RESEARCH ARTICLE

PRELIMINARY STUDY OF FULTON'S CONDITION FACTOR (CF) AND RELATIVE CONDITION FACTOR (Kn) OF *Macrobrachium assamense peninsulare* FROM RAWASAN STREAM, UTTARAKHAND, INDIA

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ARTICLE INFO	ABSTRACT
	Fultons' Condition Factors (CF) and the Relative conditions factors (Kn) of the *Macrobrachium assamense peninsulare* were studied for an interval of one year (2013-2014) in Rawasan stream, Uttarakhand, India. The Kn was observed maximum 1.179 in October 2014 and minimum in 0.904 in January 2014 in male prawn. Whereas CF was observed maximum 1.969 in January 2014 and minimum 1.491 in October 2013. But in case of female prawn minimum value of Kn was found 0.572 in June 2014 and maximum 1.214 in October 2014, but CF value was observed minimum 0.802 in October 2013 and maximum 2.388 in June 2014. The conditions factors (Kn, CF) ranged from (0.572 to 2.388), showing that the *Macrobrachium assamense peninsulare* was in a good and stable environmental condition in its microhabitat.

INTRODUCTION

The freshwater prawn of Genus *Macrobrachium* is a member of crustacean fishery among more than 200 species worldwide. Freshwater prawn is considered as important group of the fishery and form an important dollar earning commodity and biologically rich in diversity for which proper managerial planning is absolutely necessary to maintain sustainable utilization of the resource. Freshwater prawn species are divided in to major and minor prawns, but in India the research work on minor prawn is in infant stage due to the small size and of no trade value. These minor prawns are present in the foot hill streams and rivers in Uttarakhand having low water velocity. The weight length relationship provides an opportunity to calculate an index in the fish which is commonly used by fish biologists to compare the condition factor and wellbeing of fish (Weatherly, 1972). The condition factor is quantitative parameter of health state of fish which reflects its feeding condition as well as its reproductive status.

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Fish condition can be extremely important to fisheries managers. Plump fish may be indicators of favorable environmental conditions, whereas thin fish may indicate less favorable environmental conditions. In fish, the factor of condition reflects, through its variations, information on the physiological state of the fish in relation to its welfare. From a nutritional point of view, there is an accumulation of fat and gonadal development (Le Cren, 1951). Some important contributors on the study of condition factor of fish and crustaceans in Indian and abroad environments are (Le Cren, 1951; Enin, 1994; Arslan *et al*., 2004; Abohweyere *et al*., 2008; Deekae and Abowei, 2010; Idris *et al*., 2011; Omogoriola, *et al*., 2011; Rana and Kumar, 2013; Langer and Khajuria, 2014). According to Deekae and Abowei, (2010) Fulton's condition factor is the plumpness of a shrimps. It determines the well-being of the particular shrimps in a particular water body. In the present paper the attempt has been made to study the Fultons' condition factors (CF) and the Relative conditions factors (Kn) of the *Macrobrachium assamense peninsulare* for different length group of prawn for the first time from Rawasn stream. The Relative condition factor (Kn) is also significant in fishes for understanding their nutritional and biological cycles (Le Cren, 1951). According to

Swingle and Shell, (1971) "Kn" has its greatest application in studies involving fish population in lentic waters.

MATERIALS AND METHODS

Rawasan stream is located at $29^0 55'33.82"$N and $78^0 26'42.41"$E having elevation 2835 feet and eye altitude 20306 feet in Pauri district of Uttarakhand, India. The collection of prawn specimens from the said stream was done in the interval of one year from 2013-2014. The collection was made an monthly basis and the analysis was done in male and female prawns followed by the morphometric measurement by using Digital Vernier Caliper to nearest 0.1 mm and then weight were taken by using table top digital balance to the nearest 0.01gm measurements.

Fulton's Condition Factor (CF)

The condition factor of the prawns was estimated by Fulton's condition factor (CF) proposed by Fulton in 1904. It assumes that the standard weight of a fish is proportional to the cube of its length. Pauly, (1984); Wootton, (1992) have calculated CF by using mean of total length and weight of shrimp. The equation is as follows.

$$CF = \frac{\overline{W} \times 100}{TL^3}$$

Whereas "Ŵ" is the whole body wet weight in grams and "TL" is the total length in centimeters, the factor 100 is used to bring CF close to a value of one

Relative condition Factor (Kn)

The relative condition factor 'Kn' has been calculated by Le Cren, (1951) formula. This "Kn" value is used to compare conditions between species and within their size classes (Omogoriola *et al.*, 2011).

Relative condition factor (**Kn**) $= \frac{W'}{W}$

Where,
Kn = relative condition factor
W' = Weight of prawn in grams (Observed weight)
W= calculated weight
W' is calculated as, W'= aL^b

Where,
W' is weight of prawn; L is length of prawn; 'a' is intercept and 'b' is slope.

For practical purpose this relationship was expressed in logarithmic form as:

W'= Log W = Log a + b Log L

The difference between CF and Kn is that the former measures the deviation of an individual from a hypothetical Prawn weight, while the latter measures the deviation of an individual from average weight from length.

All the statistical analysis were performed using Microsoft Excel 2010.

RESULTS

The Fulton's condition factor (CF) and relative condition factor (Kn) of *Macrobrachium assamense peninsulare* have been recorded from Rawasan stream on monthly basis, shown in Fig. 1 and 2 and descriptive statistical data in Table 1. The month wise relative condition factor calculated in male prawn was found to be 0.904 to 1.179 and Fulton's condition factors ranged from 1.491 to 1.969. But in case of female prawn the relative condition factor ranged from 0.572 to 1.214 and Fulton's condition factor ranged from 0.802 to 2.388 respectively.

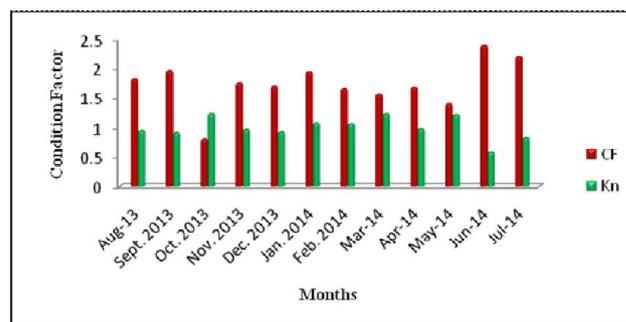The CF and Kn values showed similar trend in different months in both sexes

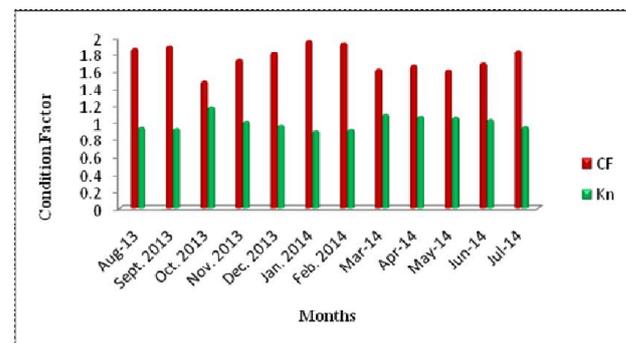**Fig. 1. Monthly variation of CF and Kn in Male** *Macrobrachium assamense peninsulare*

Fig. 2. Monthly variation of CF and Kn in Female *Macrobrachium assamense peninsulare*

The CF and Kn values showed similar trend both sexes in different months. CF is higher throughout the year than the Kn which is minimum throughout the year. It means the increase in length of the prawn don't show any effect on the weight. In male prawn minimum Kn value was recorded 0.904 in January 2014 and maximum 1.179 in October 2013. Where as CF was minimum value 1.491 in October 2013 and 1.969 in January 2014. But in case of female prawn the Kn was found maximum 1.214 in October 2013 and minimum in 0.572 in June 2014 and vice versa in case of Fulton's condition factors 0.802 in October 2013 and 2.388 in June 2014 respectively.

DISCUSSION

The condition factors value (CF, Kn) show variation during the study period in between the male and female prawn and maximum value was observed in female than male throughout the year. It is due to higher weight of the female and presence of berried female.

Table 1. Monthly variation in Fulton's condition factor (CF) and Relative condition factor (Kn) of
***Macrobrachium assamense peninsulare* in Rawasan stream in Uttarakhand India**

Months	Male Prawn (♂)					Female Prawn (♀)				
	No. of specimen	Mean±SD Length (mm)	Mean±SD Weight (g)	Fulton's condition factor (CF)	Relative condition factor (Kn)	No. of specimen	Mean±SD Length (mm)	Mean±SD Weight (g)	Fulton's condition factor (CF)	Relative condition factor (Kn)
August 2013	3	40.9±9.67	1.28±0.98	1.875727	0.9447	7	40.07±3.72	1.21±0.32	1.808037	0.939769
September 2013	13	46.08±5.86	1.86±0.76	1.905284	0.9316	14	39.75±3.66	1.22±0.42	1.944718	0.905088
October 2013	4	47.32±4.6	1.58±0.34	1.490683	1.1789	6	46.67±5.75	1.17±0.55	0.801749	1.214489
November 2013	10	47.47±9.21	1.86±1.03	1.738822	1.0093	8	41.12±8.25	1.20±0.64	1.737876	0.956898
December 2013	8	46.62±9.39	1.84±1.08	1.823987	0.9692	13	42.96±6.36	1.33±0.56	1.686036	0.91626
January 2014	8	45.63±14.75	1.87±1.62	1.968942	0.9040	5	36.3±0.95	0.92±0.80	1.927574	1.059826
February 2014	10	42±10.77	1.43±1.16	1.939585	0.9212	7	40.21±6.30	1.07±0.47	1.645291	1.049319
March 2014	8	41.68±9.30	1.17±0.70	1.627062	1.0961	12	38.16±6.29	0.86±0.48	1.551338	1.213449
April 2014	14	42.60±6.92	1.29±0.76	1.673335	1.0702	8	41.87±4.41	1.22±0.49	1.66829	0.96698
May 2014	8	38.81±7.08	0.98±0.40	1.614143	1.0608	9	36.72±8.24	0.86±0.59	1.377484	1.198069
June 2014	8	47.43±7.40	1.81±0.77	1.696731	1.0346	3	46.16±3.61	2.35±0.38	2.388264	0.572
July 2014	8	47.12±4.18	1.93±0.57	1.845374	0.9540	10	39.15±4.07	1.31±0.51	2.183112	0.826855

The mean values of relative condition factor (Kn) calculated for both sexes indicated that females were in better condition than males. Similar results were observed in *M. malcolmsonii* in Ganges River, Bangladesh by Hossain, *et al.* (2012). Relative Condition factor (Kn) range that was obtained in this study varied slightly with the results from other studies (Abowei, 2010, Nwadiaro and Okorie, 1985). The value of Kn obtained showed that *Macrobrachium massamense peninsulare* were in a good condition in its habitat which may be due to less pollution in the water bodies and low anthropogenic pressure, but need to maintain and conserve their habitat. From the calculated mean value of CF it is clear that CF increases with increase in length and length of the Rawasan stream prawn increase more than their weight. The CF was recorded low in October means the young animal are available more as compared to the rest of the months in both the sexes. It shows that the value of CF is dependent on physiological factors like maturity, spawning and other environmental factors. Moreover, several other studies have also reported sex specific differences in CF with females showing better condition than males of the same population (Deekae and Abowei, 2010). These sex specific differences are attributed to reproductive seasons and/or the presence of ovigerous females (Hossain *et al.*, 2012). According to Wootton, (1998) the value of Condition factor varies when the average weight of fish does not increase in direct proportion to the cube law of its length, but increases with increasing length. This study is the first report and is a basic information on the condition factors of *Macrobrachium assamense peninsulare* from Rawasan stream and goes a long way for providing the much needed information for the management and assessment of prawn in their microhabitat.

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