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Zoology

# **Research Paper**



# Length Weight Relationship and condition factor of Labeo rohita in Govindgarh Lake, Rewa (M.P.)

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### ABSTRACT

The investigation is the length-weight and condition factor of two hundred and fifty five adult Labeo rohita fishes in Govindgarh lake, Rewa were investigated. The value of regression coefficient for the length-body weight relationship was calculated to be 2.85  $\pm$  0.062 ( $\pm$  95%cl). This suggests almoston isometric growth form in all the specimen sampled because the values are very close to 3. The coefficient of correlation (r2) was calculated to be equal to 0.98 (i.e. > 0.9), which suggests that the two variables (Length & Weight) are highly correlated. The P value was <0.0001, which means that the correlation between the two variables is highly significant in all samples. The mean 'condition factor' (k) of the species was computed to be equal to 1.60 suggesting that the specimens were in good condition or health.

# Keywords : Length weight relationship, Labeo-rohita, Govindgarh lake.

#### INTRODUCTION

Labeo rohita (Rohu) is the most important among the three Indian major carp species used in polyculture systems. This Indo-Gangetic riverine sps. is the natural inhabitant of the reverine system of Northern and Central India. It has every high food value and commercial importance. It is highly liked for its taste and flavor.

One of the most important parameters of fish physiology is its 'growth' i.e. on overall increase in size, weight, maturity, reproductive development etc. growth means a change in length or weight or both with increasing age. Increment in size is due to conversion of the food matter into the building matter of the body by the process of nutrition.

Different fishes grow with different rates depending upon their genetic make up and the food resources available and the environmental conditions in which they live and grow. One of the methods for the evolution of growth of a fish is the estimation and relation of length and weight parameters. Theretically it is expressed by formula of a cube law (Le Cren, 1951) which states that the weight of a fish increases with cube of its length i.e. a unit increase in length causes a three fold increase in weight of the fish.

W=aL<sup>b</sup>: The value of constants 'a' and 'b' are determined compirically from data, as the coefficient of condition (Richer, 1975). How much a particular environment is favorable for optimal growth of a fish is determined by seeing the well being of the fish. This well being of fish is called 'condition of fish' and is determined on the basis of 'condition factor'. it also gives us an idea about the richness of the habitat in terms of food availability.

The application of the "cube law" equation to fish measurements has been carried out by numerous workers, beginning with Henson (1899) when he presented the first publication related to condition factor. Heincke (1908) was probably the first to link the value of 'condition factor' with the fish condition and stated that the better the fish, the higher the value of condition factor.

In India first work on LWR was done on Mahseer Tor putitora (Ham.) by Lacey and Cretin (1905); Traven (1925). Khan and Hussain (1941) studied the LWR of Labeo rohita. Cirrhina mrigala from departmental fish form at Chhenawan, Punjab. Many other workers who have worked on Length-Weight relationship of fishes also.

The present study has been under taken to establish a lengthweight relationship of Labeo rohita in Govindgarh Lake and to evaluate from this data, the condition or well being of the said species. The present study is first of its kind on any of commercially important species in lake of Vindhya Pradesh region will contribute to the existing knowledge of Length-Weight relationship of Labeo-rohita and will be helpful in the future studies on Labeo rohita in this region.

#### MATERIALS AND METHODS

**Study site** : Study was carried out at Govindgarh lake in Rewa District (M.P.), India. The Area is situated between latitude  $24^{\circ}18'$  and  $25^{\circ}12'N$  and Longitude  $81^{\circ}2'$  and  $82^{\circ}18'E$ . The big lake of this area Govindgarh lake.

**Study material**: Two hundred and fifty five fish samples of Labeo rohita used for the present study of weight length relationship were obtained on daily basis for three months during March 2011 to May 2011 form commercial catch landings at Govindgarh lake. Length measurements were made on each fish. For total length from tip of the lower Jaw to the posterior extremity of the caudal fin. Total length in (m.m.) and total weight in (grams) for each individual fish (Weighting above 1000 grams) was taken with the help of measuring scale and plateform balance respectively. Both parameters were taken in fresh and wet conditions at around 8.00 to 9.00 AM in view of the object of this study and extensive size range for the said species was inculated in this study; collection were taken en from some locality, the sex factor was not reckoned as

also the gonadial condition and gut contents. The material is, therefore, Heterogeneous.

**Length-Weight relationship**: A scatter diagram of log body weight against log total length was made for the species. The regression of weight against length was computed from the relationship.

W = aL<sup>b</sup> Where; W = Weight, L = Total Length a = Constant b = Exponent, ranging between 2.5 (Tudorancea et al. 1988). The log Transformed data gave the regression equation.

Log W = log a = b log 1 Where; a = Constant b = The regression co-efficient (Tudorancea et al. 1988).

 $\label{eq:condition} \begin{array}{l} \mbox{Condition factor :} The \ \mbox{condition factor } (k) \ \mbox{was calculated by} \\ the \ \mbox{formula :} \end{array}$ 

 $K = 100 W/L^{b}$ 

Where; W = Weight (s) L = Total Length (cm) b = Regression co-efficient.

as suggested by lima-Junior et al. (2002), the exponent 'b' value used was obtained from the estimated length-weight relationship equation (W=aL<sup>b</sup>) generated from the data of the sampled individuals.

## **RESULTS AND DISCUSSION**

A clear understanding of the laws governing length and weight must be assured.

The regression equation for the present data was calculates as follows :

Log W = -1.974 is the intercept 'a' and 2.97 is the slope 'b'. All the values obtained were highly significant (P<0.001).

Thus the average values of 'b' was calculated to be equal to 2.97 in the present study for Labeo rohita.

Mean condition factor of species was found to be 1.60. Condition factors were calculated for each length class separately. This might be associated with the collection, size of fish, sample size, development of gonad as also suggested by Rehman et al. (2004).

The correlation coefficient (r) was calculated from the data to be equal to 0.98 (i.e. >0.9), suggesting that the two variables, weight and length are highly correlated.

Total length of the fishes in the present study ranged from 39cm-70cm with a mean value of  $54.5 \pm 1.658$  at 95% confidence level. The maximum number of specimen were in the length range of 55cm-59cm with length class 59 showing maximum number of specimen (32) and 45 length class showing minimum number of specimen (1) studied.

The weight of the fish specimen studied ranged from 970g-5200g with a mean value of  $2569.02 \pm 45.82$  at 95% confidence level. The maximum no. of fishes ranged in the weight range of 2500g-3500g. To the best of our knowledge, no reference dealing with LWRs for the studied species are available from the particular reservoir or lake, Vindhya Pradesh region, thus it was not possible to compare the present results with the previous references. The 'b' value calculated for the said species in this study were generally in agreement with the results for Labeo rohita and other carps from other geographical areas.

According to Hile (1936) and Martin (1949) the value of 'b' usually remains constant at 3.0 for an ideal fish. However, Beverton and Holt (1957) suggested the departure of 'b' value from 3.0 is rare in adult fishes. In the present study the adult fish showed little deviation from the ideal values.

Pathak (1957) has reported a 'b' value of less than 3.0 for Labeo calbasu from Soni River and Harish Kumar et al. (2006) also reported values of less than 3.0 for the males and females of Rasbora doniconius from Karnataka. The change in the exponent values may be due to the changes in specific gravity and shape of the body contour and in such cases the cube law need not always hold good.

The values of 'b' and condition factor 'K' differ not only in species but in same species for different length classes also due to sex, maturity stage; feeding intensity etc. The value of 'b' and 'k' also showed variation in the present study. The lengthweight relationship present study reveals that the weight increases rapidly with the increase in length of fish. From the data collected it was calculated that the weight increase with a factor of 2.97, which is very close to the cube law value of 3.0 for an ideal fish.

Thus it can be concluded that Labeo rohita almost follows the cube law in the present study and the fish is growing isometrically in relation to length. This value is close to the values reported by various author for Labeo rohita in different environments like 3.01 by Jhingran (1952), 3.06 by Khan (1906), 3.06 by Salam and Janjua (1991). Same values have been obtained on other species also like 2.99 by Naeem et al. (1992). for Oreochromis nilotica, 3.05 by Zafar et al. (2001) for Channa punctata and 3.02 by Zafar et al. (2003) for Catla catla.

In case of the condition factor it shows fluctuations with different length classes. The results showed the highest values of 'K' occurs in the lower length classes and after that it shows a constancy at higher lengths and does not change rapidly with increasing length. The higher values in the lower length classes may be due to intense feeding in the pre adult stage. But the condition factor does not merely reflect the feeding condition of the adult stage, but include the state of gonadal development, based on the consumption of fat reserves during the spawning periods. Thus the decrease in condition factor may be due to high metabolic rates at the start of the spawning. Same results were obtained by Thompson (1942). He called 'K' the pondered index and suggested that the variations in the K values reflect not only the spawning state but also changes in appetite and general condition.

The overall results indicate that Labeo rohita showed an almost isometric pattern of growth in the present habitat and the condition factor values showed that it is in good condition or health and the present condition existing in the collection site is conducible for the feeding and optimum growth of fish.

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