



LENGTH – WEIGHT RELATIONSHIPS OF FRESHWATER FISH SPECIES IN HARO RIVER

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Abstract

The aim of this study is to report the length-weight relationship parameters (a and b) for some economically important fish species from freshwaters. The length-weight relationships (LWR) are calculated for 15 freshwater fish species collected during January–December 2017 in Haro river. 15 fish species belonging to 5 families Labeo rohita, Puntius ticto, Puntius sarana, Cirrhinus mrigala, Labeo gonius, Puntius sophore, Catla catla, Rasbora daniconius, Danio Devario, Puntius conchoni, Chanda ranga, Chanda nama, Mystus seenghala, Tilapia mossambica, Wallego attu were caught from the Haro River. The LWR with high correlation coefficient (r^2) $y = -0.020x + 1.782$, $R^2 = 0.006$ is significant for all the species. The condition factor for the 15 fish species crosswise over both season extended 1.6450 to 2.3521. These parameters are of great importance to evaluate the relative condition of populations, biology, species management and their fisheries and stock assessment. The application of the length-weight relationships presented here should be limited to the observed length ranges. The low condition figure recorded this investigation could be because of effects of sedimentation. This study has contributed to the knowledge of fish populations in this economically important area that could assist fishery management scientists in carrying out future ecological studies in line with the strategies of conservation, restoration and management.

Keywords: fish species, length-weight relationship, Fresh water, Haro river.

I. INTRODUCTION

Length weight relationship additionally gives data on the adjustments in the prosperity of the fishes that occurs amid their life cycle. (Le Cren., 1951). Weight– length connections are known for a limited number of animal groups, which hampers endeavors to display oceanic biological communities where perceptions are regularly gotten as the quantity of examples by length class that must be changed into evaluations of the biomass. (R. Froese., 2006). Length – weight relationship (LWR) of fishes are imperative in fisheries and fish science since they permit the estimation of the normal weight of the fish of a given length gather by setting up a numerical connection between them (Sarkar *et al.*, 2008 and Mir *et al.*, 2012). Length – weight relationship parameters (a and b) are valuable in fisheries science from multiple points of view, to evaluate weight of individual fish from its length, to compute condition lists, to look at life history and morphology of populaces having a place with various districts (Sani *et al.*, 2010). Length – weight relationship can likewise be utilized as a part of setting yield conditions for evaluating the quantity of fish landed and contrasting the populace in space and time (Singh *et al.*, 2011). This relationship is utilized by fishery specialists and directors for two principle purposes; to foresee the weight from the length of a fish and to analyze the normal related parameters between angle

bunches spatially or transiently. (Muzzalifah Abd Hamid., 2015). The Length – weight relationship (LWR) thinks about wind up applicable due the need to appreciate the fish lifecycle, essentially districts where fisheries speak to a standout amongst the most imperative financial exercises and fish stocks are the primary sustenance hotspot for some customary groups. (Tiago *et al.*, 2017.)

II. MATERIALS AND METHODS

2.1 Sampling area

The Haro reservoir is located in the Ghatol, Banswara (Raj.)

Latitude-23° 42' 25" N,

Longitude- 74° 23' 20" E.

Type of Dam: - Earthen Dam,

Name of river: – Haro River

Nearest city: – Ghatol

Length: – 570 Meter

Maximum height: – 46' (14 MTR)

Catchment area: – 56.00 sq. Mills.

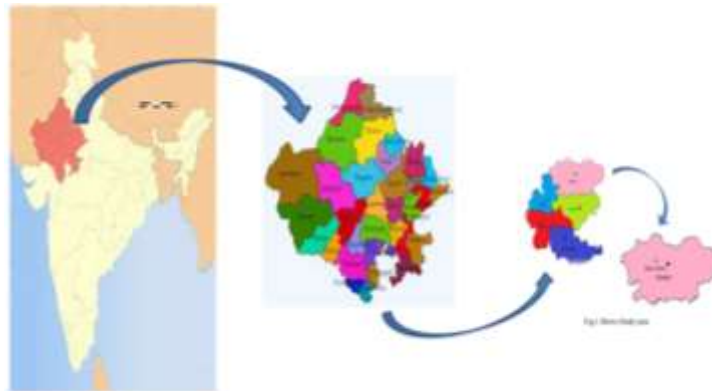


Figure.1 Shown Study Area

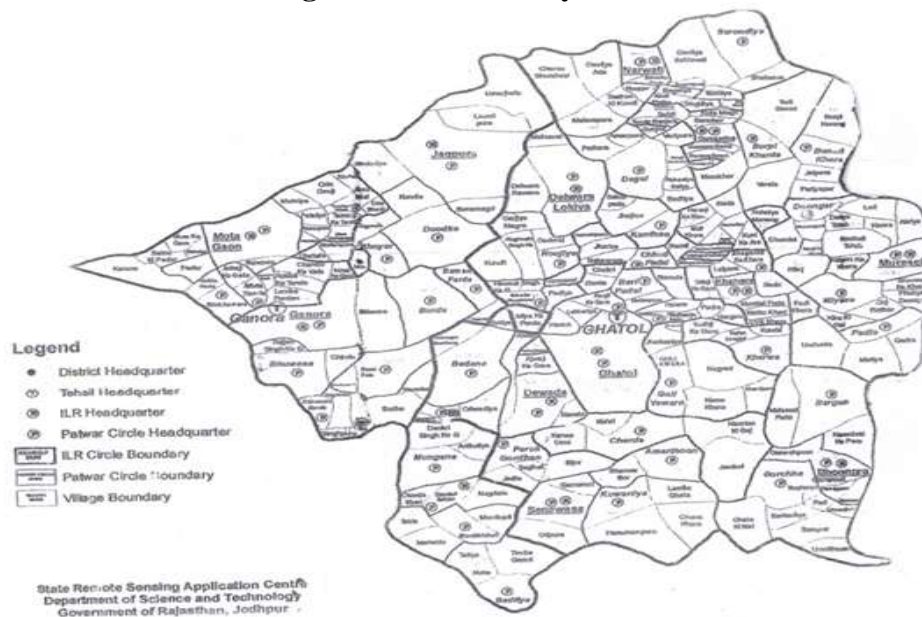


Figure 2. Map of Ghatol Tehsil

2.2 Sampling of Fish

Based on the proposed survey and preparations, of the study area based to covered baseline information on fisheries within the up and downstream of the dam location. The fish samples were collected from Haro river during January–December 2017. After collection, the specimens were transported to the laboratory in the large polyethylene bag with 5% formalin. The collected specimens were washed and mopped on filter paper to remove excess water from the body surfaces. Computing mathematical relationship between length and weight of fish is an important aspect of applied fishery biology. Length-weight relationships provide basic information in fisheries biology and therefore, useful to determine the weight of an individual fish of known length or total weight from length-frequency distribution (Forese, 1998 and Koutrakis *et al.*, 2003). This relationship was initially used to obtain information on the growth condition of fish and to find out whether the somatic growth was isometric or allometric (LeCren, 1951 and Ricker, 1975). Further, the condition factor (K) and relative condition factor (Kn) are the important biological parameters which indicate the suitability of a specific water body for growth of fish (LeCren, 1951). The condition factor is an index of species average size while relative condition factor is the ratio between observed weight and calculated weight of the fish. The values of these factors depend on physiological features of fish namely maturity, spawning, environmental factors and food availability in a water body. The length weight relationship of fishes will be determined by allometric equation of Le Cren (1951).

$$W = aL^n$$

Where L= Length, W= Weight, a and n are constants

Logarithmic transformations of the formula give a straight line relationship of the term.

$$\text{Log } W = \text{Log } a + n \text{ Log } L$$

Where Log W = Calculating weight by a and n constant. The value of a and n can be calculated by these formulae:

$$\text{Log } a = \frac{\sum \log W \sum (\log L)^2 - \sum \log L (\sum \log L \cdot \sum \log W)}{N \sum (\log L)^2 - (\sum \log L)^2}$$

$$n = \frac{\sum \log W - N \cdot \text{Log } a}{\sum \log L}$$

III. RESULTS

Table 1: Growth performance of 15 fish species (TL & TW) and standard deviation (SD) collected from sampling sites in Haro River.

S.N.	Fish Species	Family	Length (TL)	Weight (TW)	log10_TL	log10_TW	Standard Deviation (SD)
1	<i>Labeo rohita</i>	Cyprinidae	35	1200	1.54406804	3.079181246	1.085489
2	<i>Puntius ticto</i>	Cyprinidae	5.2	20.6	0.71600334	1.31386722	0.422754
3	<i>Puntius sarana</i>	Cyprinidae	12.1	26.4	1.08278537	1.421603927	0.239581
4	<i>Cirrhinus mrigala</i>	Cyprinidae	45.7	860	1.6599162	2.934498451	0.901266
5	<i>Labeo gonius</i>	Cyprinidae	36.6	675	1.56348109	2.829303773	0.895072

6	<i>Puntius sophore</i>	Cyprinidae	16.4	31.3	1.21484385	1.495544338	0.198485
7	<i>Catla catla</i>	Cyprinidae	50.1	3500	1.69983773	3.544068044	1.304068
8	<i>Rasbora daniconius</i>	Cyprinidae	16.2	28.5	1.20951501	1.45484486	0.173474
9	<i>Danio Devario</i>	Cyprinidae	3	1.49	0.47712125	0.173186268	0.214914
10	<i>Puntius conchoni</i>	Cyprinidae	5	1.94	0.69897	0.28780173	0.29074
11	<i>Chanda ranga</i>	Ambassidae	4.3	2	0.63346846	0.301029996	0.235069
12	<i>Chanda nama</i>	Ambassidae	2.5	1.1	0.39794001	0.041392685	0.252117
13	<i>Mystus seenghala</i>	Bagridae	40.2	87.3	1.60422605	1.941014244	0.238145
14	<i>Tilapia mossambica</i>	Cichlidae	25.5	350.2	1.40654018	2.544316142	0.804529
15	<i>Wallego attu</i>	Siluridae	42.2	245	1.62531245	2.389166084	0.540126

The length-weight distribution of the 15 freshwater fishes in the Haro River was tabulated in Table 1. 15 major fish species collected from each of the chosen for the Haro River was detailed analysis. 15 fish species belonging to 5 families *Labeo rohita*, *Puntius ticto*, *Puntius sarana*, *Cirrhinus mrigala*, *Labeo gonius*, *Puntius sophore*, *Catla catla*, *Rasbora daniconius*, *Danio Devario*, *Puntius conchoni*, *Chanda ranga*, *Chanda nama*, *Mystus seenghala*, *Tilapia mossambica*, *Wallego attu*. The lengths ranged from 2.5 to 50.1cm while the weights were between 1.1 and 3500 g. *Catla catla* had the highest number of fish sample, the maximum TL=50.1cm and W=3500 g. *Chanda nama* was sizes ranging from 2.5cm in TL. *Danio Devario* was the smallest size group, ranging from 3.0 cm in TL and weight ranging between 1.1 and 1.49g. The length– weight relationship conditions were resolved for genders consolidated as it were. LWR relationship gives data on development designs. Amid their improvement, angles are known to go through stages throughout their life history which are characterized by various length– weight connections. Measurable examination of LWR demonstrated that the relapse coefficients acquired from length – weight connections (LWR) are exhibited in table-1. There was a noteworthy connection amongst length and weight. The articulation can be changed logarithmically. A plot of log weight against log length yielded a straight a line (Fig-3). This demonstrated which are characteristic of isometric or allometric developments contrasts between all gatherings.

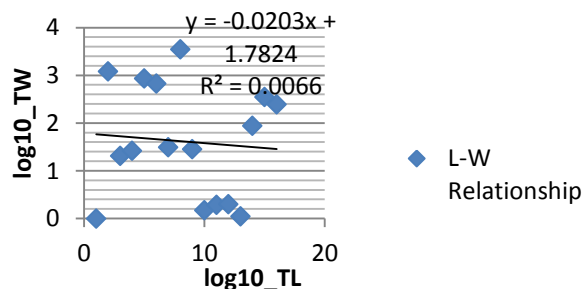


Figure 1: Length – weight relationship of all fishes

Table 2: Growth performance of 15 fish species (TL & TW) and intercept (a), slope (b) collected from sampling sites in Haro River.

S.N.	Fish Species	Family	log10_TL	log10_TW	a'	a	b
1	<i>Labeo rohita</i>	Cyprinidae	1.54406804	3.079181246	-0.98454	0.103624	2.31087422
2	<i>Puntius ticto</i>	Cyprinidae	0.71600334	1.31386722	-0.94202	0.114282	2.24265307
3	<i>Puntius sarana</i>	Cyprinidae	1.08278537	1.421603927	-1.12071	0.075733	2.35217763
4	<i>Cirrhinus mrigala</i>	Cyprinidae	1.6599162	2.934498451	-1.12013	0.075834	2.35200907
5	<i>Labeo gonius</i>	Cyprinidae	1.56348109	2.829303773	-1.09762	0.079869	2.32023656
6	<i>Puntius sophore</i>	Cyprinidae	1.21484385	1.495544338	-1.06001	0.087094	2.25866269
7	<i>Catla catla</i>	Cyprinidae	1.69983773	3.544068044	-1.05097	0.088926	2.26963100
8	<i>Rasbora daniconius</i>	Cyprinidae	1.20951501	1.45484486	-0.86141	0.137592	1.98979631
9	<i>Danio devario</i>	Cyprinidae	0.47712125	0.173186268	-0.86001	0.138034	2.00158480
10	<i>Puntius conchoniis</i>	Cyprinidae	0.69897	0.28780173	-0.90565	0.124267	2.03230655
11	<i>Chanda ranga</i>	Ambassidae	0.63346846	0.301029996	-0.77608	0.167463	1.95806797
12	<i>Chanda nama</i>	Ambassidae	0.39794001	0.041392685	-0.60893	0.246075	1.85768468
13	<i>Mystus seenghala</i>	Bagridae	1.60422605	1.941014244	4.833748	68194.27	1.64508578
14	<i>Tilapia mossambica</i>	Cichlidae	1.40654018	2.544316142	3.541814	3481.879	1.70918520
15	<i>Wallego attu</i>	Siluridae	1.62531245	2.389166084	0.985454	9.670613	2.31080000

Relationships of fishes are imperative in fisheries science since they permit the estimation of the normal weight of fish of a given length aggregate by building up a scientific connection between the two. At the point when the b-esteem is under 3, the fish has a negative allometric development yet when it is more noteworthy than 3, it has a positive allometric development and when it is equivalent to 3, the fish has isometric development (Bagenal T B., 1978) and (Khairnazam M Z., 2002). Likewise when b is far less or more noteworthy than 3, development in the fish is allometric i.e. the fish winds up more slender with increment long (King RP., 1996). There had lot of factors such as seasonal effect, gonadal

maturity, sex, number of specimens examined, health, general fish condition, preservation technique and the observed length range can be attribute to the combination for these factor and it can be difference in b value. (Wooten., 1998). The decency of attack of the relapse display is shown by the 'R square' esteem in the yield. It ought to be high for the relationship fitted to be great. In the case it is 0.96 demonstrating a solid match. The greatest estimation of 'R square' is 1.0 and the base is zero. (Somy Kuriakose., 2017). The values of a and b with their respective 95% confidence limits and the form factors for each species are presented in Table 2. Values of parameter b vary from 1.6450 for *Mystus seenghala* to 2.3521 for *Puntius sarana*. In this investigation, the relapse incline demonstrate that, all fish species showed negative allometric development pattern ($b < 3$), with length of example "b" esteem run from 1.6450 for *Mystus seenghala* to 2.3521 for *Puntius sarana*. Numerous components could add to the distinctions of development of fish, for example, contrasts of living space, angle exercises, sustenance propensities and occasional development rates (Lowe, 1987 and Mizuno, 1982.).

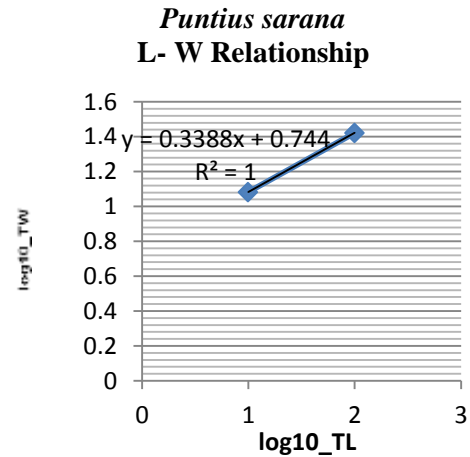


Figure 2: Length – weight relationship of *Puntius sarana*

Mystus seenghala
L- W Relationship

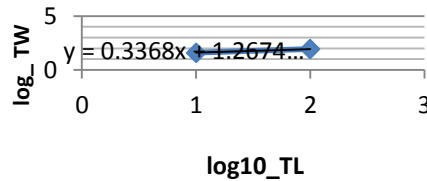


Figure 3: Length– weight relationship of *Puntius sarana*

IV. DISCUSSION

Numerous components could add to the distinctions of development of fish, for example, contrasts of environment, angle exercises, nourishment propensities and regular development rates (Lowe, 1987 and Mizuno, 1982.). Different factors, for example, temperature, trophic level and nourishment accessibility in the group were additionally essential. The 95% certainty interim of b for all the fish species went from 1.6450 to 2.3521. This is like the perceptions of past investigations of the length weight connections of the ten most normal fish in the Lower Nhamundá stream, left tributary of the Amazon. (Tiago *et al.*, 2017). Hence, residue might be a standout amongst the imperative variables deferring the recuperation of eutrophic conditions. Consequently it is recommended that the Haro supply in contrast with crisp water bodies might be horrible to angles in the repository. In this way, there would be requirement for more investigations on the connections and condition components of some fish species in the store. The distinction in condition factor could be because of the accessibility of nourishment life forms at a specific time and also the distinction of gonad improvement. The present information couldn't clear up which factors among those portrayed above could have prompted these perceptions. In outline, the distinctions in LWR and condition factor of all species in this examination could be because of the elements recorded before or a mix of components which require assist examination.

V. CONCLUSION

The examination surveyed the condition factor and length-weight relationship of five types of fish from Haro repository. The aftereffect of the length-weight relationship of the fish species showed negative allometric development design. The condition factor for the 15 fish species crosswise over both season extended 1.6450 to 2.3521. The low condition figure recorded this investigation could be because of effects of sedimentation.

VI. ACKNOWLEDGEMENT

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