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LENGTH-WEIGHT RELATIONSHIP OF FISHES OF MANSAROVAR RESERVOIR BHOPAL

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The Present paper embodies the study of furcal length and body weight relationship in economically important and abundantly found fishes from lentic water body *i.e.* Mansarovar reservoir, Bhopal. The high values of coefficient of correlation "r" (between 0.9401 to 0.9954) showed a strong positive correlation between length and weight in all cases, revealed that applicability of equation derived is high. The results obtained revealed that *Clarias batrachus* (n = 3.1151) were most conductive for Mansarovar reservoir, because only this fish should the 'n' value more than 3. The value of *Labeo fimbriatus* (n = 2.6157 and *Labeo bata* (n = 2.2500) showed slight decreases in growth constant while rest of the fishes *Notopterus notopterus* (n = 1.4177), *Mystus seenghala* (n = 1.9197), *Labeo calbasu* (n = 1.3405) and *Puntius sarana* (n = 1.1214) had quite low values. The factors responsible for decrease in growth constant are dietary, topography, taxonomic and water quality of the lakes.

Key words : Mansarovar reservoir, fishes (*C. batrachus, N. notopterus, M. seenghala, P. sarana, L. calbasu, L. fimbriatus, L. bata),* length-weight equation, exponential constant, coefficient of correlation.

INTRODUCTION

Fishes are the useful barometer of real state of purity of water. It is the highest trophic level of aquatic ecosystem and is the major material which can be extracted from water mass. Economic value of any fish depends upon the relationship between its length and weight. The present study is directed towards the mathematical relationship between length and weight and to measure expected variations from the expected length weight of individual fish or a group of fishes indicating the general well being of fish (Lecren, 1951). On plotting the value of furcal lengths against their respective weight a parabola was obtained, indicating that the increase in weight of a fish is an exponential function of its length. According to cube law, the weight of a fish equal the cube of its length times a constant (Jhingran, 1952).

The cat fish *Clarias batrachus* (predaceous Bottom Feeder) and *Mystus seenghala* (dominant cat fish) was present at all depth. It is carnivorous in habit while omnivore fishes such as *Notopterus notopterus, Puntius sarana* was present at all depths whereas *Labeo calbasu, Labeo fimbriatus* and *Labeo bata* (medium sized) were bottom feeder in nature. The length-weight relationship in some fish species was studied by Pandey (1998), Mohan & Saraswat (2000), Mohan & Jhanghria (2001) and Johal *et al.* (2005). The present study is aimed to provide a mathematical relationship and computation between body length and body weight of the seven economically importance fishes from Mansarovar reservoir.

MATERIALS AND METHODS

Mansarovar, a pisciculture reservoir with 73 hectare of productive area is situated in the densely populated southern part of Bhopal only seven economically important and abundantly present fishes of the reservoir were chosen for the study of length weight relationship. About 50 mature specimens of each fish captured with the help of "Kharki Jaal" were examined from January to December". The identification was done after Day (1878) and Jayram (1981).

For determination of their length weight relationship furcal length was measured on measuring board. Furcal Length was taken as total length, as total was often vitiated by wear and tear and standard length thought very reliable was too difficult to ascertain by external examination. Fishes were weighed on platform balance.

The data collected was grouped into class interval of 10 c.m. each, tabulated and subjected to analysis by the formula –$W = .CL^n$ where W = Weight L = Length C = multiplying constant and n = exponent of length calculated after Jhingran *et al.* (1969). For practical purposes this relationship was usually expressed in its logarithmic form :

$$\log W = \text{Log } c + n \log L$$

The coefficient of correlation (r) between length and weight was calculated by the following formula suggested by Haynes (1982).

$$r = \frac{\Sigma x y - \bar{x} y}{\sqrt{[(\Sigma x^2 - \bar{x} \Sigma x)(\Sigma y^2 - \bar{y} \Sigma y)]}}$$

where :

X = First variable (Length) $\bar{X}$ = Mean of first variable
Y = Second variable (Weight) $\bar{Y}$ = Mean of second variable

RESULTS AND DISCUSSION

The determination of a precise mathematical relationship between length weight of a fish, forms one of the important aspects in the study of biology of a fish. Analysis of collected specimens showed the formula correlating length and weight. The derived equation and their logarithmic forms are shown in Tables I & II.

Table I : Formulae correlating the length-weight parameters.

Parameter	*Clarias batrachus*	Notopterus notopterus	Mystus seenghala
Length weight equation	$W = 0.0000023\ L^{3.115}$	$W = 0.00147L^{1.4177}$	$W = 0.00023\ L^{1.9197}$
Logarithmic form	Log w = -5.6228 + 3.1151 Log L	Log w = -2.8299 + 1.4177 Log L	Log w = -3.6306 + 1.9197 Log L
Coefficient of correlation (r)	r = 0.9954*	r = 0.9948*	r = 0.9875*

* = Significant $p \leq 0.01$ Level

Here the length weight relationship of *Clarias batrachus* (n = 3.115) obeyed the general cube law. It is worth mentioning that records on length weight relationship of this fish are not available. While the value of *Notopterus notopterus* (n = 1.4177) and *Mystus seenghala* (n = 1.9197) is quite low in comparison to that (3.0140) studied by Jhingran (1952). Bhatnagar (1989) calculated length-weight relationship of *Mystus seenghala* from four water bodies and reported that fish deviates from cube law. (*i.e.* 1.457-2.5447).

Puntius sarana on plotting the log values of length against weight linear relationship was obtained whereas the equation showed the n (1.1214) value less than 3. Dutta & Kumari (1976) also reported value of n (0.752) > 1 in males of *Puntius sarana*. In case of *Labeo* species values

of 'n' was also observed less than 3. In the present study value of 'n' was 1.3405 in *Labeo calbasu*, Rao & Rao (1952) in Godavari river, Pathak (1975) in Loni reservoir, Adholia (1979) in Betwa river (1.3446) and Khan (1988) in Tilaiya reservoir (2.7970) have also observed the 'n' value less than 3 for this major carp and confirmed the present results.

The value of 'n' (2.6157) which was noted for *Labeo fimbriatus* showed than the fish deviated from general cube law. Contrary to it, the results of Karamchandani *et al.* (1967) 'n' value was (3.3089 and 2.7321) in male and female species reveal that the fish obeyed the cube law. *Labeo bata* also recorded less than 3 value of 'n' (2.2500), Adholia (1952) and Chakrawarti (1992) also reported same observations, thus fish deviating from cube law.

Table II : Formulae correlating in the length-weight parameters.

Parameter	*Puntius sarana*	*Labeo calbasu*	*Labeo fimbriatus*	*Labeo bata*
Length-weight equation	$W=0.004812L^{1.1214}$	$W=0.01016L^{1.3405}$	$W=0.000033L^{2.6157}$	$W=0.000111L^{2.2500}$
Logarithmic form	Log W = -2.3170 +1.1214 Log L	Log W = -1.9930 +1.3405 Log L	Log W=-4.4686 +2.6157 Log L	Log W = -3.9508 + 2.2500 Log L
Coefficient of correlation (r)	r = 0.9942*	r = 0.9401*	r = 0.9875*	r = 0.9795*

* Significant p $\leq$ 0.01 Level)

The factors which influence value of 'n' are dietary, topographical and taxonomic. The deviation may be due to changes in environmental conditions. The coefficient of correlation between length and weight of seven economically important fishes were found high (Tables I & II). The student 't' test showed the values significant at p $\leq$ 0.01 level. High values of coefficient of correlation have shown a positive correlation between length and weight in all cases and revealed that reliability of equation derived is high.

According to present study length weight relationship mentioned comprehensive picture of growth of fishes. Present observation showed that *Clarias batrachus* as only this fish showed the 'n' value more than 3, was most conductive for Mansarover reservoir. The values of *Labeo bata* and *Labeo fimbriatus* showed slight decrease in growth constant while rest of the fishes had very less values

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