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BIOLOGY OF GROWTH OF LIZA RAMADA IN LAKE BURULLUS, EGYPT

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ABSTRACT

*The present study concerns the growth in length and weight of **Liza ramada** inhabiting Lake Burullus. Six age groups were identified from length distribution, having mean lengths of 127, 231, 290, 320 and 347 mm of total length. Age groups I and II dominated the population, and fishes older than 3 years of age were very scarce. Estimation of rates of mortality and exploitation ratio indicate that this species is underexploited, mostly for these three age groups. Most of the mortality is due to natural causes and is affecting mainly young individuals.*

INTRODUCTION

The mullet population of Lake Burullus is composed of five species, viz: ***Mugil cephalus, Liza ramada, L. saliens, L. aurata*** and ***Chelon labrosus. L. ramada*** quantitatively constitutes 77 % of the mullets population of the lake (Hashem & Hosny, 1988). The study of the biology of ***Liza ramada*** in Lake Burullus was the subject of few investigations concerning their biology (El-Maghraby ***et al.***, 1973; 1974; Hashem ***et al.***, 1973) and their fisheries (El-Sedfy, 1971). The present study deals with the age composition, growth equations for length and weight, and estimates of rates of mortality in an attempt to throw light on the fisheries of this species in the lake.

MATERIALS AND METHODS

The present study was performed on 3835 individual of ***L. ramada*** caught from different areas of Lake Burullus. The sampling took place each month during the period from January to December 1987, using different fishing methods of various mesh size in order to cancel the effects of fishing gear efficiency, and selectivity both to fish species and size.

Random subsamples were taken each month for biological studies, during the whole period a total of 497 fish, ranging between 80 and 350 mm in total length were sampled. From each fish data on total length (measured to the nearest millimeter), total weight (weighed to the nearest gram), and scale samples were collected. Age determination from scale readings was performed using a Bosch & Lomb Tri-Simplex Micro-projector. Only 470 scale (94.8 %) were accepted for age determination, the rest, 5.2 %, were regenerated scales and were rejected.

Age-length key was constructed (FAO, 1981) and the resulting mean lengths at age were used in the construction of growth models (Gulland, 1983). The von Bertalanffy growth parameters were estimated using the Walford (1946) version as described by FAO (1981). Length-weight relationship was deduced using the exponential equation $W = cL^n$.

Mortality rates were computed using the Beverton and Holt (1957) equation for estimating total mortality coefficient from length data using the equation $Z = [K (L\infty - l_m)]/(l_m - l')$, where $L\infty$ and K are von Bertalanffy parameters, lm is the mean length in the catch and l' is the smallest length fully represented in the catch, which in this study was equal to 8 cm. Natural mortality coefficient was calculated according to Pauly (1979) as follows:

$\log M = -0.0066 - 0.179 \log L\infty + 0.6543 \log K + 0.4634 \log T.$

where T s the mean annual water temperature of the lake (= 22.33°C).

RESULTS AND DISCUSSION

Age determination from scale readings revealed the presence of six age groups of ***L. ramada*** in Lake Burullus. Age length key constructed from these data was used for the transformation of the length frequency data of the 3835

collected fish into a length composition table from which the following mean lengths a ages were deduced: 12.8, 17.54, 23.09, 28.99, 32 and 34.67 cm, respective to age groups I to VI. Table 1 shows values of mean length at age for ***L. ramada*** obtained by various authors. Wimpenny (1932) evaluated mean lengths of age groups I to III at 13.2, 19.05 and 22.8 cm, respectively, for ***L. ramada*** caught from Lake Bardawil. Rafail (1968), on the other hand, gave similar values for fishes along the Mediterranean coast of Egypt (Table 1) but he gave two lengths for fishes of age group I, i.e. 14.7 cm from scale readings and 18.0 from length frequency distribution estimates; it may be believed that this second value is unreliable due to the small size of the sample (n = 338 fish). It can be concluded, therefore, that the present results agree with those obtained by previous investigators working in Egyptian waters (Rafail, 1968; Youssef, 1973; Hashem ***et al.***, 1973), with slight disagreement for fishes of age group I; however, estimated values fishes of age group I in various localities favor the present estimations. Ezzat (1965) indicated a mean length of 113 mm for one year old fishes of Etang de Berre (France); and Albertini- Berhaut (1975), studying the 0-age group in Marseille (France), concluded that they complete their first year of life at a length of 125 mm, which is almost identical for fishes of age group I in Lake Burullus.

The percentage occurrence of each age group shows that among the six age groups represented in the lake, age group II constituted about 66 % of the landed catch, followed by fishes of age group I (29.13 %) and age group III (4.88 %). Fishes older than 3 years constituted less than 0.5 % of the population. Previous studies, gave different population structures that, in our mind only display the population structure under specific conditions, i.e., time, location, and gear characteristics, that differ from those offered during the present study. Thus, Rafail (1968) analyzing age composition of ***L. ramada***, along the Egyptian coast of the Mediterranean Sea, found six age classes having the following relative frequencies: 55.6, 22.8, 10.4, 6.2, 2.9 and 2.1 % (n = 338) for respective age groups I to VI. His result projects the population structure of this fish near the sea shore, where most of juveniles and young of the year spend a good deal of time before entering the freshwater lakes. On the other hand, Hashem ***et al.*** (1973) have shown that the population of ***L. ramada*** in Lake Burullus was previously dominated by fish of age group I (84 % of the catch). Whether or not their finding reflected the actual population structure is dubious. They used only one gear in their sampling, thus their finding may be

affected by gear selectivity and efficiency. The present data propose a normal age structure of a moderately exploited population as suggested by various authors (see Gulland, 1983).

Table (1): Length at age of *L. ramada* given by some authors at different localities.

Auhor	L_1	L_2	L_3	L_4	L_5	L_6	*Locality*
Wimpenny (1932)	132	191	228				Lake Bardawil (Egypt)
Arne (1938)	131	181	210	237	272	316	Gulf of Gascogne
Ezzat (1965) ♀	112	194	280	325	356	377	Etang de Berre
♂	114	190	363	312	333	373	
Rafail (1968)	147	238	314	377	417	462	Medit. Coast (Egypt)
Youssef (1973)	138	208	275	326	355		L. Manzalah (Egypt)
Present Study	128	175	231	290	320	347	L. Burullus

Linear growth of ***L. ramada*** in Lake Burullus was expressed mathematically by the well known von Bertalanffy growth equation (1938), $l_t = L\infty\ [1\text{-}Exp(-K(t\text{-}t_0))]$. The parameters of the equation were obtained using the Walford version of this equation. The regression of l_{t+1} against l_t developed values for $L\infty$ and K as being equal to 56.0366 cm and 0.1465/yr, respectively. The plot of $\log_e (L\infty - l_t)$ against age yielded an estimate of t_0 as being equat to -0.7455 years.

The equation expressing growth in length of ***L. ramada*** in Lake Burullus could thus be considered as follows :

$$l_t = 56.0366\ [1 - EXP\ (-0.1465\ (t+ 0.7455)]$$

The relation between total length (in cm) and total weight (in gram) for 497 individual of ***L. ramada*** ranging in length between 10 and 35 cm was found to be curve-linear and was expressed mathematically by the equation :

$$\log\ W = 3.0764\ \log\ L - 2.2911$$

The coefficient of determination beng 0.975, i.e. this equation fits the observations at the 99 % confidence level.

The asymptotic weight of this fish was computed by simple substitution of L ∞ value for L in the length-weight equation, W∞ was found to be 1124.33 gm. The theoretical equation expressing growth in weight could thus be written as :

$$W\infty = 1124.33\ [1 - EXP\ (-0.1465(t+0.7455))]^{3.0764}$$

Values of the exponent 'n' of the length-weight equation indicates that ***L. ramada*** is in good conditions and that it grows heavier relative to its length as the fish increase in length. In the Egyptian Mediterranean waters this exponent for ***L. ramada*** was found to be 2.9142 (Rafail, 1968); 2.871 in Marseille, France (Ezzat, 1965); 2.949 in Lake Manzalah (Youssef, 1973); 2.913 in experimental ponds (Bishara, 1967). Moreover, the value of this constant calculated for ***L. ramada*** in Lake Burullus was 2.9071 on an annual average and 3.0464 during the spawning season (El- Maghraby ***et al.***, 1973). It is, therefore, acceptable to admit that the condition of ***L. ramada*** population inhabiting Lake Burullus has improved than those found elsewhere, or in Lake Burullus in former periods.

Using the Beverton & Holt equation, a preliminary estimation of mortality rates exerted on the population of ***L. ramada*** of the lake was performed; the total mortality coefficient 'Z' was found to be equal to 0.6766. Meanwhile, the natural mortality coefficient 'M' was computed using Pauly equation and was found to be equal to 0.5750.

Since Z = F + M, then by simple subtraction, the fishing mortality coefficient was calculated and was found to be equal to 0.1016. The rate of exploitation 'E', or amount of death due to fishing, relative to total deaths was calculated using the relation E = F (1 - EXP (-Z) Z (Everhart ***et al.***, 1975), and was found to be 0.0738. This figure indicates that the population of L. ramara is very lightly exploited. Together with the age structure of the population, these findings reveal that most of the mortality exerted on this population is due to density-independent causes and that fishes of age group I, and younger, are the most affected by this type of mortality.

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