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Study on length weight relationship and condition factor of *(Catla catla,* Ham 1822) from Vallabh Sagar, Gujarat, India

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Abstract

This study describes the important parameters such as length-weight relationships (LWR), condition factors (K) and relative condition factor (Kn) of Catla catla from Vallabh Sagar reservoir, Gujarat. A total of 554 specimens were used to measure the total length and weight during June, 2013 to May, 2014. The LWR was analyzed and growth exponent 'b' (2.880) was observed from pooled data which indicates negative allometric growth in studied fish. The correlation coefficient 'r' (0.976) was observed during the study which depicts high correlation in length and weight variables. The value of condition factor and relative condition factor were found >1 which indicates the well-being of studied fish and conduciveness of the habitat.

Keywords: Condition factor, Length weight relationship, Relative condition factor and Vallabh Sagar.

Introduction

Catla catla[1] belongs to cyprinid family and one of the important freshwater fish among Indian major carps characterizing by large and broad head, protruding lower jaw and upturned mouth inhabits in rivers, reservoirs, wetlands, lakes and ponds of India, Pakistan, Nepal, Bangladesh and Myanmar. It's fast growth rate having commercial importance draw the attention of the fishery scientists to assess its growth rate, length weight relationship, condition factor and relative condition factor for further management practices.

Length weight relationship (LWR) is useful statistical tool to determine the weight of an individual fish of known length or total weight from length-frequency distribution[2]. The changes in length-weight relationships may appears during different events of life cycle like metamorphosis, growth and onset of maturity[3]. The information on inter-conversions of length and weight are required for setting up of yield equations and its relationship initially use to obtain the growth condition of fish[3-5].

The condition factor (K) or ponderal index is the percentage value of weight on cube of length and relative condition factor (Kn) is the ratio of observed weigh to calculated weight of fish. These factors are basically quantifying the condition of fish which influenced by several factors including age of fish, stage of maturation, fullness of gut, type of food consumed, amount of fat reserve degree of muscular development and environmental conditions[6].

Therefore, the aim of the present investigation is to elucidate the length weight relationship, condition factor and relative condition factor of *Catla catla* from Vallabh Sagar reservoir. This study will provide the information on the growth status of fish and conduciveness of the reservoir which will be helpful for the application of further management practices.

Material and methods

Sample collection: A total of 554 fish samples were collected from the commercial lending centres of Vallabh Sagar reservoir (Figure-1) during June 2013 to May 2014. The total length (TL) was measured from tip of snout to the end of caudal fin corrected up to 0.5 cm with the help of measuring tape and body weight (WT) was taken with the help of digital balance corrected up to 1.0 gm after removing water and mucus from the body of fish. To ascertain the length-weight relationship, the measured fishes were divided into seven length groups i.e. A (31 - 40 cm), B (41 –50 cm), C (51 – 60 cm), D (61–70 cm), E(71-80 cm), F(81-90 cm) and G(91-100 cm).

Length-weight relationship (LWR): The length weight key and parabolic equation of Froese[2] were used for the variables relationship from log transformed data of length and weight.

$W = aL^b$
$\log W = \log a + b \log L$

Where: W = weight of fish (gm), L = length of fish (cm), a = Coefficient, b = Exponent.

Correlation coefficient (r): The correlation coefficient (r) of the variables (total length and total weight) were calculated to follow the standard statistical procedure of Snedecar and Cochran[7].

Condition factor (K): The condition factor (K) was calculated by the following equation of Fulton[8].

$K = (W \times 100) / L^3$

Where: W = Weight of fish (gm), L = Total length of fish (cm).

Relative condition factor (Kn): The relative condition factor (Kn) associates for changes in form or condition with increase in length and it was calculated by the equation of LeCren[3].

$Kn = W / w$

Where: W = Weight of fish (gm), w = Calculated weight of fish (gm).

Statistical data analysis: For statistical data analysis computer package PAST (1.21) was used.

Results and discussion

The morphometric measurements depict that wide range of length and weight (31.0 -97.5cm and 976 - 12906 gm) were found in Vallabh Sagar reservoir. In these observations, it is also noted that length group C was dominated with 34.6 % while length group A was lacking in dominance with 2.7% (Table-1). Length group C is dominated in reservoir may be due to survival capacity and adaptation and these findings were supported by Ujjania[5] and Jain[9] in Mahi Bajaj Sagar and Silised Lake respectively.

Correlation coefficient (r) shows the degree of correlation of variables and in present study it was minimum (0.557) for length group B and maximum (0.933) for length group C whereas it was 0.976 for pooled data. A plot of log transformed weight against length yielded a straight a line (Figure-2) which indicates linier relationship of length weight variables and growth differences among the length groups. Merella[10] from the Baleric Islands, Laleye[11] from the Oueme River in Benin (West Africa) and Naeem[12] from Multan, Pakistan were also reported the similar findings.

Regression coefficient or slope (b) values shows that growth of *Catla catla* deviate from 'cube law' because value of 'b' was fluctuate from the isometric value (3.0) which indicates that length of fish was regressed with body weight.

In the present study, it was observed minimum (2.62) for length group (B) and maximum (5.07) for length groups (E) whereas it was 2.88 for pooled data (Table-1). These observations indicate that negative allometric growth was at early stage and positive allometric growth ate later stage of fish (Table-1).

The findings of current investigation conform to the views of LeCren[3], Abdallah[13] and Chauhan[14] that a fish normally does not retain the same shape or body outline throughout their lifespan and actual relationship may deviate from the cube law. These results are in consonance with earlier findings (b>2.914) of Desai and Shrivastava[15] on *Cirrhinus mrigala* from Rihand reservoir. Johal and Kingra[16] reported high variation in 'Cube law' and exponent value varying from 2.752 to 3.545 in three Indian major carps in Rajasthan. Rajkumar[17] observed 'b' value from 2.861 to 3.215 for *Catla catla* and from 2.713 to 3.292 for *Labeo rohita* in Daya reservoir, Rajasthan. Khan[18] and Gupta[19] reported deviated coefficient 'b' values for nine freshwater teleosts and endangered *Ompak paba* from river Ganga and Gomati river respectively. Sani[20] recorded mean b value 2.99 for six fresh water species (*G. chapra, W. attu, S. aor, S. seenghala, C. gurua, M. armatus, P. sophore*) from the Gomti Rivers and 2.95 from Betwa river Uttar Pradesh. Negative allometric growth with b value 2.74 has also been reported for *C. maurulius* by Dua and Kumar[21] from Harik wetland Punjab and for *C. punctata* by Haniffa[22] from Western Ghat Rivers of Tamil Nadu.

Condition factor and relative condition factor are one of the standard practices for fisheries which provide the information on status of fish physiology, feeding and other condition of fish[3,11,23]. In this study, length group wise condition and relative condition factors were analysed and condition factor (K) observed minimum (0.974) for length group 'E', maximum (1.530) for length group 'A' and for pooled data it was 1.162 (Table-2). Similarly, relative condition factor (Kn) was minimum (1.000) for length group 'G' and maximum (1.004) for length group 'A' whereas it was 1.006 for pooled data.

It observed that condition factor (K) and relative condition factor (Kn) was high at lower length groups but shows constancy at higher length groups may be due to intense feeding and rapid growth in early stage of life.

The results of K and Kn indicates that wellness of fish in the Vallabh Sagar resrvoir. Similar findings were also reported by Prasad[24] in Govindgarh Lake, Rewa (M.P.) for *Labeo rohita*, Jain[9] in Siliserh reservoir Rajasthan. Condition factor more than 1 were also reported for Mrigala in Southern Rajasthan[25], for *Monopetrus cuchia* from Pakistan[26] and for *Catla ctlla* and *Cirrhinus mrigala* from Bangladesh[27,28]. The variations in condition of fish in the present study can be attributed to maturity, growth, food and feeding of fish.

Conclusion

Based on the result it can be concluded that larger fish of *Catla catla* are more abundant in the reservoir due to survival capacity. Species deviated from cube law and negative allometric growth, condition factor and relative condition factor reveal that water body is favourable for the fish growth.

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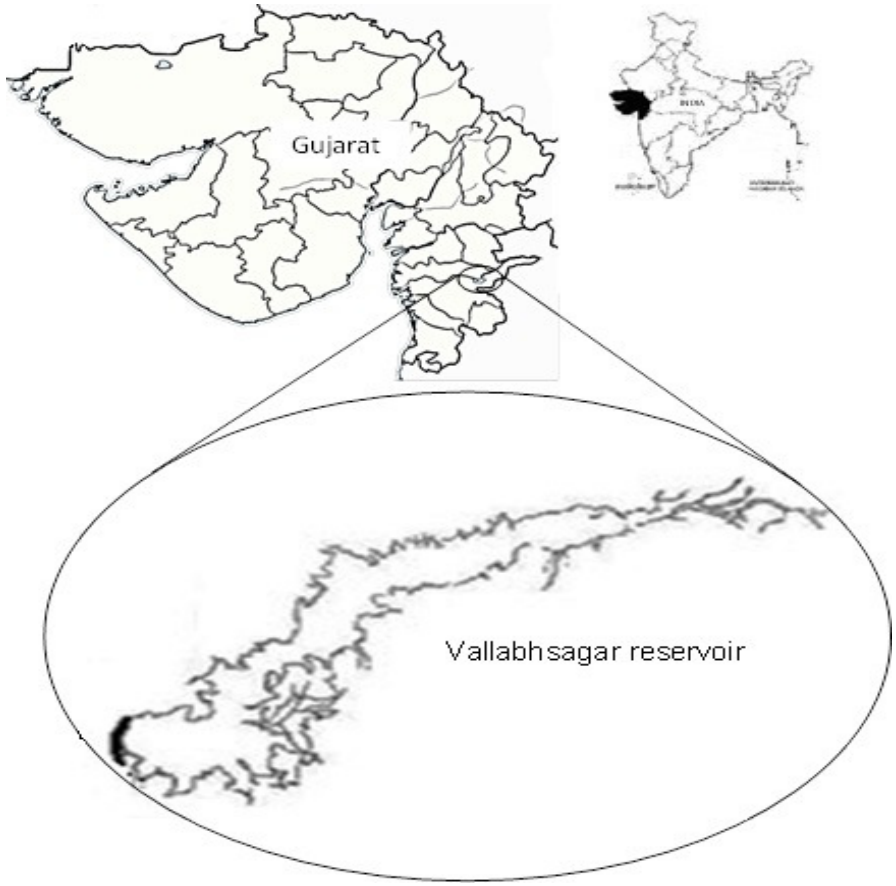

Figure-1: Map of study area.

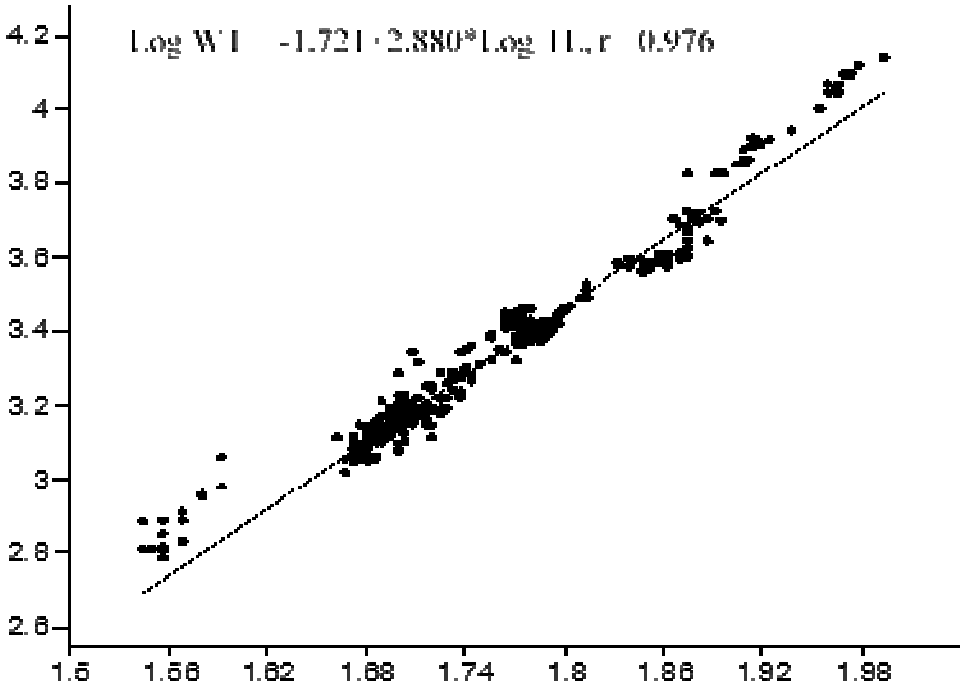

Figure-2: Length weight relationship of *Catla catla.*

Table-1: Length weight relationship of *Catla catla* at different length groups 2013-14.

Length Groups	Number of fish (n)	Intercept (a)	Slope (b)	Correlation (r)	Frequency (%)
A (31-40)	15	-3.950	4.363	0.836	2.707
B(41-50)	110	-1.294	2.621	0.557	19.855
C(51-60)	192	-2.416	3.279	0.933	34.657
E(61-70)	124	-1.803	2.923	0.817	22.382
F(71-80)	77	-5.875	5.070	0.894	13.898
G(81-90)	20	-3.718	4.859	0.871	3.610
H(91-100)	16	-5.915	5.049	0.930	2.888
Pooled	554	-1.721	2.880	0.976	100

Table-2: Condition factor and relative condition factor of *Catla catla* at different length group.

Length groups	Number of fish (n)	Condition factor (K)	Relative condition factor (Kn)
A (31-40)	15	1.530	1.004
B (41-50)	110	1.169	1.001
C (51-60)	192	1.178	1.003
E (61-70)	124	1.149	1.002
F (71-80)	77	0.974	1.002
G (81-90)	20	1.328	1.001
H (91-100)	16	1.382	1.000
Pooled	554	1.162	1.006

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