Research Article
ISSN 2277-3657
Available online at www.ijpras.com
Volume 4, Issue 4 (2015):77-81
International Journal of Pharmaceutical Research & Allied Sciences

A Study on Length-Weight Relationship and Relative Condition Factor of *Osteobrama vigorsii* (sykes, 1839) from Nira River, Bhor Maharashtra (India)

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Subject: Biology

Abstract

Osteobrama vigorsii an endemic species from Western Ghats of Maharashtra is been widely consumed by the local population in fresh as well as dried form. It is economically important and it is common in Nira River. In the present study the logarithmic regression equation obtained for *Osteobrama vigorsii (Sykes, 1939)* Male is log W = -0.9672 + 3.298 log l and for female it is log W= -1.0245 + 2.6802 log l. The regression coefficient obtained in case for Male was R=0.9466 and for the Female it was found out to be R= 0.9312. The result obtained shows a good relation between length and weight. The cubic law (n= 2.680) in female for isometric growth. While in case of male there is slight deviation from the cubic law where (n=3.298). This deviation may be because of early sexual maturity or due to intense feeding. The condition factor Kn obtained for Male is Kn= 0.0674 and for Female it is kn =0.0293. The result clearly indicates that *Osteobrama vigorsii* from Nira river shows well-being in natural habitat and this may be due to less industrialization in the area and less pollutant being added to the river since human settlement around the river area is less.

Keywords: *Osteobrama vigorsii, regression coefficient, cubic law, condition factor isometric growth*

Introduction

Osteobrama vigorsii an endemic species from Western Ghats of Maharashtra, (India). The fish belongs to the family Cyprinidae and order Cypriniformes The present study was undertaken to study the reproductive biology of the fish, since no work has been done on it. Hence the reproductive behavior of the fish could be studied in its natural habitat. Many works have been done on the L-W relationship of commercial freshwater fishes from Different water bodies in India (14,8).The length weight relationship in fishes is being carried out to understand the relation between length n weight of a species which forms the basis to measure the growth rate (2). The study helps to know the variations from the expected weight, for the known length groups, this in turn reflects its fatness, general well-being, gonad development and suitability of environment of the fish (10). The length- weight relationship has many practical application in fishery science especially for commercial fishery so as to understand and calculate the proper management of the population of fish species (1). The actual relationship between the variables, length and weight may depart from this, either due to environmental conditions or condition of fish (10).

The physical condition of the fish i.e. the relative fatness of fish is considered generally when we study the condition of fish. This condition or the degree of healthy habitat is expressed by "coefficient of condition," denoted by 'K' (also known as Fulton's condition factor, or length-weight factor, or Ponderal Index). There are many factors responsible for the variation in this degree it may be due to sexual maturity, availability of food, age and even the sex of the individual fish. To reduce the effect on the 'K' value, (10) suggested the calculation of relative condition factor 'Kn' which does so only if the exponent value is equal to 3. K value helps us in understanding the degree of variation, while Kn helps to understand the individual deviation of a fish from the expected weight which is obtained from weight derived from the length-weight relationship. Kn is useful index for monitoring of feeding intensity, age and growth rate in fish. (9).

Material and Methods: Every month from the period ranging from March 2012 to August 2014 were collected from Nira River. The specimens were wiped with the help of blotting paper after which the measurements were done. Lengths were measured from the tip of the snout upto the caudal fin to the nearest mm. The collected sample was grouped in various class intervals. The weight of the fish was calculated using electronic balance and was calculated to the nearest 0.1gm.

For calculating the length-weight relationship method suggested by (10) was followed. The length – weight relationship can be expressed as:

$W = a L^b$

Where W and L are weight (g) and length (mm) of the fish respectively and 'a' and 'b' are two constants (initial growth index and regression constants respectively). The values of constant **a** and **b** are determined empirically from data, as the coefficient of condition (17).

Logarithmically the above equation becomes straight line of the formula:

$\text{Log } W = \log a + b \log L$,

The constants 'a' represents the point at which the regression line intercepts the y- axis and 'b' the slope of the regression line were estimated by the method of least square (18).

Condition factor K, a measure of the well-being or plumpness of a fish, was calculated according to the equation presented in (5):

$K = W \times 10^5 / L^{3.}$

Where W is the weight of the fish in grams and L is the total length of the fish in millimetres. The number 105 is a scaling factor when metric units are used (i.e., grams and millimetres) and is used to bring the value of K near unity.

The relative condition factor, introduced by (10) was calculated using the formula:

$Kn = W / w$ Where, W is the observed weight and w is the calculated weight, and was

calculated based on the length- weight relation regression equation as used by (19).K and Kn was calculated for different month and size wisely for both the sexes.

Results

The study was undertaken from the period March 2012- Aug 2014. During this period 700 *Osteobrama vigorsii* were sampled month wise, the average was length and weight was calculated and was used to plot the relationship. Statistical details of length-weight relationship for male and female on the regression of the log of weight on log of length values for each month has been tabulated in (Table:1) The mathematical relationship between total length and weight of male and female of *Osteobrama vigorsii* obtained by logarithmic regression equations are as follows:

Male : $\text{Log } W = -0.9672x + 3.298 \log L$

Female : $\text{Log } W = -1.0245x + 2.6802 \text{ Log } L$

The graphical expression is shown Fig.1.1 and 1.2

The correlation coefficients (r) for male= 0.9466 ($p < 0.001$).and for female = 0.9312 ($p < 0.001$) was found to be significant since ($P < 0.001$) in both instances indicating good correlation between length and weight.

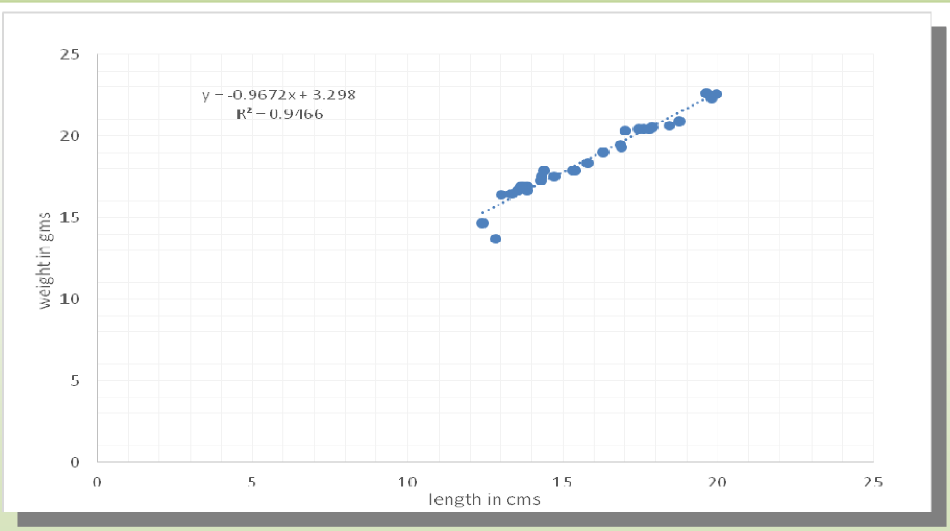

Fig:1.1 Graphical presentation of length-weight relationship of *Osteobrama vigorsii* (male)

Table 1: Values

Total Months	Average length in cm (L)	Average Weight in gms (W)	Average (Log L)	Average (Log W)	Average (Log^2)	Average (Log X log W)	Average (Log regression Log W=	Average Antilog of log W(w)	Average Relative Kn= (W/w)	Kn=
30	15.78 ,	18.55 ∑ log L=35.81537526 1.193845843 (∑Log L)^2 =1.4252678968	∑ log = 1.193845843 (∑Log L)^2 =1.4252678968	∑ log W=37.95770532 1.2652568 ∑ log W= 1.2652568	∑log L^{2}= 1.42892 ∑log L^{2}= 42.86793362 1.42892	∑log LxlogW = 1.5135574	2.9701 ∑log LxlogW=45.40672132 1.5135574	1038.057	total=0.22519 2289.1031076 0.07506 2.9701 -	m =0.0756±0.0650 kn 0.0674 31041.734 1038.057

Table 2: Values

Total Months	Average length in cm (L)	Average Weight in gms (W)	Average (Log L)	Average (Log W)	Average (Log^2)	Average (Log X log W)	Average (Log regression Log W=	Average Antilog of log W(w)	Average Relative Kn= (W/w)	Kn=
30	16.46	19.47	∑ log L=1.24554918 (∑Log L)^2 =1.551392759	∑ log W=1.2470421	∑ log ^{2} =1.58553	∑log LxlogW =1.5601011	2.31382	2437.642	Total= 0.936873908 mean=0.04312	m 0.0431±0.0297 kn =0.0297

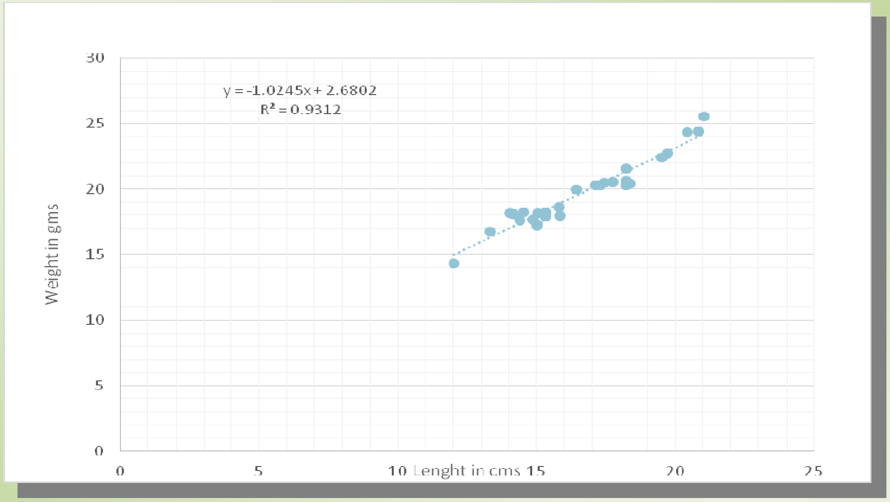

Fig: 1.2: Graphical presentation of length-weight relationship of *Osteobrama vigorsii* (female)

Discussion

The Logarithmic regression equation obtained for *Osteobrama vigorsii* Male: Log W =-0.9672x + 3.298 log L and for female it was Female: Log W = -1.0245x + 2.6802 Log L. The obtained result indicates cubic where n= 2.6802 in female for isometric growth. In case of male n=3.298. The obtained value shows slight deviation there may be various environmental factors responsible for it. This change may be due to a number of factors Including season, habitat, gonad maturity, sex, diet, stomach fullness, health, preservation techniques and locality (4,6,20), 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 according to (3) the value of 'n' ranges between 1.39 to 4.83. The present results obtained are in agreement with reports of previous findings. (2). The length-weight relationship of fish have significant importance in studying the growth, gonadal development and general well-being of fish population (10, 15,12) and for comparing life history of fish from different localities (16). The condition factor calculated for *Osteobrama vigorsii* male ranged between m = 0.07506±0.0650. kn= 0.0674 and for female it ranged between M= 0.0431±0.0297 kn =0.0297.There is gradual rise in the conditional factor as the length of the fish increases. A difference in relative condition factor suggests that environmental factor promoting growth may also be contributory (11). The high Kn value may be due to intense gonad activity during breeding season. The deviation of Kn value may be a onset of maturity and feeding intensity as observed in Pomfrets (13).

The conclusion can be drawn that feeding intensity, physiological factors like gonadal maturation and spawning along with environmental factors, pollution play an important role in the variations in condition factor *Osteobrama vigorsii* .

Acknowledgment: I express my sincere thanks to the department of Zoology, Abasaheb Garware College, karve road. Pune-4. for providing me the laboratory facilities to carry out my research work.

"Cite this Article"

NS Pimple, SS Kharat "A Study on Length-Weight Relationship and Relative Condition Factor of Osteobrama Vigorsii (sykes, 1839) from Nira River, Bhor Maharashtra (India)" Int. J. of Pharm. Res. & All. Sci. 2015;4(4):77-81

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