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WEIGHT-LENGTH AND CONDITION FACTOR RELATIONSHIP OF WILD *CHANNA PUNCTATA* FROM MULTAN

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Abstract: The weight-length and condition factor parameters of wild fresh water *Channa punctata* from a natural pond in Multan have been presented. Log transformed regressions were used to test the allometric growth. It was observed that growth in weight was allometric of the form: $W = -1.86\ L^{2.88}$. The value of slope $b = 2.88$, is significantly lower than $b = 3$, the weight grows less rapidly as compared to the cube of length. It was concluded that body proportions changed as fish grew in size. Condition - factor showed no significant correlation with increasing length and weight

Key words: Length, weight, condition factor, *Channa punctata*, fish.

INTRODUCTION

The weight–length relationship has mainly been used for two different purposes. Firstly, to describe mathematical relationship between length and weight so that one could be converted into other, secondly to compute the departure from the expected weight for length of individual fish or a group of fish as indications of fatness or degree of well being of fish.

Condition factor or ponderal index is one of the most important parameter, which throws light on the physiological state of the fish in addition to indication of the onset of the sexual maturity. This parameter has been extensively used by Bashirullah and Kadir (1970) Javaid and Akram (1972), Mann (1979), Salam and Janjua (1991), Javaid *et al.* (1992), Salam and Mahmood (1993), Abbas (2000) and reviewed by Weattherly (1972), Ricker (1975), Weatherly and Gill (1987) and Wootton (1990, 1998).

The present study deals with the weight-length and condition factor of a wild, commercially important fish, *Channa punctata*.

MATERIALS AND METHODS

Thirty-seven wild *Channa punctata* from a natural pond in Basti Ratan Wali, Multan were selected for this study during February 2000 to May 2000. The fishes were selected at random for present study. The fishes were killed, blotted dry, weighed to nearest 0.01g using an electronic digital top-pan balance (Chyo, Japan) and their length

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measured to nearest 0.1cm on fish measuring board. Condition factor (K) for each fish was calculated using the formula proposed by Weatherely and Gill (1987) and Wootton (1990, 1998). Weight-length relationship has been calculated by the allometric growth formula used by Huxley (1932), where W (g) is the body weight, a and b are the constants and L (cm) is the length of the fish. Logarithmically transformed, the relationship is represented as:

$$\log W = \log a + b \log L$$

Meek (1903) Le Cren (1951), Kohler (1959), Javaid and Akram (1972), Willis (1989), Atkinson (1989), Salam and Janjua (1991) and Abbas (2000) have applied this technique on a number of species.

Using computer packages Excel and Minitab carried out statistical analysis including regression analysis and calculation of correlation coefficient. Calculation of "t" test and comparison of slopes were done following Zar (1996).

RESULTS

The relationship between wet weight and total length (Fig 1) is exponential having the general form:

$$Y = a X^b$$

or

$$W = a L^b$$

The log-log transformed data when plotted against log total length and log wet weight, a linear relationship is obtained having the general form:

$$\log W = \log a + b \log L$$

Table I: The regression parameters of log wet weight (W) on log total length (TL) and of condition factor (K) on total length (L) and wet weight (W).

Regression equation	n	r	r2	S.E(b)	t-value when b=3
Log W = log -1.86+2.88 log L	37	0.9544***	0.911	0.1535	$0.781^{n.s.}$
K = 1.010+0.0010 W	37	$0.2437^{n.s}$	0.0594	0.0007	P<0.001
K = 0.9578+0.0061 TL	37	$0.221^{n.s}$	0.0493	0.0045	P<0.001

n.s. = Not significant; *** = P<0.001 (student's "t" test)

Table II: Weight-length parameters and condition of various fish species.

Species	a	b	K	Source
Catla catla	-1.45	2.66	1.16-1.41	Javaid and Akram (1972)
Labeo rohita	-2.04	3.06	0.83-1.32	Salam and Janjua (1991)
Cirrhinus mrigala	-2.03	3.02	–	Salam and Khaliq (1992)
Channa punctata	-1.88	2.9	0.84-1.17	Present study

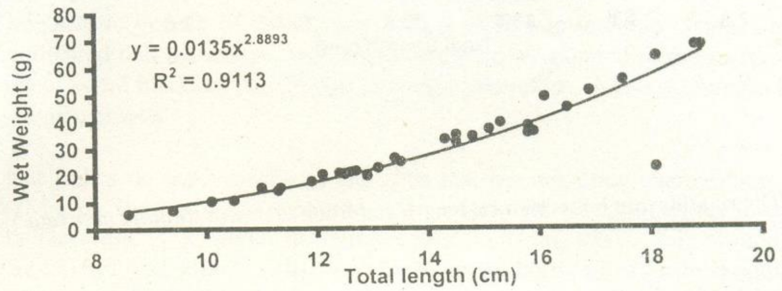

Fig. 1: The relationship between total length and wet weight of *Channa punctata*.

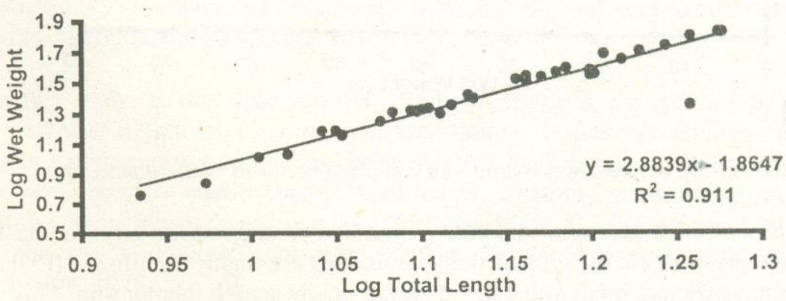

Fig. 2: The relationship between log total length and log wet weight of *Channa punctata*.

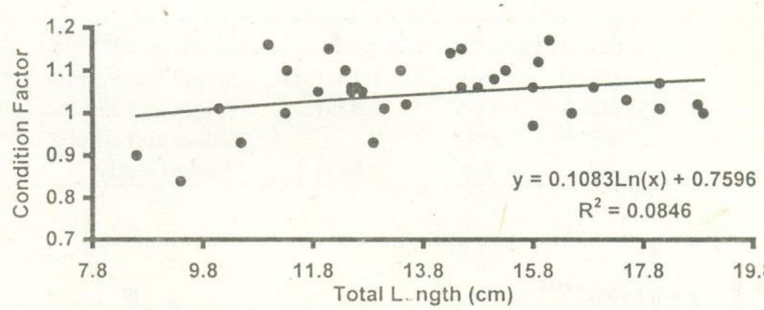

Fig. 3: The relationship between total length condition factor of *Channa punctata.*

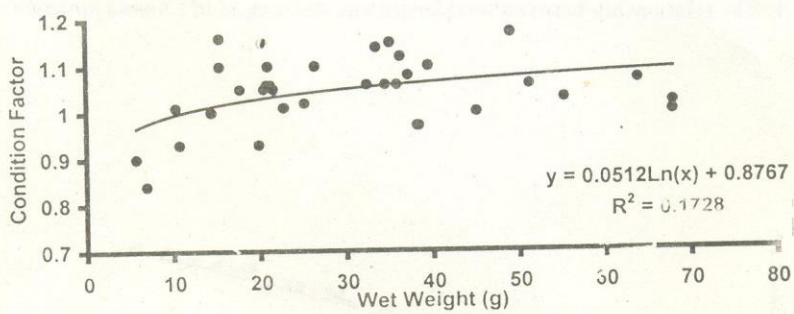

Fig. 4: The relationship between wet weight and condition factor of *Channa punctata.*

The values of these constants and other regression parameters are given in the Table I and II. The regression coefficients of this relationship are highly significant ($P<0.001$). The regression coefficient b has value b = 2.88 for weight-length relationship. This value are less than b =3 (Fig 2). Condition factor K when analyzed against total length and wet weight, it was observed that condition factor remains constant with increasing length and wet weight of *Channa punctata* (Figs. 3-4).

DISCUSSION

In fish, weight is considered to be a function of length. According to Wootton (1990, 1998) if the fish retains the same shape and its specific gravity remain unchanged during lifetime, it is growing isometrically and the value of exponent 'b' would be exactly 3.0 (Ricker, 1975). A value less than 3.0 shows that the fish become lighter for length as it grows an exponent greater than 3.0 indicates that the fish becomes heavier for its length as it increase in size.

The specific gravity of the flesh of fish is known to undergo changes but Le Cren (1951) 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 conform to the cube law because they change their shape with growth (Martin, 1949) and the exponent 'b' may have values significantly lower or higher than 3.0. The value of 'b' may vary with feeding (Le Cren, 1951), state of maturity (Frost, 1945), sex (Hile and Jobes, 1940) and furthermore between different populations of a species (Hile, 1936; Jhingran, 1968) indicating taxonomic differences in small populations.

In the present study, *Channa punctata* have the values b = 2.88. This value is significantly less than b = 3 showing that weight of this fish increase less than cube of its length (Table I).

Apart from present study, many workers have reported growth pattern in other fish species (Table 2) indicating that cube law may be held in some cases (Salam and Jnjua, 1991; Khaliq, 1991; Salam and Mahmood, 1993) and may not held in other cases (Javaid and Akram, 1972; Salam and Sharif, 1997).

In this study, it was observed that condition factor is not affected by increasing length and wet weight of *Channa punctata*. Similar results of condition factor with increasing length and wet weight has been reported by Salam and Khaliq (1992). When weight increases more rapidly than cube of length, condition factor would increase with increasing length. Which means that body form change as the fish becomes larger. When weight increase less than the cube of length than 'K' would decrease with growth of the fish (Wootton, 1998).

Condition factor may be influenced by a number of factors (Le Cren, 1951). The factors which affect the value of 'b' in weight-length relationship i.e., age, sex, maturity etc. also influence the value of 'K' except in those which follow the cube law. The factors like food, environment and parasitism influence K directly through growth rate. Seasonal fluctuations in feeding activity. gonadal development and growth can also bring changes in value of 'K'.

Keeping in view the multiple factors affecting the condition factor. its interpretation is a complicated matter and should be dealt with due care to avoid confusions (Le Cren. 1951).

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