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Green Mussel *(Perna viridis)* and Silkworm *(Tubifex sp.)* Feeding Trial as an Alternative Feed for Crayfish Seeds (*Cherax quadricarinatus*)

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Abstract

The high cost of shrimp or lobster feed is also a problem in the sustainability of aquaculture, even though freshwater crayfish, including eaters, require proper and relatively cheap feed selection. One source of feed that can be used as an alternative is green clams and silkworms. This study aims to determine which meal is better and more affordable for freshwater lobster seeds. The sustainability of cultivation can be well maintained in terms of economy, quality and quantity. The method used was descriptive, comparing the two feeds given a dose of each treatment, namely 10% of the lobster seed biomass, then analyzed using a 95% confidence level t-test.

The results showed a significant effect ($P < 0.05$) on the absolute length growth and absolute weight of freshwater lobster seeds. The complete length of the sources given green shellfish feed is 0.94 ± 0.38 cm, and silkworm feed is 0.66 ± 0.27 cm, for the absolute weight of green shellfish feed is 5.11 ± 0.38gr and silkworm feed 2.68 ± 0.18 gr. The best results from the two feeding treatments for freshwater lobster seeds were using green shellfish feed with an absolute weight value of 5.11 ± 0.38gr, and the complete length is 0.94 ± 0.38 cm. So that green shellfish feed can be used as a better alternative feed for the cultivation of freshwater lobster seed enlargement.

Keywords: Feed, Freshwater Lobster, Green Clams, Silk Worms

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Introduction

Freshwater crayfish (*Cherax quadricarinatus*) has been known to the world community, especially in Australia, since 1975. Australia has cultivated and exported Cherax to various countries in the last 20 years. However, in Indonesia, the existence of Cherax is still relatively rare, both in cultivation and consumption. The need for export markets in Europe and Southeast Asia reached 1,589 tonnes. In 2004 the demand was increasing, so that the export opportunities for freshwater crayfish were wide open. Freshwater crayfish also have other advantages, namely uncomplicated maintenance, more disease resistance, and are all-consuming. (Tim Agro, 2006). So we need the best feeding to maximize the growth of freshwater crayfish.

The development of freshwater crayfish is relatively rapid, but in 2007 it experienced a decline due to the limited number of superior,

good seeds in quality, quantity and continuity. WrongOne factor that affects the availability of excellent seeds is feed. Food sources that can be used as alternatives are green clams and tubifex worms.

Besides having a high economic value compared to other feed ingredients, green clams also have a high enough protein content reaching 47.6%, Fat 7.0% Water 19.9%, Ca 0.45% (Suwignyo et al., 1984). The green shellfish has a soft texture so that it can be digested easily by the crayfish seeds. It is hoped that the abundant availability of green clams in the waters is expected to be used as an alternative feed, which can reduce the cost of spending to meet dinner during the cultivation cycle and optimize the growth rate of freshwater lobster seeds.

The second feed is silkworms (Tubifex sp.) Which is one of the feeds that can be given to cultivators that are being cultivated. This worm has a protein content of 57%, 13% fat, 2.04% crude fibre, 3.6% ash content, and 87.7% water (Pardiansyah et al., 2014).

For this reason, it is necessary to research the two feeds to find out which meal is better and more affordable for freshwater lobster seeds so that the sustainability of
cultivation can be well maintained in terms
of economy, quality and quantity.

Materials and Methods

The research was conducted using a descriptive method by comparing two feeds. The seeds were obtained from spawning results, which was carried out in the Aquaculture Laboratory of the Muhammadiyah University of Gresik measuring 2.5 cm in size; the seeds were sown in the morning with ten fish in each treatment aquarium.

The container media used is a dark blue aquarium, dimensions P50 x L30 x T30, totalling four pcs then placed in a concrete pool measuring 2 m X 2m. Placing the aquarium in the concrete pond is to maintain the stability of the temperature of each treatment container so that it remains homogeneous so that it can minimize if there is temperature fluctuation which can cause the appetite of freshwater lobster seeds to decrease, each aquarium unit is given treatment marks A and B. were given silkworms. Group B was given a green shellfish test feed, which was carried out twice. Each aquarium unit is provided aeration and par dim sized pipe, then cut between 10-15 cm, which serves as a shelter for freshwater crayfish. Then, the aquarium is filled with water with a depth of 10 cm in each container. Treatment A freshwater lobster seeds were fed silkworms, and treatment B was provided green shellfish. The portion of the feed given was each treatment given in the morning and evening, with a dose of 10% of the weight of the freshwater lobster seeds with two treatments and two adventures.

Treatment A used frozen silkworms so that it needed to be thawed before giving it to freshwater lobster seeds. Treatment B with test feed using green clams blended until smooth so that they can be quickly eaten and digested by the seeds of freshwater crayfish (Cheraxquadricarinatus), then the green clams and worms are stored back into the freezer so that they can last until the research is complete.

The maintenance of freshwater lobster seeds was carried out for 40 days. The observed variables were absolute weight growth, absolute length growth and survival rate, and several water quality data, including temperature, pH (acidity level), and DO (dissolved oxygen). Growth observations were carried out every ten days by measuring all freshwater lobster seeds for each treatment. This was done to get better accurate data. The increase in absolute

weight, absolute length, and survival rate uses the following formula:

Absolute Weight Growth

The growth of the total weight of Freshwater Lobster (W) is calculated using the formula According to Effendi (2002):

$$W = Wt - Wo$$

Information :

W: Growth in Weight (gr)

Wt: Average lobster weight at a time end (gr)

Wo: Average lobster weight at a time initial stocking (gr)

Absolute Length Growth

Absolute length growth is calculated using the Effendie formula (1997) as follows:

$$Lm = TL1 - TL0$$

Information :

TL1: Total length at the end of the study (cm)

TL0: The total length at the start of research (cm)

Lm: Absolute length growth (cm)

Survival Rate (SR)

To calculate survival, it is calculated using the formula (Muchlisin et al., 2016):

$$SR = \frac{Nt}{N0} x100\%$$

Results and Discussion

Absolute Weight Growth

Absolute weight growth is a description of the change in the average weight of each treatment from the start to the end of the maintenance, which is determined based on the difference between the final weight and the initial weight of care. Growth is influenced by several factors, namely internal and external. Factors include heredity, gender, age, parasites and disease. Meanwhile, external factors that influence growth include food and water temperature (Effendie, 2002).

According to Jarwantosih (2011), weight growth is strongly influenced by stocking density in the enlargement container in the enlargement and maintenance of lobsters. If the stocking density is too high, the lobsters will compete for food, resulting in the lobsters experiencing stress. Their appetite decreases, and they hide more in the shelter so that the feed given cannot be consumed optimally.

Kristanto and Kusmini (2007) stated that the decrease in weight growth rate could be due to energy transfer. The general energy from the feed consumed will be used for energy such as moving and being active in the water, while the rest is used for weight growth.

The results of observing the total length growth of Freshwater Lobster seeds after giving different types of feed treatment to the development and survival of Freshwater Lobster (*Cherax quadricarinatus*) seeds carried out for 40 days are as follows:

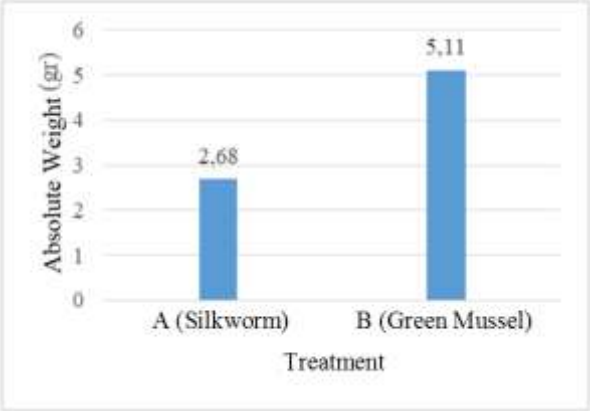

Figure 1. Seed absolute weight histogram freshwater crayfish

Based on observations of histogram data, the absolute weight growth of freshwater lobster seeds showed that there were differences between treatments. The highest result was found in treatment B, namely with the total weight growth rate of lobster seeds of 5.11 ± 0.38 (gr) which had been given

feed (green shellfish), while treatment A had a lower total weight growth rate of 2.68 ± 0.18 (gr) after being given meal (silkworms).

Wiyanto and Hartono (2003) state that the efficiency of feed utilization is the value-added weight by the amount of feed that has been given during the maintenance period. For the utilization of this feed to have high efficiency, it is balanced with a good quality feed. So that the freshwater lobster seeds can grow optimally. The two treatments above showed that treatment B using green shellfish feed had better weight growth than treatment A fed silkworms. This is presumably because the meal and natural green shellfish food content are easier to digest and absorb. It is known that the nutrition from raw green shellfish food is47.6% protein, 7.0% fat, 19.9% water, 14.5% Ca, 0.45% fat, and 18.5% carbohydrates (Suwignyoet al, 1984).

To spur weight growth, several essential elements have an effect, not only high protein content but other nutrients, macro and micro components such as carbohydrates, fats and minerals are needed to increase the weight of freshwater lobster seeds during the maintenance period, this is reinforced by Marnani and Pramono (2016).) that feed is determined by protein content and other supporting content such as carbohydrates, fats, minerals, and vitamins as a source of nutrition.

The high water content in silkworms compared to green clams also affects the weight gain of freshwater lobster seeds. In this case, lobster seeds fed green shellfish will feel full faster because most of the feed components given have denser meat. In contrast to silkworms, the majority of the parts are water, as much as 87.7%.

Even though it has a higher protein content, the crayfish seeds have not absorbed the high protein complex. Other substances or enzymes are needed to make it easier for the crayfish seeds to absorb protein in a more straightforward form.

Based on the results of the t-test with a 95% confidence level using excel between the two treatment groups had a significant effect (P <0.05) on the growth of the absolute weight of freshwater lobster seeds. In treatment B, the highest test results were obtained, namely 5.11 ± 0.38 gr. A balanced diet and nutrition can increase the weight growth of freshwater crayfish.

Absolute Length Growth

The results of observing the total length growth of Freshwater Lobster seeds after giving different types of feed treatment to the development and survival of Freshwater Lobster (*Cherax quadricarinatus*) seeds carried out for 40 days are as follows:

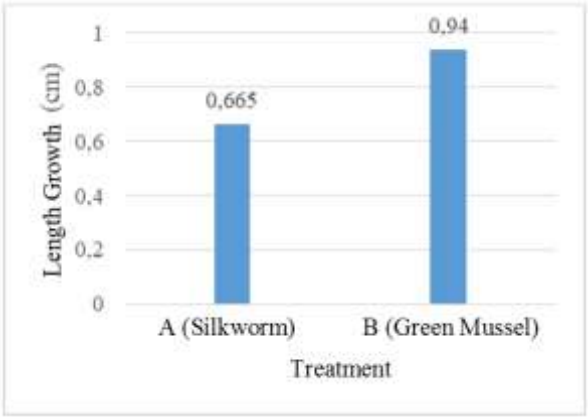

Figure 2. Length growth histogram absolute crayfish seeds

Based on the results of histogram data observations, the highest total length of freshwater lobster seeds was found in treatment B with an absolute length growth rate of lobster seeds of 0.94 ± 0.38 cm fed green shellfish. In contrast, treatment A had a higher complete length growth lower than treatment B, namely 0.66 ± 0.27 cm fed silkworms. This is because the nutritional content in green clams is better and evenly distributed than the content of silkworms, where the majority of the nutrients are protein because to support the extended

growth of freshwater lobster seeds, protein is not only needed, but the content of other nutrients also plays an important role such as carbohydrates and fat. as macronutrients needed by fish and shrimp.

The growth rate is one of the critical parameters that must be considered in cultivation. The success and effectiveness of the maintenance were obtained from the lobster growth rate. Various factors can support growth, one of which is intensive handling and attention to feed. Feed and environmental control can be the key to increasing the growth rates of freshwater crayfish.

According to Effendie (2002), growth is defined as the addition of length or weight in a certain period during the maintenance period. Trijoko and Madyaningrana (2004) also stated that the absolute increase in body length was obtained from the difference in body length at the end and beginning of the study.

Based on the results of the t-test with a 95% confidence level using excel between the two treatment groups had a significant effect (P <0.05) on the total length growth of freshwater lobster seeds. According to Effendie (2002), growth is defined as the addition of length or weight in a certain period during the maintenance period. An absolute increase in body length is obtained from the difference in body length at the end and beginning of the study.

Survival Rate

The results of observations on the survival of Freshwater Lobster seeds after treatment The effect of different types of feed on the growth and survival of Freshwater Lobster (Cherax quadricarinatus) carried out for 40 days are as follows:

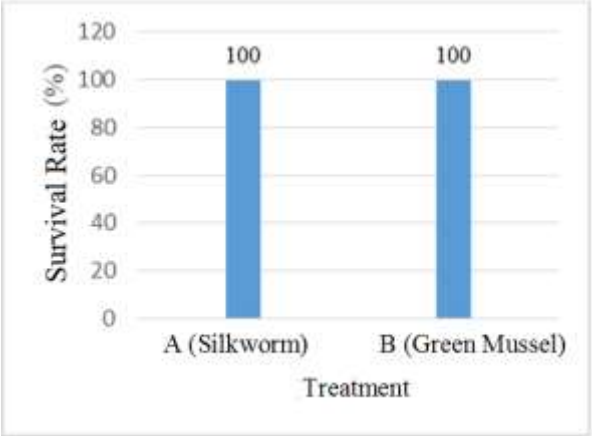

Figure 3. Freshwater lobster seed survival rate histogram

Based on the observations of the histogram data above, it can be seen that the survival of Freshwater Lobster in all treatments (A and B) has the same survival value, namely 100%. This can be caused by several things, namely the level of density and controlled environment. Two density effects affect the population of aquatic organisms, the first affecting growth and the second affecting survival. The impact of development, which depends on density, generally occurs in early life and will affect survival. The high density causes the effect of competition on space and feed consumed. Too high density also dramatically affects the stress level of freshwater crayfish.

According to Adams (1990), one of the causes of stress is the density of lobsters. When stress occurs, there is a lot of death in containers with high stocking densities. Strong lobsters will prey on weak lobsters, and an invalid condition occurs when lobsters experience moulting. The lobster shells will peel off so that the lobster body becomes soft and easy to eat by one another; this is thought to be due to the cannibalism between lobsters. The distance from one lobster to another is too close, making it easier for lobsters to prey on one another. The need for feed that is not fulfilled optimally will trigger lobsters to prey on one another and become one factor causing

the low survival rate of lobsters on the maintenance media.

Water quality and the environment also influence and are essential factors in supporting the survival of the freshwater lobster seeds that are kept. Controlled and appropriate conditions will cause lobsters to have a better appetite and avoid stress.

Water Quality and Environment

Table 1. Water Quality Data

Treatment	Water Quality			
	Temp (°C)	pH	DO (ppm)	Ammonia (ppm)
A (Silkworm)	27,5 - 29	7 - 8,4	5,5 - 6,9	0
B (Green Mussel)	27,5 - 29,7	7 - 8,3	5,5 - 7,5	0

Based on the table. One indicates that the water quality parameters obtained during the fieldwork practice are within a range that is still feasible and can support the life of freshwater lobster seeds. The temperature range obtained in treatment A was (27.5-29) ^{0}C, B (27.5-29.7) 0C. From the temperature measurements received, the temperature range in each treatment is good enough for the maintenance and growth of freshwater lobster seeds. The optimal temperature for intensive supervision of freshwater crayfish is 24 -30 ^{0}C. If the temperature exceeds this limit, it will reduce appetite, so that growth will be stunted. Patasik (2004) states that the requirements for freshwater crayfish maintenance must be in the range of 24-30 ^{0}C.

The pH measurement results ranged from 7 - 8.4, and treatment B was 7 - 8.3. The pH range level obtained during maintenance indicates that it is still within normal limits for freshwater crayfish. This follows what was conveyed by Sukmajaya and Suharjo (2003), the optimal pH and can still be tolerated by freshwater crayfish, namely the range of 6 - 8. The hardness level, which is still within the standard limit, is influential in maintaining the dissolved calcium content needed in skin formation only after moulting (Wiryanto and Hartono, 2003).

Dissolved oxygen measured in treatment A was 5.5 - 6.9 ppm, treatment B was 5.5 - 7.5 ppm. The range of dissolved oxygen from rearing for 42 days is suitable for freshwater crayfish survival.

Wiyanto and Hartono (2007) also state that the range of dissolved oxygen that can guarantee the life of freshwater crayfish is> 3 ppm. The content of dissolved oxygen(DO) affects the lobster's metabolism, so it must be in good condition. Lobsters need dissolving oxygen to burn food which later forms energy used for growth, reproduction and activity. The solubility of oxygen in water is influenced by the temperature of the water, the presence of air contact with water and the compounds in the water.

Conclusion

The conclusion from this Research was that giving and comparing two different types of feed gives a real difference (P <0.05) to the growth in absolute weight and increase in the whole length.

The best results for absolute weight growth were in group B treatment of 5.11 ± 0.38 (gr), and the total length yield was 0.94 ± 0.38 cm. While the complete weight results obtained by treatment group A were 0.94 ± 0.38 cm and for the absolute length growth 0.66 ± 0.27 cm. This shows that the treatment in group B, which was given green shellfish feed was much more effective than silkworms; from an economic point of view, green clams were also much more affordable to obtain and use as freshwater lobster seed feed during maintenance.

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