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NOTE

Length-weight relationship and condition factor of catfish *Arius tenuispinis* Day, 1877

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ABSTRACT

The study deals with the total length-weight and standard length-weight relationship and condition factors of 184 fishes of *Arius tenuispinis* collected from the Bay of Bengal. The total length-weight and standard length-weight relationship are expressed by Log W = –0.8772 + 2.2562 Log TL and Log W = –0.9850 + 2.4520 Log SL for male and Log W = –1.3234 + 2.5589 Log TL and Log W =0.7197 + 2.2796 Log SL for female. The mean values of condition factor (K) and relative conditon factor (K_n) observed in male are, 1.0755 and 1.0144 in total length-weight and 1.7806 and 1.0005 in standard length-weight relationship and in the case of female, 1.0307 and 1.0025 in total length-weight and 1.8148 and 1.0031 in standard length-weight relationship respectively.

Growth fluctuation is more frequent in fishes of tropical and sub-tropical waters due to variations in seasons, multiple spawning and food composition (Rounsefell and Everhart, 1953; Lagler, 1956). In most fishes where form and specific gravity do not change significantly throughout life, length and weight bear a specific relationship from which physical well-being of a fish can be ascertained for a given body at a given time (Doha and Dewan, 1967).

There are many reports on the length-weight relationship of individual marine and inland fishes but very limited reports are available on the length-weight relationship of fishes of the genus *Arius*. Homiara (1992) and Dan and Mojumder (1978) studied the length-weight relationship of *Arius jella* from Karnafully estuary and *Tachysurus tenuispinis* from Viskhapatnam estuary respectively. Mojumder (1971) and Menon (1981) reported on the length-weight relationship of *Tachysurus thalassinus*. In the present study an attempt has been made to establish the length-weight relationship of *Arius tenuispinis* collected from the Bangladesh coastal water.

One hundred and eighty four specimens were collected from the fish landing centre of "Sea Resources Ltd., Sadarghat", Chittagong during the period extending from December 1993 to November 1994, of which 112 were

males and only 72 were females. After washing, the specimens were blotted to remove excess water and then the total length and standard length were measured nearest to 0.1 cm from snout to the end of the tail and to the base of the caudal fin respectively. The weight of the fish corresponding to both total length and standard length were measured nearest to 1 g.

The most widely used formula for length-weight relationship as given below (Rounsefell and Everhart, 1953) was used.

$$W=CL^n$$

where, C = constant, n = exponent, W = weight and L = corresponding length of weight (total length or stan-dard length).

The exponential from of above formula can be expressed in the logarithmic (10 base) form as follows:

$$\text{Log } W = \text{Log } C + n \text{ Log } L$$

The values of Log C and n were calculated by using the standard mathematical relationship (Rounsefell and Everhart, 1953).

Condition factor (K) and Relative condition factor (K_n) are expressed as follows:

$$K = \frac{W}{L^3} \times 100$$

where, W = observed body weight (g) and L = body length (cm).

$$K_n = \frac{W}{W'}$$

where, W = observed body weight (g) and W' = calculated weight (g).

Total length and standard length of male and female varied between 20.1-41.0 cm, 17.6-32.0 cm and 22.1-43.0 cm, 19.1-34.0 cm respectively, and the weight 85 -625g and 125-653g. In case of total length-weight and standard length-weight relationship, the values of Log C and n were found to be –0.8772 and 2.2562, and –0.9850 and 2.4520 in male and –1.3234 and 2.5589 and 0.7197 and 2.2796 in female respectively. These values may be expressed by the following equations-

$$\text{Log } W = -0.8772+2.2562 \text{ Log } TL$$

$$\text{Log } W = -0.9850 + 2.4520 \text{ Log } SL$$

for male and

$$\text{Log } W = -1.3234 + 2.5589 \text{ LogTL}$$

$$\text{log } W = -0.7197 + 2.2796 \text{ Log } SL$$

for female.

Similarly in exponential form, these values (W) are expressed as $0.13267\ TL^{2.2562}$ and $0.10351\ SL^{2.4520}$ for male and $0.04748\ TL^{2.5589}$ and $0.19067\ SL^{2.2796}$ for females repectively.

The curve for calculated body weight was smooth and gradually increased with increasing total length in both the sexes (Fig. 1). Similar results were also obtained in case of body-weight and standard length relationship.

The equation for regression line of body weight (Y) on the total length (X) is: ~ $Y = -0.8766 + 2.2558\ X$

$r = 0.9895$, $t_{cal} = 20.5288$ for male and

$$Y = -1.3246 + 2.5598\ X$$

$r = 0.9908$, $t_{cal} = 21.9250$ for female

The co-efficient of correlation (r = 0.9895 in case of male and 0.9908 in case of female) was tested by 't' test and found significant at 5% level of significance (t 0.05 = 2.262 in case of male and 2.447 in case of female), with 9 degrees of freedom in both the sexes.

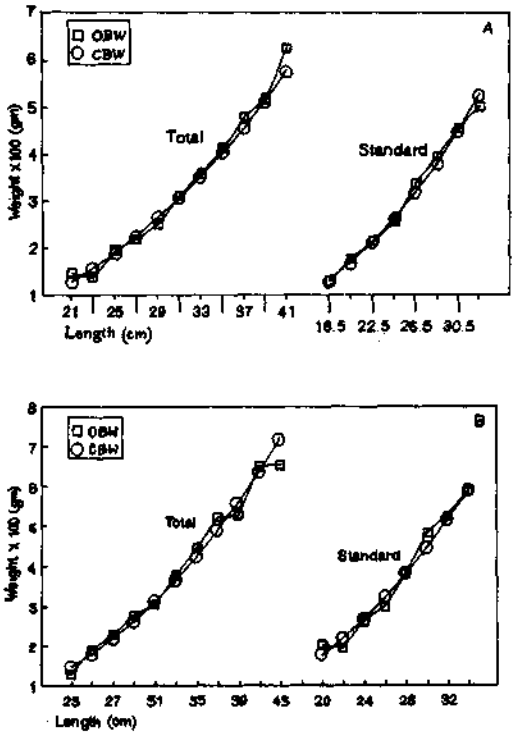

Fig.1. Relationship between total length-weight and standard length-weight of *A. tenuispinis* (A=male, B=female).

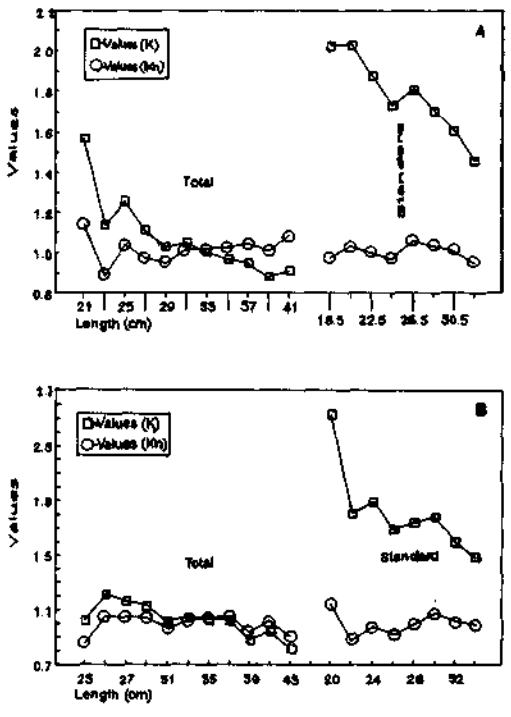

Fig.2. Relationship between total length-condition factor (K) & relative condition factor (K_n) and standard length-condition factor & relative condition factor of *A. tenuispinis* (A = male, B = female).

Similarly the equation for regression line of body weight (Y) on standard length (X) is:

$Y = -0.9859 + 2.4526\ X$

$r = 0.9970$, $t_{cal} = 31.7821$ for male and

$Y = -0.7167 + 2.2775\ X$

$r = 0.9807$, $t_{cal} = 12.2977$ for female.

The co-efficient of correlation (r=0.9970 in case of male and 0.98071 in case of female) was tested by 't' test and found significant at 5% level of significance (t 0.05 = 2.447) with 6 degrees of freedom in both the sexes.

The values of K for total length-weight and standard length-weight relationship ranged from 0.8766 to 1.5657 and 1.4565 to 2.0306 respectively in male, and 0.8213 to 1.2168 and 1.4899 to 2.5313 in female respectively . In the same way the values of K_n ranged from 0.8807 to 1.1361 and 0.9480 to 1.0542 in male, and 0.8627 to 1.0655 and 0.8779 to 1.1491 for female respectively. A fluctuating graph was obtained for both K and K_n values with increasing total and standard length in both the sexes (Fig. 2).

The difference in the values of n between total length-weight and standard length-weight relationship is due to disproportionate growth in the tail region in both sexes. The result shows

a close similarity with the report of Kader and Rahman (1978) on *Tilapia mossambica* . The difference 0.3027 in the value of n for total length-weight relationship of male and female indicates that the females were heavier than the males of the same length and the growth of female fish was slightly affected due to weight of of the ripe ovary. Homiara (1992) got similar result when he worked on *Arius jella.* Hile (1936) proposed that the value of n for an ideal fish may range between 2.50 and 4.00. In the present investigation the value of n (2.5589) for total length of female fish only agrees with the value proposed by Hile (1936) which indicated the weight increases as the cube of the total length. This statement also coincides with the results shown by Singh (1965), Menon (1981) and Homiara (1992). The values of n for total length and standard length of male and female fish indicate that the weight does not increase as Hile's proposed for ideal fish. The low n values in both male and female fish may be due to their peculiar body shape which increases considerably in length with little increase in body weight. The result is similar to that reported by Bashirullah and Kader (1970) on *Trichiurus savala.*

The values of K showed significant fluctuation for both male and female which may be due to difference in the weight of food contents in the stomach. This result supports the report of Kader and Rahman (1978) on *Tilapia mossambica.* The condition factor of *A. tenuispinis* fluctuates with spawning season. This result agress with that found by Majumder (1995) on the same species where he showed that values of K fell during spawning season due to heavy laying of eggs and gradual rise in post-spawning due to rebuilding of the reproductive system. The changes of K value with increasing standard length depends on the size at first maturity which was also stated by Jhingran (1972) and Bashirullah (1975). The values of K_n showed significant fluctuation for both male and female fishes which may be due to smaller sample size or different stage of maturity or spawning on the part of females or difference in weight of food content in the stomach.

References

Bashirullah, A.K.M. 1975. Biology of *Lutjanus griseus* (L) of the Cubagua Island, VeneZuela. 1. Length-weight, body length-gut length relationships and condition factor. *Biological Institute of Oceanography, University of Oriente,* **14** (1) : 101-107.

Bashirullah. A.K.M. and M.A. Kader 1970. The length-weight relationship and conditon of *Trichiurus savala* Cuv. and Val. *Pak. J. Sci. Ind. Res.,* **13** (4): 414-419.

Dan, S.S. and P. Mojumder 1978. Length-weight relationship in catfish *Tachysurus tenuispinis* (Day). *Indian J. Fish.,* **25** (1&2) : 23-28.

Doha, S. and S. Dewan 1967. Studies on the biology of tilapia (*Tilapia mossambica* Peters). Length-weight relationship and condition factor. *Pak. J. Sci.,* **19** (1&2) : 23-28.

Hile, R. 1936. Age and growth of the Cisco, *Leucichthys artedi* (LeSuur) in the lakes of three northern highland, Wisconsin. *Bull. U. S. Bur. Fish.,* **48**: 209-317.

Homiara, S.J. 1992. Biology and population dynamics of the cat fish, *Arius jella* Day, 1877 from the Karnafully River Estuary, Chittagong. *M.Sc. Thesis, Chittagong University, Bangladesh.*

Jhingran, A.G. 1972. Fluctuations in the ponderal index of the gangetic anchovy *Setipinna phase* (Ham.) *J. Inld. Fish. Soc. India,* **4** : 1-9.

Kader, M.A. and M.M. Rahman 1978. The length-weight relationship and condition factor of tilapia (*Tilapia mossambica* Peters). *J. Asiatic Soc. Bangladesh (Sci.),* **3** (2) : 1-17.

Lagler, K.F. 1956. Length-weight relationship and condition. In: *Freshwater Fishery Biology.* W.M.C. Brown Co. Publishers, Dubuque, Lowa, XII + 421.

Majumder, M.A. 1995. Study on some aspects of the biology of cat fish *Arius tenuispinis* (Day) from the Bay of Bengal. *M.Sc. Thesis, Chittagong, University, Bangaldesh.*

Menon, N.G. 1981. Studies on the biology and fishery of the giant marine catfish, *Tachysurus thalassinus* (Ruppell). *Ph.D. Thesis (Abstract), Kerala University.*

Mojumder, P. 1971. The length-weight relationship in the catfish, *Tachysurus thalassinus* (Rupell). *Indian J. Fish.,* **18** : 179-182.

Rounsefell, G.A. and Everhart, W.H. 1953. Age and growth. In: *Fisheries Sciences,* John Willey and Sons, New York, p. 297-327.

Singh, V.D. 1965. A study of *Tachysurus sona* (Ham). *M.Sc. Thesis, Bombay University, India.*