NOTE

Length-weight relationship in *Clarias batrachus* (Linn.) from the Brahmaputra river system

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ABSTRACT

The length to weight relationship shows an isometric pattern of growth in *Clarias batrachus* (Linn.), an endemic air-breathing cat fish of the Brahmaputra river system. The weight of the adult fish proportionately increases almost to the cube of its length. There is a remarkable difference between the exponential value of juvenile and adult fishes. The higher exponential value in the juvenile fishes indicates a better adaptability in the natural habitat of the Brahmaputra river system of the northeastern India.

The relationship between length and weight of fish is of significant importance. If properly applied, this factor is of practical value since it makes possible the conversion of length into weight and vice-versa.

The determination of the precise mathematical relationship between length and weight of fish can be formulated in an equation through which one measure can be converted into another. The equation has biological significance because it represents isometric growth i.e. the weight increases as the cube of the length. Empirical observations, however, strictly do not always conform to the cube law and the equilibrium constant shows certain variability around 3. Since the weight of a fish is usually closely proportionate to the cube of length, the length-weight relationship is expressed by the formula: \( W = aL^n \),

or, when expressed in logarithm:

\[ \log W = \log a + n \log L \]

where \( W = \) Weight of fish, \( L = \) Length of fish, \( a = \) Constant, \( n = \) Equilibrium constant (Le Cren, 1951).

In the present study an attempt has been made to study the length-weight relationship of *Magur*, *Clarias batrachus* (Linn.) an air-breathing cat fish of commercial importance from the swamps of the Brahmaputra river system.

The length-weight relationship of *C. batrachus* was studied based on the examination of 550 specimens in the size range of 2.7-35.0 cm in length and 0.160-320.0 g in weight during October - February of 1990-93. Live specimens were procured from the catches of derelict ponds, stray ditches, paddy fields and low lying areas and swamps.

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from the lower reaches (91°E - 92°E / 26°N - 27°N) of the Brahmaputra river system of Assam. The total lengths of the fish were recorded to the nearest millimeter from the tip of the snout to the tip of the caudal fin. Weights of fish were recorded to the nearest gram with the help of double pan physical balance. It has not been possible to determine the sex of the juveniles accurately since *C. batrachus* is not sexually dimorphic (Thakur, 1975) during juvenile stage.

The samples were collected every year during October February covering the years 1990-’93. Not much differences in the length and weight relationship were observed between male and female specimens. The gonads were in the resting phase and fish did not show any variation between the sexes.

The length-weight relationship of *C. batrachus* was found to be:

\[ \log W = -5.064 + 2.998 \log L \]

and correlation co-efficient \( r^2 = 0.98 \)

There is no significant difference between the exponent value and '3'. Hence, it can be concluded that the weight of *C. batrachus* increases proportionately to the cube of the length as the exponent value was observed to be almost '3' (2.998). It clearly reveals that the fish is neither heavier nor lighter for its length in the agroclimatic condition of Assam. A scatter diagram of weights in relation to their respective lengths is found to be general parabola (Fig. 1).

The length-weight relationship was also separately studied in the juveniles of *C. batrachus* in the size of 2.7-10.0 cm belonging to 0-year age group. The regression for juveniles was estimated to be:

\[ \log W = -5.6291 + 3.5022 \log L; r^2 = 0.9873 \]

The value \( r^2 \) in the above equation indicates a proper determination of regression through this equation. The exponent value of 3.5022, which is significantly higher than '3', indicates that the weight of the juvenile fishes is comparatively heavier in relation to its length.

A low exponential value was, however, observed to be significantly less than '3' (Log W = 3.8262 + 2.3619 Log L; \( r^2 = 0.9446 \)) in the fishes of size range 40-145 mm in length belonging to 0-year age group which revealed that the weight of *C. batrachus* during juvenile stage is lighter in its length (Thakur, 1975).

Length and weight relationship of *C. batrachus* has been studied by several workers on fish of different regions of India (Hora and Pillay, 1962; Thakur, 1975) and Thailand (Sidhimunka et al., 1968). This is the first report on the same of *Clarias* collected from the
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Brahmaputra river system of northeastern India.

The exponential value in the present studies does not significantly differ from the value observed by Thakur (1975) in adult *C. batrachus* reported from Bihar, (northern part of India). The exponential value observed in the juveniles of present studies, however, shows a significant variation from that observed by Thakur (1975). The exponential value of the juveniles and adults of *C. batrachus* found in Assam as compared to that of Bihar indicates that the weight gain in juveniles collected from Assam is higher than the juveniles collected from Bihar. It can be concluded that the agroclimatic condition of Assam is more suitable for the growth of the juvenile fishes.

It has been earlier shown that the agroclimatic conditions of north eastern India and Assam have unique environmental characteristics particularly with reference to rainfall (Barthakur, 1986), which has a direct influence on the growth as well as reproduction of the fish.

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References


