GROWTH MONITORING OF SAND LOBSTER (*Panulirus homarus*) USING THE BOTTOM CAGE METHOD IN THE EXAMPLE UNIT OF MARINE LOBSTER CULTIVATION, BANYUWANGI REGENCY, EAST JAVA PROVINCE

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Abstract
With the high demand for sea lobster as the industry has developed, Indonesia has an opportunity to establish the world's largest lobster aquaculture production. Therefore, a study related to the growing-out of lobster and also the development of engineering technology of lobster enlargement is needed. This study aims to determine the growth performance of Panulirus homarus reared in a bottom cage method. Lobsters with an average size of 116,25 g were reared for 150 days and fed with trash fish of 3%-4% of the biomass daily. The results showed that the use of the bottom cage method had positive effects on the survival rate, average body weight, specific growth rate dan food conversion ratio was 85%, 170 g, 0.25 g per day and 11.16 respectively. The water quality were also still within the suitable range for lobster rearing.

Keywords: Bottom cage, lobster, *Panulirus homarus*, growth, survival

Introduction

Lobsters have become one of the marine biological resources that are developing in various countries, including Indonesia, considering that the waters are dominated by coral reefs which are the habitat of various types of lobsters. There are six species of lobster from the genus Panulirus in Indonesia, namely *P. homarus, P. longipes, P. ornatus, P. penicillatus, P. polyphagus,* and *P. versicolor* (Pratiwi, 2008). Sand lobster (*P. homarus*) and pearl lobster (*P. ornatus*) are types of lobster that are commonly found in waters where sand lobster is the most dominant species whose population can reach three to nine times more than pearl lobster (Jones, 2008).

The abundance of lobster in tropical waters makes this animal caught in large numbers to meet the needs of the global market. Therefore, lobster cultivation efforts continue to be carried out as a step to meet the needs of market demand. The type of lobster that is widely cultivated is the sand lobster. This is because the catch of seeds in nature is more than other types of lobster (Ningtias, 2019). The lobster rearing process begins with catching seeds that come from nature to be collected first in a holding container before being reared. The seeds collected are generally young lobsters in the juvenile stage, weighing 70-100 g/ind (Setyono, 2006).

One of the main obstacles in lobster cultivation activities is the low survival rate of cultivated seeds (Thuy & Ngoc, 2004). The high mortality in lobster culture was generally caused by the cannibalistic nature of the lobster. One of the efforts to prevent cannibalism can be done through innovation in aquaculture containers, including the provision of artificial hiding places (shelters) (Musbir & Palo, 2014) as well as the use of various materials and designs in the sea cage system (Mohammed et al., 2010). In Indonesia, the use of various materials and designs in floating net cages for lobster rearing has been widely used, generally made of bamboo and wood. However, the use of floating net cages is still not optimal considering that lobsters only inhabit the bottom column of waters (Anissah et al., 2015). The basic cage method was an alternative design in an effort to increase the production of cultivated lobster. It was possible because the basic cages in principle applied a design that resembles the nature of life in the lobster's natural habitat, namely at the bottom of the water column. Based on this, research on the use of basic cages in lobster cultivation was important to obtain information about the growth and survival of cultured lobsters.

Materials and Methods

The research was conducted at the Pesona Bahari Lobster Cultivation Pilot Unit,

Banyuwangi Regency, East Java. Sand lobster seeds came from natural caught and then reared on the bottom cage media. The research procedure was carried out by observing and collecting data through a descriptive method approach which included Survival Rate (SR), Average Body Weight (ABW), Average Daily Gain (ADG), and Food Conversion Ratio (FCR). Growth observations were carried out by measuring the length and weight of lobsters every 30 days for 150 days of rearing.

Results and Discussions

Site Selection

The choice of location greatly affected the success of lobster cultivation activities. The selection of the location was carried out by considering several factors such as the quality of the bottom of the waters, the conditions of contamination, tidal conditions and the pattern of wave flow and bottom of the waters. It was in accordance with the opinion of Mustafa (2013), the location for lobster rearing activities should meet requirements such as not being too influenced by freshwater flows and other flows from the mainland originating from factory, agricultural and residential activities. protected from strong winds and big waves, closed to seed and feed sources, easy to reach by transport and salinity ranges from 30-35 ppt. The water quality conditions at the lobster culture locations include salinity 30-35 ppt, temperature 25-30^{o}C, pH 7.8-8.5, and dissolved oxygen levels ranging from 2.7-5.4 mg/L, pH (Philip & Kittaka, 2000; Wickins & Lee , 2002).

Cultivation Preparation

The rearing container used for rearing sand lobster (*P. homarus)* was a round bottom net cage with a diameter of 3 m and a height of 1 m. The use of bottom cages was considered more effective than floating net cages considering that lobsters in their life stage inhabit the bottom of the water column. The structure of the cage was made of an iron frame with two layers of nets, the first layer was a fine net that functions to keep feed from leaving the cage, while the second layer served to protect the lobster from predatory attacks as well as to withstand currents and waves. Installation of cages was carried out at a depth of 6-10 m from the lowest tide by placing iron in each corner of the cage at the bottom of the water. Installation of cages at the bottom of the water was carried out with the aim of making the cultivation process more optimal because it was protected from waves both at high and low tide (Mustafa, 2013).

Spreaded seeds

Sand lobster (*P. homarus)* seeds originating from natural catches were first checked including clarity of seed origin and morphological conditions of the seeds, where lobster seeds must be in good health, missing lobster legs must not be more than or equal to three in a coupled position and the seeds must not be in good condition. limp except for lobsters in a molting state. The seed dispersal began with an acclimatization process carried out at the seaside for 10-15 minutes to ensure the condition of the seeds was in good condition and then the seeds were brought to the stocking location at the bottom of the water. Lobster of 100-120 g/ind. The stocking density system in lobster rearing was carried out by taking into account the weight of the lobster, the condition of the lobster and the size of the cage to reduce the level of cannibalism (Cokrowati et al., 2012).

Feed Management

The feed program used in the production of sand lobster was restricted feeding. It was based on previous tests conducted with a Feeding Rate (FR) range of 5–10%. The first week after stocking, feeding was carried out with an FR of 5% of the total biomass, because sand lobster at the beginning of the stocking period generally experienced stress which resulted in decreased appetite. Along with the increase in growth and appetite, feeding was increased with an FR of 10% of the total biomass until the end of harvest. The frequency of feeding was based on the size of the lobster, small lobsters (<200g/ind) were fed twice a day while larger sizes (>200g/ind) were fed once per day, either in the form of chopped shrimp, crabs, small crabs, squid. squid and trash fish. However, fresh trash fish had a larger proportion of 70% of the total feed used from other types considering the availability and nutritional content inside.

Growth Monitoring

The growth of sand lobster (*P. homarus)* during the rearing period was observed to increase at each observation time, as well as the increase in total length. The results of observations of sand lobster growth during the 150-day rearing period observed an increase in the value of ABW and

Total Length (TL), which at the began of rearing ranged from 116.25 g/ind with a total length of 15.25 cm to 170 g/ind with a total length of 18 cm at the end of the rearing period and resulted in an average weight and length gain of 53.75 g/ind and 2.75 cm, respectively (Figure 1). However, this value was relatively lower when compared to the study results of Pratiwi (2016), at a lower stocking density of 24 ind/m^2 with a rearing period of 270 days from a stocking size of 45 g/ind resulting in a weight gain of around 120 g/ind. This also agrees with Cokrowati et al. (2012), stocking density had an important influence on growth where lobsters with low stocking densities tend to be more efficient in the utilization of the feed provided.

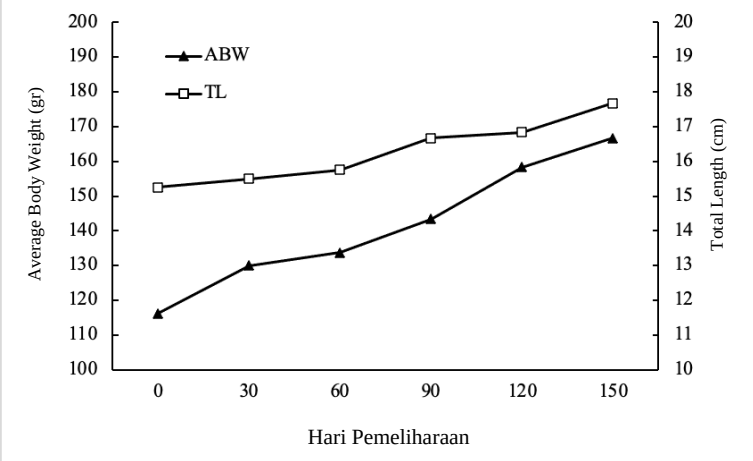
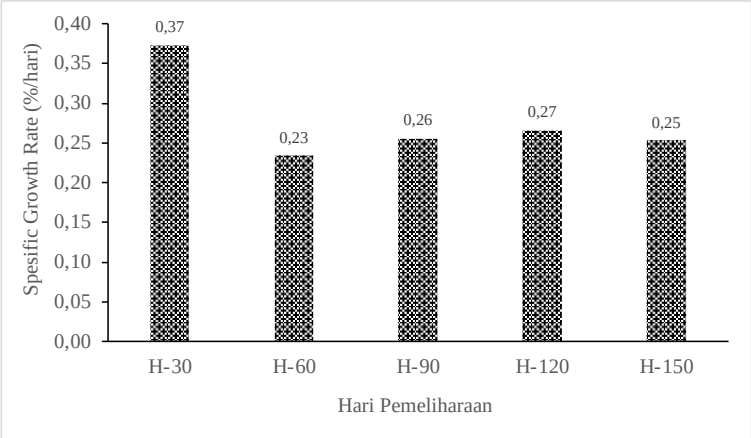


Figure 1. Average of ABW and TL of sand lobster (*P. homarus*) rearing by bottom cage method

Observation of the Specific Growth Rate (SGR) value on Day-30 of 0.37%/day was observed to be relatively higher than the value at other times of observation. The lowest SGR value was observed on the Day-60 observation, which was 0.23%/day. This value was also observed to decrease when compared to the previous observation (Day-30). The SGR value obtained was observed to increase and decrease in subsequent observations and tend to fluctuate at each observation time with an average SGR range of 0.28% (Figure 2).

One of the fluctuations observed in SGR during the rearing period was related to mortality due to cannibalism of sand lobster. Increased mortality as a result of cannibalism or other environmental factors would further reduce the level of competition and increase feed utilization in the lobster community that was kept. This agrees with Adiyana & Pamungkas (2017), the cannibalism factor would reduce the number of lobster populations, so that competition for feed would decrease and lobsters can utilize feed better while also getting other feed intake apart from the feed provided.



Gambar 2. SGR value of sand lobster (*P. homarus*) rearing by bottom cage method

Table 1. SR, biomass and FCR of sand lobster (*P. homarus*) rearing by bottom cage method

Parameter	Day-30	Day-60	Day-90	Day-120	Day-150
SR (%)	90.20	89	86.20	85	85
Biomass (Kg)	58.63	59.52	63.03	68	72.25
FCR	2.41	5.15	7.31	9.69	11.16

The lowest of FCR during the lobster rearing period was observed on Day-30 which was 2.41 with an initial biomass weight of 58.63 kg and at the end of the Day-150 rearing period the FCR value and biomass weight were observed at 11.16 and 72.25 kg each (Table 1). The low FCR value at the beginning of the rearing period compared to other observations was related to the high mortality that occurred, namely on Day-30 reaching 9.8% compared to other observations. This high mortality value reduces competition and feed utilization by lobsters so that feed efficiency for growth is more optimal. This can be seen from the high values of SGR and ABW observed on the Day-30 observation. The high FCR value at the end of the Day-150 rearing period of 11.16 was also related to the use of trash fish feed during maintenance. The water content of trash fish given to lobster rearing has a fairly high content, ranging from 78.62% (Adiyana & Pamungkas, 2017). Several other research results also showed that the use of wet feed on juvenile lobster resulted in a feed conversion ratio ranging from 3-9 (Phillips & Kittaka, 2000), 12:1 to 15:1 with the use of fresh fish in lobster rearing in KJA (Priyambodo & Sarifin, 2009). Besides, according to Lesmana (2013), several factors that affect the FCR value include the type of feed, lobster age, body size, salinity and temperature.

The SR value at the end of the rearing period was observed at 85% with an average weight and length of lobster 170 g/ind and 18 cm/ind, respectively. The survival value indicates the percentage of viability of the lobster in the cultivation conditions carried out in this case used the bottom cage method. The SR value obtained during the maintenance period, which was 85%, relatively good, as well as the conditions for the average weight and length that have met the harvest criteria. (Priyambodo & Sarifin, 2009), stated that mortality in the postpartum phase was very high, reaching 50-60%, which was mainly due to cannibalism. The survival of lobsters in the juvenile phase ranges from 60-90%, while at the rearing period it was relatively varied between <50% to >90% depending on the knowledge and experience of the farmers as well as the cultivation method and feed management. In addition, the use of appropriate rearing methods, optimization of density levels, availability of sufficient feed, use of shelters and the use of mobile nets in rearing containers can reduce the level of cannibalism in the aquaculture system as well as increase the survival value of cultured lobsters (Chau et al. 2009; Adiyana et al. 2015).

Conclusion

Based on observations during the rearing of sand lobsters, the use of the bottom cage method has a positive effect on the growth and survival performance of the cultured lobsters. Water quality and location suitability were also still within the ideal range.

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