International Journal of PharmTech Research
CODEN (USA): IJPRIF, ISSN: 0974-4304, ISSN(Online): 2455-9563
Vol.9, No.6, pp 336-338, 2016

Nutrient Content of Body and Growth as Physiological Responses of Mud Crab *Scylla olivacea* Reared Male Monosex in Mangrove

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Abstract : The dynamics of the body nutrient content and growth in the mud crab *Scylla olivacea* were studied as physiological response in mangrove areas. Crab farming in mangrove areas is a concept of silvofishery. The ecofriendly aquaculture began to develop. The body nutrient and growth significantly ($p<0,01$) influnced by density of mud crab in mangrove areas.
Keywords. Crabs; density; growth; mangrove, nutrient.

Introduction

Today intensive aquaculture system is not ecofriendly. The cultivation systems often do not consider the environmet in its development, so the impact on the quality decrease of a healthy environment. Therefore required an environmentally approach to aquaculture.

Silvofishery is one of the ecofriendly fish farming system. Utilization of mangrove areas as farms provides many advantages, because the ecosystems of mangrove provide many nutrients. The existence of mangrove roots play a role in filtering water, so the water quality is maintained for aquaculture.

Almost all of the economic aquatic organisms can be cultivated with the silvofishery. Mud crab is one of economic aquatic organisms, which is widely cultivated in mangrove areas. E.g. crab fattening. However, the resulting production is not maximized in generating growth. Methods of cultivation should be observed by adjusting the bahavior and habits of the crab.

Mud crabs are known as commercial aquatic organism, but studies are required for aquaculture development in Indonesia. Recently, studies of RNA expression be a valuable knowledge to crab development [(1;2)], especially for soft shelling crab production.

Stocking density is one of the factors that affect to the growth, behavior, survival and the production of crab[(3)]. Density produces a social hierarchy and have an impact on growth of *Javanese flounder*. The increase of stocking density significantly affect the growth inhibition of invertebrate[(4;5)], stimulating individual neuroendocrine, accelerate energy consumption, and the dynamics of the nutrient content of the body[(6)].Therefore under stress condition, the crab uses a number of nutrients resulting in a decrease of nutrient content of the body.

In this study we observed the nutrient content of body and growth, which became a reference in determining the ideal density of male monosex crab farming in mangrove (silvofishery).

Material and Method

Animals

Adult mud crabs *Scylla olivacea* wereobtained from Pallime Village, Bone Regency, South Sulawesi. Research conducted on mangrove areas in Mandalle Village, Pangkep Regency, South Sulawesi.

Crab Cultivation

Cultivation cage used is woden cage size lenght 1.0, width 1.0, and height 1.0 m. The 12 cages placed randomly in mangrove area. Crabs were fed fresh fish obtained from fishermen around the study site. The feed is given twice a day, 10% of crab biomass.

Analysis of Nutrient Content and Growth

Nutrient content analyzed include protein, fat, and energy. Analysis was performed by following the procedure of AOAC 1990. Growth was measured using the formula of specific growth rate, and absolute growth. The data were analyzed with ANOVA and W-Tukey test.

Result and Discussion

Analysis of the nutrient content is a chemical analysis to identify nutrient reserves in the body of the organism. Nutrient content of crabs which were maintained with male monosex system in mangrove area, showed significant differences (Table 1). Based on the results, stocking density showed significant differences ($P<0,01$) on the content of nutrient in crabs. The highest nutrient content showed by 5 and 10 crabs/cage, and lowest showed by 20 crabs/cage.

Tabel 1. Nutrient content of monosex mud crab in mangrove areas

Density (crabs/cage)	Nutrient content		
	Protein (%)	Fat (%)	Energy (kcal/g)
5	$48,90 \pm 0,19^{a}$	$12,09 \pm 0,10^{a}$	$3.691 \pm 31,09^{a}$
10	$48,86 \pm 0,11^{a}$	$12,09 \pm 0,05^{a}$	$3.663 \pm 11,15^{a}$
15	$46,31 \pm 0,55^{b}$	$10,95 \pm 0,07^{b}$	$3.503 \pm 14,80^{b}$
20	$44,22 \pm 0,22^{c}$	$10,33 \pm 0,07^{c}$	$3.520 \pm 20,52^{b}$

The font difference in the same column is significant at the 0.05 level.

The lowest nutrient content of 15 and 20 crabs/cage, due to the competition in obtaining food and space. While the crabs in density group of 5 and 10 crabs/cage actively obtained food in cage. The high density resulted stress to crabs, so the physiological process resulting in the use of the body's nutritient. The stress also impacted to neuroendocrine process [(6)].

The growth of monosex mud crab in mangrove area, which reared by different densities showed in Table 2.

Table 2. Growth of mud crab in mangrove area.

Density (crabs/cage)	Specific Growth Rate (%/day)	Absolute growth (g)
5	$1,41 \pm 0,01^{a}$	$55,73 \pm 5,66^{a}$
10	$1,09 \pm 0,10^{a}$	$44,96 \pm 4,93^{a}$
15	$0,70 \pm 0,06^{b}$	$28,26 \pm 0,83^{b}$
20	$0,57 \pm 0,06^{c}$	$22,57 \pm 2,59^{c}$

The font difference in the same column is significant at the 0.05 level.

The present study found that crabs reared in male monosex system in mangrove area showed significant difference ($p < 0,01$) on the specific growth rate and absolute growth.

As shown in Table 2, specific growth rate and absolute growth of mud crabs are highest in density group of 5 and 10 crabs/cage, while the lowest resulted by density group of 15 and 20 crabs/cage. This suggests that the density group of 5 and 10 crabs/cage is best for crab fattening in mangrove area. The stocking density is one of the factors that influence on growth, therefore the maximum growth can only be obtained if the crab is maintained at the proper density. As reported in shrimp, the density influence on survival, growth, bevhavior, and production biomass [(1)]. The growth data of crabs supported by nutrient content of body. Bioenergetically, the growth is external indicator of physiological process that utilizing nutrient content of body in certain time. The magnitude of change can be predicted by the content of retention material.

The low rate of specific growth and absolute growth in density group of 15 and 20 crabs/cage, may be due to competition between crabs in cages. This competion resulted in stress [(6)], so stunted growth [(7;5)].

The parameter of water quality observed in this research showed ideal value for mud crab (Temperature 25-29°C, pH 7.23-7.48, salinity 25-27 ppt, DO 4.58-4.91 ppm, ammonia 0.004-0.006 ppm, nitrat 0.30-0.37 ppm, turbidity 26.72-29.12 NTU), so that the external factors can be ignored in influencing physiological process of crabs. As suggested for optimal growth at temperature of 26-32 ^{o}C, pH of 7.5-8.5, dissolved oxygen >3 ppm, ammonia <0,1 ppm dan nitrit < 0,5 ppm[(7)].

Conclusion

The present study showed that nutrient content and growth of mud crab *Scylla olivacea* highest in density group of 5 and 10 crabs/cage. We suggest that stocking density of male monosex for silvofishery.

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