REARING TECHNIQUE OF CRAFT SEED (*Portunus pelgicus linn*) AT THE BRACKISHWATER FISHERIES DEVELOPMENT CENTER (BBPBAP) JEPARA

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Abstrack

Blue crab is one of the fishery commodities that should be preserved because of the increasing market demand so that the selling price of crabs increases every year. Blue crab seed maintenance techniques are very necessary in the cultivation of blue crab seeds to support the continuous availability of seeds and be able to meet market demand. The main parameters observed in this study were growth monitoring and survival rate. Growth monitoring started from the zoea stage to the carblet, which at the blue crab carblet stage was 0.5-1 cm in size. The survival rate value is 3.33%. The water quality value obtained at the time of the study were pH 7.43-7.9, temperature 20,9-33,9^{0}C, DO 4,39-6,6 mg/l and salinity 15-30 ppt.

Keyword: Blue crab, rearing, growth rate and survival rate

Introduction

Blue crab (*Portunus pelagicus*) is one of export commodity that has high selling values. The economy is blue crab fishery products with high selling values to export commodities. Indonesia is a blue crab exporters to various country like singapore, malaysia, china, japan, and several countries in europe especially a united. Based on year 2017, statistic the export value blue crab and crabs ranked after the third largest shrimp and tuna-tongkol-cakalang. But the domestic market almost 90 % meat production blue crab Indonesian into american markets each year (Agustina *et al* ., 2014; Supriadi *et al*., 2019).

Blue crab in Indonesia is fisheries products exported United States, especially to a country at 60 % of the total catch blue crab (Setiyowati, 2016; Maylandia *et al*. 2021). Based on the data year 2020, export commodities blue crab the crabs and ranked 5 in the volume of exports of fisheries products get 27.616 tons, and the export value ranked 4. But, the year 2020 the volume of exports 2016 to show a trend of decreasing the volume of exports of % -1,08 for (PDSPKP, 2021).

Technique maintenance seed blue crab very necessary so that in an effort to seeding capable of producing seeds blue crab in the number of sufficient to meet a demand the market because the availability of seeds that have not yet been widely the market and also demand seed continues to rise.

Materials and Methods

The research was carried out in 2022 at the Balai Besar Pengembangan Perikanan Budidaya Air Payau (BBPBBAP) Jepara. Activities include rearing the larvae (preparation of larvae dispersal media, transfer of larvae), natural feed culture (Chlorella sp, Rotifer and Artemia), water quality monitoring (suhu, pH, DO and salinity), feeding, growth monitoring, pest and disease management and harvest and post-harvest. The maintenance seed blue crab uses container fiber tub with a capacity of 300 liters with a dark color.

Results and Discussion

Maintenance of larvae
Maintenance of media preparation

Before the distributed to the fiber and a concrete maintenance, larvae water be stored first into a tub of water body in hatchery that sterile water is always available. The shelter rubbed use brush to remove impurities that may still attached and rinse, with fresh water then the sterilization or disinfect tub for remove or reducing bacteria pathogen that may be attached to a water body with a solution of kaporit, a dose of kaporit 30 ppm. Process of sterilizing done by dissolving into the water 100 kaporit, liters which will be watered keseluruh evenly with the surface of the water pumps and left for 24 hours.

A tub shelter am flushed fresh water and give thiosulfate use. Next, done install the aeration that has been washed (hose aeration, stone aeration and tin/equipped with a ballast weighing stone aeration) mounted on a tub maintenance of the larvae. Water replenishment used available in the raising of the larva seeding unit includes blue crabs derived from shrimp right behind seeding unit includes blue crabs. Before the used underwater in order first filtered using a filter bag and to chlorine in with a dose of 15 ppm. According to setiawan *et al.*(2013), the provision of chlorine in aim is to reduce and kill microorganisms that is in water. Then water in let for 24 hours with a system of aeration run to neutralize chlorine in naturally. Chlorine in can be measured is using chlorine test. Chlorine in neutral signifying after water supply are ready to be a medium of maintenance of the larvae.

Dispersal of larvae

Larvae spread the larva of eggs that hatch (zoea-1) becomes a larva through a process for the by 1-2 days.Total of larvae the 2.225.000 tail. Zoea a mown field diwadah shelter then distributed in the pemelihraan larvae.The maintenance zoea should use the small to ease the observation and monitoring feed during maintenance. Maintenance in the fiber container with 300 liter with a dark color.Zoea populated individual get 50-100 / i. Density must be considered so zoea affects survival.
The process of the dispersal which is to the larva can be seen in figure 1.

Figure 1. Dispersal of larvae
(Personal documentation, 2022)

According Tanti dan Laksmi (2010), in the maintenance of blue crab seeds the density used is not more than 100 fish/liter.So the dispersal which is to seeds that was conducted in the two maintenance denser of the tub are advised to.The larva of being too dense and food that limited will cause the larva stress and lacks bread and cause its death.

Transfer of larvae

In stadia zoea 5 done according to transfer to a tub greater by the purpose of extending the room at the time of turned into megalopa so that the death due to cannibalism when processing moulting can be reduced.In stadia megalopa media other than move only 1 to broader maintenance were also added shelters for the purpose of can be used by megalopa as a substrate for sticking or take refuge from cannibalism, because of the nature of cannibalism in stadia megalopa very high. This is in accordance with statement juwana (2002), that cannibalism occurring during stadia megalopa can be reduced by providing shelter.

Wahyuni *et al.* (2020), one of the solutions in suppressing cannibalism in blue crab hatcheries is through engineering cultivation media by providing shelter. Shelter is a shelter so it can reduce the mortality rate. Shelter can be in the form of black waring, blue waring and white fibers. Substrate material at the bottom of the tub is optimal for reducing mortality at this stage because megalopa tends to be at the bottom of the rearing tank.

Natural feed culture
Chlorella sp culture

Natural feed is a good feed for fish rearing activities because it is known to have a higher nutritional content than artificial feed. Tanti and Laksmi (2010), stated that blue crab seeds during the rearing period were given natural food in the form of phytoplankton and zooplankton, additional feed and fine shrimp. Natural food is an important source of nutrition in the early stages of organism development. One of the natural feeds used for fish farming is Chlorella sp. Chlorella sp. is a type of phytoplankton that is often used in the hatchery of marine organisms in almost all hatcheries as feed directly given to fish or shrimp seeds or indirectly by being given to zooplankton first, then the zooplankton is given as feed to fish or blue crab seeds (Chilmawati and Suminto, 2008). Chlorella sp. has a nutritional content of 51-58% protein, 28-32% oil, 12-17% carbohydrates, 14-22% fat, and 4-5% nucleic acids (Rachmaniah *et al.*, 2010).

Mass-scale culture uses a container in the form of a concrete tub with a capacity of 120,000 liters. Filling seawater with a salinity of 30-32 ppt. Seawater treatment uses chlorine

(60% active ingredient) at a dose of 30 ppm and left for 24 hours using aeration. Washing the culture tubs is sterilized with chlorine solution, a dose of 30-50 ppm by dissolving the chlorine in 100 liters of water, which will then be sprinkled evenly over the entire surface of the tub with a water pump and left for 24 hours. The ratio between the seeds and the seawater media is 2: 1 for the Chorella sp. the culture used comes from intermediate or semi-mass scale with an initial culture density of approximately 2 million cells/ml, the seeds are placed in the culture medium. Fertilization using fertilizers, namely EDTA 5 ppm, ZA 10 ppm, UREA 10 ppm, TSP 15 ppm, aeration is increased so that the fertilizer spreads and does not settle directly to the bottom. Harvesting of seeds is done after 5-6 days. Harvesting technique using a submersible pump and distributed into the rotifer tub. Mufidah et al. (2017), stated that the harvesting of Chlorella sp. performed on the 6th day with a cell density of 797,500 cells/ml. On the 6th day, Chlorella sp. was in an exponential phase.

Rotifer culture

The culture tub that has been cleaned is filled with water from the holding tank which is passed through the filter bag filter. After the water is ready, then the rotifer seeds are added at a density of 10-20 fish/ml. Rotifer feeding was carried out by filling Chorella sp media via the transfer method using a submersible pump from a mass culture tub. Charging Chorella sp. as much as 25-50% of the volume of culture tanks and feeding silage. The water condition of the rearing medium greatly influences the growth of rotifers, especially temperature and salinity. The optimal temperature range for rotifer maintenance is around 22-31 °C while the optimal media water salinity is in the range of 15-35 ppt. In addition to the water conditions, the availability of Chorella sp. is the main key to the success of rotifer mass culture. Setiyono and Purwo (2020), Rotifers have maximum reproduction at temperatures of 30-340C, but the recommended temperature for culture is 20-30oC. Rotifer populations cultured at 22-30oC can reproduce optimally. Rotifers that are kept at a constant temperature of around 29-30oC will grow faster than those with low water temperatures (23-27oC), because this temperature will stimulate the process of rotifer metabolism faster.

Harvesting can be done on day 4 or as needed. At the time of harvesting the rotifers, the water in the culture tanks is not used up but some is left or at least 50% of the total volume, the aim is to be used for seeds in the next culture. The harvest is then accommodated in a container and given a multivitamin for enrichment before being given as food for the blue crab larvae.

Artemia culture

Artemia is a natural food that is very important both in serving marine fish, crustaceans, freshwater consumption fish and freshwater ornamental fish. The advantages of artemia as natural food are their relatively small size, high nutrient content according to the needs of fish and crustacean larvae (Firmansyah *et al.*, 2013). Artemia hatching can be done, both on a small scale and on a large scale according to the required larvae feed requirements. Artemia hatching was done by decapsulation. The artemia hatchery can use a fiber tub with a conical bottom. Before use, the culture or hatchery containers are cleaned and sterilized with 15 ppm chlorine. Furthermore, the hatchery media in the form of sterile seawater is put into the hatchery container which has been equipped with aeration equipment. During the hatching process, aeration is carried out in a strong position for the stirring process. Artemia that is not stirred generally has a poor degree of penetration. The air medium for hatching is seawater which has been sterilized (28-30 ppt).

Artemia will hatch after 24 hours. Artemia that has hatched can be identified simply by looking at the change in the color of the hatching media. Artemia that have not hatched are generally light brown in color, but after hatching the media color changes to orange. To ensure that the artemia has hatched perfectly, a sample of artemia is taken using a beaker glass. If all nauplius artemia are free swimming, it means that hatching is complete. Harvesting is done by lifting and turning off the aeration from the hatching container. After 15 minutes you will see artemia naupli swimming above the surface and the shell settles to the bottom. The harvesting process is carried out by siphoning at the top to harvest artemia, the artemia siphoning results are collected using a 120 micron filter, the artemia is filtered and then rinsed using clean sea water and accommodated in a bucket container for further enrichment with multivitamins for 1-2

hours. After the process of enriching the artemia with multivitamins is complete, the artemia is filtered and rinsed with sterile sea water and can be given to the blue crab larvae as needed. The artemia decapsulation process can be seen in Figure 2.

Figure 2. Artemia decapsulation process (Personal documentation, 2022)

Water quality monitoring

Water quality monitoring includes pH, water temperature, salinity, and DO. Water quality affects the speed of development of blue crab larvae until they become crablet.

pH

The pH value ranges from 7.43-7.90. pH is the chemical condition of water that plays a role in the development of blue crab larvae. At a high pH, the toxicity of ammonia will increase, therefore a good pH range for the maintenance of blue crab larvae is 7.44 to 7.78. According to Syahidah (2003), pH 7.0-8.5 is still within normal limits for the life of megalopa stage blue crab larvae.

Temperature

Temperature measurements in cultivation activities range from 20.9-33.9 ^{0}C. Temperature factors can affect various metabolic functions of aquatic organisms such as the rate of embryonic development, movement, metamorphosis (moulting), growth, appetite and reproduction of blue crab. Ruliaty et al. (2004), which states that the optimal water temperature for the maintenance of blue crab seeds ranges from 29 - 32^0 C. The optimal temperature range during maintenance is maintained by providing a heater so that the water temperature in the media remains warm. Adi (2011), said that the water temperature of 31^{0}C with sufficient feeding can accelerate the molting of blue crab larvae. Furthermore, the temperature range between 29-30^{0}C is still very suitable for blue crab life.

Dissolved oxygen

DO measurements during larval rearing activities ranged from 4.39 - 6.6 mg/l. In general, a low dissolved oxygen content of <3 ppm will decrease the appetite of organisms and affect the behavior and physiological processes of aquatic organisms. Generally all cultured organisms (fish and crustaceans are unable to tolerate extreme oxygen fluctuations). Therefore, the dissolved oxygen content must always be maintained in optimum conditions.

Salinity

Salinity is one of the water quality parameters that affect the growth of blue crab larvae, the range of sallinity in aquaculture activities ranges from 15-30 ppt. Azra and Ikhwanuddin (2015), cultured blue crab larvae at 25–30°C at a salinity of 30–35 g/l to optimize growth, survival and development of crab larvae.

Feeding of blue crab

There are 3 types of larvae feed given, namely natural feed, artificial feed and additional feed. According to Effendy et al. (2005), that the provision of sufficient feed makes it easier for the larvae to take and eat the feed given, so that survival can last. Yusneri et al., (2020), complete nutrition in feed is absolutely necessary to maintain normal blue crab growth. One of the important factors in larval rearing is feed nutrition. Therefore, the larvae must be fed with proper and balanced nutrition to obtain optimal survival rates. Each stage of blue swimming blue crab has differences so that the maintenance techniques applied are also different, especially in the feeding process. Feeding can be seen in table 1 below:

Tablel 1. Feeding frequency

No	Stadia	Feed type			Frequency
		Natural feed	Artificial feed	Additional feed	
1	Zoea 1-2	Rotifer	-	-	11.00-16.00
					20.00-22.00
2	Zoea 3-5	Rotifer dan Artemia	-	-	11.00-13.00
					16.00-19.00
					20.00
3	Megalopa	Artemia	Flake		06.00-10.00
					13.00-16.00
					20.00-23.00
4	Crablet	Biomass	Flake	Trash fish	06.00-10.00
					13.00-16.00
					20.00-23.00

(Primary data, 2022).

The natural feed used during the larval rearing period is rotifers (Brachionus sp) at zoea 1-5 stadia with a density of 10-15 individuals/ml. In zoea I, the rotifers are given, because the rotifers are able to provide a high survival rate for the development of blue crab larvae and can significantly accelerate the moulting process to the zoea II phase. Before being given, rotifers were enriched using multivitamins and oxy for 1-3 hours at a dose of 200 ppm, and Artemia salina which was also enriched was started to be given to zoea 3-5 and megalopa at a density of 2-3 individuals/ml. The artificial feed used during the larval rearing period, namely flake, was given to the crablet stage at a dose of 4 grams at a density of 100 individuals. The additional feed used during the larval rearing period was trash fish that had been boiled and then given to the crablet stage at a dose of 4 grams at a density of 100 individuals, artemia biomass was given to the crablet stage at a density of 2-3 individuals.

Growth monitoring

Monitoring the growth of the zoea stage larvae was carried out to determine the development of the larval stage. The development of blue crab larvae starts from satadia zoea to carblet. The zoea period consists of five stages from zoea-1 to zoea- 5. The time taken from zoea-1 to zoea- 2 is 4 days, zoea- 2 to zoea- 3 is 3 days, zoea- 3 to zoea- 4 is 3 days, zoea- 4 to zoea- 5 is 3 days, zoea- 5 to megalopa is 5 days, megalopa to crablet is 7 days. Yusneri et al. (2020), to determine the growth rate of blue swimming blue crab seeds, absolute weight growth was measured. Measurements were made at the beginning and end of the study.

Stadia Zoea 1

The blue crab larvae in zoea 1 are transparent, eyes attached, antennule not segmented and short. Long barbed antennae, wide mandibles, and relatively hard with two teeth and sharp serrated edges. Maxillale has a two-segmented endopodite, namely the first segment with one seta and the second segment with six seta. Maxilla with non-segmented endopodite which has four terminals. The abdomen consists of five pleomeres. Zoea 1 can be seen in figure 3.

Figure 3. Zoea 1
(Personal documentation, 2022).

Stadia Zoea 2

Blue crab larvae in Zoea 2 sub-stadia are more active in catching feed, because their organs are growing, both in size and function. Eyes have stalked, Antennule with four aesthestes and two short setae of unequal length. Antenna similar to Zoea-1 but different size. Abdomen has pleomeres three to pleomeres five have lateral spines interrupted. Zoea 2 can be seen in Figure 4.

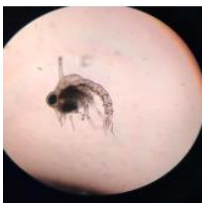

Figure 4. Zoea 2
(Personal documentation, 2022)

Stadia Zoea 3

Blue crab larvae at sub-stadia Zoea3 actively catch food and have more complete body organs. Antenulle as in zoea-2 but larger. Antennae are small buds that originate from flagella. In maxilliped-1 it consists of eight natatory seta and in maxilliped-2 it consists of 9 natatory seta. The abdomen has eight somites with lateral spines on the pleomeres. Zoea 3 can be seen in figure 5.

Figure 5. Zoea 3
(Personal documentation, 2022)

Stadia Zoea 4

Blue crab larvae in sub-stadia Zoea-4 are increasingly active. This is supported by the development of their organs. The antenulle has two long aesthetes and two sub-terminal setae. The antenna has a long flagellum or endopodite. The maxillule consists of 12 setae on the coral endite and 14 seta on the basal endite. The maxilla has 22-27 plumose seta. Formed maxiiliped-3 and cheliped forked two. Abdomen with pleopod buds on pleomere- 2 to pleomere 6. Zoea 4 can be seen in figure 6.

Figure 6. Zoea 4
(Personal documentation, 2022)

Stadia Zoea 5

Substadia Zoea-5 (figure 7) blue crab larvae are able to effectively prey on the feed given and remain active swimming.

Figure 7. Zoea 5
(Personal documentation, 2022)

This is supported by pleopods that are quite long and periopods are starting to appear. Antenulla with aesthetes in three levels. Endopodite is an antenna endopodite bud that grows in length and begins to segment. The abdomen consists of pleomore-3 lateral spines extending posteriorly.

Stadia Megalopa

In the megalopa phase, the blue crab larvae are able to bite which is characterized by the growth of sharp teeth on the edges of the mandible and maxilliped-3 which are more perfect. The blue crab larvae already have a long and rather long curved rostrum spine. Maxilliped- 3 development is very good. The shape is very different compared to the zoea stage. Megaloppa can be seen in Figure 8.

Figure 8. Megalopa
(Personal documentation, 2022)

Stadia Crablet

Crablet yaitu benih rajungan kecil yang organ tubuhnya sudah menyerupai rajungan besar. Stadia crablet berukuran 0,5-1 cm dan berumur 1 bulan, cangkangnya telah terlihat sempurna, dan bentuk tubuhnya telah terbentuk sempurna seperti halnya rajungan dewasa. crablet dapat di lihat pada gambar 9.

Figure 9. Stadia Crablet
(Personal documentation, 2022)

Management of Pests and Diseases

Fungal diseases that attack blue crab larvae generally include Fusarium sp and Lagenidium sp, protozoa of the Zoothamnium sp species, parasites of the Epistyles sp, Verticella sp, and Leucothrix sp, and Vibrio sp bacteria. Diseased larvae appear to swim imperfectly and are pale in color. Leucotorix sp attack, or better known as filamentous bacteria, generally occurs in blue crab eggs.

Prevention of disease infection in larvae is carried out by siphoning dead larvae

and dirt that settles at the bottom of the rearing container to suppress the accumulation of organic matter. As well as providing feed with sufficient nutrition so that it has sufficient energy for the process of changing the skin (moulting). If the larvae have been attacked by disease, treatment can be done with 20 ppm formalin for about 30 minutes for protozoa attacks. During immersion using formalin, the aeration position is also set to the maximum so that there is no decrease in dissolved oxygen content.

Harvest and post-harvest
Harvest

From the total of crablets harvested there were 75,000 individuals, the survival rate value was 3.33%. According to Effendy *et al.* (2005), stated that the highest survival rate of blue swimming blue crab was SR: 41.78% and the lowest survival rate was SR: 15.11% that lack of nutrition and treatment in the larval rearing phase caused mass death. Another thing to pay attention to is the condition of the crablets in the holding tanks that are moulting. Moulting usually occurs simultaneously and is left for some time before packing or packing. Marjono et al. (2002) that the low survival rate of blue crab larvae is caused by cannibalism between blue crab larvae. Susanto and Setyadi (2008), further stated that the survival rate of the various blue crab larvae is affected by the blue crab larvae having cannibalistic properties which will prey on other larvae. So this condition greatly affects the percentage of survival.

Post-harvest

After the harvesting activity is complete, the grading activity aims to separate the crablets based on size (uniform), choose good crablets (no defects, uniform color, and healthy). After harvesting, the crablets that are in the fiber tub are taken for packing. The number of seeds per bag depends on the age and distance traveled to the pond location. Transportation of crablets is with a closed system.

Transportation with a closed system, namely by preparing plastic packing then filled with water and leaves as a shelter or crablet shelter during the shipping process to avoid cannibalism. After that, the crablets were put into plastic packing with the optimum density of crablet stadia 5-10 with a size of 1 cm as many as 300 individuals/liter, at a temperature of 22°C. The ratio between water and oxygen for transportation is 1:3. When the seeds are 2-15 cm in size, the density in the bag is reduced to 75-100 individuals/bag. The number of ice cubes placed is arranged in such a way that the temperature in the Styrofoam box is around 22°C. This treatment is done so that the blue crab seeds are not stressed during the trip. After that, the Styrofoam was closed and taped so that it would not break easily and was easy to transport.

Conclusion

a. Blue crab seed Maintenance Techniques using a fiber tub and a concrete tub. For the volume capacity of the fiber tub, which is 300 liters of water, and for the size of the concrete tub, length: 4.77 m and width: 3.10 m.
b. The total number of larvae or zoea at the start of stocking was 2,225,000 larvae. Result obtained the harvest was 75,000 crablets with an SR of 3.33%.
c. Monitoring water quality in larval rearing includes temperature 20.9-33.9 0C, pH 7.43-7.90, salinity 15-30 ppt, and dissolved oxygen (DO) 4.39 - 6.6 mg/l.

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