

## Length-Weight Relationship and Condition Factor of a Near Threatened Fish Species *Ctenops nobilis* McClelland, 1845

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**Abstract** *Ctenops nobilis* is one of the highly demanding and important among the 8 indigenous Gourami species. Length weight relationships are important in fisheries science, notably to raise length-frequency samples to total catch, or to estimate biomass from underwater length observations. In the present study length-weight relationship and condition factor of *C. nobilis* were estimated from 400 individuals collected from foot hill of Assam border during May 2015 to April 2016. The total length of observed species ranged from 23 to 100 mm and the total body weight ranged from 0.11 to 10.6 g. The scatter diagram showed the linear relationship in between total and standard length and weight of the fish. The relationship of log values of length and weight was found highly significant justifying a strong relationship between L-W of *C. nobilis*. The condition factor of the fish was found to 2.005 indicating good condition of the fish.

**Keywords** Length-weight relationship, Condition factor, Gourami, *Ctenops nobilis*.

### Introduction

Length weight relationship as well as the condition factors is useful parameters for assessing the well-being of the individuals and for determining possible differences among different stocks of the same species (King 2007). The study of length-weight relationship of fishes provides a mathematical relationship between length and weight as a means of inter-conversion for estimating the weight from the known length and vice-versa. It not only helps for estimating the weight from the known length and vice-versa, also to determine the duration of gonadal maturation, increase or decrease in feeding activity, possibly due to modifications in food resources (Bhattacharya and Banik 2012). The study of length-weight relationship is useful in determining the condition factor or ponderal index and is a quantitative parameter of the state of well-being of the fish that will determine present and future population success by its influence on growth, reproduction and survival (Hossain et al. 2006). *Ctenops nobilis* McClelland, 1845, is one of the important native ornamental fish under Perciformes order and Osphronemidae genus is commonly known as Frail Gourami or Nobel Gourami. The fish is quite demanding and high priced due to its importance in ornamental fishery. The species is described from Sikkim, north-eastern India, West Bengal, Bihar and Assam states in India and rivers, ponds, beels of Bangladesh and more recently in Nepal (Rahman 2005 and BedFISH 2011). As per IUCN Red List the fish is now in threatened condition due to habitat loss (IUCN Red List 2010). In view of the importance of length-weight relationship and condition factor of Gourami fish species, considerable atten-

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tion has been paid by many workers (Awasthi et al. 2015 and Jafaryan et al. 2014) to this aspect of fishery biology but no work has been done yet on Nobel Gourami. So understanding the importance of this species, the length weight relationship and condition factor of *C. nobilis* was studied in the present work to assess the biology of the species.

## Materials and Methods

### Collection of sample

A total of 400 specimens were taken to study of length-weight relationship and condition factor in which 207 species are male, 118 are female and 75 species are un-identified sex. The species are randomly collected from Assam-Bangladesh border during May 2015 to April 2016. All samples are in live condition.

### Measurements of length and weight of the fishes

The measurements for length and weight were taken using vernier caliper and an electrical balance respectively. The total length was recorded to the nearest millimeter from the tip of the snout to the tip of the caudal fin and standard length was also recorded to the nearest millimeter from the tip of the snout to the base of the caudal fin. The weights were taken to the nearest g.

### Computational formula for length-weight relationship and condition factor

The length-weight data were analyzed according to the method given by Le Cren (1961). In the present study, the equation of the length-weight parabolic relationship of the form  $W=aL^b$  was used where, W represents weight of the fish in g and L denotes total length in mm and a the constant and b an exponent to which L can be raised. The equation can be expressed in logarithmic form as :  $\log W = \log a + b \log L$ . All calculations are done by using MS Excel 2010. Condition factor was calculated by using the following formula  $K=100W/L^3$  as given by Bagenal and Tesch (1978) Where W denotes weight of the fish in grams and L denotes total length of the fish in mm. The relative condition factor is calculated by  $Kn= W/W1$  given by Le Cren (1961). Where W denotes observed

**Table 1.** Descriptive statistics of male, female and combined sex of the fishes.

Sex	Analysis	Total length	Standard length	Weight
Combined	Minimum	23	15	0.11
	Maximum	100	96	10.6
	Mean	56.7669	46.5188	3.8930
	Median	53	45	2.5
	Mode	46	35	2.9
	Standard Error	0.8284	0.7894	0.1184
	Standard Deviation	16.5474	15.7689	2.3665
Male	Minimum	38	33	1.7
	Maximum	100	88	10.6
	Mean	60.6359	50.1068	4.4471
	Median	58	47	3.8
	Mode	53	44	2.9
	Standard Error	0.9517	0.9199	0.1395
	Standard Deviation	13.6599	13.2030	2.0025
Female	Minimum	35	25	1.3
	Maximum	100	96	10.1
	Mean	63.0854	52.0085	4.7854
	Median	62	50	4.2
	Mode	46	36	2.8
	Standard Error	1.4259	1.4347	0.2099
	Standard Deviation	15.4236	15.5189	2.2707

value of fish and W1 denotes calculated value of the fish.

## Results and Discussion

The descriptive statistics of male, female and combined sex of length weight data were presented in Table 1. It revealed that the total length and standard length of male fishes are ranges between 38 to 100 mm and 33 to 88 mm respectively whereas in case of female the total length and standard length are ranges between 35 to 100 mm and 25 to 95 mm respectively. The weight ranges between 1.3 to 10.1 g in case of female and 1.7 to 10.6 in case of male.

The length weight data of *C. nobilis* was collected and converted into logarithm form to estimate the length weight relationship and make it linear form for estimation of regression parameters. The length weight data was presented in the form of scatter diagram from which it is observed that the relationship is linear (Figs. 1, 2). From the closeness of the scatter diagram and from the parabolic nature of the plot, it is

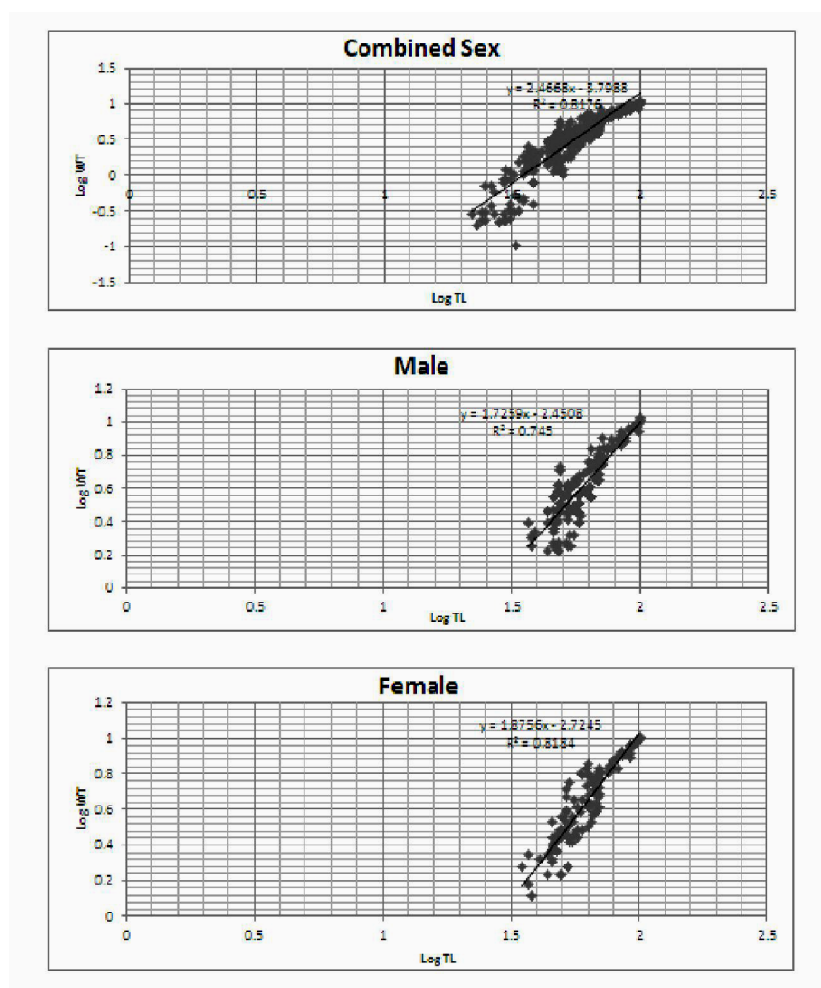


Fig. 1. Total length and weight relationship of combined, male and female *C. nobilis*.

clear that there is a good relationship between every variables of the crab and also the suitability of fitting the exponential formula,  $W=aL^b$  to the data.

Calculation of coefficient of correlation ( $r$ ) along with coefficient of determination ( $r^2$ ), adjusted  $r^2$  and Standard Error of the estimate were presented in the Table 2 which is showing a high degree of correlation between  $r$  and  $r^2$  parameters. The  $r^2$  was used as an indicator of the quality of the linear regressions. That justified the fact that there was a strong significant relationship between length and weight. In the present

study higher regression coefficient ( $b>3$ ) were recorded only for total length and weight relationship in case of combined sex which is a indication of positive allometric growth.

The exponential values ( $b$ ) for total length/weight relationship of combined sex is 3.7987 show that there is marked deviation from the isometric growth pattern and that is positive allometric growth. But in all other cases total length and standard length-weight relationship shows negative allometric growth. In this study  $b$  was found to be highly significant as evi-

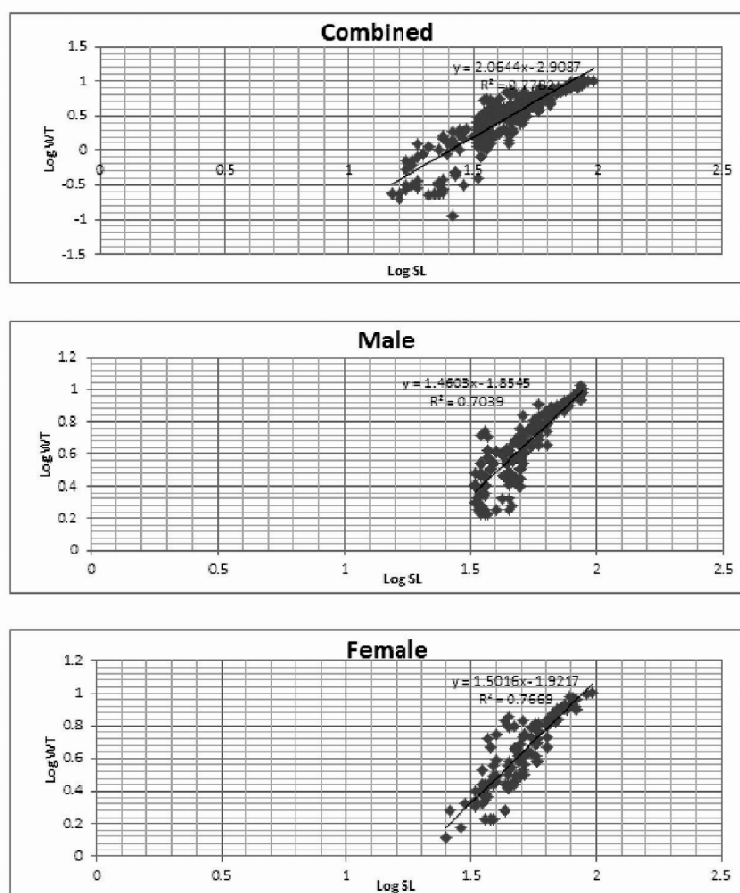


Fig. 2. Standard length and weight relationship of combined, male and female *C. nobilis*.

denced from t test presented in that Table 2. Here the calculated value of t is found to be much higher from the tabulated value of t justifying that the regression co-efficient calculated based on L-W data of *C.*

*nobilis* is significant.

The variation of condition factor reflects information on the physiological state of the fish. The

Table 2. Relationship between total length, standard length and weight of *C. nobilis*.

Variation	Sex	Equation	Regression statistics		t-stat	
			R	R <sup>2</sup>	Cons	Log L
Total length/weight	Male	Log W = -2.4508 + 1.7258L	0.8631	0.7449	-19.58	1.58
	Female	Log W = -2.7244 + 1.8756L	0.9047	0.8184	-18.56	22.86
	Combined	Log W = -3.7987 + 2.4668L	0.9041	0.8175	-37.39	42.23
Standard length/weight	Male	Log W = -1.8545 + 1.4602L	0.8389	0.7038	-16.59	22.07
	Female	Log W = -1.9217 + 1.5016L	0.8757	0.7669	-14.69	19.53
	Combined	Log W = -2.9086 + 2.0644L	0.8821	0.7781	-31.94	37.36

**Table 3.** Traditional and relative condition factor (K and Kn value) for total length/weight.

Sex	K value	Kn value
Male	2.005	1.05
Female	1.912	1.05
Combined sex	2.090	1.01

mean K value and mean Kn value was calculated of male, female and combined sex for total length/weight is metioned in Table 3. The condition factor indicates the good physiological condition like well growth, good L-W relationship of the fish. It is observed that the K value and Kn value of male fish are little better than female fish.

Several biological factors like sex (Pal et al. 2013), size of fish (Debraj 1973), physiological condition and gonadal maturity (Reddy and Rao 1992) and fatness have significant influence over length-weight relationship of fishes. The study on the sex ratio showed 1 female: 1.76 male. The result of the study will be useful for future researchers and policy planners and also helpful for the fishery managers to implement adequate adaptation-centric regulation for sustainable fishery management.

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