

Note

Length-weight relationship of *Sufflamen fraenatus* (Latreille, 1804) and *Zenodon niger* (Ruppell, 1835)

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ABSTRACT

The relationship between total length and total weight in balistids is not significantly different in males and females. The common equation for both the sexes in *Sufflamen fraenatus* is

$$\text{Log } W = -9.0429 + 2.7296 \log L \text{ or } W = 0.000000000905 * L^{2.7296},$$

$$R^2 = 0.9301,$$

and in *Zenodon niger* is

$$\text{Log } W = -6.507 + 2.085 \log L \text{ or } W = 0.0000003117 * L^{2.08556}$$

$$R^2 = 0.6749.$$

Studies on the length-weight relationship in balistids are few. Aiken (1983) studied the length weight relationship of *Balistes vetula* and *Canthidermis sufflamen* from the Caribbean waters. Balasubramanian *et al.* (1995) studied this relationship on *S.fraenatus*, *Odonus niger* and *Balistes niger* from Tuticorin, India. Gracia *et al.* (1998) have determined the length-weight relationship of *Balistes vetula* from the Gulf of Salamanaca, Columbia and Letourner *et al.* (1998) studied this relationship for *Abalistes stellatus* and *S.fraenatus* from the coral reefs and lagoons of New Calendonia. Length and weight being a fishery biological tool to understand the general condition of the fish, an attempt was made to determine the length-weight relationship of *S.fraenatus* and *Z.niger* from the Indian seas.

The length-weight relationship of *S.fraenatus* was estimated with 514

specimens, 278 males ranging from 169-358 mm (TL), 236 females ranging from 175-311 mm (TL), collected during April 1999 to April 2000 from the hook and line landings centre at Tuticorin. In *Z.niger*, 225 specimens, 97 males ranging from 169 - 282 mm (TL) and 128 females ranging from 158-277 mm (TL), collected during June 1999 to April 2000 from the trawl landing at Kanyakumari were analysed. The total length (mm) and weight (to nearest g), of the freshly collected specimens were taken and the specimens were dissected to note the sex.

The method suggested by Le Cren (1951) was followed to compute the length-weight relationship and it is expressed as:

$$W = aL^b$$

Where W=Weight, L=Length and 'a' and 'b' are constant and expressed logarithmically as $\log W = a + b \log L$.

Analysis of covariance (Snedecor and Cochran, 1967) was employed to find out whether the regression coefficients differed significantly between males and females. The significance of difference in the estimate of 'b' in pooled data of sexes from the expected value of 3 (isometric

estimate of 'b' value from the cubic relation was tested by the 't' test.

$$t = \frac{2.7296 - 3.0000}{0.0328} = -8.24$$

The 't' value was significantly different; hence the growth was not isometric

Z.niger

Analysis of covariance showed that the difference between the regression coefficients of the two sexes is not significant, hence the data were pooled and relationship calculated for the species:

$$\text{Log } W = -6.507 + 2.085 \log L \text{ or } W = 0.0000003117 * L^{2.0856}$$

$$R^2 = 0.6749.$$

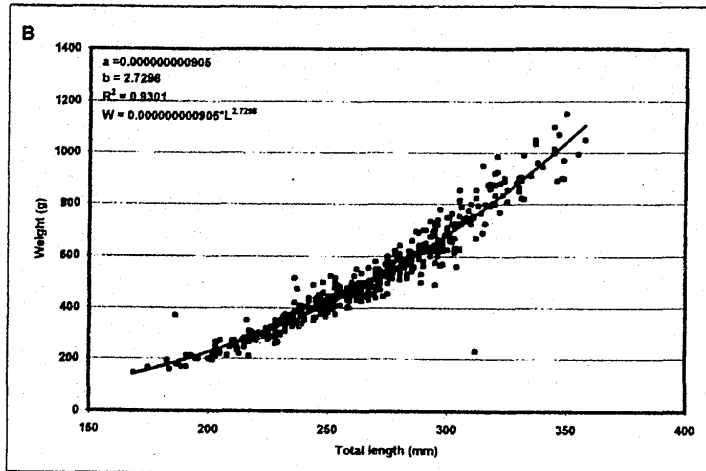


Fig. 1. Regression of length-weight relationship in *Sufflamen fraenatus*

growth) was tested by the 't' test as given by the formula.

$$t = \frac{|b - 3|}{S_b}$$

b = regression coefficient of log transformed data.

S.fraenatus

Analysis of covariance showed that the difference between the regression coefficients of the two sexes was not significant, hence the data were pooled and the equation obtained is:

$$\text{Log } W = -9.0429 + 2.7296 \log L \text{ or } W = 0.00000000905 * L^{2.7296}$$

$$R^2 = 0.9301$$

The scatter diagram of length-weight relationship is presented in Fig. 1.

The significance of difference in the

The scatter diagram of length and weight relationship is presented in Fig. 2. The significance of the difference in the estimate of 'b' value from the cubic relation was tested by the 't' test.

$$t = \frac{2.085 - 3.0000}{0.0964} = -9.49$$

The 't' value was found to be significantly different hence the growth was not isometric.

The length weight relationship of *S.fraenatus* obtained by Balasubramanian *et al.* (1995) from the fish landings at Tuticorin fisheries harbour had 'b' value of 2.4357 (TL min. = 140 mm, max. = 214mm) and *Z.niger* had 'b' value of 2.7376 (TL min = 120 mm, max = 184 mm.) Letourneur *et al.* (1998) obtained 'b' value of 2.950 (TL min. = 19 cm, max. = 36.4 cm) for *S.fraenatus* and 'b' value of 2.692 (TL min.=14cm, max. = 53.3cm) for *Abalistes stellatus* from New

Caledonia. The 'b' values in case of *S. fraenatus* from different regions were 2.435 (Tuticorin) and 2.950 (New Caledonia) and the present value was 2.7296. But in case of *Z. niger* 'b' value from Tuticorin (2.7376) was different from the present value from Kanyakumari (2.0855) because the length ranges are different and also due to the fact that as the fishes grow, the caudal fin length is inversely proportional to body length (fork length) and body weight.

In fishes, generally the growth pattern follows the cube law (Lagler, 1952). Beverton and Holt (1957) stated that major deviations from isometric growth are rare. Such cubic relationship for fishes will be valid when fish grows isometrically. But in reality, the actual relationship between the variables, length and weight, may depart from this, either due to environmental conditions or condition of fish (Le Cren, 1951). According to Martin (1949) the value of the exponent 'b' in the parabolic equation usually lies between 2.5 and 4.

Depending upon the deviation of 'b' values from '3' fishes can be classified into three groups (i) $b=3$ where the body form of fish remains constant at different lengths (isometric) (Allen, 1938), (ii) $b<3$ when fish becomes more slender as the length increases and (iii) $b>3$ (allometric) when fish grows more stouter with

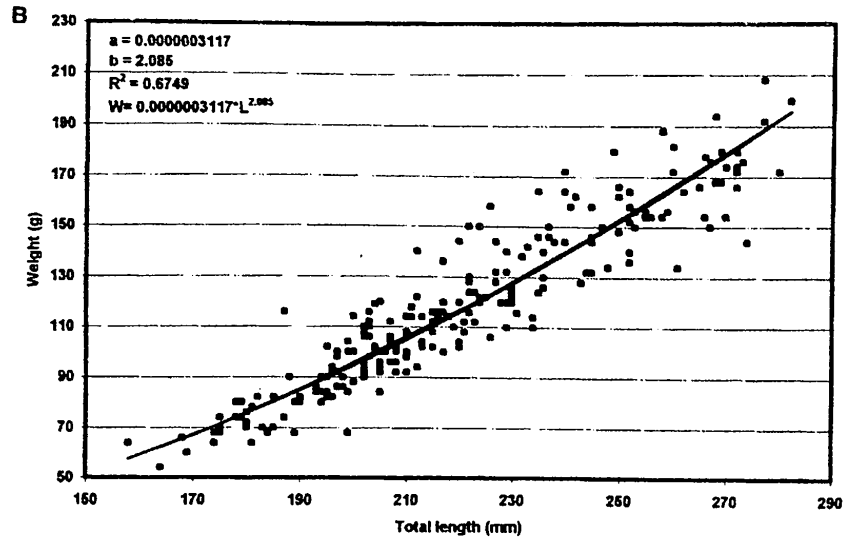


Fig. 2. Regression of length-weight relationship in *Zenodon niger*

increase of length (Gronner and Juliano, 1976). In majority of the fishes the shape and density change with increasing age, which often causes the regression coefficient of weight of length, depart from 3. The present observation is also in agreement with the above view and it can be concluded that the cube formula $W=al^3$ will not be a proper representation of the length-weight relationship for *S. fraenatus* and *Z. niger* as the 't' value is significantly different and the growth is not isometric.

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References

Aiken, K.A. 1983. The biology, ecology and bionomics of the trigger fish, Balistidae. *Caribbean coral reef fishery resources*, 7:191-

205.

Allen K.R. 1938. Some observations on the biology of the trout (*Salmo trutta*) in Windermere. *J.Anim. Ecol.*, 7:333-347.

Balasubramanian T.S., S. Rajapackiam, K.M.S. Ameer Hamsa and H. Mohamad Kasim 1995. On the bumper catch of balistids from Tuticorin with notes on length - weight relationship and gut contents. *Mar. Fish. Infor. Serv., T&E ser.*, 137: 18-19.

Beverton, R.J. and S.T. Holt 1957. On the dynamics of exploited fish population. *Fishery Invest. Lond.*, 2(63): 1-91.

Garcia, C.B., J.O. Duarte, N. Sandoval, D. von Schiller, G. Melo, and P. Navajas 1998. Length-weight relationship of demersal fishes from the Gulf of Salamanca, Colombia, *Naga ICLARM Q.* 21 (3): 30-32.

Growner, H. John and Rogelio, O.

Juliano 1976. Length-weight relationship of pond raised milk fish in the Philippines. *Aquaculture*, 7: 339-346.

Laglar Karl F., 1952. *Fresh Water Fishery Biology*. Dubuque, IOWA. 360pp.

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.*, 20:210-209.

Letourneur, M. Kulbicki and P. Labrosse 1998. Length-weight relationship of fishes from coral reefs and lagoons of New Caledonia - An update, *Naga, ICLARM Q.* 21 (no.4): 39-46.

Martin, V.R. The mechanics of environmental control of body form in fishes. *Pub. Out. Fish. Res. Lab.*, 48: 311-317.

Snedecor, G.W. and W.G. Cochran 1967. *Statistical Methods* (6th Edn). Oxford and IBH publishing Co., New Delhi. 250pp.

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