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Length-Weight Relationship and Condition Factor of *Labeo rohita* and *Hypophthalmichthys molitrix.*

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ABSTRACT

The length-weight relationship (LWR) and condition factor (K) for two commercially important carps (*Labeo rohita* and *Hypophthalmichthys molitrix*) was carried out in two fish ponds in and around Roorkee ,Haridwar (Uttrakhand).The samples were collected in four different seasons (spring, summer, autumn and winter) from March 2012 to February 2013. In the present study, growth co-efficient (b values) ranged from 2.07 to 3.53. The value of b was maximum in *Labeo rohita* (3.27) in winter and lowest in *Hypophthalmichthys molitrix* (2.17) in summer from site I. However for site II the value of b was maximum in *Labeo rohita* (3.35) in winter and lowest in *Hypophthalmichthys molitrix* (2.07) for pooled data. It was observed that the condition factor for *Labeo rohita* and *Hypophthalmichthys molitrix* was greater than 1 for all the seasons and for pooled data (except for *Hypophthalmichthys molitrix* in summer season i.e., 0.6 at site II).

Keywords: Length-weight, condition factor, major carps, Uttarakhand

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INTRODUCTION

Fisheries management and research often require the use of biometric relationships in order to transform data collected in the field into appropriate indices (Ecoutin and Albaret, 2003). The length-weight relationship of fish is an important fishery resource management tool and also useful for comparing life history and morphological aspects of populations inhabiting different regions (Goncalves *et al*., 1997). Its importance is pronounced in estimating the average weight at a given length group (Beyer, 1987) and in assessing the relative well being of a fish population (Bolger and Connoly, 1989). This relationship serves three purposes *viz*., i) to elucidate the mathematical relationship between the two variables so that if one variable is known the other could be computed, ii) to determine the relative condition that can be used to assess the general well being and type of growth, *i.e*., whether isometric or allometric growth and iii) to estimate the potential yield per recruit in the study of fish population dynamics (Prasad and Anvar, 2007). In addition, the data on length and weight can also provide important clues to climatic and environmental changes, and the change in human subsistence practices (Pauly, 1984; Luff and Bailey, 2000). However, the size attained by the individual fish may also vary, because of variations in food supply, and these in turn may reflect variations in climatic parameters and in the supply of nutrients or in the degree of competition for food.

Condition factor is an index of the degree of fatness or well being of a species (Bagenal and Tesch, 1978). The study of condition factor is important to understand the life cycle of fish species and contribute to an adequate management of the species and to the maintenance of the ecosystem equilibrium (Haruna and Bichi, 2005). Condition factor has been used as an index of growth and feeding intensity (Fagade, 1979). Condition factor decrease with increase in length (Fagade, 1979; Bakare, 1970) and also influences the reproductive cycle in fish (Welcome, 1979). Different values in K of a fish indicate the state of sexual maturity, the degree of food sources availability, age and sex of some species (Anibeze, 2000). Perusal of literature revealed that no work has been done on the selected study site hence, the present study have been undertaken to investigate the length-weight relationship and condition factor in species of *Labeo rohita* and *Hypophthalmichthys molitrix* from pond ecosystems in and around Roorkee, Uttrakhand.

MATERIAL AND METHODS

Study area

For the present investigation, two different sampling sites viz. Bhagwanpur fish pond (Site I; 29˚56’ N and 77˚48’ E) which is located approximately 13.6 kms from Roorkee, Uttrakhand and Saliyar fish pond (Site II; 29˚53’ N and 77˚52’ E) which is located approximately 5 kms from Roorkee, Uttrakhand were selected. Both the fish ponds are used for polyculture of Indian major carps and exotic carps.

Sample collection

A total of 80 samples were collected seasonally from March 2012 to Feb 2013 using different fishing gear. A total length of each fish was measured to the nearest 0.01cm and individual body weight was recorded to the nearest 0.01g. Length-weight relationship of fish was estimated by using parabolic equation: $W = a.L^b$ (LeCren, 1951 and D. Pauly, 1984). The relationship was transformed into a linear form using the logarithm equation: Log W = Log *a* + *b* Log L. Where, W = weight of fish (g), L = total length of fish (cm), a= regression constant and b = the allometric coefficient. The condition factor, (k) was determined using the equation: $K = W*100/L^3$ after (Ricker, 1975). Where, K = the condition factor, W = Weight of fish in (g) and L = total Length of fish (cm).

RESULTS AND DISCUSSION

The regression equations from length - weight of the two species were computed during the four seasons from the two ponds (Tables 1 and 2). The value of (b) of the length- weight relation were ranged from 2.26 to 3.53 for *Labeo rohita* and 2.07 to 3.26 for *Hypophthalmichthys molitrix* . The value of ‘b’ for *Labeo rohita* (site I) was maximum in winter (3.27) and minimum in autumn (2.32). However the value of ‘b’ was near to 3 for spring season and pooled data. For *Hypophthalmichthys molitrix (*site I) the value of ‘b’ was recorded (2.97) in autumn and for pooled data (2.95) and lowest for summer season (2.17).The value of ‘b’ for *Labeo rohita* (site II) was maximum in winter (3.53) and minimum in autumn (2.26). However for *Hypophthalmichthys*

molitrix (site II) the value of 'b' was maximum in winter (3.26) and minimum for pooled data (2.07). In the present study the value of 'b' ranges from 2.07 to 3.53.

Table 1: Length-Weight relationship and condition factor of *Labeo rohita* from fish ponds

Period	Site	ML(cm)	MW(g)	a	b	r	k
Spring	**I**	24.74	191.2	-1.88	2.98	0.951	1.26
	II	25.72	215.2	-2.17	3.19	0.963	1.26
Summer	**I**	29.4	330	-1.4	2.67	0.938	1.29
	II	32.56	542	-1.1	2.51	0.938	1.57
Autumn	**I**	33.32	480	-0.86	2.32	0.991	1.29
	II	34.86	644	-0.69	2.26	0.981	1.52
Winter	**I**	28.42	285.6	-2.31	3.27	0.969	1.24
	II	41.5	1219	-2.71	3.53	0.996	1.7
All season	**I**	28.97	321.7	-2.05	3.1	0.982	1.32
	II	33.66	655.05	-1.91	3.04	0.9	1.71

ML: Mean Length, **MW**: Mean Weight, **a**: regression constant, **b**: allometric coefficient, **r**: correlation coefficient, **k**: condition factor

Table 1: Length-Weight relationship and condition factor of *Hypopthalmichthys molitrix* from fish ponds

Period	Site	ML(cm)	MW(g)	a	b	r	k
Spring	**I**	30.24	324	-1.61	2.77	0.987	1.17
	II	28.12	269.3	-1.21	2.51	0.947	1.21
Summer	**I**	32.28	340	-0.74	2.17	0.898	1.01
	II	51.2	810	-1.57	2.62	0.819	0.6
Autumn	**I**	34.46	554.5	-1.85	2.97	0.994	1.35
	II	28.12	269.4	-1.45	2.67	0.938	1.21
Winter	**I**	34.9	466.5	-1.31	2.58	0.998	1.09
	II	41.98	846.1	-2.36	3.26	0.995	1.14
All season	**I**	32.97	421.25	1.87	2.95	0.924	1.17
	II	37.35	548.7	0.56	2.07	0.918	1.05

ML: Mean Length, **MW**: Mean Weight, **a**: regression constant, **b**: allometric coefficient, **r**: correlation coefficient, **k**: condition factor

Length- weight relationships of Indian major carps in relation to growth parameters have been studied by Jhingran (1959), Sinha (1972), Choudhary et al (1982), Zafar and Mustafa (1992), Ahmed and Saha (1996), Jain (2000) and Saxena and Saxena (2009). Johal and Tandon (1983) reported a strong linear relationship between total length and weight of *C. catla* from Gobind Sagar. Ideally, the regression coefficient 'b' of a fish should be very close to 3.0 (Allen, 1938), however the cube law does not hold good throughout the life period and the weight gain in a fish may not be always cube of its length gain (Rounsefell and Everhart, 1953). Hile (1936) and Martin (1949) opined that the value of 'b' may range between 2.5 and 4.0. Antony Raja (1967) recorded the value of 'b' within a range of 2.0 to 5.4. Le Cren (1951) has stated that the length-weight relationships in fishes are probably related to the seasonal variation since fat and water content of fish may vary according to temperature. Sarkar et al (1998) while performing a study on *C. mrigala* , observed that fish spawned in Bundh and a hatchery reared stock indicated an allometric growth of the from both these environments. Jhingran (1952) has found the values of 'b' departed slightly from 3, i.e., 3.15, 3.02 and 3.01 in *Cirrhinus mrigala, Catla catla* and *Labeo rohita* respectively, thus means that 'b' values were higher than 3 showed positive allometric growth. Chondar (1972) has observed the value of 'b' as 3.15 in *L. gonius*, which indicated a positive allometric growth of fish from Keetham reservoir. However, it has been observed that value of 'b' less than 3 for major carp, *Labeo calbasu* and was considered as negative allometric growth in Loni reservoir (Pathak, 1975). The length-weight relationship of carp exhibited quite unsatisfactory growth as the values of 'b' found to be 2.79 for rohu, 2.61 for *Catla* 2.1 for *mrigala* and 2.55 for common carp in a fish pond in Gwalior (Saxena and Saxsena, 2009). The change in 'b' value shows allometric growth of the body due to the influence of numerous factors *viz.*, seasonal fluctuations, and change in physiological condition during spawning periods, gonad development, sex, physicochemical conditions of the environment and nutrition conditions of thes environment (Sinha, 1973). Negi and Negi, (2009**)** studied the length–weight relationships of *Puntius conchonius* from lakes of Kumaon Himalaya Uttarakhand State,India and reported that value of regression coefficient was 3.0 from lake of Nainital India. In the present study it was observed that the

condition factor for *Labeo rohita* and *Hypophthalmichthys molitrix* was greater than 1 for all seasons and for pooled data (except for *Hypophthalmichthys molitrix* in summer season i. e., 0.6 from site II). Ekanem (2000) reported that the low condition factors observed during the dry season may be attributed to physiological stress due to changes in physical and chemical conditions of the habitat. There are also suggestions that fish condition can be influenced by certain extrinsic factors such as changes in temperature and photoperiod (Youson *et al,* 1993). The values of the condition factor vary according to seasons and are influenced by environmental conditions. The condition factor of fish, gives information when comparing among populations living in certain feeding area, density, climate; when determining the period of gonad maturation; and when following up the degree of feeding activity of a species to verify whether it is making good use of its feeding source (Weatherley, 1972). The K-value also reflects information on the physiological state of the fish in relation to its welfare.

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