

The Fecundity of Freshwater Prawn (*Macrobrachium rosenbergii*) in Menduk River, Bangka, Bangka Belitung

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Abstract–Freshwater Prawn (*Macrobrachium rosenbergii*) in Bangka, is one of the important economic prawn. The sustainability of freshwater prawn is threatened by degradation of natural habitat. Information of reproductive aspect is needed for further management. The objective of this study was to examine fecundity of freshwater prawn. Based on the data, during sampling sex ratio showed that female freshwater prawn population are greater than male population, which ratio Female: Male = 9:1. Berried female freshwater prawn found 5 with mean value of fecundity was $11,808 \pm 8,155$. The mean value of Body Weight was 98.56 ± 74.29 gr and Total Length was 15.28 ± 3.18 cm. In general, physicochemical water parameters were ideal range for freshwater prawn to dwell. The mean values of temperature, pH value, turbidity and Dissolved Oxygen were $27.56 \pm 1.02^\circ\text{C}$; 5.56 ± 0.51 ; 39.66 ± 2.97 ; 3.09 ± 0.25 respectively. The reproductive potential of freshwater prawn stock as well as an assessment on stock size of their natural population can be analyzed using the fecundity data [1].

Keywords–fecundity, sex ratio, giant freshwater Prawn

I. INTRODUCTION

Freshwater prawn (*Macrobrachium rosenbergii*) is indigenous species from Southern Japan to north-eastern Australia and the Indian Ocean. This prawn requires brackish water in the beginning stages of their life cycle, even though their complete life cycle in inland saline and freshwater lakes [2][3]. Understanding about their ecology, biology physiology and behavior of *M. rosenbergii* is the importance for commercial fisheries and aquaculture [4][5][6].

The aspect reproductive studies are important in assessing on the prawn stock size of their natural population and estimating the reproductive potential of prawn brood stock development in the hatcheries as well. Furthermore, there is still a lack of studies about the aspect reproductive of freshwater prawn include fecundity, brood

stock quality and ecology of freshwater giant prawn from natural habitat such as in the Menduk River. [7][8][9][22].

In addition, water pollution as caused of tin mining in Bangka as well as the degradation of natural habitats, reduction of mangroves cause great threats to freshwater prawn population. Moreover, investigating the aspect reproduction and environmental physicochemical water parameters may contribute to understanding the current status and population structure of the freshwater giant prawn in natural habitat.

The objective of this study was to analyzing of reproductive biology aspect including sex ratio, fecundity and physicochemical water parameters of giant freshwater prawn in Bangka.

II. METHODOLOGY

A. Description of study area

The study area was carried out in the Menduk River, Bangka. This river is the representative of prawn habitat, accessibility. River Menduk is also a popularity location of giant freshwater prawn as fishing ground. The river was divided into three research stations which are upstream, middle and downstream of the river (Figure 1).

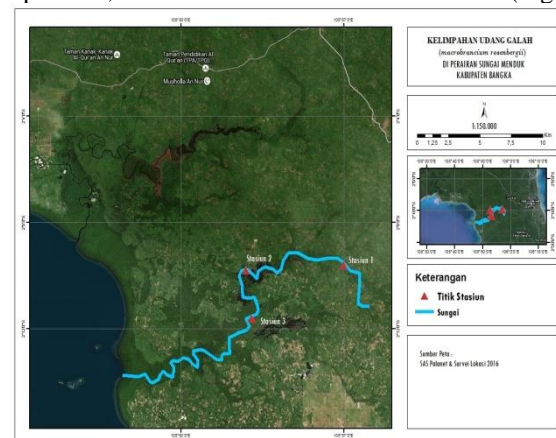


Figure 1. The Three Research Sampling Stations Of Giant Freshwater Prawn In Menduk River.

B. Environmental physicochemical water parameters

Physicochemical water parameters are important to giant freshwater prawn population. Those environmental factors can effect to their life. The characteristics of physicochemical water parameters of habitats chosen were recorded for all stations. Environmental physicochemical water parameter variable including pH, temperature (°C), dissolved oxygen (DO) (mg/l) and turbidity (NTU) were determined in situ.

C. Prawn sampling and identification

Prawn collections were made using traps with 36 cm length and 9 cm height were set parallel to the river banks. The traps were placed 10 traps each research sampling station in the water for 6 hour. All prawn specimens were analyzed in Laboratory. Some anatomical body parts were recorded for each individual include body weight (g), total length (cm), sex (based on presence or absence of the male appendix on the second pair of pleopods). Total length (TL) was measured to the nearest 0.1 cm. Fecundity was analyzed using Efendie (1979)[10]. In total, 5 gravid female prawns were used to estimate fecundity. The relationship of fecundity (F) compared to body weight (BW) was described by the algometric equation $\ln F = b \ln BW + a$, while the relation of fecundity (F) compared to total length (TL) was described by the algometric equation $\ln F = b \ln TL + a$.

III. RESULT AND DISCUSSION

A. Sex Ratio

Overall, sampling revealed that the sex ratio of freshwater giant prawn was 18 female, 2 male and 5 berried female. The sex ratio showed that during the research, the number of female *Macrobrachium rosenbergii* was significantly greater than the male population, with a ratio of Female : Male = 9 : 1. This ratio is harmful to prawn stocks since female outnumbered male. Meanwhile, the balanced ratio between female and male remained equal at 1:1. Furthermore, the maximum proportion between female and male of the prawn was 4:1 [11]. Comparisons between both sexes of female and male, show that the number of females was greater than males.

B. Fecundity

The mean fecundity of female gravid giant freshwater prawn was $11,808 \pm 8,155$. Meanwhile, the mean total length and weight of prawn were 15.28 ± 3.18 cm ; 98.56 ± 74.29 g, respectively (Table 1.). According to [12], the fecundity of giant freshwater prawn species connected with the female age and their maturity. Bal and Rao (1990)[13] also stated that each individual of the same prawn species producers have different number of eggs depending on their age, length, weight and environmental condition. The fecundity of gravid giant freshwater prawn in this research is varying compare to the literature. According to [14], [7] and [9] the fecundity of wild population of giant freshwater prawn is ranged from 60000 to 130000. The differences of *M. rosenbergii* fecundity

may be associated to various conditions of female maintenance in the laboratory, its physiological conditions and season [8]. Furthermore, [15] stated that there was no significant differentiation of the fecundity of berried female giant freshwater prawn which was recorded.

The correlation between fecundity with total length and body weight of giant freshwater prawn from Menduk River is shown in Table 2. The fecundity of *M. rosenbergii* population showed negative correlation with total length and body weight. Babu (2014)[15] stated that correlation between the fecundity and total length and body weight of *Penaeus monodon* varied from different geographical locations significantly. The fecundity data can be utilized to estimate the reproductive potential aspect of the giant freshwater prawn spawning stock. Indeed, the present research showed that berried female is appropriate as the potential brood stock from the wild population for prawn breeding. Moreover, the stocks from wild giant freshwater prawn brood could be a significant resource for genetic refinement of culture stocks in the future. In order to protect of *M. rosenbergii* from decreasing in number as well as berried female, some agenda must be carried out. Still, some efforts, for instance, breeding program should be carried out to enhance the reproductive output of wild brood stock of the *M. rosenbergii* species. In addition, the protection of berried female during spawning season is needed to ensure the sustainability of giant freshwater prawn stock as well.

TABLE 1. THE MEAN TOTAL LENGTH (CM), THE MEAN BODYWEIGHT (G) AND FECUNDITY OF BERRIED PRAWN.

	Mean
Total length	15.28 ± 3.18
Total weight	98.56 ± 74.29
Fecundity	$11,808 \pm 8,155$

TABLE 2. THE CORRELATION OF FECUNDITY WITH TOTAL LENGTH AND BODY WEIGHT OF *MACROBRANCHIUM ROSENBERGII* FROM MENDUK RIVER, BANGKA.

	a	b	R2
Total Length vs fecundity	19.45	-3.84	0.895
Body weight vs fecundity	13.61	-1.03	0.899

TABLE 3. MEAN OF PHYSICOCHEMICAL WATER CHARACTERISTICS OF RIVER MENDUK.

Parameters	Mean
Temperature (°C)	27.56 ± 1.02
pH	5.56 ± 0.51
Turbidity (NTU)	39.66 ± 2.97
Dissolved Oxygen (mg/L)	3.09 ± 0.26

C. Physicochemical Environmental Water Parameters

The mean value of the physicochemical environmental water parameters from site research is illustrated in Table 3. The mean value of temperature recorded was 27.56 ± 1.02 °C and pH was 5.56 ± 0.51 . Meanwhile, mean value of turbidity was 39.66 ± 2.97 and dissolved oxygen concentration was 3.09 ± 0.26 mg/L.

Generally, the characteristic of physicochemical water quality in Menduk River as giant freshwater prawn habitat measured were discovered to be within the suitable range for this prawn to survive and growth [16][17][18]. Oben *et al.* (2015)[19]state that the characteristic of physicochemical water quality parameters did not have an impact on the difference and composition of sex ratio in natural population of *Macrobrachium vollehovenii* collected from the Yoke River. Nevertheless, deforestation of mangrove ecosystem, degradation of prawn natural habitats, reclamation, overexploitation, the use of illegal methods for catching of biological resources and water pollution will create great threats to giant freshwater prawn populations[20][21].

IV. CONCLUSIONS

- The value of sex ratio of *Macrobrachium rosenbergii* population showed that the female was significantly greater than its male population, with a ratio of Female : Male = 9 : 1
- The mean fecundity of Freshwater giant prawn in Menduk River, Bangka was $11,808 \pm 8,155$.
- The characteristic of physicochemical environmental water quality measured were discovered to be within the suitable range for freshwater prawn to survive and growth in Menduk River.
- Some efforts should be revealed to enhance the sustainability of freshwater prawn stock.

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