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Length-Weight and Length-Length Relationships of *Garra mullya* (Sykes, 1839) from Ujani Wetland of Maharashtra, India

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Length-weight relations give information on growth patterns and condition of fish. LWRs data is very useful for proper management and good exploitation of population of fish species. Length-weight relations are used for providing information on body growth pattern of species whether it is isometric or allometric. The present study was conducted on *Garra mullya* commonly called stone sucker fish for investigation of length-weight relationships (LWRs) from Ujani wetland, a dam constructed on Bhima river of Maharashtra, India. During the study period of November 2021 to October 2022, total of 202 samples were collected from local fishermen. The intercept (a value) was found to be 0.01126 and slope (b value) was 3.0499 which are in expected range of 2.5 to 3.5.

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The slope value was found almost equal to 3 and it indicated isometric growth of fish. Fulton's condition factor was 1.2798 that was more than 1.0 and indicated that fishes were in good physical form in habitat.

Keywords: Length-weight; length-length relationships; Garra mullya; Ujani wetland.

1. INTRODUCTION

Fish comprises more than half of all known vertebrate species. Currently about 32,000 fish species have been described that show great diversity in their morphology, habitats, physiology and behavior [1]. The length-weight relationship is the relationship between length and weight for a particular species, and it can be used to estimate the growth pattern of species and assessment of biomass of fish stock [2]. The knowledge of length-weight relationships (LWR) is an important tool for the efficient management of any fish species that have been applied in the assessment of fish stocks and populations. It is also important in fisheries biology for evaluating comparative growth studies of fish [3]. It is widely used for estimating the weight from given length because direct weight measurements on filed can be time-consuming [4]. The condition factors are important and useful for determining the physiological state of fish in relation to wellness based on the assumption that heavier fish of a given length are well being in habitat [5,6].

1.1 Introduction to Study Area

Ujani wetland: The major rivers of Maharashtra are Godavari, Krishna, Bhima and Tapi making a river basin of about 3200 kms in total length with their tributaries. The basin of the river Krishna lies in the extreme South of Maharashtra State. Bhima river, a tributary of Krishna river flows above the Krishna basin between Mahadeo and Balaghat ranges in South of Maharashtra and Karnataka [7]. Ujani dam was built on Bhima at Ujani village of Solapur district and is third largest water reservoir in Maharashtra with storage capacity of 110 TMC. It provides nearby population with large agricultural irrigation area, fisheriesand hydroelectric power generation station [8,9]. Fish diversity of Ujani was studied by Yazdani and Singh in 2002 and recorded 54 species belonging to 15 families [10]. Later in another attempt made in 2010, 60 fish species belonging to 6 orders, 15 families and 36 genera were recorded by Sarwade and Khillare [11].

The present study was done on length-weight and length-length relationships of *Garra mullya* commonly called stone sucker fish from Ujani wetland. *Garra mullya* was reported widely in freshwater of India except Assam and Himalaya [12] and Nepal [13]. It is one of the commercially important fish sold at nearby markets of Bhigwan, Indapur, Pune and Mumbai. Length-weight relationships of this fish was not studied earlier from Ujani wetland region so this attempt was made to know about length-weight and length-length relationships of *Garra mullya.*

2. MATERIALS AND METHODS

Fish Collection and preservation: For present study *Garra mullya* fish was investigated from Ujani wetland. A total of 202 samples of *Garra mullya* were collected during the study period of November 2021 to October 2022 from local fishermen from Ujani wetland backwater fishing sites (Fig. 1). Collected samples then preserved in 10% formalin solution and brought to the laboratory for identification and measurements.

Fish Identification: Fishes were identified based on various morphometrics and meristic characters by using literature of Jayaram [14].

Length and weight measurements: Measurements of length (L) were taken by using digital caliper (Baker) to the nearest 0.01cm and body weight (W) was measured using weighing balance to nearest 0.01 gm (CONTECH – CB Series).

Length weight relationships were estimated by the common formula: $W = aL^b$ [2,15]. Where, 'L' is the total length (cm), 'W' is the body weight (g), 'a' is the intercept and 'b' is the slope of the log-transformed linear regression, r^2 is the coefficient of determination to estimate the goodness of fit. Length- length relationships were determined by using total length, fork length and standard length measurements data in Past 4.11 software.

Fig. 1. Ujani Wetland: Fish collection sites

3. RESULTS AND DISCUSSION

Table 1 shows different length-weight parameters for *Garra mullya* observed during the present study. The length- weight relationships of fishes can be affected by many factors like condition of fishes, season, sex, sample size investigated, length ranges etc. Ecological conditions of the habitat and physiological variations of the animals are responsible for change in length-weight relationships in same species in different months of a year [5]. The total length of fishes investigated was ranged between 9.19 cm (8.94 g) to 15.26 cm (43.79g) whereas body weight ranged between 8.26 g (10.28 cm) to 50.66 g (15.00 cm). The relationship between total length and body weight was shown in Fig. 2. Majority of samples were lie between 10 to 14 cm total length range and 10 to 30 g weight ranges. In the present study authors recorded intercept (a) value of 0.0126 and slope (b) value of 3.0499 closely similar values were reported by Gorule et al. They reported intercept (a value) of 0.0150 and slope (b value) of 2.957 [16]. Mercy T.A. et al., 2018 found values close to the findings of present study. They reported 'a' value of 0.0116and slope value 3.0319 for 16 samples they investigated that indicated isometric growth in fishes as in present study [17]. Slope value (b) less than 3.0 is indication that fish becomes more slender because length increases more than height i.e., the growth is negatively allometric [18,19]. The value of 'b' generally found in range of 2.5 to 3.5 [2]. The slope value (b) equal to 3.0 indicates that body form of the fish remains constant at different lengths [20]. This type of relationship is found in fishes, which maintain a constant body shapes [21]. The differences in slope value (b) and intercept value (a) maybe due to different environmental conditions at habitat, fish capture procedures, sample number investigated for study, food availability etc. [22, 23]. The r^2 (coefficient of determination for goodness of fit) value obtained during the present study was 0.927 (Fig. 2) indicated a good fit as normal value ranges between 0 to 1.0 [19]. The Fulton's condition factor (K) value recorded for present study was 1.2798. K value greater than 1 showed that fishes were well being and good in condition in their habitat. Condition factor (K) gives idea about physical and biological conditions and changes in it due to feeding habits, parasitic infections etc [5].The length- length relationships between total length, standard length and fork length were represented in Figs. 3, 4 and 5 by using data in PAST 4.11 software. These relations between lengths indicated positive correlation for total length, standard length and fork length [24].

Table 1. Length-weight relations parameters of Garra mullya (N: Number of samples; TL: Total length; cm: centimeter; SD: Standard deviation; Min: Minimum; Max: Maximum; g: gram; Std. error: standard error)

Parameters	Results
N	202
Min. TL (cm)	9.19
Max. TL (cm)	15.26
TL range	9.19 - 15.26
TL (Mean±SD)	11.73147±1.35
Std. error	0.09531116
Length stand. Dev	1.354626
Median	11.559
Min. Weight (g)	8.26
Max. Weight (g)	50.66
Weight range (g)	8.26 - 50.66
Wight (Mean±SD)	21.54703±8.19
Std. error	0.5761722
Weight Stand. Dev	8.188946
Median	19.82
Fork length range	8.644- 14.479
Standard length range	7.193- 12.612
a value	0.01126
b value	3.0499
r^2 (Coefficient of determination)	0.927
Fulton's Condition factor	1.2798

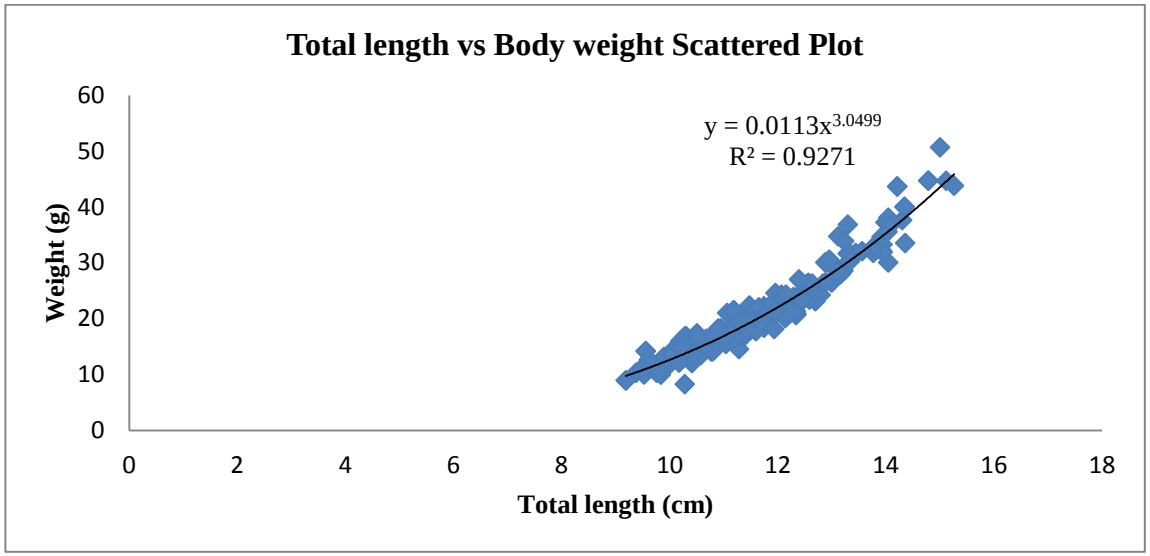

Fig. 2. Graph showing total length Vs body weight scattered plot

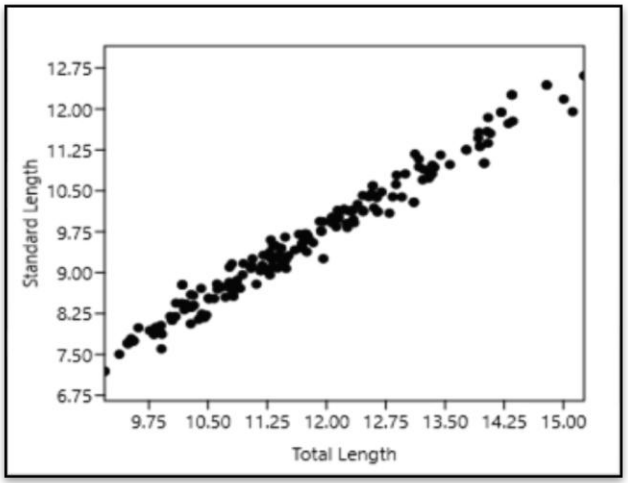

Fig. 3. Total length Vs standard length

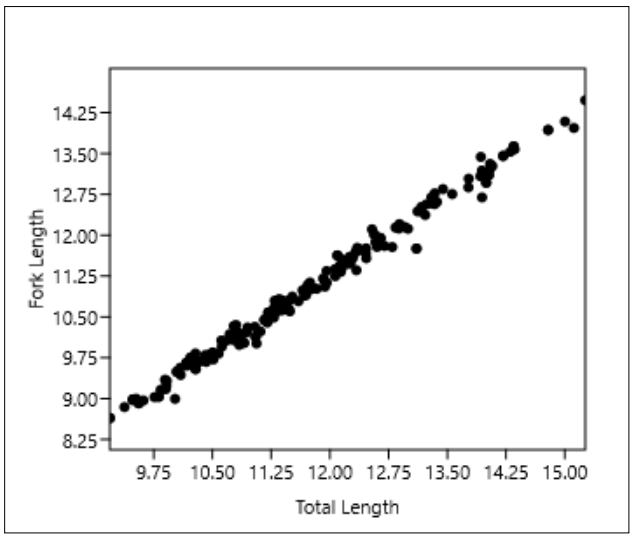

Fig. 4. Total length Vs fork length graph

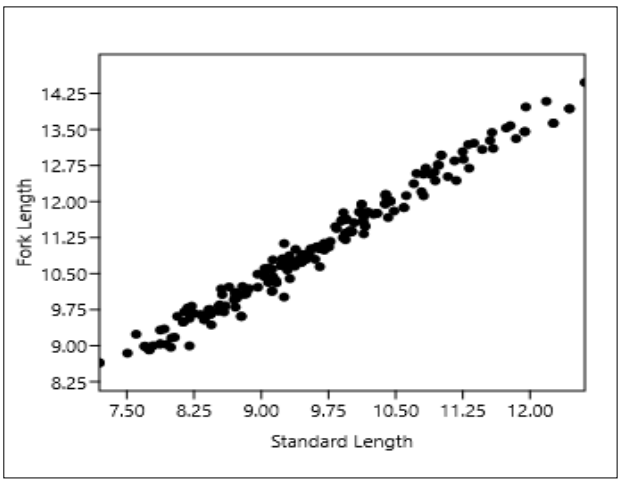

Fig. 5. Standard length Vs fork length graph

4. CONCLUSION

Authors reported slope (b) value of 3.0499 during present study that is indication of isometric growth of fishes in habitat. Fulton's condition factor (K) reported was 1.2798 that was more than 1.0 and indicated that fishes were in good physical form in habitat. The length weight relations and condition factor value reflected that fishes got sufficient food from their habitat.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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