A Study on Length-Weight Relationship and Condition Factor of Freshwater Murrel, *Channa punctatus* (Bloch, 1793) from Budameru Channel, Vijayawada, Andhra Pradesh

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Abstract - The present study was aimed to describe the length – weight relationship and condition factor of *Channa punctatus* from Budameru channel, Vijayawada. 50 fishes of different lengths ranging from 6-18 cm were collected for the present work. A correlation value of 0.731 was observed, which implies a high degree of correlation exists between the length and weight of the fishes. The parabolic regression was found to be $W = 0.0331L^{2.873,\ while}$ the regression equation was Log W=52.17+4.720 logL. It was observed that the cube law was deviated and with increasing length the condition factor (K) also was found to be decreasing continuously. This indicates the response shown by the fish to the changing environmental conditions of selected water body. The study of fishery biology demands the knowledge of length and weight relationship. Lecren (1951) explained in it with two objectives-- a mathematical model may be described between the two parameters -- length and weight, so that one parameter may be derived from the other (Beverton and Holt 1957; Wooton 1990), the second objective is the deviation from the expected weight for length of a single fish or a group of fishes can be taken as a sign of fat ness or the extent of health condition of a fish which may be computed. (Wooton 1990) described such relationship as condition factor. The growth of fish in different environments can be assessed significantly by using length weight relationship (Mirza et al.1988). In general much work was done – related to length and weight of fishes under stress which are exposed to polluted water. The present study was taken up specifically in Channa punctctus (Bloch, 1793), the fish is being highly relished and with high commercial value, since the fish inhabits the polluted waters of Budameru channel in Vijayawada. The present study also throws light on the need for implementing the corrective measures of the natural resources to make them habitable for such species of high food value.

I. INTRODUCTION

For the study of fish biology and fishery assessment length-weight relationship is required as one of the principal practical parameters (Goncalves, 1996). It is used as a referral point for estimating unknown length from known weight and vice versa (Yousaf et al 2009). There is still potential scope for knowing the length-weight relationship of majority of fish species inhabiting tropical and sub-tropical waters. This tool is useful for estimating the weight of the fish, assessing changes in health of the population and their comparison with the other populations. It also helps to analyze the growth patterns of fish whether isometric or allometric (Lacren, 1951; Tesch, 1968) and nature of stock, mortality rate, life span and productivity (Bogler & Conneely, 1989; King, 1996; Moutopoulos & Stergiou, 2002). *Channa punctatus*, commonly called as snake headed spotted murrel, is a fresh water fish of the family, Channidae and order Channiformes. It is widely distributed throughout the South Asian countries. Having accessory respiratory organs, the fish can survive in uninhabitable conditions. The lipid content of the fish is very low throughout the year. The average total lipid content being 0.37%, this makes the fish to be termed as lean fish and easy for digestion (Ghosh, 2006). Yet it has not drawn the attention of nutrition experts. Being less spiny and highly palatable it has become a highly demanded fish in the market fetching a good price. Unfortunately, loss of habitat due to pollution made the species to be identified as threatened by IUCN (Camp Report, 1998). Though many species of freshwater fishes were studied in terms of length-weight relationship, less information is available in air breathing fishes, especially *Channa* species. Reports on length-weight relationships of *C.punctatus* are available from the riverine systems of Western Ghats (Haniffa et al, 2006) but little information is available of the same species from the waters of southern (Anitha Kumar and Sairam Kumar, 2006) and northern parts of India (Ali and Iqbal, 2000).

II. MATERIALS AND METHODS

The samples of *Channa punctatus* were collected from Budameru channel, Vijayawada (Southern part of India) of Andhra Pradesh. Budameru is a rivulet or the river Krishna, originating in the hills of Mylavaram flows through Vijayawada, Krishna district and ends up in Kolleru Lake. Familiar as **The Sorrow of Vijayawada**, the Budameru Diversion Channel (BDC) was dug from Velagaleru while a dam was constructed at Velagaleru village for the purpose of controlling floods. At the upstream of Prakasam Barrage the channel joins the Krishna river.

Budameru Diversion Channel (BDC) is the first of its kind to the river Krishna. Having the flow capacity of 10,500 cusecs , this channel is connected at its tail end to Polavaram right bank canal. It is estimated to enhance it flow capacity to 17,500 cusecs to suit the capacity designed for the right bank canal of Polavaram. The water from Polavaram right bank canal can be connected to Eluru canal of Krishna delta through the Budameru channel to which the river Krishna passing by its side in Vijayawada city is connected ('Google Earth' geographic maps).

A total number of 50 fish samples were collected from the selected site with the help of cast net and drag net. The samples were transferred to the laboratory for further analysis.

Length-Weight Relationship study:

- The statistical relationship between length and weight of fishes was established using the following formula:

$$W = aL^b \text{(Lecren 1951)}$$

Where, W is the Weight of the fish, L is Length of the fish, a = constant, b = regression coefficient

- The Length-Weight Relationship is usually expressed in its logarithmic form as:

$$\text{Log}\, W = \text{Log}\, a + b\, \text{Log}\, L \text{(Lecren 1951)}$$

- The correlation coefficient (r) was calculated by using the following statistical formula:

$$r = \sum LW \Big/ \sqrt{\sum L^2 \sum W^2}$$

where L is log length, W is log weight.

III. RESULTS AND DISCUSSION

The parabolic and logarithmic relationship between length and weight of *Channa punctatus* from Budameru is shown below graphically. When the observed length (cm) was plotted against the observed weight (gm), an exponential curve was obtained as shown in the graph but when both the variables were plotted against each other in their logarithmic forms, a linear curve was obtained.The value of the correlation(r) was calculated to be 0.731 indicating a high degree of correlation between the length and the weight. The regression equation derived using the recorded data is represented by logW = 52.17+4.720 logL, and its arithmetic transformation is $W= 0.0331L^{2.873}$.

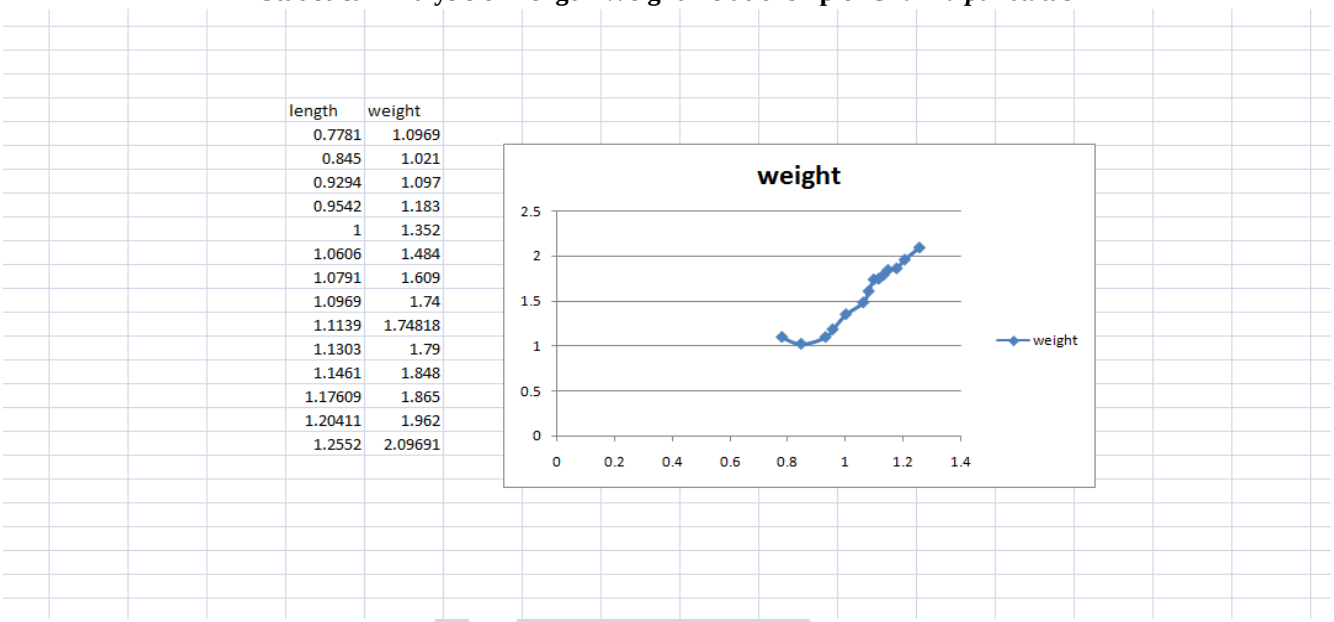
Basing on the value of regression coefficient obtained (b=2.873), which is less than "3", it is indicated that the Budameru fish samples show deviation from the cube law. According to Spencer (1871) and Allen (1938), the value of "b"remains constant at "3"for an ideal fish which follows the the cube law. According to Hile (1936) and Martin (1949), the value of "b" usually ranges from 2.5 to 4.0. But "b" is not equal to 3 in most of the cases since the fish do not maintain the similar shape or body structure throughout its life (Lecren 1951: Rounsefell and Everhart 1953: Ali et al. 2000). The value of b<3 represents that the fish becomes less rotund as the length increases and the value of b > 3 represents that fish becomes more rotund as the length increases. In both the cases, the dimensions of the fish change with growth. Further, if "b" equals 3, growth may be isometric (Allen 1938) meaning that the fish grows equally in all directions in the form of cube, where as if b >3 or b<3 growth may be allometric (Grover and Juliano1976; Bagenal and Tesch 1978) meaning that the fish grows unequally.

One of the indicators of the general health of the fish is Condition factor (K). The present study showed continuous declining values of the Condition Factor (K) from 3.935 to 2.005 in successive length groups (table). Similar results obtained by Macgregor (1959) suggested that if the value of exponent "b" is less than 3, then the condition factor should decrease with increase in size/age of fish. Further decline in the value of condition factor confirms the allometric growth of the fish (Kumar et al 2006).

The present study also revealed that the sample fish did not follow the cube law indicating allometric growth pattern. According to many authors, various factors of the aquatic body influence the "b" value and Condition Factor (K). According to Srivastava & Pandey 1981; Zafar et al 2003, feeding intensity, maturity, sex, differences in identity of the species, competition among the members of the population, influence the value of "b" and Condition Factor (K). However, since the present study was carried out in a heavily polluted water body the fish might have been

stressed due to the altered water parameters. The reason for the abnormal growth patterns observed due to changes in length-weight status and Condition Factor (K) might be the cumulative effect of the stress undergone by the fish. The changes so observed in the present study are a clear indication of how the fish respond physiologically to the varied environmental conditions of aquatic resources.

Statistical Analysis of Length-Weight Relationship of *Channa punctatus*



Length-weight relationship in fresh water murrel (*Channa punctatus)*

Statistical data of the above graph:

Length (L) = ∑ (L) =586.3 cm
Weight (W) = ∑ (W) = 2378.5 gm
Mean value of length = 11.726 cm
Mean value of weight = 47.57 gm
Square of length L^2 = 7933.0 cm^2
Square of weight W^2 = 14999.0 gm^2
Product of length and weight (L *X* W) = 32454
Standard deviation of length = 4.600 cm
Standard deviation of weight = 27.145 gm
Covariance of length and weight (L & W) = 91.28
Correlation value = 0.7310

- The condition factor (K) was determined by using the following formula:

$$K = W \times \frac{100}{L^3}$$

Where L is Length in cm, W is weight in gm.

Table showing Statistical values of *Channa punctatus*

Length(cm)	Weight (g)	K - value
6.0	8.5	3.935
7.0	10.5	3.061
8.5	12.5	2.035
9.0	15.5	2.126
10.0	22.5	2.250
11.5	30.5	2.005
12.0	40.6	2.350
12.5	55.0	2.816
13.0	56.0	2.549
13.5	61.6	2.501
14.0	70.4	2.566
15.0	73.3	2.172
16.0	91.6	2.236
18.0	125.0	2.143

IV. CONCLUSION

The obtained results contribute to the knowledge about the length-weight relationships of *Channa punctatus* of Budameru channel showing allometric and unsatisfactory growth indicating the polluted condition of the channel. The current information is important for fishery management and resources.

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