. is 52.7% protein, 4.8% fat, 15.4% carbohydrates, 10.3% water content, and 11.2% ash content (Marihati et al. 2013).

Clownfish hatchery production activities at the study location with broodstock input and 3 cm seed output which are sold at a price of IDR 5,000/head. Based on the results of business analysis calculations, in one year of the production process, the total number of seeds produced was 108,912 individuals. The analysis obtained is that the investment cost required is IDR. 706,692,500, while the total cost is IDR 415,720,159. Total revenue in one year is IDR 544,560,000, Profit obtained is IDR 128,834,841, R/C ratio 1.3, payback period (PP) for 5.5 years, BEP (unit) of 73,858 head / year, BEP (rupiah) is IDR 369,291,697, and cost of production (HPP) is IDR 3,817/head.

CONCLUSSION

The process of seeding clownfish Amphiprion sp. at the study location spawned naturally. Clownfish spawn throughout the year and can spawn twice a month. In one spawning process, the fecundity of clown fish can produce 300-700 eggs in one spawning time, with a resulting fertilitation rate (FR) of 76.37%, hatching rate (HR) 75.25%, and survival rate (SR) 58. 35%. So that in one year the production of clownfish seeds is around 108,912 fish.

ACKNOWLEDGEMENT

The author would like to thank all the leadership and staff of the Lampung Center for Marine Aquaculture (BBPBL), as well as all parties who have helped so that this study can be completed successfully..

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