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Length-weight relationship and condition factor in different age groups of *Aspidoparia morar* (Ham.) inhabiting river Tawi and its tributaries

ROOPMA GANDOTRA, VIVEK, DALVINDER SINGH and RAVI SHANKER

Department of Zoology, University of Jammu, Jammu-180 006 (India).

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ABSTRACT

The present work, based on 600 specimens (ranging from 2.9 cm to 13 cm of Total Length and 1.03 gm to 19 gm of Body Weight), describes Length–Weight relationship and Condition factor in different age groups of *Aspidoparia morar* (Family:Cyprinidae) from river Tawi and its tributaries. The value of correlation coefficient indicated a high degree of correlation between length and weight in all the age groups. It was 0.988 in 0^+ age group, 0.956 in 1^+age group, 0.960 in 2^+age groups and 0.971 in 3^+age group. The parabolic equations obtained were $W=0.2249L^{1.436}$, $W=0.01148L^{2.86}$, $W=0.009997L^{2.941}$ and $W=0.007228L^{3.073}$ in 0^+, 1^+, 2^+ & 3^+ age groups respectively. The condition factor (K) was found to decrease with advancing age viz. 1.057, 0.882, 0.875 and 0.877 in 0^+, 1^+, 2^+ and 3^+ age groups respectively.

Key words: Length-Weight relationship, Condition factor.

INTRODUCTION

In fishery practice, the knowledge of length weight relationship for a given species is useful in many ways. The poundage of fish caught, a better measure of produce, can be easily computed, without having to actually weigh the fish produce, from data on number and sizes of fish. Fisheries may be regulated in response to the demand in the market for a fish not having less than a particular weight. Accordingly, length can be estimated for the weight of fish for which there is market value and mesh size of the gear determined in order that the fishes smaller than the particular size escape. Such fishes can be caught again when they have attained the desired size /weight. Further, the relationship is also helpful to determine the type of growth (Isometric or Allometric) and Condition factor, which determine the condition of a fish. A number of workers have already studied this aspect of fish biology viz. LeCren (1951); Javaid & Akram (1972); Johal & Tandon (1981); Bhagat & Sunder (1983); Gairola *et al.* (1990); Pandey & Sharma (1998); Kar and Barbhuiya (2004); Sunil (2000); Zafar *et al.* (2001, 03); Johal *et al.* (2005); Malviya *et al.* (2006); Deepak *et al.*(2007); Gandotra *et al.*(2008) and Joadder (2009).

MATERIAL AND METHODS

The fishes for the present study were collected monthly from different tributaries of river Tawi by using cast net and hand net for a period of one year (January,2008 to December,2009). In the laboratory, they were weighed after soaking water with the help of a blotting paper. The data obtained was put to statistical analysis. The statistical relationship between length and weight was established using the following formula:

$$W=aL^b,$$

where 'W' & 'L' are weight & length respectively and 'a' & 'b' are constants.

For the practical purpose this relationship is usually expressed in its logarithmic form as:

$$\text{Log } W = \text{Log } a + b \text{ Log } L \quad \text{(Le Cren, 1951)}$$

Condition factor (K)

Condition factor also known as Ponderal Index, an indicator of the well being of the fish, was calculated by the following formula:

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

where L = length in cm and W = weight in gm.

Age determination

Age was determined by counting the growth rings on the scales, which were taken from the third or forth row beneath the origin of dorsal fin just above the lateral line (Johal and Tandon, 1985; Rawat & Nautiyal, 1996; Gandotra, 2008).

RESULTS AND DISCUSSION

Age determination

The fishes were divided in different age groups on the basis of information derived from scales. It was observed that first growth ring/annulus formation started at 6.9 cm and was observed up to 9.3 cm. Therefore, fishes from 6.9 cm to 9.3 cm with 8.08 ±1.15 cm as mean were grouped as 1^+ year age class. The fishes from 9.4 cm to 10.5 cm with 9.9 ±0.5 cm as mean were designated as 2^+ year age class due to the presence of 2 annuli. Finally, the fishes from 10.6 cm to 13.0 cm with 11.03 ±0.40 cm as mean length were designated as 3^+ year class due to the presence of 3 annuli (Table 2)

Length-Weight relationship

As inferred from Table 2, a high degree of correlation was observed in all the cases viz. 0.988 (in 0^+age group), 0.956 (in 1^+age group), 0.960 (in 2^+age groups) and 0.971 (in 3^+age group). The

Table 1: The range of length for different age groups as inferred from the study of scales

S. No.	Age Groups	Length range (cm)		
		Minimum	Mean	Maximum
1.	0^+	2.9	5.36 ±1.97	6.8
2.	1^+	7.0	8.08 ±1.15	9.3
3.	2^+	9.4	9.90 ±0.5	10.4
4.	3^+	10.7	11.03 ±0.40	11.5

Table 2: Length- weight relationship and condition factor in different Age groups of *A. morar*

Age Class	Value of regression Coefficient (b)	Value of correlation coefficient (r)	Parabolic equation ($W= aL^b$)	Logarithmic equation (LogW = Log a+bLog X)	Condition factor (K)
0^+	1.43	0.988	$W =0.2249L^{1.43}$	Log W= -0.648+1.43LogL	1.057
1^+	2.86	0.956	$W=0.01148L^{2.86}$	Log W= -1.94+2.86LogL	0.882
2^+	2.94	0.960	$W=0.00999L^{2.94}$	Log W= -2.001+2.94LogL	0.875
3^+	3.07	0.971	$W=0.00722L^{3.07}$	Log W= -2.141+3.07LogL	0.877

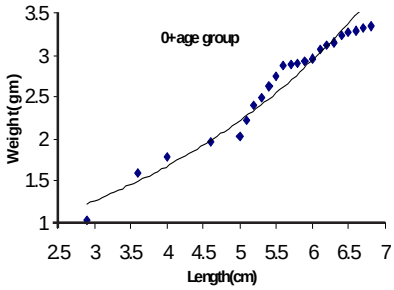

Fig. 1: Parabolic relationship between Length & weight

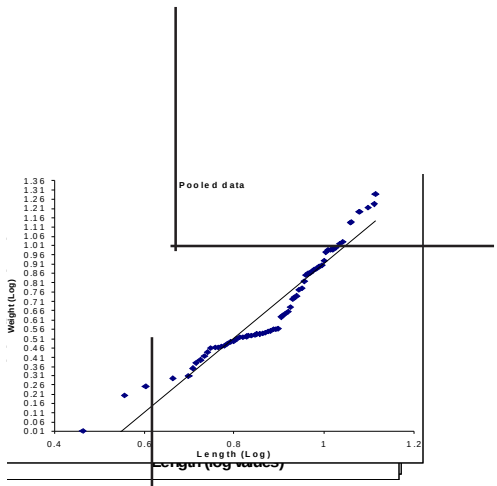

Fig. 2: Logarithmic relationship between Length & weight

values of regression coefficient (b) for different age groups were observed to be 1.43 (in 0^+age group), 2.86 (in 1^+age group), 2.94 (in 2^+age group) and 3.07 (in 3^+age group).

Allen (1938) suggested that for an ideal fish following 'cube law' the value of 'b' remains constant at '3'. But Hile (1936) and Martin (1949) illustrated that the value of 'b' usually ranges between 2.5 and 4.0 and in majority of the cases 'b' is not equal to 3. The value of b<3 represents that fish becomes less rotund as length increases and the value of b>3 represents that fish becomes more rotund as length increases. In both the cases, the dimensions of fish change with growth. If 'b' equals 3, growth may be Isometric meaning that the fish grows equally in all directions in the form of a cube. Rounsefell & Everhart (1953) and Ali *et al.* (2000) have stated that most of the fishes change their shape with respect to their body proportions during growth in their life. Therefore, such "Cube" relationship does not hold true.

It is evident from the present findings that although there are variations in the value of 'b' in different age groups, yet the value remains close to '3' in all the cases except 0^+ age group, thus, depicting the applicability of 'cube law' in the former cases. This proves that the present fish grows Allometrically in the earlier stages of life but grows Isometrically in later ones.

Isometric growth has been reported by a number of workers in different fish species viz. Nautiyal (1985), Dasgupta (1991), Tandon *et al.* (1993), Zafar *etal.* (2001) and Johal *et al.* (2005). Similarly, Allometric growth has been reported by Sunil (2000), Kar & Barbhuiya (2004), Sunder *et al.* (1979), Johal & Tandon (1981), Gupta *et al.* (2005), Malviya *et al.* (2007), Gandotra *et al.* (2008) and Joadder (2009). However, Gandotra *et al.* (2008) reported Allometric growth in 0^+ Age group but Isometric in advanced age groups in *Tor putitora* from Jhajjar stream, Jammu (J&K).

The present findings are in confirmation with those of Gandotra *et al.* (2008). Such a variation in the pattern of growth in different age groups (Allometric in earlier stages but Isometric in later stages) may be attributed to the fact that fishes tend to gain more length than weight in earlier stages –a strategy to overcome mortality during earlier stages of life (Cabello *et al.*, 2003).

Condition factor (K)

In the present case the values of 'K' for different age groups were found to be 1.057 (in 0^+ age group), 0.882 (in 1^+ age group), 0.875 (in 2^+ age group) and 0.877 (in 3^+ age group) as shown in Table 2. The nearness of 'K' value to 1.0 clearly indicates the suitability of the environment for fish growth. The present findings are in conformity with those of Kumar *et al.* (2006) and Mortuza & Rahman (2006). Further, there is decrease in 'K' value with the advancing age showing that there is less weight gain in comparison to the cube of length. The declining value of 'K' with increasing length has also been reported by MacGregor (1959), Javaid & Akram (1972), Johal & Tandon (1981) and Gandotra *et al.* (2008).

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