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Length- Weight Relationship of Labeo calbasu (Hamilton-Buchanan) from Sone Beel, the biggest Wetland of Assam, India

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ABSTRACT

The Length-Weight (LW) Relationship is immensely valuable to ascertain of well-being of a fish. the The genus Labeo (Order Cypriniformes, Family Cyprinidae) is of much of importance, as many species under this genus is rightly considered as the "Poor man's diet". They are an almost zero-carbohydrate food, good for diabetic and other such patients1. The values of the Log C are 1.7189 and n is 1.5573 for Labeo calbasu. Calculating the LWR for the both fishes it was found that growth fish population from the data it could be concludes as allometric in nature. The study presents valuable data for fisheries scientists. The predictive equation can be used to estimate parameters investigated with a fair amount of accuracy within the size range studies.

Keywords : LW Relationship, Labeo calbasu, Sone Beel, Assam, India.

INTRODUCTION

Basic information, such as, knowledge on parameters that relate weight to length of fish is scanty, even though it is of great importance in studies on fisheries biology and on the evaluation of fish stocks. Among its most frequent uses, the importance of length-weight relationships (LWR) in the calculation of the fish average weight at a certain length class and the conversion of an equation of growth in weight, besides morphological comparisons between populations of the same species or between species. LWR is of great importance in fishery assessments. Length and weight measurements can give information on the stock composition, life span, mortality, growth and production. The results obtained from this study will be useful to fishery biologists. This relationship serves three purposes, *viz.,* (a) to determine the type of the mathematical relationship between two variables; so that, if one variable is known, the other could be computed; (b) the relative condition could be estimated to assess the general well-being of the fish and type of growth, *i.e.* whether isometric or allometric; (c) it helps to estimate the potential yield per recruit in the study of fish population dynamics. Such relationship for the fishes could be valid when the fish grows isometrically.

Concomitant to above, studies on the relationship between length and weight of fishes constitute important aspect of their biology. A formulation of this relationship could either be of purely academic interest as far as the formula could be used to calculate a corresponding length or weight when only one of these parameters is known. It could also be of practical utility in measuring the yield of fish from water bodies. It could further be useful in regulating the fisheries through maintenance of desirable mesh size of the fishing gears which could provide for the escapement of smaller individuals and retention of commercial-sized fishes[5]. Furthermore, since LWR of fish varies depending on the condition of life and environment, the variation in this relationship provide a measure of condition co-efficient of fish and the suitability of the environment[1,2].

In addition to the above, study of LWR of fishes have wide application in delineating the growth patterns during their developmental pathways; in measuring the yield of fishes from water masses, etc.

Studies on LWR in freshwater (FW) fishes have been limited and have been restricted mainly to the works of the conversion of growth-in-length equations; and, to some extent, on some aspects of the ecology of the species, notably in stock assessment models of fish. Further, many of the species may not have any record of LWR in Fishbase[7]. Therefore, our results may contribute to this database.

Notwithstanding the above, historical resume revealed that there are some significant works done on the LWR of commercial freshwater fishes from different water bodies.

Concomitant to above, studies on the LWR of fishes from North-East (NE) India in general, and Assam in particular, have been few. As such, the present investigation has been undertaken to study the LWR of a widely distributed prize food fish, *Labeo* sp.(an Indian major carp or IMC) collected from Sone Beel (3458.12 ha, 92^0 24' 50" - 92^0 28' 25" E and 24^0 36' 40" – 24^0 44' 30"), which is the biggest wetland in Assam[7].

MATERIALS AND METHODS

In fishes, generally the growth pattern follows the cube law. Such relationship for the fishes will be valid when the fish grows isometrically. In such cases, the experimental value must be exactly[3]. But, in reality, the actual relationship between length and weight may depart from the ideal value due to environmental conditions or condition of fish. This relationship is expressed by the equation $W= aL^n$. This equation was used by several workers for different fish species form different habitats[8].

Genus *Labeo* is a large-sized cyprinid that forms an important food fish in Asia. Fish samples were collected through netting operations during April to August, 2013. Individual measurements of *Labeo* spp. pertaining to total length (TL cm) and total weight (g) were done with the help of precision Vernier Calliper and Digital Sartorious Electronic Balance respectively. The total length (TL) of each fish species were taken from the tip of snout to longest ray of caudal fin.

The LWR was established by fitting equation of the form

$$W=cL^n \quad \text{.....(1)}$$

Where W is the weight of the fish, 'L' its length and 'c' and 'n' are constants. The equation 1 could be expressed in the linear form by using logarithms, as given below:

Log W = Log c + n Log L

The estimates of the constants c and n were obtained empirically by using the formulae, as given below:

$$Log\ C = \frac{\sum Log\ W \times (\sum\ LogL^2) - \sum Log\ L \times \sum(LogL \times LogW)}{N(\sum\ LogL^2) - (\sum\ (LogL)^2)}$$

$$n = \frac{\sum Log\ W - NLogC}{\sum og\ L}$$

Significance of the variation in estimates of n from the expected value 3 (cube law). Weights were estimated for different lengths using relationship equation. The relation between length and weight for each fish was computed with help of statistics. The Fulton's Condition Factor (K) was computed by using the formulae, as given below:

$$Condition\ Factor\ (K) = \frac{Weight\ (g)}{(Length)^3\ (cm)} \times 100$$

RESULTS

A total of 20 specimens numbers specimens belonging to *Labeocalbasu* under family Cyprniformes from Sone Beel were used in the analysis. The number of specimens, LWR, Fultons Condition Factor and Le Cren Condition Factor are presented in Table I and Table II. Specimens of *Labeo calbasu* ranged in total length (TL) from 10.2 to 42.02 cm and body weight (BW) from 39.88 to 979.5 g; were collected, to study the parameters of length- weight and condition factor relationship. The values of the Log C and n are 1.7189 and 1.5573 respectively. The average K value for the *Labeo calbasu* is 1610.1554; the Le Cren Condition Factor (K_n) value minimum 11.2540 and maximum 45.9778.

The value of K may vary when average weight of the fish is not increasing in direct proportion to the cube of its length. If, however, the weight increases more rapidly than the cube of length, K would increase with increase in length[1]. When the weight increases less than the cube of length, K would tend to decrease with the growth of the fish. In the present study, condition factor (K) appeared to increase with increasing length or weight of the fish. It means that weight of *Labeo calbasu* increase more rapidly than the cube of its length.

SL. No	Observation	Length (cm)	Weight (g)	Log C	N	Fultons Condition Factor (K)	Le Cren Condition Factor (K_n)
1	1	22.3	230.11	1.1789	1.5573	1173.2649	3.2786
2	2	11.7	39.44	1.1789	1.5573	2462.5174	2.9025
3	3	18.1	169.21	1.1789	1.5573	1167.1673	3.1373
4	4	14.2	63.21	1.1789	1.5573	2207.6018	2.9732
5	5	22.1	120.10	1.1789	1.5573	1112.6695	3.2113
6	6	10.2	39.88	1.1789	1.5573	3757.9814	2.7495
7	7	11.6	70.80	1.1789	1.5573	4535.8563	2.8364
8	8	18.8	172.20	1.1789	1.5573	1086.5848	3.1630
9	9	26.8	724.56	1.1789	1.5573	647.1041	3.4028
10	10	29.8	830.78	1.1789	1.5573	494.1883	3.4746
11	11	36.8	956.92	1.1789	1.5573	314.8725	3.6173
12	12	42.02	979.50	1.1789	1.5573	229.7224	3.7070
13	13	10.01	30.80	1.1789	1.5573	3070.778	2.7368
14	14	31.10	831.87	1.1789	1.5573	438.3942	3.5034
15	15	22.10	416.78	1.1789	1.5573	1081.9112	3.2723
16	16	18.10	270.79	1.1789	1.5573	1193.8126	3.1376
17	17	16.14	271.56	1.1789	1.5573	1702.0007	3.0599
18	18	14.80	164.39	1.1789	1.5573	1986.2471	2.5308
19	19	16.10	171.56	1.1789	1.5573	1714.7179	2.5731
20	20	15.40	166.68	1.1789	1.5573	1825.7168	2.5513

Table I. Length-Weight Relationship of *Labeo calbasu*

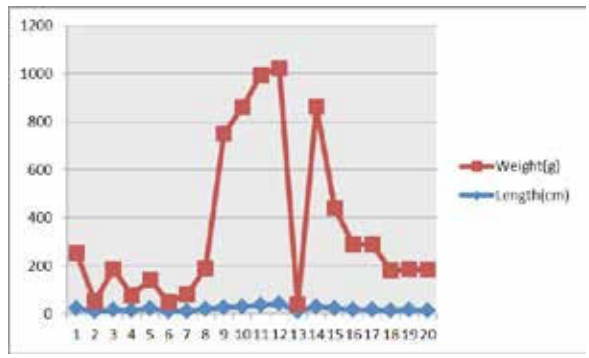

Fig. II: Relationship between Total length (cm) and Body weight (g) of *Labeo calbasu*

DISCUSSION

This study provides information on the LWR of some fish species, *hitherto* unknown. A comparison of the result of this study and the information in the electronic database revealed that, there have no previous data on the LWR of the studied fishes in FishBase[6] nor is there any previous data on the LWR of the same fishes from Sone Beel. The condition factor (K) reflects, through its variations, information on the physiological state of the fish in relation to its welfare.

The present study has similarity with the works of Prasad and Ali[3]; Kar[4]. The overall results indicates that *Labeo calbasu* showed an allometric pattern growth in the studied habitat and the present conditions exists in the collection site is conducible for the feeding and optimum growth of the fish. Even though the change of n values depends primarily on the shape and fatness of the species, various factors may be responsible for the differences in parameters of LWR among seasons and years, such as temperature salinity, food, sex and time of year and stage of maturity.

From a nutritional point of view, there is the accumulation of fat and gonad development[8], from a reproductive point of view; the highest K values are reached in some species. K also gives information when comparing two populations living in certain feeding, density, climate, and other conditions; when determining the period of gonad maturation; and when following up the degree of feeding activity of a species to verify whether it is making good use of its feeding sources. An important merit of the present study is the contribution of base line data on the LWR and condition factors of fish species in Sone Beel in India. The current interpretation of the parameters resulting from the LWR of the species could disclose information which may be is useful to the study of fishery biology and management of fishes.

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