iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** V **Month of publication:** May 2019

DOI: https://doi.org/10.22214/ijraset.2019.5394

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue V, May 2019- Available at www.ijraset.com

Length Weight Relationship (LWR) of Fish, Labeo rohita (Hamilton)from Ropar Wetland, Punjab, India

Kaur V[1], Arengh CN[2], Heer BK[3], Sharma N[4]
[1, 2, 3, 4]Department of Zoology and Fisheries Sciences, Dolphin (PG) College of Science and Agriculture,ChunniKalan,Fatehgarh Sahib, Punjab (INDIA)

Abstract: Length- weight relationship (LWR) of a fish,Labeorohita (Hamilton) have been studied from Ropar wetland, Punjab, India. Samples were collected monthly during study period of January 2019- April 2019. Fish ranging from 29-35.4 cm in total length and from 265-560 g in total weight were randomly sampled. The value of correlation coefficient between Total length (cm) and Total Weight (gm) has been found to be 0.808 highly significant at P≤0.01. The 'b' value between Total Length and Total Weight was found to be 3.63 which showed significant positive allometric growth.
Keywords: Length-Weight Relationship, Labeorohita, allometric growth, Total Length, Total weight, Ropar wetland

I. INTRODUCTION

In fishery science, the length-weight relationship study of fishes is considered to be one of a basic tool to assess its production, growth, productivity of the habitat, stocking density, maturity etc. The length-weight relationship is very important in fishery assessments, and to measure the fish growth pattern or age (Garcia *et al*., 1998). Length and weight relationship is also necessary in assessing fish stocks particularly in regions where fisheries represent one of the most important economic activities and fish stocks are primary food source for many communities (Froese*et al*., 2011).

The length and weight relationship are also used in estimation of fish biomass from length frequency distributions, and condition of fish (Petrakis and Stergiou, 1995). Length-weight relationships may alter throughout cycle of life. It can also be used as a character for differentiation of taxonomic units. Thus the aim of present study was to investigate LWR of a fish, *Labeorohita* (Hamilton) from Ropar wetland, Punjab.

II. STUDY AREA

Ropar wetland (30.9664º N Latitude and 76.5331 º E Longitude) is situated on Sutlej river and is located in state Punjab, India. This wetland is included into list of National importance in 1996 and Ropar wetland was declared as Ramsar site in 2002. This is one of the great potential fishery resources in Punjab. Wetland serves as a important habitat for threatened species and serves as an important source of water for distant areas through Sirhind and Bist Doab canals and also provide protection against flooding and improves water quality.

III. MATERIALS AND METHODS

A total number of fifteen specimens of Labeorohita (Hamilton) were collected from Ropar wetland from January 2019-April 2019. The specimens were preserved in 5% formaldehyde solution on the spot. Fishes were brought to laboratory for further analysis. The parameters of the length-weight relationships were calculated by the following equation:

$$W = aL^b$$ (Le Cren, 1951; Ricker, 1973; Pauly, 1983)

Where

W: Weight of the fish in grams (gm)

L: Total length of the fish (cm)

a: Constant (intercept)

b: the length exponent (slope)

The length-weight pairs were plotted initially in order to identify and delete the possible outliers. The "b" is an exponent with value ranging between 2.5-3.5 demonstrating normal growth dimensions or the interpretation of relative well-being (Bagenal, 1978; King, 1996 a, b). Linear transformation was made by using the natural logarithm at the observed lengths and weights proposed by Zar (1984). The expression of the equation is represented by the following formula:

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

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue V, May 2019- Available at www.ijraset.com

A graph of the log W against log L forms a straight line with slope of "b" and a Y-axis (log w) intercept of log a. All the above statistical calculations were done using the software SPSS (Version 25) and then the graphs were plotted using the observed values and log of observed values.

IV. RESULTS

The present studies have been carried on the fifteen specimens of the rohu, *Labeorohita* (Hamilton) collected from the Ropar wetland, Punjab, India. The total fish length ranged between 29-35.4 cm and the total weight of the fish varies between 265-560 gms (Less than 1 Kg). Every effort was made to have a random sampling so as to include all size groups. The data included in the present studies include both male and female specimens and belongs to all phases of life.

On the analysis of the data, it has been observed that the length-weight shows a significant correlation between these two parameters and the value of the correlation has been found to be 0.808**.

All the observed values are plotted on graph with length on the X-axis and weight on Y-axis. It has also been observed that when the observed values of total length and the weight are plotted on X and Y axis respectively, a curvilinear relationship has been obtained which is very much evident in the graph (Fig. 1). To calculate the length-weight relationship, these values have been converted into logarithmic values so as to obtain a straight line relationship (Fig. 2). Therefore all the calculations of the length weight relationship are based on log values not on the original values.

The value of correlation coefficient is on very high side 0.808** and value of "b" is 3.63. The value of "b" which is also known as "n" value or exponent value. The exponent value is a measure of robustness of the fish. It can be concluded that fish increases more in weight and less in length because the values of "n" is more than 3 i.e 3.63. This increase in value can be attributed to either the sample includes more females and they may be in the last stage of maturity or they may be feeding actively.

Table 1 Correlation coefficient "r", value of constant "a" and "b", regression equation of*Labeorohita*(Hamilton).

Total Length (cm)	N	Weight (gms)	Correlation Coefficient	Value of "a"	Value of "b"	Regression equation	$W=aL^n$
29-35.4	15	Less than 1Kg	0.808**	-2.89	3.63	=-2.89+3.63logTL	$= 0.001288.L^{3.63}$

N= number of specimens ** correlation significant at 0.01 level.

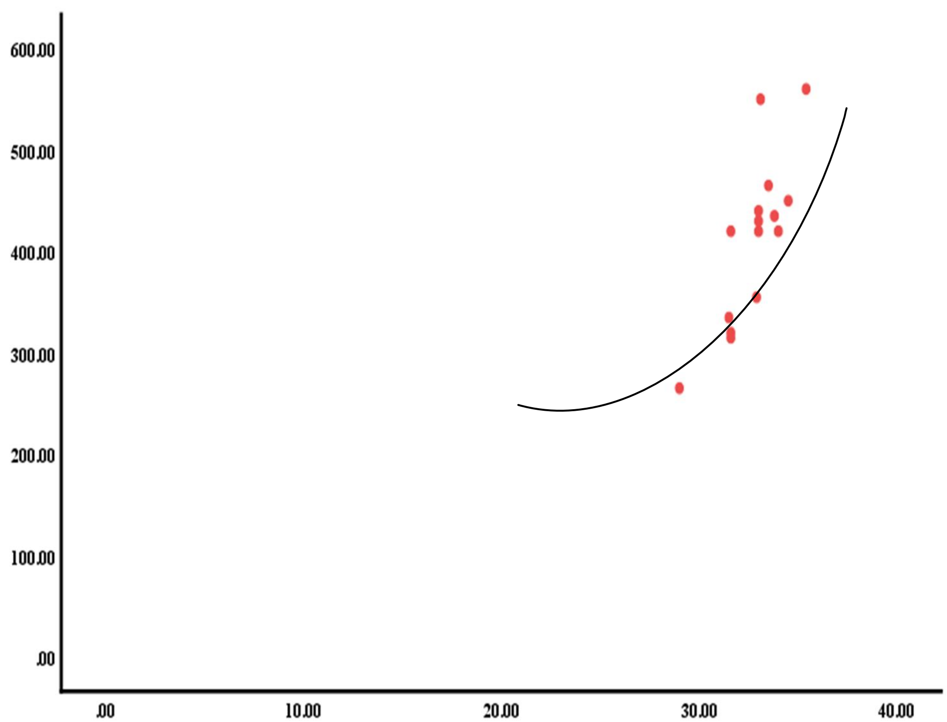

Fig. 1.Curvilinear relationship between Total Length (cm) and Total Weight (gm) of *Labeorohita*(Hamilton) from Ropar wetland, Punjab, India.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue V, May 2019- Available at www.ijraset.com

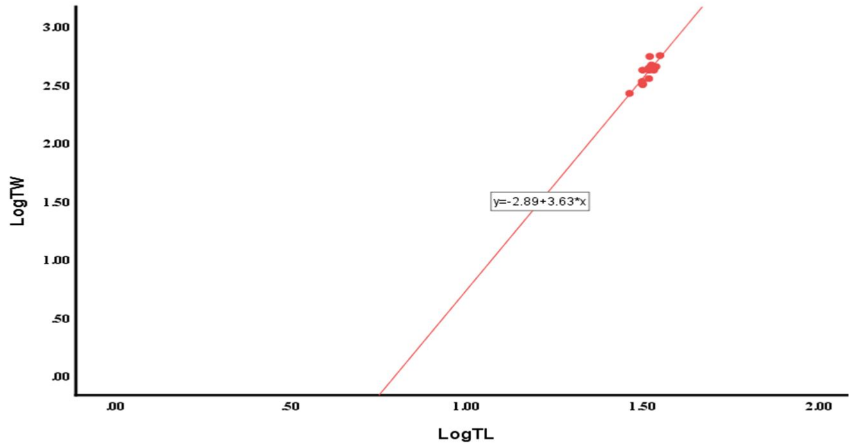

Fig.2. Graph between LogTL and LogTW ofLabeorohita (Hamilton) from Ropar wetland, Punjab, India.

In Table 1, the regression equations based on logarithmic values are given for the extrapolation of results. For extrapolation the log total length value is used which gives log weight and by calculating antilog of the log weight, it gives the calculated weight of fish. In practice there is always a difference between the calculated and observed weight.

V. DISCUSSION

The length–weight relationships are a basic and fundamental device in fish science, physiology, environmental science and fisheries evaluation (Oscoz et al., 2005). LWRs are required for the estimation of weights from lengths as direct weight measurements can be a time consuming process in the field (Koutrakis and Tsikliras, 2003) and play an important key in fish biology and can provide information on stocks or condition of an organism (Gonzaleet al., 2004). A variety of useful concepts, centering on the body shape of individual fish, arise from the consideration of combined length-weight data. In general “b” less than 3 represents fish that becomes less rotund as the length increases. For most species and population, “b” is greater than 3 (Murphy and Willis, 1996). If “b” equals 3, growth may be isometric, meaning that fish grows equally in all the direction in form of cube which is practically not possible. If “b” is greater than 3, the growth is allometric and dimensions change with growth. Results of present study indicate that the fishes having size range 29-35.4 cm and fish increase more in weight and less in length because value of “n” was found to be 3.63 and shows positive allometric growth.

Jhingran (1952) calculated the value for Catlacatla, Cirrhinuscarpio and Labeorohita to be 3.151172, 3.0248352 and 3.0140028 respectively. Kaur and Rawal (2015) also observed value of ‘‘b’’ for Glossogobiusgiuris from Sukhna Lake to be 3.18. Kaur and Rawal (2017) also calculated value of “b” for Notopterusnotopterus from Sukhna Lake to be more than 3 i.e. 3.57. Similar results were observed in present studies i.e value of “b” more than 3. According to Prasad and Anwar (2007), the values of “b” above 3 are possible in some conditions such as stress free environments.

It is understood that the increase in weight of any individual was not due to a single factor but various factors (Silvia et al., 2002). 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 various factors which affect the length and weight of the fish include food availability, available conditions in water body, seasonal changes and sufficient space area (Townsend et al., 2003). LWRs play an important role in conservation and management of fishery.

VI. CONCLUSIONS

The length-weight relationships of Labeorohita (Hamilton) have shown positive allometric growth. The results of present study shall be of great importance in evaluating the relation of fish population, species, biology, conservation and fisheries management in Ropar wetland, Punjab, India.

VII. ACKNOWLEDGEMENTS

Authors are very thankful to the Dr. BhupinderjitKaur, (HOD), Department of Zoology & Fisheries Science, College Management, Dolphin (PG) College of Science and Agriculture, ChunniKalan, Fatehgarh Sahib, Punjab, India for providing necessary laboratory facilities.

REFERENCES

[1] Garcia, C.B., Buarte, J.O., Sandoval, N., Von Schiller Mello, D. and Najavas, P. Length-weight Relationships of Demersal Fishes from the Gulf of Salamanca, Colombia. Fishbyte, 21: 30-32, (1998).

[2] Forese, R., Tsiliars, A.C. and Stergious, K.I. Editorial note on weight- length relationship of fishes .ActaIchthyologicaEtPiscatoria, 41: 261-263, (2011).

[3] Petrakis, G. and Stergiou, K.I. Weight-length relationships for 33 fish species in Greekwaters. Fish. Res., 21: 465-469, (1995).

[4] Ricker, W.E. Linear regressions in fishery research. J. Fish Res. Board Can. 30: 409-434, (1973).

[5] Le Cren, E.D. The length-weight relationship and seasonal cycle in weight and seasonal cycle in weight and condition in perch, Percafluviatilis from the opercular bone. J. Ani. Eco.20: 201-219, (1951).

[6] Bagenal, T.B. Methods for Assessment of Fish Production in Freshwaters. IBP Handbook No. 3, Blackwell Scientific Publications, Oxford, (1978).

[7] King, R.P. Length-weight relationships of Nigeria Freshwater fishes. Naga ICLARIM Q 19 (3): 49-52, (1996a).

[8] King, R.P. Length-weight relationship of Nigerian Coastal water fishes. Fishbyte, 19(4): 53-58, (1996b).

[9] Zar, J.H. Biostatistical Analysis. Prentice Hall, New Jersey, (1984).

[10] Oscoz, J., Campos, F. and Escala, M.C. Weight-length relationships of some fish species of the Iberian Penninsula. J. App. Ichthyol. 21: 73-74, (2005).

[11] Koutrakis, E.T. and Tsikliras,A.C. length – weight relationships of fishes from three northen Aegean esturine systems (Greeece), J. Appl. Ichthyol,19: 258-260, (2003).

[12] Gonzalez AAF, De La Cruz Aguero G, De La Cruz Aguero J. Length-weight relationships of fish caught in amangrove swamp in the Gulf of California (Mexico). J. App Ichthyol.,20, 154-155,(2004).

[13] Murphy, B.R. and Willis, D.W. Fisheries Techniques. American Fisheries Society, Bethesda, (1996).

[14] Jhingran, A.G. The length-weight relationship and K factor of Gudusiachapra (Ham) from the Ganga river system. Proceedings of National Academy of Science, India, 88B: 249-263, (1968).

[15] Kaur, V. and Rawal, Y.K. Length-Weight Relationship in Glossogobiusgiuris (Ham.) from Sukhna Lake Chandigarh, Int. J. Sci. Res., 4(9): 2319- 7064, (2015).

[16] Kaur, V. and Rawal, Y.K. Length-Weight Relationship (LWR) in Notopterusnotopterus (Pallas) from Sukhna Lake, Chandigarh." IOSR Journal of Pharmacy and Biological Sciences, IOSR-J. Pharma. Bio. Sci, 12(4) 63-65, (2017).

[17] Prasad,G. and Anwar, A.P.H. Length-Weight Relationship of a Cyprinid fish Puntiusfilamentosus from Chalakudy River, Kerala. Zoos Print. J., 22(3): 2637-2638. (2007).

[18] Silvia, H.L., Schwarmborn, P.F. and Ferreira, B.P. Age structure and growth of a dusky damselfish, Stegatesfuscus, from Tamandare reefs, Pernambuco, Brazil. Env. Bio.Fish. 63: 79-88, (2002)

[19] Youson, J.H., Holmes, J.A., Guchardi, J.A., Seelye, J.G., Beaver, R.E., Gersmehl, J.E., Sower, S.A. and Beamish, F.W.H. Importance of condition factor and the influence of water temperature and photoperiod on metamorphosis of sea lamprey, Petromyzonmarinus. Can. J. Fish Aqu.Sci. 50: 2448-2456, (1993).

[20] Townsend, C.R., Silva, L.V.F. and Baldisserotto, B. Growth and survival of Rhamdiaquelen(Siluriformes, Pimelodidae) larvae exposed to different levels of water hardness. Aquaculture, 215: 103-108, (2003).