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Short Communication

Length-weight relationship and relative condition of a silver biddy G*erres oblongus* (Pisces: Perciformes) from the Jaffna lagoon, Sri Lanka

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Cultivation of *Gerres oblongus* is likely to be profitable because of the consumer demand. The values obtained for the mean weight by sex show that females were significantly (P<0.05) larger than males. Covariance analysis for length–weight relationships of male and female fishes reveals that there was significant variation between male and female fishes (P<0.05). The calculated length-weight relationships of $W = 0.01127 \times L^{2.958}$ and $W = 0.015319 \times L^{3.126}$, obtained for males and females respectively. The exponent value, b=2.958 for males and b=3.126 for females, not significant from 3 (P>0.05) reflect an almost isometric growth in both instances. The relative condition of fish showed seasonal variation. The highest median values of average condition factor recorded from 175 to 225 mm total length clearly shows that *G. oblongus* would be in good condition if harvested at this total length range. Males, generally are in better condition than females. The low relative condition values in February to June indicate female *G. oblongus* spawn during February to June during which the breeding stock should be protected in order to maintain the sustainable exploitation of this species.

[**Key words:** Length-weight relationship, silver-biddy, relative condition, *Gerres oblongus*, covariance analysis, spawning]

Gerres oblongus (Cuvier, 1830) (Pisces: Perciformes: Gerreidae) is commonly referred to as the silver biddies and is one of the three species of Gerreids recorded along the coastal areas and brackish water bodies in the nothern part of Sri Lanka, and is one of the economically important groups of fishes inhabiting the Jaffna lagoon[1]. The ratio of the length to the weight of fish is known to be a useful index of the condition of fish. The knowledge of length-weight relationship has a vital role in the fishery. It helps in establishing the yield and also in converting one variable into the other as is often required during monitoring field measurements. This study presents information on the size distribution, length-weight relationship parameters and relative condition of *G. oblongus* from the Jaffna lagoon. *Gerres oblongus* is perhaps one of the most abundant edible fishes with high consumer demand. No studies have been made on length weight relationship of these species in Sri Lanka, so far. It was selected as a candidate for the present study since the knowledge on these parameters will help in mass culture of this species.

The Jaffna lagoon is a shallow water body located in the northern province of Sri Lanka. It lies between approximately 79° 52′E to 80° 38′E longitude and 9° 26′N to 9° 46′N latitude and has an area of about 412 km^2 (160 square miles) and the depth does not exceed 4 m. Random samples of fishes were obtained from four stations namely Kakkaithevu, Navanthurai, Kurunagar and Pashaiyoor from Nov.1999 to Dec 2000. A total of 158 specimens were analysed. Total length (TL) was measured to the nearest 5 mm with a measuring board. Weight (W) was measured to the nearest 0.1 g by an electronic balance (AND, FY 300) after draining the water from the buccal cavity and wiping the moisture content on the body of fish[2]. The parameters a (proportional constant or intercept) and b (exponent) of the length (L) – Weight (W) relationship of the form $W = aL^b$ were estimated for males and females separately by using the logarithmic transformation $\log W = \log a + b.\log L$. The regression line was calculated by the method of least square regression analysis. The regression lines of male and female fishes were then analyzed further by covariance analysis for significant differences.

The monthly mean relative condition factor (K_n) of samples was calculated using the equation $K_n = W/aL^b \times 100$, where K_n = Fulton's condition factor, W = weight in grams and L = Length in millimeters[3]. The mean relative coefficient of condition was also obtained for each length group.

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The size (total length-TL) of *G. oblongus* ranged from 87 to 253 mm (mean 147 mm). Males ranged from 103 to 253 mm TL (mean 145.9 mm), females from110 to 253 mm TL (mean 152.6 mm) while immature ranged from 87 to 154 mm TL (mean 125.4 mm). The values obtained for the mean weight by sex were simply compared by two-sample t-test (Table 1). The results show that females were significantly ($P < 0.05$) larger than males.

For length-weight relationship the estimates of the regression parameters for male, female and pooled sexes, obtained by regression analysis are shown in Table 2. The equations of total length-weight relationship and their logarithmic transformation are given in Table 3. The b values 2.958295 and 3.126119 obtained for male and female respectively indicate that the fish follows the cube law, its growth is proportionally three-dimensional. That is, with increasing age, rate of growth in terms of weight in this fish becomes faster than that of its length. Correlation coefficients(r) 0.93074 for male and 0.905441 for female were found to be significant ($p < 0.05$) in both instances indicate good correlation between length and weight.

The significance of variation in the estimates of 'b' for *G. oblongus* from the expected value for the ideal fish (3.0) was tested by Students' *t* test[4,5]. Students' *t* test was employed by dividing the difference between 'b' and '3' by standard error of 'b'. The results are as follows:

Male: (2.958295~3.0)/0.127578 = 0.326898 Not significant (computed $t_{\alpha(2),0.05,84} < 1.989$)

Female: 3.126119-3.0)/0.173926 = 0.725130 Not significant (computed $t_{\alpha(2),0.05,72} < 1.993$)

Pooled: (3.095936-3.0)/0.105057 = 0.91318 Not significant (computed $t_{\alpha(2),0.05,157} < 1.9755$)

The regression exponent value 3.126 for females indicates an isometric growth in *G. oblongus* females while the exponent value 2.958 for males very close to 3, not significant from 3 ($P > 0.05$) indicates almost isometric growth in *G. oblongus* males. To test the equality of length-weight relationship between males and females, the analysis of covariance was carried out (Table 4). The analysis of covariance showed that the values of the slopes (b) for males and females exhibit a significant interaction (computed $F_{1,157} > 3.84$, $P < 0.05$). Length-weight relationship parameters are very much useful for cultivators and managers since they may calculate the total weight or yield of the cultured fishes from the equation.

Condition factor is used to compare the 'condition', 'fatness' or 'well being' of fish and are based on the hypothesis that the heavier fish of a given length are in better condition[6]. The monthly mean relative coefficient condition values for males and females are presented in Fig. 1. Males had relatively higher mean K_n values than females (mean 1.6300 ± 0.0452SE and mean 1.4109 ± 0.03906SE, respectively). Relative K_n

Table 1 — Parameters obtained from two-sample t-test for mean weight of male and female *G. oblongus* collected from Jaffna lagoon, Sri Lanka

	Female	Male
Mean	61.6016	46.2224
Variance	995.7351	1246.0149
Observations	73	85
Hypothesized mean difference	0	
DF	156	
t stat	2.8909	
P (T <= t) one-tail	0.0021	
t critical one-tail	1.6546	
P (T <= t) two-tail	0.0043	
t critical two-tail	1.9752	

Table 2 — Length-weight relationship parameters of *G. oblongus* collected from Jaffna lagoon, Sri Lanka

Sex	r	N
Male	0.93074	85
Female	0.905441	73
Pooled	0.920717	158

Table 3 — Relationship between total length and weight of male, female and pooled sexes of *G. oblongus*

Sex	Length-weight relationship	Logarithmic transformation
Male	$W= 0.01127*L^{2.958295}$	LogW= -1.947835+2.958295*LogL
Female	$W= 0.015319*L^{3.126119}$	LogW= -1.814752+3.126119*LogL
Pooled	$W= 0.01135*L^{3.095936}$	LogW= -1.944638+3.095936*LogL

Table 4 — Test of equality of regression lines for *G. oblongus*

{MS=SS/DF; $F = (SS_{total} - SS_{pooled}/k\text{-}1)/(SS_{pooled}/DF_{pooled})$}

Source	DF	SS	MS	F
Male	83	0.833345	0.01004	
Female	71	0.720069	0.010142	
Total	154	1.553414	0.010087	
Pooled	156	1.707247	0.010977	14.05651792

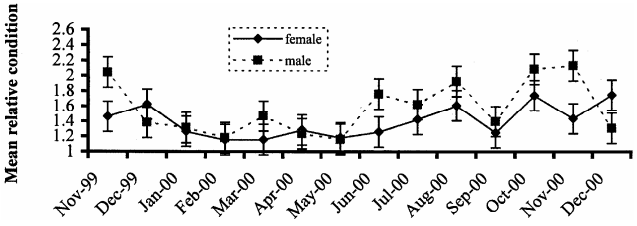

Fig. 1 — The monthly K_n values of *G. oblongus* from the Jaffna lagoon, Sri Lanka

value for females decreased gradually from December 1999 and attained a low value during February 2000 to May 2000. Again it increased to 1.6 in August 2000 and attained a low value (1.24) in September 2000. The low K_n values in February to June express the female *G. oblongus* spawn during February to June. In males also low value of K_n was obtained in February 2000, May 2000 and September 2000. During this peak spawning period breeding stock should be protected, in such a way the rules and legislations should be imposed in order to maintain sustainable exploitation of this species.

The mean relative coefficient of condition was plotted against 25 mm class intervals of length without regard to sex (Fig. 2). The K_n values of different size groups give an idea about the variations in the condition of the fish during its growth. The average K_n increases with increasing length up to 175 mm showing high feeding activity, normal growth and active maturation. A gradual decrease from 175 mm and a considerable drop at 250 mm shows that it is the breeding length of the species. The highest median values of average condition factor recorded from 175 to 225 mm TL clearly shows that *G. oblongus* would be in good condition if harvested at 175 to 225 mm TL range. This information will be very much useful for fish cultivators and fishery managers especially in specifying the minimum size above which it should be exploited, in determining the selectivity of gill nets and in imposing fishery regulations.

Even though *G. oblongus* grows only up to about 30 mm in TL, it has been attributed a marked place among the people living in the Jaffna Peninsula as it is a valued fish available throughout the year and hold

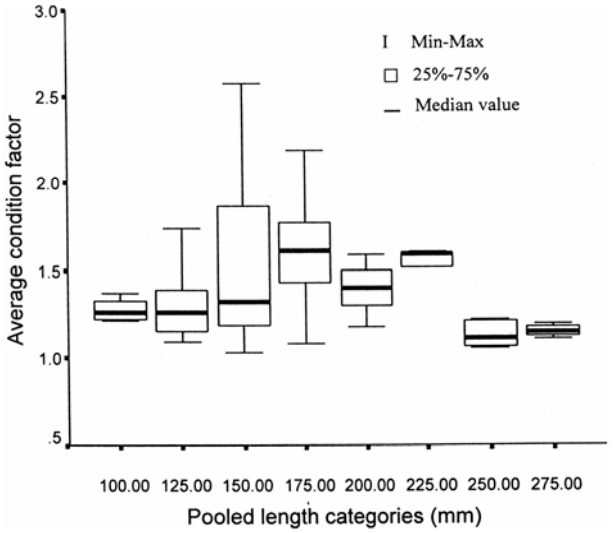

Fig. 2. — Average condition factor at different lengths of *G. oblongus* from the Jaffna lagoon, Sri Lanka

an important place in aquaculture. In a long-term basis, the above measures along with further studies on breeding biology, nutritional studies, feeding biology and age and growth will lead to a successful sustainable management of *G. oblongus* in Sri Lankan waters.

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