

Length-weight relationship and condition factor of *Schizothorax niger* (Heckel, 1838) Misra from Dal lake, Kashmir

Shaheena Shafi, A. R. Yousuf

Centre of Research for Development: (190006), University of Kashmir, India

Abstract- The length-weight relationship of *Schizothorax niger* from Dal lake was calculated, which can be expressed by the equation, $\text{Log } W = -5.13 + 3.07 \text{ Log } L$, for combined ones. The coefficient of correlation indicated a high degree of positive relationship between the two parameters. The exponential value (b) of the relationship in this fish species followed the cube law (3.07) which indicated the isometric growth pattern. K values of different length-groups exhibited variations which ranged from 0.94 to 1.14 during different months, with an average value of 0.7 which indicated that fish is under physiological stress in this water body.

Index Terms- *schizothorax niger*, dal lake, length-weight relationship, co-efficient of correlation, condition factor

I. INTRODUCTION

Schizothoracines, the indigenous cyprinids (also called snow trouts), locally known as 'Alegad'. They inhabit both lentic as well as lotic water bodies of Kashmir. The fish belongs to the family Cyprinidae and order Cypriniformes. Schizothoracines are highly valued fish, preferred to most other fish species. They feed on detritus, attached plant (including algal) coating of stones and rocks, and the associated invertebrate fauna. The fish population in the Dal lake has been declined to large extent due to encroachment, urbanization, agricultural activities, eutrophication and overfishing. Most fish species inhabiting the Himalayan region are small in size. Their distribution depends on environmental conditions such as velocity of water current, nature of substratum, and the availability of food. *S. niger* being a truly lacustrine fish does not show any spawning migration.

A number of research papers have been published on the length-weight relationship and condition factor of fishes (Torres 1991, Yousuf *et al.* 1992, King 1996, Firdous 1995, Raizada *et al.* 2005, Rao and Sreeramullu 2006, Singh and Gupta 2008, Devi *et al.* 2008.)

II. MATERIALS AND METHODS

The length frequency data of male, female and combined sex of fresh samples of *Schizothorax niger* were collected from the four different basins of Dal lake, viz; Hazratbal, Nishat, Gagribal and Nageen. These specimens were caught with the help of cast net weighing 9 to 10 kg with total number of iron sinkers 244 and with a mesh size of 13mm to 15mm from knot to knot. The total length of the fish was measured to its nearest 0.1 mm. and total body weight was measured to its nearest 0.01g. The determination

of length-weight relationship was made by applying the log transformation equation $w = aL^b$ to the data (Hile, 1936) Where, W = Total weight of the fish in grams. L = Total length of the fish in millimeters. a = Initial growth constant and. b = Regression co-efficient.

To assess the stoutness of the fish, ponderal index or condition factor was evaluated by Fultons formula i.e. by the following formula,

$$\text{Ponderal index } K = \frac{W \times 10^5}{(L)^3}$$

Where,

W = Total weight of fish in grams.

L = Total length in millimeters.

10^5 = It has been introduced to bring the value of ponderal index near the unity.

III. RESULTS

As far as the length weight relationship of this fish was concerned, it was based on data of 151 specimens with a size range of 121mm to 359mm and weight range of 35g to 628g respectively. The regression equation is expressed as:

Male: $\text{Log } w = -5.14 + 3.07 \text{ Log } L$ ($r = 0.988$)

Female: $\text{Log } w = -4.277 + 2.77 \text{ Log } L$ ($r = 0.988$)

Combined: $\text{Log } w = -5.13 + 3.07 \text{ Log } L$ ($r = 0.900$)

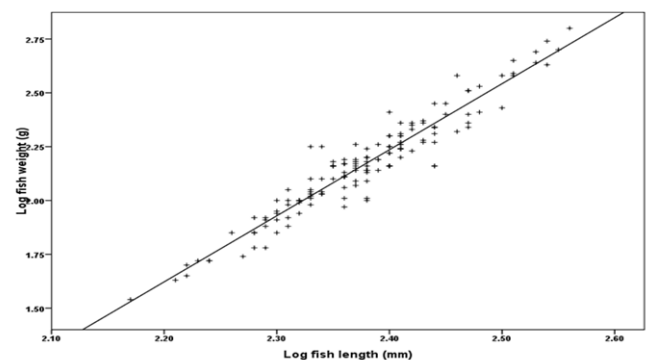


Fig. 1: Length Weight relationship of *S. niger*

IV. PONDERAL INDEX

The value of condition factor (K) ranged from a minimum of 0.996 in November to the maximum of 1.24 in March (Table 1) whileas, it observed its minimum value during November (0.99). The condition factor recorded an irregular trend throughout the

year. The k-factor varied in different length groups, among various length groups the smallest length group I (121-151) exhibited a K-value of 0.95 whereas, the highest length group

VIII (330-359) was found to be in better condition and recorded a K-value of 1.14 respectively (Table 2).

Table 1: Monthly fluctuations in various indices in *S. niger*

	Months											
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Comb.	1.06	1.068	1.24	1.118	1.082	1.062	1.16	1.04	1.153	1.162	0.996	1.10

Table 2: Fluctuation in condition factor of various length groups of *S. niger*

	I	II	III	IV	V	VI	VII	VIII
Length Group	121-151	152-180	181-210	211-240	241-269	270-299	300-329	330-359
Condition factor	0.95	1.0	1.06	1.12	1.0	1.03	1.10	1.14

In case of males 'b' was 3.07, while in females it was 2.77 and in case of pooled data its value was 3.07. Thus on the basis of above equations it can be inferred that cube law is not followed in any case. As males exhibited slightly more growth than females, these acquired the value of exponent 'b' less than 3, therefore it can be concluded that females acquired lesser weight than cube of its length.

V. DISCUSSION

The length-weight relationship of fish have significant importance in studying the growth, gonadal development and general well-being of fish population (LeCren, 1951; Pauly, 1993 and Nagesh *et al.* 2004) and for comparing life history of fish from different localities (Petrakis and Stergion, 1995)

Ideally, the value of 'b' usually fluctuates between 2 and 4 (Tesch 1971) and in majority of cases it is not found equal to 3 (Hile, 1936). Allen (1938) worked out that the cube law is applicable only for those species, which maintain their form and specific gravity throughout their life. But the shape and the form of fish may change with time, so the length-weight relationship of most of the fish species may deviate the cube law. Further, the cube law does not hold good throughout the life period and the weight gain in a fish may not be always cube of its length gain (Rounsefell and Everhart 1953, Lagler, 1956. Hile (1936) and Martin (1949) opined that the value of 'b' may range between 2.5 and 4.0. Antony Raja (1967) recorded the value of 'b' within a range of 2.0 to 5.4. LeCren (1951) pointed out that the variation in 'b' value is due to environmental factors, season, food availability, sex, life stage and other physiological factors.

The males and females revealed significant differences in the value of 'b' in this fish species. In *S. niger* males recorded higher exponential value than females. Similar to our observations, Dashmona (1990) and Thapliyal (2002) have also reported significant differences in length-weight between different seasons and sexes of fishes studied by them. High 'b' values in case of males were also reported by Sunder *et al.* (1984), Yousuf *et al.* (2001). Hatikakota and Biswas (2004) and Rao and

Sreeramullu (2006) reported higher values of 'b' in females, while higher values of 'b' in females were also observed by Sunder (1985), Kulshrestha *et al.* (1993) and Firdous (1997) .

The present work revealed that the studied species did not followed the cube law completely. Similar departure from cube law has been observed by Subla and Sunder (1981), Sunder *et al.* (1984), Torres (1991), Yousuf *et al.* (1992), King (1996), Firdous (1995), Raizada *et al.* (2005) Rao and Sreeramullu (2006), Singh and Gupta (2008), Devi *et al.* (2008) and Mandal *et al.* (2008). The present data make it quite clear that the relationship was influenced by environmental conditions like food and physiological parameters (Sunder *et al.*, 1984; and Sandhya and Shameem, 2003).

According to LeCren (1951) and George *et al.* (1985) the relative condition factor K_n is an indicator of general well-being of the fish. K_n greater than one (1) is indicative of the general well being of fish, whereas its value less than one (1) indicates that fish is not in a good condition. Carlander *et al.* (1952) is of opinion that condition factor may vary with increasing length when average weight of fish does not increase in direct proportion to cube of its length. However, Salam *et al.* (2005) pointed out that 'K' remained constant with increase in length and weight of fish.

Yousuf and Pandit (1989) suggested that condition factor of *S. niger* varied seasonally in close association with gonadal development and feeding intensity. During the present study, the fish was found in better condition in March (1.24) when gastro-somatic index was 7.40 and another peak in 'Kn' was noticed in October. Mahapatra and Datta (2004) attributed low mean K_n values in *Aristichthys nobilis* to spawning strain, spent condition and low feeding rate. Likewise, Hatikakoty and Biswas (2004) suggested increase in the weight of body due to weight of mature gonads.

The gonad weight and feeding intensity as influencing factors were emphasised by previous workers (LeCren, 1951 ; Babu and Nair, 1983, Yousuf and Pandit ; 1989, Narejo *et al.* ; 2002). Several other workers stressed that Pollution is responsible for

variations in Kn values of fish (Bakhom, 1999 and Devi *et al.*, 2008). During the present study also the monthly fluctuations in condition factor in studied species seemed to be influenced by gonadal development, availability of food and gastral activity and environmental factors. Chatterji (1979), have also related the changes in condition factor with age, feeding intensity and gonadal development.

VI. CONCLUSION

In conclusion, it can be said that feeding intensity, physiological factors like gonadal maturation and spawning along with environmental factors play an important role in the variations in condition factor of *S.niger*.

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AUTHORS

First Author – Shaheena Shafi, Department Centre of Research for Development, University of Kashmir, Pin-190006, India, Email: Shaheenashafi79@rediffmail.com

Second Author – A.R.Yousuf, Department Centre of Research for Development, University of Kashmir, Pin-190006, India