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Short Communication: Length-Weight Relationship, Condition Factor and Relative Condition Factor of *Macrobrachium rosenbergii* in Rice Fields

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Abstract

To determine the length-weight relationship of *Macrobrachium rosenbergii* a total of 100 shrimps were collected from the experimental plots of integrated rice fish/shrimp culture which was carried out at the Agronomy Field Laboratory, Bangladesh Agricultural University, Mymensingh, Bangladesh from 2nd August to 30th November, 2003. Standard length-weight relationship of *Macrobrachium rosenbergii* was obtained: Log W= -2.0518341 + 3.07513132 Log L. The co-efficient of correlation (r) was 0.99 which showed strong and highly significant relationships between length and weight. The mean values of condition factor (K) and relative condition factor (Kn) were 1.0893674 and 1.0012671, respectively, which suggest good condition of the prawn in rice fields.

Introduction

Fresh water prawn (*Macrobrachium rosenbergii*) is one of the most commercially important species in the fisheries sector in Bangladesh as a

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source of animal protein and foreign exchange earner. This species is widely distributed in freshwater as well as in brackish water mainly in ponds, rivers, *khals*, canals and estuaries (Ahmed 1957). Among all the species *M. rosenbergii* is the biggest and probably one of the biggest natantians in the world (Rao 1967). There is also a big potential for the culture of this species in rice fields in Bangladesh. Length-weight relationship has a number of uses including the estimation of weight from length for individual fish, and for length classes of fish, and estimation of standing crop biomass when the length-frequency distribution is known (Anderson & Gutreuter 1983; Petrakis & Stergiou 1995). A study on the biology of any species requires adequate knowledge of length-weight relationship. In the present study it was aimed to establish the relationship between length and weight and condition factor and statistical analysis of the regression coefficient of *M. rosenbergii* that might have an important implication towards its conservation, scientific culture and management. Many researchers have studied the length-weight relationship for different species of penaeid shrimps and prawns (George 1956; Chin 1960; Kutkuhn 1962; McCoy 1968; Aliakbar & Ali 1978). However, only a few workers studied this aspect in Bangladesh for *M. rosenbergii*. Hence, the authors undertook the present work on this species as part of an integrated rice-fish/prawn culture program.

Materials and Methods

To determine the length-weight relationship, a total of 100 *Macrobrachium rosenbergii* were taken from the rice field during harvesting. Then total length (cm) and weight (g) of individuals were measured. Among the recorded data, the lowest and highest total length were determined and the range was divided into nine class intervals for *M. rosenbergii*. Then the frequencies were determined for various class intervals. The regression line of length-weight relationship was drawn by plotting body weight data against total length data. Again, all the mid values (cm) of the class intervals and the corresponding average weight (g) were converted to base log10 to obtain straight line relationship between length and weight. The length-weight relationship was fitted using the formulae established by Le Cren (1951).

Results and Discussion

The results of the study on length-weight relationships of *M. rosenbergii* are presented in table 1 and figures 1 and 2. The logarithmic form of equations so far estimated was Log W= -2.0518341 + 3.07513132 Log L. The exponential value of "n" estimated for *M. rosenbergii* was 3.07513132 which indicated the isometric growth. This findings agrees with the findings of Aliakbar & Ali (1978) and Hossain et al. (1987) for *M. rosenbergii*, Shafi et al. (1977) for *M. lamarrei*, and Shafi & Quddus (1976) for *M. rudis* recorded in earlier studies, but the values of "n" for *M. mirabilis* recorded by Shafi et al. (1977) do not agree with the findings of the present study. The correlation coefficient (r) value recorded was 0.99 which showed strong and highly significant relationships between length and weight. The values of (r) recorded by Hossain et al. (1987) were 0.96 for *M. rosenbergii,* Shafi et al. (1977), 0.97 for *M. mirabilis* and Shafi & Quddus (1976), 0.97 for *M. rudis* which are more or less closely similar to our investigation. In fishes, the length-weight relationship generally follows the linear relationship. To test this hypothesis the regression lines for length-weight relationship was drawn graphically from the data of length and weight. The growth curves showed curvilinear relationship (Fig. 1). The growth curves obtained from log weight against log length showed a linear relationship (Fig. 2). Slight differences between observed weight and calculated weight in certain lengths were obtained but the correlation between observed and calculated weight was good. The fluctuations obtained in certain length groups might be due to variation in sample size, sex, gonadal condition and gut contents. Again, a more or less straight line was obtained by plotting the values of log weight against the values of log lengths. Both conditions are in conformity with the exponential growth of this species. Similar observations were also recorded by Aliakbar & Ali (1978) in their study on *M. rosenbergii*.

The values of condition factor (K) varied from 0.9672695 to 1.1651751 and the mean value of the same was recorded as 1.0893674. There is a small variation observed in the case of condition factor. Rao (1967) stated that variations in the values of condition factor in the case of prawn may also be attributed to the attainment of maturity similar to fish. The values of relative condition factor (Kn) varied from 0.9023255 to 1.0782363 and the mean values of the same obtained was 1.0012671 which indicates the good condition of the prawn in rice fields. Rajyalakshmi (1961), in her studies of *M. brevicornis* from the Hoogly estuaries of India,

found similar fluctuation in the Kn. Shafi & Quddus (1976) also observed similar fluctuations in their study of *M. rudis* from the Sundarban estuaries of Bangladesh.

Table 1. Length-weight relationship of *M. rosenbergii* in the experiment

#	Class Interval	Mid value (L) (cm)	f	Average Weight (W)	log L	log W	Log L x log W	$(\log L)^2$	r	Calculated Weight (W')	K	Kn
1	12.0-12.7	12.35	4	18.22	1.0917	1.2605	1.3761	1.1917		20.1923	0.9673	0.9023
2	12.7-13.4	13.05	12	23.83	1.1156	1.3771	1.5363	1.2446		23.9229	1.0722	0.9961
3	13.4-14.1	13.75	15	30.29	1.1383	1.4813	1.6862	1.2957		28.0929	1.1652	1.0782
4	14.1-14.8	14.45	18	34.46	1.1599	1.5373	1.7831	1.3453		32.7274	1.14212	1.0529
5	14.8-15.5	15.15	13	39.94	1.1804	1.6014	1.8903	1.3934	0.99	37.8521	1.1486	1.0551
6	15.5-16.2	15.85	14	44.18	1.2000	1.6452	1.9743	1.4401		43.4924	1.1095	1.0158
7	16.2-16.9	16.55	10	48.75	1.2188	1.6880	2.0573	1.4855		49.6741	1.0754	0.9813
8	16.9-17.6	17.25	12	54.59	1.2368	1.7371	2.1484	1.5297		56.4228	1.0635	0.9675
9	17.6-18.3	17.95	2	61.33	1.2541	1.7877	2.2419	1.5727		63.7645	1.0604	0.9618
			∑f= 100		∑logL= 10.5955	∑logW= 14.1157	∑(logLx logW) 16.6939	∑(log L)²= 12.4986			K= 1.0894	Kn= 1.0013

Note: f = frequency

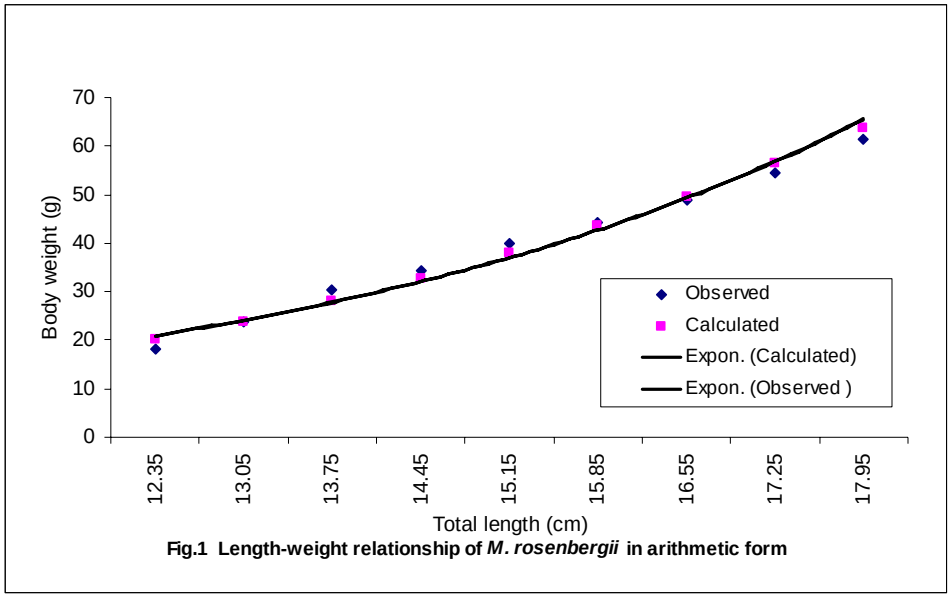

Fig.1 Length-weight relationship of *M. rosenbergii* in arithmetic form

Length-weight relationships were found to be very useful for this research as well as in other relevant researches for they (a) allow the conv-

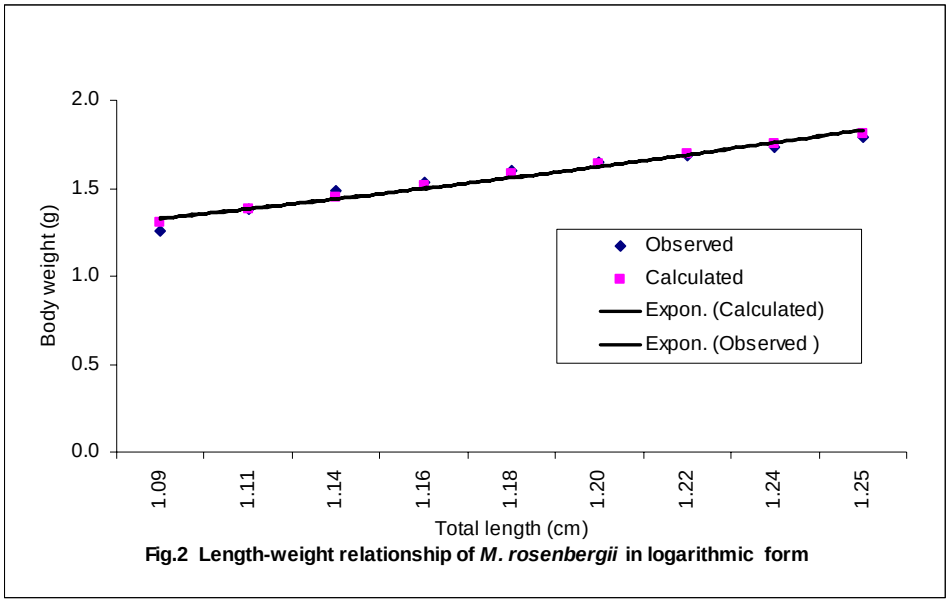

Fig.2 Length-weight relationship of *M. rosenbergii* in logarithmic form

version of growth-in-length equations growth in-weight for use in stock assessment models; (b) allow the estimation of biomass from length observations; (c) allow an estimate of the condition of the fish; and (d) are useful for between region comparisons of life histories of certain species (Goncalves et al. 1996; Froese & Pauly 2000; Moutopoulos & Stergiu 2000). Based on the present results, it can be noted that *M. rosenbergii* is compatible for rice fish/prawn integrated culture system.

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