



Length-weight relationship and ponder index of two Indian major carps in Dejala Dewada reservoir, Khargone, M.P.

S.K.Pathak¹ and Sandhya Kshetre²

Received: 28.12.2012

Revised: 26.03.2013

Accepted: 8.04.2013

Abstract

The total 200 specimens of *Catla catla* and *Cirrhinus mrigla* were worked out during the two year study periods, from Dejala Dewada reservoir of Khargone district. Total length and body weight were estimated. The correlation coefficient ("r") and ponder index ("Kn") have also been computed. The result showed the growth of two IMC is satisfactory. The value of exponent 'n' in the equation $W=cL^n$ were 1.9416 and 1.4798 for *Catla catla* and *Cirrhinus mrigla*. The relative condition factor ("Kn") remained greater than one for both IMC indicating their good well being.

Keywords Length-weight relationship, Indian major carp, cube law, Ponder index

Introduction

The study of the length -weight relationship of fishes is of vital importance to the fishery biologists. The application of our knowledge with context of fishery biology will help in detecting suitable and fertile fishing water body and to increase the fish production in our country. The environmental factors and the availability of fish food also effects this relationship. The length-weight relationship shows economic value of fish.

The length -weight relationship of the Indian major carps expressed by the equation: $W=cL^n$. Several workers viz. Jhingran (1959,68), Sinha (1972), Pathak(1975), Soni and Kathal(1979), Quadri and Mir(1980), Srivastava and Pandey (1981), Prakash and Rawat(1990), Adholia(1990), Das Gupta (1990),Shrivastava and Desai (1993),Patgiri et al.(2001), Saroja et al. (2002)Pathak (2005),Dagonkar and Prakash(2009) have been reported from various water bodies in India. The available literature in this context in M.P. is very meager, therefore the present study was planned. The investigation describes the length -weight relationship in two economically important fishes viz *Catla catla* and *Cirrhinus mrigla* collected from Dejala Dewada reservoir.

Author's Address

¹P.G. Department of Zoology, B.L.P.Govt P.G. College, Mhow

²P.G. Department of Zoology, Govt P.G. College, Khargone

E-mail:skpathak57@gmail.com

Material and Methods

After the collection of fishes from Dejala Dewada reservoir and local market preserved in 5% formaline and were analysed for its length -weight relationship. The total length of both major carps were measured on the measuring board. The preserved fishes were weighed on a platform balance. The data of L-W relationship and their log values K_n etc. have been shown in the table.

The L-W relationship was calculated according to formula:-

$$W=cL^n$$

Where, W represents the weight of fish, L its length and c and n are constants. A logarithmic transformation of the formula given a straight line relationship of the term as -

$$\text{Log } W = \text{Log } c + n \cdot \text{log } L$$

The ponderal index (Kn) was calculated by the formula:-

$$\text{Wt. in gr.} \times 100$$

$$\text{Ponderal index (Kn)} = \frac{\text{Wt. in gr.} \times 100}{L^3 \text{ in cm.}}$$

Results and discussion

The regression equations in the logarithmic form of *Catla catla* and *Cirrhinus mrigla* were found be $\text{Log } W = 0.00145 + 1.9416$ and $\text{Log } W = 0.00329 + 1.4798$ respectively (Table-1).



Table 1: Length weight relationship of *Cirrhinus mrigala*

S.NO	No. of Fishes	Average length in cm. (L)	Log L	Average observed Wt. in gm (W)	Observed LogW	Log L X Logw	(Log L) ²	(Log W) ²	Calculate Log a	Calculate Log n	Calculate Log W	Calculate Wt. In gm.	Ponderal index
1	12	8.8	1.0253	18	0.8854	0.8362	0.892	0.7839	0.003296	1.47978	1.4009	25.1725	1.1269
2	11	10.6	1.1239	22.3	1.2553	1.287	1.0512	1.5757	0.003296	1.47978	1.5205	33.1534	1.5113
3	15	13.3	1.2014	25.8	1.3483	1.5153	1.263	1.8179	0.003296	1.47978	1.6663	46.3825	0.9479
4	18	15.9	1.3054	67.7	1.4116	1.6959	1.4433	1.9927	0.003296	1.47978	1.7811	60.4094	0.6418
5	16	20.2	1.3945	101.3	1.8306	2.3895	1.7039	3.3511	0.003296	1.47978	1.9349	86.0864	0.8213
6	16	24.8	1.4609	286	2.0057	2.7967	1.9445	4.0224	0.003296	1.47978	2.0668	116.6229	0.6641
7	18	28.9	1.4712	362	2.4564	3.5884	2.1342	6.0337	0.003296	1.47978	2.1651	146.2545	1.1849
8	17	29.6	1.5092	421.6	2.5587	3.7646	2.1647	6.5469	0.003296	1.47978	2.1804	151.5271	1.3959
9	20	32.3	1.5671	527.2	2.6249	3.9615	2.2777	6.8901	0.003296	1.47978	2.2366	172.421	1.2511
10	20	36.9	1.6365	670.2	2.7219	4.2654	2.4556	7.4091	0.003296	1.47978	2.3221	209.9699	1.0493
11	17	43.3	1.6981	814.3	2.8262	4.6251	2.6781	7.9874	0.003296	1.47978	2.4249	266.0389	0.8313
12	20	49.9	1.63378		2.9108	4.9428	2.8835	8.4727	0.003296	1.47978	2.5161	328.1849	0.6554
Σ =	Σ =200	Σ L=314.5	Σ logL=	Σ W=	Σ log W=	Σ log L X W	Σ logL ² =	Σ logW ² =					
			16.3378	3324.14	24.8357	35.6686	22.8919	56.8838					

Table 1: Length weight relationship of *Catla catla*

S.NO.	No. of Fishes	Average length in cm. (L)	Log L	Average observed Wt. in gm (W)	Observed LogW	Log L X Logw	(Log L) ²	(Log W) ²	Calculate Log a	Calculate Log n	Calculate Log W	Calculate Wt. In gm	Ponderal index
1	10	8.2	0.9138	0.9138	1.2922	1.2922	0.835	1.6698	0.001396	1.94211	1.7761	59.7207	3.55479
2	15	15.2	1.1818	1.1818	2.1477	2.1477	1.3967	4.6126	0.001396	1.94211	2.2967	198.0613	4.0008
3	18	24.1	1.382	1.382	2.602	2.602	1.9101	6.7707	0.001396	1.94211	2.6854	484.6489	2.85765
4	16	29.2	1.4654	1.4654	3.0146	3.0146	2.1473	0.0876	0.001396	1.94211	2.8479	704.5384	4.1539
5	18	33.4	1.5237	1.5237	3.1609	3.1609	2.3218	9.9914	0.001396	1.94211	2.9607	913.4429	3.9842
6	13	34.1	1.5327	1.5327	3.179	3.179	2.3493	10.1064	0.001396	1.94211	2.9782	950.9896	3.8089
7	18	45.6	1.659	1.659	3.3181	3.3181	2.7522	11.0114	0.001396	1.94211	3.2233	1672.209	2.19366
8	16	48.2	1.683	1.683	3.3598	3.3598	2.8326	11.2886	0.001396	1.94211	3.2701	1862.3481	2.04509
9	20	56.4	1.7513	1.7513	3.4802	3.4802	3.067	12.1122	0.001396	1.94211	3.4026	2526.825	1.68433
10	16	65.6	1.8169	1.8169	3.5798	3.5798	3.3011	12.815	0.001396	1.94211	3.5301	3388.6414	1.34612
11	20	72.4	1.8597	1.8597	3.6474	3.6474	3.4586	13.335	0.001396	1.94211	3.6132	4104.0756	1.16995
12	20	80.2	1.9042	1.9042	3.7638	3.7638	3.6259	14.1663	0.001396	1.94211	3.6995	5006.2738	1.12537
	Σ =200	Σ L= 512.6	Σ L=18.6737	Σ W=18.6737	Σ log W= 36.5457	Σ logLx Logw=36.5457	Σ (Log L) ² = 29.9977	Σ (Log W) ² = 116.9355					

The value of correlation coefficient (r) =0.98 of grand average ponderal index (Kn) of *Catla catla* and 0.97 of *Cirrhinus mrigala*. The when all the 12 groups were taken together and



computed was found to be 3.0492, the highest being 4.1535 of the length 24.10 cm. and lowest being 1.3254 in 80.20 cm. length. The average coefficient of condition (Kn) of *Cirrhinus mrigla* was found to be 1.0067 (table-), the lowest being 0.6418 of the 15.90 cm. and the highest being 1.5113 in 10.6 cm. length. The average value of ponderal index (Kn) to be more than one of both IMC. It indicated that, the well being of the fish were found to be good. This acts for better reproduction in a better space to give better spawn. The value of 'n' was comparatively low of the both IMC viz. *Catla catla* and *Cirrhinus mrigla* in this locality. This show these fishes deviates from the general "cube law" and did not hold good in the above cases. The similar observation reported by Jhingran (1968) in *Gudusia chapra*, Rao and Rao (1972) and Pathak (1975) have also observed the 'n' value less than three for the fishes of Godavari river and Loni reservoir respectively. Khan(1988) in *Labeo*

calbasu, Adholia (1990) in *Labeo rohita* and *Catla catla*. Harish et al. (2006) reported 'n' value less than three for *Rasbora daniconus* from Sarvathi reservoir, Karnataka. This deviation in the value of 'n' may be due to change in the environmental factors, the availability of fish food and difference in condition of fish population. Very high values of coefficient of correlation (r) between L & W in *Catla catla* (0.98) and *Cirrhinus mrigla* (0.97) existed. It means that the total weight of the fish is highly correlative to its total length. This observation of present study were supported by Chacko and Ganapathi (1981), Kartha and Rao (1990) and Pandey (1998). The value of "Kn" more than one in both studied fishes. Nasar (1990) also supported this finding in *Heteropneustes fossilis* (bloch). Therefore a need for study of physico-chemical parameters of Dejala Dewada reservoir of Khargone district is unavoidable.

Table 3- Length weight relationship of two species of Indian Major Carps of Dejala Dewada reservoir, M.P.

Family	Species	c	n	r	Mean L range (cm.)	Mean W range (mg.)	Mean (Kn)	Mean calculated Log W	Mean calculated Wt.
Cyprinidae	<i>Catla catla</i>	0.001446	1.9416	0.98	42.72 (8.20 - 80.20)	2165.84 (19.60 - 5805.20)	3.0492 (1.3254 - 4.1535)	2.8756 (1.7761 - 3.6995)	1822.6429 (59.7207 - 5006.2738)
Cyprinidae	<i>Cirrhinus mrigla</i>	0.003295	1.4798	0.97	26.21 (8.80 - 49.90)	277.01 (7.68 - 814.30)	1.0067 (0.6418 - 1.5113)	2.0180 (1.4009 - 2.5161)	136.8519 (25.1725 - 328.1849)

References

- Adholiya, U.N. 1990. Length weight relationship in few cypriniformes fishes from the river Betwa, India. *MATSYA*, 15 & 16:138-144.
- APHA, AWWA and WPCF 1989. *Standard Methods for the Examination of Water and Waste Water*, 17th edition, APHA, Inc. New York. P.1268.
- Chacko, P.I. and Ganapathi 1951. Bionomics of the Mrigala, *Cirrhinus mrigla* (Ham.) in south Indian water. *Bombay Nat. Hist. Soc.*, 50(1): 13-19.
- Dagonkar, Amita and Prakash, M.M. 2009. Length weight relationship of twofish species in Munjsagar talab, Dhar, M.P. *Indian research communication* 3(1) 41-42.
- Das Gupta, M. 1990. *Length weight relationship and Condition of the Mahaseer Tor tor (Hamilton) from Garo Hills*, India. Proc. 77th Ind.Sc. Cong. Part III.
- Harish, Kumar K., Kiran, B.R., Purushotam, R., Puttaia, E.T. and Manjappa, S. 2006. Length weight relationship of Cyprinid fish *Rasbora daniconus* (Hamilton-Buchanan) from Sarvathi reservoir, Karnataka. *Zoo'Print Journal* 12(1):2140-2141.
- Jhingran, A.G. 1952. *General length weight relationship of three major carps of India*. Proc. Nisc. India 18 : 449- 455.
- Jhingran, A.G. 1968. *The length weight relationship and K factor of Gudusia chopra (Ham.) from Ganga river system*. Proc. Nat. Acad. Sci. India, 35(b). :249-362.
- Khan, M.A. 1988. *Biology of Labeo calbasu (Ham.) from Tilaya reservoir, Bihar I): Length weight relationship, Condition index and feeding habits*. Proc. Acad. Sci. India, 58 (B) I 41-47.
- Kartha, K.N. and Rao, K.S. 1990. Length-weight and length-maximum girth relationship of *Catla catla* (Ham.) in commercial landings of Gandhisagar Reservoir. *Fish. Techno.*, 27:155-156.



- Le Cren, E.D. 1951. The length weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca-fluyia jillis*). *J. Anim. Ecol.*, 20: 201-219.
- Patgiri, A., Goswami, M.M., Kar, D. and Barbhuiya, M.H. 2001. Comparative study on length weight relationship and relative condition factors in major and exotic carps in pounds of Guwahati. *J. Environ. & Ecopl.* 5(1):179-180
- Pandey, Anil 1998. *Hydrobiological studies on Gambheer dam, Ujjain (M.P.) including up and down stream with special reference to fisheries*. Ph.D. thesis, Vikram University, Ujjain, (M.P.).
- Prakash, M.M. and Rawat, H. 1990. Length weight relationship in *Oxygaster bacaila* (Ham.). *J. Inst. Agric. Anim. Sci.* 11:127-131.
- Pathak, S.C. 1975. Length weight relationship, Condition factor and food study of *Labeo calbasu* (Hamilton) from Soni reservoir (Madhya Pradesh). *Journal of Inland fisheries Society of India* 8:409-434.
- Pathak, S.K. 2005. *Limnological status of Virla Reservoir, District West Nimar (Kargone) M.P., India*. Ph.D. thesis, Devi Ahilya Vishwavidyalaya, Indore, (M.P.).
- Quadri, M.Y. and Mir, S. 1980. Length weight relationship of *Oreinus plangiostomus* (MCCL), *Geobios.*, 7: 158-159.
- Saroja, S.P., Sivakumar, A.A. and Chandran, Rashmi 2002. Studies on length weight relationship and sex ratio in *Oreochromis mossambicus*. *Indian J. Environ. & Ecoplan.* 6 (2):251-254.
- Shrivastava, N.P.C. and Desai, V.R. 1993. *Observation on length weight relative condition and net selectivity of Silonia silondia (Hamilton) from Rihand Reservoir (U.P.)*. Geobios New Rep., 12(1)26-29.
- Sinha, M. 1972. Observation on the biology of *Puntius sarana* (Hamilton) of Loni reservoir (M.P.). I. Length weight relationship food and Condition factors. *J. Inland Fish Soc. India*, 4:122-131.
- Soni, D.D. and Karthal, K.M. 1979. Length weight relationship in *Cirrhinus mrigla* (Val) and *Cyprinus carpio* (Ham.). *Matsya*. 5:69-73.
- Srivastava, S. and Pandey, A.K. 1981. Length weight relationship and Condition factor of three Indian major carps in composite fish farming. *Matsya*. 7: 70-74.

