AGE DETERMINATION AND LENGTH-WEIGHT RELATIONSHIP IN THE MUDSKIPPER \textit{BOLEOPHTALMUS DENTATUS}

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\textbf{ABSTRACT}

Since the otolith of \textit{Boleopthalmus dentatus} has been found to be having easily readable, typical alternating opaque and translucent rings, the age of the fish is determined by counting the number of completed translucent rings. The formation of the central opaque zone occur in fish less than 30 mm in length, which are considered to be in the first year of life (0-age group). As the maximum number of rings found in the samples studied are two, the fish are classified into 0-, 1- and 2-age groups. The length-weight relationship, being a power relationship, is expressed using logarithms as a linear equation: \[ \log W = -0.0823 + 2.759 \log L, \] i.e., \[ W = 0.8274 L^{2.759}. \]

\textit{Boleopthalmus dentatus} were collected once a week during July 1980-January 1981 from Jodia coast of Saurashtra, Gujarat. More than 500 fish were collected and 95 fish, of different lengths, were selected for the length-weight relationship study and 50 were selected for the age-assessment. As no difference could be noticed between males and females, sex was not taken into consideration for the study.
For age assessment, the otoliths of both sides were taken out by dissecting the skull under dissecting microscope and removing the extraneous tissue. The otoliths were examined convex-side up in transmitted light under stereomicroscope. Otoliths exhibited the typical alternate opaque and translucent rings, and the age was assessed by counting the number of completed translucent rings. The outline figures of otoliths were drawn with the help of camera lucida.

To study length-weight relationship, total length of a fish was measured to the nearest mm from the tip of the snout to the end of the caudal fin. Weight of each fish was recorded to the nearest 0.5 g after wiping off the moisture from the body surface. The length and weight ranges of the fish were found to be 20-133 mm and 0.1-10.5 g, respectively. Scatter diagram was drawn by plotting the length of fish against the weight (Fig. 1). Logarithmic transformation of the data gave a straight-line relationship (Fig. 1). The general parabolic form of equation, $W = aL^b$, was used to show statistical relationship between length and weight. Since the weight-length ratio is a power relationship, logarithms were used so that the exponential relation could be expressed by a linear equation:

$$\log W = \log a + b \log L$$
which corresponds to the regression line equation:

\[ Y = a' + bX \]

where \( Y \) (\( \approx \text{Log } W \)) and \( X \) (\( \approx \text{Log } L \)) are two variates and \( a' \) (\( \approx \text{Log } a \)) and \( b \) are the constants.

Thus, the above equation with weight \( W \) and length \( L \) in logarithmic form can be treated as the equation regression line, \( Y = a' + bX \), wherein the values are constants, \( a' \) and \( b \) are to be determined. The following equations have been used for this purpose.

\[ b = \frac{\sum XY}{\sum x^2} \quad \text{and} \quad a' = \frac{\sum Y - b \sum X}{n} \]

where \( X \) and \( Y \) are the logarithmic forms of length and weight, respectively, \( n \) is the number of samples and \( x \) and \( y \) are the deviation values of \( X \) and \( Y \), respectively, from their mean, i.e. \( X - \bar{X} = x \) and \( Y - \bar{Y} = y \).

The otolith of \( B. \text{dentatus} \) consists of a central opaque area surrounded by alternate translucent and opaque rings (Fig. 2), which are easy to count and record. One opaque and translucent ring together represent one year’s growth in a fish.

![Otoliths of B. dentatus of three different lengths. (Left - 30 mm; Centre - 95 mm; Right - 130 mm) (Stippled portion represents opaque rings and clear portion represents translucent rings).](image)

FIG. 2. Otoliths of \( B. \text{dentatus} \) of three different lengths. (Left - 30 mm; Centre - 95 mm; Right - 130 mm) (Stippled portion represents opaque rings and clear portion represents translucent rings).

The formation of central opaque zone occurred in the fish measuring less than 30 mm in length. In this particular group of \( B. \text{dentatus} \), larvae, alevin and fingerling stages can be included, and the group is classified as age group 0. A fish of age group 0 is in its first year of growth. Table 1 shows the length
in relation to age groups of *B. dentatus*. As a maximum of two translucent rings were observed in the otoliths, the fish can be divided into 0-, 1- and 2-age groups.

According to Buckman (1929) transparent rings begin to form late in summer, whereas opaque zones are found in the spring. Winter growing species show transparent zones during summer and opaque zones during winter (Koops 1959). As *B. dentatus* spawns once a year, in January-February, the central opaque zone appears during the summer. Thus the completion of a transparent ring and beginning of an opaque ring indicate the completion of one year and the beginning of the next year of the fish. Thus, 0-, 1- and 2-year classes could be fixed in *B. dentatus* by the help of otolith study.

Figure 1 shows that the length ($X$) bears curvilinear relationship to the weight ($Y$), which becomes linear after logarithmic transformations. The equations showing the relationship between length and weight are expressed as:

\[ W = 0.8274 \cdot L^{2.759} \]

\[ \log W = -0.0823 + 2.759 \log L \]

This approximates the 'cube law'.

The correlation coefficient ($r$) is 0.9878, $P < 1\%$, therefore, it is highly significant.

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**REFERENCES**


