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Weight-length and Condition Factor Relationship of Thaila, *Catla catla* from Rawal Dam Islamabad, Pakistan

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Abstract: Twenty-five fresh water "Thaila", *Catla catla* of various sizes were sampled from Korang River Islamabad, to study the parameters of weight-length and condition factor. Log transformed regression were used to test the allometric growth. It was observed that growth in weight is almost proportional to the cube of its length. The value of slope b = 3.05 coincides with the slope of that of an ideal fish. Condition factor remains fairly constant with increasing length or weight. The predictive equation can be used to estimate parameters investigated with a fair amount of accuracy with in the size range studies.

Key words: Thaila, *Catla catla,* weight-length relationship, condition factor

Introduction

Thaila fish, *Catla catla* are among the most important game fish of South Asian Subcontinent. It is fast growing fish of fresh water. It is a herbivorous fish (Atkinson, 1989).

The relationship between weight and length for fish in a given population can be analyzed by measuring weight and length of the same fish throughout their life or of a sample of fish taken at a particular time (Wootton, 1998).

Weight-length relationship has been commonly used for two different purposes. Firstly, to describe the mathematical model between weight and length so as to derive one from the other (Wootton, 1990). Since length can be easily and accurately measured, the data on length are available in various studies. It is highly valuable in cases where weight can be determined from length already known and vice versa. Secondly, weight length relationship is used to compute the departure from the expected weight for length of the individual fish or a group of fishes as indications of fatness or degree of well being of fish, this relationship is called "Condition factor"(Wootton, 1990). This parameter helps to assess the experimental improvements in an environment for an existing fish and for the purpose of new stocking.

The study of weight-length has its applied value in fish biology. The significance of the study in fishes is to assess the growth of fish in different environments (Mirza *et al*., 1988).

In the application of the length-weight relationships to define a population, fish length is measured and predicted average weight is assigned to all fish in a given length group. This is often faster and more convenient than weighing fish individually, especially when large number of live fish must be sampled. Weight-length relationship is used in commercial scales and population assessments (Steeby *et al*., 1991; Ali *et al*., 2000).

Length weight relationship allows prediction of weight from length in yield assessments (Pauly, 1993) and can also be indicative of the "condition factor" i.e., the general well going of fish population.

The growth in animals is considered in terms of increase in volume. The volume is represented by weight, which is related to the cube of linear dimension. It is therefore, true that a relationship exists between length (linear dimension) and weight in animals. The relationship between weight and length for fish of a given population can be analyzed either by measuring weight and length of the same fish throughout their life or of a sample of fish taken at a particular time (Wooton, 1990).

The relationship between weight (W) and length (L) typically takes the algometric formula W= a Lb, or in the linear form log W = log a+log L, where a and b are constants estimated by regression analysis. If fish retains the same shape it grows isometrically and length exponent "b" has the value b=3.0. a value significantly larger or smaller than b=3.0 shows algometric growth (Bagenal and Tesch, 1978). A value less than b=3.0 shows that fish becomes heavier for its length as it grows.

The present study is a sequence of this chain and is dealing with weight-length and condition factor relationship of *Catla catla.* It is for the first time that this species is being studied from this point of view in Pakistan.

Materials and Methods

Twenty five fish sample of *Catla catla,* were sampled from Rawal Dam, Islamabad during September 2002 to January 2003. Fishes were collected with the help of cast net of circumference 2 to 2.5 meter and have mesh size 2.5 cm. They were transported alive to the laboratory in fiberglass hauler. Fishes were then killed with sharp blow on the head blotted dry and weighed on an electrical digital balance (MP-3000 Chyo, Japan) to the nearest 0.01 gm. All measurements were made from the tip of the masilla to the longest caudal fin ray on Peripex measuring tray having a millimeter ruler. Condition factor "K" was calculated by the formula suggested by Hile (1936).

$$K = \frac{W \times 100}{L3}$$

Where K= condition factor; W= body weight and L= total length of the fish.

Results

The relationship between wet body weight (W) and total length (L) is exponential having the general form Y = a xb or W = a Lb. When the data is transformed into logarithmic form (Fig.1), a linear relationship is obtained having the general form = Log10 W = Log10 + b log10 L.

Table 1: The Regression Parameters of Body Weight (W) on Total Length (TL) for Thaila, *Catla Catla*

Regression equation, Correlation co-efficient Proportion of variance accounted for by the regression r2S.E.(b)T. Value when b=3Y=-3.0202+3.7534x250.98270.96550.031.6N.S*

Condition factor "K" when analyzed against total length and body weight, it was found to remain constant with increasing length or weight.

* Non significant

Table 2: Weight-Length relationship for different fish species from different localities

Fish species	Slope (b)	References
Cirrhina mrigala	4.56	Javaid and Akram (1972)
Labeo rohita	3.06	Salam and Janjua (1991)
Oreochromis nilotica	2.99	Naeem *et al.* (1992)
Tor putitora	3.05	Zafar *et al.,* (2001)
Channa punctata	2.9	Ali *et al.*, (2000)
Rita rita	2.80	Lal and Dwivedr (1965)
Labeo rohita	3.01	Jhingran, (1952)
Catla catla	3.02	present study

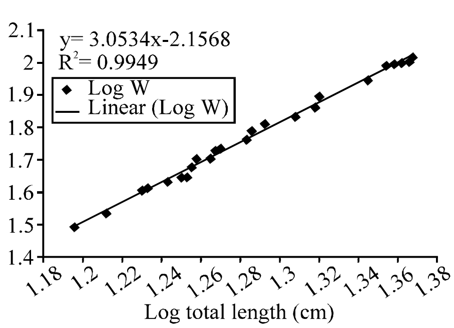

Fig. 1: Relationship between Log total length (cm) and Log wet body weight

The regression coefficients "b" has a value almost equal to b=3.0 (t-test).

Discussion

In fish, the weight is considered to be function of length (Weatherley and Gill, 1987). According to Wooton (1990), if the fish retains the same shape and its specific gravity remains unchanged during lifetime, it is growing isometrically and the value of exponent "b" would be exactly 3.0. A value significantly larger or smaller than 3.0 indicates allometric growth. A value less than 3.0 shows that the fish becomes lighter (negative allometric) or greater than 3.0 indicates that the fish becomes heavier (positive allometric) for a particular length as it increases in size (Wootton, 1998).

The specific gravity of the flesh of the fish is known to undergo changes but it is indicated that the density of the fish might be maintained in the surrounding water by means of swim bladder. The change in weight, therefore, is due to changes in form and not in specific gravity. Most fishes do not confirm the cube law because they change their shape with growth (Ali *et al.*, 2000). The cube law may be held in some cases (Salam and Davies, 1992). The exponent "b" may have value significantly lower or higher than 3.0. The value of "b" may vary with feeding, state of maturity, sex and further more between different populations of a species indicating taxonomic differences in small populations.

From Table 1 and Fig. 1 it is clear that the weight of *Catla catla* increases as the cube of the length. The value of b= 3.02 which is almost same from b=3 (The slope for an ideal fish) and the fish is growing isometrically in relation to length. This value is close to the values reported for numerous fish species (Javaid and Akram, 1972).

Conditions factor (K) appears to remain constant with increasing length or weight in the present study. The condition factor may vary when average weight of the fish is not increasing in direct proportion to the cube of its length (Wooten, 1990). Therefore when b = 3, K would remain constant. If however, the weight increases more rapidly than the cube of length, K would increase with increase in length. When the weight increases less than the cube of length, K would tend to decrease with the growth of the fish (Javaid and Akram, 1972).

The fish "Thaila" *Catla catla* nearly resembles the ideal fish because the value of slope (b) of weight-length relationship is not significantly different from b=3 (b for an ideal fish) therefore K remains constant.

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