IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.
Volume. 1 Issue 6, PP 33-37
www.iosrjournals.org

Length-Weight Relationship and Condition Factor of *Catla catla in* Chhirpani Reservoir, Chhattisgarh, India

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ABSTRACT: *The Chhirpani reservoir is situated in the Kabirdham district of Chhattisgarh which is about 30 km from district headquarter in Bodla block. The construction of a dam was done during 1981 to 1988. This study aimed to estimate the length-weight relationship and characterize the condition factor of Catla catla the most abundant and economically important species in Chhirpani Reservoir. The length weight relationship was calculated based on samples collected during study period reveled a strong liner relationship between total length and weight. The correlation coefficient was found to be highly significant between length and weight of this fish. The growth performance of Catla catla was very good in Chhirpani reservoir. Condition factor showed a steady rise from the month of April and attained the peak in the September. The results show that Catla catla fish is suitable for Chhirpani reservoir fisheries.*

Key Words: *Condition Factor, Catla catla Chhirpani, Chhattisgarh, length- Weight Relationship,, Reservoir.*

I. Introduction

The study of length weight relationship may vary from time to time in the same water body due to alteration in water quality and fish stocks. Studies on length weight relationship and condition factor have widely attracted attention of fishery biologists.

The studies on the length weight relationship of fishes are connected primarily to the assessment of growth rate in the fishes. In view of Practical utility in estimating the weight of fish to know length or vice versa in assessing the condition cycle of fish. In general the weight of fishes would vary as the cube of length and may depart significantly from this (Le Cren.1951), as fishes normally do not retain the same shape or body outline throughout their life span and the specific gravity of the tissues may not be the same in capture and culture fisheries. Kabirdham district has number of reservoirs and Chhirpani is important as their catchments is full of forest and hence, flow of humus results in to good productivity leading to good growth in Catla.

II. Material and method

The morphmetric features of the reservoir are given in (Table 1). Chhirpani is a medium irrigation reservoir which is about 10 years old and located in Kabirdham district of Chhattisgarh State. The dam is located at latitude 22º12'30" and longitude 81º11'45" on Sakri, a local tributary of Mahanadi river basin.

The fish samples were collected landing centers representing all size groups. The fish were caught by nylon gill net the standard length of each fish was measured and before weighing the moisture on each fish was removed. Length-weight relationship of the fish can be is expressed: $W = a L^b$ Where W= weight of Fish, L= Length of Fish, a=constant/intercept, b= constant/ regression coefficient/ slope.

This formula was transformed into a linear equation, $Y = a + bx$ and logarithmic transformation gives a straight line relationship as:

$$\text{Ln } W = \text{Ln } a + b \text{ Ln } L$$

Where:

LnW is the dependent variable (y),
Ln L the independent variable(x)
n the regression coefficient or slope (b);
Ln a the y - intercept.
Ln a and the regression coefficient (b) were estimated by usual method of least squares as given by (Le Cren, 1951).

Various workers have analyzed body changes by means of Condition Factor or K-Factor or Ponderal Index, used here calculated by using different formulas. Fulton's Condition Factor wasgenal, 1978).

$$K = \frac{W \times 100}{L^3}$$

Where :

K = The coefficient of Condition.
W = Whole body weight in grams.
L^3 = The Standard length in cm.

III. Results

The present investigation is based 48 mature specimens taken from the commercial catches of the Chhirpani reservoir. The sampled fishes weight ranged between 800 g. to 8300 g. for *Catla catla* in Chhirpani reservoir (Table: 2). There for specimen of *Catla catla* raining form 34.75 cm to 54.05 cm in mean total length and 1150 gm to 4875 gm in mean total weight was calculated using the given formula and depicted in length weight relationship (Table 3 and fig.1). The relationship between the length and weight of the fish was determined on the basis of individual measurements.

Equation for the relationship was worked out as: W=0.004351695 L 3.462004618
Or expressed logarithmically as: LnW=-5.437189939+3.462004618

The coefficient of correlation was 0.930011139 showing a high degree of correlation (Table 3). Parabolic curve was obtained between total length and total weight of *Catla catla* of Chhirpani reservoir (Fig. 1) drawn when the average weight of fish was plotted against average length. A logarithmic graph drawn from the above data (Fig. 2) showed a straight liner relationship. Condition factor was calculated from the fish sampled in the month of April, May, Sept and October, during study period 2013. Condition factor from *Catla catla* showed a steady rise from the month of April and attained peak in September (Fig. 3). From September, it showed a down ward trend-reaching minimum in October. Again, a gradual rise in value was found from November indicating recovery in the condition of the fish.

IV. Discussion

The observation of *Catla Catla* of Chhirpani reservoir in Chhattisgarh clearly indicate that the relationship between weight and length were highly significant. The coefficient of correlation between length and weight was 0.931 showing a high degree of correlation. General equation straightly linear curve drawn between total length and weight was similar *Labeo sp.* in Jawahar Sagar dam and Rana Partap Sagar (Choudhary *et. al.*1991). The observation on the length – weight relationship clearly supports the view that straight linear relationship holds good only when the form of the fish and gravity remain constant throughout the active growth period as seen in *Catla catla* in Sillier Reservoir (Jain, 2000), in the studies of age and growth of the Carps, *Catla catla* (Hamilton, 1882) from the northern India (Johal and Tandon, 1992) and Ravishankar Sagar in Chhattisgarh. Tondon & Johal (1981) and Sarang & Sharma (2010) have described length weight relationship similarly for few of the reservoir populations and a deviation in the length weight relationship on the basis of cube law was applied for fishes.

ACKNOWLEDGEMENTS

We acknowledgement the facilities provided by Chhattisgarh Department of Fisheries, Kawardha, Kabirdham District.

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Table:1 Morphometric features of Chharipani Reservoir, Chhattisgarh, India

S. No.	Particular	
	Locations: Latitude Longitude	 22°12’30 81°11’45”
1	Water Catchment area	1633 Sq K.M
2	Average rainfall (inch)	600inch
3	Maximum depth (m)	31.64m
4	Mean depth (m)	15.82m
5	Length of dam (m)	450.0m
	Nature of dam	Erath Dam
7	Year of Dam Constriction Start	1981
8	Year of impoundment	1998
9	Total Coast	34.53 Cores
10	Purpose	Irrigation
11.	Tehsil and district	Bodla, Kabirdham
12	State	Chhattisgarh

Table: 2. Total length and total weight of *Catla catla* in Chhirpani Reservoir during April, May, September & October, 2013

Sample No.	Name of Fish	April		May		September		October		Mean	
		Total Length (cm)	Total weight (gm)	Total Length (cm)	Total weight (gm)	Total Length (cm)	Total weight (gm)	Total Length (cm)	Total weight (gm)	Total Length	Total Weight
1	*Catla catla*	35.0	1000	62.0	6500	34.0	900	64.0	6000	48.8	3600
2	*Catla catla*	35.2	1000	66.0	6200	35.2	1000	66.0	6200	50.6	3600
3	*Catla catla*	38.2	1500	70.0	8300	38.0	1400	70.0	8300	54.1	4875
4	*Catla catla*	38.0	1500	39.0	1500	36.0	1300	36.0	1200	37.3	1375
5	*Catla catla*	34.0	1000	38.0	1500	30.0	800	37.0	1300	34.8	1150
6	*Catla catla*	39.0	1500	46.0	2000	42.0	1800	47.0	2000	43.5	1825
7	*Catla catla*	38.0	1500	45.0	1900	46.2	2000	45.0	1800	43.6	1800
8	*Catla catla*	51.0	2000	42.3	1800	40.0	1700	40.0	1700	43.3	1800
9	*Catla catla*	46.0	1500	45.2	2000	41.0	1600	44.0	1900	44.1	1750
10	*Catla catla*	38.0	1000	46.2	2500	42.0	2000	45.0	2000	42.8	1875
11	*Catla catla*	70.0	8000	39.0	1500	40.0	1500	40.0	1500	47.3	3125
12	*Catla catla*	62.0	3500	38.0	1500	35.0	1200	32.0	1200	41.8	1850

No Fishing in June, July & August, 2013 due to Close Season.

Table: 3. Relationship Between total length & total weight of *Catla catla* in Chhirpani Reservoir during April, May, September & October, 2013

S.No.	Mean Total Length	Mean Total Weight	Ln L	Ln W	Particular Value	
1	48.75	3600	3.88671	8.18869	b =	3.396205846
2	50.60	3600	3.92395	8.18869		
3	54.05	4875	3.98991	8.49188		
4	37.25	1375	3.61765	7.22621	A =	-5.167267252
5	34.75	1150	3.54818	7.04752		
6	43.50	1825	3.77276	7.50934	a =	0.005700125
7	43.55	1800	3.77391	7.49554		
8	43.33	1800	3.76873	7.49554	r =	0.930011139
9	44.05	1750	3.78533	7.46737		
10	42.80	1875	3.75654	7.53636	r^2 =	0.864920719
11	47.25	3125	3.85545	8.04719		
12	41.75	1850	3.73170	7.52294	Standard Error =	0.15675181

Fig. 1: Length-weight relationship of *Catla catla* of Chhirpani Reservoir during April, May, September & October, 2013

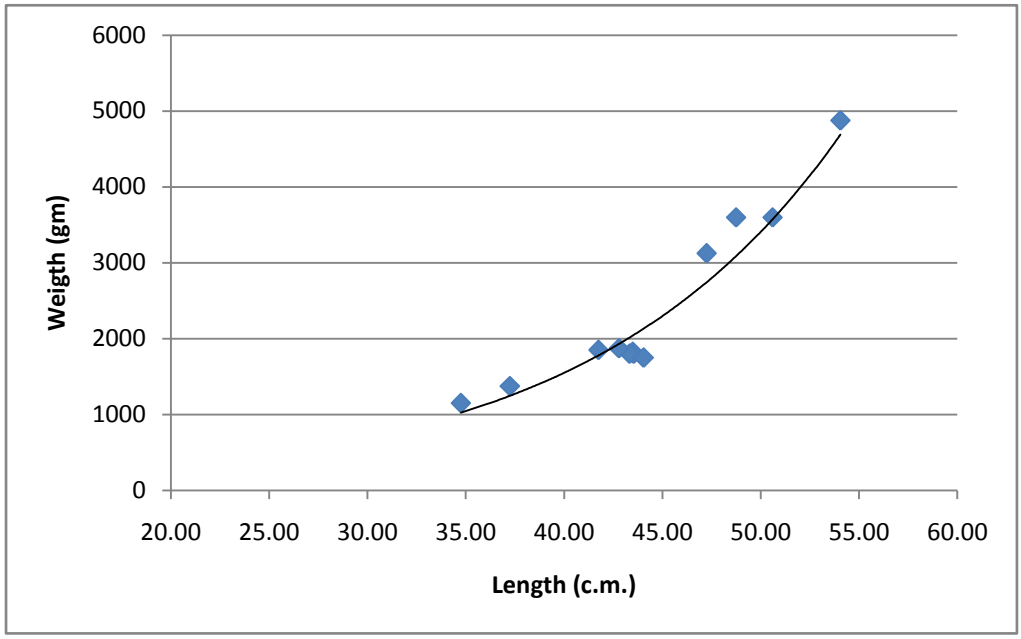

Fig. 2:Logarithmic form Total Length- Total weight relationship of *Catla catla* in Chhirpani Reservoir during April, May, September & October, 2013

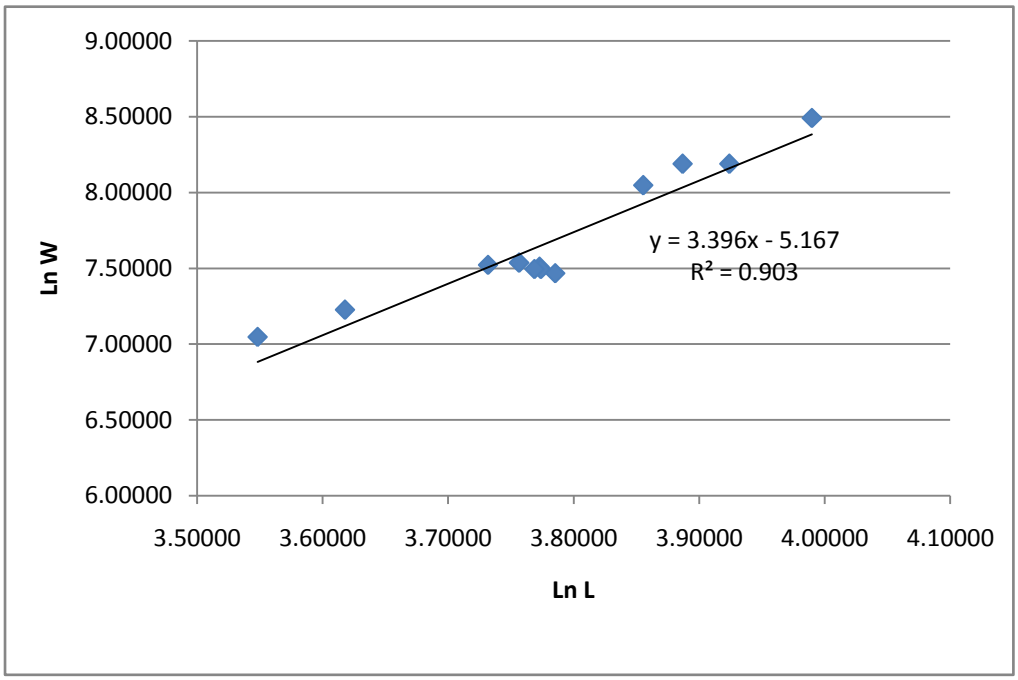

Fig. 3 Variations in the Condition Factor (K) of *Catla catla* of Chhirpani Reservoir, Kawardha.