

Length-weight Relationship of *Tilapia mossambicus* of Idukki Reservoir

P. GOPINATHAN NAIR*

Zoological Survey of India, Cochin - 682 011

The results of ten months study (September 1983 to July 1984) of the length-weight relationship of males and females of *Tilapia mossambicus* of the reservoir waters of Idukki Hydel Project show deviation from the cubic relationship of these two parameters. This is due to the retarded growth pattern of this exotic species in this oligotrophic habitat.

Production could be defined, in broader sense, as the tissue elaborated in time among higher organisms. This elaboration of tissue is usually referred to as growth in popular sense and is reflected in terms of weight and length or height of an organism. Among fish there is relationship between its length and weight; the weight varies as the cube of its length (Le cren, 1951). The present study was undertaken to verify this relationship in *Tilapia mossambicus* of the Idukki Reservoir.

Materials and Methods

The studies were carried out in Idukki Reservoir in Western Ghats at an altitude of about 850 m above M.S.L. (Long. 76° 59'E and Lat. 8°51'N). A detailed description of the study area and fish landing centres have been given in an earlier study (Gopinath & Jayakrishnan, 1984).

Monsoon season, commencing from June to September, is distinct in Kerala marked by heavy rains. The months, October to January constitute the post-monsoon and February to May, the pre-monsoon seasons.

The ambient temperature varied from 22.5 to 26.8°C while the water temperature from 22.7 to 28.2°C during the study period 1983-84.

* Division of Wildlife Biology, Kerala Forest Research Institute, P. O. Peechi, Trichur - 680 653

The landing centres were visited regularly from September 1983 to July 1984, on an average of five days a month. Total weight (W) and total length (TL) of the species under study by sampling the catch of a boat chosen at random at the landing centres. The weight and length were corrected to 5 g and 0.1 cm respectively.

Length-weight relationship of the species were investigated by fitting the well known equation $W = aL^b$ where W is the weight, L the length, and a and b are constants. By regressing log W on log L, constants, a and b were estimated. Length-weight relationship was estimated from the data recorded from 449 specimens comprising 244 males and 205 females ranging 9 to 22 cm and 10 to 150 g in length and weight respectively.

Results and Discussion

The relationship of length and weight of *Tilapia mossambicus* is depicted in Fig. 1. A plot of the weight on length, and the regression lines are shown in this figure.

The length-weight relationship worked out to

$$W = 0.0290 L^{2.86}$$

The standard error of b (the index) was 0.0735 providing a 95% confidence interval for b as 2.78 to 2.92. The index thus falls short of 3, which is the value when cubic law

Table 1. Analysis of covariance of length and weight of *T. mossambicus*

	df	$\sum x^2$	$\sum xy$	$\sum y^2$	Reg. coeff.	Deviation from regression		
						df	SS	MS
Within males	243	1.681952	4.711423	14.065496	2.8012	242	0.868029	0.0035869
Females	204	0.580380	1.764607	5.912730	3.040	203	0.547559	0.0026973
						445	1.415588	0.012273
Pooled, W	447	2.262332	6.47603	19.978226	—	446	1.440290	0.0032293
		Difference between slopes			—	1	0.024702	0.024702
W + B	448	2.314599	6.598391	20.264681	—	447	1.454179	0.0032531
		Between adjusted means			—	1	0.013889	0.013889

Comparison of slopes $F = \frac{0.024701}{0.012273} = 2.01$ N S (d f = 1.445)

Comparison of deviations $F = \frac{0.013889}{0.0032293} = 4.30^*$ (d f = 1.446)

* Significant at 5% level; N S = not significant

holds good. Analysis of covariance (Snedecor & Cochran, 1968) did not show any significant difference in *b* for males and females (Table 1).

Difference in the elevation of regression line for males and females were found to be just significant. As sufficient number of specimen (sex-wise) were not available for a single year, the above test was done for the pooled data for 1983 and 1984. Therefore, the significance in the difference of elevations need further confirmation.

However, the separate regression lines are:

Males: $\log W = 1.48 + 2.80 \log L$

Females: $\log W = 1.75 + 3.04 \log L$

The fish growing harmoniously depict perfectly symmetrical body contour which obey the cubic law. Conversely this law is born out of the length-weight relationship of fish with well defined symmetrical shape.

In Plover Cove Reservoir, Hong Kong *Sarotherodon mossambicus* show a steady and progressive increase in abundance (Man & Hodgkiss, 1977) and the pooled regression of length-weight relationship for each sex of this species has been worked out to be: $W = 0.0307 L^{3.0527}$ for males and $W = 0.0303 L^{3.0564}$ for females (Hodgkiss & Man, 1977). The results of the present study show much lesser values for these parameters indicating the retarded growth

pattern of this species in this reservoir habitat. The largest specimen of *S. mossambicus* found in Plover Cove Reservoir was 32 cm in length and 1,100 g in weight (Hodgkiss & Man, 1977). More or less similar sizes of this species have been reported from Egypt (Koura & El Bolock, 1958), Singapore (Le Mare, 1950) and Africa (Fryer & Iles, 1972). The maximum size of *Tilapia* obtained from Idukki Reservoir was 28 cm long and weighed 340 g which again indicated the stunted growth of this species in this reservoir. According to Iles (1973) such stunting is an adaptive device to overcome the high mortality rate and dwarf populations have been reported from other natural aquatic bodies (Fryer & Iles, 1969; 1972).

The cubic law need not hold good when other factors operate to change the body line of the fish (Rounsefell & Everhart, 1953). These factors might be abiotic, biotic or both. Abiotic factors are temperature, dissolved oxygen, free carbon dioxide, pH etc. and biotic factors are food and production at primary and secondary trophic levels.

Hodgkiss & Man (1977) postulate there is no direct relationship between variations in body condition and changes in temperature. But a fall in temperature retards the efficiency of digestion in *S. mossambicus*

and 20°C is considered as the critical temperature for optimum digestion and absorption (Man & Hodgkiss, 1977). In Idukki Reservoir the ambient and water temperature never have fallen below 22.5°C during the study period and variations of these temperature in the range of 4.0 to 5.5°C are quite unlikely to affect the growth patterns of this species.

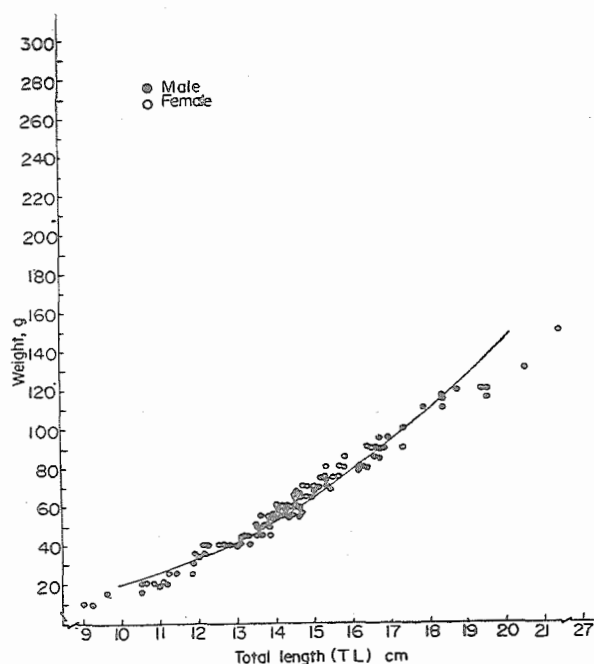


Fig. 1. Scatter diagram of the weight against length and the common regression line for *Tilapia mossambicus* females and males

The feeding intensity which depends chiefly upon the availability of food is closely allied with the body condition of the fish (Hodgkiss & Man, 1977). The stunted growth of *Tilapia* again shows the depleted nutrient level of this reservoir and the consequent reduction in its feeding intensity. The fish as a group has remarkable plasticity to cope up with the given physical and biological environment. *S. mossambicus* is endowed with this morphologic plasticity to a very great extent (Cridland, 1960).

The trophic dynamic studies of this water body clearly show this reservoir is in a trophic depression stage. The trophic levels of the reservoir have not reached a maturity sufficient to support and maintain a standing crop of even primary consumers, zooplankton (Khatri, 1985). The results of the

present study reveal *T. mossambicus* in this waterbody have stunted growth and are susceptible, especially during the egg stage, to the changes of abiotic and biotic factors of the environment.

The author is indebted to Zoological Survey of India for having given him the opportunity to work on this project. He records his thanks to Dr. K. C. Jayaramakrishnan, Ex-Joint Director, Zoological Survey of India, Calcutta and Dr. P. T. Cherian, Officer-in-Charge, Idukki Project Office, Cochin, for their keen interest in this study.

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