Effectivity of rearing with difference composition of feed toward body weight gain of mud crab *Scylla olivacea* in the mangrove area, Tuhaha Village, East Saparua, Central Maluku-Indonesia

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**Abstract.** This study was aimed to determine the level of weight gain of adult mud crabs given different doses of feed at the front of the mangrove area in Tuhaha Bay, Central Maluku Indonesia. Mud crabs (*Scylla olivacea*) with average initial body weight (BW) of 100.36±8.35g were placed in a plastic basket measuring 50 x 25 x 17 cm³ which hanging on bamboo raft. Prior to measurement, the crabs were acclimatized for one week at the location with 3% feeding/BW. Treatment with three different fish feed doses i.e., 5% trash fish: 5% mashed raw papaya (Treatment A), 7.5% trash fish: 2.5% mashed raw papaya /BW (Treatment B) and trash fish 10%/BW (Treatment C). Each treatment consisted of 6 individuals as replicates. Data collection includes absolute BW and Specific Growth Rate (SGR). Data were analyzed using descriptive statistic and displayed in tables and graphs. The results showed that mud crabs given treatment A, B and C had an average BW of 95.03±2.84g, 100.22±3.81g and 114.83±2.55g, respectively. Relative BW gain and SGR of treatment B was higher than those of treatment A and treatment C. These results indicated that treatment B is quite effective in meeting the energy needs for increasing the body weight of individual crabs at this location.

1. Introduction

Research into various aspects of mud crab rearing has been carried out in Indonesia for at least a decade. The rearing technology is still ongoing which consists of aspects of seeding and growing. However, both activities must be carried out based on the precautionary principle which aims to sustain the mud crab resources. The efforts have not been able to solve the most important problem in the development of mud crab rearing, which is to ensure adequate supply of young crabs to mature [1]. It seems that research requires a new approach because the rearing technique requires technology that is productive, efficient, cost-effective and environmentally friendly. Therefore, this study was conducted with the concept of a suitable mud crab cultivation model approach for growing activities because it relates to the availability of resources and geographical conditions of an area.

Tuhaha Village is one of the coastal villages in Saparua Timur District, Central Maluku Regency, Maluku Province. This village has mangrove forest with various marine biotas, especially mud crabs (*Scylla* spp.) which are potential to be developed. The crabs that weigh between 50 and 400 g are sufficiently available so that they are not a limiting factor in the area. In addition, the availability of non-economic fish resources as a source of feed for the crabs is quite abundant. Therefore, it is necessary to
develop the nutritional feed that is cost-effective. Efficient use of feed and maximum utilization of all dietary nutrients is important so that the digestive efficiency of cultured species can be increased [2]. According to Anderson et al. (2004)[3], the digestibility of crabs to all plant fiber ingredients is very high, so the opportunity to formulate a feed with various sources of raw materials that have bioactive components appropriate to the needs of cultivation. Based on this, the study was conducted to determine the effect of fed trash fish supplemented diet with raw papaya fruit and its enzymatic processes on weight gain of mud crab rearing in a floating system around the mangrove of Tuhaha bay, Saparua Island, Maluku Indonesia.

2. Materials and Method

2.1. Rearing of mud crabs

The research took place for one month starting from February to March 2018. Plastic basket measuring 50 x 25 x 17 cm³ was used to keep individual crab of *Scylla olivacea*. Before experiment, crabs were acclimatized for one week and fed with trash fish as much as 3% of body weight (BW) once a day in the afternoon.

2.2. Research design and data collection

Observations on individual weight gain of mud crabs were carried out by treatment of different feed composition as much as 10% / BW. Each composition of treatment feed consisted of 5% mixed trash fish with 5% mashed raw papaya (Treatment A), 7.5% trash fish mixture with 2.5% mashed raw papaya (Treatment B), and 10% trash fish (treatment C). Feed of treatment A and B were mixed with 2% wheat flour and dipped in boiling water then cooled before use. The average initial weight of individual crabs was 100.36 ± 8.35g which was maintained with a floating system using a raft made of a bamboo stick. All treatments consist of six containers filled with 1 individual crab as a replication. On termination of the experiment, the weight of all the animals was recorded and the following observations were calculated using formula proposed by Patil and Singh (2014) [4]:

\[
\text{Weight gain (\%)} = \frac{\text{Final weight} - \text{Initial weight}}{\text{Initial weight}} \times 100
\]

\[
\text{Specific Growth Rate (\%)} = \frac{\ln \text{final weight} - \ln \text{initial weight}}{\ln \text{initial weight}} \times 100
\]

2.3 Data analysis

Data were analyzed using descriptive statistics by Microsoft Excel software and displayed in tables and graphs. To test differences in the experiment were analyzed with one way ANOVA.

3. Results and Discussion

3.1. The Body weight gain of mud crab *Scylla olivacea*

Average body weight of mud crab *S. olivacea* for each treatment at the end of the experiment is presented in Table 1. It can be seen in Table 1 that average body weight of mud crab given treatment C is higher than average weight of mud crab treated with treatment A and treatment B. However, the result of ANOVA showed that there is no significant difference of average body weight of mud crab given treatments A, B and C. The higher average size of mud crab given treatment C at the end of the
The experiment may be due to the larger initial weight of those individual crabs at the beginning of the experiment. According to Cholik (2005)[5], the difference in the growth of crabs in cultivation is caused by feed, age, initial weight, space of motion, and other factors.

On the contrary, the average value of body weight gain of mud crab given treatment B was relatively higher (3.05%) than those given treatment A (2.75%) and treatment C (2.43%) (Table 1). The results of this study indicate that the individual crab group treated with B feed composition, which is a mixture of 7.5% trash fish with 2.5% mashed raw papaya/ body weight, apparently responded to the high body weight gain value. It is suspected that to increase the proportion of crab body weight, besides the protein content of trash fish, the addition of 2.5% mashed raw papaya is enough to meet this need when compared to the crab individual group given C treatment, only 10% trash fish feed without mashed raw papaya. According to Anderson et al. (2004)[3], digestibility of crabs to fiber and all raw materials for plant-based feed are very high, ranging from 94.4 to 96.1%. Similarly, the range of protein content for crab feed is 34-54%. Crab is classified as opportunistic feeders, carnivores, herbivores, scavenger, and cannibals [6] or it can be said that mud crabs are omnivores. Therefore it has the opportunity to formulate feed with various sources of raw materials that have bioactive components according to aquaculture needs.

Table 1. Average wet body weight and body weight gain, of mud crab fed with diets during experimental period.

| Growth Parameter | Treatment | A          | B          | C          |
|------------------|-----------|------------|------------|------------|
| Average body weight ± SD.(g) | 95.03 ± 2.84 | 100.22 ± 3.81 | 114.06 ± 2.55 |
| Body weight gain (%) | 2.75     | 3.05       | 2.43       |

3.2. Specific growth rate (SGR) of mud crab Scylla olivacea
Specific body rate (SGR) during the rearing period showed that the crab group treated with B is higher (1.51%), followed by the crab treated with A (1.28%) and treatment C (1.08%) (Figure 1). This result shows that the individual crab fed with treatment A and B which is trash fish mixed with mashed raw papaya can increase the SGR.

![Figure 1. The SGR value of mud crabs given treatments A, B and C](image-url)
Papaya has many components of bioactive compounds and two important compounds of them are chymopapain and papain [7]. The results of the study have shown that papain as a protease enzyme found in latex is quite high, especially in raw papaya fruit, and it is a major constituent in various proteolytic enzyme activities. Papain is a proteolytic enzyme from the cysteine proteinase family as evidence that works to break down protein connective tissue. Better growth in *Salmo salar* by supplementing proteolytic enzymes to the diets has been similar. In addition, supplemented diets were due to the increase in protein digestion.

Thus, the proteolytic enzymes play a role in protein digestion. This may be due to the increase in digestion capacity because of the ready availability of papain along with feed [4, 7, 8, 9, 10]. In addition, the rearing condition with a floating system can guarantee the need for water quality in the habitat around the mangrove forest that is suitable for the needs of mud crabs for its growth.

### 4. Conclusion

Body weight gain of mud crabs *S. olivacea* that were treated with a mixture of trash fish and mashed raw papaya feed as much as 10% body weight is higher than mud crabs fed only with trash fish. It seems that the amount of food consists of 7.5% trash fish with 2.5% mashed raw papaya/crab BW is quite effective in meeting the energy needs for increasing the body weight of individual crabs at this location.

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