LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF FRESHWATER FISH *TILAPIA MOSSAMBICA*

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(Received on Date: 5th August 2016 Date of Acceptance: 10th September 2016)

ABSTRACT

The present study describes the length – weight relationship (LWR) and condition factor (k) from 1050 specimens of *Tilapia mossambica* to determine the growth pattern. The experimental fish ranged from 0.50 to 150 cm and 3.00 to 350 g in length and weight respectively. The obtained correlation coefficient for length- weight relationship was ranged between 0.60 and 0.98. There was a significant correlation between length and weight. This suggests that the positive allometric growth from the specimen sampled. The mean values of computed condition factor for all the specimens of *T.mossambicas* was 0.79 which indicated that the good health condition of the specimens.

Key words: LWR, condition factor and *T.mossambica*

No: of Tables: 2 **No:of Figures: 2** **No:of References: 22**

INTRODUCTION

Fisheries management and research often require the use of biometric relationships in order to transform data collected in the field into appropriate indices (Ecoutin and Albaret,2003). Length – weight relationship (LWR) of fishes are important in fisheries and fish biology because they allow the estimation of the average weight of the fish of a given length group by establishing a mathematical relation between them (Sarkar *et al.,* 2008 and Mir *et al.,* 2012). Like any other morphometric characters, the LWR can be used as a character for the differentiation of taxonomic units and the relationship changes with the various developmental events in life such as metamorphosis, growth and onset of maturity (Thomas *et al.,* 2003). Besides this, LWR can also be used in setting yield equations for estimating the number of fish landed and comparing the population in space and time (Singh *et al.,* 2011). LWR parameters (a and b) are useful in fisheries science in many ways, to estimate weight of individual fish from its length, to calculate condition indices, to compare life history and morphology of populations belonging to different regions (Sani *et al.,* 2010) and to study ontogenetic allometric changes (Teixeira de Mello *et al.,* 2006).Length-weight relationships can be used to predict weight from length measurements made in the yield assessment (Pauly, 1993). Fish can attain either isometric growth, negative allometric growth or positive allometric growth. Isometric growth is associated with no change of body shape as an organism grows. Negative allometric growth implies the fish becomes more slender as it increase in weight while positive allometric growth implies the fish becomes relatively stouter or deeper-bodied as it increases in length (Riedel *et al*., 2007). The condition factor which show the degree of well-being of the fish in their habitat is expressed by 'coefficient of condition' also known as length – weight factor. This factor is a measure of various ecological and biological factors such as degree of fitness, gonad development and the suitability of the environment with regard to the feeding condition (Mac Gregoer, 1959). When condition factor value is higher it means that the fish has attained a better condition. The condition factor of fish can be affected by a number of factors such as stress, sex, season, availability of feeds and other water quality parameters (Khallaf *et al*., 2003).

Tilapia mossambica could be easily identified by dark bands or stripes found on their bodies are most prominent in mature forms. They inhabit freshwater and water bodies of low salinity, as is typical of most *Tilapia species* (Olurin and Aderibigbe 2006). Hence the present study aims to provide information on the length-weight relationship and condition factor of freshwater fish *Tilapia mossambica*.

MATERIALS AND METHODS

Our study estimates LWR of 1050 freshwater fish *Tilapia mossambica*. The fish samples were collected from river Thamirabarani during January–March 2016. After collection, the specimens were transported to the laboratory in the large polyethylene bag with 5% formalin. The collected specimens were washed and mopped on filter paper to remove excess water from the body surfaces.

Length of the fish was measured to the nearest cm and weight upto 0.1 gm by using digital weighing balance respectively. The experimental fish were ranging from 0.5-150 cm in total length (TL) and 3-350 gm in weight respectively.

Length and weight relationship and condition factor:

The relationship between length and weight of fish was analysed by measuring length and weight of fish specimens collected from study area. The statistical relationship between these parameters of fishes were established by using the parabolic equation by Froese (2006).

$$W = aL^b$$

Where, W = weight of fish (g), L = length of fish (cm), a = constant and b = an exponential expressing relationship between length-weight.

The relationship ($W = aL^b$) when converted into the logarithmic form gives a straight line relationship graphically

$$\text{Log } W = \text{Log } a + b\text{Log}L$$

Where b represents the slope of the line , Log a is a constant.

Fulton's condition factor (K) : Fulton's condition factor K was calculated using Fulton (1904)

$$K = W \times 100 / L^3$$

Results and Discussion:

Length and weight relationship: The length–weight relationship equations were determined for sexes combined only. LWR relationship provides information on growth patterns and growth of animals. During their development, fish are known to pass through stages in their life history which are defined by different length–weight relationships. The mean lengths for *T.mossambicas* were 11.82 ± 3.2, 46.11±2.93, 77.9±2.62, 95.3±3.4 and 136±2.4 cm respectively, while the mean weights were 37.32±4.8, 147.44±5.5, 177.12±5.89, 276.66±6.21 and 300.40±7.6 g respectively. The empirical values were plotted against their respective weight on an arithmetic scale, smooth curve was obtained (Fig-1). Statistical analysis of LWR showed that the regression coefficients obtained from length – weight relationships (LWR) are presented in table-1. There was a significant correlation between length and weight. The expression can be transformed logarithmatically as suggested by Froese (2006). A plot of log weight against log length yielded a straight a line (Fig-2). This showed that, which are indicative of isometric or allometric growths differences between all groups.

Condition factor:

The computed condition factor for the experimental fish is shown in table 2. Condition coefficient is one of the standard practices in fisheries which is used as an indicator of the variability attributable to growth coefficient (b). Here, the individual fish a species condition is determined based on the analysis of length weight data reflecting that the heavier fish at a given length is in better condition (Bolger and Connolly,1989), hence indicating favourable condition. The differences were attributed to the effect of eutrophication and pollution on growth

and other biological aspects of *Oreochromis niloticus* as suggested by Khallaf *et al*., (2003). Similar result is also observed by Bhuiyan and Biswas (1982) in *Puntius chola*, Afroze *et al.,* (1992) in *Amplypharyngodon mola*, Hoque and Hossain (1992) in *Mystus vittaus* , Alam *et al.,* (1994) in *Ailia coila*, Mortuza and Mokarrama (2000) in *Botia lohachata*,

Santic *et al.,* (2006) in *Trachurus mediterrsneus* and Dadzie *et al.,* (2008) in *Parastromateus niger*. The study presented the basic information on length – weight relationships and condition factor of *T.mossambica* of study area which would be useful for fishery managers as well as the sustainable management. Findings of the present work will help in future research in *T.mossambicas*.

Class interval (cm)	Mean total length (cm)	Mean total weight (g)	a	b	R^2
< 30	11.82	37.32	0.778	5.122	0.605
30 – 60	46.11	147.44	0.973	2.893	0.935
60 – 90	77.9	177.12	0.672	3.629	0.768
90 – 120	95.33	276.66	0.996	0.993	0.986
120 – 150	136.44	300.40	0.813	1.283	0.618

Table 1: LWR between total weight (cm) and wet weight (g)

Table 2: Condition factor (K) values for combined sexes of *T. mossambica*

Length group (cm)	Observed weight (g)	Calculated weight (g)	Condition factor (K)
<30	37.32	61.32	3.71
30 – 60	147.44	129.79	0.13
60 – 90	177.12	218.37	0.05
90 – 120	276.66	260.85	0.03
120 – 150	300.40	335.56	0.01

Figure 1: Length-weight relationship of sexes combined *T.mossambica*

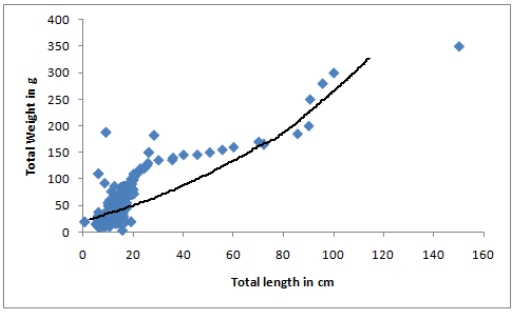
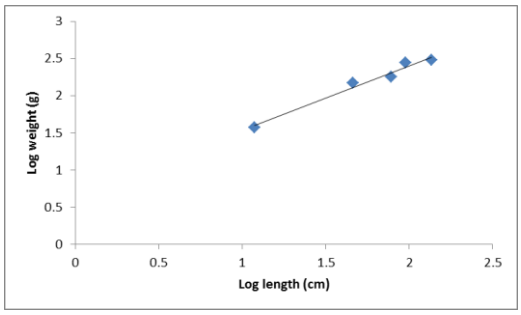


Figure 2 : Log L- log W relationship of sexes combined *T.mossambica*



REFERENCES

Afroze,S., Hossain, M.A and Parween S. (1992). Notes on the size frequency distribution and length – weight relationship of freshwater fish *Amblypharyngodon mola* (Hamilton) (Cypriniformes:*Cyprinidae*). *Univ. J. Zool. Rajshahi Univ*.10& 11: 103-104.

Alam M.R., Mortuza M.G, Islam M.S. and Hossain M.A. (1994). Notes on the size frequency distribution and length-weight relationship of the freshwater fish *Ailia coilia* (Hamilton-Buchanan) (Siluriformes :*Schibeidea*). *Univ. J. Zool. Rajshahi Univ*. 13: 69-70.

Bhuiyan A.S. and Biswas B. (1982). Studies on morphometry of *Puntius chola* (Hamilton-Buchanan) (Cypriniformes :*Cyprinidae*). Univ. J. Zool. Rajshahi Univ. 1:29-34.

Bolger, T., P. L. Connolly, P. L (1989). The suitable indices for the measurement analysis of fish condition. *Journal of Fish Biology*. 34:171-182.

Dadzie S., Abou-Seedo F. and Manyala J.O. (2008). Length–length relationship, length–weight relationship, gonadosomatic index, condition factor, size at maturity and fecundity of *Parastromateus niger* (Carangidae) in Kuwaiti waters. *J. Appl. Ichthyol.* 24: 334-336.

Ecoutin, J.M. and J.J. Albaret.(2003). Length-weight relationship of 52 fish species from West African estuaries and lagoons. Cybium, 27, 3-9.

Froese, R. (2006). Cube law, condition factor and weight–length relationships: history, meta-analysis and recommendations. *Journal of Applied Ichthyology* 22:241–253.

Fulton,T.W (1904). The rate of growth oh fishes. *Twenty-second Annual Report, Part III.* Fisheries Board of Scotland, Edinburgh, pp.141-241.

Hoque M.A. and Hossain M.A. (1992). Length-weight relationship and condition factor of the cat fish *Mystus vittatus* (Bloch) (Cypriniformes:*Bagridae*). *Univ. J. Zool. Rajshahi Univ*. 11: 113-114.

Khallaf, E. A., M. Galal and M. Authman. (2003). The Biology of *Oreochromis niloticus* in a polluted canal. *Ecotoxicol*, 12: 405-416.

Mac Gregoer, J. S. (1959). Relation between fish condition and population size in the sardine (*Sardinops* cacrulea). U.S. Fishery Wild Service, *Fish Bulletin,* 60:215-230.

Mir, J.I., U.K.Sarkar, A.K. Dwivedi, O.P.Gusain, A.Pal and J.K.Jena (2012): Pattern of intrabasin variation in condition factor, relative condition factor and form factor of an Indian Major Carp, *Labeo rohita* (Hamilton-Buchanan,1822) in the Ganges Basin, India. *Europ. J. Biol.Sci.,* 4, 126-135.

Mortuza M.G. and Mokarrama N.T. (2000). Notes on the length-weight relationship and condition factor of mud loach *Botia lohachata* (Chaudhuri) (Cypriniformes:Cobitidae). *Univ. J. Zool. Rajshahi Univ*. 19: 113-114.

Olurin, K.B., Aderibigbe, O.A (2006). Length-Weight Relationship and Condition Factor of pond reared juvenile *Oreochromis niloticus*. *Journal of Zoology,* 1:82-85.

Pauly, T.A. (1993). General characters for the classification of the cichlid family. Ricker, W.E. (Ed.). Blackwell, Oxford.

Riedel, R., Caskey, L.M and Hurlbert, S.H. (2007). Length-weight relations and growth rates of dominant fishes of the Salton Sea: implications for predation by fish-eating birds. Lake and Reservoir Management. 23:528-535.

Sani, R., B.K. Gupta, U.K. Sarkar, A. Pandey, V.K. Dubey and W.S. Lakra (2010) : Length weight relationship of 14 Indian freshwater species from river Betwa (Yamuna River tributary) and Gomti (Ganga river tributary) *J. Appl. Ichthyol*., 26, 456-459.

Santic M., Pallaoro A. and Jardas I. (2006). Co-variation of gonadosomatic index and parameters of length-weight relationships of Mediterranean horse mackerel, *Trachurus mediterraneus* (Steindachner,1868), in the eastern Adriatic Sea. *J. Appl. Ichthyol.* 22: 214-217.

Sarkar, U.K., P.K. Deepak and R.S. Negi (2008): Length-weight relationship of clown knifefish *Chitala chitala* (Hamilton 1822) from the Ganga basin, India. *J. Appl. Ichthyol*., 25, 232-233.

Singh,N.O., D.Sarma and N.G.Singh (2011): Length-weight relationship of *Tor putitora* (Hamilton) from Kosi River Uttarakhand considering different stages of its lifespan. *Indian J. Fish*., 58, 35-38 (2011).

Teixeira de Mello, F., C. Iglesias, A.I. Borthagaray, N. Mazzco, J. Vilches, D. Larrea and R Ballabio (2006): Onthogenic allometric coefficient changes. Implications of diet shift and morphometric attributes in *Hoplias malabaricus* (Bloch) (Characiforme, *Erythrinidae*). *J. Fish Biol., 69*, 1770-1778.

Thomas, J.S., Venus and B.M. Kurup (2003): Length-weight relationship of some deep-sea fish inhabiting continental slope beyond 250 m depth along West coast of India *Naga, World Fish Center Quart*., 26, 17-21.