VOLUME 9 ISSUE 1 2023

ISSN 2454 – 3055

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 9, No. 1, 219-223 (2023)

International Journal of Zoological Investigations
Contents available at Journals Home Page: www.ijzi.net
Editor-in-Chief: Prof. Ajai Kumar Srivastav
Published by: Saran Publications, Gorakhpur, India

ISSN: 2454-3055

Length-Weight Relationship of Mahseer (*Tor tor*) from Kerwan Reservoir (Bhopal, Madhya Pradesh, India)

Nigam Anukriti N.

Department of Zoology, Fergusson College (Autonomous), Pune 411004, India

Received: 14th December, 2022; **Accepted:** 17th January, 2023; **Published online:** 6th February, 2023

https://doi.org/10.33745/ijzi.2023.v09i01.026

Abstract: Mahseer, the cyprinid which is considered to be endemic to continental Asian region is one of the popular cultural icons due to not only its economic and recreational value but also conservation interests due to its decline in number in their native range (Siraj *et al.*, 2007; Nguyen, 2007; Pinder *et al.*, 2013; Pinder, 2020). Mahseer, commonly known as 'tiger of the water' (Nautiyal, 2006) and considered as the world's hardest fighting fish managed to get placed among the twenty 'mega fishes' of the world due to its large size (Stone, 2007). It is reported that fishes like Mahseer which qualify as megafauna (defined animals with maximum body mass exceeding 30 kg) (Carrizo *et al.*, 2017; He *et al.*, 2017) are easy targets due to their high economic and consumptive value.

Generally, growth of organisms is reflected by increase in size i.e. the increase in length and the weight during development. Apart from availability of food there are many other factors which influence the growth of fishes, among those the quantity and quality of available food, number of fishes with similar feeding habits in each stratum, temperature, dissolved oxygen and other physico-chemical parameters of the water body play a key role. At the same time, the growth of fish is also dependent on the attainment of sexual maturity and age. Length and weight relationship has both applied and basic significance. The present study deals with the length-weight relationship of Mahseer, i.e. *Tor tor* (Hamilton) from Kerwan Reservoir (Bhopal, Madhya Pradesh, India) by using a general equation proposed by Le Cren.

Keywords: Length, Weight, Cyrprinid, Relationship, Growth, Mahseer, *Tor tor*

Citation: Nigam Anukriti N.: Length-weight relationship of Mahseer (*Tor tor*) from Kerwan Reservoir (Bhopal, Madhya Pradesh, India). Intern. J. Zool. Invest. 9(1): 219-223, 2023.

https://doi.org/10.33745/ijzi.2023.v09i01.026

Introduction

Mahseer is the most important fish among carp in rivers of Madhya Pradesh. It contributes 15.6% in the central zone of Narmada in Hoshangabad and Khandwa districts (Shrivastava and Nath, 2002). In past, Mahseer has been a matter of study and a number of scientists have worked on various aspects of its life. The important contributors among them are Hora (1940), Desai (1970, 1973), Nautiyal and Singh (1989), Dehadrai *et al*. (1994) and Singh *et al*. (1995). The importance of length-weight relationship studies in fishes has been discussed by Allen (1938), Le Cren (1951), CIFRI

(1967), Lal (1969), Shekharan (1968), Vinci and Nair (1974), Lal and Nautiyal (1980), Qadri and Mir (1980), Nautiyal (1985) and Desai (1992). Allen (1938) is of the opinion that the weight of a fish increases as the cube of its length. But Le Cren (1951) has replaced this cubic relationship. Le Cren has reviewed the methods employed in estimating the length-weight relationship of fishes with a clear exposition of the superiority of the equation $W=a.L^n$ over that of Allen, i.e. $W=a.L^3$.

The present study deals with the length-weight relationship of Mahseer, i.e. *Tor tor* (Hamilton) from Kerwan Reservoir (Bhopal, Madhya Pradesh, India) by using a general equation proposed by Le Cren. The correlation coefficient of *Tor tor* showed varying degrees of significance of total length in relation to the increase in the total weight of fish.

Materials and Methods

In the present study 323 specimens ranging between 216 and 505 mm were collected from two markets of Bhopal *viz*. Budhwara wholesale market, and Bittan fish market. These markets receive Mahseer catch from Barna, Kerwa, Kolar and Halali reservoirs. The samples were collected at two weeks intervals from each market and the sampling was undertaken for 18 months (November 2000 to April 2002). The fishes were brought to market and the samples were dried with a cloth and measured.

Results and Discussion

The data were studied in two ways. First, the data were separated sex-wise. Then, the whole data were pooled and studied.

Sex Linked Length-Weight Relationship:

The specimens ranging between 216 and 505 mm in length and 500 and 2850 g in weight were sex-wise divided into two groups and the each group was studied separately. The two groups were classified into three class intervals of 110 mm. Each class was studied separately and finally, pool data of the two groups were studied separately.

The female group consisted of 126 samples ranging between 226 and 505 mm (500-2700 g). While the male group comprised 197 samples ranging between 216 and 487 mm. (500-2850 g). The log values of the two groups were taken separately and the two equations as follows were achieved:

Female: Log W = -1.7144 + 1.8475 Log L

Male: Log W = -2.4593 + 2.1299 Log L

The correlation coefficient for female group was calculated 0.806 for which t = 15.2845 significant at 1% probability. The r value for male group was 0.8187. The t test (t = 20.0138) showed probability less than 0.01.

In sex linked study the first group of 210-320 mm. showed correlation in both sexes as for female r = 0.0346, while for male r = 0.2927 which describes that isometric growth pattern is not followed in early stages i.e. first year of life cycle. However, during the second year onwards it is observed to achieve a positive significant correlation. The values of the regression coefficient are female 1.8475 and male 2.1299.

General Length-Weight Relationship:

The specimens ranging between 216 and 505 mm in length and 500 and 2850 g in weight were divided into four class intervals of 80 mm. Log values of length and weight were calculated separately and the formula Log W = -2.1144 + 1.9992 Log L was derived for the whole population. The correlation coefficient between length-weight was calculated as 0.8125. The t value of the r was calculated 25.0454, which is significant at 1% probability.

The lowest correlation coefficient 0.188 was observed in the group 201-280 mm showing positive insignificant relationship between length-weight while the highest value of r was recorded in the group ranging between 281 and 360 mm (r = 0.8971).

Available literature shows that the fishes deviate from cube law. However, generally the value of the regression coefficient is observed to be around 3 depending upon the stage of life cycle.

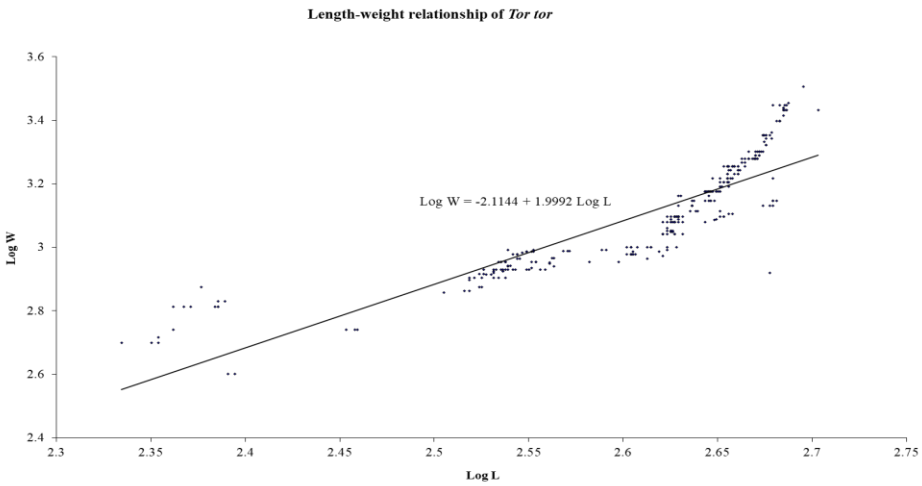

Fig 1: Length-weight relationship of *Tor tor.*

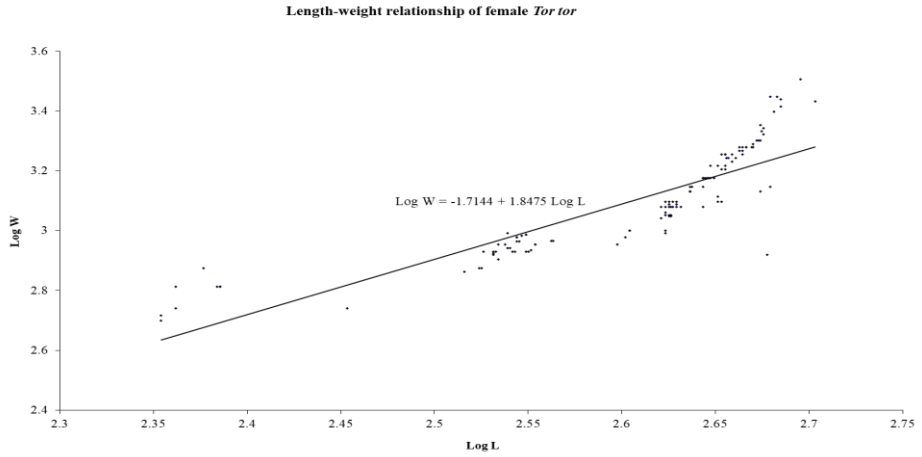

Fig 2: Length-weight relationship of Female *Tor tor.*

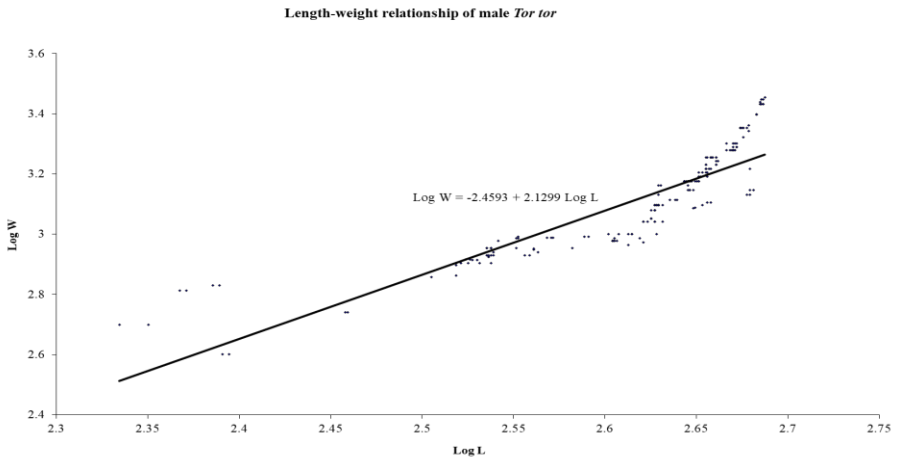

Fig 3: Length-weight relationship of Male *Tor tor.*

In the present study value of b varies with sex and length group. CIFRI (1967), Lal and Nautiyal (1980), Desai (1992) and other workers have shown that the value of the regression coefficient may either be close to the cube of the length or differ significantly from it.

Different values of correlation coefficient of the two sexes and pooled data infer that at various life stages, level of significance of the total body length differs for the increase in the total weight of *Tor tor*. The data presented in this study also shows that the significance of body length for increase in total weight differs with the sex. This may be depicted as a difference in the gonadal development in the two sexes. These deviations may also be due to environmental, seasonal changes and body shape of the species.

The observations recorded in the study may be summarized as follows: (i) The length-weight relationship of *Tor tor* may be expressed as $W=a.L^b$ (Log W = -2.1144 + 1.9992 Log L), and (ii)The correlation coefficient of *Tor tor* shows varying degrees of significance of total length in relation to the increase in the total weight of fish. It depends on sexes and length group (Figs.1-3).

Conclusion

Kerwan reservoir is located near Bhopal which inhabits Mahseer in different compositions and fish growth in this water body is varied. To make a general picture of Mahseer catch of this reservoir random sampling of Mahseer was undertaken from two fish markets of Bhopal and morphometric data was collected for the period of eighteen months. As fishing is prohibited in Kerwan, only a negligible quantity of fish through poaching arrives from Kerwan. Therefore, the data presented in this paper is mainly based on Mahseer catch arriving in the market .

General length-weight relationship was derived as Log W = -2.1144 + 1.9992 Log L while sexwise relationship was also assessed and Log W = -1.7144 + 1.8475 Log L was derived for female whereas Log W = -2.4593 + 2.1299 Log L was calculated for male group of Mahseer. The correlation coefficient between length-weight of pool data was calculated as 0.8125. It could be concluded from the data that females of the same length group have differences in weight as compared to males.

Acknowledgements

The author is grateful to Dr. Praveen Tamot and Dr. T.A. Quereshi for the technical support and guidance they have provided throughout the study period.

References

Allen KR. (1938) Some observations on the biology of the trout (*Salmo trutta*) in Winderemere. J Anim Ecol. 4: 333-349.

Carrizo SF, Jähnig SC, Bremerich V, Freyhof J, Harrison I, He F and Darwall W. (2017) Freshwater megafauna: Flagships for freshwater biodiversity under threat. Bioscience 67(10): 919-927.

CIFRI (1967) Biological investigations on the fish and fisheries of Narmada river (1958-1966). Govt India, CIFRI Bull. 10: 40.

Dehadrai PV, Das P and Verma SR. (1994) The endangered golden Mahseer in Garhwal Himalaya: A decade of retrospection. Natcon 4: 191-196.

Desai VR. (1970) Studies on fishery and biology of *Tor tor* (Ham.) from river Narmada. 1. Food and feeding habits. J Inland Fish Soc India 2: 101-112.

Desai VR. (1973) Studies on fishery and biology of *Tor tor* (Hamilton) from river Narmada. II. Maturity, fecundity and larval development. Proc Nat Sci Acad. 39B(2): 230-248.

Desai VR. (1992) Investigations on Tor Mahseer, *Tor tor* Hamilton from river Narmada (around Hoshangabad) with utility for reservoir fisheries development of Narmada basin. Pb Fish Bull. XVI(1): 21-24.

He F, Zarfl C, Bremerich V, Henshaw A, Darwall W, Tockner K and Jahnig SC. (2017) Disappearing giants: a review of threats to freshwater megafauna. https://doi.org/10.1002/wat2.1208.

Hora SL. (1940) The Game fishes of India IX. The Mahseers or the large – scaled Barbels of India. 2. The Tor Mahseer, *Barbus* (*Tor*) *tor* (Ham.) J Bombay Nat Hist Soc. 41(3): 518-525.

Lal MS. (1969) Studies on the fishery and biology of a freshwater teleost, *Rita rita*. II. Length-weight relationship. Ind J Zoot. X(1): 27-35.

Lal MS and Nautiyal P. (1980) Eco-biological status of

some hill-stream fishes of Garhwal Himalayas. II. Length-weight relationship of *Tor putitora* (Ham.). Ind J Zoot. XXI(1-3): 107-110.

Le Cren ED. (1951) The length-weight relationship and seasonal cycle in gonad weight and condition in perch (*Perca fluviatilis*). J Anim Ecol. 20: 201-219.

Nautiyal P. (1985) Length-weight relationship and relative condition factor of the Garhwal Himalayan Mahseer with reference to the fishery. Indian J Anim Sci. 55: 65-70.

Nautiyal P. (2006) Rising awareness and efforts to conserve the Indian mahseers. Curr Sci. 91(12): 1604.

Nautiyal P and Singh HR. (1989) River projects and the endangered Himalayan Mahseer *Tor putitora* in the Indian uplands of Garhwal region: A critical evaluation. Him J Env Zool. 3: 129-134.

Nguyen TTT, Na-Nakorn U, Sukmanomon S and Ziming C. (2008) A study on phylogeny and biogeography of mahseer species (Pisces: Cyprinidae) using sequences of three mitochondrial DNA gene regions. Mol Phylogenet Evol. 48: 1223-1231.

Pinder AC. (2020) Conserving the iconic and highly threatened Mahseer fishes of South and Southeast Asia. Doctoral Thesis. Bournemouth University.

Pinder AC and Rajeev R. (2013) Conserving the endangered Mahseers (*Tor* Spp.) of India: The positive role of recreational fisheries. Curr Sci. 104(11): 1472–1475.

Qadri MY and Mir S. (1980) Length-weight relationship of *Oreinus plagiostomus* (Mc. Cl.) Geobios 7(4): 158-159.

Shekharan KV. (1968) Length-weight relationship in *Sardinella albella* (Val.) and *S. gibbosa*. Ind J Fish. 15(1,2): 166-174.

Shrivastava NP and Nath D. (2002) Mahseer in river Narmada from Pipariya to Harsud in Madhya Pradesh-Present status and proposed conservation measures. Proc Nat Work Biodiversity Conserv Aquat Resources Threatened Fish Mahseer, CIAE Tech Report, 262: 74-77.

Singh AK, Singh SP, Singh LB and Joshi LM. (1995) Critical evaluation and categorization of endangered Mahseer in Kumaon region (Bhimtal Lake). New Agriculturist 6(1): 19-26.

Siraj SS. (2007) Mahseer. In: The Biology, Culture and Conservation. Malaysian Fisheries Society, Serdang, Malaysia, pp. 235.

Stone R. (2007) The last of the leviathans. Science 316:1684-1688.

Vinci GK and KesavanNair AK. (1974) Length-weight relationship in the threadfin-bream *Nemipterus japonicus* along the Kerala coast. Ind J Fish. 21(1): 299-302.