Journal of FisheriesSciences.com

ORIGINAL ARTICLE

Research Article

Length-Weight relationship and Condition factor of *Parluciosoma daniconius* (Hamilton) from the upper Assam, India

Dakua Sanjay[1], SantoshKumar Abujam[2*], Islam Mofidul[3] and Basumatary Nilam[4]

[1]Dept. of Zoology, Aniruddha Deva Junior College, Dibrugarh-786003

[2]Dept. of Life sciences, Dibrugarh University, Assam, India-786004

[3]Dept. of Zoology, West Goalpara College, Assam, India – 783129

[4]Dept. of Zoology, Cachar College, Assam, India- 788001

Abstract:

Length-weight relationship of Parluciosoma daniconius (Ham.) had been carried out from two different waterbodies of upper Assam during 2011-2013. The co-efficient of regression (b) was recorded as 1.104 in juveniles; 1.86 in males; 2.12 in females. The result reveals that females have better growth than males and juvenile. Again, the 'b' value of male was found to be highest (1.348) in 7-8 cm and its lowest (1.087) in 4-5 cm. The highest 'b' value (2.427) of female was recorded in 3-4 cm while the lowest (1.393) in 5-6 cm. Further, the 'b' value of male was found to be highest (1.051) in monsoon while lowest (1.004) in post-monsoon. In female, it was ranged from 1.145 (monsoon) and 1.033 (pre-monsoon). In overall, both the sexes of P. daniconius also did not follow the cube law (b=3) and show allometric growth. The lowest Condition factor 'K' for male (1.010) was recorded in 6-7 cm and highest (1.578) in 3-4 cm while, for female the lowest (1.019) was in 7-8 cm and highest (1.952) in 3-4 cm. Again, the highest 'K' (1.242) was found in post-monsoon and lowest (1.019) in winter for male while, for females 'K' value fluctuated from 1.099 to 1.186 during monsoon and winter. Coefficient of correlation (r) shows more or less similar trend in all length groups as well as in seasons for male and female.

Keywords: Parluciosoma daniconius; Length-weight relationship; Condition factor; Assam

---

*Correspondence to:

Xiaohua Nie, Department of Life Sciences, Dibrugarh University, Assam, India-786004, Tel: 09401479699; Fax: 0373-2370323

E-mail: santosh.abujam@gmail.com

Introduction

FLength-weight relationship (LWR) and condition factor are important not only the mathematical relationship between its length and weight, but also to study the biology of a fish. It is one of the important morphometric characters that can be used for taxonomy and ultimately in fish stock assessment. LWR of a fish is essential, since various important biological aspects, viz., general well-being of fish, appearance of first maturity, onset of spawning, etc., can be assessed with the help of condition factor, a derivative of this relationship (Le Cren, 1951). In fishery science, the condition factor or K- factor is used in order to compare the 'condition', 'fatness' or well-being of fish and it is based on the hypothesis that heavier fish of a given length are in better condition (Bagenal & Tesch, 1978). Moreover, the LWR of fish is an important fishery management tool because they allow the estimation of the average weight of the fish of a given length group (Beyer, 1987). This analysis will reveal the extent to which the two variables, length and weight are related to each other and thereby help one to calculate with ease one variable when the other is known (Chandrika & Balasubramonium, 1986).

The study length-weight relationship of *P. daniconius* is very limited in NE region. So far, Kumar *et al*. (2005) studied on the length-weight relationship of *Rasbora daniconius* from Saravathi reservoir of Karnataka while Balescu (2005) reported the external morphology of *Rasbora argyrotaenia*. Again, Gaikwad *et al*. (2009) also studied on the length and weight relationship and morphometric of *Rasbora daniconius*. Generally, *P. daniconius* is a small fresh water fish, belonging to the family Cyprinidae and they prefer to live in wetland, water logged bodies, paddy fields, pond, road side ditches. They are fairly common in their abundance and probably the most important food fish in the rural areas. Due to their colour, size and playful behaviour, they are highly rated as aquarium fish in the region. As per IUCN (2014), *P. daniconius* was included in Least Concern category. Keeping the above views of its importance, therefore, present investigation has been taken up from the different waterbody of upper Assam, India.

Materials and Methods

Length-weight relationship

Length-weight relationship of an ornamental fish, *P. daniconius* had been carried out from the Maijan wetland ($27^0 30'$ 14.4″ N and $094^0 58'$ 04.8″ E) and Guijan Ghat ($27^0 34'$ 40.27″ N and $95^0 19' 29.54''$ E) of Brahmaputra river of upper Assam during 2010-2012. A total number of 475 specimens were dissected and out of which 345 males and 130 females (Figures 1 and 2). Apart from sex, the fish were classified into 5 size groups: 3-4, 4-5, 5-6, 6-7 and 7-8 cm. The length group 3-4cm was considered as juvenile, whereas the rest of the groups were separated into males and females. The length-weight relationship was calculated by the allometric growth formula as used by Ricker (1973) and Pauly (1983) in the form of: W=aL^b; where 'W' stands for weight, 'L' for length, 'a' is a constant and 'b' the exponent. The equation was transformed into a logarithmic as suggested by Le Cren (1951) and expressed as: Log W=Log a + b Log L; where 'a' is a constant being initial growth and 'b' is the growth coefficient. The values of 'a' and 'b' were determined empirically.

Condition factor

Changes in condition factor (K) or 'ponderal index' has been calculated by using the following formula (Wooton, 1992).

$$K = \frac{W \times 10^3}{L^3}$$

Where; K=condition factor, W=Mean weight of the fish (g) and L=Mean length of the fish (cm). The number 10^3 is a factor to bring the ponderal index (K) to near unity (Carlander, 1970).

Results

The co-efficient of regression 'b' value was 1.104 in juvenile; 1.86 in male and in case of female, it was 2.12. *P. daniconius* also did not follow the cube law (b=3). However, the 'b' value indicated that females had better growth than males and juveniles.

Juvenile: $Y = -3.497 + 1.104 X \left(r = 0.509 \right)$

Male: $Y = -2.317 + 1.86 X \left(r = 0.853 \right)$

Female: $Y = -1.176 + 2.12 X \left(r = 0.601 \right)$

As far as different length group is concerned (**Table 1**), the 'b' of male was found to be highest (1.348) in 7-8 cm and its lowest (1.087) in 4-5 cm. The highest 'b' value (2.427) of female was recorded in 3-4 cm while the lowest (1.393) in 5-6 cm. The result indicates that both the sexes shows allometric growth as well as higher length groups was better growth rate (b) for males and lower length groups was better growth for female. Again, the value of coefficient of correlation (r) shows similar in trend in all length groups of both the males and females (Table 1). The value of 'r' for males and females were positively correlated in the entire length group. The lowest 'r' value was found in the 3-4 cm (for males) and 7-8 cm length group (for females) and highest for males and females was recorded in the 7-8 cm and 5-6 cm length group respectively. Condition factor 'K' for male, the lowest (1.010) was recorded in 6-7 cm and its highest (1.578) in 3-4 cm while, in case of female, the lowest (1.019) was recorded in 7-8 cm and its highest (1.952) in 3-4 cm.

Length-weight Relationship of *P. daniconius* in Different Seasons

Length-weight relationship and condition factor of *P .daniconius* in different season has been shown in **Table 2.** The 'b' value of male was found to be highest (1.051) in monsoon while lowest (1.004) in post-monsoon. In case of female, it varied between 1.145 (monsoon) and 1.033 (pre-monsoon). In different season too, of *P. daniconius* did not follow the cube law (b=3) and reveals that both sexes showed allometric growth. Highest co-efficient of correlation (r) were ranged from 0.709 (pre-monsoon) to 0.943 (monsoon) for males while for females, it was varied from 0.734 to 0.925 during pre-monsoon and monsoon respectively. The value of 'r' for both sexes were strongly positive correlated in different season. Condition factor 'K' for males was found to be highest (1.242) in post-monsoon and lowest (1.019) in winter whereas in females 'K' value fluctuated from 1.099 to 1.186 during monsoon and winter respectively.

Discussion

The 'b' values for juvenile, males and females of *P. daniconius* were found to be lower than 3; indicating allometric growth. It

Table 1: Length- weight relationship of *P. daniconius* in different size group.

Length Group	Sex	' r '	' b '	' a '	' K '	Regression equation (Y=a + bX)
3-4	Male	0.550	1.122	-3.545	1.578	Y= -3.545 + 1.122X
	Female	0.783	2.427	-8.913	1.952	Y= -8.913 + 2.427X
4-5	Male	0.561	1.087	-3.894	1.243	Y= -3.894+ 1.087X
	Female	0.735	1.429	-5.276	1.533	Y= -5.276 + 1.429X
5-6	Male	0.588	1.095	-4.310	1.048	Y= -4.310+ 1.095X
	Female	0.859	1.393	-5.902	1.141	Y= -5.902 + 1.393X
6-7	Male	0.538	1.161	-5.103	1.010	Y= -5.103 + 1.161X
	Female	0.653	1.402	-6.189	1.059	Y= -6.189+ 1.402X
7-8	Male	0.827	1.348	-6.311	1.023	Y= -6.311 + 1.348X
	Female	0.642	1.753	-9.142	1.019	Y= -9.142+ 1.753X

Table 2: Length- weight relationship of *P. daniconius* in different season.

Season	Sex	' r '	' b '	' a '	' K '	Regression equation (Y= a + bX)
Winter	Male	0.843	1.020	-3.915	1.019	Y= -3.915 + 1.020 X
	Female	0.832	1.060	-3.595	1.186	Y= -3.595 + 1.060 X
Pre-monsoon	Male	0.709	1.013	-3.628	1.128	Y= -3.628 + 1.013 X
	Female	0.734	1.033	-3.463	1.161	Y= -3.463 + 1.033 X
Monsoon	Male	0.943	1.051	-3.728	1.239	Y= -3.728 + 1.051 X
	Female	0.925	1.145	-4.494	1.099	Y= -4.100 + 1.153 X
Post-monsoon	Male	0.886	1.004	-3.474	1.242	Y= -3.474 + 1.004 X
	Female	0.847	1.115	-4.193	1.170	Y= -4.193 + 1.115 X

Figure 1:*Parluciosoma daniconius* (Male).

Figure 2:*Parluciosoma daniconius* (Female).

reveals that female had more growth rate than juvenile and male. The females are always bigger in size as well as more weight than their male counterpart. Pathak (1975) also reported a '*b*' value of less than 3 in *Labeo calbasu* from Soni River and Harish Kumar *et al*. (2006) reported values less than 3 for the males and females of *Rasbora daniconius* from Karnataka. According to Rizvi *et al*. (2002) the value of '*b*' is generally close to 3 and may vary between 2.5 and 4.0. However, Dasgupta (1988), Abujam & Biswas (2014) and Dakua *et al*. (2015) have also observed an intraspecific difference in the '*b*' values of length in relation to body weight in *Acrossocheilus hexagonolepis*, *Macrognathus aral* and *Esomus danricus* respectively at different stages of their growth.

The '*b*' value of *P. daniconius* was significantly different from cube law and this indicates negative allometric growth. The slope (b) values slightly over 1, in all the length groups, however, in adult female, it was slightly over 2 in 3-4 cm. The variation in the '*b*' value is supposed to be under the influence of numerous factor viz, seasonal fluctuation, physiological condition of the fish at the time of collection, sex, gonadal development and nutritive condition of the environment of the fishes (Le Cren, 1957; Bagenal & Tesch, 1978b; Goncalves *et al*., 1997; Singh, 2011; Paswan *et al*. 2012). The correlation coefficient (r) for length-weight relationship was more or less, an increase in weight with increase in every unit of length. A positive correlation was found in the length group as well as in various seasons. The present findings are agreed with earlier studies on length and weight in other fish species (Merella *et al*. 1997; Singh, 2011; Paswan *et al*. 2012, Abujam & Biswas, 2014).

The relative condition factor (Kn) is an indicator of general well-being of the fish. 'Kn' values greater than 1 is an indicative of general well-being of the fish good. In the present study, the mean K value is found greater than one, and this shows that the studied fish specimens are in good condition. The variation in mean K values was higher during pre-monsoon and monsoon season, related to the breeding activities of the fish due to depletion of reserves during rainy season. Condition factor has also been closely linked with reproductive cycle for fishes in other water bodies (Saliu, 1997). Month wise and size group fluctuation of K factor shows no specific trend. Variations in the 'K' may be attributed to different factors, such as environmental condition, food availability, fullness of the alimentary canal and the gonadal maturity as has been suggested by many workers (Wheatherly, 1972; Bashirullah, 1975).

Conclusıon

It could be conclude that the exponent value (b) of *P. daniconius* does not follow the cube law and this indicates negative allometric growth. The 'b' values for juvenile, males and females were found to be below 3; showing an allometric growth rate. Again, 'b' value for both the sexes was deviate from 3 in different length as well as seasons. Correlation coefficient (r) for length-weight relation is high, with a positive correlation in the length group as well as during the season. K value for the fish species was found to be greater than one, and this indicate that the studied fish species are in good condition.

References

Abujam, S. K. S., Biswas, S. P. (2014). Length-Weight relationship and Condition factor of spiny eel *Macrognathus aral* from upper Assam, India. *Intl. J. Current Life Sci.*, **4**(3): 605-611.

Bagenal, T. B., Tesch, A. T. (1978). Conditions and Growth Patterns in Fresh Water Habitats. Blackwell Scientific Publications, Oxford.

Bagenal, T. B., Tesch, F. W. (1978b). Age and Growth patterns in fresh water habitats. In: Methods for Assessment of Fish Production in Freshwater. 3rd Edn T. B. Bagenal (ed). IBP. Handbook No. 3. Blackwell Scientific Pub, Ltd. Oxford, 101-136.

Balescu, C. A. (2005)**.** Comparative study on the external morphology of the encephalon in three fish species belonging to Cyprinidae family: *Amblypharyndon mola*, *Danio malabarius* and *Rabora argyrotaenia*. Biologie Animala, **1**: 145-150.

Bashirullah, A. K. N. (1975). Biology of *Lutjanus griseus* (L.) of the Cubagua Island, Venezuela. I. Length-weight, Body length-gut length relationship and condition factor". *Boletino Del Instituto Oceanografico*, Universidad de Oriente, **14**(1): 101-107, 71-494.

Beyer, J. E. (1987). On length-weight relationship computing the mean weight of the fish of a given length class. *Fishbyte*, **5**(1): 11-13.

Carlander, D. K. (1970). Handbook of Freshwater Fishery Biology. Vol. I, The Iowa State Univ. Press, Amer. Iowa.

Chandrika, B., Balasubramonium, N. K. (1986). Length-weight relationship of *Xenentodon cancila* (Ham.) (Teleostei: Belonidae). Proc. India Acad. Sci. **95**(2): 187-190.

Dakua, S. Abujam, S. K. S. Choudhury P., Biswas, S. P. (2015). Length-Weight Relationship of *Esomus danricus* (Hamilton) from upper Assam, India. Int. J. Fish. Aqu. Studies, **2**(4): 125-128.

Dasgupta, M., (1988). A study on the food and feeding habits of the Copper Mahseer *Acrossocheilus hexagonolepis* (McClelland). Indian J. Fish., **35**: 92-98.

Gaikwad, M. V., Pathan, T. S., Gaikwad, S. L., Hiwarale, D. K., Davne, P. M., et al. (2009). Feeding and Growth Patterns in Three Freshwater Fishes From River Godavari in Maharastra (India). Recent Res. Sci. Technol., **1**(5): 23-234.

Goncalves, J.M.S., Bente, L., Lino, P.G., Ribeiro, J., Canario, A.V.M., et al. (1997). Weight-length relationships for selected fish species of the small-scale demersal fisheries of the south and south-west coast of Portugal. Fish. Res., **30**: 253-256.

HarishKumar, K., Kiran, B.R., Purushotham, R., Puttaiah, E.T., Manjappa, S. (2006). Length-weight relationship of cyprinid fish, *Rasbora daniconius* (Hamilton) from Sharavathi Reservoir, Karnataka. Zoos' Print Journal, **21**(1): 2140-2141.

IUCN, (2014). IUCN Red List of Threatened Species. Version 2014.3. www.iucnredlist.org

Kumar, K.H., Kiran, B.R., Purushothom, R., Puttaiah, E.T., Manjappa, S. (2005). Length-Weight Relationship of Cyprinid Fish, *Rasbora daniconius* (Hamilton-Buchanon) from Sharavathi Reservoir, Karnataka. Zoos' Print Journal, **21**(1): 2140-2141.

Le Cren, E. D. (1951). The length-weight relationship and seasonal cycle in gonad weight and condition in perch. J. Anim. Ecol., **20**: 201-219.

Merella, P. (1997). Quetglas, A. Alemary, F. and Carbonell, A. Lengthweight relationship of fishes and cephalopods from the Balearic Islands (Western Mediterranean). Naga ICLARM quarterly, **20**(3-4): 66-68.

Paswan, G., Abujam, S.K.S., Dey, M., Biswas, S.P. (2012)**.** Length-weight relationship of two species of *Trichogaster* (Colisa) from Brahmaputra basin of Assam. J. Bioinno., **1**(1): 6-13.

Pathak, S.C. (1975). Length-weight relationship, condition factor and food study of *Labeo calbasu* (Ham.) from Loni reservoir (MP). J. Inland Fish. Soc., **7**: 58-64.

Pauly, D. (1983). Some simple methods for the assessment of tropical fish stocks. FAO Fish. Fisheries Technical Paper, 243-253.

Ricker, W. E. (1973). Linear regressions in fishery research. J. Fish. Res. Bd. Canada, **30**: 409-434

Rizvi, A.F., Nautiyl, P., Deshmukh, V.D. (2002). Comparison of growth in length-weight of *Lepturacanthus savala* and *Eupleurogammus muticus* from Mumbai coast. University of Allahabad Studies, **1**(1): 57-60

Saliu, J.K.O. (1997). Age, growth, feeding and reproductive ecology of the Characid: *Brycinus nurse* (Paugy) in Asa reservoir, Ilorin, Nigeria. Ph. D. Thesis, University of Ibadan, Nigeria.

Singh, S.K.A. (2011). Studies on ecology, biology and rearing feasibility of two spiny eel, *Macrognathus aral* (Bloch & Schneider) and *Macrognathus pancalus* (Hamilton-Buchanan) from Upper Assam. Ph. D Thesis, Dibrugarh University.

Wheatherly, A.H. (1972). Growth and ecology of fish populations. London, Academic Press, pp. 293.Wooton, R. J., (1992). Fish ecology. Tertiary Level Biology. Blackies, New York, p. 212.