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LENGTH – WEIGHT RELATIONSHIP IN BLACK-SPOT INFECTED *SCHIZOTHORAX RICHARDSONII* (GRAY) FROM RIVER ALAKNANDA (GARHWAL: WEST HIMALAYA).

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ABSTRACT

Investigations were carried out to determine the length-weight relationship of *Schizothorax richardsonii* (Gray) infected with blackspot disease. Samples of snow trout were collected randomly from the Alaknanda at Srinagar Garhwal from the fisherman for a period of one year. Samples were segregated on the basis of sex to determine the length-weight relationship. In both sexes of *S. richardsonii* the relationship did not follow the cube law and exhibited allometric growth, attributed to absolute (100%) incidence of the disease.

Key words : *length-weight relationship, S. richardsonii*

INTRODUCTION

Diseases are known to influence fisheries of economically important fish fauna in numerous ways. The black spot disease is common in the snow trouts of this region (Lal 1980 a, Misra and Lal 1980, Singh *et. al.*, 1981). It is caused by the metacercariae larvae of the nematode *Diplostomum minimum*. The spot develops around each larva. The purpose of the study was to determine the length-weight relationship of the diseased fish *S. richardsonii* and nature of growth (isometric or allometric).

The variations in the length-weight relationship provide a measure of condition of the diseased fish and the suitability of its environment. Most of workers were content only to describe the estimated relationship without proceeding further to list whether the departures from cubic relationships that they had noted are statistically significant or not. The important contributions on the length-weight relationship were those of Hile (1936) and David (1953). These studies were extended to other species by Lal (1980 b,c) and Basheer *et. al.*, (1993).

MATERIALS AND METHODS

Samples of snow trout were collected randomly from the Alaknanda at Srinagar Garhwal

from the fisherman for a period of one year during 2001-2002. The fish sampled were sorted out and grouped with respect to their sex. All fishes (male and female) were found to be infected by black spot disease, resulting in 100% incidence, the magnitude of which differed in fish of different size. In order to determine the length-weight relationship the total length (in cm) and weight (in gm) were measured in fresh condition and the data was transformed into logarithmic value. The length-weight relationship was estimated by the method of least squares using the parabolic equation as suggested by LeCren (1951); $W = aL^n$, where, W = body weight in grams, L = total length in cm, a = constant and n = exponent. This relationship was fitted to straight line through the logarithmic transformation Log W = Log a + b Log L. The constant 'a' is the intercept and 'b' the regression coefficient. The equations were obtained by performing regression analysis in a computer. The analysis was performed using MS-EXCEL (version 7.0). The significance level of the linearity of regression was tested using single ANOVA. Straight line and parabolic relationship were also expressed with the help of charts obtained by same software.

In order to determine if the population was exhibiting allometric or isometric growth, student's 't' test was used. If the exponent 'b' of the length-weight relationship $W= aL^n$ significantly deviates from an assumed value of 3.0 it represents isometric growth and if it did not differ significantly then it was considered to show allometric growth.

OBSERVATIONS

Length-weight Relationship

The correlation coefficient showed that the total length was highly correlated to the total weight of the fish in male (0.96196) and female (0.95879) of *S. richardsonii*. The regression equations for different length-weight relationship were as follows.

Male Y = 0.408815+1.336236X; Female Y = -0.56974+2.006157X

When the calculated log-weights for different length groups were plotted against their log-lengths straight lines were obtained (Figs.1 - 4). The weight tended to increase in parabolic fashion especially in male *S. richardsonii*. The test of linearity by analysis of variance showed that total length was highly significant for increase in total weight of the fish. The student's't' test indicated that the growth was allometric in *S. richardsonii* (Table 1).

According to Nautiyal (1985) the exponent 'n' usually varied between 2.3 and 3.1 in Garhwal Himalayan Mahseer. In the pooled data the value of 2.9 indicated that the length weight relationship of *T. putitora* closely follows the cube law and thus may be considered as an ideal fish. Basheer *et. al.,* (1993) observed that the value of regression coefficient (b=2.9419) reflects the facts that it follows the cube law. The departure from the cube law may be due to several factors including certain environmental factors. According to Dhasmana and Lal (1993) the value of 'n' differs with sex, season and year and locality, the range being 2.5 to 3.9 in hill-stream fish *Garra gotyla gotyla*. The length-weight relationship was found parabolic and has no significant difference between the sexes. These observations were in close conformity with Lal (1980 b, c)and Krishnamoorti (1971). In the present studies 'n' was found to vary with sex in *S. richardsonii* male having very low value (1.3) and female a moderate value (2.0). In both sexes of *S. richardsonii* the length-weight relation does not follow the cube law and exhibit allometric growth since its growth coefficient were significantly different from 3.0 ($P<0.05$). Warkentine and Rachlin (1986) observed allometric growth in *P. oblongus* as its growth coefficient (2.8386) was statistically shown to be significantly different from 3.0 ($P>0.05$). In the silver hake (*Merluccius bilinearis mitchill*) n=3.17 was not significantly different from 3.0 ($P>0.05$) and the fish were growing isometrically (Rachlin and Warkentine 1986). According to Rounseefell and Everhart (1985) as the specific gravity or outline of the fish are subject to changes, the cube law does not necessarily hold good always. There are reports of significant deviation from the cube law in case of different fishes (Sultan 1981, Sultan and Khan 1981 a, b, Hoda 1987, Sivakami 1987).

Nikolsky (1963) described that parasitic and other disease of the fishes effect the productivity of the stock far more in an indirect way, through changes in the growth rate and reproductive capacity of the individuals. The form of influence probably has far greater significance than the direct mortality of fishes due to diseases. One or a combination of harmful effects such as reduced growth emaciation or smaller average length in heavily parasitized fish when compared with uninfected fish from the same lake was reported by a few workers. In case of *S. richardsonii* also the black spot disease appeared to affect the length-weight relationship as 'n' was considerably low. Mishra (1982) when compared the 'n' value for undiseased fish 3.1869 (male), 3.0666 (female) and diseased fish 2.2115 (male) and 2.6847 (female) in *S. richardsonii* he found that the value or 'n' decreased in diseased fishes as compared to undiseased fishes. Statistically significant weight loss in 4-inch small mouth bass experimentally infected with strigiid cercarie of *Uvulifer amploplitis* was observed by

Hunter and Hunter (1938). Fish with heavy metacercariae infections were 10% shorter than those with lighter infections reported by Hugghins (1959). Fish with heavy infections of metacercariae had noticeable less visceral fat and were often thin (Bengham 1938). It may be concluded that disease affects the weight attainment pattern with respect to length resulting in a decreased weight gain (not exceeding 2.0) despite increase in length. Earlier studies indicate that length-weight relationship follows cube law in undiseased fish (Mishra loc. cit.)

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