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Length-Weight Relationship of 9 Fish Species in Amarpura Dam, Simalwada Dungarpur, (Rajasthan).

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Abstract: *The Length-Weight relationship of some fish species from Amarpura Dam was studied from January to December 2020. The slope (b) values obtained in the nine species ranged from -2.164 to 3.145, with most of the fishes indicating a positive allometric growth pattern except for Mystus seenghala with b value of 2.16, thus showing a negative allometric growth pattern. The following fish species showed a high degree of negative correlation at (P < 0.05); Labeo rohita, Puntius sarana, Cirrhinus mrigala, Labeo gonius, Puntius sophore, Catla catla show this positive correlation. These parameters are of great importance in evaluating the relative condition of populations, biology, species management, 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 in this probe could be because of the effects of sedimentation. This study has contributed to the knowledge of fish populations in this economically vital area that could assist fishery management scientists in carrying out future ecological studies in line with conservation, restoration and management strategies.*
Keywords: - Length-Weight relationship, Amarpura dam, Fish Species, Dungarpur.

I. INTRODUCTION-

All life on our planet depends on freshwater through water networks and their flow characteristics—only 0.01% of the world's freshwater supports about 100,000 species of biodiversity. Freshwater biodiversity has cultural, scientific, aesthetic and economic values (Naiman., et al., 2006). Weight–length relationships are known for a restricted number of species (Froese., 2006). Water is an essential factor in sustaining life; therefore, water supply is essential (WHO., 2008).

One of the environmental problems is the anthropogenic alteration of the biogeochemical cycles of phosphorus, carbon and nitrogen (Falkowski et al., 2000). Length–weight study is useful in fisheries for estimating the weight of individual fish from its length (Sani et al., 2010). Length–weight relationship of fish is important in fisheries and fish biology because, with this, managers can estimate the average weight of fish of a given length group (Sarkar et al., 2008 Mir et al., 2012).

Fish reflects water's physical, chemical and biological conditions, which are influenced by biotic and abiotic factors (Le Cren., 1951).

Fish is an essential component of animal and human food, so there is a need for proper fishery management because fish is a relatively cheap source of animal protein. Pollutants, pathogens and other harmful conditions can easily contaminate water. Cultured fishes in such contaminated water may be potentially stressful and can function as carriers of infections (Torimiro et al., 2014). Fishery researchers use the length-weight relationship to predict the weight from the length of a fish. With the help of this relationship, fisheries managers can compare the parameters between fish groups (Hamid et al., 2015).

Length-weight studies are relevant for fish lifecycles (Freitas et al. 2014). The growth and survival of a fish are directly related to good quality of water; this water quality is easily determined by analysis of the physic-chemical conditions of the water body (Sheikh et al., 2017).

It is essential to conduct the length-weight analysis of the stock to assess the changes in their growth vis-à-vis the ever-changing ecological conditions. Fish found in tropical and sub- tropical water system experience frequency growth fluctuation due to factors such as food composition changes, environment changes, and rate of spawning, to mention a few, length- weight and length-weight relationship can be used to assess the influence of these factors in fish (Laurat et al., 2019).

II. MATERIAL AND METHODS

Sampling area

Amarpura dam is constructed on the Bhadar River. This river is a tributary of river Mahi originated

from hills near village Kangrua. The study area is 13 km. from Simalwara and 53 km. from Dungarpur and it is situated on latitude 23º29'23"N, and longitude73º48'48"E. Amarpura dam is an earthen dam, the maximum length of the dam is 228 m, maximum height is 20.0 m. The catchment area is 67 sq. miles. The gross capacity of the dam is 15.20 Mcum. This reservoir is useful for irrigation, drinking, and fishing purposes.

Fig. 1 – Study Site.

Sampling of Fish

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

$W = aL_n$

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

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

Log W = Log a + n Log L

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

$$Log\ a = \frac{\Sigma \log W \ \ \Sigma(Log\ L)^2 - \Sigma\ Log\ L\ \ (\Sigma\ Log\ L.\ \Sigma\ Log\ W)}{N\Sigma\ (Log\ L)^2 - (\Sigma\ Log\ L)^2}$$

$$n = \frac{\Sigma\ Log\ W - N.Log\ a}{\Sigma\ Log\ L}$$

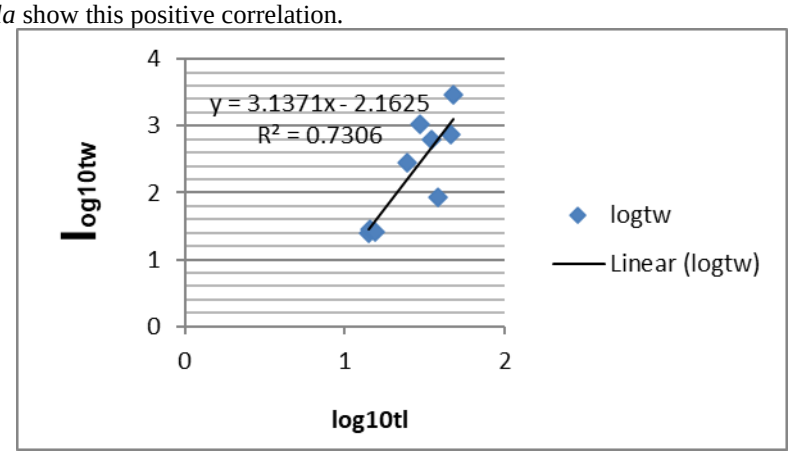
III. RESULTS AND DISCUSSION

The species, number of specimens, length-weight relationship parameters **a** and **b**, mean length of fish species, mean weight of fish species and growth type (allometric or isometric) are presented in table1.

Table 1: Length-weight relationship parameters and condition factor of some fishes from Amarpura Dam.

S. N	Species	No.	Standard Length (SL) (CM)		Body weight (BW) (g)		Regression Coefficient		
			Range	Mean	Range	Mean	a	b	
1.	*Labeo rohita*	15	20-39	29.5	850-1250	1050	-2.162475575	3.137072772	PA
2	*Puntius sarana*	9	12.1-16.2	14.15	22.5-26.4	24.45	-2.121726254	3.057937049	PA
3	*Cirrhinus mrigala*	6	45.2-47.4	46.3	660-850	755	-2.10620346	3.048165889	PA
4	*Labeo gonius*	5	32-37.8	34.9	564-660	612	-2.229433665	3.145608801	PA
5	*Puntius sophore*	8	12.4-16.6	14.5	22.6-33.5	28.05	-2.108909754	3.03618756	PA
6	*Catla catla*	12	45.2-50.6	47.9	2260-3500	2880	-2.210071353	3.10025951	PA
7	*Rasbora daniconius*	9	14.3-16.5	15.4	23.5-28.5	26	0.066024984	1.346514287	NA
8	*Mystus seenghala*	10	35.6-40.6	38.1	85.3-87.5	86.4	6.069583787	-2.614336612	NA
9	*Tilapia mossambica*	25	22.2-26.6	24.4	224-330	277	4.046789232	-1.654654287	NA

The study also showed that all the fish investigated exhibited positive allometric growth patterns with regression analyses exponents' **b** values less, or more than three, except for Mystus seenghala with b value of-2.16, thus showing a negative allometric growth pattern. The following fish species showed a high degree of negative correlation at ($P < 0.05$); *Labeo rohita, Puntius sarana, Cirrhinus mrigala, Labeo gonius, Puntius sophore, Catla catla* show this positive correlation.



The shape and weight of fish species are determinative for the determination of 'b' for length-weight relationships (Gubianiet al., 2009). Temperature, food availability, salinity, sex, age, time and stage of maturity are controlling and conducting factors for study-related with the length-weight relationship (Pauly, 1983). During this study, sampling was completed at three different stations of the Amarpura Dam. However, data from the different water bodies combined to provide a more species-specific overall relationship and the results of the present study were in favour of the views of other workers (Le Cren, 1951; Wootton, 1990; Khan et al., 2012; Chakravarty et al., 2012; Kumar et al., 2013 and Nair et al., 2015). Fish normally does not retain a similar shape throughout their life. Therefore, variations in 'b' values were due to temperature, spawning conditions, sex,

fishing area, sample size variations and fishing time (Ricker, 1973; Bagenal and Tesch, 1978; Kleanthidset al., 1999). Positive or negative allometry indicates a rounder or slimmer body, respectively, whereas isometric growth shows that the body grows in the same proportion in all dimensions (Jobling, 2008).

IV. CONCLUSIONS

In conclusion, the present study makes several contributions to the biometric relationships between physico-chemical parameters and length-weight of fishes in the Amarpura Dam. This research will contribute towards future studies of dietary aspects as well as for population dynamics in the region. This study indicates that the growth pattern of all the fish species showed negative allometric growth. It indicates that the state of the aquatic environment is in good condition, and there is an existence of a balance between prey and predator. Future aspects of the present study are based on biochemical studies of fishes in the relation of nutritional values, which will be beneficiary for the health of inhabitants. Socio-economic studies of fishes, some important aspects of the length-weight relationship such as seasonal studies, studies related to the reproductive cycle and sex-ratio, growth will be also focused on future studies.

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