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COMPARATIVE STUDY ON LENGTH-WEIGHT RELATIONSHIP AND CONDITION FACTOR OF THE GENUS OREOCHROMIS IN POLLUTED AND NON-POLLUTED PARTS OF LAKE MARIUT EGYPT.

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ABSTRACT

The aim of work is the determination of pollution effect on length-weight relationship and condition factor of two dominant tilapia species (O. niloticus and O. aureus) in Lake Mariut.

The results indicated that, there are highly significant variations in length-weight relationship and condition factor of both mentioned species in polluted and non-polluted parts of the lake. This study indicates that the environmental conditions in the Southeast basin are more suitable for growth of both species than that in Lake proper.

INTRODUCTION

The tilapia fishes are of considerable importance in the fisheries of Lake Mariut, they represent about 90% of the total catch, the dominant tilapia species in the lake are Oreochromis niloticus and Oreochromis aureus (El Shazly, 1993). Lake Mariut is situated south of Alexandria at latitude 31° 10' N and longitude 29° 55' E. It has a total area of about 15000 feddans, which is divided by the Desert Road and the Umum drain into four basins, the Lake proper, the fish farm, Southeast and Southwest basins. The Lake proper represents the main basin in the lake. It receives most of its water from the polluted water of Qallaa Drain through Moharram Bey Bridge. Other sources of pollution include industrial water effluents discharged at the north eastern corner, Gheit El-Enab Drain receiving sewage from Karmous and El-Kabbary out-fall that discharges raw sewage at the north west side. The Southeast basin is totally

separated from the lake by a dike bordering the Umum Drain. It was nearly free from pollution. (Abdel-Moneim et al. 1987, Saad, 1987 and Guerguess, 1988). Numerous studies have been carried out on Lake Mariut, of which some deal with pollution aspects: Anonymous (1978); El-Sharkawy (1978); Wahby et al. (1978), Halim (1984) and Ghazaly (1992).

However, this paper presents a comparative information on length-weight relationship and condition factor of O. niloticus and O. aureus in polluted (Lake proper) and non-polluted (Southeast basin) parts of Lake Mariut, which may be helpful in understanding the pollution effect on fish growth.

MATERIALS AND METHODS

Tilapia fishes used in this study were collected from lake proper and Southeast basin of Lake Mariut during the period from January to December 1993. A total number of 517 specimens were examined (283 of O. niloticus , 234 of O. aureus) ranging in size from 9 to 20 cm. T.L. for O. niloticus and from 9 to 16 cm. for O. aurea . the length-weight relationship is usually expressed by the equation: $W = a L^b$ (Beckman, 1948 and Le Cren, 1951) where W = weight in grams, L = total length in mm. and a & b are constants, the coefficients a & b are calculated after linearization by taking logarithms of both sides of the equation. In the present study, this relationship was computed from the combined data for all fish regardless of capture time, sex and state of gonad maturity. However, in this paper, the gutted weight is used in order to exclude the effect of stomach contents and weight of gonads (Lagler, 1956 and Ricker, 1975).

The coefficient of condition (k) is based on the cube law $K = W / L^3$ (i.e. Fulton condition factor) where W = gutted weight in grams, L = total length in millimeters. This factor is often used as an approximation even when the allometric factor is theoretically more appropriate (Bagenal & Braum, 1971 and Ricker, 1975).

RESULTS

1- Length-weight relationship:

The agreement between the observed and calculated weights of both species as well as in non-polluted was fairly good (Figs. 1 , 2).

The equation of length-weight relationship for mentioned species in southeast basin and lake proper are the following:

For O. niloticus

Southeast basin : Log w = -1.7106 + 2.9322 log L (r = 0.99876)
Lake proper : Log w = -1.9611 + 3.1376 log L (r = 0.99742)

For O. aureus

Southeast basin : Log w = -1.4289 + 2.6258 log L (r = 0.99036)
Lake proper : Log w = -1.7419 + 2.8514 log L (r = 0.99738)

The equations of length-weight relationship of the two species which are based on available data collected from two mentioned parts of the lake showed a log - log linear fit with regression coefficient (b) differing from polluted and non-polluted parts for both species (Table 1,2).

To test if the regressions are significantly different for the two species in polluted and non-polluted parts, analysis of covariance was employed (Table 3). For O. niloticus , covariance analysis shows that there are highly significant differences between Southeast basin fish and lake proper fish.

Likewise, for O. aureus , analysis of covariance shows a significant difference at 1% level between regressions of polluted basin fish and those of the non-polluted basin.

2-Condition factor (K):

The mean values of "k" for both fish species of the same length range from Southeast basin and lake proper are shown in (Table 1,2). The difference in condition factor of two species is statistically tested between Southeast basin fish and lake proper fish by using t-test (Table 4).

Condition factor for O. niloticus specimens shows that there are highly significant difference between Southeast basin and lake proper i.e., fishes captured from Southeast basin are heavier than those of lake proper. Also in O. aureus specimens, the mean value of "K" is higher in Southeast basin than in lake proper and this variation is statistically highly significant ($P<0.01$).

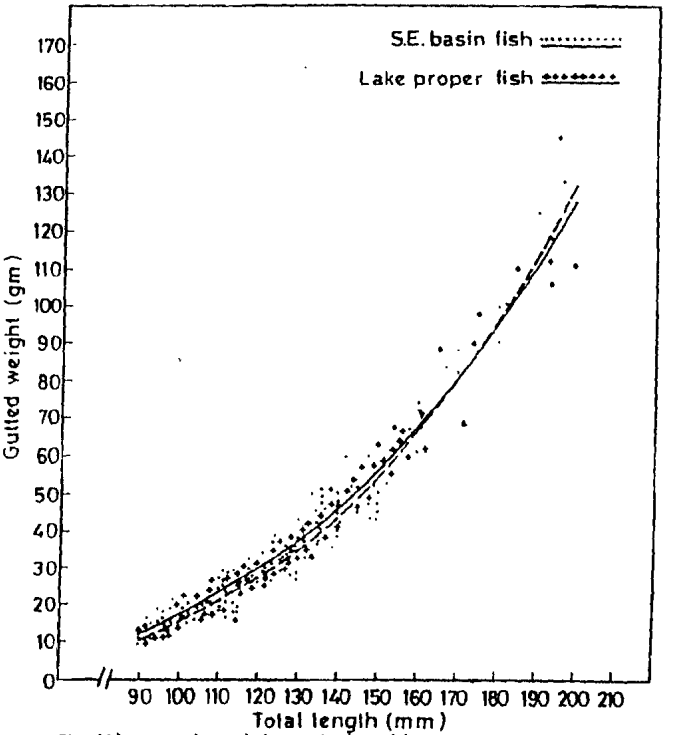

Fig. (1): Length-weight relationship of Oreochromis niloticus in Southeast basin and Lake Proper

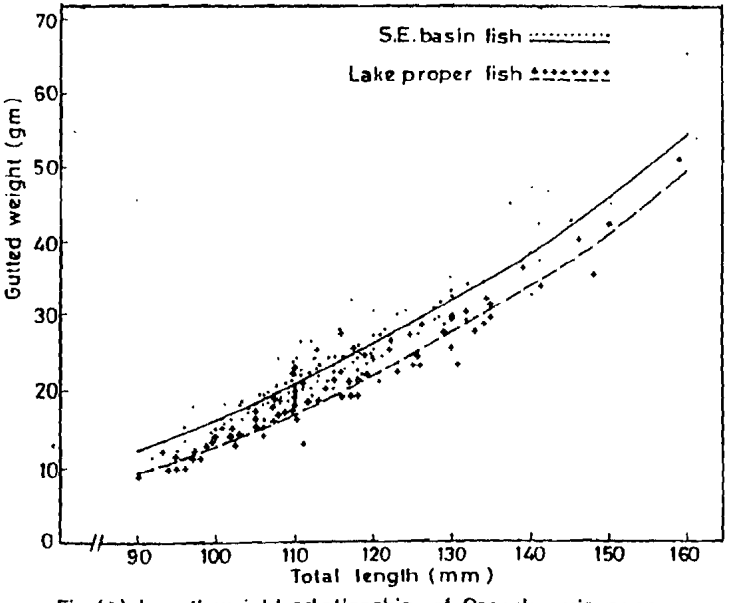

Fig. (2) Length-weight relationship of Oreochromis aureus in Southeast basin and Lake Proper

Table (1) Mean observed, Calculated weight and condition Factor of Oreochromis niloticus in Southeast basin and Lake Proper.

Range of total length (mm)	Southeast basin				Lake proper			
	Mean observed weight (gm)	Calculated weight (gm)	Condition Factor (K)	No. of Fish	Mean observed weight (gm)	Calculated weight (gm)	Condition Factor (K)	No. of Fish
85 — 94	12.60	12.20	1.728	5	11.25	10.79	1.543	4
95 — 104	16.91	16.63	1.691	23	13.00	15.01	1.300	7
105 — 114	22.14	22.02	1.663	21	20.65	20.25	1.552	34
115 — 124	27.74	28.44	1.605	27	26.81	26.60	1.552	26
125 — 134	35.87	36.00	1.633	23	34.23	34.20	1.558	30
135 — 144	44.52	44.78	1.623	21	43.64	43.15	1.590	11
145 — 154	52.00	54.86	1.541	11	54.56	53.58	1.617	9
155 — 164	70.17	66.34	1.713	6	64.57	65.61	1.576	7
165 — 174	83.50	79.30	1.700	4	77.50	79.35	1.578	2
175 — 184	96.67	93.83	1.658	3	93.00	94.94	1.595	2
185 — 194	117.00	110.02	1.706	2	108.00	112.49	1.575	2
195 — 204	133.67	127.95	1.671	1	128.00	132.13	1.600	2

Table (2) Mean observed, Calculated weight and condition Factor of Oreochromis aureus in Southeast basin and Lake Proper.

Range of total length (mm)	Southeast basin				Lake proper			
	Mean observed weight (gm)	Calculated weight (gm)	Condition Factor (K)	No. of Fish	Mean observed weight (gm)	Calculated weight (gm)	Condition Factor (K)	No. of Fish
85 — 94	11.00	11.93	1.509	3	9.33	9.53	1.280	6
95 — 104	16.24	15.74	1.624	17	12.60	12.87	1.260	20
105 — 114	20.45	20.21	1.536	58	17.13	16.88	1.287	30
115 — 124	24.58	25.40	1.423	31	22.43	21.64	1.298	21
125 — 134	29.79	31.34	1.356	14	26.53	27.18	1.208	17
135 — 144	42.00	38.08	1.531	6	32.50	33.58	1.184	4
145 — 154	45.00	45.64	1.333	1	39.00	40.88	1.156	3
155 — 164	59.50	54.07	1.453	2	51.00	49.14	1.245	1

Table (3) Test of significance of length -weight relationship of genus Oreochromis spp. at Lake proper and Southeast basin of Lake Mariut.

Species	Test of slope (FB)				Test of adjusted mean (FM)			
	d.f	Sum of squares (S.S)	Mean squares (M.S)	F-ratio	d.f	Sum of squares (S.S)	Mean squares (M.S)	F-ratio
O.niloticus	279	7783.3089	27.8972	1.6786	280	7830.1378	27.9648	
	1	46.8288	46.8288		1	276.2967	276.2967	9.8802 **
O.aureus	230	637.4631	2.7716		231	725.4164	3.1403	
	1	87.9533	87.9533	31.7340 **	1	650.6404	650.6404	207.1905 **

** Significant at 1 % level.

Table (4) Test of significance of condition factor of Oreochromis spp. in lake proper and southeast basin of Lake Mariut.

Species	Southeast basin		Lake proper		Cal. t
	Range	Mean ± S.D.	Range	Mean ± S.D.	
O. niloticus	1.541-1.728	1.643 ±0.0463	1.300-1.617	1.551±0.0617	14.2820 **
O. aureus	1.333-1.624	1.498±0.0805	1.156-1.298	1.262±0.0393	27.2004 **

** Significant at 1 % level.

DISCUSSION

During growth, the weight of fish increases as a function of its length (Hile, 1948 and Le Cren, 1951). On the other hand, the environmental parameters are very effective on the fish growth (Brown, 1957 and Sinha 1975). In addition to Lagler et al.

(1977) mentioned that length-weight relationship leads itself to comparison of individuals within and between different populations. In the present investigation it was found that there are highly significant differences between regressions of both mentioned species in the Southeast basin and lake proper, the fishes captured from Southeast basin were heavier than those of lake proper.

Condition factor gives an indication of the degree of the well-being of fish. It is used to indicate the suitability of an environment for a certain fish species by comparison with another environment (Ricker, 1971). In this study, the mean value of condition factor for both species are higher in Southeast basin than in lake proper. This difference was significant ($p<0.01$) as shown by t-test which indicates the suitability of environmental conditions in Southeast basin to tilapia fishes.

From all aspects, it is clear that the environmental conditions in Southeast basin are more suitable for growth of O. niloticus and O. aureus than those in lake proper basin.

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