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Length-weight relationship and condition factor of *Dawkinsia filamentosa* (Valenciennes, 1844) in different aquatic habitats

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Short Communication

Abstract

The growth rate of a species in any aquatic environment is an indicator of the water quality of the system. In the current study, the Length-weight relationship (LWR) and the condition factor of *Dawkinsia filamentosa* from various aquatic ecosystems especially lotic, lentic and brackish lentic systems were compared. It was observed that growth rate of the fish was more in brackish lentic systems. The study showed that already reported growth rate (b) of the species in brackish lentic systems is around 3.273 indicating proximity towards the isometric growth pattern as compared to the growth rate in reservoirs (2.3184) and that in lentic systems (3.116) obtained from present study. Similar studies supplemented with environmental variables can be used to study the health status of the ecosystem. The best system suitable for the adaptive growth of the species can be ascertained only after a holistic approach involving environmental variables.

Keywords: *Lotic, lentic, LWR, condition factor, growth rate*

Introduction

Length-weight relationship (LWR) is an important tool used in local and inter-regional morphological comparison of populations (Froese, 2006; Arslan *et al.*, 2004). The use of LWR includes stock assessment, estimation of standing crop biomass, estimation of weight at age, evaluation of the index of well-being of fish population and assessment of age structure and function of fish populations (Pauly, 1993; Petrakis and Stergeiou, 1995; Bagenal and Tesch, 1978). LWR determines the condition of fishes using an index called condition factor (Gurkan and Taskavak, 2007; Ujjania *et al.*, 2012; Alam *et al.*, 2014), which is an important biological parameter as well as an indicator of the suitability of a specific water body for growth of fish and an index of species average size. Various studies have attempted to establish the condition factor (K) as a function of physiological features of fish, life cycle, environmental factors and food availability in the environment (Ujjania *et al.*, 2012; Dan-Kishiya, 2013; Martin-Smith, 1996).

Dawkinsia filamentosa (Valenciennes, 1844), belonging to the family Cyprinidae under the order Cypriniformes, is found to be a common inhabitant of rivers and lakes. This species forms a fishery in various water bodies ranging from brackish water

lentic systems (Vembanad Lake) to lotic systems (rivers) and impounded manmade lacustrine environments (man-made lentic systems). Abraham (2015) studied the length-weight relationship of *D. filamentosa* in brackish water lentic system. The present study aimed to assess the length-weight relationship and condition factor of *Dawkinsia filamentosa* (Valenciennes, 1844) in various aquatic ecosystems.

Material and methods

Study site

Two stations, namely Pothundi (a manmade impoundment) in Palakkad district of Kerala and nearby tributary of Ayalampuzha were identified for this study. Pothundi reservoir is a small reservoir of 364 ha with geographic co-ordinates 10.5390N and 76.6364E and is a man-made lentic system. Meanwhile, the other study site, Ayalampuzha is a river (a lotic system) draining in to the Pothundi reservoir. *D. filamentosa* forms a major fishery in Pothundi reservoir whereas it forms a minor subsistence fishery in Ayalampuzha, the lotic system (Fig. 1).

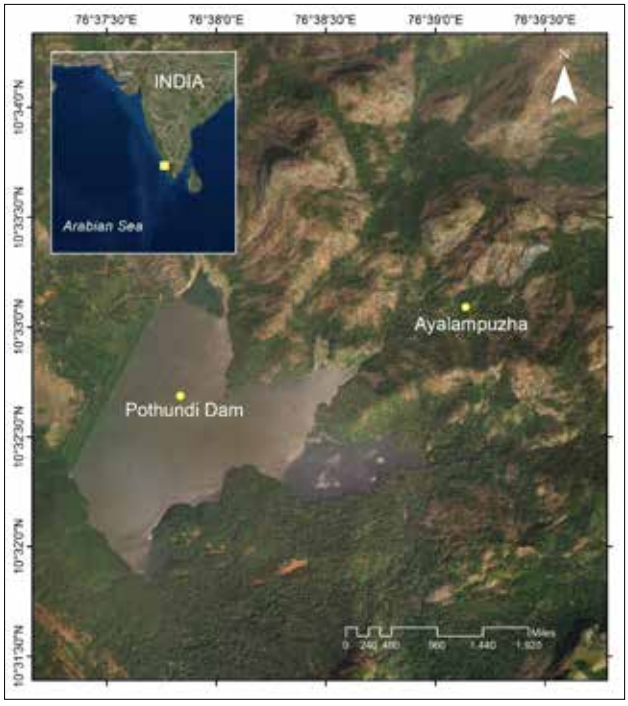

Fig. 1. Sampling stations for the study, Pothundy (lentic environment) and Ayalampuzha (lotic)

Sampling procedure

A total of 64 specimens of different sizes ranging from 1.79 cm to 30.5 cm TL were collected using gillnets from the study sites during April 2016 to May 2017. Length of fishes was measured with an mm scale and weighed with a top loading electronic balance in fresh condition to the nearest 1mm and 0.1g respectively.

Statistical procedures

The length-weight relationship was determined by the equation $W = aL^b$ (Le Cren, 1951), where 'W' is total weight (in g), 'L' is total length (in cm), 'a' is the intercept and 'b' is the slope. The slope determines growth pattern of the studied species. The logarithmic transformation of the equation, expressed as: Log W = a+b Log L (Wang *et al.*, 2012; Kahraman *et al.*, 2014), was performed to estimate the parameters a and b. The degree of correlation between the variables was computed by the coefficient of determination (r^2). The student's t-test (t_s) was used to determine whether the parameter b is significantly different from the expected or theoretical value of 3 (i.e., the value of slope for an isometric growth). The Fulton's condition factor (K) was estimated according to Le Cren (1951) and Froese (2006) using $K = 100 \times W/L^3$, where, K is condition factor, W is weight of fish in grams and L is total length of fish in cm.

The length-weight relationship and condition factor (K) of same species in two different ecosystems for all measured length groups were estimated. Comparative expected weights obtained at various average lengths were estimated using LWR data from lotic, lentic and brackish water lentic systems. LWR data of *D. filamentosa* in a natural lentic environment (Vembanad Lake) were obtained from Abraham (2015). All the statistical analyses were considered at the significant level of 5%. Statistical analyses were performed using the Statistical Package for the Social Sciences–SPSS *ver.* 16 package (SPSS Inc.)

Results and discussion

The length-weight relationship (LWR) of *D. filamentosa* in Pothundi reservoir was $y = 2.3184x–1.0674$ with the coefficient of determination (r^2) of 0.8472 (Fig. 2). Similarly, LWR of the species (Wang *et al.*, 2012) in Ayalampuzha river was estimated as $y = 3.1161x–2.0033$ with r^2 at 0.9712 (Fig. 3). The LWR showed that the growth rate (b) of the species in lotic system is around 3.116 indicating proximity towards the isometric growth pattern, compared to the growth rate in reservoirs

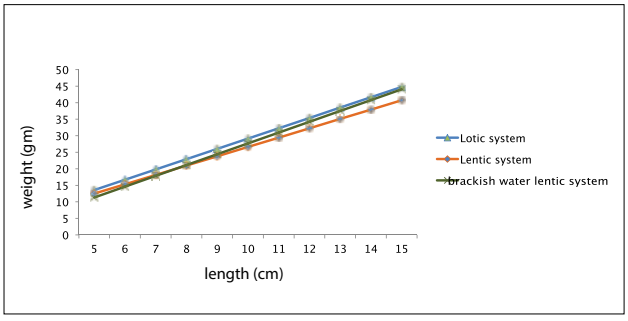

Fig. 2. LWR of *Dawkinsia filamentosa* in Lentic system.

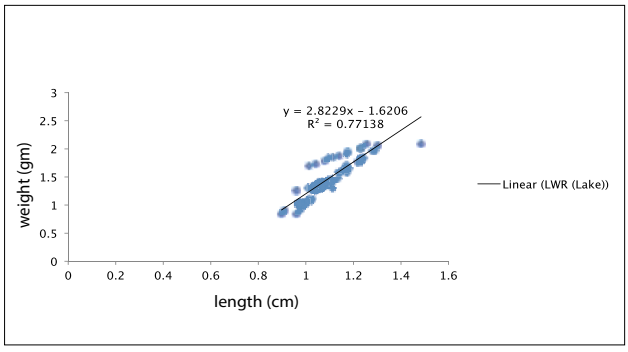

Fig. 3. LWR of *Dawkinsia filamentosa* in Lotic system.

which is 2.3184. The student's t- statistics showed that there is a significant difference in the growth rate of fishes in these two different aquatic systems ($P<0.05$).

Relative condition factor

The relative condition factor of the fish in lotic system is found to be 2.19 and reservoirs are found to be 1.649. The t-statistics showed a significant difference in the condition factor of this species ($P<0.05$) similar to the findings by Seher and Suleyman (2012).

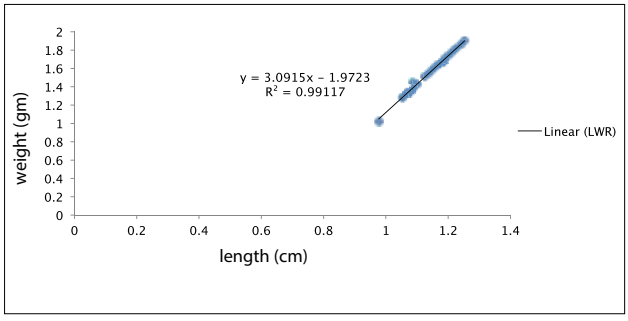

Fig. 4. Comparative growth rates of *Dawkinsia filamentosa* in various aquatic systems.

In the study of Abraham (2015), the growth rate of the species was found to be 3.273, which is closer to the isometric growth rate. A comparative expected weight obtained at various average lengths were estimated using LWR data from lotic, lentic and brackish water lentic systems (Fig. 4). It was found that the expected weight gain of the species is more in the lentic system as compared to that of the lotic habitats. In comparison with a brackish water lentic system, the manmade fresh water lentic system supported lower growth rate of the species. Similar studies are very effective in determining the health of the ecosystem with fish as an indicator species. A holistic study involving the role of environmental variables in varied growth rate in various aquatic systems in relation to the prevalent water quality indicators is required to point out that the aquatic system is in favour of higher growth rate of fishes.

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References

Abraham, K. J. 2015. Assessment of biodiversity of brackishwater ornamental fish species in Vaikom- Vechoor locality of Vembanad backwaters and studies on the biology of selected species. Report of Minor Research Project submitted to University Grants Commission. 55pp.

Alam, M. M., M. T. Rahman and S. Parween. 2014. Morphometric characters and condition factors of five freshwater fishes from Pagla River of Bangladesh. *International Journal of Aquatic Biology*, 2(1):14- 19.

Arslan, M., A. Yildirim and S. Bekta. 2004. Length-weight relationship of brown trout, *Salmo trutta* L., inhabiting Kan Stream, Çoruh Basin, North-Eastern Turkey. *Turk J. Fish Aquat. Sci.,* 4: 45-48.

Bagenal, T. B. and F. W. Tesch. 1978. Age and growth. In: T. B. Bagenal (Ed.). Methods of Assessment of Fish Production in Fresh Waters, Oxford Blackwell Scientific Publication. p. 101-136.

Dan-Kishiya, A. S. 2013. Length-weight relationship and condition factor of five fish species from a tropical water supply reservoir in Abuja, Nigeria. *Am J. Res. Commun.*, 1(9): 175- 187.

Froese, R., 2006. Cube law, condition factor and weight-length relationships: history, meta-analysis and recommendations. *J. Appl. Ichthyol.*, 22(4): 241-253.

Gurkan, S. and E. Taskavak. 2007. Length-weight relationships for syngnathid fishes of the Aegean Sea, Turkey. *Belgian J. Zool.*, 137(2): 219.

Kahraman, A. E., D. Göktürk and E. Aydin. 2014. Length-weight relationships of five fish species from the Sakarya River, Turkey. *Annu Res. Rev. Biol.*, 4(15): 2476-2483.

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

Martin-Smith, K. M. 1996. Length-weight relationships of fishes in a diverse tropical freshwater community, Sabah, Malaysia. *J. Fish Biol.*, 49 (4): 731- 734.

Pauly, D. 1993. Fishbyte. Section editorial. *Naga,* The ICLARM Quarterly, 16(2-3): 26-27.

Petrakis, G. and K. I. Stergiou. 1995. Weight-length relationships for 33 fish species in Greek waters. *Fish Res.*, 21 (3-4): 465- 469.

Seher, D. and C. I. Suleyman. 2012. Condition factors of seven cyprinid fish species from amligöze Dam Lake on central Anatolia, Turkey. *Afr. J. Agric. Res.,* 7 (31): 4460-4464.

Ujjania, N. C., M. P. S. Kohli and L. L. Sharma. 2012. Length-weight relationship and condition factors of Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) in Mahi Bajaj Sagar, India. *Res J. Biol.*, 2 (1): 30-36.

Wang, T., H. S. Wang, G. W. Sun, D. Huang and J. H. Shen. 2012. Length-weight and length-length relationships for some Yangtze River fishes in Tian-ezhou Oxbow, China. *J. Appl. Ichthyol.*, 28(4): 660-662.