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# Impact of Different Small Fish Feeds on the Growth and Survival of Mangrove Crabs (*Scylla serrata*)

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***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

Mangrove crab (*Scylla serrata*) is a type of crustacean that lives in mangrove forests and estuaries, a member of the portunidae tribe. Mangrove crabs have considerable economic potential at home or abroad and the demand is also quite high. Its availability can only be obtained by continuous capture in the wild, so people are worried about its population. One way to overcome this is by maintaining mangrove crab fattening apartment system. Determination of feed dosage is one of the cultivation processes that needs to be understood because it affects the growth rate, survival and production levels of mud crabs. Therefore, it is necessary to conduct research on the effect of feeding different doses of raw fish on the fattening and survival of mud crabs (*Scylla serrata*). The purpose of this study was to analyze the optimal feed weight and frequency of feeding on fattening and survival of mud crabs in the crab box. The method used in this research is experimental method with complete randomized design. This treatment was carried out with 4 treatments and 3

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replications, namely P1: 4%, P2: 8%, P3: 12% and P4: 16%. The four treatments were repeated 3 times so that 12 experimental units were obtained. the value of water quality parameters obtained during the study is still considered optimal. The results of the research conducted can be concluded that the provision of different doses of raw fish feed in fattening mud crabs is significantly different from the results of absolute weight and Specific Growth Rate (SGR) but not significantly different from the results of Survival Rate (SR) and Feed Conversion Ratio (FCR). The best treatment is p3 with a dose of 16%. The conclusion of this study can be concluded that the provision of different doses of feed affects the absolute weight and specific weight growth rate (SGR) of mangrove crabs (*Scylla serrata*). The water quality obtained is still optimal for mangrove crab cultivation.

*Keywords: Aquaculture; feed; growth; Scylla serrata; survival rate.*

## 1. INTRODUCTION

Fishery commodities that have the potential to support the lives of the community, especially small-scale fishermen, include mangrove crabs (*Scylla serrata*). Most of the mangrove crabs live in almost all shallow waters, mangrove beaches, estuaries and sandy mud beaches. Mangrove crabs are an economically important and expensive coastal fishery resource. This type of crab is popular among the public because of its high nutritional value and contains a variety of essential nutrients [1]. Mangrove crabs have a high protein content of 47.5% and fat of 11.20% as well as good meat flavor and have high nutrition [2]. In addition to having a fairly high economic value, mangrove crabs are also a major export commodity in demand by various countries, such as Australia, the United States, Hong Kong, Japan, Benelux, South Korea, North Korea, Taiwan and Singapore. Mangrove crabs have considerable economic potential at home or abroad and the demand is also quite high and its availability can only be obtained by continuous capture in the wild, so people are worried about its population.

Determination of feed dosage is one aspect of the cultivation process that needs to be understood because it affects the growth rate, survival and production levels of mangrove crabs. Based on observations in the field, some mud crab farmers have been fattening adult crabs, but none of the farmers know exactly the optimal feed dosage for fattening mud crabs. In fact, the farmers give feed without mentioning the dose, resulting in a lot of leftover feed that cannot be eaten by crabs, the remaining feed is toxic to crabs so that water quality becomes unstable and causes excessive feed waste. This study was conducted to determine the optimal feed weight for fattening mangrove crabs by providing different doses of feed in each treatment for fattening mangrove crabs (Edy 2017).

## 2. MATERIALS AND METHODS

### 2.1 Research Methods

This research activity was carried out for 45 days starting June 8 - July 23, 2024 at the Crab Enlargement Unit of CV Alula Dua Satu, Jl. Ahmad Yani No 21, Sayang-Sayang Village, Cakranegara District, Mataram City. Before the research activities, the preparation of maintenance containers and preparation of test animals was carried out for one month starting on May 8 - June 7. This study used an experimental method with a completely randomized design (CRD) consisting of 4 treatments and 3 replications, so that twelve experimental units were obtained as follows: The doses used in this study were P1 (4%/day), P2 (8%/day), P3 (12%/day), and P4 (12%/day). The tools used include aeration as a source of oxygen with a diameter of 5mm, stationery to record the results of practicum such as (books, pencils and pens), crab box as a container of biota tested with a size of 40 x 32 x 18, DO meter to measure dissolved oxygen with Lutron YK-22DO model, bucket for sampling tools with a size of 50 liters, camera phone to document activities during the study, tray as a container when measuring crabs where the tray used is rectangular with a size of 30 cm x 40 sm, ruler to measure the length of the crab carapace, pH meter to measure the acidity of the water using a digital pH meter, refractometer to measure salinity using a brix meter reftaktometer model, thermometer to measure temperature where the brand used is Effosola thermometer, digital scales to weigh the weight of the crab using the SF400 model, measuring cup as a measure of making maintenance media, scissors to cut the aeration hose, scopnett to catch crabs, sponge to clean the crab box as for the soap used to clean the crab box, namely sunlight, after washing the crab box is dried first, claws to catch crabs, blowers as oxygen suppliers, the blower used is Jebo P-50, jerry cans as seawater

reservoirs with a size of 25 liters and pipes as oxygen distributors with a diameter of 1/2 “. The materials used include seawater taken around Senggigi beach, fresh water, fish feed in the form of lemuru fish obtained from the Kebon Roek ampenan market and mangrove crabs measuring 52-75 g obtained from mangrove crab farmers in Sekotong.

The importance of mixing freshwater and seawater in this study is to equalize the salinity of the original habitat of mangrove crabs. The initial salinity obtained in the cultivator is 21 ppt, while the salinity of seawater ranges from 30-33 ppt, so fresh water is mixed with seawater to reduce salinity.

## 2.2 Research Procedures

Preparation of containers and maintenance media is a very important initial stage to be considered. The container used is a crab box for the maintenance of twelve test animals with a size of P 40cm x L 36cm x T 18cm. Crab boxes used as maintenance media were previously washed so that they did not smell when used. The next stage is to assemble the crab box on a rack that has been prepared beforehand then what must be done is the installation of aeration on the pipe and all its equipment as an oxygen supply during the study and enter seawater and fresh water that has been mixed into the crab box with a predetermined salinity with a water level of ± 5 cm or ± 4 liters.

Mangrove crabs (*Scylla serrata*) used weighed 52-75 g/head and the sex of the crabs used was male. The test animals used were obtained from farmers in the Sekotong area, Sekotong District, West Lombok Regency. Before stocking, acclimatization was carried out so that the test animals could adapt to their new environment so that the crabs used did not experience stress. The crabs used in this study were densely stocked with 1 crab per container, so the total crabs stocked in 12 containers were 12 crabs. Crabs that are ready are adapted first before stocking.

The feed used in this study is runcah fish feed derived from lemuru fish obtained from the Kebon Roek market, Ampenan. Where the feed is filleted and then cut into small pieces first before being given to the test animals. The dose of feed given is adjusted to the provisions of the dose that has been determined for each treatment used, namely, P1 (4% / day), P2 (8% / day), P3 (12% / day) and P4 (16% / day). Where the feed given is calculated from the body weight.

Maintenance of test animals was carried out for 45 days with a stocking density of 1 tail per container. Before entering the maintenance period or being treated, fish are first acclimatized for approximately 2-3 days so that biota can adapt to the new environment or maintenance media so as to minimize the occurrence of stress on biota that can result in death in biota or test animals. Stocking in each container, 1 tail per container. In the process of feeding, feeding is done twice a day, starting in the morning at 08.00 and in the afternoon at 17.00. Data collection or sampling was carried out 7 times, starting from day 0, 7, 14, 21, 28, 35, 41 and the last day, namely day 45. The feed dose given is adjusted to the provisions of the dose that has been determined for each treatment used, namely, P1 (4%), P2 (8%/), P3 (12%), and P4 (16%), where the weight of the feed will increase every week following the weight of the crab. During the rearing period, daily watering and water changes are carried out twice a week, and water quality is checked once a week in the morning and evening.

## 2.3 Data Collection

The parameters measured in this study include two parameters, namely the main parameters and supporting parameters. The main parameters consist of checking the biological conditions of biota or test animals, such as absolute weight growth, SGR, FCR and SR. Meanwhile, the supporting parameters in this study consisted of water quality parameters (physical and chemical) such as temperature, *dissolved oxygen*, pH, and salinity. Absolute weight measurement uses the formula Wm = Wt-Wo [3], SGR measurement uses the formula (ln Lt – ln L0)/t x 100% [4], FCR measurement uses the formula FCR= F/(Wt+D)-W0 [5], and SR measurement uses the formula SR= Nt/No x 100% [5].

## 2.4 Data Analysis

Data from the results of the study were then tested using Analysis of variance (ANOVA) with a 95% confidence level using the SPSS 16 program. Analysis of variance test aims to determine the effect of each treatment given. If the final results are significantly different, then further tests are carried out with the Duncan test. Then, for the results of water quality parameters

obtained were analyzed descriptively. The data obtained are presented in the form of narratives, graphs and tables that are reinforced or supported by literature studies, so that complete and clear information is obtained.

## 3. RESULTS AND DISCUSSION

### 3.1 Results

#### 3.1.1 Absolute growth

The results of feeding crab with different doses of feed on fattening and survival of mangrove crabs for 45 days showed that the absolute weight obtained ranged from 3.67-9.33 gas can be seen in Fig. 1.

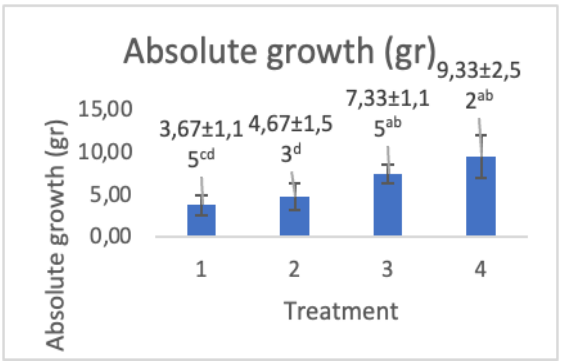


**Fig. 1. Absolute growth of mud crab (*Scylla serrata*) with different doses of groundfish feed**

Based on the results of the Analysis of variance (ANOVA) test, the results obtained are significantly different (P>0.05) so that further tests can be carried out using the Duncan test. Duncan's test results showed that P1 was significantly different from P3 and P4 but not significantly different from P2 (p>0.05), P2 was significantly different from P4 but not significantly different from P1 and P3 (p>0.05), P3 was significantly different from P1 and P2 but not significantly different from P4 (p>0.05), P4 was significantly different from P1 and P2 but not significantly different from P3 (p>0.05). The highest absolute weight was found in treatment P4 (feeding with a dose of 16%) with an average absolute weight value of 9.33 g, followed by treatment P3 (feeding with a dose of 12%) with an average absolute weight value of 7.33 g, then treatment P2 (feeding with a dose of 8%) with an average absolute weight value of 4.67 g, and the lowest value was in treatment P1 (feeding with a dose of 4%) with an average absolute weight value of 3.67g.

#### 3.1.2 Specific weight growth rate (SGR)

The results of feeding with different doses of feed on fattening and survival of mangrove crabs for 45 days showed that the average specific weight growth rate obtained ranged from 2.07%-3.10% as can be seen in Fig. 2.

Based on the results of the Analysis of variance (ANOVA) test, the results obtained are significant (P>0.05) so that further tests can be carried out using Duncan. Duncan's test results show that P1 is significantly different from P4 but not significantly different from P2 and P3 (P>0.05), P2 is not significantly different from P1 and P3 but significantly different from P4 (P>0.05), P3 is significantly different from P4 but not significantly different from P1 and P2 (P>0.05), P4 is significantly different from P1, P2 and P3 (P>0.05). The highest specific weight growth rate value occurred in treatment P4 (feeding with a dose of 16%) with an average value of 0.26%, followed by treatment P3 (feeding with a dose of 12%) with an average value of 0.22%, then treatment P2 (feeding with a dose of 8%) with an average value of 0.18%, and the lowest value was in treatment P1 (feeding with a dose of 4%) with an average value of 0.15%.

#### 3.1.3 Survival rate (SR)

The results of feeding with different doses of feed on fattening and survival of mangrove crabs for 45 days show that the SR obtained on average is 100% except in the P3 treatment which is 67% which can be seen in Fig. 3.

Based on the results of the Analysis of variance (ANOVA) test, the results obtained in the mangrove crab survival rate test were not significant (P < 0.05) or there was no effect given to the provision of different doses of small fish feed on the survival rate of mangrove crabs.

#### 3.1.4 Feed convertion ratio (FCR)

The results of feeding small fish with different doses of fattening and survival of mud crabs for 45 days show that the FCR value obtained is high, which ranges from 1.7-3.8 as can be seen in Fig. 4.

Based on the results of the Analysis of variance (ANOVA) test, the results obtained in testing the Feed Conversion Ratio (FCR) of mud crabs were not significant ($P < 0.05$) or there was no effect given to the provision of different doses of small fish feed on mud crab FCR, so no Duncan test was performed.

### 3.1.5 Water quality

| Parameter | Range | Literature |
|---|---|---|
| Temperature (°C) | 26,6-30 | 25-35°C [6] |
| pH | 7,2-7,4 | 7-7,9 [7] |
| Dissolved Oxygen (mg/l) | 7,3-7.7 | >5 mg/L [8] |
| Salinity (ppt) | 15-22 | 10-30 ppt [8] |

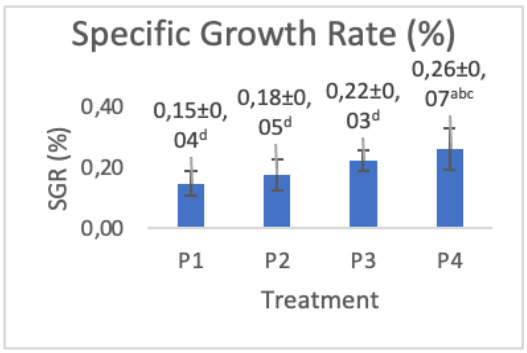


**Fig. 2. Daily weight growth rate of mud crab (*Scylla serrata*) with different doses of stray fish feed**

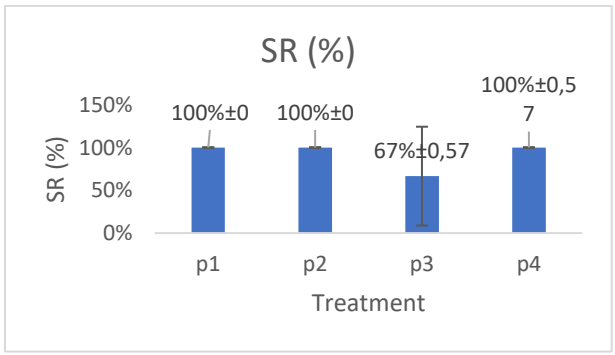


**Fig. 3. Survival rate of mangrove crab (*Scylla serrata*) with different feed doses of raw fish**

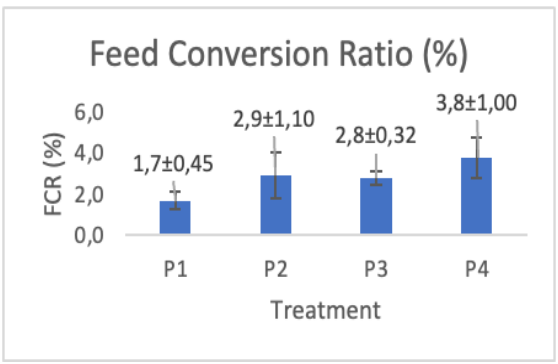


**Fig. 4. Feed conversion ratio of mangrove crab (*Scylla serrata*) with different feed doses of small fish**

## 3.2 Discussion

### 3.2.1 Absolute weight

The observation of absolute weight growth is the growth that occurs during the maintenance process. Where this research was conducted during the 45-day maintenance period. The highest absolute weight results were in the P4 treatment (16% feed dose) which had an absolute weight increase of 9.33 g, followed by the P3 treatment (12% feed dose) which had an increase of 7.33 g, followed by the P2 treatment (8% feed dose) which was 4.67 g and the lowest treatment was in the P1 treatment (4% feed dose) which was 3.67 g. The weight of mangrove crabs fed with 16% feed dose (P4) was 4.67 g, followed by the P2 treatment (8% feed dose) which was 4.67 g. The weight of mangrove crabs fed with 16% feed (P4) experienced the highest increase from week 5 to week 6, which increased by about ± 3 g, where previously the weight did not increase too much even in one week there were those that did not gain weight. This is thought to be influenced by mangrove crabs that at the beginning of rearing have not adapted to their new environment, after the 5th week they just started adapting to their environment. This is in line with the statement of Suryani et al. [4] that the overall weight gain of mud crabs is influenced by feed and favorable environmental conditions. In the study [9] the highest average weight gain during the study in the first week to the fourth week was in the P1 treatment, this happened because at the beginning of the maintenance period the crabs were still active in finding food. In addition, in research [10] that based on daily monitoring at the beginning of mangrove crab rearing, the weight obtained was still not too much, this was thought to be caused by stress caused by environmental transportation and adaptation. The crabs used are male crabs because the growth of male crabs is faster, and they are more resistant to disease. Because male crabs use their energy to focus on growth only, while the female's energy is divided for growth and for reproduction to lay eggs, where the energy from food will be channeled to the eggs later [11].

The results of the Duncan test showed that P1 was significantly different from P3 and P4 but not significantly different from P2, where the P1 treatment was the lowest absolute weight obtained during the maintenance period, this was thought to be due to the availability of food in P1 less than the other treatments so that the weight or weight obtained was lower. Furthermore, the P2 treatment is significantly different from P4 but not significantly different from P1 and P3, P3 is significantly different from P1 and P2 but not significantly different from P4, P4 is significantly different from P1 and P2 but not significantly different from P3, where the P4 treatment is the highest absolute weight obtained during maintenance, this is thought to be because in the P4 treatment the feed given is more so that it meets the eating needs of mangrove crabs. This is in line with the statement of Hariyanto et al. [12] that adequate feed utilization refers to the ability of organisms to support metabolic processes and growth as efficiently as possible, the more feed given, the more adequate the crab's nutritional needs.

Based on the results obtained in Fig. 4, the lowest absolute weight was in the P1 treatment with a feeding dose of 4% of the mangrove crab weight. The cause of this poor absolute weight growth is thought to be influenced by the smaller percentage of feed given compared to the other treatments, so that it does not meet the needs of the crabs. This is in line with the statement [5] that the feeding of lower fish feed does not meet the needs of mangrove crabs. So that it is only able to increase relatively low weight gain. Some factors that can affect the absolute weight obtained in mangrove crab cultivation are the type of feed given. In this study, the feed used was ground fish feed with lemuru fish. The nutritional content of the feed must be in accordance with the needs of mud crabs, such as containing protein, carbohydrates, fat, vitamins and minerals. Where it can be seen that lemuru fish has a high enough protein content value to meet its nutritional needs, which is around ± 20gr/100g. This is in line with the statement [13] that each 100 grams of lemuru (Sardinella longiceps) contains 3 grams of omega 3, 20 grams of protein, 20 mg of calcium, 100 mg of phosphorus, 1 mg of iron, and 10.05 mg of B vitamins. Suryani et al. [4] added that the range of nutritional requirements for mangrove crab growth is 30-40% protein. In research [14] stated that protein is the most important component of feed raw materials for the needs of mangrove crab life. Protein in feed functions as a source of energy for the growth and repair of mangrove crab tissues. Hudita (2020). The feed used in his research is ikan rucah. Ground fish used as feed for crabs is a type of kuniran fish taken from the body which is cut into small pieces and then mashed using a chopper.

### 3.2.2 Specific weight growth rate

Specific weight growth results are growth that can be calculated per day, so this specific growth aims to determine the growth of a biota every day during the maintenance period of 45 days. The results showed that the highest specific growth rate was in the P4 treatment (16% feed dose) which was 0.26%/day, followed by the P3 treatment (12% feed dose) which was 0.22%/day, then in the P3 treatment (8% feed dose) which was 0.18%/day and the lowest specific growth rate was in the P1 treatment (4% feed dose) which was 0.15%/day. The Duncan test results showed that P1 was significantly different from P3 and P4 but not significantly different from P2, P2 was not significantly different from P1 and P3 but significantly different from P4, P3 was significantly different from P1 but not significantly different from P2 and P4, P4 was significantly different from P1 and P2 but not significantly different from P3. This shows that the effect of different doses of feed on the fattening of mangrove crabs is significant.

Based on the results seen in Fig. 2, the highest specific weight growth rate occurred in the P4 treatment (16% feed dose), which was 0.26 ± 0.07%. This result is considered good because the growth is quite optimal, and the feed consumed by mud crabs is higher than other treatments, causing a high daily weight growth rate for growth purposes. This is in line with the statement [15] that high feed availability can meet the total needs of mud crabs after being used for movement, maintenance and metabolic activities. Feeding fresh fish, although not containing complete and balanced nutrients, can provide optimal growth. Suhardin et al. [16] added that maximum growth can occur if the energy stored is greater than the energy used for body activities. The higher the feed utilization by cultivars, the higher the percentage value of specific growth rate.

The lowest specific growth rate was in the P1 treatment (4% feed dose) which was 0.15 ± 0.04%. One of the factors affecting the low value of daily weight growth rate in treatment P1 compared to the other treatments is the amount of feed consumption in P1 is lower at 4% of body weight. This is thought to be influenced by the absolute weight growth obtained higher than the other treatments as well as the feed consumed and the surrounding environment conditions. This is in line with the statement [17] that this phenomenon also occurs in the average value of absolute growth obtained. In the study [18], it was found that the specific weight growth rate was quite significant between each treatment, this was influenced by internal factors that affect the specific weight growth rate, namely disease resistance and denetics while external factors include the availability of food in the environment.

### 3.2.3 Survival rate

Survival rate (sr) is the level of comparison of the number of crabs that live at the beginning of maintenance and at the end of maintenance. Based on the results of analysis of varience (ANOVA) showed no significant difference ($p>0.05$) or no effect given to the SR of mangrove crabs. The highest SR value obtained during the maintenance period is in P1, P2 and P4 where the SR obtained is 100% or no deaths occurred during the maintenance period. Meanwhile, the lowest SR was in the P3 treatment, which was 67%, where death occurred in treatment 3 replication 3. This test crab died allegedly due to the weak immune system of the crab at high temperatures, causing the crab to limp and die. This is in line with the statement [13] that the survival rate is influenced by internal factors including sex, offspring, age, reproduction, disease resistance, and external factors such as water quality.

The highest survival rate in the P1, P2 and P4 treatments is 100%, this sr value is classified as good for mangrove crab cultivation. This high sr result is influenced by several factors such as water quality that is always considered, where in this study a water change is carried out every 3 days and daily flushing so that the water as a medium for maintaining mangrove crabs is maintained. The absence of deaths in P1, P2 and P4 is also suspected because each crab box contains 1 crab so that there is no competition for food that causes death or cannibalism. This is in line with the statement [5] that mortality is caused by competition for space in the struggle for food and cannibalism towards mangrove crabs. In addition, in research [19] that crabs are raised in individual culture containers to eliminate the potential for competition between species and cannibalism. Judging from the results of the sr value obtained during the study, it can be seen that raw fish feed can meet the needs of mangrove crab life, because it can be seen that good food plays a very important role in maintaining survival. This is in line with the statement of Suhardin et al., [16] that feeding quality and favored by crabs can increase the

degree of survival efficiency of mangrove crabs (*Scylla serrata*).

### 3.2.4 Feed conversion ratio (FCR)

Feed Conversion Ratio (FCR) is the level of feed consumption consumed by crabs during the rearing period or a measure stating the ratio of the amount of feed needed to produce 1 kilo gram of meat. In Fig. 4, the best FCR value is obtained in the P1 treatment (4% feed dose) which is 1.7, followed by the P2 treatment (8% feed dose) which is 2.9, then the P3 treatment (12% feed dose) which is 2.8, while the highest FCR is in the P4 treatment (16% feed dose) which is 3.8. It can be seen in Fig. 4, it is known that P1 is significantly different from P2, P3 and P4, P2 is significantly different from P1 and P4 but not significantly different from P3, P3 is not significantly different from P2 but significantly different from P1 and P4, then P4 is significantly different from all treatments. It can be seen that if the higher the fcr value obtained, the more the amount of feed needed so that it becomes not optimal. This is in line with the statement [12] that the higher the feed conversion ratio value, the more inefficient the feeding.

Based on the results obtained in Fig. 4, the highest fcr value is found in the P4 treatment (16% feed dose) which is 3.8. This happens because basically in the P4 treatment the weight of feed used is the most, namely 16% of the crab's body biomass, where every week there is an increase in crab weight which always increases so that the amount of feed given will also increase every week. During the maintenance period P4 is classified as the best treatment which can be seen in the increase in absolute weight and the highest specific weight growth rate among other treatments, but in the feed consumption fcr parameter in P4 is high and less efficient, but its growth is more optimal. This is in line with the statement [3] that the smaller the FCR value, the more efficient the utilization of feed, the quality of feed can be known through feed conversion because the fcr value provides an overview of the efficiency of feed use for mangrove crab growth.

Based on the results obtained in Fig. 4, it can be seen that the lowest FCR is found in the P1 treatment (4% feed dose), which is 1.7. This is because the amount of feed consumption given in the P1 treatment is smaller than the other treatments. In treatment P1 the test crabs used were smaller, with an average weight of 53g. For crabs that are smaller in size, more feed should be given to support their growth. This is in line with the statement [3] that small crabs require a larger percentage of feed than adult crabs, smaller crabs require more energy supply for growth. Hanif et al., [20] added that the level of underfeeding results in stunted growth and crab molting, while overfeeding can cause water pollution from accumulated feed residue. It can be seen from the fcr obtained during the study that it is quite high, where the feed consumed by mangrove crabs is not fully utilized for fattening their bodies but is also needed as their metabolic needs. This is in line with the statement [21] that optimum physiological growth can be achieved if the energy from the feed is maximally utilized after deducting the food waste.

### 3.2.5 Water quality

Temperature is one aspect of the parameters that are very important for the survival of mud crabs. The results of temperature measurements during the study from all treatments ranged from 25.6-29.5, where the highest temperature was in treatment p1 which was 28.5 in the 2nd week of maintenance while the lowest temperature was in treatment p4 which was 25.6 in the 5th week of maintenance. Things that affect the high and low temperature can be influenced by several factors, one of which is weather conditions and the high and low aeration in the crab box, but the temperature measurement results obtained during the study are still considered optimal. This is in line with the statement [6] which states that water temperature affects the growth and survival of mangrove crabs, with an optimal temperature range between 25-35°C. The results of temperature measurements obtained during the study were compared with the results of other studies. The temperature measurement results obtained during the study compared to the temperature in the original habitat of mangrove crabs are almost the same where in each treatment the temperature results are not much different. The temperature range for mangrove crab (*Scylla serrata*) cultivation in its natural habitat is 28-29°C. This can be compared with research [22] that temperature measurements were taken when the sea water at the research site began to tide. The results found that the temperature in the mangrove conservation area is 29 ° C, which means that this temperature is still good for the life of mangrove crabs. Mangrove crabs are biota that are quite resistant to high and low water temperatures where it can be seen from research [23] that the temperature

received by mangrove crabs ranges from 18-35 ° C, but the normal range is 25-30 ° C.

The pH value obtained was measured at 7.2-7.5. The results of pH measurements during the study from all treatments were 7.2-7.5, the pH value obtained was measured every time sampling or every week, where the pH value obtained was still considered optimal in mangrove crab cultivation. This is in line with the statement [24] that the optimal pH for mangrove crab growth is neutral to alkaline, which is 7 - 8.5. The pH value greatly affects the survival of mangrove crabs if the pH value is <7 or >8.5 can cause crabs stress and death. The results of pH measurements during the study in each treatment showed results that were not much different from the pH value in mangrove crab cultivation in their natural habitat. This is in line with the statement of Thasya et al. [25] that the acidity value obtained in mangrove waters where mangrove crabs live ranges from 6.7-7.0.

The results of *dissolved oxygen* measurements during the study showed the lowest result was 7.3 and the highest was 7.7. The Do value obtained is still considered optimal. This is in line with the statement [8] that the good *dissolved oxygen* value for mangrove crab cultivation is >5 mg/L. *Dissolved oxygen* has a very important role in the life activities of an organism, such as respiration and the process of decomposition of organic matter by decomposers. The value of *dissolved oxygen* obtained in the study shows results that are not too different from the results of mangrove crab cultivation in their natural habitat, where in the original habitat of mangrove crabs, *dissolved oxygen* levels are usually obtained at 4->5 mg/L for maximum growth. This is in line with the statement [26] that the oxygen requirement for mangrove crab life is >4 mg/L, while the oxygen requirement for maximum growth of mangrove crabs is >5 mg/L, but it is also stated that mangrove crabs have tolerance to low *dissolved oxygen* concentrations or smaller than these figures. In the study [27], the results of *dissolved oxygen* during the maintenance period were (5.1 mg/L-5.7 mg/L) where the results obtained showed an optimum or stable value. The role of optimal *dissolved oxygen* is one of which can overcome stress conditions that may be caused by external and internal factors in mud crabs.

The results of salinity measurements during the study from all treatments were the highest 25 ppt and the lowest 20 ppt. The salinity measurement results obtained are still considered optimal for the life of mud crabs. This is in line with the statement of Aji et al., [28] that (*Scylla Serrata*) can live and grow in a salinity interval between 10 ppt and 30 ppt. During the maintenance period, every time the water is changed, the water used is seawater which has been reduced in salinity by mixing fresh water which initially had a salinity of 33 ppt to 20 ppt. The initial salinity in this study had previously been determined to be 20 ppt, measured once every 1 week, the results varied, ranging from 20-25. Where the salinity value can also be influenced by the time of checking the salinity, the high and low temperature also affects the salinity value obtained. The salinity of mangrove crab life in its natural habitat on average shows 25 ppt [24]. In the study [23], it was found that the optimal growth results of mangrove crabs were good during the maintenance period, namely at salinities ranging from 15-25 ppt. In research [29] stated that the salinity range for the development of S. paramamosain larvae is 25-35 ppt, while adult crabs can survive in seawater that has a salinity range of 5-33 ppt, even 0 ppt.

## 4. CONCLUSIONS

The conclusion of the study can be concluded that different feed doses affect the absolute weight and specific weight growth rate (SGR) of mangrove crabs (*Scylla serrata*). The best treatment is in the P4 treatment (16% feed dose) which is absolute weight of 9.33 ± 2.52 g, specific weight growth rate of 3.01 ± 0.27%. The best FCR in the P1 treatment (4% feed dose) was 1.7 ± 0.45%, and the survival rate (SR) was 100%. Water quality in the study was still optimal for mangrove crab cultivation.

### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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