

Study of the Relationship Pattern of Ecdysis with Age of Freshwater Lobster *Cherax quadricarinatus* Aged 76 Days

Arif Habib Fasya

Fakultas Perikanan dan Ilmu Kelautan, Universitas Brawijaya, Malang, Indonesia

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ABSTRACT

The purpose of this study was to determine the pattern of LAT ecdysis especially the Freshwater Lobster of the *Cherax quadricarinatus* type, aged 76 days to 116 days. The purpose of this study was to determine the pattern of LAT ecdysis, especially the Freshwater Lobster of the *Cherax quadricarinatus* type, aged 76 days to 116 days. This research was conducted at the Experimental Station for Freshwater Aquaculture Sumber Pasir, Faculty of Fisheries and Marine Sciences, Universitas Brawijaya from July to August 2007. The method used in this study was a descriptive method in which this research gave an accurate description of an individual or group. Data collection techniques by way of direct observation. Then the data were analyzed statistically using the SPSS computer program version 11.5 for windows. Using simple linear regression analysis Crustacean growth is related to molting. In crustaceans, changes in shape and size can only occur if the hard calcareous exoskeleton is removed before the new cuticle hardens. Periodic molting 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.

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Corresponding Author:

Arif Habib Fasya

Fakultas Perikanan dan Ilmu Kelautan, Universitas Brawijaya

Jl. Veteran, Ketawanggede, Kec. Lowokwaru, Kota Malang, Jawa Timur 65145

Email: fasyahabib@gmail.com

1. INTRODUCTION

In Indonesia, not many people know about the existence of freshwater crayfish. When it comes to lobsters, people's minds tend to focus on seawater crayfish. This is very reasonable because freshwater crayfish were only pioneered around the 90s. In contrast to seawater crayfish which cannot be cultivated and are only available on the market because fishermen catch them, several types of freshwater crayfish can already be cultivated for consumption needs (Iskandar, 2003).

One of the cultivation activities that has not been optimally cultivated is the cultivation of freshwater crayfish (LAT), because LAT is a fishery production with high economic value. LAT is easily cultivated 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 carried out since

1980. One of the excellent commodities in the sub-sector which is expected to increase foreign exchange a country other than shrimp that is difficult to expect an increase in the level of exports is LAT cultivation.

The demand for shrimp commodities abroad tends to increase day by day and the sufficient resources available in Indonesia provide great opportunities for their cultivation to be developed. At this time LAT cultivation has developed widely in society. So it is hoped that it can increase the volume of shrimp production and become one of the export commodities of fishery products. *Cherax quadricarinatus* is known as Red claw or commonly also known as North Queensland Yabby. It is called red claw because the adult LAT of this type has a red color on the outer claws, especially in male LAT.

LAT with a green-brown base color, in their area of origin is the food of the local population. LAT are nocturnal, they like to hide during the day and need a place to hide. They are also cannibals if the density is high or they don't get proper protection and enough food. In general, the original habitat of crayfish is freshwater lakes, swamps or rivers which are only located in the waters of Papua, Papua New Guinea and the states Australia. Besides that, the natural habitat that is always occupied is the roots or stems submerged in water and the leaves are above the water surface.

Cherax quadricarinatus is very easy to distinguish from other types of *Cherax*. This is characterized by its Latin name, namely *quadricarinatus*, which means having four keels (*quadri* = four, *carinatus* = *carinae*, a keel-like formation). Crustacean growth has something to do with molting. In crustaceans, changes in shape and size can only occur if the hard calcareous exoskeleton is removed before the new cuticle hardens.

Periodic molting 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 intermolt.

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) says that descriptive research is a study that aims to make systematic, factual and accurate predictions about the factors and characteristics of a population or a particular area, while the data is taken by direct observation.

2.2 Research variable

The main variable is the period of the molting cycle, especially the ecdysis phase, which takes place in Freshwater Crayfish, *Cherax quadricarinatus*, aged 76 days to 116 days. , and *Ammonia*. Water quality as a supporting variable is measured every two days, while for *ammonia* it is measured every week.

2.3 Research design

The design used was a completely randomized design (CRD) where each treatment was carried out as a separate unit, there was no grouping relationship. According to Gasperz (1991), some of the advantages of using RAL are: The layout of the trial design is easier; Statistical analysis of experimental subjects is very simple; Flexible in the use of the number of treatments and the number of repetitions; The possibility of losing information is smaller.

2.4 Sampling location

The research was carried out with samples of Freshwater Lobster of the type *Cherax quadricarinatus* aged 76 days to 116 days.

2.5 Time and Place of Research

This research was conducted at the Laboratory of Sumber Pasir Freshwater Cultivation Experimental Station, Faculty of Fisheries and Marine Sciences, Brawijaya University, Malang, from July to August 2007.

2.6 Tools and materials

The tools used in research: Aquarium 1 fruit measuring 2 mx 0.4 mx 0.25 m; 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 were freshwater lobsters of the type *Cherax quadricarinatus* aged 76 days with body lengths between 3.01 – 5.5 cm and body weight between 1.48 gr – 4.01 gr. Water, as a living medium for freshwater crayfish. Commercial pellets.

2.7 Research procedure

Preparation of research tools and materials begins with bottles as cages, aquariums, setting tools and other supporting tools are prepared as well as the main sample namely test lobsters are prepared, test lobsters used are 76 days old and during the transportation process the test lobsters are put in a plastic bag filled with oxygen to the location 20 test lobsters were sampled, adapted for about 2 hours before being stocked in each bottle in the next aquarium. feed with a frequency of once a day every afternoon at 17.00 and observations were made every day to determine the ecdysis phase and weight gain of the lobsters. Water quality measurements including temperature, pH, DO, and ammonia were carried out 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 study used simple linear regression analysis obtained from the classic assumption test which included the normality test and autocorrelation test.

3. RESULTS AND DISCUSSION

3.1 Research result

This study used 20 *Cherax quadricarinatus* lobsters with an age of 76 days and a non-uniform weight between 1.67 gr – 4.49 gr. Due to the non-uniform weight, the data was divided into 3 groups, with the aim of obtaining a more accurate data analysis. Based on previous research, it was possible to obtain information about dividing the groups into three based on the initial weight of the study (30 days old), which was between 0.35 gr – 1.32 gr.

3.1.1 Classical Assumptions Test and Simple Linear Regression Analysis

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 analytical model used so that the conclusions drawn can also be accounted for and to determine whether there are autocorrelation symptoms in the regression analysis model used, namely by testing the serial model correlation with the Durbin-Watson (DW) method. From the results of observing the pattern of the relationship between ecdysis and age during the study, it is known that each time the LAT reaches the ecdysis stage and experiences moulting, it is followed by an increase in the weight of the LAT and the number of days needed for the LAT to reach the next ecdysis stage, the longer.

Table 1. Classical Assumptions Test

variable	Regression coefficient	t Count	Sig
Ecdysis	2,6	13	0.001
Constant	6		
R	0.991		
R square	0.983		
N	5		

M Dependent variable : Number of days

By entering the values obtained from the calculation results, a simple linear regression equation can be obtained as follows: $Y = 6 + 2.6X$ Based on the simple linear regression equation it can be seen that a constant of 6.00 means that the number of days needed LAT to reach the ecdysis stage before the start of the study was ± 6 days.

The regression coefficient of 2.6 means that ecdysis has a positive and unidirectional effect on the number of days, which means that each time LAT reaches the ecdysis stage, it causes an increase in the number of days by 1-2 days. From the results of the linear regression analysis above, it can be seen that the coefficient of determination (R square) is 0.983. This figure indicates that the ecdysis variable can explain variations or is able to influence the dependent variable (number of days) of 98.3%.

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 range of water quality obtained during the study.

Table 2. Water quality

DO (mg/l)	Temperature (°C)	Ph	Ammonia(mg/l)
6,81	25.5	7,74	0.465

Dissolved oxygen content in the study media ranged from 6.5 – 7 mg/l. The content is quite feasible for the growth of freshwater crayfish. According to Sukmajaya and Suharjo (2003), the species *Cherax quadricarinatus* is able to tolerate dissolved oxygen levels in water up to 1 mg/l. The water temperature of the research media ranged from 24 – 27°C.

This range is optimal for the growth of crayfish. According to Wickins and Lee (1992), the temperature range for freshwater crayfish (*Cherax quadricarinatus*) cultivation is 24–32°C. Effendi (2003) added that temperature changes affect the physical, chemical and biological processes of water. Aquatic organisms have a certain temperature range (upper and lower limits) that is favorable for their growth. An increase in temperature causes an increase in the rate of metabolism and respiration of aquatic organisms, and in turn results in an increase in oxygen consumption. An increase in water temperature of 10°C causes an increase in oxygen consumption by aquatic organisms of about 2-3 times. The pH value of the media water during the study was 7.5 – 8. The water was in a neutral condition. This range is sufficient to support the growth of crayfish.

According to Sukmajaya and Suharjo (2003), the pH of the water that supports the growth of *Cherax quadricarinatus* is 6 – 9.5. The content of ammonia in the study media ranged from 0.44 – 0.49 mg/l, this range is sufficient to support the growth of crayfish. According to Mosig (1998), total ammonia above 0.5 mg/l 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 that is 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

The growth of fish in aquaculture sites is heavily influenced by food, stocking density, oxygen and temperature and is slightly influenced by genetics (Purdom, 1993). Environmental factors that play a very important role are nutrients and ambient temperature, but in the tropics nutrients are more important than ambient temperature. Nutrients including food, water and oxygen provide raw materials for growth, genes regulate the processing of these materials and hormones accelerate processing and stimulate genes. If conditions like this last a long time it will interfere with the health of the fish. While indirectly the high water temperature causes the oxygen in the water to evaporate as a result the fish will lack oxygen. LAT is also tolerant of very cold temperatures close to freezing to temperatures above 35 °C. However, for LAT in the tropics, it should be maintained at a temperature range of 24 – 30 °C.

Optimum growth will be achieved if they are maintained at a temperature interval of 25 - 29 °C (Anonymous, 2004). the diagonal line and its spread follow the direction of the diagonal line so that it can be seen that the data is normally distributed.

Testing the normality of the research data for group 3 using the normality graph presented in Figure 5c, the figure shows that the research data are spread around the diagonal line and the spread follows the direction of the diagonal line so that it can be seen that the data is normally distributed. 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). The calculation results obtained Durbin Watson values for group 1 of 0.735, group 2 of 0.754, group 3 of 1, 950 which means there is no autocorrelation in the regression model. So that from the normality test and autocorrelation test it is concluded that the data analysis that meets the requirements is Simple Linear Regression Analysis.

4. CONCLUSION

From the results of the study to determine the pattern of LAT ecdysis, especially the Freshwater Lobster type *Cherax quadricarinatus* aged 76 days to 116 days, it can be concluded that with a positive correlation (+) between Ecdysis and the number of days and in the group and the quality of water in the rearing medium while the research was still within the normal range for survival of *Cherax quadricarinatus*. Namely DO 6.81 mg/l, temperature 25.5 0C, pH 7.74 and ammonia 0.465 mg/l.

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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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