



Length Weight Relationships of Small Indigenous Fish *Parambassis ranga* (Hamilton, 1822) 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 relationships parameters are useful in fisheries science to estimate weight of individual fish from its length. It can always be used for determination of condition indices and to compare life history and morphology of populations of given species. *Parambassis ranga* commonly called Indian glassy fish was investigated for the study of length-weight relationships (LWRs) from Ujani wetland, a dam constructed on Bhima river of Maharashtra state of India. During the study period of November 2021 to October 2022, total of 300 samples were collected from local fishermen and length-weight parameters were recorded in laboratory at Modern College, Ganeshkhind, Pune. The present study shows intercept (a value) of 0.0089. Slope (b value) was 3.2303 which lie in expected range of 2.5 to 3.5. The slope value was more than 3 i.e. above isometric growth value that indicates positive allometric growth of fish.

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1. INTRODUCTION

Study of fish species and populations are important to understand many vital biological aspects for their proper management of resources [1]. Length-Weight Relationship (LWR) is one of the most commonly used procedures for obtaining fisheries data [2]. The length-weight relationship (LWR) of fishes is commonly used tool to estimate the weight of a specimen from its length and vice versa, evaluation of fish populations and growth studies [3,4]. It has valuable role in fishery research for the study of fish population dynamics and growth patterns. It has importance in assessment of taxonomic differences in fish populations, metamorphosis stages and maturity [5]. Length-weight relationship parameters are useful in fisheries science to estimate weight of individual fish from its length. It can always be used for evaluating condition indices and to compare life history and morphology of populations of given species [6]. Fish can attain either isometric growth, negative allometric growth or positive allometric growth. These growth patterns are associated with no change in body shape as fish grows, shape becomes slender as it increases in weight and becomes relatively stouter as it increases in length [7]. The determination of condition factor is important index for study of fish biology, as it provides important information related to fish physiological state that individuals of a given length having higher weight are in a better condition. The condition factor describes the wellness of fish in the habitat. While study of wellness of any species having different sizes population, the relative condition factor was more appropriate index [8]. The changes in the condition factor based on length-weight relationships reflect seasonal alterations in the metabolic balance, maturation patterns and stomach repletion. Decline in condition factor values may be due reproductive period and changes in the foraging habits of certain species [9].

Present study was conducted to study length-weight relationships of small indigenous fish species (SIF), *Parambassis ranga* from Ujani wetland of Maharashtra. It is commonly called as Indian glass fish and found in India, Pakistan, Bangladesh, Myanmar, Thailand, Malaysia [10] and Nepal [11]. SIF generally eaten whole with bone, head and eyes so provide good quantity of

calcium and micronutrients [12]. SIF are a valuable food that provide vitamins and minerals with good quantity of proteins [13]. SIF have considerably good amount of vitamins A and D that are vital for human bones, teeth, eyes and skin [14]. SIF are part of diet of rural poor population as these have not good market price and are easily available [15,16]. Ujani wetland is a dam constructed on terminal region of upper Bhima river basin located on the western side of South Indian peninsula. River Bhima is a tributary of river Krishna originates in Western Ghats. The Ujani dam was constructed in year 1980 as a major dam and irrigation project. It has a hydroelectric power project which generates 12 MW of electricity [17]. The fishes were collected monthly from November 2021 to October 2022 from local fishermen at Ujani wetland. The present study aims at providing information on length-weight relations and condition factor of *Parambassis ranga* from Ujani wetland. This relation between length and weight of fish is helpful in assessment of physical status of fish in that habitat.

2. MATERIALS AND METHODS

2.1 Materials

Total of 300 samples of *Parambassis ranga* (Fig. 2) were collected from local fishermen from Ujani wetland backwater fishing areas (Fig. 1) during the study period of November 2021 to October 2022. Collected samples were then preserved in 10% formalin solution and brought to the laboratory for identification and LWRs study.

2.2 Methods

2.2.1 Identification of fishes

Fishes were identified based on literature of Jayaram [18].

2.2.2 Measurements of length and weight

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:



Fig. 1. Satellite view of Ujani wetland showing sites of fish collection



Fig. 2. Study fish: *Parambassis ranga*

$W = aL^b$ [19,3]. 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. Graphs were generated by using FISAT II statistical software.

3. RESULTS AND DISCUSSION

3.1 Results

Table 1 shows descriptive statistics and estimated parameters of LWRs such as total

length range, mean, standard deviation, body weight range, mean, standard deviation, a and b values, r^2 (coefficient of determination for goodness).

3.2 Discussion

'a' is the coefficient of the arithmetic weight-length relationship and the intercept of the logarithmic form. Ninety percent of the values ranged between 0.001 and 0.05. Current study recorded 'a' value of 0.0089, which is in expected range of 0.001 to 0.05 (Froese, 2006). The 'a' value close to present study of 0.0070 was

recorded by Baitha et al. [20]. The value of 'b' for the samples investigated during study was found to be 3.2303 which lie in expected range of 2.5 to 3.5 (Froese, 2006). The value of 'b' was found to be close to 3.309 of the findings of Baitha et al. [20]. The present study b value was higher than 2.794 recorded by Karna et al. [21] for *P. ranga* from Hirakud reservoir, Odisha, India. Islam et al. [22] reported slope, b value of 2.525 from Atrai and Brahmaputra rivers, Bangladesh. Winn et al. [23] found b value of 3.059 from Sunye lake, Myanmar which was close to the b value of this study.

The variation reported in b values may be because of differences in sample size investigated, habitat, variations in stomach fullness, sex of fishes, gonad maturity, season, health status of fish and differences in observed length of specimen [3,24,25]. The b value of 3.2303 reported during present study shows positive allometric growth as it is above 3.0 (isometric growth) level. Such positively allometric growth pattern shows large specimens have increased in height or width more than in length [3]. Fulton's condition factor that is free from regression parameters (a and b) calculated based on length and weight data of fish species was used to determine the physical fitness of fish. The present study reported Fulton's

condition factor of 1.353 that indicates fishes are in good physical state in their habitat [26].

Table 1. Length-weight relations parameters of *Parambassis ranga*

Parameters	Results
N	300
Min. TL (cm)	3.713
Max. TL (cm)	7.945
TL range	3.713 - 7.945
TL (Mean±SD)	5.735±0.8336
Std. error	0.04812831
Length stand. Dev	0.8336067
Median	5.737
Min. Weight (g)	0.64
Max. Weight (g)	8.07
Weight range	0.64 - 8.07
Wight (Mean±SD)	2.751±1.2695
Std. error	0.07329833
Weight Stand. Dev	1.269564
Median	2.615
a value	0.0089
b value	3.2303
r ²	0.909
Fulton's Condition factor	1.353

N: Number of samples; *TL*: Total length; *cm*: centimeter; *SD*: Standard deviation; *Min*: Minimum; *Max*: Maximum; *g*: gram

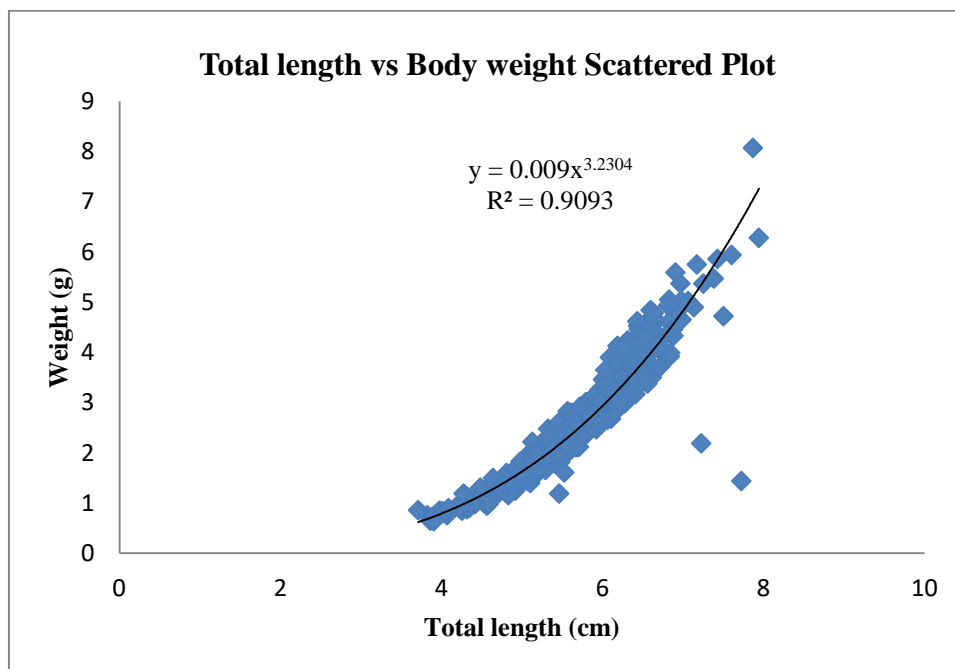


Fig. 3. Plot of Total length Vs body weight of *Parambassis ranga*

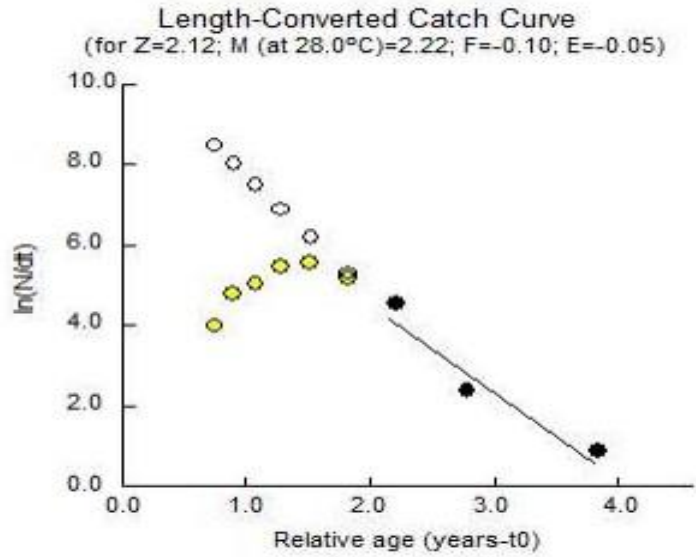


Fig. 4. Length- converted catch curve

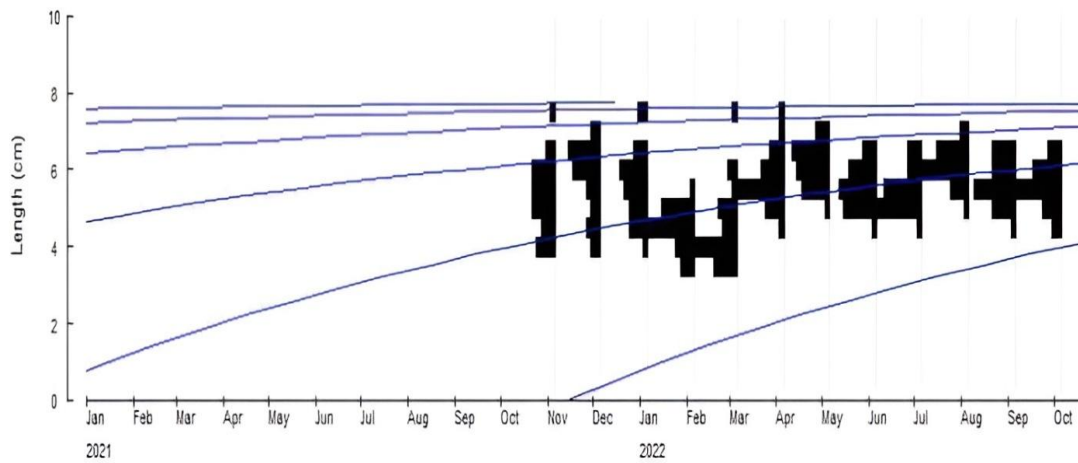


Fig. 5. Growth curve from November 2021 to October 2022

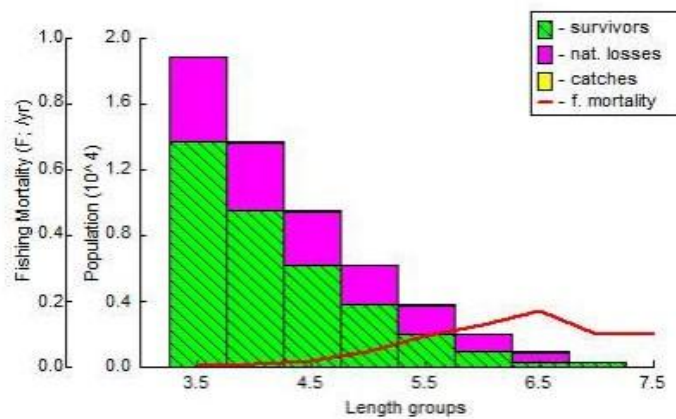


Fig. 6. Length- structured virtual population analysis (VPA)

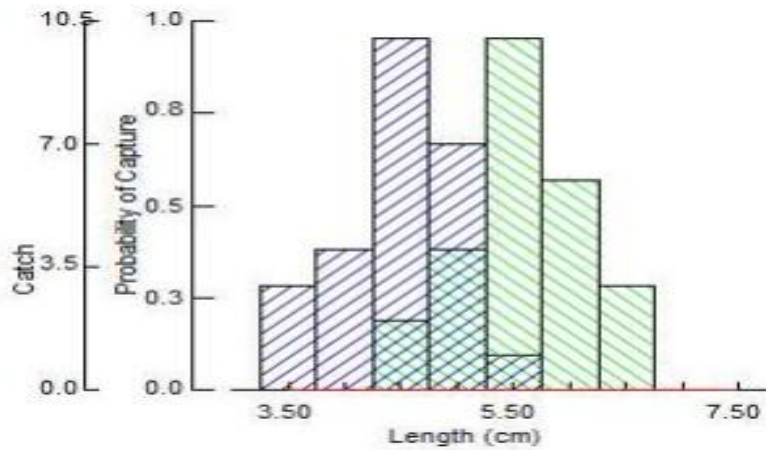


Fig. 7. Probability of capture

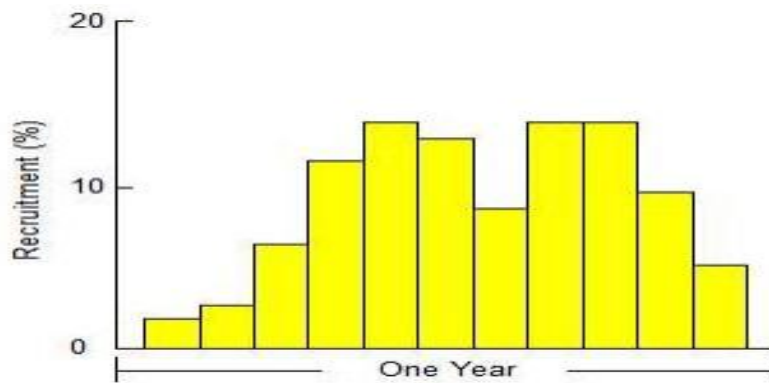


Fig. 8. Recruitment Pattern for 1 year

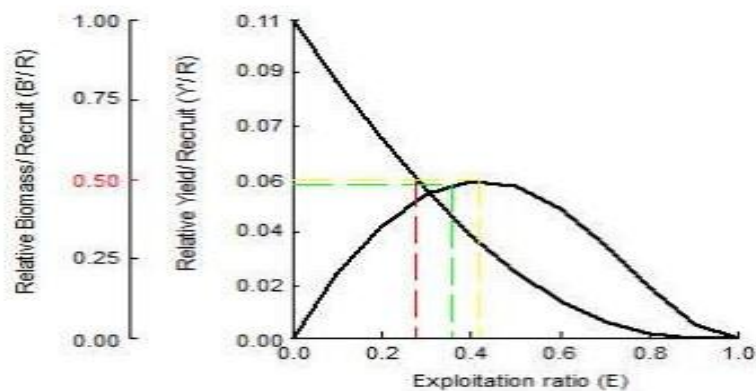


Fig. 9. Relative yield per recruit (Y/R) and relative biomass per recruit (B/R)

4. CONCLUSION

The present study showed positive allometric growth pattern of length-weight relationship of

Parambassis ranga from Ujani wetland. It reflected that the fish species is in good physical state in that habitat.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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