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GROWTH AND SURVIVAL OF WHITELEG SHRIMP LARVAE AND POST LARVAE (*Litopenaeus vannamei*) WITH DIFFERENT STOCKING DENSITIES AT PT SUMMA BENUR SITUBONDO

Pertumbuhan Dan Sintasan Larva Dan Post Larva Udang Vaname *(Litopenaeus vannamei)* Dengan Padat Tebar Yang Berbeda Di Pt Summa Benur Situbondo

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ABSTRACT

Stocking density plays a very important role in the process of Whiteleg shrimp seeding. High stocking density in Whiteleg shrimp larvae will affect the growth and survival of the shrimp. This study aims to analyze the growth and survival of whiteleg shrimp larvae with different stocking densities. The research method used is experimental. This study consists of 1 stocking density treatment with a stocking density of 115 fish/L (treatment A) and 176 fish/L treatment (D) which is repeated 3 times. This study consists of 6 tanks with a volume of 13,000 liters. During the maintenance period, the larvae were given natural feed and artificial feed. The parameters tested were water quality (temperature, pH, DO and salinity), survival and growth parameters. Data analysis used ANOVA. The results of the study showed that the population in the form of a presentation of each larval stage of treatment A was significantly different from treatment D. Likewise, the results of the survival analysis of treatment A were significantly different from treatment B. This means that treatment A with a density of 115 fish/L had better survival compared to a density of 176 fish/L. However, the results of the analysis in treatment A were not significantly different from treatment D. This means that the stocking density does not affect the growth of post larvae. The recommendation for proper stocking density in larval maintenance to produce high survival is to use a stocking density of 115 fish/L.

Keywords: Larvae, Growth, Stocking Density, Survival Rate

ABSTRAK

Padat tebar memenag peran yang sangat penting dalam proses pembenihan udnag vaname. Padat tebar yang tinggi pada larva udang vaname akan berpengaruh terhadap pertumbuhan dan sintasan udang tersebut. Penelitian ini bertujuan untuk menganalisis pertumbuhan dan sintasan larva udang vaname dengan padat tebar yang berbeda. Metode penelitian yang digunakan adalah secara eksperimen.Penelitian ini terdiri dari 1 perlakuan padat tebar dengan padat tebar 115 ekor/L (perlakuan A) dan 176 ekor/L perlakuan (D) yang diulang sebanyak 3 kali. Pada

penelitian ini terdiri dari 6 bak dengan volume 13.000 liter. Selama masa pemeliharan larva diberi pakan alami dan pakan buatan. Parameter yang diuji adalah kualitas air (suhu, pH, DO dan salinitas), parameter sintasan dan pertumbuhan. Analisis data yang digunakan ANOVA. Hasil penelitian menunjukan bahwa pupulasi dalam bentuk presentasi setiap stadia larva perlakuan A berbeda nyata dengan perlakuan D. Begitu juga hasil analisis sintasa perlakuan A berbeda nyta dengan perlakuan B. Artinya bahwa perlakuan A dengan kepadatan 115 ekor/L memiliki kelangsungan hidup lebih baik dibandingkan dengan kepadatan 176 ekor/L. Akan tetapi hasin analisis pada perlakuan A tidak berbeda nyata dengan perlakuan D. Artinya padat tebar tidak berpengaruh terhadap pertumbuhan post larva. Rekemondasi untuk padat tebar pada pemeliharaan larva yang tepat untuk menghasilkan sintasan yang tinggi yakni dengan menggunakan padat tebar 115 ekor/L.

Kata kunci: Larva, Padat Tebar, Pertumbuhan**,** Sintasan

INTRODUCTION

One of the potential sources of foreign exchange in Indonesia is the fisheries sector. The development of brackish water cultivation in Indonesia for the future is very important for development in the fisheries sector and is one of the expected priorities. Currently, one of the brackish water cultivation commodities that is developing in the fisheries sector is vaname shrimp (KKP, 2015).

Vaname shrimp is a superior fishery commodity with high economic value (Herawati & Hutabarat, 2014). This is because vaname shrimp is more resistant to disease attacks, grows faster, is resistant to environmental fluctuations, is feed efficient and has a fairly high survival rate (Anita *et al*., 2017). Based on the decision of the Minister of Marine Affairs and Fisheries number KEP. 41 / MEN / 2001 that vaname shrimp began to be officially cultivated in Indonesia in 2001.

The demand for national shrimp production has increased from year to year. Based on data from the Ministry of Maritime Affairs & Fisheries (2020), shrimp production in 2015 reached 421,089 tons, in 2016 it reached 498,174 tons, in 2017 it reached 757,793 tons, in 2018 the production reached 717,094 tons and in 2019 it reached 1.05 million tons, for that, the availability of quality seeds is very much needed to meet the increasing demand for vaname shrimp, so the existence of shrimp hatcheries is expected to help the needs of pond farmers in providing seeds (Anam *et al*., 2016).

In shrimp seed farming, the most critical phase is the larval phase, because there is usually a high mortality rate which can result in low survival of vaname shrimp larvae (Syukri & Ilham, 2016). Survival and growth are aspects that need to be monitored because they will affect the level of successful seed production, where one aspect that affects growth and survival is the right stocking density. Therefore, this study aims to analyze the growth and survival of shrimp larvae and post-larvae vaname (*Litopenaeus vannamei*) with different stocking densities, so that it can determine the right stocking density to increase the production of vaname shrimp fry.

RESEARCH METHOD

This research was conducted at PT. Summa Benur Situbondo for 2 months, namely March-May 2023. The materials used in this study were 4-5 nauplii, sea water, fresh water, chlorine, quicklime, probiotics and natural and artificial feed.

Research Procedure

Preparation of containers and media

Preparation of this maintenance media uses sea water that has been collected in a reservoir tank. The treated water is flowed using a mechanical filter process, and a pressure filter process. Several stages of media preparation as a. Cleaning the sedimentation tank b. Filling the reservoir water c. Giving potassium permanganate 0.025 ppm d. Giving quicklime 10 ppm e. Treatment 5 - 10 hours f. Mechanical filtration g. Filling the reservoir h. filter pressure i. filling the UV reservoir tank. The container used is washed using detergent and given chlorine. The container used has a volume of 13,000 liters.

Nauplii Distribution

The nauplii to be distributed in the maintenance tank come from PT. Tirta Mutiara Makmur Situbondo. The stages carried out before the nauplii distribution process are the preparation of the container and maintenance media which can be seen in attachment 1. Before the nauplii distribution process, each maintenance tank is given probiotics at a dose of 10 ppm, then the aeration pressure in the maintenance tank is set to low pressure and the nauplii are ready to be distributed. The nauplii distributed in the maintenance tank are nauplii 4 to nauplii 5. Distribution is carried out in the morning with acclimatization treatment for 10-15 minutes.

Feeding and Water Quality Monitoring

During the maintenance period, the larvae are given natural feed in the form of skeletons, artemia and artificial feed. Measurement of water quality parameters including temperature, salinity, pH and dissolved oxygen are measured every day.

Research Design

The research was conducted using the Completely Randomized Design (CRD) method with stocking density treatment and 3 replications. Treatment A with a stocking density of 115 individuals/l and Treatment B with a stocking density of 176 individuals/l. The research dose used is the result of preliminary tests that have been carried out in order to obtain the best dose range for this research.

Table 1. Treatment

Code	Volume of tub (liter)	Number of Spread (nauplii tail)	Stocking Density (head/l)
A1	13.000	1.500.000	115
A2	13.000	1.500.000	115
A3	13.000	1.500.000	115
D1	17.000	3.000.000	176
D2	17.000	3.000.000	176
D3	17.000	3.000.000	176

Test Parameters

The parameters observed include post-larva growth, larval population and Survival rate (SR). The following is the formula used:

1. Survival or survival rate (Amri dan Kanna, 2008).

$$\text{Survival} = \frac{\text{Harvest Amount}}{\text{Number of Spreads}} \times 100\%$$

2. Calculating the population (PT. Summa Benur)

$$\text{Population size} = \frac{\text{Number of samples}}{\text{Sample water volume}} \text{ x volume of tub}$$

3. Average length of post larva (Effendie 1997 *in* Anisa *et al.*, 2021)

$$\text{Average length} = \frac{sample\ length\ amount}{\text{many samples}}$$

Data Analysis

Population data, survival and growth in this study used ANOVA analysis or analysis of variance. ANOVA test was conducted using the SPSS application. One Way ANOVA is an analysis technique that functions to distinguish the average of more than two groups of data by comparing their variations. Meanwhile, water quality data was analyzed descriptively and presented in table form.

RESULT

The results of the study in Figure 1 show that the stocking density of 176 fish/l population up to the larval stage is significantly different from the lower stocking density of 115 fish/l ($P < 0.05$). This means that the lower stocking density has better larval population results compared to the high stocking density.

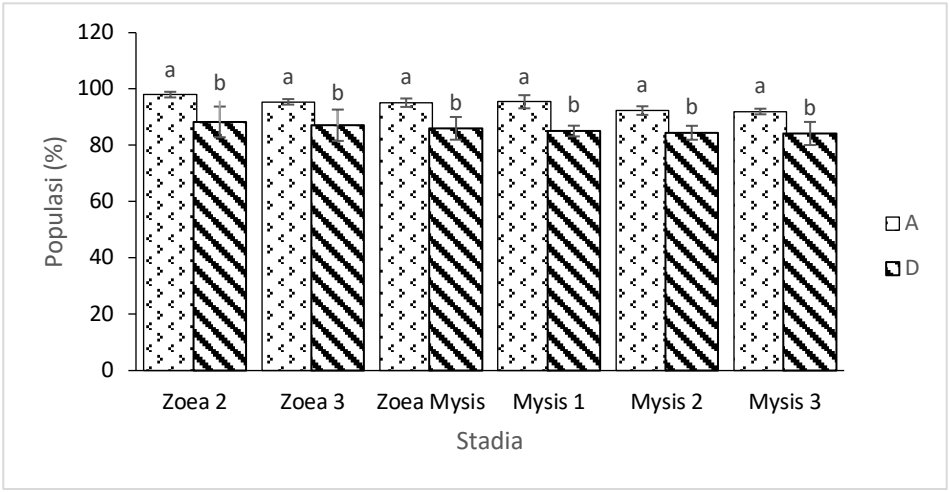

Figure 1. Calculation of Survival Rate at Each Stage of Vaname Shrimp Larvae

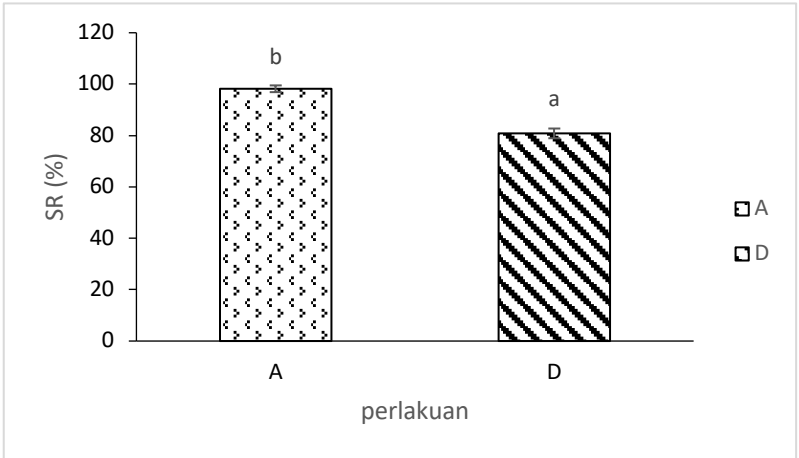

Figure 2. Post Larvae Survival at End of Rearing

Based on Figure 2, it shows that there is a significant difference in stocking density treatment on survival (P<0.05). Treatment A (115 fish/L) has a higher SR compared to Treatment D (176 fish/L).

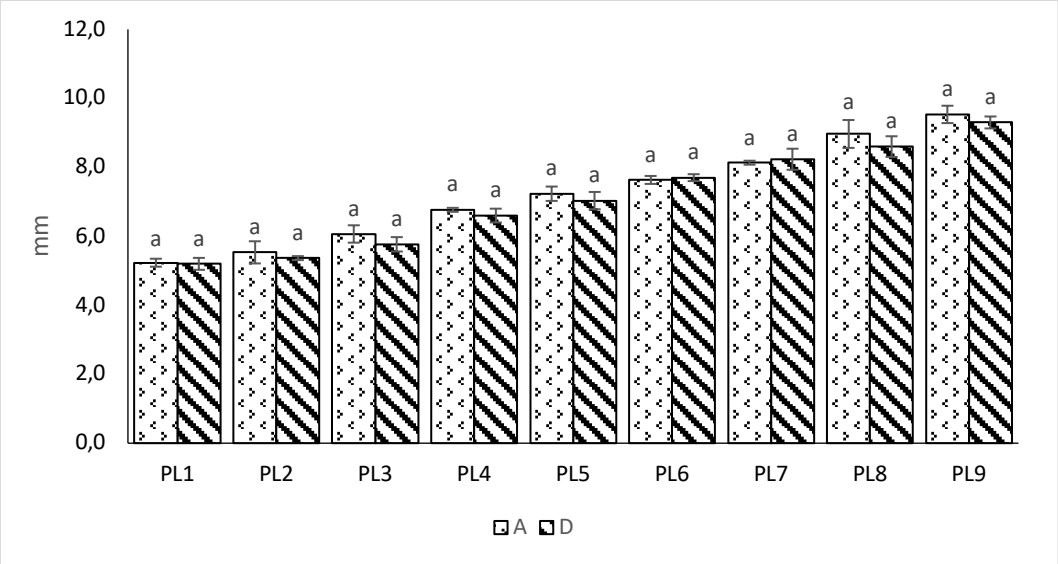

Figure 3. Growth of post-larvae of vaname shrimp at different stocking densities

Based on Figure 3, the length of the post larvae was calculated from PL 1 to PL 9. It can be seen that each day the post larvae experienced an increase in length growth in each tub. The average length of the post larvae on the first day was 5.2 mm. The results of the ANOVA test showed that the growth of the length of the post larvae in all treatments observed showed results that were not significantly different.

Table 1. Results of water quality parameter measurements on larvae and post larvae

No	Parameter	Unit	Zoea	Mysis	PL	(SNI 7311:2009)
1	Temperature	^{0}C	30 – 31	30 - 31	31 - 32	29 – 32
2	Salinity	ppt	33	33	33	31 – 34
3	pH	-	8 – 8,1	8 – 8,1	8 – 8,2	7,5 – 8,5
4	Dissolved oxygen	ppm	5 – 6	5 – 6	5 – 6	5

DISCUSSION

According to Rakhfid *et al*., (2017) stated that the population tends to decrease with increasing stocking density. The difference in population numbers is thought to be caused by competition between individuals in utilizing space and obtaining food from natural feed. The high population value at a stocking density of 115 fish/l is estimated to have a relatively large space to move and natural food is available in sufficient quantities, so that competition between individuals in utilizing space to move and obtain food can be suppressed. Conversely, the lower population value at a stocking density of 176 fish/l is estimated to have a narrower space to move and competition for food is higher, which causes the larvae to become more aggressive. This can cause stress in the larvae which triggers cannibalism between individuals, so that mortality increases. In addition to stress, cannibalism can also be caused when the larvae experience asynchronous moulting so that the larvae that are moulting are attacked by other larvae, which triggers death, although the larval population at a stocking density of 176 fish/l

is lower, but based on SNI 7311:2009 that the survival rate of fry at harvest is at least 30%. This shows that the population observed at each stocking density is still above the target that has been set.

According to Usman *et al*., (2022) different stocking densities affect post-larvae survival. The survival of post-larvae of whiteleg shrimp can be influenced by several factors. According to Fuady (2013), the factors that affect the high and low survival are abiotic and biotic factors. When the skin changes, it is a very vulnerable time for post-larvae of whiteleg shrimp. When the outer skin is removed, the post-larvae of whiteleg shrimp will look weak and have no body protection which ultimately makes it very easy to be preyed on by other post-larvae of whiteleg shrimp, it is said that the cannibalism process also occurs in adult shrimp against smaller shrimp and against eggs.

During the moulting process, the mortality rate in shrimp can reach 30%, one of which is caused by cannibalism (Nainggolan, 2008). In addition to being caused by cannibalism, mortality in shrimp is also caused by feed that does not meet the needs so that there is competition in obtaining food. The need for feed that is not optimally met will trigger shrimp to prey on each other and become one of the factors causing low survival of post-larvae of whiteleg shrimp in the maintenance media.

Usman *et al*., (2022, that stocking density does not affect growth in length. This is thought to be due to the use of aeration, feed and water quality which are very supportive for post-larvae growth in length.

Based on the measurement results in table 1, all water quality parameters of temperature, salinity, pH and dissolved oxygen and all larval stages meet SNI 7311: 2009. The results of the water quality measurements are good for larval growth because they meet the standards. Temperature affects the metabolic process of whiteleg shrimp. A significant increase in temperature can increase the rate of chemistry in the body. According to Nur *et al*., (2018) the optimal temperature for larval growth is 26-30 ° C. high temperatures can reduce growth that causes death.

pH affects the growth of larvae and post larvae. According to Liew *et al.,* (2022) the process of changing larvae into post larvae requires a pH above 7 and temperatures below 7 will cause growth disorders. In addition, according to Supriatna *et al.,* (2020), pH affects the level of shrimp appetite. According to Tibun *et al.,* (2015), pH affects the osmotic pressure in the body of the larvae and the reaction rate of the body of the shrimp larvae.

The ideal salinity is 10-35 ppt (Pratiwi *et al.,* 2021). So that monitoring salinity measurements at all stages is suitable for shrimp growth. Salinity in larval maintenance affects osmoregulation in larvae. Salinity that is not in accordance with growth, then larval growth is only intended to adapt without any increase in larval body length. According to Usman *et al*., (2022) salinity that is too high can cause stunted growth.

Dissolved oxygen plays an important role in the metabolic process of aquatic biota. The availability of oxygen in water is a limiting factor for the life of aquatic biota (Anisa *et al*., 2021). Dissolved oxygen in the table meets SNI because the larval and post-larval maintenance containers are given sufficient aeration to support the growth of vaname shrimp.

CONCLUSION

The results of this study can be concluded that stocking density affects the survival rate but different stocking densities in larvae do not affect post-larval growth. Water quality such as temperature, pH, salinity and dissolved oxygen during the larval maintenance period are good for growth.

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