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# Length–weight relationships (LWR) of threatened Asian catfish, *Clarias batrachus* under poor availability in natural conditions from Unnao, Uttar Pradesh, India

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**ABSTRACT**

*The relation between length (L) and weight (W) was estimated for asian catfish, Clarias batrachus, now called Clarias magur, under poor availability in natural conditions. Samples were caught by different gears and a total 22 specimens (standard length 16.2-28.0 cm and total length 18.0-32.5 cm, av. wt., 46-251g) used in this study were caught with traditional fishing gear during January, 2008 - August, 2008. The estimation of parameter b of the length and weight relationship ($W=aL^b$) ranged between 2.0111 to 3.4727. The average allometric coefficient 'b' of the LWR was found close to the isometric value (b = 3.4890). The results further indicated that the LWRs were highly correlated ($r^2$ = 0.924389, $p<0.01$) and Fulton's condition factor (K) ranged, between 0.0830114 to 1.374421. Length-weight parameters can be used for several biological or fishery purposes to enable the derivation of weight estimates from given a value of length or vice-versa. We can conclude that this study has provided basic information on LWR and condition factor, which will be useful to fishery biologists in imposing adequate regulations for sustainable fishery management in the natural ponds, derelict water systems and culture system of this fish, in future, in Indian climatic condition.*

**Key words:** Length-weight relationship, *Clarias batrachus*, condition factor

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## INTRODUCTION

Weight-length relationship (WLR) is reported for 22 fishes, *Clarias batrachus*, belonging to family Clariidae. *Clarias batrachus*, now called *Clarias magur*, is an air-breathing threatened [1], endangered [2] catfish, normally breeds from April to August and attains a maximum length of 35cm and weight of 250g [3]. Locally known as Magur, is a fish of great demand and attracts the attention of farmers for its high market value in Bangladesh [4]. The relationship between length and weight in fishes is affected by a number of factors including seasons, habit, gonad, maturity, sex, diet, stomach fullness, health, preservation techniques and locality[5]. Weight–length relationships have several applications, mostly in fisheries stock assessment [6]. For estimation of weight-at-age [7] and the conservation of growth-in length is equivalent to the growth-in-weight [8]. The establishment of weight-length relationship (WLR) is often needed for the calculation of production and biomass of a fish population [9], based on visual census [10]. Finally, WLR allow life history and morphological comparisons between different fish species or between fish populations from different habitats and/or regions [11]. Weight-length relationship (WLR) is an important tool in fish biology, physiology, ecology and fisheries assessment [12]. Among several applications of WLR in fish biology, knowledge of these relationships is useful for the production of weight from length values as an indication of fish condition or for fish stock assessment [7,13]. Length-weight relationships (LWR) has both

basic and applied applications in fishery management practices [14-18]. It explore the basis for estimation of length from weight observations or reverse calculations and calculate biomass production of a fish population and information on natural stocks and/or organism condition. Length-length relationships (LLRs) are also useful in fisheries management for overall growth studies [19-25]. The condition of a fish exhibits the recent biological and physical circumstances, and varies due to changed feeding conditions, pathogen infestations, body physiology and other ecological factors [26-30]. Thus, the main aim of the present study is to complete WLR data in India, condition factors, especially for Asian catfish, *Clarias batrachus* under poor availability in natural condition in derelict water systems. In this study we report the parameters of length-weight relationships ($W=aL^b$) for 22 fishes collected from District Unnao of UP, India.

## MATERIALS AND METHODS

The samples of asian catfish, *Clarias batrachus* were collected from the non-drainable ponds and derelict waters located in Unnao District between January 2008 to August 2008 with the help of various gears and also hand-picked from swamp area. Fisheries management and research often require the use of biometric relationships in order to transform data collected the field into appropriate index [9,31]. One of the most commonly used in any analysis of fisheries data is the WLR ($W=aL^b$). The specimens were preserved in 4% buffered alcohol-formalin, packed in bottles and transported to the laboratory. All specimens (22) were measured for total length (TL) and standard length (SL) and average weight (g) using millimeter scale to the nearest 1 mm, while body weight (g) was determined with a digital balance to the nearest 0.01 g. All length–weight relationships were calculated using the least squares fitting method to estimate a and b parameters of the function $W = aL^b$ , where W and L data were log transformed, where W is the weight of the fish in grams; L is the total length in cm where coefficient '*a*' is the intercept in the *y*-axis, and the regression coefficient '*b*' is an exponent indicating isometric growth which equals to 3.0. The statistical significance level of $r^2$ was estimated and the parameters *a* and *b* were estimated by linear regressions on the transformed equation, $\log BW = \log a + b \cdot \log SL$[32]. To test for possible significant differences in both slope and intercept, the analysis of covariance was followed. All statistical analyses were considered significant at $p < 0.01$. The Fulton's condition factor (*K*) was calculated for each individual fish according to equation $K = (BW/SL^3) \times 100$. The obtained coefficients were analyzed with ANOVA.

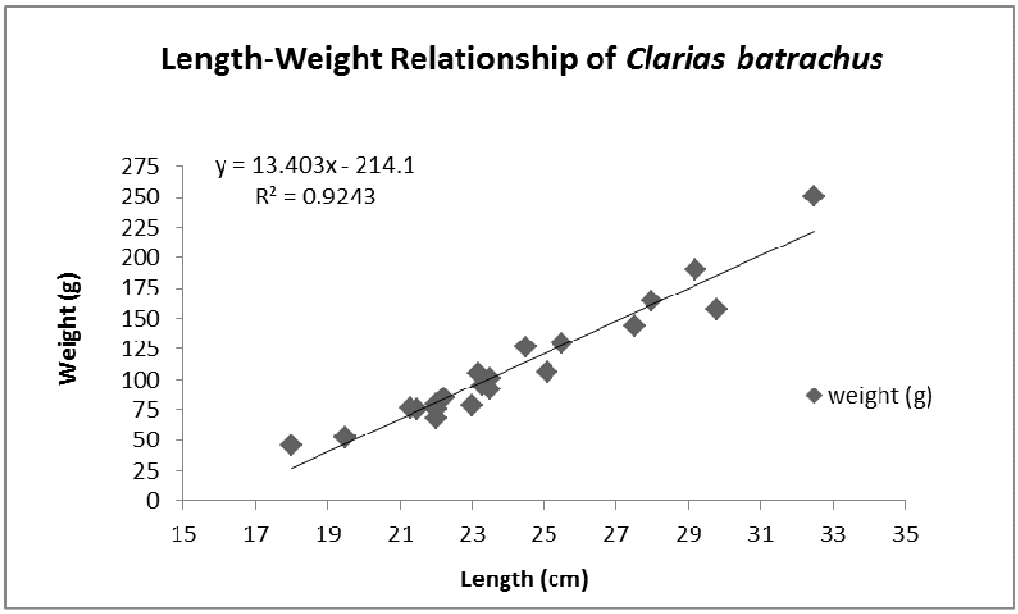
**Table 1: Length – Weight relationship in *Clarias batrachus***

| TL(Cm) | SL(Cm) | W(g) | SL% of TL | a | logW | b | $r^2$ | K |
|---|---|---|---|---|---|---|---|---|
| 29.2 | 24 | 190 | 82.2 | 0.0137 | 3.1452 | 3.62774 | 0.924389 | 1.374421 |
| 22 | 19.5 | 79 | 88.6 | 0.0107 | 2.4480 | 3.42664 | | 1.065426 |
| 21.5 | 19.1 | 75 | 88.8 | 0.0108 | 2.4020 | 3.41135 | | 1.076369 |
| 23.2 | 21 | 105 | 90.5 | 0.0113 | 2.6725 | 3.49256 | | 1.133787 |
| 24.5 | 21.5 | 127 | 87.8 | 0.0128 | 2.8032 | 3.52489 | | 1.277875 |
| 21.3 | 19.5 | 76 | 91.5 | 0.0102 | 2.4263 | 3.42286 | | 1.024967 |
| 29.8 | 26.5 | 157 | 88.9 | 0.0084 | 3.1253 | 3.65302 | | 0.843649 |
| 23.3 | 22 | 95 | 94.4 | 0.0089 | 2.6549 | 3.50447 | | 0.892186 |
| 22.2 | 20 | 84 | 90.1 | 0.0105 | 2.5035 | 3.44524 | | 1.050000 |
| 19.5 | 18.5 | 53 | 94.9 | 0.0084 | 2.1850 | 3.36355 | | 0.837068 |
| 18 | 16.2 | 46 | 90.0 | 0.0108 | 2.0111 | 3.28803 | | 1.081964 |
| 25.5 | 22 | 130 | 86.3 | 0.0122 | 2.8378 | 3.53922 | | 1.220887 |
| 23.5 | 23 | 101 | 97.9 | 0.0083 | 2.7293 | 3.53243 | | 0.830114 |
| 27.5 | 24 | 144 | 87.3 | 0.0104 | 2.9790 | 3.59457 | | 1.041667 |
| 32.5 | 28 | 251 | 86.2 | 0.0114 | 3.4727 | 3.74148 | | 1.143404 |
| 23.5 | 21 | 92 | 89.4 | 0.0099 | 2.5966 | 3.47857 | | 0.993413 |
| 28 | 24 | 164 | 85.7 | 0.0119 | 3.0570 | 3.61013 | | 1.186343 |
| 25.1 | 22.3 | 106 | 88.8 | 0.0096 | 2.7307 | 3.52319 | | 0.955853 |
| 22 | 19.2 | 68 | 87.3 | 0.0096 | 2.3517 | 3.40454 | | 0.960739 |
| 22 | 19 | 75 | 86.4 | 0.0109 | 2.3977 | 3.40874 | | 1.093454 |
| 23 | 20.2 | 78 | 87.8 | 0.0095 | 2.4698 | 3.44260 | | 0.946325 |
| 19.5 | 17 | 52 | 87.2 | 0.0106 | 2.1115 | 3.32139 | | 1.058416 |
| Average | | | | | | 3.4890 | | 1.049469 |

*TL = Total length; SL = Standard length; W = Weight*

## RESULTS AND DISCUSSION

The LWRs measured from 22 specimens of *C. batrachus* indicated that the calculated allometric coefficients were, in general, variable (Table-1). The fish LWR are affected by a series of factors including season, maturity, sex, habitat, diet, stomach fullness, health and preservation techniques [5,33-35]. The WLR were calculated for these 22 fishes living in natural habitat are depicted in graph-1. Overall mean of the b coefficient was 3.488964. A value of 3.0 indicates that the fish grows iso-metrically; and the values other than 3.0 indicate allometric growth. According to Froese [13], b of the length and weight relationship ($W=aL^b$) ranged between 2.0111 to 3. 4727 although they could vary between 2 and 4 [33]. Of the total 22 fishes examined, the longest captured fish was 32.5 cm (TL) and 28.0 (SL) and maximum weight was 251 g. The Fulton's condition factor (*K*) ranged from 0.0830114 to 1.374421. The mean Fulton's condition factor in relation to size class (*K*m = 1.049469) is shown in Table-1. Bhatt[36] demonstrated that highest values of $K_m$ occurs at SL <4.5 cm, gradually decreasing from SL 5.0 cm onwards to the lowest $K_m$ values at SL 6.0 cm, in case of *Mystus sp.* when their females showed breeding activity. In conclusion, this study has provided baseline information on the LWR and *K* of *C. batrachus* that would be useful for fishery biologists/managers to adapt the adequate regulations for sustainable fishery management in the natural rural ponds, derelict water systems and culture system of this fish, in future, in India.




**Graph 1: Length – Weight relationship in *Clarias batrachus***

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