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AGE AND GROWTH OF OREOCHROMIS NILOTICUS (Linn.) IN LAKE MARIUT, EGYPT.

By

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ABSTRACT

Age and growth of Oreochromis niloticus (Linn.) from Lake Mariut were studied by scale reading of 215 fish. Back - calculated lengths of age show that fish grow rapidly during the first year of life then slow down considerably. Statistically, no significant differences in the growth and length-weight regressions between males and females were found. The growth of O. niloticus was described by von Bertalanffy growth equation with parameters:

$L\infty = 33.29$ *cm,* $W\infty = 677.65$ *gram,* $K = 0.2389$ *&* $t_o = 0.1847$.

The estimated longevity of the fish was 12.4 years and growth performance index was 2.42.

INTRODUCTION

Lake Mariut is a small shallow brackish lake near Alexandria at latitude 31° 10' N and longitude 29° 55' E. Its area is about 15,000 feddans with average depth of 100 cm. Tilapias contribute about 89 % of the total catch of Lake Mariut during the period of 1981-1990 (Anon., 1981-1990). O. niloticus is considered the most important species of tilapias fishes in Lake Mariut (El-Shazly, 1993). In addition, its growth is clearly superior to that of other related species (Bishara, 1973; Hosny, 1987; El-Shazly, 1993). The age and growth of O. niloticus have been studied in the

northern Delta Lakes (El-Zarka et al., 1970; Bishara, 1973; Talaat, 1979; Hosny, 1987; Abdel Aziz et al., 1990; El-Haweet, 1991; El-Shazly, 1993), Lake Nasser (Abdel Azim, 1974; Talaat, 1979) and River Nile (Talaat, 1979; Latif et al., 1989).

The present study aims to give a detailed account of the growth of O. niloticus in Lake Mariut comparing it with other regions which may help in its fishery management.

MATERIALS AND METHODS

The tilapias were collected randomly from Lake Mariut through the period from January to December 1993. A total of 215 individuals were taken measuring 9-26 cm. The following information were recorded at the laboratory: total length (L) in cm., total weight (W) in gram and sex. Scales from each individual were used for age determination by means of binocular microscope (X 25). Back-calculated growth was derived from scale readings using the formula given by Lee (1920).

Length-weight relationship was determined from the formula of Le Cren (1951).

Theoretical growth study was made using the von Bertalanffy growth equations, developed by Beverton and Holt (1957). Their parameters ($L\infty$, $W\infty$, K &t_0)were calculated by Gulland's method (Gulland, 1965).

Maximum age ($t_{max.}$) was calculated from the relation $t_{max.} = 3/K + t_0$ (Pauly, 1983) Growth performance index ϕ was estimated by the use of the formula of Moreau et al. (1986) ($\phi = \text{Log } K + 2 \text{ Log } L\infty$).

RESULTS

Scale radius and total length relationship :

The relationship between scale radius (S) and total length (L) is commonly accepted to be linear.

The regression equations are as follows :

Males : $L = 0.3527 + 0.2721\ S$ ($r = 0.9941$).
Females : $L = 1.5420 + 0.2514\ S$ ($r = 0.9955$).

Covariance analysis showed no significant difference in the regressions between the sexes. Hence, equation for the two sexes combined was calculated as

$$L = 0.4499 + 0.2708\ S \quad (r = 0.9984).$$

This relationship is shown in Figure (1).

Growth in length :

From Table (1), the fish examined were not more than three years old for the females and four years for males. The growth of males differed from that of females being higher particularly after two years of age. Both sexes exhibited the highest annual length increment during the first year of life (8.15 cm for males and 8.32 cm for females), thereafter they showed a tendency to decrease as fish grow older. The t-test showed no significant difference between the growth of males and females.

Length-weight relationship :

The equations of the length-weight relationship for the two sexes were found to be:

Males : $\text{Log } W = -1.7709 + 3.0197 \text{ Log } L \quad (r = 0.9986).$

Females : $\text{Log } W = -1.7548 + 3.0111 \text{ Log } L \quad (r = 0.9991).$

On the basis of these relationships, it is shown that the females tend to be slightly heavier than males of equal length. Analysis of covariance showed no significant difference between sexes ($P > 0.05$). Hence the length-weight data of males and females were pooled to calculate the relationship for the combined sexes and was found to be :

$$\text{Log } W = -1.7593 + 3.0126 \text{ Log } L \quad (r = 0.9996).$$

The observed values of length and weight were plotted and the calculated length-weight curve fitted the data (Fig. 2).

Growth in weight :

Data on the calculated growth in weight (Table 1) are obtained by using length-weight relationship. It is obvious that the annual weight increment tend to increase with increasing age. Although the average weight increment showed that males had higher growth in weight as compared to females, no significant difference was found between males and females ($P > 0.05$) by applying t-test.

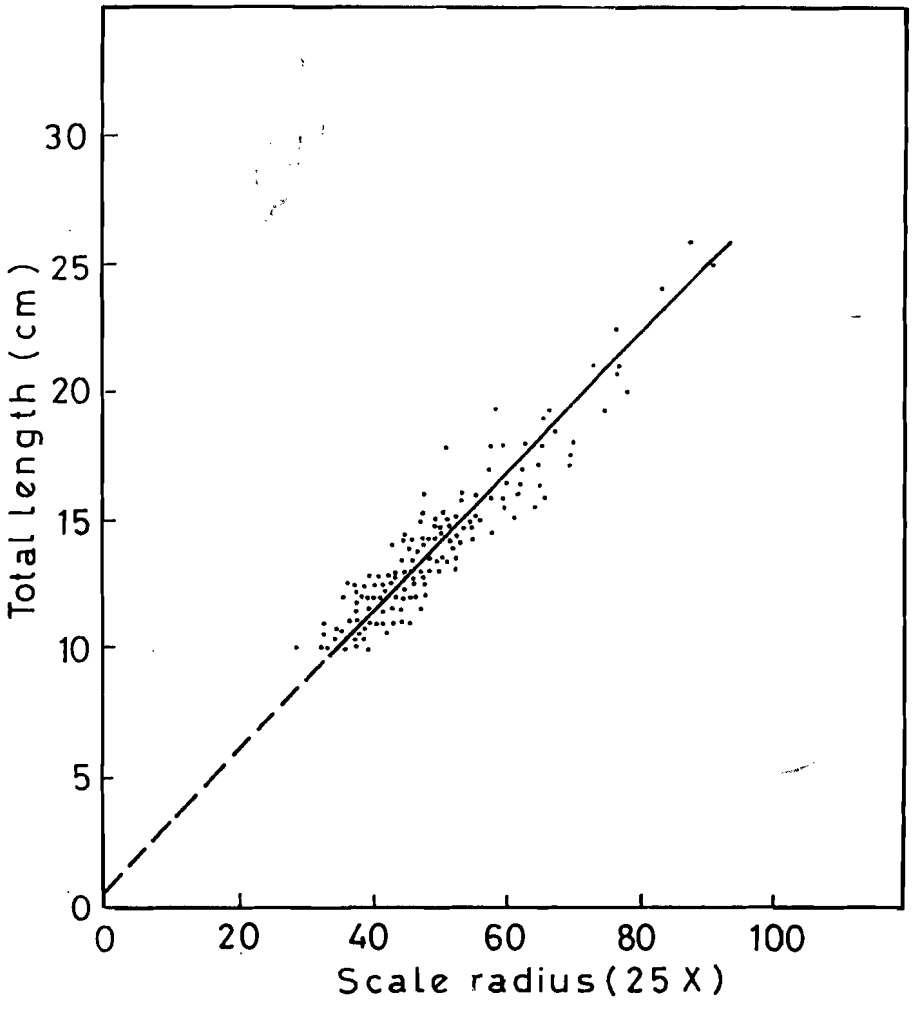

Figure 1: Relationship between Scale radius & total length of O. niloticus.

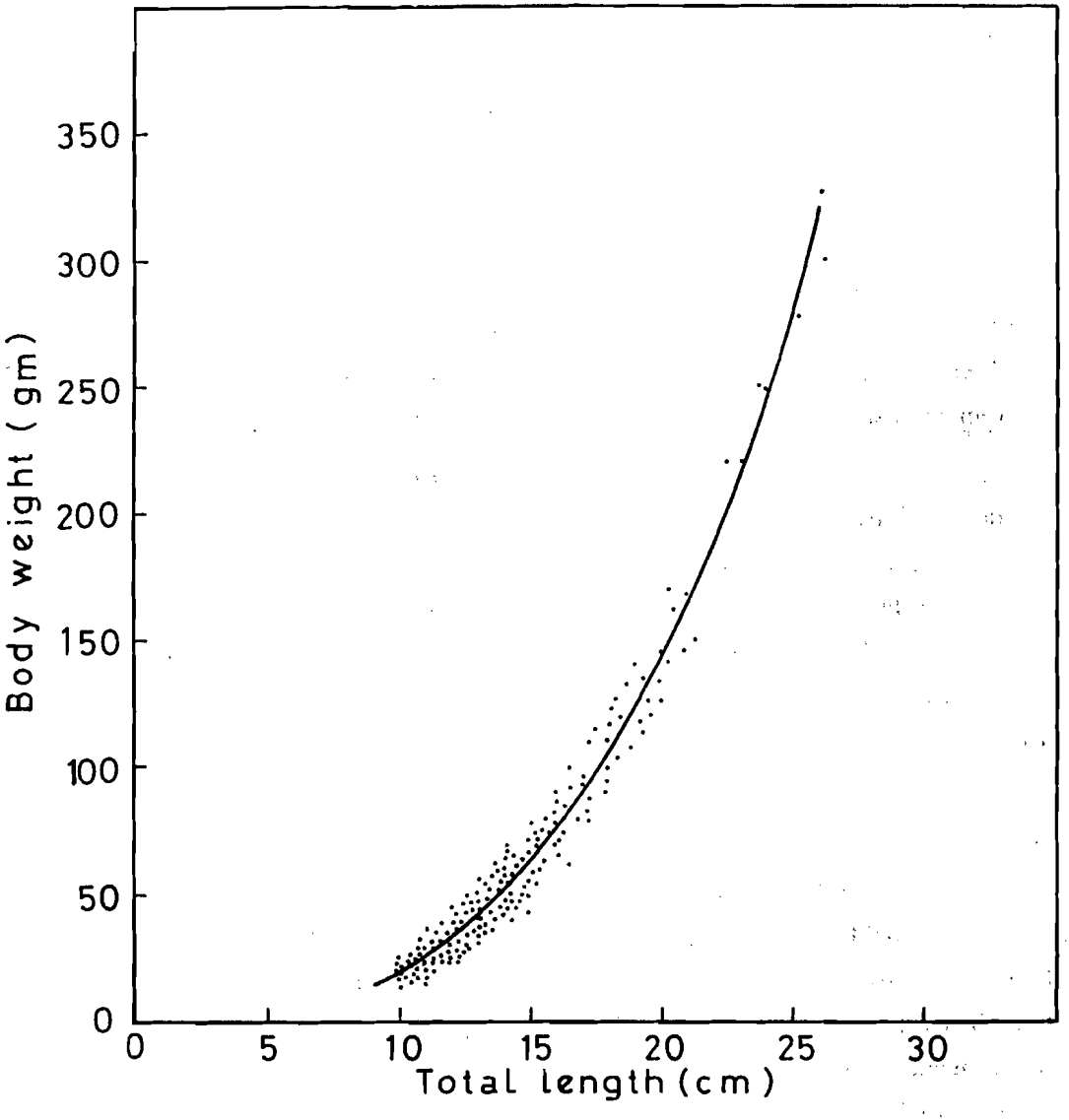

Figure 2: Relationship between total length & body weight for O. niloticus in Lake Mariut.

Table (1): Back-calculated lengths (cm) & weights (gm) at different ages and those predicted from von Bertalanffy (v.B) equation for *O. niloticus* in Lake Mariut.

Back-calculated length	I_1	I_2	I_3	I_4
		Males		
Number of fish	95	30	10	3
Mean length at capture (cm)	11.91	14.85	20.23	26.00
Back-calculated length (cm)	8.15	13.62	18.05	21.04
Increment of length (cm)	8.15	5.47	4.43	2.99
Back-calculated weight (gm)	9.56	45.08	105.51	167.62
Increment of weight (gm)	9.56	35.52	60.43	62.11
		Females		
Number of fish	57	14	6	-
Mean length at capture (cm)	12.26	15.10	18.59	-
Back-calculated length (cm)	8.32	13.38	17.04	-
Increment of length (cm)	8.32	5.06	3.66	-
Back-calculated weight (gm)	10.37	43.36	89.81	-
Increment of weight (gm)	10.37	32.99	46.45	-
		Combined sexes		
Number of fish	152	44	16	3
Mean length at capture (cm)	12.06	14.96	19.45	26.00
Back-calculated length (cm)	8.21	13.53	17.75	21.04
Increment of length (cm)	8.21	5.32	4.22	3.29
Lengths (cm) predicted from v.B.	8.21	13.54	17.73	21.04
Back-calculated weight (gm)	9.89	44.55	100.93	168.46
Increment of weight (gm)	9.89	34.66	56.38	67.53
Weights (gm) predicted from v.B.	9.97	45.05	101.63	170.07

Theoretical growth rate :

The growth model, von Bertalanffy equation is usually used to study the growth of fish. The growth equations obtained for the combined sexes were :

$$L_t = 33.29\ [1- exp.- 0.2389\ (t + 0.1847]$$
$$W_t = 677.65\ [1- exp.- 0.2389\ (t + 0.1847]^{3.0126}$$

Fitting von Bertalanffy equations for length and weight (Table 1) showed negligible differences between the back-calculated lengths & weights and those calculated from the above equations.

Maximum age (t_{max}) :

It is a measure of the longevity of the fish species. It was found to be 12.4 years using formula of Pauly (1983). Also, the life-span 12.4 years was estimated after Taylor's concept (Taylor, 1962) which refers to the age of fish when they attain 95 % of their asymptotic total length.

Growth performance index :

It has been used for comparing the over-all growth performance of the fish species since it is the best index for expressing the fish growth (Moreau, et al., 1986). It was found to be 2.42.

DISCUSSION

Comparing the lengths of O. niloticus at different years of life as given by various authors in different regions (Table 2), it was found that the growth of O. niloticus in Lake Mariut (Present study & El-Shazly, 1993) is well below that reported for the same species in other Egyptian Lakes. Furthermore the lengths of O. niloticus in the present study is greatly lower than those found by El-Zarka et al. (1970) for the same region at corresponding ages. Whether this reflects conditions of retarded growth due

Table (2): Back-calculated lengths (cm) of *O. niloticus* attained in different regions by different authors.

Back calculated lengths								
Authors and regions	*Sex*	l_1	l_2	l_3	l_4	l_5	l_6	l_7
River Nile								
Talaat (1979)	M + F	11.6	16.8	21.3	27.1	30.9		
Latif *et al.* (1989)	M+ F	7.6	12.0	14.6				
Lake Nasser								
Abdel-Azim (1974)	M + F	26.0	37.8	45.5	50.8			
Talaat (1979)	M+ F	18.9	31.1	41.4	47.8	52.8	54.7	56.7
Lake Manzalah								
Bishara (1973)	M	10.8	16.9	21.0	22.7	25.9		
	F	9.9	14.6	18.0	19.7	20.0		
Hosny (1987)	F + M	9.0	13.4	19.8	25.0			
Abdel-Aziz *et al.*(1990)	F + M	10.11	15.50	20.2	22.3			
Lake Borollus								
El-Haweet (1991)	F + M	10.7	16.8	21.3	24.9	27.5	28.5	
Lake Edku								
Talaat (1979)	F + M	10.8	17.5	24.4	29.7	33.9		
Abdel-Aziz *et al.*(1990)	F + M	10.6	16.6	21.3	25.0	27.4		
Lake Mariut								
El-Zarka *et al.*, (1970)	F + M	8.4	21.1	29.2	32.7	37.6		
El-Shazly (1995)	F + M	8.4	14.2	18.8	24.2			
Present study	F	8.2	13.6	18.1	21.0			
	M	8.3	13.4	17.0				
	F + M	8.2	13.5	17.8	21.0			

to deterioration of the nutrient base of the biological productivity. According to Salah (1961) and Abdalla et al. (1991), the annual standing crop of phytoplankton (1982) greatly decreased to about 13 % of its value (1958-1959).

The asymptotic length ($L\infty$ = 33.3 cm) of the species under study, was highly compatible with that $L\infty$ = 32.8 reported by Abdel-Aziz et al. (1990) in Lake Edku and El-Haweet (1991) in Lake Borollus. While, it was smaller than those estimated in Lake Manzalah (36.6 cm) & Lake Nasser (63 cm) as given by Hosny (1987) and Talaat (1979) respectively.

Growth performance index ϕ was used for comparing the over-all growth of the species under study in different regions. It was found that O. niloticus were best growing fishes (ϕ = 3.15) in Lake Nasser (Talaat, 1979). While, in the present study, it had relatively lower value (ϕ = 2.42) than those of Lake Manzalah (ϕ = 2.48) & Lake Edku (2.55) reported by Abdel-Aziz et al. (1990) and Lake Borollus (ϕ = 2.55) found by El-Haweet (1991).

It is worthy to mention that the growth performance of species under study was considerably lower than that previously computed for the some species (ϕ = 2.71) in Lake Mariut (El-Zarka, 1970). This means that the environmental conditions become less suitable for that fish species.

Also, the longevity of O. niloticus varies from one locality to another. Thus the older recorded fish was 4 years in the present study while it attained 7 years in Lake Nasser (Talaat, 1979).

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