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EFFECT OF FRESH FEED AND DENSITY TO THE SURVIVAL RATE OF JUVENILE MANGROVE CRAB *SCYLLA SERRATA*

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ABSTRACT

The problem of seed production of Scylla serrata juvenile is the massive mortality due to cannibalism among them that normally happen when the animal undergone the molting. The density of juvenile and the feed play important role to avoid the cannibalism. The aim of the study is to understand the interaction between fresh feed and density in controlling the mortality of the juvenile reared in the laboratory scale. A factorial plot with three levels of treatments of fresh feed and three levels of juvenile densities was used in this experiment. The fresh feed treatment did not significantly influence either survival rate or growth rate of juvenile. On the other hand, the density strongly influenced the survival rate of juvenile but not to the growth rate.

Key words: Mangrove crab, Scylla serrata, survival rate, growth rate

INTRODUCTION

Scylla serrata, known as mangrove crab, and due to its high economic value, has become a subject to intensive fishing since many decades. (Delsman and De Man, 1925; Wahyuni, 1986; Suprapto et al., 2001).

In Indonesia, fattening of small crab traditionally has been conducted for several years. These activities are found in some places, for example in Cilacap, Central Java; Samboja, East Kalimantan; Pallima–Bone, South Sulawesi (Cholik et. al., 1990). Aquaculture venture have been stimulated caused by declining production of crab from fishing activities. The decline of crab fishing production and limitation of small crab for fattening leading to the laboratory experiment for production of seed.

Studies on the artificial rearing of *Scylla serrata* larvae in the laboratory skill have been conducted and reported by several authors, among others: Ong (1964, 1966); Du Plessis (1971); Hill (1974); Brick (1979); Wahyuni (1985); Kasri (1986); Juwana and Suprapto (1992).

The problem of seed production of *Scylla serrata* larvae is the massive mortality. This condition has still happened even though the seed has already reached the stage of Crab 1 – Crab 41. One of the reasons is the cannibalism among them, which normally happen when crab undergone the moulting. The density of organism in the culture system and the type of fresh feed play a very important role in the success of seed production, especially in increasing the growth rate.

The aim of this study is to understand the interaction effect of fresh feed type and density of juvenile to the

survival rate and growth rate and finally to understand the optimum density of juvenile and the most preferable fresh feed towards survival and growth rate.

MATERIAL AND METHOD

Stock of Juvenile

A series of experiment on rearing of megalopa had been done at the same time with this experiment. Therefore the stock of juvenile was collected from the parallel culture of megalopa. The stock of juvenile is 30 – 34 days of age, with 2 mm carapace width, 2 mm carapace length and 4 – 6 mg of weight.

Culture Medium

Culture medium was sea water obtained from Jepara waters; filtered by sand filter which then was followed by filtration of 100 and 5 micron pore-size. The stock culture was held in a 100 ml plastic container previously filled with clean beach sand particle of 2 cm thickness.

Variable

The variables of research during the experiment are presented in the table 1.

Table 1. Variable of Research Measured

No	Variable	Equipment	Accuracy
1	Weight of Juvenile	Electronic Balance	0.1 mg
2	Water Temperature	Thermometer	0.5° C
3	Quantity of Juvenile	Handy counter	-
4	Salinity	Refractometer	0.5 ppt
5	Dissolved Oxygen	DO-meter	0.05 ppm
6	Ammoniac	Spectrophoto-Meter	0.05 ppm

Experimental Design

The Experimental design employed in this experiment is factorial plot with three levels of treatments of fresh feed and three levels of juvenile densities. Treatment combination in the experiment is executed three times on every level of fresh feed (F) and density (D), table 2.

Table 2. Factorial Combination of Three Levels of Fresh Feed and Density

Factors		Fresh Feed (F)		
		F1	F2	F3
Density (D)	D1	F1D1	F2D1	F3D1
	D2	F1D2	F2D2	F3D2
	D3	F1D3	F2D3	F3D3

RESULT AND DISCUSSION

Survival Rate

The survival rate of juvenile in every treatment is presented in table 3. Anova on the survival rate of juvenile of the experiment showed that the effect of different fresh feed on the survival rate were not significantly different ($P<0.05$). On the other hand, the effect of density on the survival rate of juvenile was very significantly different ($P<0.01$).

D1 (5 juveniles) gives the best survival rate, followed by D2 (10 juveniles) and D3 (15 juveniles) respectively. This finding is in line with Juwana and Suprapto (1992). These authors stated that the effect of temperature and density of larvae on survival rate were significant. In fact survival rate of juvenile might be affected by several factors, such as:

- Biological and physiological condition of juvenile
- Ratio between density and feed provided
- Environmental condition and water quality

Table 3. Survival Rate of Juvenile Feed with Different Fresh Feed and Reared in Different Density

Treat-ment	Replication			Average
	1	2	3	
F1D1	60,00	60,00	60,00	60,00
F1D2	30,00	20,00	20,00	23,33
F1D3	13,33	13,33	06,66	11,11
F2D1	60,00	40,00	60,00	53,33
F2D2	30,00	50,00	30,00	33,66
F2D3	06,66	13,33	06,66	08,88
F3D1	80,00	80,00	60,00	73,33
F3D2	30,00	20,00	30,00	26,66
F3D3	13,33	20,00	13,33	15,55

Brick (1974) reported that survival and development of larvae of *Scylla serrata* varied with the type and concentration of food organism used. In this experiment even though the type of fresh feed do not affect survival rate but most of the juveniles fed by shrimp meat resulted in the highest survival rate whatever the densities. Based on the result of proximate analysis (table 4) showing that shrimp meat having highest protein content (18.37%) compared with *Anadara* sp. (11.82%) and trash fish (11.42%). According to Akiyama et. Al. (1991) protein is very important for growing juvenile mangrove crab and should contained 10 essential amino acid, particularly lysine, arginine, leucine, isoleucine and valine. According to Hutabarat (1997) fresh feed used in this experiment contain 10 essential amino acid. Kanazawa (1985) stated that beside the availability of EAA, the feed should contain a long chain of fatty acid (n-3 HUFA) and (n-6 HUFA). Since the fatty acid could not be synthesized by mangrove crab (Castel, 1982) therefore they should be available in the diet given to the crab in a certain concentration. Djuwito et. al. (1992) stated that the protein requirement of fattening mud crab was ranging from 30% - 35%. It means that the fresh feed given to the juvenile is still lower than it should be. Anyhow, the shrimp meat which having protein content of 18.37% still giving the highest survival rate. Hutabarat (1984) stated that protein content in aquatic animal feed should be in a high percentage to produce a good quality, efficient and better conversion of feed. It seems that the results were affected by the quality of fresh feed since the water quality during all experiment was in a good condition.

Table 4. Proximate analysis of fresh feed used in the experiment (%)

No	Para-meter	Fresh Feed		
		Trash fish	Shrimp	Clam
1.	Protein	11.42	18.37	11.82
2.	Lipid	0.26	0.19	0.29
3.	Water	77.38	75.22	80.27
4.	Ash	1.16	1.23	1.27
5.	Rude fibre	1.57	0.32	1.22
6.	Hidrat Carbon	8.21	4.67	5.24

Growth Rate

The result of measurement of growth rate of juvenile under different fresh feeds and densities could be seen in Table 5. Anova on the growth rate of juvenile showed that there was no effect of different fresh feed and different density. Furthermore, there is no interaction from both treatments. This finding is in line with Juwana and Suprapto (1992), which indicated that initial density of larvae, had no effect on the growth rate and the development of larvae. The development of larvae is rather accelerated by temperature, salinity and other environmental condition.

According to Cowan (1984) minced shrimp and chopped mollusc can be the foods for megalopa to metamorphose to crab instar I in the concentration of 50-200 gram/ton (water medium). This author also stated that rotifers are not suitable for portunid larvae.

Since juvenile tends to stay at the bottom of the container rather than to swim near the surface, it is not recommended to give planctonic organism as the main food. Yatsuzuka and Sakai (1980) provided minced *Tapes japonica* for rearing of the later zoeal stages to megalopa. In this case, continuous aeration was provided in the way that the rearing water always circulated from the bottom to the surface, so that the megalopa will not stay at the bottom. Another technique of feeding can be mentioned here that 2-4 day old nauplii of *A. salina* can be used to obtain the higher production of juvenile than the newly hatched nauplii of *A. salina* (Juwana, 1989). In addition, time of feeding of juvenile has also influenced the growth rate. The most important is having regular schedule of feeding. In this experiment, the feeding time are: 07.00 – 08.00 a.m.; 13.00 – 14.00 p.m. and 19.00 – 20.00 p.m. regularly.

According to Brick (1974) reported the use of single and combination for feeding the organisms, and found that no single food other than *Artemia* nauplii supported Zoeal survival to the megalopal stage. Production of megalopa was well related to food concentration. Development time of megalopa is comparable among feeding treatments. Though the variation of food concentration in overall is significantly different. Megalopal production varies significantly only between the extreme treatments.

Table 5. Average Weight Data per Individu and Every Stages (n=3)

Treatment	Stages						
	C1	C7	C13	C20	C27	C34	C41
F1D1	0,023	0,120	0,177	0,190	0,223	0,260	0,294
F1D2	0,023	0,099	0,295	0,307	0,526	0,508	0,691
F1D3	0,023	0,097	0,281	0,550	0,690	0,931	1,063
F2D1	0,023	0,096	0,198	0,226	0,824	0,361	0,446
F2D2	0,023	0,197	0,476	0,980	0,980	0,479	0,507
F2D3	0,022	0,205	0,274	0,469	0,031	1,924	1,553
F3D1	0,023	0,055	0,157	0,220	0,290	0,407	0,445
F3D2	0,023	0,091	0,156	0,905	0,387	0,557	0,791
F3D3	0,023	0,101	0,249	0,425	1,353	1,529	1,78

Water Quality Medium

Data of environmental condition recorded during rearing of juvenile of mangrove crab during experiment was useful to describe water quality maintaned during the experiment. The data of environmental condition compiled from the present study was presented in the table 6. The variable and its value of water quality measured during the experiment were temperature (26-31°C), salinity (30–32 ppt), pH (7), DO (5.2–6.8 ppm) and ammonia (0.012-0.08 ppm). According to the values the water quality of the rearing medium during the experiment was considered to be very good.

Those variables are chosen to be monitored since they have very important influence to the growth and survival rate of the juvenile of mangrove crab. The variation of temperature will influence strongly the energy needed by the organism (Thompson and Newell, 1985) as with salinity, ammonia and pH (Verranan, 1974). Furthermore, dissolved oxygen should be maintained above the critical point of consentration since beyond the optimum condition will influence the organism in form of hyperoxy and hipoxy (Rosenmann And Morrison, 1974). In the

condition when the partial pressure of oxygen is low, the diffussion of oxygen into the lamelle of branchy will be difficult. It is caused by the difference of the partial presure between blood and in the medium.

Table 6. Water quality of the raearing medium

Treatment	Temperature (°C)	Salinity (ppt)	pH	DO (ppm)	Ammonia (ppm)
J1 D1	26-31	30-32	7	5.2-6.4	0.0024-0.08
J1 D2	26-31	30-32	7	5.6-6.4	0.0012-0.024
J1 D3	26-31	30-32	7	5.6-6.8	0.0028-0.003
J2 D1	26-31	30-32	7	5.6-5.8	0.0024-0.043
J2 D2	26-31	30-32	7	5.2-6.8	0.003-0.05
J2 D3	26-31	30-32	7	5.6-6.8	0.0015-0.003
J3 D1	26-31	30-32	7	6.0-6.8	0.003-0.0035
J3 D2	26-31	30-32	7	5.2-6.4	0.0028-0.05
J3 D3	26-31	30-32	7	6.0-6.8	0.0024-0.017

Note: D1, D2 and D3 are the density of juvenile that are 5, 10 and 15 juvenile per litre respectively.

CONCLUSION

The result of the present study can be concluded as follows:

1. The fresh feed used in this experiment having the equal influence to the survival rate and growth rate of the juvenile of mangrove crab *Scylla serrata*.
2. The density has very significant influence to the survival rate of the juvenile of mangrove crab *Scylla serrata*.
3. The protein content of the fresh feed showed the positive correlation with the survival rate.

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