LENGTH-WEIGHT RELATIONSHIP IN PANGASIUS PANGASIUS

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Abstract

  The study described the LWR of commercially important and indigenous freshwater shark catfish, Pangassiuspangasius. It grows to a standard length of three meters (9.8 ft). This species is important as a food fish. Sample of fishes was collected from the fisherman for a period-during Jan, 2019 -Dec,2020. Positive Isometric growth 'b' in LWR is2.9, indicating the potential of the shark catfish for aquaculture. The LWR with a high correlation coefficient is significant for the species.

Keywords

  Catfish, length-weight relationship

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Introduction

The importance of length-weight relationships (LWRs) of a fish in fishery assessment studies is considered as one of the most important features in biological studies (Beverton and Holt 1957) as it provides information on stock condition (Bagenal& Tesch 1978). Earlier, (Lecren,1951) asserted the utility of the mathematical relationship between weight and length as a practical Index of growth, maturity and general condition of the fish. It has been used extensively in fishery analysis due to difficulties in getting data from the field (Ayoade,2011; Froese, 2006; and Yousaf et. al., 2003). Knowledge of the length-weight relationship is necessary to facilitate the conversion of measure into another and also for calculating condition factors to know the wellbeing of the fish. It is used to measure variation from the expected weight on the length of an individual or relevant group of individuals. The length-Weight relationship is also useful in differentiating the population as a variation may also occur within populations of different localities (Chondar,1972). Besides providing means for calculating weight from the length and a direct way of converting logarithmic growth rates calculated on length into growth rates. Weight may also indicate taxonomic differences and events in life history, such as metamorphosis, the onset of maturity and the spawning season. The length-weight relationship of fish varies depending upon the condition of life in the environment. It is argued that b maybe change during different time periods illustrating the fullness of the stomach, general condition of appetite and gonads stages (Zaher,et. al., 2015). The variation in this relationship provides a measure of the condition of the fish and its suitability to its environment. The length-weight relationship forms an important criterion for studying the growth of fish populations (Agarwal and Saxena, 1979). According to Saxena and Kulkarni (1982), the factors such as nutrient level of reservoirs, production of fish food organism and depth are influencing the growth of fish. The present study was undertaken to study the length-weight relationship is known for its practical utility in fish management and conservation because the two variables are useful in deriving the index of the condition of fish. Many works have been done on the length-weight relationship of commercial freshwater fishes from different water bodies in India(Patgiri, et .al, 2001) and(Kar and Barbhuiya,2005).

Materials and Methods

Sample of fishes was collected from the fisherman for a period-during Jan, 2021 – June 2021. The length of the fish was taken from the tip of the snout to the extended tip of the caudal fin in cm and weight in gm was taken by a digital weighing machine. Total length and weight transformed into logarithmic value. The length-weight relationship using the equation as suggested by Lecren (1951).

$$W = aL^b$$

Where

W	=	Body weight in grams
L	=	Total length in cm
a	=	intercept
b	=	Exponent (Regression coefficient or slope of the regression

curve or slope of the growth)

This relationship was fitted to a straight line through the logarithmic transformation.

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

Observations

The study was undertaken from the period Jan 2021 to June 2021. During this period 200 catfishes were sampled month-wise, the average length and weight were calculated and were used to plot the relationship.

The correlation coefficient showed that total length was highly correlated to the total weight of the fish (0.934108279).

The regression equation calculated from the data of length-weight for pooled or combined ones were scatter plotted as follows:

$$Y = +2.905446296 \, X - 1.865384393$$

When the calculated log -weights for different length groups were plotted against their log -length, straight lines were obtained. The weight tended to increase in logarithmic in manner.

. The test of linearity by analysis of variance showed that total length was highly significant for the increase in the total weight of the fish. Linearity was highest in *P. pangasius*.

. The value of 'nor 'b' showed the growth is slightly less 2.90,(Table 3) .

. The value of "F Showed that the total length is highly significant for the increase in total weight (Table 2).

. correlation coefficient showed a high degree of correlation ,0.934108279(Table 1). The value of the growth coefficient was found near 3.0.

Table 1. REGRESSION ANALYSIS OF TOTAL WEIGHT OF *P. PANGASIUS* IN RESPECT OF THE TOTAL LENGTH

Regression Analysis

A	-1.865384393
B	2.905446926

R   0.934108279

Regression Equation

Y = 2.905446296   X-1.865384393

Table 2. REGRESSION DATA: ANALYSIS OF VARIANCE

Source	df	SS	MS	F	Significance F
S.S. due to regression	1	1.336351103	1.336351103	581.9715	8.72E-40
Residual S.S.	85	0.195181102	0.002296248		
Total	86	1.531532206			

Table 3. Use of ' t' test determine Isometric /allometric growth

Growth value b   2.905446926

Ideal value   3

No. of fish   200

Remarks   Isometric

Fig.1 Logarithmic relation of length and weight in Pangsius pangasius.
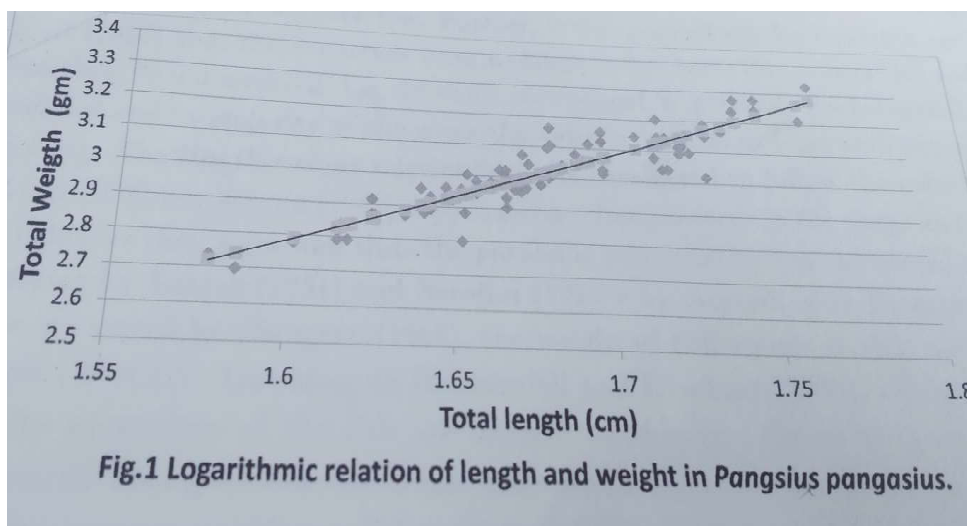
Discussion

In fish bioecology, the length-weight relationship is of great value, as it assists in understanding growth patterns and the general wellbeing in a fish population because the length-weight relationship of fish show variations depending upon the condition of life in aquatic environment (Nagesh, T. S., et. al., 2004) and the empirical relationship between length and weight of the fish enhance the knowledge of natural history of

commercially important fish species thus making conservation possible (Yusuf,et. al., 2003). Allen in 1938, suggested that the value of 'n' remains constant at 3.0 for an ideal fish and it follows the cube law. Further, it was pointed out by Beverton and Holt (1957) that the departure from n=3.0 is rather rare. But Hile (1936) and Martin (1949) illustrated that the value of exponent 'n' generally lies between 2.5 and 4.0 and in majority of the cases the value n = 3.   The length-weight relationship was considered to follow the cube law (Allen., 1938) but Martin (1949) reported that changes occur in the shape and size of fishes as they grow and thus the parabolic relationship was considered to be superior by Lecren (1951) and Sarojini (1957). According to Rickers(1937), Cube Law, as stated by Jhingran (1968), the weight of fish equals to the cube of its length (W=CL"). 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 (Mohammad Yasir Arafat and Yahya Bakhtiyar,2018). According to Dhasmana and Lal (1993), environmental conditions such as water quality may be responsible for this deviation from cube law and the value differs with sex, season ad year and locality, the range being 2.5 to 3.9 in hill-stream fish *Gara gotylagotyla*. The length-weight relationship was found parabolic and has no significant differences between the sexes. These observations were in close conformity with Lal (1980) and Krishnamoorti (1971). There are reports of significant deviation from the cube law in the case of different fishes (Sultan, 1981; Sultan and Khan, 198l., Hoda 1987, Sivakami 1987).   In the present study, the value of 'n' 2.907 implies that the species gain weight at a faster in relation to its length. The value was hence, near to the ideal value of n=3.0 in Fish species and it resembles to that of Lal and Nautiyal (1980) , Lal (1980) in which the value of exponent 'n' was reported to be 2.8807 for *Tor putitora* and 2.964 for *S. plagiostomus*respectively. 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 *Pangasius pangasius*closely follows the cube law and thus may be considered as an ideal fish.   As far as the growth of fish is concerned, the value of 'b' is equal to isometric growth. Basheer et. al., (1993) observed that the value of regression coefficient b=29419 reflects the fact that in fish *Channa punctatus,* length-weight relationship does not exactly follow the cube law. The departure from the cube law may be due to general factors. 0ur results are in conformity with the reports of Bhagat and Sunder (1983)and Bhatt et. al.,(2010).

A student's 't test determined that in silver lake (*Merluccius bilinearis Mitchill*) 3.17 was not significantly different from 3.0 (P >0.05) and the fish were growing isometrically (Rachlin and Warkentine, 1985). Warkentine and Rachlin (1986),

observed growth in two sympatric species of Flatfish, *P. oblongus* was exhibiting allometric growth since its growth coefficients (2.8386) were statistically shown to be significantly different from 3.0 (P >0.05). The growth pattern exhibited by *L. ferruginea* was determined to be isometric, since its growth coefficient at 3.1626 was not significantly different from 3.0 (P >0.05). If the fish retains the same shape and its specific gravity unchanged during its 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 (Bwathondi, R.J.H., and Pratap, H.B., 1981) the value of ranges between 1.39 to 4.83.

Finally, it was concluded in the present study that the value of 'nor 'b' in *P.pangasius* exhibits isometric growth since its growth coefficient was not statistically shown significantly different from 3.0 (P<0.05). In the present study, a significant positive correlation 'r 0.934108279 was observed between the length-weight relationship. A similar kind of results was noticed during morphometric studies of *Schizothoracines* in river Lidder of Kashmir wherein the results revealed a positive correlation coefficient of total length with other parameters under comparision and the correlation coefficient r of total length with standard length was observed to be maximum(r =0.999) compared to all other parameters studied (Bhatt, F. A., et. al.,2013). It was concluded in the present study that the value of 'nor 'b' in *P.pangasius* exhibits isometric growth since its growth coefficient was not statistically shown significantly different from 3.0 (P<0.05).

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Dr. Padma Vashist

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