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Length–weight Relationship and Condition Factor of Silver Pomfret (*Pampus argenteus*), Damanganga Estuary, Daman

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A study was conducted on the length-weight relationship and condition factor of the commercially important fish, Silver Pomfret (*Pampus argenteus),* in the Damanganga estuary in Daman. Fish samples were collected from January 2021 to March 2021, with a total of 330 randomly sampled fish collected from fishermen. The average total length was 23.309±0.775 cm and the average total weight was 259.606±20.144 grams measured using standard methods. The 'b' value of *Pampus argenteus* showed a negative allometric (b<3.0) growth pattern, with the total length being positively correlated with the total weight of the fish (r^2=0.829). The growth pattern was negative allometric while the Fulton condition factor (2.03±0.114) indicated good condition. Therefore, further studies on the length-weight relationship should focus on the sustainable management of the fisheries.

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Keywords: Length-weight; fulton condition factor; silver pomfret (Pampus argenteus); Damanganga; estuary.

1. INTRODUCTION

The estuary is a unique environment that is influenced by both fresh water from the land and salt water from dynamic habitats, creating a blend of characteristics from both the land and ocean. This special water composition fosters the growth and sustainable development of fish species. These developments are evaluated the length-weight relationship (LWR) and Fulton condition factor (K), which offer valuable insights into the assessment of fish stocks.

Growth can be defined as an increase in size resulting from food components into body mass. Fish continue to grow throughout their lives, but varies significantly depending on species, geographical location, and seasons. Methods for estimating fish growth include empirical, length-frequency, anatomical, and biochemical approaches. Length-weight relationships are also useful for converting length observations into weight estimates [1,2,3] Similarly, Length-weight regressions are commonly used to estimate weight from length, as directly measuring weight can be time the field [4]. Growth index define as the length-weight relationship, is an important management tool for determining the mean weight at a particular length of growth [5,6]. Length is a linear measure (centimetre), and the weight of a fish (gram) is roughly equivalent to its volume (cubic centimetre). Therefore, the weight of a fish is dependent on its length. This relationship can be expressed by the theoretical equation ($W=aL3$) and the Fulton condition factor (K) which is used to evaluate the condition of different fish species under study. The uniform growth and good condition of the fish are influenced by the interaction between biotic and abiotic factors in the natural environment of the studied fish population [7,8,9].

The Fulton condition factor decreases as the length increase, and it also provides information on the physiological position used for comparing populations in specific feeding grounds and feeding sources [10]. This information was assessed during different periods including warm for spring and summer, and cold for fall and winter [11]. It is important to note that the stomachs of the fish were not emptied before weighing [12]. Several scientists and researchers have worked on the length-weight relationship and Fulton condition factor [13,14,15]. Therefore, this present study aims to establish a valuable guideline for future biometric studies on fish collected along the coastal line.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in the Damanganga estuary, situated at 20.416099 N Latitude and 72.840356 E Longitude in Daman, where the Damanganga River meets the Arabian Sea (Fig. 1).

2.2 Sample Collection

Samples were collect at random intervals from January to March 2021, resulting in the collection of 330 species. The total length and weight of each species were recorded.

Fig. 1 Map of study area

2.3 Statistical Analysis

2.3.1 Length-weight relationship

The relationship between length and weight can be represented by the parabolic equation [10], in statistical analyses. This relationship can also be expressed as W = a L b, and the logarithmic transformation of this equation result in a linear equation.

$$\text{Log } W = \text{Log } a + b \text{ Log } L \quad \text{——— (1)}$$

Where,

W = Weight in gram
L = Length in cm
a = A constant being the initial growth index, and
b = Growth coefficient
Constant 'a' represents the point at which the regression line intercepts the y-axis and 'b' the slope of the regression line.

2.3.2 Fulton condition factor

Advancements in fish condition assessment have introduced several new approaches to estimate fish condition. The Fulton condition factor was calculated using the formula from reference [16] as follows:

$$\text{Condition Factor (K)} = 100W/L^3 \quad \text{——— (2)}$$

Where,

W is the weight (gram) and L is total length (cm)

3. RESULTS AND DISCUSSION

The length-weight relationship is used for estimating in age, weight, general health, and habitat condition, while population dynamics reflect the growth patterns of fish. A linear relationship was established between the total length (cm) and total weight (grams) of silver pomfret (*Pampus argenteus*) using the equation y = mx + c, where m represents the slope of the linear graph. The values of total length and total weight of 330 samples of the fish species were recorded and plotted on a graph (Fig. 2). The average total length was 23.309±0.775 cm and the total weight was 259.606±20.144 grams. The points formed by the values of total length and total weight were connected to form a linear line on the graph with the equation (y=2.109x–0.4833) and a value (r^2=0.829) symbolizing the negative allometric growth performance based on environmental conditions [17]. Furthermore, the Asian striped catfish (*Mystus vittatus*) exhibited disproportion in the exponent in length-weight relationships and differences in the b values due to environmental conditions and seasonal changes [18]. Similar observations were made by [19,20] of silver pomfrets in the south western region of Bangladesh and marine fishes of the Northern Bay of Bengal, West Bengal, India, respectively. It was noted that fish species from tropical environments vary in growth patterns, which may be a result of environmental parameters, sex, food availability, and habitat [21].

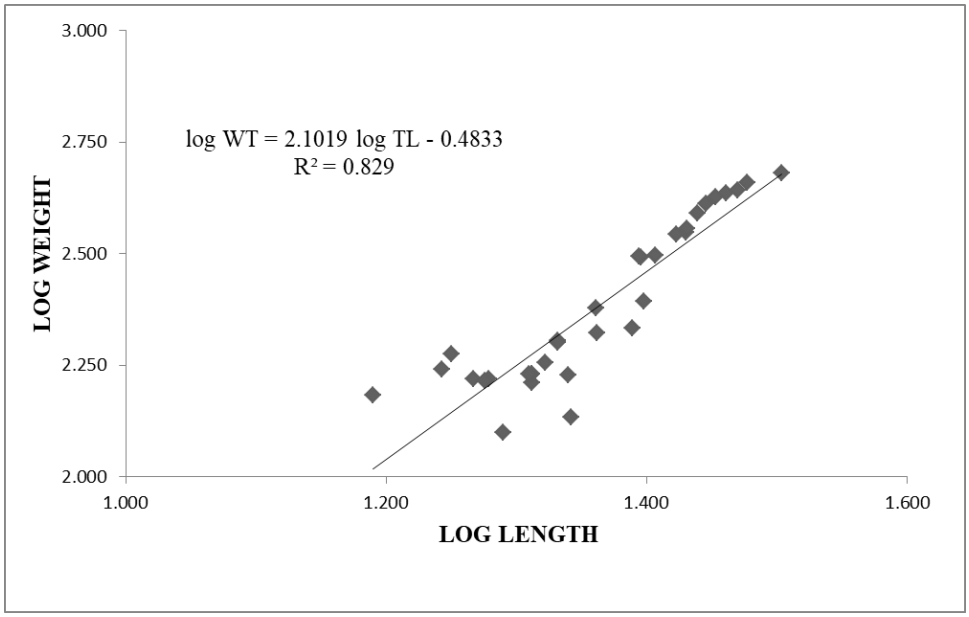

Fig. 2 Relationship between log L (length) cm and log W (weight) grams of silver pomfret

The Fulton condition factor K is a measure of the environment's ability to support fish growth, with a value ≥ 0.5 indicating good fish condition [22]. In this study, the Fulton condition factor ranged from 1.28 to 4.08, with an average value of 2.03±0.114. This measure was used to assess differences in fish condition, which is influenced by biotic and abiotic environmental factors, as well as the size of collected fish samples, seasonal changes, and growth [23,24,25].

4. CONCLUSION

In conclusion, the relation silver *pomfret* (*Pampus argenteus*) exhibited negative allometric growth apart from condition factor which indicates good condition; be due to depends upon the biotic, abiotic factors, seasonal fluctuation, and environmental stress condition.

ETHICAL APPROVAL

The experiments were carried guidelines and approved by the Institutional Animal Ethics Committee.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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