

AGE AND GROWTH IN LETHRINUS BUNGUS FROM THE RED SEA

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ABSTRACT

The annulus is formed in winter and is reliable for age determination. The relation between standard length (L_s) and scale radius (S) is described by the equation $L_s = 2.248455 + 4.038189 S$. Thus for back calculation, Lee's equation is adopted as follows:

$$L_n = (L_s - 2.248455) rn / R + 2.248455.$$

The calculated lengths are 13.28, 17.21, 19.72 and 21.65 cm with increment of 13.28, 13.93, 2.51 and 1.39 cm for age groups

I to IV, respectively. The relation between standard length (in cm) and weight (in g) is expressed by the equation: $W = 0.329536 L^{2.928992}$. The difference between the actual and calculated weights is narrow in small fishes becoming wider with increase in length. Condition factor ranges from 0.882 to 1.110.

Weight increment is 64.23, 73.01, 67.25 and 64.32 g for age groups I to IV, respectively. Thus, from the heaviest weight value, the weight increment is 27% for age group II followed by 25% for age group III while increment for age groups I and IV is slightly less (24%).

INTRODUCTION

Lethrinid fishes are of great economic importance in the Red Sea. Seven species were before identified (Salem, 1961). They are usually caught throughout the year, especially during the summer-time mainly by hook and line from the coastal, coral reef and rocky areas.

Few scientific works have been reported on Lethrinid's biology. Aldonov and Druzhinin (1978) and Hashem and Shakour (1981) have provided information on some Lethrinids in other regions on the Red Sea and Arabian Gulf.

The present study is a part of the program directed to the study of the biology of Lethrinids in the Red Sea and deals with the age and growth of *Lethrinus bungus* Ehrend.

MATERIAL AND METHODS

Random monthly samples of *Lethrinus bungus* were obtained fresh from the coastal areas in the vicinity of Al-Ghardaqa

through hook and line fishing by the crew of the Marine Biological Station of Al-Ghardaqa. The work is based on 1415 specimens of different sizes. For each specimen, standard length, total weight, sex, stage of maturity and gonadal weight were recorded respective to fishing date. Scale samples were taken from the left side of the body just under the pectoral fin area for subsequent age determination.

RESULTS

A- Scale Characteristics

As in other lethrinids., the scales of *Lethrinus bungus* are ctenoid. They are thin, transparent and fan-shaped.

I- Time of Annulus Formation:

Examination of the scales of fishes with one annulus (age group 1) revealed that the increment in the scale radius decreases from April to attain its lowest value in June, (Fig. 1) denoting that the new growth begins along this period and that the annulus is formed in the winter time. In turn, these observations besides the examination of scales of older fish, revealed that the annulus is valid as a year mark and reliable for age determination.

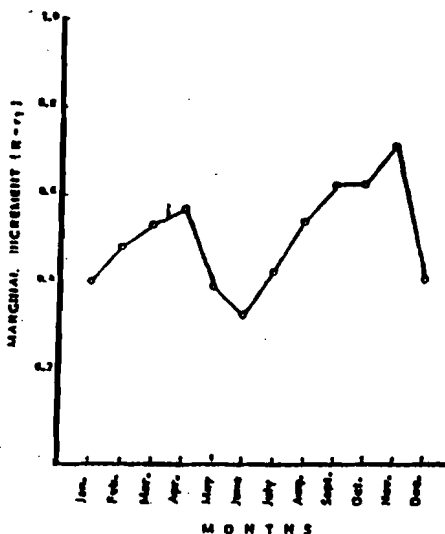


FIG. 1
Monthly marginal increment of the first annulus
to the scale margin of *Lethrinus bungus* from the Red Sea.
(R = total scale radius; r₁ = radius of the first annulus)

II- Length - Scale Relation:

Analysis of this relation was based on 165 specimens, assorted into 15 length groups, with 1 cm length interval. The smallest fish covered the range 10 - 10.9 cm and the longest fish group is for 24 - 24.9 cm samples. The relation between these two variables is linear, (Fig. 2) and can be described by the equation:

$$L_s = 2.248455 + 4.038189 S$$

(Correlation coefficient $r = 0.901875$)

where L_s = standard length (cm)
 S = scale radius (mm)

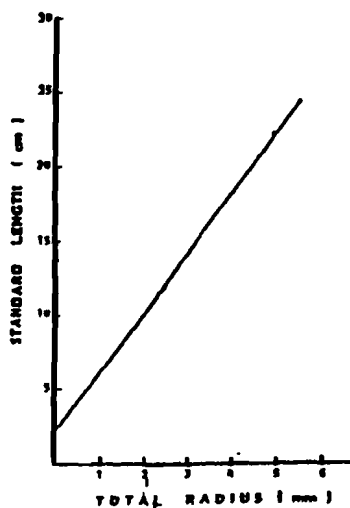


FIG. 2
Body length scale radius relationship of
Lethrinus bongus from the Red Sea.

B- Growth in Length

For the back calculation of the growth along the different year, the following Lee's equation (1920) was adopted:

$$L_n = (L_s - a) rn / R + a$$

where L_n = standard length of the fish at the annulus n
 L_S = standard length of the fish.
 rn = radius of the annulus n.
 R = total scale radius
 a = intercept.

For *Lethrinus bungus* on the basis of the afore mentioned scale radius equation, Lee's equation thus becomes:

$$L_n = (L_S - 2.248455) rn / R + 2.248455$$

By applying this equation, the calculated standard lengths are 13.28, 17.21, 19.62 and 21.65 cm, with a growth increment of 13.28, 3.93, 2.51 and 1.93 cm for the successive age groups from I to IV, respectively (Fig. 3).

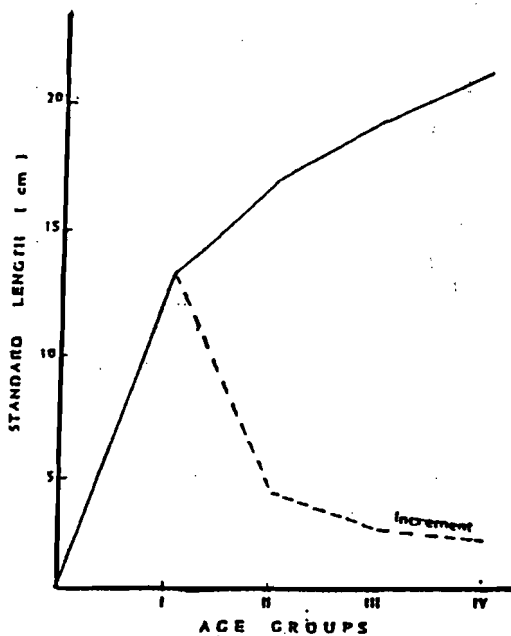


FIG. 3
 Growth and increment in length of *Lethrinus bungus*
 from the Red Sea.

C- Length - Weight Relation

This relation was computed by applying data available from 1396 specimens ranging in length from 5 to 25.9 cm. Generally, for a given length, the actual weight is not fixed but variable (Fig. 4). Fish were grouped with 1 cm length interval. The average length ranged from 5.39 cm to 25.04 cm for the different groups from the smallest to the largest fish. The respective actual weights ranged from 4.33 g to 395.2 g.

The relation between the two variables is generally expressed by the following equation:

$$W = a L^n$$

where W = weight of fish
 L = standard length of fish

a and n = constants derived by using least square regression.

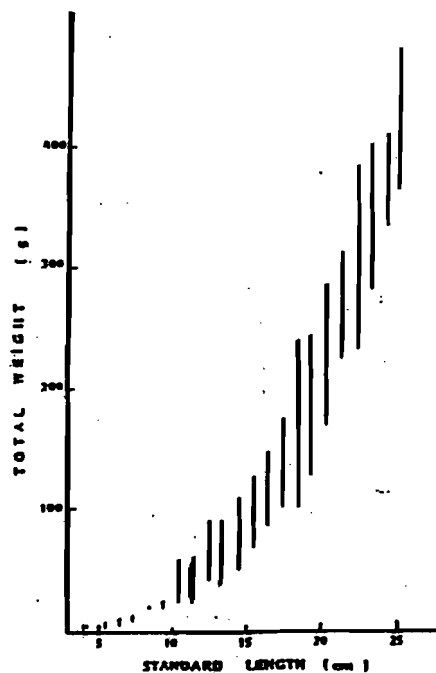


FIG. 4
Extent of variation of the total weight with the standard length of *Lethrinus jangas* from the Red Sea.

For *Lethrinus bungus* the equation deduced:

$$W = 0.0329536 L^{2.928992} \text{ or} \\ \text{Log } W = -1.482097 + 2.928992 \text{ log } L$$

(W = weight in g; L = standard length in cm)

On the basis of the computed data, Fig. 5 was drawn for calculated weight 4.58 g for 5.39 cm length to 411.62 g for 25.04 cm length. On the whole, the difference between the actual and calculated weights is narrow in small fishes and is wider for the large fish.

In addition, the "Condition Factor" is a parameter adopted for examining the well-being of fish based on the relation between length and weight. The factor is usually analyzed in the following ways:

Fulton's condition factor or

$$K_C = \frac{W}{L^3}$$

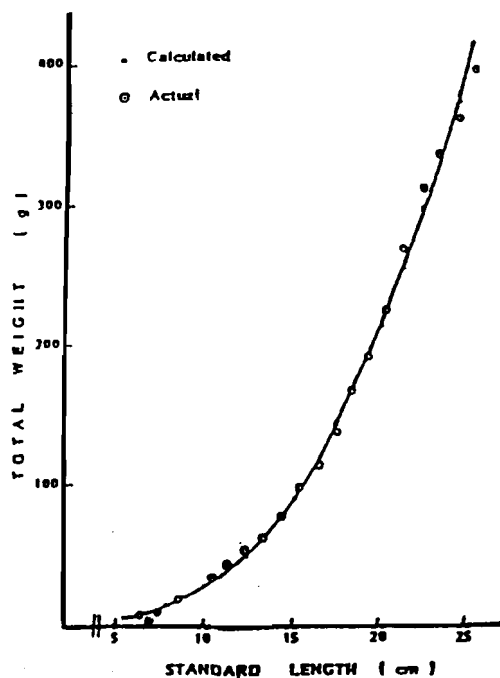


FIG. 5
Length-weight relationship of *Lethrinus bungus*
from the Red Sea.

Relative condition factor K_n , Le cren (1951)

$$K^n = \frac{W \text{ observed}}{W \text{ calculated}} \quad \text{or} = \frac{W}{a L^n}$$

K_n measures the deviation of an individual from the average weight for the length unit while K_c measures the deviation from a hypothetical ideal fish.

As seen from Table 1, the values of K_n is around one, and ranged from 0.882 to 1.110, as compared with K_c value more than 2.4 and ranging from 2.479 to 3.142 with most values within the range of 2.6 - 2.8.

TABLE 1
Length-weight relationship and condition factor
of *Lethrinus badius* from the Red Sea.

Standard Length (cm)		No. of fish	Total Weight (g)		Condition Factor		
Interval	Average		Range	Average	Calculated	K_n	K_c
5- 5.9	5.39	8	3.4- 5.5	4.33	4.58	0.945	2.765
6- 6.9	6.45	10	5.1- 8.4	7.25	7.75	0.935	2.702
7- 7.9	7.32	5	9.5- 12.4	10.72	11.22	0.955	2.733
8- 8.9	8.53	3	19.0- 20.0	19.50	17.56	1.110	3.142
9- 9.9	9.36	3	18.0- 23.0	20.33	23.05	0.882	2.479
10-10.9	10.46	30	23.0- 58.0	33.10	31.92	1.037	2.892
11-11.9	11.38	86	30.0- 60.0	42.95	40.86	1.051	2.414
12-12.9	12.39	157	41.0- 89.0	54.27	52.42	1.035	2.853
13-13.9	13.23	157	44.0- 89.0	63.15	63.52	0.994	2.727
14-14.9	14.36	157	55.0-107.0	77.86	80.76	0.964	2.629
15-15.9	15.35	192	68.0-125.0	96.56	98.18	0.983	2.670
16-16.9	16.28	139	85.0-147.0	114.68	116.64	0.983	2.657
17-17.9	17.30	116	100.0-175.0	136.90	139.36	0.982	2.644
18-18.9	18.34	80	102.0-236.0	166.65	165.33	1.008	2.702
19-19.9	19.28	70	127.0-242.0	191.93	191.41	1.003	2.678
20-20.9	20.30	43	168.0-285.0	222.77	222.61	1.001	2.663
21-21.9	21.30	58	223.0-312.0	267.05	256.28	1.042	2.764
22-22.9	22.35	37	231.0-282.0	310.43	295.07	1.052	2.781
23-23.9	23.27	31	279.0-398.0	335.39	332.08	1.010	2.662
24-24.9	24.27	9	332.0-408.0	361.00	375.63	0.961	2.525
25-25.9	25.04	5	362.0-478.0	395.20	411.62	0.960	2.517

D- Growth in Weight

Based on the calculated values, the weight growth pattern is shown in Fig. 6. On the whole, the calculated weights are 64.23, 137.24, 204.49 and 268.81 g with weight increment of 64.23, 73.01, 67.25 and 64.32 g for the successive age groups from I to IV, respectively. On the whole, between the different age groups, the addition in weight does not vary considerably. In other words, percentage weight increment is about 24% for age groups I or IV and 25% for age group III, with the highest value of only 27% for age group II.

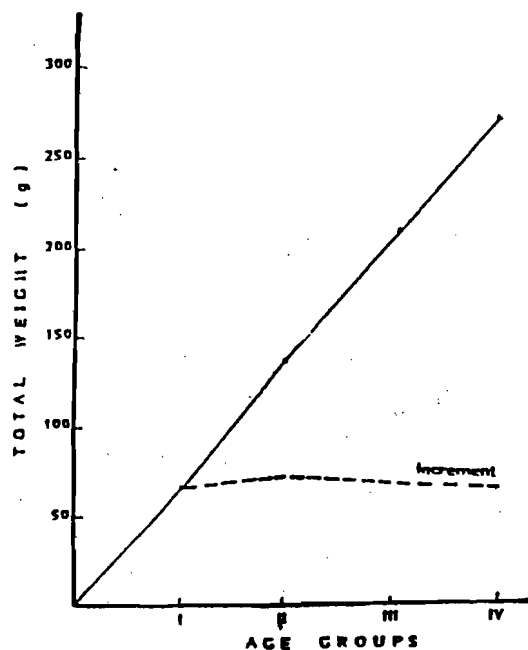


FIG. 6
Growth and increment in weight of *Lethrinus bungus*
from the Red Sea.

DISCUSSION

Lethrinid fishes are common members of hook and line fishing in Red Sea. The seven species recorded in the vicinity of Al-Ghardaqa (Salem, 1971) usually attain varying sizes, and are being subject to successive studies. On the whole, these fishes usually dwell the shore and coral-reef area and are carnivorous in the food habit (Al-Hussaini, 1946; Latif, 1967). Thus while *Lethrinus nebulosus* and *L. mahsena* can be more than 35 cm long, other as *L. variegatus* and *L. bungus* do not exceed 25 cm in length.

The longevity of lethrinids is different. *L. variegatus* lives for three years, *L. bungus* can be one year older. The oldest *L. mahsena* are 5 years old, but *L. nebulosus* can live for 8 years. The maximum lengths are about 25 cm for *L. bungus*, 36 cm for *L. mahsena* and about 60 cm for *L. nebulosus*.

The calculated length is higher for *L. mahsena*, while *L. bungus* comes next and *L. variegatus* shows the lowest length. Numerically, these lengths for successive age groups I -III are respectively 16.1, 22.6 and 27.8 cm for the first species as compared with 13.3, 17.2 and 19.7 cm for the second species and 7.7, 13.3 and 17.1 cm (standard length) for the last species. In turn, the calculated weights for a given age or length is higher for *L. mahsena*, while *L. bungus* and *L. variegatus* come next. Thus, the calculated weight for age group I is 129, 64 and 11 g, for age group II is 339, 137 and 53 g, and for age group III is 613, 204 and 108 for the above three species respectively.

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