LENGTH-WEIGHT RELATIONSHIP OF TWO SPECIES OF *TRICHOGASTER* (COLISA) FROM BRAHMAPUTRA BASIN OF ASSAM

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ABSTRACT

Length-weight relationship (LWR) of *Trichogaster* species belongs to the Belontidae family inhabiting Brahmaputra basin, were studied. The fishes *Trichogaster fasciata* and *T. sota* were obtained from fish landing site at different floodplain beels of Brahmaputra basin during 2010 to 2011. The parameters 'a' and 'b' of the length-weight relationship of the form W = aLb and condition factor (K) = W1000/L^3 are presented for the two fish species. The results reveals that the value of regression coefficient 'b' of *Trichogaster fasciata*, tends to be higher during pre-monsoon and lower during winter while in *T. sota*, it tends to be higher during winter and lower during post-monsoon seasons. The exponential index 'b' for female (2.040) was found to be lower than that of male (2.424) in *Trichogaster species* while male (1.042) was lower than female (1.232) in *T. sota*. The 'K' value was found between 16.87 and 22.19 for *T. fasciata*, while it was between 19.71 and 33.59 for *T. sota*. This indicates an allometric relationship in the growth and healthy condition for both the species.

Key words: Length-weight, condition factor, fish species, Brahmaputra Basin, Assam

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INTRODUCTION

Length-weight relationship (LWR) is of great importance in fishery assessments and can give information on stock condition (Bagenal & Tesch, 1978; Garcia *et al*., 1998; Haimovici & Velasco, 2000). Further, length and weight measurements in conjunction with age data facilitates assessment on the stock composition, age at maturity, life span, mortality, growth and production (Beyer, 1987; Bolger & Connoly, 1989; King, 1996a and b; Diaz *et al*., 2000).According to Le Cren (1951) and Ricker (1975), this relationship was initially used to obtain information on the growth condition of fish and to find out whether the somatic growth was isometric or allometric. Pitcher & Hart (1982) reported length-weight has both applied and basic uses. Length-weight relationship is essential to provide basic information in fisheries biology. It is useful to determine the weight of an individual fish of unknown length or total weight from length frequency distribution and to compare specific growth among different region (Froese, 1998; Koutrakis & Tsiklivas, 2003).Very little works were done by Chandraika & Balasubramonian (1986); Anna Mercy *et al*. (2008); Manorama & Ramanujam (2010). Length-weight relationships data for fresh water fish resources of North-East India of Assam are also limited and the present contribution is aimed at compensating for this. Also, the fact that most of these fish species are in high demand in the

NE region, the use of LWR for assessment of their maturity, growth and production is important. Therefore, this study examines the LWR of *Trichogaster fasciata* and *T. sota* in Brahmaputra basin of Assam.

MATERIALS AND METHODS

The present study was conducted during 2010-2011 and the specimens were collected from certain floodplain wetlands of Jorhat district of Assam, India. The fishes were brought to the laboratory and preserved in 5% formalin. The collected fishes were classified under four seasons representing pre-monsoon (Mar-May), monsoon Jun-Aug), post-monsoon (Sept-Nov) and winter (Dec-Feb). Total length (cm) of individual fish was taken from the tip of the snout to the extended tip of the caudal fin using Vernier calipers. Body weight (g) of each fish was taken to the nearest gram using a top Mark Electronic Balance after blot-drying excess water from the body.The LWR was estimated by using the equation $W = aL^b$ (Ricker, 1973). The values of constant 'a' and 'b' were estimated from coefficient of regression equation. The condition factor was calculated by usual formula $(K) = 1000W/L^3$ (Pauly, 1984; Wootton, 1992); where W= weight in grams; L= total length (cm).

RESULT AND DISCUSSION

The length-weight relationships obtained for the males and females of both the species in different seasons have been shown in Table 1 (a) & (b). A total of 128 specimens of *Trichogaster fasciata* the average total length 7.5 cm and body weight 8.15 g while 114 specimens of *Trichogaster sota* average total length 4.4 cm and body weight 2.05 g were used for the studies. A linear relationship between the length and weight and as well as

condition factor was established for both males and females of the *Trichogaster* species. The regression equations represented as pooled data are as follows:

Trichogaster fasciata

Males: Y = -9.795 + 2.424X (r = 0.699)

Females: Y = -7.317+2.040X (r = 0.760)

Trichogaster sota

Males: Y =-2523 + 1.042X (r = 0.681)

Females: Y =-3.261+1.232X (r = 0.532)

The length-weight relationship was calculated for different seasons to see the seasonal impact on the relationship. Four seasons, viz., winter, pre-monsoon, monsoon and post-monsoon have been taken into consideration. In *T. fasciata*, the coefficients of regression (b) for different seasons were found within the range of 1.053 (monsoon) to 3.43 (pre-monsoon) for male and from 1.676 (post-monsoon) to 3.312 (winter) for female. While in *T. sota*, it was ranged from 1.002 (post-monsoon) to 1.493 (winter) for males and from 1.115 (pre-monsoon) to 1.358 (monsoon) for females. The co-efficient of correlation (r) for different seasons of *T. fasciata* was found from 0.559 to 0.943 and from 0.517 to 0.956 for male and female respectively. In *T. sota*, 'r' values for different seasons were ranged between 0.522 and 0.946 for males and 0.507and 0.909 for females.

A higher value of regression coefficient (b>3) was observed in pre-monsoon and winter in both the sexes of *T. fasciata* indicating of a positive allometric growth. However, lower value of regression coefficient (b<3) were recorded in monsoon and post monsoon seasons was an indication of negative allometric growth. In case of *T. sota*, the negative allometric growth (b<3) were recorded in

all the monsoon seasons in both the sexes. Similar observations were found in *Ilisha africana and Clarias gariepinus* (Marcus, 1982; King, 1996).
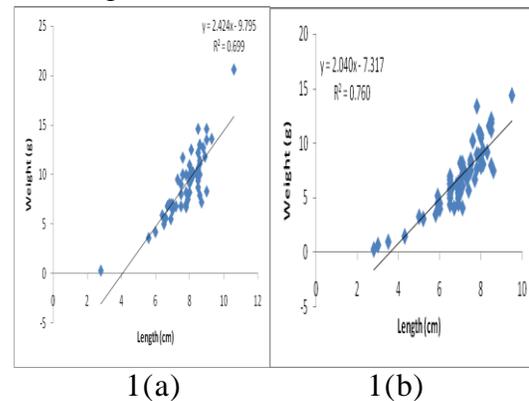

1(a)   1(b)

Fig. 1(a): Length-weight relationship in male of *Trichogaster fasciata* Fig. 1(b):Length-weight relationship in female of *Trichogaster fasciata*.

It is evident from the results that the value of regression coefficient 'b' of *T. fasciata*, tends to be higher during pre-monsoon and lower during winter while in *T. sota*, in overall it tends to be slightly higher during winter and lower during post-monsoon seasons. The intercept 'a' of all the seasonal was negative which indicates a perfect linear relationship between the variables. According to Bagenal & Tesch (1978a) and Goncalves *et al.* (1997) the 'b' value may change seasonally, and even daily and also between habitats. Therefore, it can be suggested that the length-weight relationship in fish is affected by different factors like age, sex, maturity, temperature, diet and habitats. It is assumed that for an ideal fish the exponent 'b' value is remains constant or in many cases it is found to be very close to 3. Hence, it is generally called the 'cube law'. Again, the cube law (b=3) is not confirmed for all fishes because

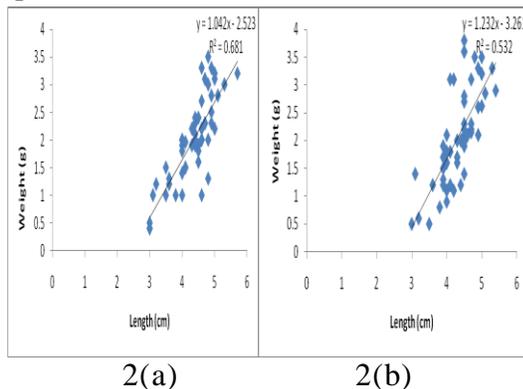growth causes for the change of their shape (Ali, 1999).

2(a)   2(b)

Fig. 2(a): Length-weight relationship in male of *Trichogaster sota* Fig. 2(b): Length-weight relationship in female of *Trichogaster sota*

Higher values of 'b' (> 3) were reported in carps (Bhatnagar, 1972; Khan, 1972). While exponential values 'b' less than 3 were reported in major carps (Pathak, 1975; Kulshrestha *et al*., 1993). The length weight relationship shows the values of 'b' was found to be less than 3 in *Labeo calbasu* (Ham.) and some cyprinid fish and even in the same species from different water bodies (Khan, 1988; Yousuf *et al*., 1992). The variations in the exponential values 'b' might be due to composite culture and certain environmental conditions (Narejo *et al*., 2003).

The correlation coefficient (r) values suggested that the length and weight of female (0.928) are slightly better correlated than the male (0.794) but reverse value has been recorded in *T. sota* where the relationship is closer male (0.808) than that of female (0.762). In both the species 'r' is highly correlated in all the seasons. As a whole, the maximum value of 'r' in both the sexes of *T. fasciata* is recorded in post-monsoon and that of minimum was recorded in pre-monsoon while, in *T. sota*, it was recorded the maximum and minimum in post-monsoon and winter respectively. In fish, the weight is considered to be a function of length (Weatherley & Gill, 1987). The exact relationship between length and weight differs among fish species according to their inherited body shape, and within a species according to the condition (robustness) of individuals, sometimes reflected by the food availability and growth within the weeks prior to sampling (Yousuf & Khurshid, 2008).

Seasons	Sex	'b'	'a'	'r'	'K'	Regression equation
Winter	M	2.601	-10.45	0.943	21.362	Y = -10.45 + 2.601 X
22(Dec-Feb)	F	3.312	-17.67	0.893	16.878	Y = -17.67 + 3.312 X
Pre-monsoon	M	3.43	-18.28	0.786	17.700	Y = -18.28 + 3.43 X
(Mar-May)	F	1.925	-5.586	0.517	18.613	Y = -5.586 + 1.925 X
Monsoon	M	1.053	-0.689	0.559	17.10	Y = -0.689 + 1.053 X
(Jun-Aug)	F	2.431	-9.87	0.899	21.64	Y = -9.87+ 2.431 X
Post-monsoon	M	2.337	-8.564	0.889	20.546	Y = -8.564 + 2.337 X
(Sep-Nov)	F	1.676	-4.842	0.956	22.198	Y = -4.842 + 1.676 X

Table 1(a): Length-weight relationship and condition factor (K) values for males and females of *Trichogaster fasciata* in different seasons.

Seasons	Sex	'b'	'a'	'r'	'K'	Regression equation
Winter	M	1.493	-4.283	0.856	26.816	Y = -4.283 + 1.493 X
(Dec-Feb)	F	1.213	-3.318	0.507	24.036	Y = -3.318 + 1.213 X
Pre-monsoon	M	1.033	-2.684	0.522	19.715	Y = -2.684 + 1.033 X
(Mar-May)	F	1.115	-2.893	0.840	22.979	Y = -2.893 + 1.115 X
Monsoon (Jun-	M	1.069	-2.334	0.946	26.842	Y = -2.334 + 1.069 X
Aug)	F	1.358	-3.139	0.793	33.599	Y = -3.139 + 1.358 X
Post-monsoon	M	1.002	-2.609	0.908	24.522	Y = -2.609 + 1.002 X
(Sep-Nov)	F	1.126	-3.168	0.909	21.085	Y = -3.168+ 1.126 X

Table 1(b): Length-weight relationship and condition factor (K) values for males and females of *Trichogaster sota* in different seasons.

As far as length-weight relationship of male and female of *Trichogaster* species is concerned, the regression line derived from the data for male and female showed a linear relationship between two variables viz., length and weight. It can be seen from Fig.1A & B and Fig. 2A & B that points are more or less very close to the regression line and hence it can be assumed that there is a close relationship between length and weight. The exponential index 'b' for female was found to be lower than that of male in both the species. This shows that a female is lighter in weight in relation to its length than their male counterparts. Similarly, the exponential index 'b' for the male was lower than female in *T. sota*. The exponential value (b) of the pooled length-weight data for male and female was found to be slightly deviate from the cube law (b=3), indicating an allometric pattern of growth in both the species. Moreover, the correlation coefficient (r) showed a very high degree of correlation between length and weight of male and female in both the species.

In *T. fasciata*, the highest mean K value (21.362) was recorded in winter and that of the lowest (17.10) in monsoon for male (Table 1A) while in females, the average highest condition factor was 22.198 (post-monsoon) and that of the lowest was 16.878 (winter). In case of *T. sota*, the average maximum and minimum K values were 26.842 (monsoon) and 19.715 (pre-monsoon) for males while in female, the maximum values (33.599) and minimum (21.085) were recorded during monsoon and post-monsoon respectively (Table 1B). As a whole, the values of mean condition factor *(K)* of *T. fasciata* were recorded as 19.18 ± 1.81 (male) and 19.83 ± 2.18 (female) while in *T. sota*, it was recorded as 24.47 ± 2.90 (male) and 25.42 ± 4.84 (female).

The values of the condition factor vary according to seasons and are influenced by environmental conditions, food availability and the gonadal maturity as has also been suggested by many workers (Jhingran, 1972; Bashirullah, 1975; Braga, 1986). In both the species, it has been observed that the female were found to be slightly in better condition than the male. Similar observations have also been

reported by Jhingran (1952) and Dasgupta (1991) in major carps and *Tor putitora* respectivel*y*. The relative condition factor (Kn) is an indicator of the general well being of the fish (Pandey & Sharma, 1997). The values of condition factor (K) indicated that both the species were in 'healthy' condition in their natural habitat.

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