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Studies on The Length-Weight Relationship and Morphometric Characteristics of Rohu, *Labeo Rohita* (Hamilton) from Pond in Radhamohanpur, Jirania, Tripura, India

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Abstract

*The present study describes the length–weight (LWR) relationship and morphometric characters of 30 specimens of the rohu, Labeo rohita (Hamilton) collected from the pond situated in Radhamohanpur, Jirania, Tripura, India over a period of six months extending from (January 2020-June 2020). The fish were caught by traditional fishing gear. Total length (TL) reading has been taken from Vernier Calliper and Body weight (BW) measured with digital balance. The readings of morphometric parameters were converted into percentages. These percentages were then used to compute mean, standard deviation (S.D) and range. The actual values were used to calculate correlation coefficients (r), regression equations between independent and dependent parameters and for plotting the regression lines. A positive significant correlation was found between two parameters (0.872)**. The coefficient b of the LWR was found to be 2.02 (b < 3.00) suggesting negative allometric growth in Labeo rohita (Hamilton). The various morphometric characters revealed a high degree significant positive correlation when compared with each other. With respect to Total Length (TL), ten genetically controlled characters, two Intermediate characters and four environmentally controlled characters have been observed. This study will provided the baseline data about LWRs and morphometric characters and helps fishery managers in establishing a monitoring and management system of the fish species. The morphometric measurements confirmed that the test organism Labeo rohita (Hamilton-Buchanan) has very little impact of environment because this area is still undisturbed from environmental degradation point of view.*

Keywords: Length–weight (LWR) relationship, morphometric characters, labeo rohita (hamilton)

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INTRODUCTION

The study of length-weight relationship is major parameter for the utilization and handling of fish species which is very important for stabilizing the taxonomic characters of the species [1]. Length-weight relationships and morphometric characters have great significance in fisheries science [9, 10]. The information acquired from LWRs can have important role in developing modern aquaculture techniques for better commercial yield productions of such economically and commercially important fish species [6] and can provide useful information for fishery managers. The study of morphometric and meristic characters give detailed information on the genetic improvement of stocks [12]. Furthermore, it act as great tool for giving information on relationships among various

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categories [11].

MATERIALS AND METHODS

The present study was conducted on 30 specimens of *Labeo rohita* (Hamilton) collected from a pond situated in Radhamohanpur, Jirania, Tripura over a period of six months extending from (January 2020-June 2020). Fish sampling was done during the different months.

Length–Weight (Lwr) Relationship and Morphometric Characters

The length-weight relationships were estimated from formula proposed by Le Cren [7]

$$W = aL^b$$

Where,
W = Weight of the fish in gram (g)
L = Total length of the fish (cm)
a = Constant (intercept)
b = the length exponent (slope)

Linear transformation was made by using the natural logarithm at the observed lengths and weights proposed by Zar [13]. The expression of the equation is represented by the following formula:

$$\text{Log } W = b \log L + \log a$$

The morphometric measurements of all specimens were done from the left side of the body of the fish. The total lengths of the fish were recorded with an accuracy of ± 0.5 cm. the graphs were plotted based on the regression and correlation of each morphometric character. Regression equation is given by the formula:

$$Y = a + b(X)$$

Where,
Y = Dependent variable
a = Constant
b = Slope of line
X = Independent variable

The morphometric readings were then converted into percentages and have been expressed with respect to total fish length and head length. These percentages were then used to compute mean, standard deviation (S.D) and range. The actual values were used to calculate correlation coefficients (r), regression equations between independent and dependent parameters and for plotting the regression lines. For computation of mean, standard deviation (S.D), range difference, correlation coefficient, regression equation and plotting of the regression lines, the standard version of computer program SPSS (25) was used.

RESULTS AND DISCUSSION

Length –Weight Relationship

The present investigations are based on 30 specimens collected from pond situated in Radhamohanpur, Jirania, Tripura, India. The sampled fish weight ranged between 220-2100 gram and total fish length ranged between 27.4-71 cm. The length-weight shows a significant correlation between these two parameters and the value of the correlation has been found to be 0.872**). The coefficient ‘b’ of the LWR was found to be 2.02 ($b < 3.00$) suggesting negative allometric growth in *Labeo rohita* (Hamilton). Length weight relationship of fish is considered to be of prime importance as it is used in estimating average weight at a given length group (Table 1, Figure. 1, 2). Similar results have been observed by Desai and Shrivastava [2]. The availability of living space and food could strongly influence the values of exponent [3].

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

Total Length (cm)	N	Weight (g)	Correlation Coefficient	Value of "a"	Value of "b"	Regression equation	$W=aL^n$
27.4-71	30	Less/More than 1Kg	0.872**	-0.273	2.027	= -0.273+2.027 logTL	$0.824L^{2.02}$

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

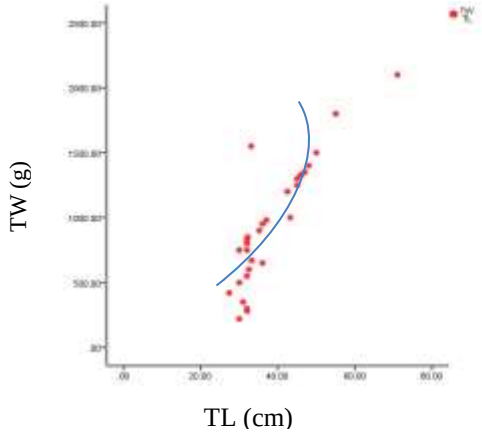

Figure 1. Curvilinear relationship between Total Length (cm) and Total Weight (g) of *Labeo rohita* (Hamilton) from the pond in Radhamohanpur, Jirania, Tripura, India.

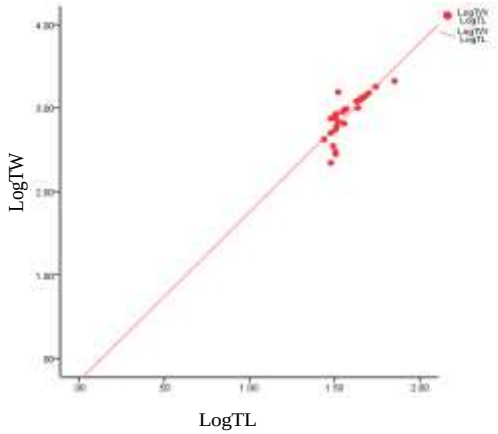

Figure 2. Graph between LogTL and LogTW of *Labeo rohita* (Hamilton) from the pond in Radhamohanpur, Jirania, Tripura, India.

Sixteen morphometric characters were analyzed in *Labeo rohita* (Hamilton) with respect to total length (Total Length). During the present investigation, ten characters were genetically controlled, two characters were intermediate and four characters were environmentally controlled. It gives clear indication that this pond is still undisturbed from environmental point of view. Similar results have been observed *by* Johal *et al*. [4, 5] i.e. 18 characters, 11 characters were found to be genetically controlled, 5 characters were intermediate and 2 characters were environmentally controlled in *Tor putitora* from Pong reservoir in Himachal Pradesh. Similar results were observed in previous study by Brraich and Akhter [8] on fish, *Crossocheilus latius latius* (Hamilton-Buchanan) from Ranjit Sagar Wetland, India.

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Table 2. Mean, correlation coefficients (r) and regression equation between Total Length (TL) vs. all other morphometric characters of *Labeo rohita* (Ham.) collected from pond in Radhamohanpur, Jirania, Tripura, India.

S.N.	TL	Mean	Correlation coefficient 'r'	Regression Equation (y=a+bX)
1	Standard Length (SL)	31.22	0.991**	2.813+0.741X
2	Pre-Dorsal distance (PreD)	14.41	0.955**	-0.617+0.392X
3	Post-Dorsal distance (PostD)	18.48	0.893**	4.344+0.369X
4	Pre-Anal distance (PreA)	22.21	0.967**	-5.960+0.734X
5	Length of Dorsal Fin (LDF)	5.70	0.973**	-2.152+0.205X
6	Depth of Dorsal Fin (DDF)	6.1	0.970**	-2.533+0.225X
7	Depth of Anal Fin (DAF)	2.16	0.933**	-0.425+0.067X
8	Length of Pectoral Fin(LPecF)	5.75	0.930**	-0.715+0.169X
9	Length of Pelvic Fin (LPelF)	5.33	0.896**	0.075+0.137X
10	Length of Anal Fin (LAF)	5.13	0.968**	-0.775+0.154X
11	Length of Caudal Peduncle (LCP)	2.20	0.854**	-0.951+0.082X
12	Length of Caudal Fin (LCF)	7.14	0.935**	-2.813+0.259X
13	Distance between Pectoral and Pelvic fin (DPP)	10.34	0.940**	-1.846+0.318X
14	Distance between Pelvic and Anal Fin(DPA)	3.94	0.944**	-2.108+0.158X
15	Minimum Body Width (MIN)	2.99	0.821**	-0.388+0.088X
16	Maximum Body Width (MAX)	10.14	0.958**	1.818+0.217X
TW (g); all other morphometric measurements (cm) **Correlation is significant at 0.01 level (2-tailed)				

Table 3. Percentage body proportions versus Total length (TL) of *Labeo rohita* (Ham.) collected from pond in Radhamohanpur, Jirania, Tripura, India.

S.N.	In % of Total Length (TL)	Mean %	Range %		Range Difference %	S.D.%
			Max. %	*Min. %*		
1	Standard Length (SL)	81.76	87.18	71.66	15.52	3.36
2	Pre-Dorsal distance (PreD)	37.51	42.43	31.02	11.41	3.07
3	Post-Dorsal distance (PostD)	48.58	55.83	38.30	17.52	5.08
4	Pre-Anal distance (PreA)	57.10	71.45	46.87	24.57	6.18
5	Length of Dorsal Fin (LDF)	14.58	17.45	10.62	6.82	1.85
6	Depth of Dorsal Fin (DDF)	15.61	20.84	12.18	8.65	1.76
7	Depth of Anal Fin (DAF)	5.56	7	3.75	3.25	0.83
8	Length of Pectoral Fin (LPecF)	14.92	18.33	11.87	6.45	1.77
9	Length of Pelvic Fin (LPelF)	13.91	17.18	10.93	6.25	1.71
10	Length of Anal Fin (LAF)	13.26	15.45	11.25	4.20	1.10
11	Length of Caudal Peduncle (LCP)	5.58	8	3.43	4.56	1.35
12	Length of Caudal Fin (LCF)	18.23	28.33	12.81	15.52	3.36
13	Distance between Pectoral and Pelvic fin (DPP)	26.74	34.16	21.56	12.60	3.07
14	Distance between Pelvic and Anal Fin (DPA)	10.05	15.07	7.5	7.57	1.42
15	Minimum Body Width (MIN)	7.69	9.78	4.33	5.45	1.52
16	Maximum Body Width (MAX)	26.70	30.33	23	7.33	1.86
Max. = Maximum; Min. = Minimum and S.D. = Standard deviation **Correlation is significant at 0.01 level (2-tailed)						

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The various morphometric characters showed significant high coefficient of correlation (r) values with respect to total length of the fish. The highest degree of correlation was obtained between total length and standard length and there was significant positive correlation between all the other parameters with respect to total length. In *Labeo rohita* (Hamilton), maximum growth with respect to total length was shown by standard length (0.991**) followed by length of dorsal fin (0.973**) and depth of dorsal fin (0.970**) (Tables.2,3, Figs. 3,4,5,6,7)**.**

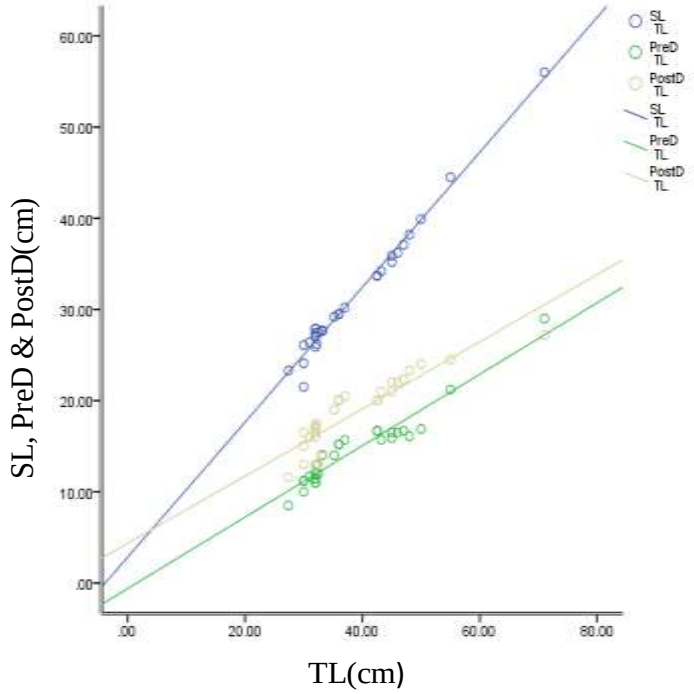

Figure 3. Graph showing relationship between Total Length of the fish (TL) with Standard Length (SL), Pre-Dorsal distance (PreD) and Post-Dorsal distance (PostD) in *Labeo rohita* (Hamilton).

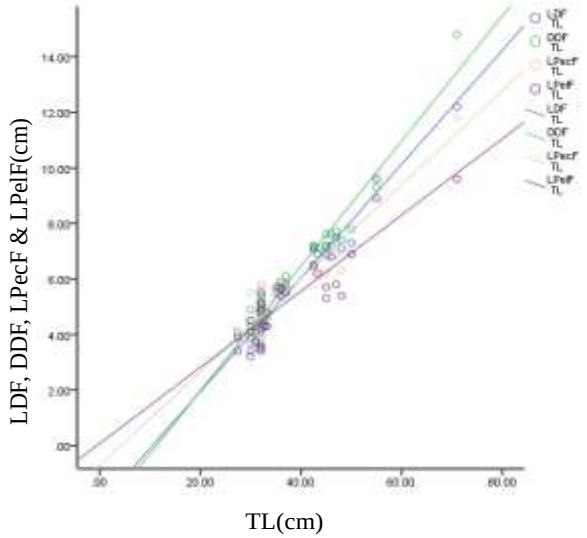

Figure 4. Graph showing relationship between Total Length of the fish (TL) with Length of Dorsal Fin (LDF), Depth of Dorsal Fin (DDF), Length of Pectoral Fin (LPecF) and Length of pelvic Fin (LPelF) in *Labeo rohita* (Hamilton).

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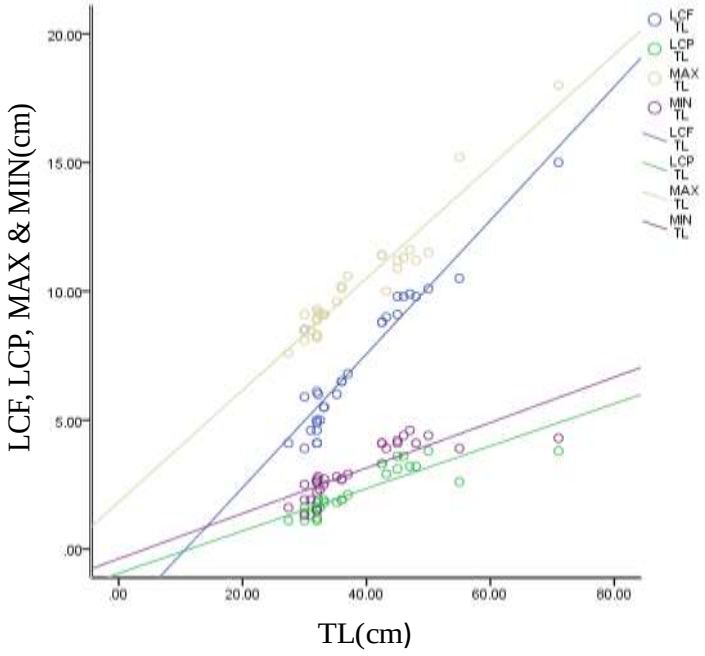

Figure 5. Graph showing relationship between Total Length of the fish (TL) with Length of Caudal Fin (LCF), Length of Caudal Peduncle (LCP), Maximum (MAX) and Minimum (MIN) in *Labeo rohita* (Hamilton).

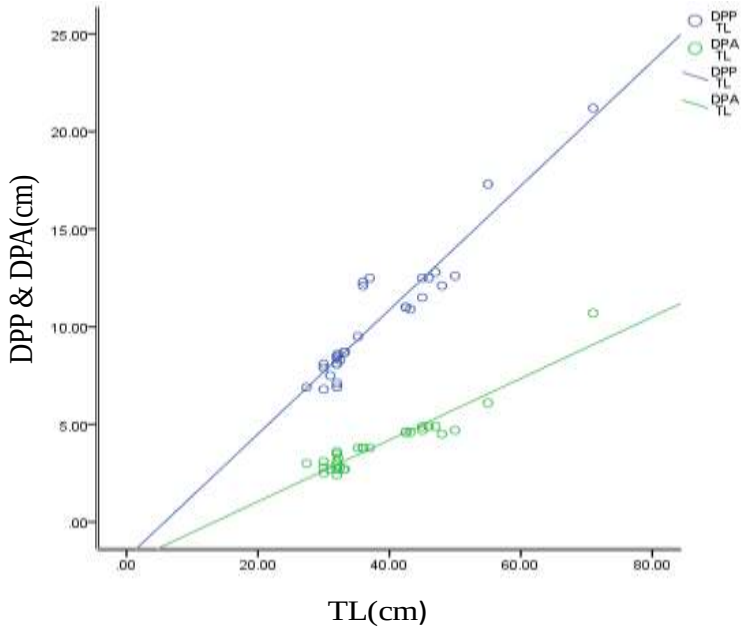

Figure 6. Graph showing relationship between Total Length of the fish (TL) with Distance between Pectoral and Pelvic Fin (DPP) and Distance between Pelvic and Anal Fin (DPA) in *Labeo rohita* (Hamilton).

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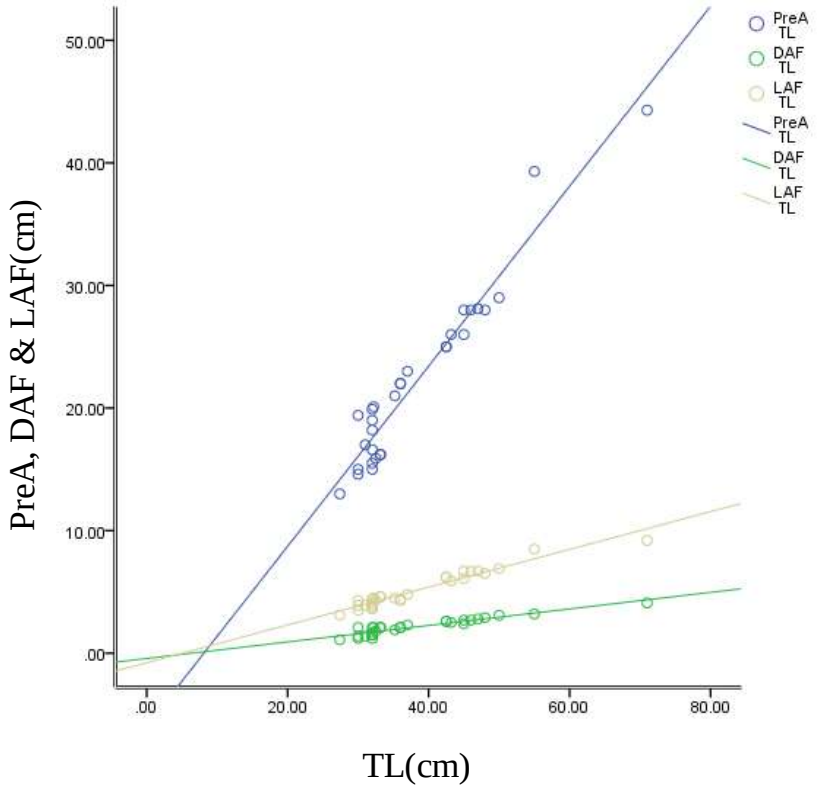

Figure.7 Graph showing relationship between Total Length of the fish (TL) with Pre-Anal Distance (PreA), Depth of Anal Fin (DAF) and Length of Anal Fin (LAF) in *Labeo rohita* (Hamilton).

CONCLUSION

On the basis of observations, it can be concluded that the current study provided the baseline data about LWRs and morphometric characters and helps fishery managers in establishing a monitoring and management system of the fish species. The morphometric measurements confirmed that the test organism *Labeo rohita* (Hamilton-Buchanan) has very little impact of environment because this area is still undisturbed from environmental degradation point of view.

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