



Research Note

Length-Weight Relationship and Condition Factor of *Dawkinsia exclamatio* (Pethiyagoda & Kottelat, 2005) from Kallada River of Kerala, India

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Dawkinsia exclamatio (Pethiyagoda & Kottelat, 2005) is one of the endemic cyprinid of the southern region of Kerala. *D. exclamatio* was formerly included in the genus *Puntius* and 'Puntius filamentosus group' of related species which also contained *P. arulius*, *P. assimilis*, *P. filamentosus*, *P. rohani*, *P. rubrotinctus*, *P. singhala*, *P. srilankensis* and *P. tambraparniei*, but all of these species were moved to the new genus *Dawkinsia* by Pethiyagoda et al. (2012). *D. exclamatio* refers to inhabit in both slow-flowing pools and relatively fast-flowing areas and also occurs in clear-water, rock and pebble substrate areas. The specific name of the species is derived from Latin word 'exclamatio' because of its colour pattern resembling an exclamation mark at snout-down position. This cyprinid locally known as *Ascharya Paral*, is listed as endangered species (Abraham, 2011) and has great economic value as an ornamental fish.

The length-weight relation is an important tool in fish biology, physiology, ecology, and fisheries assessment and has been originally used to provide information on the condition of fish and determine whether somatic growth is isometric or allometric (Zhu et al., 2008). No report on the length-weight relationship and condition factor of *D. exclamatio* is available. Hence the present study was carried out for *D. exclamatio* from Kallada river as it is endemic to this region.

The specimens of *D. exclamatio* were collected from the Kallada river, South Kerala (Latitude 24°22' N; Longitude 88°35' E) from March 2010 to February 2011. Fishes were caught by means of cast net as well as surrounding net and specimens were preserved in 10% formalin. Total length and weight of 99 specimens ranging from 4.30 - 13.50 cm total length and 1.09 - 41.37 g total weight were recorded in the laboratory using standard methods. The specimens' length was measured with vernier callipers to the nearest 0.1 cm and weighed with an electronic balance (Sartorius-GD603) to the nearest 0.1 g. The length-weight relationship was established separately for different length groups by employing Le Cren's (1951) hypothetical formula, $W = aL^b$. The equation has been transformed into the following logarithmic form, $\log W = \log a + b \log L$. The constants 'a' and 'b' were estimated using the method of least square and the linear equation was fitted separately for each length groups. The t-test (Snedecor & Cochran, 1967) was employed to test, whether the regression co-efficient (b) departed significantly from the expected cubic value. The regression coefficients of different length groups were compared by analysis of covariance (ANCOVA). Condition factor (K) was determined using the formula $K = W \cdot 100 / L^3$ by following Tesch (1971), where W is the weight of the fish and L is the length of the fish.

The length-weight relationship of *D. exclamatio* was pooled into a single equation which was calculated to be: $W = 0.158968921 L^{3.0809}$. A positive correlation between length and weight was indicated by the correlation coefficient ($r^2 = 0.86$). The value of 'b' (regression coefficient) in the equation is 3.0809 which indicated that the length-weight relationship

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followed the cube law for isometric growth. Similar isometric growth pattern has been reported in *Puntius sarana* (Sultan & Shamsi, 1981); *Mastacembalus armatus* (Narejo et al., 2000; *Puntius filamentosus* (Prasad & Ali, 2007); *Puntius carnaticus* (Kumar & Kurup, 2010); *Botia dario* (Choudhury et al., 2012) and *Puntius denisonii* (Mercy et al., 2013). The logarithmic and parabolic equations derived from the different length groups of *D. exclamatio* were,

Group I (4-9 cm) $\text{Log } W = -1.773 + 2.9963 \log L$; $W = 0.16978131 L^{2.9963}$

Group II (9-14 cm) $\text{Log } W = -1.630 + 2.8811 \log L$; $W = 0.19580681 L^{2.8811}$

Group III (4-14 cm) $\text{Log } W = -1.839 + 3.0809 \log L$; $W = 0.15896892 L^{3.0809}$

The length-weight relationship equations and condition factor (K) of different length groups of *D. exclamatio* were presented in Table. 1. Normally the regression coefficient value (b) = 3 for length-weight relationship indicates that the fish grows symmetrically or isometrically. Fish having 'b' value as 3

maintain their specific body shape throughout their life (Day, 2007). The 'b' value of *D. exclamatio* (3.0809, S.E = 0.1227) which did not significantly deviate ($p > 0.05$) from the ideal value of 3 ($t = -0.6595$, $df = 97$, $p = 0.5111$). Variation in the relative growth (b-value) of fish is correlated with the ecological variations of the habitats or variation in the physiology of the animal or both (Bhattacharya & Acharya, 1984; Jaiswar & Kulkarni, 2002).

Where, n= number of samples, a= intercept of regression line, b= slope of regression line, r^2 = coefficient of determination, S.E= standard error, K= condition factor, S.D= standard deviation, G.P= growth pattern, IG= isometric growth

The regression coefficient (2.9963, S.E = 0.1783) of length group I ($t = -0.0206$, $df = 43$, $p = 0.9836$) and the regression coefficient (2.8811, S.E = 0.3872) of length group II ($t = 0.3070$, $df = 52$, $p = 0.7600$) revealed that there is no significant departure from the isometric cubic value '3'. On plotting the logarithmic weight of *D. exclamatio* against the logarithmic length of different length group, a

Table 1. Regression data of length-weight relationship and condition factor of *Dawkinsia exclamatio*

Length group	n	a	b	r^2	S.E	K $\pm$ S.D	G.P
Group I (4-9 cm)	45	-1.77	2.9963	0.87	0.1783	1.72 $\pm$ 0.42	IG
Group II (9-14 cm)	54	-1.63	2.8811	0.52	0.3872	1.84 $\pm$ 0.48	IG
Pooled (4-14 cm)	99	-1.83	3.0809	0.87	0.1226	1.77 $\pm$ 0.45	IG

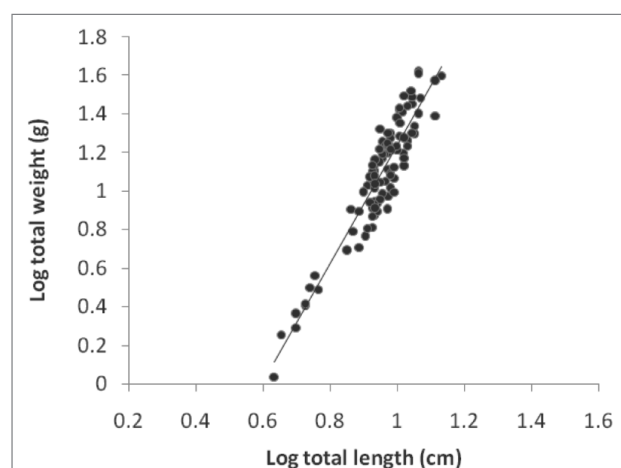


Fig. 1. Scatter diagram of logarithmic length weight relationship of *Dawkinsia exclamatio* of Group III (4-14 cm; pooled)

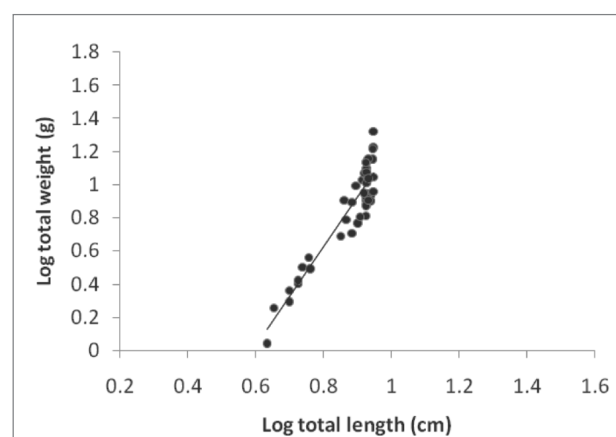


Fig. 2. Scatter diagram of logarithmic length weight relationship of *Dawkinsia exclamatio* of group I (4-9 cm)

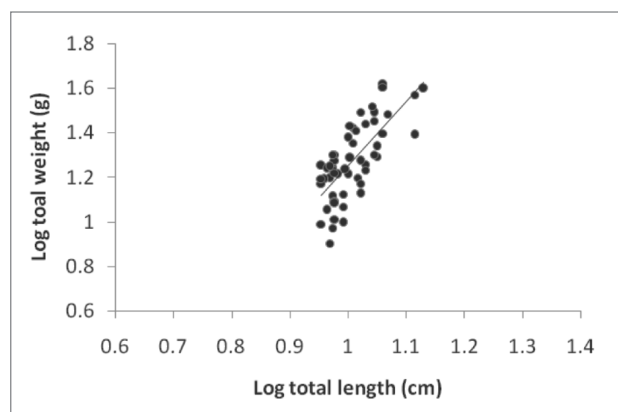


Fig. 3. Scatter diagram of logarithmic length weight relationship of *Dawkinsia exclamatio* of group II (9-14 cm)

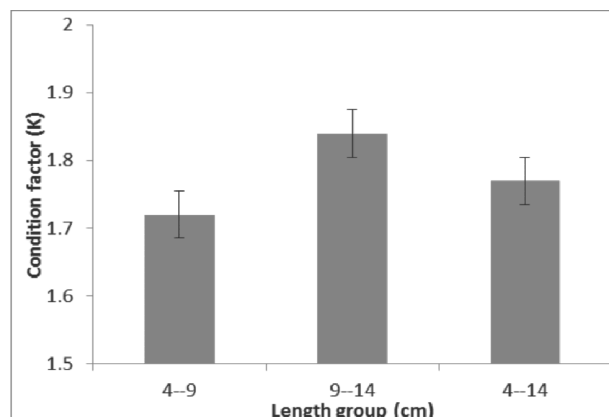


Fig. 4. Condition factor of *Dawkinsia exclamatio* in different length groups

parabolic curve was obtained (Fig. 1, 2, 3). The regression coefficient (b-value) of *D. exclamatio* obtained from smaller length group (Fig. 2) was slightly higher than that obtained from larger length group (Fig. 3), the difference was not significant ($df = 95$, $p > 0.05$). The variations in the value of the exponent 'b' is influenced by numerous factors, such as seasonal fluctuations, physiological conditions of the fish at the time of collection, sex, gonadal development and nutritive conditions of the environment (Le Cren, 1951; Froese, 2006) and these factors were not considered in the present study.

Condition factor is a useful index for monitoring of feeding intensity, age and growth rates in fish (Oni et al., 1983; Baby et al., 2011). If the K-value is less than 1, it indicates that fish growth is poor and more than 1 indicates that the general well-being of fish is good. In the present study, K-value of pooled samples of *D. exclamatio* was 1.77 ± 0.45 (Table 1, Fig. 4). The condition factor value of group II (1.84 ± 0.48) was higher than that of Group I (1.72 ± 0.42). The variations in the condition factor (K) observed in different length groups may be attributed to different factors, such as the onset of maturity (Gowda et al., 1987), spawning (De Silva & Silva, 1979), sex and maturity (Doddamani & Shanbhogue, 2001), biotic and abiotic environmental conditions (Baby et al., 2011) and feeding intensity (Wheatherley, 1972). Variations in the condition factor of *D. exclamatio* with increase in length may yield evidences concerning the gonadal maturation. Similar results were also reported for *Puntius carnaticus*

(Kumar & Kurup, 2010) and *Ombok pabo* (Bhattacharya & Banik, 2012).

Dawkinsia exclamatio is endemic to Kerala region of the Western Ghats and to the best of our knowledge, there is no other reports on the growth studies on *D. exclamatio*. The results of the present study indicate that population of *D. exclamatio* in Kallada river follow an isometric growth pattern with 'b' values close to cubic law but there was no significant difference in the condition factor of *D. exclamatio* between length groups. This study adds basic information of this species, which may be useful in fisheries management and also in the conservation point of view.

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