



Evaluation of condition factor of a small indigenous freshwater prawn, *Macrobrachium lamarrei* (H. Milne-Edwards, 1837) in Bangladesh

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ABSTRACT

The condition factor of a small indigenous freshwater prawn, *Macrobrachium lamarrei* (H. Milne-Edwards, 1837) was studied to evaluate the health status of the species sample over a calendar year. A total of 1018 specimens (485 males and 533 females prawn) were used in this study, where condition factor for male, female and combined prawn varied with months. In case of male, the highest condition index was found in June (1.141) and lowest was found in August (0.886), and for female, the highest condition index was obtained in May (1.221), and the lowest was in July (0.947). In the combined sex, the highest condition index was determined in June (1.235), and lowest value was in September (0.966). The study suggested that both male and female individuals of the prawn population *M. lamarrei* were fatty in May and June; on the other hand, they appeared in lean condition in July and August over a calendar year.

Key words: Condition factor, freshwater prawn, *Macrobrachium lamarrei*, Bangladesh

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INTRODUCTION

Bangladesh has a very rich source of prawns and shrimps in the freshwaters, estuaries and the Bay of Bengal which is a vital source of foreign currency. Among 57 prawns including 37 salt water, 12 brackish water, and 7 freshwater, *Macrobrachium lamarrei* (H. Milne-Edwards, 1837) has lucrative importance due to its short life-span, faster growth, and it forms an extremely important component of the subsistence catch in Bangladesh inland waters. *M. lamarrei* is commonly known as “kuncho river prawn” and is a small indigenous freshwater prawn belonging to the family Palaemonidae, plentifully spread out in whole country in shallow water of beels, freshwater ponds and rivers round the year in the North-Western districts of Bangladesh (Ali et al. 1980; Kibria 1983). *M. lamarrei* is also found in Indo-west pacific regions. This is a popular prawn among low income group of people and served as food fish for nutritional security through protein supply at low cost.

The degree of well-being of a fish is expressed by condition factor. It is also known as ‘coefficient of

condition’ as well as length-weight factor. It is an important fishery tool and an indicator of the general fish condition which is based on the hypothesis that heavier fish of a given length are in fatty condition (Bagenal and Tesch, 1978). Bakare (1970) and Fagade (1979) reported that with increase in length of fish, condition factor decrease and it also influences the reproductive cycle in fish (Welcome, 1979). This factor is a measurement of a number of different biological and ecological aspects such as degree of fitness, gonad development and the suitability of the environment with regard to the feeding condition (Mac Gregoer, 1959). It also acts as an index of growth and feeding intensity (Fagade, 1979) i.e. when the fish has attained a better condition the value of condition factor is higher. A number of factors such as stress, sex, season, availability of feeds, and other water quality parameters affect the condition factor of fishes (Khallaf et al., 2003). Environmental factors specially affect the fish body condition, growth performance and yield. Condition factor is also known as ponderal index or condition index. In Bangladesh, there is hardly any work that has been conducted on

determination of condition factor of this valuable prawn species. Recently, fisheries biologists and fishers are paying significant attention to this prawn fishery due to their greater commercial prominence. There is insufficient information on prawn biology and lack of scientific work on *M. lamarrei* prawn diversity in Bangladesh. The aim of the present study is to assess the monthly variation of condition factor for male, female and combined population of *M. lamarrei* separately for understanding the health status and life cycle of this prawn species. Therefore, the present findings will provide baseline information for the condition factor of this species, and the data and information may assist as a tool for management initiatives for the sustainability of this freshwater prawn as well as other prawn species in Bangladesh and conservation practices.

MATERIALS AND METHODS

Sample collection

M. lamarrei prawn species was collected randomly using a fine-meshed push net from the L-shaped pond situated in Bangladesh Agricultural University campus, Mymensingh, Bangladesh once in a month over a calendar year. All specimens were preserved in 10% buffered formalin soon after collection. Carapace lengths (CL) of all specimens as the distance from the tip of the rostrum to the posterior edge of the carapace were measured with a slide calipers to the nearest 0.01 mm, whilst body weight (BW) was taken with a digital balance to the nearest 0.01 g. Detailed description of prawn sampling is given in Table 1.

Table 1

Collection record of freshwater prawn *M. lamarrei* from L-shaped pond at Bangladesh Agricultural University (BAU), Mymensingh.

Sampling month	Number of Male	Size Range		Number of Female	Size Range	
		CL (mm)	BW (g)		CL (mm)	BW (g)
January	39	5.75-16.00	0.18-2.36	48	4.80-15.60	0.11-2.36
February	26	10.00-18.00	0.76-3.60	41	6.68-15.14	0.45-2.50
March	37	6.22-18.48	0.32-4.08	24	11.05-18.29	1.10-3.98
April	42	9.80-19.10	0.81-4.76	32	9.70-15.15	0.86-2.51
May	43	10.93-17.31	1.07-3.65	34	5.89-16.05	0.22-2.52
June	26	6.78-18.92	0.30-4.64	39	7.63-15.45	0.41-2.73
July	35	8.24-15.66	0.41-2.82	53	9.22-15.35	0.46-2.65
August	43	7.12-15.35	0.25-2.11	71	7.00-15.50	0.21-2.44
September	44	6.00-15.30	0.17-2.11	53	8.30-15.80	0.31-2.83
October	55	6.00-13.10	0.17-1.38	51	5.00-13.80	0.10-1.93
November	41	6.40-18.00	0.34-3.53	34	7.60-17.10	0.42-3.17
December	54	7.00-15.00	0.26-2.20	53	8.00-17.00	0.46-3.56
Over a year	485			533		

Sex determination

Male was identified observing second chelate legs which were extraordinary large, spiny and strong with naked eyes. Individuals confirmed as female with the presence of one pair of genital pore in the cox of third pairs of walking legs under a stereo microscope.

Length-weight relationship (LWR)

The relationship between carapace length and body weight was established using the equation, $BW = aCL^b$. The equation is converted to its logarithmic expression: $\ln W = \ln a + b \ln CL$ where the parameters $\ln a$ and b were obtained from linear regression.

Determination of condition factor

The generalized length-weight relationship was constructed from the pooled CL-BW data of all monthly samples collected over the study period. To determine condition factor of the individuals at a particular month, the mean body weight (BW_{mean}) of all individuals in a monthly sample was compared with the predicted mean body weight ($BW_{\text{pred.}}$) at the mean carapace length of the prawns at the same month. The equation, therefore, is of the form as $CF_{BW} = BW_{\text{mean}} / BW_{\text{pred.}}$. The predicted mean body weight ($BW_{\text{pred.}}$) at the mean carapace length of a particular month was calculated using the generalized length-weight relationships.

RESULTS AND DISCUSSION

For better prawn management, condition factor can play a vital role because they provide information of the specific condition under which organisms are developing to the prawn producer (Araneda et al., 2008). According to Le Cren (1951), condition factor expressed the recent physical and biological developments which may vary by interaction among feeding conditions, physiological factors as well as parasitic infections. A total of 1018 specimens of *M. lamarrei* were used to evaluate condition factor where 485 were males and 533 were female prawn showing a sex ratio 1: 1.09 (male: female). The carapace length and body weight of all monthly samples collected all over the year varied and ranged from 4.80 mm to 19.10 mm and from 0.10 g to 4.76 g respectively. The carapace length and

body weight of male ranged from 5.75 mm to 19.10 mm and from 0.17 g to 4.76 g respectively. And the carapace length and body weight of female ranged from 4.80 mm to 18.29 mm and the body weight ranged from 0.08 g to 3.98 g (Table 1).

The seasonal variations in conditions occurred in male, female and combined prawn were determined in this study (Table 2). Based on CF_{BW} , monthly condition factors were determined and it ranged from 0.886 to 1.141 for male, from 0.949 to 1.221 for female and from 0.966 to 1.235 for combined prawn, indicating that the prawns are in good condition as well as this result agrees with the finding of Kunda et al. (2008) for *Macrobrachium rosenbergii*. They found the values of condition factor varied from 0.967 to 1.165, and the mean value of the same was recorded as 1.089. They also reported a small variation observed in the case of condition factor. In the case of prawn, that variation in the values of condition factor may also be attributed to the attainment of maturity similar to fish (Rao, 1967).

Table 2 illustrated that in case of male, the highest value ($CF = 1.141$) was found in June and lowest value ($CF = 0.886$) was found in August. In case of female, the highest value ($CF = 1.221$) was found in May and lowest value ($CF = 0.949$) was found in July. In case of combined prawn, the highest value ($CF = 1.235$) was found in June and lowest value ($CF = 0.966$) was found in September. Similar ranges of condition have also been reported in other species of *Macrobrachium* (Arimoro and Meye, 2007; Enin, 1994).

Figure 1 displayed the condition factor of male population was sharply increasing from January to April. Then it drastically decreased in May and again increased in June. Thereafter it again decreased in July and remained approximately same till December. Condition factor of female was poor in January but it drastically increased in February and remained approximately same till June. In July the condition factor for female decreased sharply and remained more or less similar till November but in December it again sharply increased. In case of combined prawn, condition factor was lower in January and sharply increased in February and remained same till June. Thereafter it gradually decreased in July and remained more or less similar till November but in December it again increased. Condition factor

significantly varied between sexes which may be due to better environmental conditions in the habitat, food abundance, feeding regime, seasonal variation and higher weight of female gonad. Dineshbabu (2006) reported similar results of

condition factor of male and female *Metapenaeus monoceros* from Bhidiya, India. Condition factor significantly varied in males and females of *M. macrobrachion* from great Kwa River, Nigeria was reported by Andem et al., (2013).

Table 2
Sex-wise monthly variation of condition factor of *M. lamarrei* according to CF_{BW}

Month	Sex	n	Mean CL (mm)	Mean BW (g)	General a	General b	BW _{pred}	CF _{BW}	Growth Inference
January	Male	39	11.746	1.211	0.0009	2.8933	1.176	1.029	Fatty
	Female	48	10.047	0.812	0.0012	2.790	0.744	1.091	Fatty
	Combined	87	10.809	0.991	0.0010	2.844	0.903	1.097	Fatty
February	Male	26	13.427	1.858	0.0009	2.8933	1.732	1.073	Fatty
	Female	41	10.989	1.136	0.0012	2.790	0.956	1.189	Fatty
	Combined	67	11.935	1.417	0.0010	2.844	1.197	1.183	Fatty
March	Male	37	14.479	2.337	0.0009	2.8933	2.155	1.085	Fatty
	Female	24	12.917	1.815	0.0012	2.790	1.500	1.210	Fatty
	Combined	61	13.865	2.132	0.0010	2.844	1.833	1.163	Fatty
April	Male	42	14.649	2.518	0.0009	2.8933	2.228	1.130	Fatty
	Female	32	12.956	1.76	0.0012	2.790	1.513	1.163	Fatty
	Combined	64	13.917	2.190	0.0010	2.844	1.853	1.182	Fatty
May	Male	43	14.544	2.396	0.0009	2.8933	2.182	1.098	Fatty
	Female	34	11.50	1.325	0.0012	2.790	1.085	1.221	Fatty
	Combined	77	13.199	1.923	0.0010	2.844	1.594	1.206	Fatty
June	Male	26	14.653	2.544	0.0009	2.8933	2.229	1.141	Fatty
	Female	39	11.641	1.340	0.0012	2.790	1.122	1.194	Fatty
	Combined	65	12.845	1.822	0.0010	2.844	1.475	1.235	Fatty
July	Male	35	11.942	1.214	0.0009	2.8933	1.234	0.984	Lean
	Female	53	12.213	1.218	0.0012	2.790	1.283	0.949	Lean
	Combined	88	12.106	1.216	0.0010	2.844	1.246	0.976	Lean
August	Male	43	10.923	0.845	0.0009	2.8933	0.953	0.886	Lean
	Female	71	11.642	1.115	0.0012	2.790	1.123	0.993	Lean
	Combined	114	11.371	1.013	0.0010	2.844	1.043	0.971	Lean
September	Male	44	11.918	1.129	0.0009	2.8933	1.227	0.921	Lean
	Female	53	12.009	1.194	0.0012	2.790	1.224	0.975	Lean
	Combined	97	11.968	1.165	0.0010	2.844	1.206	0.966	Lean
October	Male	55	9.956	0.710	0.0009	2.8933	0.729	0.974	Lean
	Female	51	9.356	0.641	0.0012	2.790	0.610	1.051	Fatty
	Combined	106	9.667	0.677	0.0010	2.844	0.657	1.029	Fatty
November	Male	41	11.661	1.227	0.0009	2.8933	1.152	1.065	Fatty
	Female	34	11.015	1.046	0.0012	2.790	0.962	1.087	Fatty
	Combined	75	11.368	1.145	0.0010	2.844	1.042	1.098	Fatty
December	Male	54	11.719	1.234	0.0009	2.8933	1.168	1.057	Fatty
	Female	53	11.889	1.363	0.0012	2.790	1.190	1.145	Fatty
	Combined	107	11.803	1.298	0.0010	2.844	1.159	1.119	Fatty

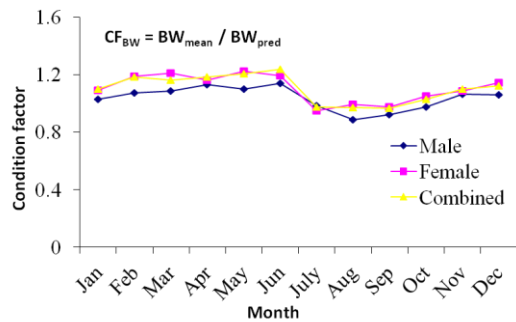


Figure 1
Monthly variation of condition factor of male, female and combined *M. lamarrei* according to CF_{BW} .

In the present study sex wise comparison revealed higher value of condition factor in female compared to male in some months and vice-versa. Hossain et al. (2012) also found better condition factor of *M. malcolmsonii* in females than males in Ganges River, Bangladesh. Minimum and maximum values for male and female populations were computed as 0.33-0.99 and 0.3-1.8 and results suggest that *M. malcolmsonii* in the lower Indus river are in good condition. However, Abohweyere and Williams (2008) and Arimoro and Meye (2007) observed higher condition factor in male of *M. macrobrachion* compared to female and suggested that males generally appear to have better mean condition factor than the females. The differences between sex wise comparisons in different months may occur due to reproductive season, food availability and the presence of ovigerous females (Hossain et al., 2012) in the sample during study period.

Finally, the present results revealed that condition factor of *M. lamarrei* prawn species may be considered as a reliable indicator and knowledge on condition factor which is essential for assessment, sustainable prawn management and provides guidance to the future researcher in carrying out further detail study on other prawn species of Bangladesh.

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