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Length weight relationship and condition factor of selected freshwater fishes of govardhan sagar lake, Udaipur, Rajasthan

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Abstract
The present study was carried out to estimate the length-weight relationship and condition factor of selected freshwater fishes of Goverdhan Sager Lake, Udaipur, Rajasthan during January- June, 2018. The relationship between length and weight of *Catla catla* and *Labeo rohita* from fish catch was calculated by establishing correlation and regression between the two parameters. The exponent values of total length and weight varied from 0.676 to 1.495 and 0.336 to 6.046 for different length groups of *Catla catla* and *Labeo rohita*. The higher value of 'n' could be attributed to high rate of weight increase with per unit increase in length. The correlation co-efficient 'r' between total length and weight were found to be significant for all the length groups of both the species. The values of condition factor (K) of both the species were also computed and found that both the species performed well in Lake Environment. The maximum 'K' value was found 1.251 in *Catla catla* (group A) and 1.210 in *Labeo rohita* (group B). On the basis of length-weight data, the regression equations of body-weight on total body length were calculated.

Keywords: *Catla catla*, condition factor, *Labeo rohita*, length, weight

1. Introduction
For the exploitation and management of the fish species in the reservoir it is very important to estimate the length weight relationship. Relationship between total length and fish body weight are also very much essential for stabilizing the taxonomic characters of the species [10]. Data on the length and weight of fish have commonly been analysed to yield biological information [1]. *Catla catla*, and *Labeo rohita* are the most important fishes among the Cyprinidae family due to their good Taste and high market value [14]. For comparing the condition or well-being of the fish it is necessary to estimate the weight corresponding to a given length and condition factor is used [12], based on assumption in a given length heavier fish is in better condition. Both concepts have been used in fisheries research since the beginning of the 20th century. The condition factor and relative condition factor are the important biological parameters which indicate the suitability of a specific water body for growth of fish [8]. It has been as pointed out by [6] that weight-length relationships are only known for restricted number of species which hampers efforts to model aquatic ecosystem where observations are typically obtained as the number of specimen by length class that has to be transformed into estimates of the biomass.

2. Materials and Methods
2.1 Climate of Southern Rajasthan
This zone experiences a subtropical climate with average rainfall ranging from 67 cm. and relative humidity of 75-95 per cent during the monsoon period. The summers are hot and winters are cool having an average range of maximum temperature between 38-41ºc and minimum between 1-5ºc. The elevation of study zone is 582 m above mean sea level.

2.2 Study Area
Goverdhan Sagar, the area of study, lies on the Udaipur-Ahmedabad highway,at about 2.5 km distance from Udaipur city (24º32'N latitude and 73º41'E longitude) having a maximum length of 1.97 km, thus covering a total water spread area of 30.81ha. The lake is totally rain-fed. The catchment area is about 2.56 sq. km. The capacity at full lake level is 9 million cubic meters.

2.3 Collection of fish and water sample

300 specimens each of Indian major carps (*Catla catla, and Labeo rohita*) were collected from the landing centre and used to measure total length (cm) and body weight (gm) from the commercial fish catch of Govardhan Sagar during the months January to March, 2018.

2.4 Measurement of length and weight of fishes

The measurement on the fishes was taken at the landing site of the reservoir. The total length and total weight was taken for major carps, *Catla catla* and *Labeo rohita*. Length of the fishes was recorded with the help of fish measuring board. The weight of the fishes was also taken with the help of electronic balance. Cubes law was applied to know the length weight correlation. The well-known equation is

Log W = Log a + b Log L or W = aL b

Where,

W = weight in kg,

L = length in cm and

a and b were derived empirically from length and weight.

The length was measured in centimeter and the weight was in grams. The general linear equation Y = a + bx is used to estimate the constants 'a' and 'b'. The estimation of regression coefficient was tested for significance, Correlation between length and weight of the major carps.

3. Result and Discussion

For is purpose, the fishes selected for the study were grouped into 3 length groups *i.e.* A-30.0 to 40.0 cm, B-41 to 50 cm and C-51 to 60 cm.

It would be seen from Table 1 and Fig. 1 that *Catla catla* from goverdhan Sagar Lake was primarily dominated by A length-group (44.33%) while the other length groups *viz*., B and C followed in the same sequential order, with percentage of 42.0, and 13.66 respectively.

In the case of *Labeo rohita*, the picture was slightly different to that of *Catla catla* with B length-group dominating the scene (56.00) followed by A (34.333), and C (9.66) as shown in the Table 2 and Fig 1.

The statistical relationship of body-weight with total body-length in the case of *Catla catla* was highly significant as seen by significant correlation co-efficient (r value) indicate the Table 1 for all length groups. It may be noted here that the highest 'r' value (0.864) was in C length group followed by length-group B (0.618) and A (0.24).

Table 1 also depicts that *Catla catla* deviates from cube law in all the length groups. The exponents value for body weight and total body weight ranged between 1.495and -0.676. The above highest and lowest of 'n' were observed in length-groups A and C, respectively. For other length-groups *i.e*., B, the exponent value was 0.601.

The statistical relationships of body-weight with total body-length of *Labeo rohita* were calculated for different length-groups. A highly significant correlation was observed between body-weight and total body-length for all the length-groups (Table 2). The highest 'r' value (0.758) was in B length-group followed by C (0.430), and A (0.302) length-groups. r^2 is high in *Catla catla* length-group C in (.71%), followed by those of A (.06%) and B (.38%) (Table 1) and *Labeo rohita* in A (09%) B (62%) and C (18%) (Table 2) respectively variation could be explained together in the value of weight and then is due to other factor.

b value length influence significantly for corresponding weight of fishes in *Catla catla* is high length-group in C (3.96) and B (1.425) and Labeo rohita in length-group B (3.47) and C (2.273) respectively.

The mean values of condition factor (K) for all the length-group of *Catla catla* and *Labeo rohita* are shown in Table 4.3. The 'K' values of *Catla catla* ranged between 0.91 and 1.249. The highest 'K' value was recorded from the length-group A followed by those of B and C groups in order of 1.027, and 0.91, respectively. The values of condition factor for the different length-groups of *Labeo rohita* ranged between 1.07 and 1.210, the highest value being of 1.210 from the length group B. In the case of length-groups A and C the values of K were 1.155 and 1.074 respectively.

Such a variation in length-weight relationship between different size-groups could be attributed to the prevailing environmental conditions, available food and space besides, of course, the biological features specific to species. The latter may result into varied growth performance.

In the present study, the exponent value 'n' was found to deviate from `cube law' *i.e.* the values fluctuated from 0.676 to 1.495 in *Catla catla* and 1.666 to 3.466 in *Labeo rohita*. Such deviation from 'Cube law' was also observed by earlier workers. [3] observed an exponent value 'n' of 2.914 for *Cirrhinus mrigala* from Rihand reservoir. [5] reported an exponent value varying from 2.752 to 3.545 in three Indian major carps. In Rajasthan [4] reported a high variation from "Cube law'' in catla, rohu and mrigal from Siliserh reservoir and observed that availability of living space and food could strongly influence the values of exponent. [9] also observed the exponent values 'n' in several species of fishes from chulliar reservoir and reported that in the case of catla and rohu the values of 'n' were 3.353 and 3.113, respectively. According to him, the shifting of exponent value to the higher side of 3 indicates a favorable environment in the reservoir for the growth and wellbeing of the fish.

The exponent values obtained in the present study in respect of catla and rohu from the reservoir Goverdhan Sagar Lake are comparable to those reported by [4], [13], [11] and [7].

Condition factor is the physiological indicator of the well-being fish in any water body. Low values of condition factor or K, as it is normally referred to in a fishery language, is a definite sign of non-allometric fish growth probably owing to the competition for the good and space within the different fish communities in a water body. In the present study, the value of k varied between 0.761 and 1.251 for catla and 0.956 and 1.210 for rohu. The nearness of the K values to 1.0 in both the species clearly indicates the environmental suitability of the Goverdhan Sagar Lake good for fish growth.

Further, the high value of condition factor in the present study is an indication of higher 'K' value for catla in comparison to that of rohu are supportive of the assumption that rohu has a higher length increment than in catla. Conversely, the latter has higher weight increase [2] The 'K' values of *Catla catla* ranged between 1.484 and 2.278 in saroda reservoir are comparable and supportive as [7]. Similarly [10] reported. The 'K' values of *Catla catla* ranged between 1.484 and 2.278. It is reported that such values of 'K' are indicative of the sustainability of the water body for good fish growth. All the above studies support the presently made observations in catla and rohu on Goverdhan Sagar Lake.

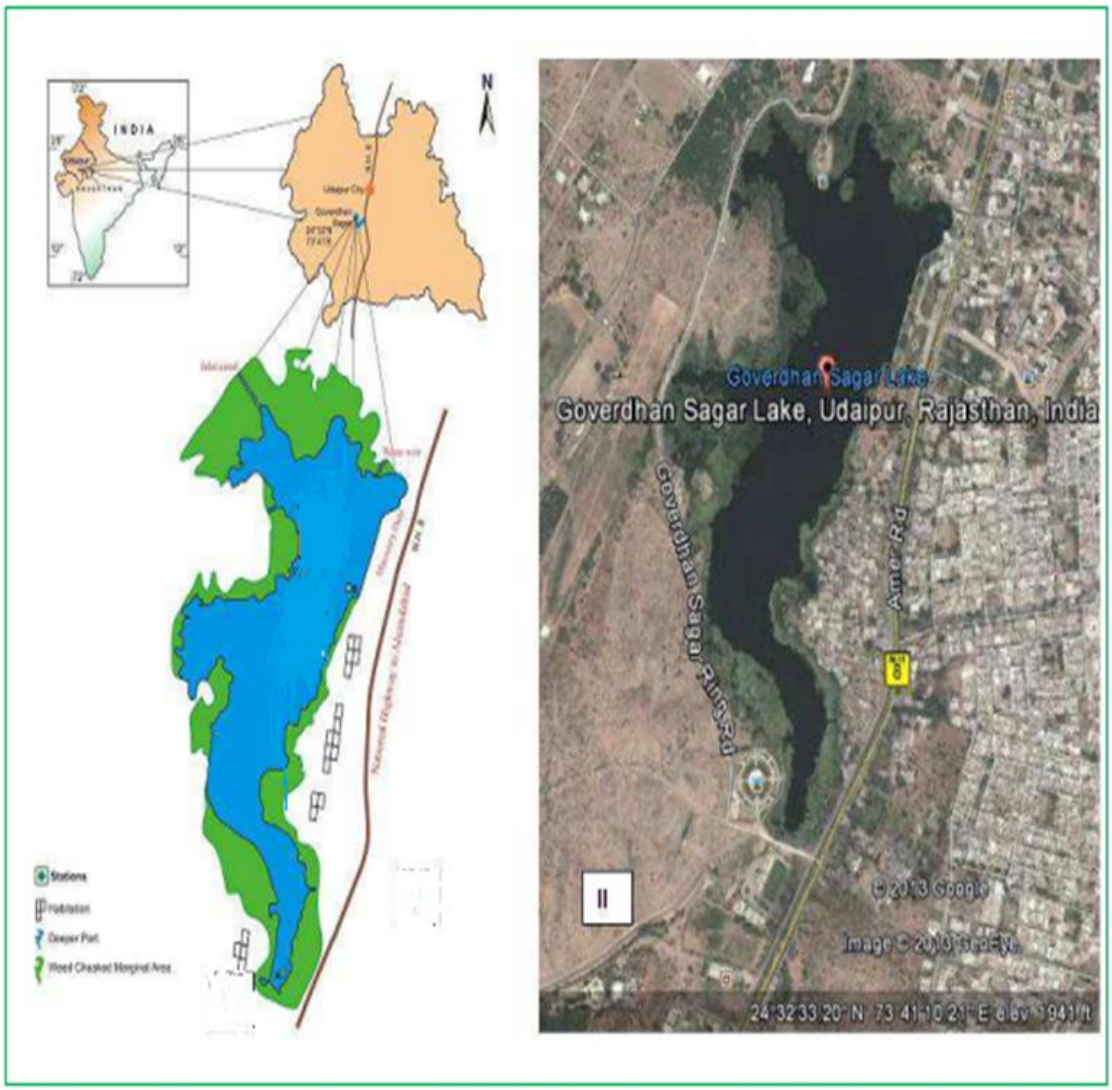


Fig. 1: Showing location map of study area (Goverdhan Sagar Lake)

Table 1: Correlation and regression of total body length (cm) with body weight (gm) of *Catla catla* at different length groups

S. No	Length (cm)	Group	No. of fish	Frequency (%)	Mean L ±SD	Mean W±SD	'b' Value	'r' Value	'r^2' (%)
1	30-40	A	133	44.33	36.90 ± 1.00	628.22 ± 44.711	0.849	0.24**	0.0576
2	41-50	B	126	42	44.176 ± 2.760	886.103 ± 94.067	1.425	0.618**	0.3819
3	51-60	C	41	13.66	53.125 ± 1.89	1381.43 ± 216.04	3.96*	0.864**	0.7157

** Significant at 1 per cent level of significance
* Significant at 5 per cent level of significance

Table 2: Correlation and regression of total body length (cm) with body weight (gm) of *Labeorohita* at different length groups

S. No	Length (cm)	Group	No. of fish	Frequency (%)	Mean L ±SD	Mean W±SD	'b' Value	'r' Value	'r^2' (%)
1	30-40	A	103	34.33	38.73 ± 0.907	671.69 ± 63.45	1.932	0.302	0.0912
2	41-50	B	168	56	43.545 ± 2.612	999.37 ± 245.74	3.467*	0.758**	0.6162
3	51-60	C	29	9.66	53.625 ± 1.843	1477.38 ± 198.66	2.273*	0.43**	0.1849

** Significant at 1 per cent level of significance
* Significant at 5 per cent level of significance

Table 3: Condition factor of *Catla catla* and *Labeorohita*

S. No	Length groups	Condition factor (K)	
	(cm)	catla	Rohu
1	30-40	1.249	1.155
2	41-50	1.027	1.210
3	51-60	0.905	1.074

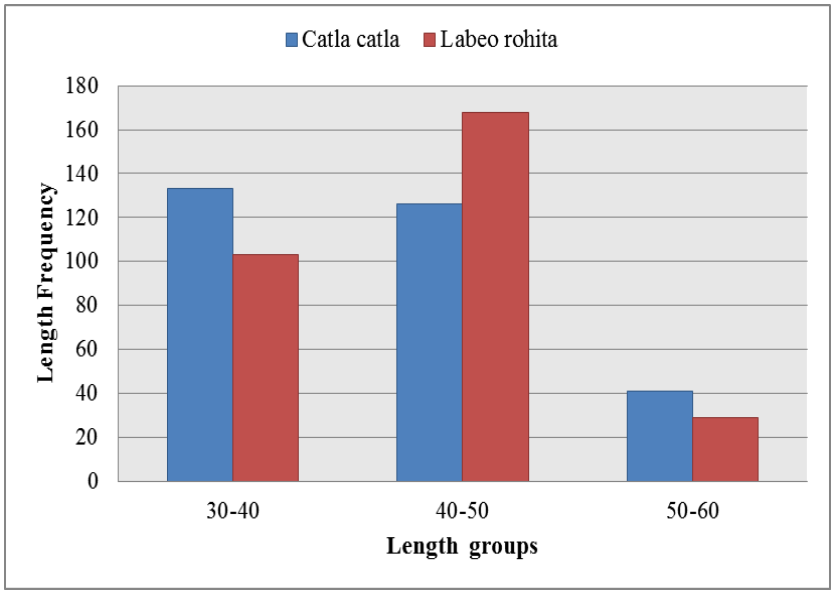
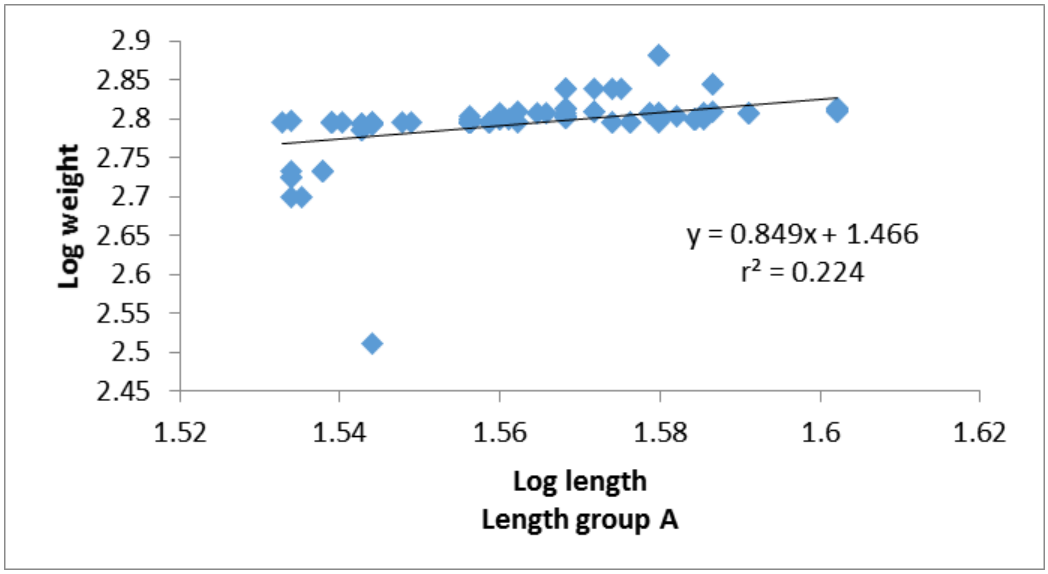
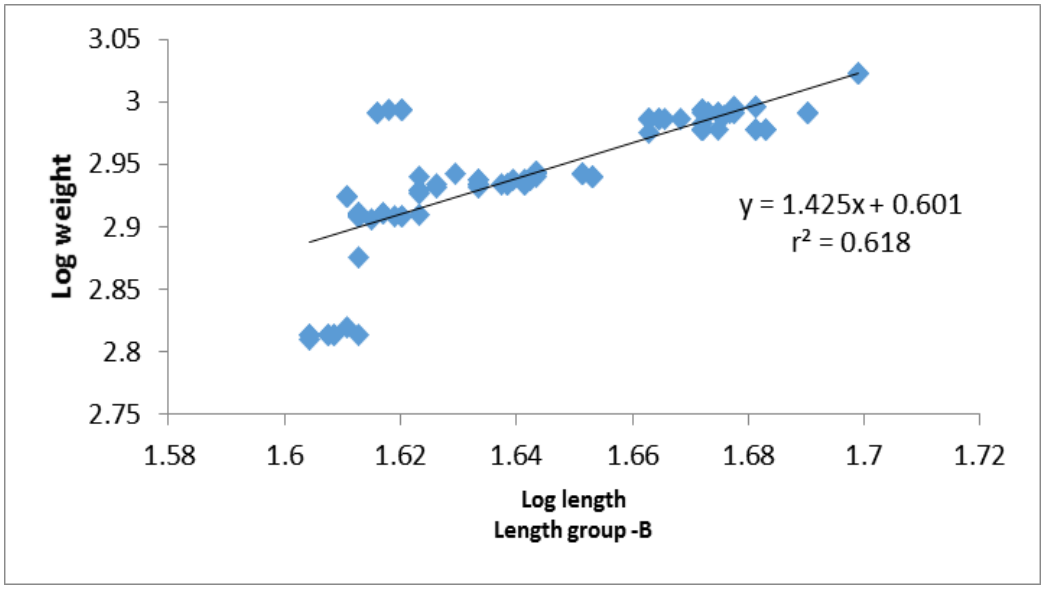


Fig 2: Length frequency distribution of *C. catla* & *L. rohita* of Goverdhan Sagar Lake





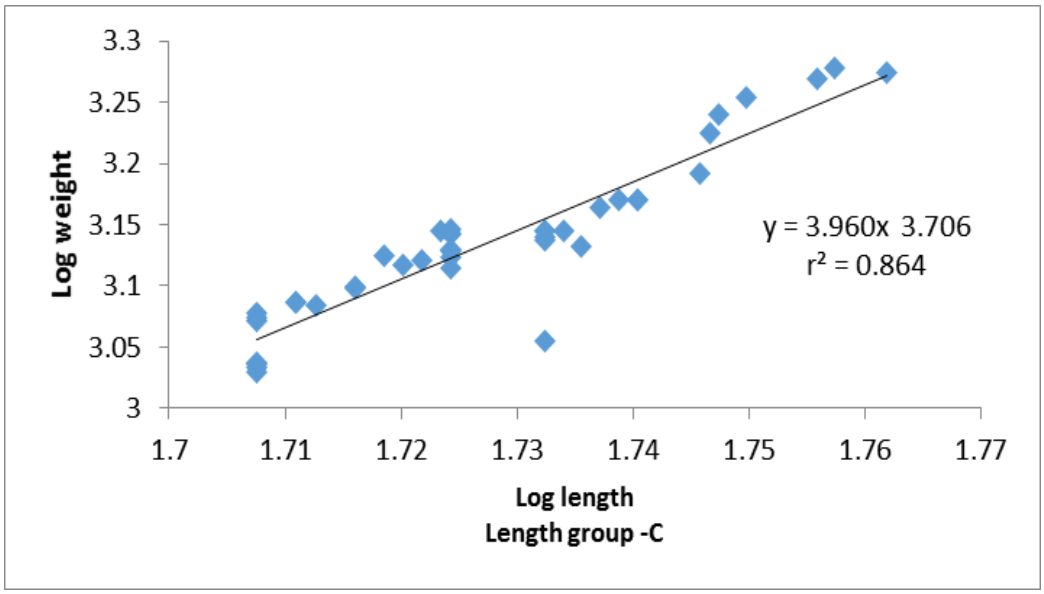
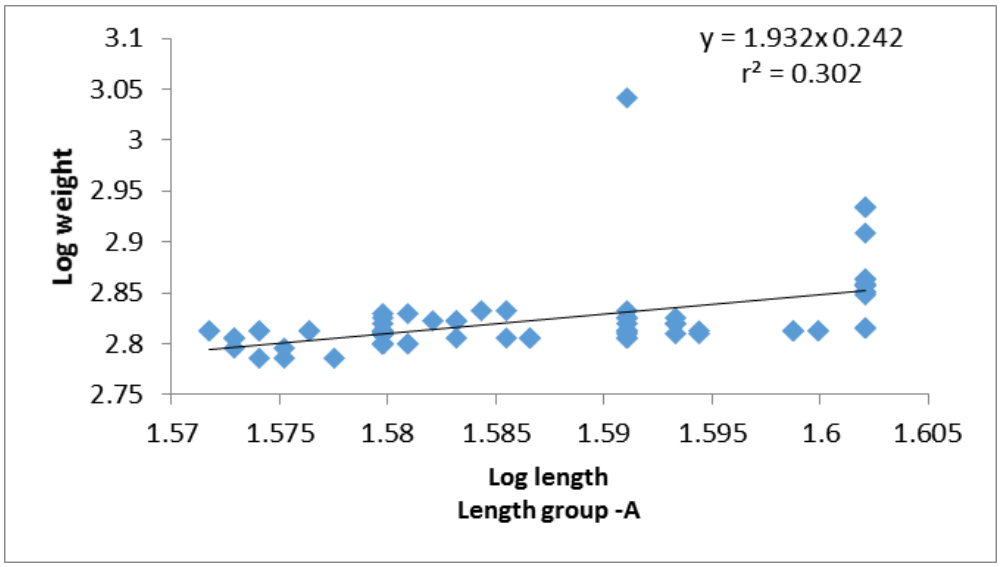
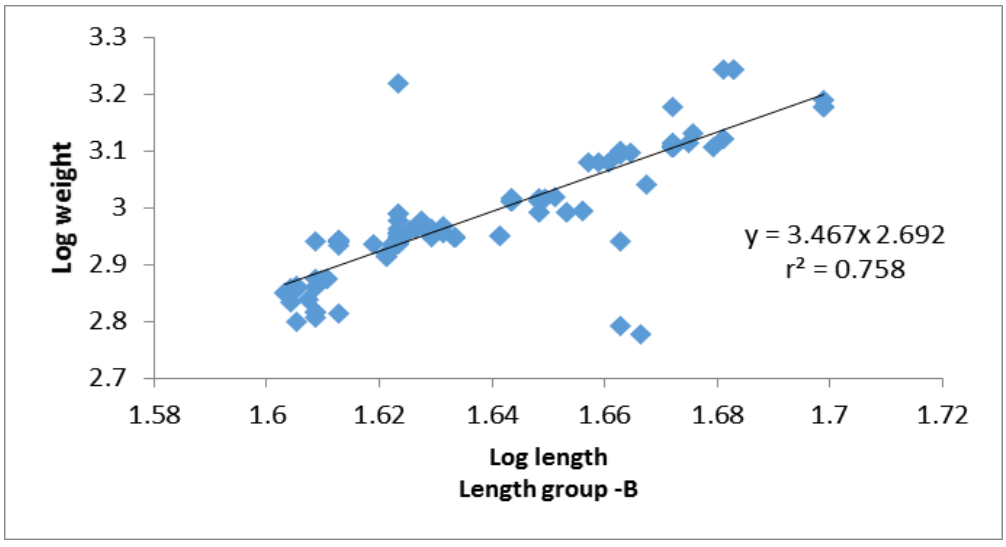


Fig3: Relationship between log length and log weight of *C. catla* of Goverdhan Sagar Lake





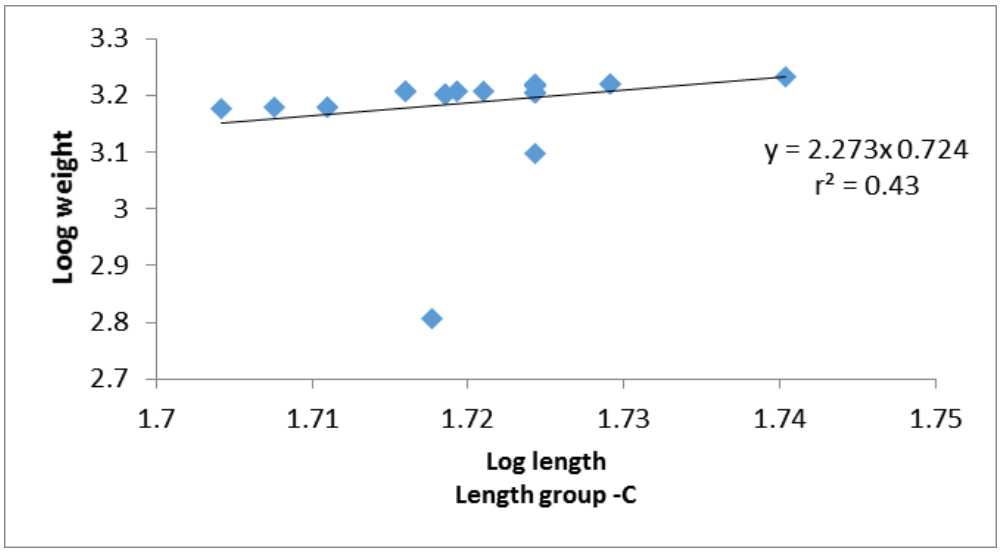


Fig 4: Relationship between log length and log weight of *L. rohita* of Goverdhan Sagar Lake.

4. Conclusion

From the present study it can be concluded that the length and weight of the fish species from the Goverdhan Sagar Lake could be highly correlated to each other. The present study also conclude that the regression coefficient 'b' showed the isometric and allometric growth of Catla and Rohu. On the basis of exponent value of length-weight relation, finally it could be concluded that the fishes *Catla catla* attained more weight per unit of length in the Goverdhan Sagar Lake. Observed condition factor of both the species reported that both fishes were in good condition during the study period.

5. References

1. Ahmed EO, Ali ME, Aziz AA. Length-Weight relationships and condition factors of six fish species in Atbara river and Khashm El- Girba reservoir, Sudan, International Journal of Agriculture Sciences. 2011; 3(1):65-70.
2. Bhatt NA, Sharma BK, Shwetanshumala, Shah T. Length-weight relationship and condition factor of *Catla catla* in Lake Pichhola, Udaipur, Rajasthan, *International* Journal of Fauna and Biological Studies. 2016; 3(4):19-23.
3. Desai VR, Shrivastava NP. Studies on age, growth and gear selectivity of Cirrhinus mrigala (Hamilton) from Rihand reservoir, Uttar Pradesh. Indian Journal of Fisheries. 1990; 37(4):305-311.
4. Janin MK. Biology and Fisheries of Indian major carps from Siliserh reservoir, Alwar, Rajasthan (Doctoral dissertation, Maharana Pratap University of Agriculture and Technology; Udaipur), 2000.
5. Johal MS, Tandon KK. Age and growth of the carp *Catla catla* (Hamilton, 1822) from Northern India. Fisheries Research. 1992; 14(1):83-90.
6. Kulbicki M, Guillemot N, Amand M. A general approach to length-weight relationships for New Caledonian lagoon fishes. *Cybium*. 2005; 29(3):235-252.
7. Kumar A, Jakhar JK, Vardia HK. Length-Weight relationship and relative condition Factor of *Labeo rohita* and *Catla catla* (Hamilton, 1822) in Saroda Reservoir, Kawardha, Chhattisgarh, International quarterly journal of life sciences. 2017; 12(2):709-714.
8. LeCren ED. The Length-weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*). Journal of Animal Ecology. 1951; 20:201-19.
9. Panicker AC. Ecological impact of tilapia, *Oreochromis mossambicus* (Peters) on the indigenous fish species in two reservoirs of Kerala. Ph.D. Thesis, University of Kerala, 2000.
10. Pervin MR, Mortuza MG. Notes on length-weight relationship and Condition Factor of freshwater Fish, *Labeo boga* (Hamilton) (Cypriniformes: Cyprinidae). University Journal of Zoology Rajsahi University. 2008; 27:97-98.
11. Rathore LK, Sharma BK. Length-weight relationship and condition factor of *Catla catla* in reservoir Udaisagar (Udaipur, Rajasthan), International Journal of Fisheries and Aquatic Studies. 2017; 5(4):07-10.
12. Tesch FW. Age and growth. In methods for assessment of fish production in fresh waters. W. E. Ricker (Ed.). Blackwell Scientific Publications, Oxford. 1968, 93-123.
13. Ujjania NC, Sharma LL, Balai VK. Length-weight relationship and Condition Factor of Indian major carp (*Labeo rohita* Ham., 1822) from Southern Rajasthan, India, Applied Biological Research. 2013; 15(2):1-5.
14. Zaryab M, Yousaf MA, Gul S, Rehman HU, Sadia H, Kiani BH *et al.* Length-weight relationship (LWRs) of Chambaidam fishes district Karak, KP, Pakistan, Journal of Entomology and Zoology Studies. 2017; 5(1):117-119.