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Study of the Relationship Pattern of Ecdysis with the Age of Crayfish Type Procambarus clarkii Aged 21 Days

Intan Fatimah Rahmania
Fakultas Perikanan dan Ilmu Kelautan, Universitas Brawijaya, Malang, Indonesia

Article Info

ABSTRACT

The purpose of this study was to determine the pattern of LAT ecdysis, especially the Freshwater Lobster Procambarus clarkii, aged 21 days to 66 days. In crustaceans, moulting is part of the growth mechanism. Changes in shape and size can only occur if the hard calcareous exoskeleton is removed before the new cuticles have hardened. Periodic moulting or ecdysis continues by separating the old cuticle from the new instar, this growth process takes place continuously. The moulting cycle can be divided into four stages, namely: proecdysis, ecdysis, metecdysis and intermoult. Moulting occurs when the LAT is 2 to 3 weeks old. Death often occurs in this period, death occurs due to cannibalism caused by moulting in LAT which does not take place simultaneously because each individual grows differently, thus allowing cannibalism to occur in other individuals who are molting. Process moulting in LAT may be standardized by administering the hormone Phytoecdysteroids given at the time of proecdysis. To find out proecdysis, you must first know the LAT ecdysis pattern. The results showed that the more often the LAT had molted, the longer the number of days needed for the LAT to experience the next moulting. This is because the size of the lobster is getting bigger so that energy is needed not only for activity and maintenance but also for growth.

Corresponding Author:

Intan Fatimah Rahmania
Fakultas Perikanan dan Ilmu Kelautan, Universitas Brawijaya
Jl. Veteran, Ketawanggede, Kec. Lowokwaru, Kota Malang, Jawa Timur 65145
Email: fatimahrahmania@gmail.com

1.   INTRODUCTION

Freshwater Lobster type Procambarus clarkii has systematics Procambarus clarkii has a dominant body color of red. Therefore they are often referred to as red swamp crayfish. Adult Procambarus clarkii is dark red, while young Procambarus clarkiii is red-gray.

Adult Procambarus clarkii can grow up to 20cm in length (Anonymous, 2006). In general, the body of the Freshwater Lobster (LAT) is divided into two parts, namely the head (chepalothorax) and body (abdomen). These animals are covered in an exoskeleton of chitin, which contains mostly chalk and sclerotin which makes the skeleton harder and heavier but serves as a very good protective layer. The outer chitin is thin and connected, to provide maximum flexibility.

The anterior part of the body is called the carapace, and each posterior abdominal segment consists of a dorsal tergum arch, two lateral pleura and a ventral sternum. All the efforts seen in the process of production and marketing of Indonesian shrimp exports are sectors that provide a source of livelihood for the common people. The Indonesian shrimp export business sector is the foundation for fishermen, pond farmers, collectors, laborers, laborers, and entrepreneurs who invest in this sector.

Experts involved in research and development of shrimp aquaculture, processing and marketing techniques, who have a very important role so that indirectly shrimp exports can be used as a source of foreign exchange from non-oil and gas export commodities Bun, (2005). One of the cultivation activities that has not been optimally cultivated is Freshwater Lobster (LAT) cultivation, because LAT is a fishery production with high economic value. LAT is easy to cultivate and in several countries, such as Australia, United States, United Kingdom, China, Costa Rica, Fiji, Guatemala, Israel, Mexico, South Africa, and Mexico it has been done since 1980. According to Sukmajaya (2003), the aim is to fulfill

aesthetic needs (small lobsters) and consumable lobsters weighing 30-80 grams which are alternative consumption materials from crustacean commodities.

In Indonesia, LAT cultivation was pioneered since 1991 (Adijaya, 2003). Several types of LAT have been successfully developed and cultivated in Indonesia, including Cherax destructor, Cherax quadricarinatus, Procambarus claarkii and several local species from Irian from the genus Cherax. LAT has a character that is not easily stressed and not susceptible to disease, eats both plants and animals (omnivores), relatively fast growth, and has high egg laying/fecundity, can be easily cultivated in a pond, fast growing, can easily adapt to even extreme water quality, free from disease, namely LAT including organisms that are resistant to various diseases. For feed, LAT is considered cheap in providing feed, as well as a market that is ready to distribute produce from farmers' production.

In crustaceans, moulting is part of the growth mechanism. Changes in shape and size can only occur if the hard calcareous exoskeleton is removed before the new cuticle hardens. Periodic moulting or ecdysis continues by separating the old cuticle from the new instar, holding water absorption through the digestive tract, which is a characteristic of the Crustacea group as well as other aquatic insects. Then, the absorbed water is gradually replaced by biosynthesized protein, this growth process takes place continuously, the molting cycle can be divided into four stages, namely: proecdysis, ecdysis, metecdysis and intermoult.

2. METHOD

2.1 Types of research
In this research used descriptive method. With the descriptive method will be able to describe all the circumstances and events in a particular activity. Suryabrata (1991) said that descriptive research is a research that aims to make systematic, factual and accurate predictions about the factors and characteristics of a particular population or area, while the data is taken by direct observation.

2.2 Research variable.
As the main variable is the LAT ecdysis pattern of the type Procambarus clarkii aged 21 days to 66 days and the supporting variable in this study is the water quality of the live media of freshwater crayfish seeds including temperature, DO (dissolved oxygen) and pH (acidity), measured every day while Ammonia is measured once a week.

2.3 Research design
The analysis used is Simple Linear Regression Analysis. As the main variable in this study was the ecdysis pattern of LAT type Procambarus clarkii aged 21 days to 66 days. Supporting variables are the water quality of the LAT seed living medium (temperature, DO, pH and Ammonia).

2.4 Sampling location
This research was conducted with LAT ecdysis samples of the type Procambarus clarkii aged 21 days to 66 days.

2.5 Time and Place of Research.
The research was conducted at the Laboratory of Sand Source Freshwater Cultivation Experimental Station, Faculty of Fisheries, Brawijaya University, Malang, from May to June 2007.

2.6 Tools and materials
The tools used in the research are as follows: 1 aquarium measuring 2m x 0.4m x 0.27m; Plastic bottles of 20 pieces of 600 ml; Blower, aeration hose, aeration stone; Whatman filter paper; Measuring cup; DO meters; pH meter; Thermometer; Refractometer; Analytical balance; Light.

The materials used in this study are: Freshwater Lobster type Procambarus clarkii is 21 days old with body length between 2.5 - 4 cm and body weight between 0.44 - 1.12 gr; Water, as a living medium for freshwater crayfish; Pellets.

2.7 Research procedure

Prior to being stocked, the lobsters were first sampled, the initial weight was measured and 3⁄4 of the test lobsters were stocked in bottles that had been prepared in the aquarium and the test samples were given commercial pellet feed sold on the market given once a day every afternoon at 17.00 and observations were made every day to find out ecdysis phase and weight gain of the lobsters. Water quality testing includes temperature, pH, DO, measured every day and ammonia is done once a week, the aquarium is sipped every day and water changes are done every two days.

2.8 Data analysis.

The data obtained during the research was statistically analyzed using the SPSS (Statistical pocket for social science) computer program version 11.5 for windows. The analysis used is Simple Linear Regression Analysis obtained from the classical assumption test which includes the normality test and autocorrelation test.

3.   RESULTS AND DISCUSSION

3.1 Research result

This study used 20 Procambarus clarkii lobsters of the same age (21 days) and non-uniform weight between 0.44 g – 1.12 g. Due to non-uniform weight, the data was divided into 2 groups, with the aim of obtaining more accurate data. For more details on the division of groups

3.1.1   Classical Assumption Test

In order to find out which regression model satisfies the basic assumptions of the observed data, it is necessary to perform a classical assumption test in order to obtain the best unbiased or BLUE (Best Linear Unbased Estimated) regression model. This test includes the normality test and autocorrelation test. Part of the normality test with this assumption test is expected to meet a good regression model which will result in biased decision making or conclusions more precise and descriptive real condition. The use of the regression model must meet the assumption that the data is normally distributed, the fulfillment of normality requirements will guarantee the accountability of the analysis model used so that the conclusions drawn can also be accounted for. To find out whether there are autocorrelation symptoms in the regression analysis model used, namely by testing the correlation serial model with the Durbin - Watson (DW) method. Conventionally it can be said that a regression equation is said to have met the assumption of no autocorrelation if the value of the Durbin Watson number is between -2 to +2 (Santoso, 2001:219). The calculation results obtained the Durbin Watson value for group 1 of 1.613, for group 2 of 1.334, which means that there is no autocorrelation in the regression model.

From the results of observing the pattern of the relationship between ecdysis and age during the study, it was found that each time the LAT reached the ecdysis phase and experienced molting, it was followed by an increase in the weight of the LAT and the number of days needed for the LAT to reach the next ecdysis phase was getting longer. Moulting has a positive effect on the number of days so that it has a unidirectional effect on the number of days, which means that the more often the LAT experiences moulting, the more days will increase, and vice versa.

The molting process is a stage of LAT growth. In its place will appear a new exoskeleton. At first the skin is still very soft then it will start to harden, along with the increase in body size LAT. When forming a new skin, LAT needs calcium carbonate so that chitin is fully formed. When the LAT moulting experiences severe stress, their appetite drops dramatically and their energy is drained

3.1.2 Water quality

Supporting data in this study is water quality which includes temperature, pH, and dissolved oxygen. Water quality has an important role in aquaculture because the feasibility of water as an environment is determined by the physical and chemical properties of water. Besides feed, water quality also influences the growth of cultivated organisms. The results of measuring the water quality of the maintenance media during the study can be seen in After being analyzed by Simple Linear Regression analysis, it turns out that there is an influence of 21% of other factors, one of which is water quality.

Table 1. Water Quality Parameter Data During the Study

Temperature (°C)	DO (mg/lt)	pH	Ammonia
24-27	6,5-7	7.5-8 0	44-0.49

The water temperature of the study media ranged from 24-27o C. This range was optimal for the growth of LAT species of Procambarus clarkii because according to D'Abramo, L. R, Cortney L. Ohs, Terrill R. Hanson and Jose L. Montanez (2004) Procambarus clarkii grew optimal in a cold place, namely with a water temperature of around 19-30o C. The pH value of the media water during the study was 7.5-8 where the water was in a neutral condition. This range is sufficient to support the growth of crayfish. According to Sukmajaya and Suharjo (2003), the acidity of the water that supports the growth of Procambarus clarkii is 7 – 9 (D'Abramo et all, 2004). Therefore, it is clear that the availability of oxygen for fish determines the cycle of fish activity. Feed conversion, as well as growth rate, depend on oxygen.

The pH value of the media water during the study was 7.5-8 where the water was in a neutral condition. This range is sufficient to support the growth of crayfish. According to Sukmajaya and Suharjo (2003), the acidity of the water that supports the growth of Procambarus clarkii is 7 – 9 (D'Abramo et all, 2004). The content of ammonia in the study media ranged from 0.44–0.49 mg/lt, this range is sufficient to support the growth of crayfish. According to Mosig (1998), total ammonia above 0.5 mg/lt must be very concerned because high ammonia content can cause toxicity in waters. Feces from aquatic biota which is a waste of metabolic activities also emits a lot of ammonia. Ammonia measured in water is total ammonia (NH3 and NH4 +) and can be toxic. Ammonia toxicity will increase if there is a decrease in DO, pH, and temperature. However, aquatic invertebrates are more tolerant of ammonia toxicity than fish (Effendi, 2003). In this study, there was no decrease, so it is still considered safe.

3.2   Discussion.

By entering the values obtained from the calculation results, a simple linear regression equation can be obtained as follows: Y = 4.524 + 2.286X Based on the simple linear regression equation it can be seen that the constant is 4.524, which means that the number of days needed to reach LAT The ecdysis phase before the study started was ± 5 days. The regression coefficient of 2.286 means that moulting has a positive effect on the number of days so that it has a unidirectional effect on the number of days, which means that every LAT experiences moulting which causes an increase in the number of days by ± 2 days.

From the results of the simple linear regression analysis above, it can be seen that the coefficient of determination (R square) is 0.718. This figure indicates that the moulting variable can explain variations or is able to give effect to the dependent variable (number of days) of 71.8%. From the results of the multiple linear regression analysis above, it can be seen that the coefficient of determination (R square) is 0.837. This figure indicates that the moulting variable can explain variations or is able to influence the dependent variable (number of days) of 83.7%.

The molting system of crustaceans is similar to that of insects. After the insect has digested the food, ecdysone is excreted from the blood. This hormone is secreted by two prothoracic glands, which are located in the thoracic section. Furthermore, the prothoracic glands are stimulated by a hormone, namely PTTH (Prothoracicotropic hormone) which is released specifically by neurosecretory cells in the brain (corpora cardiaca). Then it will stimulate the release of alpha-ecdisone, which hydroxylation occurs in the fat body to form beta-ecdisone. The outer skin will digest the old cuticle and the new cuticle is removed under the influence of beta-ecdisone. The absence or presence of juvenile hormone determines the shape of the new cuticle (Nielsen, 1991). While the terms corpora cardiaca, thoracotrophic hormone and thoracic gland in insects are successively the same as the terms sinus gland, mouth inhibiting hormone and Y organ in crustaceans.

4.   CONCLUSION

From the results of research to determine the pattern of LAT ecdysis, especially Freshwater Crayfish type Procambarus clarkii aged 21 days to 66 days, it can be concluded that there is a positive correlation (+) between Ecdysis and the number of days, i.e. the older the LAT, the longer the Ecdysis phase. 1 obtained a linear regression equation Y = 4.524 + 2.286X, for group 2, Y = 4.123 + 2.658X and the water quality in the rearing medium during the study was still in the normal range for the survival of Procambarus clarkii, namely dissolved oxygen ranging from 6.5 –7 mg/lt,

temperature 24°C-27°C, pH 7.5–8, and ammonia which is still in the normal range of 0.44-0.49 (<0.5) mg/lt.

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Cultivators should use LAT with uniform weight and selected seeds for cultivation, because weight affects the number of days needed for LAT when experiencing ecdysis. LAT with a large size requires a longer day than the LAT which is smaller when ecdysis.

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