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A STUDY OF AGE AND GROWTH OF BARBUS BYNNI FORSKAL FROM LAKE NASSER

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ABSTRACT

The population of Barbus bynni in Lake Nasser was composed, at least, of 6 age-groups, of which the third one was dominating the catch. The scale characteristics, definition of the annulus, beside the time of annulus formation and its validity as a year mark, were discussed. It was found that the annulus is laid during December-February. Some irregularities were found in the structure of scales. The body-length relationship is linear. It revealed that the increase in weight, nearly, follows the cube of length. The most rapid growth in length was found during the first year of life. The percentages of annual weight increments showed that their maximum value was attained between age-groups I and II, followed by age-groups II and III, then markedly decreased. It was advised to capture these fishes at a length not less than 28.0 cm, after they complete their second year.

INTRODUCTION

Reservoirs are generally planned for solving a number of economic problems, one of which is to overcome the

continuous decrease in the animal protein resources necessary for food, due to the progressively increasing number of human population. As fishes are considered as one of the main resources of this protein, attention was directed to increase their catch specially in inland waters. This, undoubtedly, could be fulfilled through the good management of their fisheries, which must be based on scientific and accurate informations about the important and economic inhabitants of fish species.

Lake Nasser is one of the greatest man made reservoirs in Africa. It is located at the southern part of Egypt (informations about this lake were published before - Latif, 1974 and Massoud et al., 1985). Although this lake has a large area, yet its production is relatively low. This indicates, that more studies have to be made on the important inhabiting fish, in order to improve their yield.

Family Crprinidae is one of these important inhabitants. It is represented in Lake Nasser by 13 species, belonging to five genera, of which genus Barbus Cuv., 1816 is the most important. This genus comprises five representatives namely: B. bynni Forskal; B. werneri Blgr. ; B. perince Rupp.; B. neglectus Blgr. and B. anema Blgr., of which the first species is the most common (Latif, 1974).

Very few studies were carried out on cyprinid fishes in Egypt. Therefore, it was found that the study of age and growth of Barbus bynni from Lake Nasser is interesting.

It is worthy to note, that fecundity of this important species was studied before in a previous work (Shenouda, 1986).

The ultimate objective of this work is to help in a better management of fisheries in lake Nasser and to improve its fish production to a continuous higher level of abundance.

MATERIAL AND METHODS

Fish samples required for the present study were collected from the commercial catch landed at Aswan High-Dam harbour, during the period from October 1990 till September 1991. Beside the length, weight, sex and date of capture, scales were taken from the region between the insertion of dorsal fin and lateral line, as suggested by Rounsefell & Everhart (1953).

About 1832 specimens were investigated, ranging in their body lengths from 11.0 to 65.0 cms.

Two methods were used in the preparation of scales, by soaking overnight in either 10% ammonia or in cloth-detergent solutions. The second solution appeared to be more

suitable. Scales were cleaned under a binocular microscope of low magnification, with the help of a hard brush. The cleaned scales were washed by distilled water, then mounted between two glass slides on which serial numbers were written.

RESULTS AND DISCUSSION

a - AGE

1- Scale characteristics and definition of the annulus:

Scales of Barbus bynni Forskal are typically of the cycloid type, with smooth anterior and posterior margins. Radii and transverse grooves are lacking, however, lines of flexbility are sometimes found. A conspicuous focus, which may be central or slightly anteriorly or posteriorly eccentric, is present in the scales. The "normal" scales have repeatedly widely and closely spaced circuli radiating from the focus, indicating the fast summer and the slow winter growth, respectively. The wider spacing is found typical at the beginning of each new band of growth. The closely spaced circuli are laid at the end of the growing season.

Following Semko (1954); Vedensky (1954); Birman (1960); Bilton and Ludwig (1966) & Latif and Shenouda (1972 & 1985), the term "annual ring" is used for the definition of the annulus and the "new growth" for designation of the part of scale found after the last annulus.

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2- Time of annulus formation and its validity as a year mark :

The use of scales for age and growth studies is based on the assumption, that only one annulus is laid during the year and almost at a certain time. Examination of scales of B. bynni from Lake Nasser revealed that the small-sized fishes showed no annulus formation. Marginal annuli firstly appeared on the scales during December. The percentage of scales having annuli on their edges reached its maximum during January (about 80%) then decreased during February. Such a long period may be due to the fact that new growth on the scales of different individuals is completed at different times, since the collected samples cover a large area of the lake, whereby they may live in different environmental conditions. Scales collected during the period from March through November showed variations in the position of the annulus.

From the above-mentioned examination of scales of B.bynni, it is clear that the annulus is laid once in the year and at a definite time i.e. from December to February. This indicates that the annulus is a true winter-ring and consequently, the scales of the present species are valid for age and growth studies.

According to Thompson (1904), temperature is considered as the principal factor in the formation of annual rings on scales as it affects the food supply of the fish.

It is worthy to mention, that the water temperature in this lake drops to its lowest degree during January, as was stated by Massoud et al. (1985). The same authors reported also, that the annulus of Hydrocynus forskalii Cuv., in Lake Nasser is formed during January. This supports the above mentioned result about the time of annulus formation for B. bynni.

Other proofs for the validity of the annulus as a true year mark could be obtained from the body-scale relation. Also, according to Bishai (1981), the agreement between the actual and calculated lengths of fish in any age-group is an additional evidence for the validity of the annulus as a true year mark.

3- Body - Scale relation:

The establishment of a cer ain relationship between the growth of fish, represented by its length, and that of the scale is regarded as a good proof for the validity of growth calculations from scale measurements. For this purpose, either the scale diameter or, more often, its anterior radius is used. Also, the total, fork, or standard "body" length may be adopted.

According to Van Oosten (1923), a nearly constant relationship exists between the scale diameter of fish and its length. However, the same author (Van Oosten, 1929)

stated that this relationship is nearly const[illegible]e completion of the first annulus. On the other ha[illegible] authors found that a linear relationship exists between [illegible]he anterior radii of scales and the standard length of the fish (Carlander, 1945; Shenouda, 1969; Latif and Shenouda, 1972 & 1985; Bishai and Labib, 1973; El-Maghraby et al., 1973; Hashem, 1973 - a,b & c; Ezzat et al., 1977 & Hashem and Fayek, 1977).

In the present study it was difficult to locate the annuli in the posterior field of the scales, therefore, the anterior scale radii were used. The relation between the anterior magnified scale radius (X 40) and the standard length of the fish was studied. Fishes having lengths of 3.0 cm. intervals were grouped together. The mean lengths of these groups and the corresponding means of scale-radii are shown in table (1). It was found that the ratio between these two variables (L/S) is nearly constant. This ratio, though it showed a little increase in larger fish, had no particular trend. Also, it was noticed that the scale-radii grow in direct proportionality with the body length .

It is worthy to note, that this direct proportionality is not valid for the same species in Nozha-Hydrodrome (Hashem and Fayek, 1977).

The plotting test revealed that the relation between them is apparently linear. Therefore, the straight line formula of the form:

$$L = a + bS \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

was applied, where L = standard length in cms.; S = magnified anterior scale-radius and a & b are constants. The values of these constants were computed by the least square method and were found to be (-50) and (1.1), for a and b, respectively. Thus, equation (1) became:

$$L = -50 + 1.1\ S \quad \ldots\ldots\ldots\ldots\ldots (2)$$

Since younger fishes (less than 13.0 cm. in body length) were not represented and accordingly were not included in the present analysis, the extrapolation of the straight line with the axis representing the length of the fish was not possible. Therefore, the value of the intercept- to be used as a correction factor for the direct proportion computations - could not be detected. A straight line was fitted to the present data. A graphical representation of the body-scale relationship is shown in figure (1).

As the scales grow in direct proportion to the length of fish after the completion of the first annulus, the past growth calculations by the direct - proportion method of "Dahl-Lea" is valid in the present work.

Negative values of the correction factor (a) in equation (1) were, also, observed by Ezzat et al. (1981) for Epinephelus aeneus in the Egyptian Mediterranean water and by Wadie et al., (1981) for Epinephelus alexandrinus in the same area.

4- Age determination:

The validity of age determination by counting the number of annuli was clearly established by Van Oosten (1929). However, it was found that the first winter ring laid on the scales or vertebrae of many subtropical fishes, which spawn during Spring or Summer, represents what is called a "fry" or a "zero" ring (Gottlieb, 1956; Jensen, 1965; Wadie et al., 1985 and Khallaf, 1988). Accordingly, this ring was not encountered in the age determination study of the present species.

It must be noted that some irregularities in the structure of scales, such as accessory marks "false rings" or regenerated ones, were frequently detected. These irregularities were observed by many authors through the examination of scales of the studied fishes (Van Oosten, 1929; Hile and Jobes, 1941; Ananiadis, 1949 ; Scaccini, 1949; Bougis, 1952; Numann, 1955; Cable, 1956; Planas and Vives, 1956; June and Raith-mayer, 1960; Shenouda, 1969; Hashem, 1972, 1973 a & 1977; Latif and Shenouda, 1972, 1985 & Wadie et al., 1985).

In regenerated scale, the clear well-developed focus is completely obliterated and, instead, a rough and irregular structure is developed. Regenerated scales were found in almost every fish. This indicates that the scales of the present fish species are of deciduous type, i.e. loosely attached to the body.

Scales, which showed any of these abnormalities or did not agree with the L/S ratio, were discarded from age and growth studies. On the whole, the possibility of some error in the age- determination study could not be completely excluded.

5- Age - composition:

The population of B. bynni in Lake Nasser, as determined from the collected samples during the period from October, 1990 till September 1991, was consisting of six age-groups (regardless small fishes of age-group 0). The available data are shown in table (2), from which it is clear that the length of individuals within any age-group varied greatly and overlapped with the preceding and the following ones. Also, these data revealed that fishes of age-group III were dominating in the landed catch, participating by about 28.45%. Representatives of age-group IV came next, contributing for about 22.53%. The third position was occupied by fishes of age-group I, II and V, since they had comparable percentages and contributed for about 13.32, 12.83 and 12.67%, respectively. The last fourth place was reached by representatives

of age-group VI, since they possessed a percentage of about 10.20% in the landed catch.

b - GROWTH

In order to study the growth rate of a fish during its different successive age-groups, either according to the length or to the weight, the length - weight relationship must be studied at first.

1 - The length - weight relationship and coefficient of condition:

The length - weight relationship is one of the most important biological relations. It depends on the mathematical principle of variation of the volume of an object with the cube of any linear dimension, if the shape and specific gravity are both constants (Hile, 1936). According to many authors (Hile and Jobes, 1941; LeCren, 1951; Jobes, 1952; Smith, 1956, El-Zarka, 1959 & 1961; Shenouda, 1969; Latif and Shenouda, 1972 & 1985; Latif and Khallaf, 1974 & Massoud et al., 1985) this relation can be satisfactorily expressed by the equation:

$$W = C L^n \quad \ldots\ldots\ldots (3)$$

where, W = weight in gms.; L = length in cms., while C & n are constants, whose values are calculated from the empirical data by applying the statistical least square method to the logarithmic formula described by Beckman , 1948).

Many authors had shown that this relationship is best achieved when based on the grouped data of all individuals, regardlese the time of capture , sex and state of maturity (Beckman, 1948; El-Zarka, 1959 & 1961; Shenouda, 1969; Hashem and Fayek, 1977 & Latif and Shenouda, 1985).

Application of the logarithmic form of equation (3) to the grouped data of 1832 fish, ranging in total lengths from 13.0 to 62.9 cms. and collected during the sampling period, led to the following equation:

$$\text{Log } W = -1.94 + 3.012 \log L \quad \ldots\ldots (4)$$

By using equation (4), weights corresponding to each 1.0 cm-interval of the total length of fish were calculated. These data are shown in table (3) and graphically represented by Fig. (2). From this table, it was noticed that there is a wide range of weight for the same length of fish. This range is lesser in smaller fishes than in larger ones. Also, it was remarked that slight differences were found between the actual and calculated weights. This may be attributed to some ecological and biological factors. The ecological factors are represented, to a great extent, by the environmental conditions in the different Khors within the lake, where the commercial fishing boats were operating. On the other hand, the biological factors are mainly due to the state of fishes during the sampling period, which included the spawning

season when fishes are relatively heavier than in other times. Also, the individual variations of the collected fishes must be taken into consideration.

Moreover, from equation (4), it is evident that the increase in weight of fish nearly follows the cube of length. The differences between the values of actual and calculated weights (Table 3) indicate that the relative heaviness varies from one fish to another. Such variations were expressed by Hile (1936) as the coefficient of condition. The general formula used for measuring it is:

$$K = \frac{W \times 100}{L^3} \quad \ldots\ldots\ldots\ldots\ldots (5)$$

Where W = weight of fish in gms., L = its length in cms. and (K) is the coefficient of condition.

As shown in table (3) this coefficient did not vary significantly with the increase in length. This is unusual, since as fishes grow older they tend to gain, relatively, more in weight than in length (Rounsefell and Everhart, 1953). Therefore, the average values of the coefficient of condition may be regarded as a measure of the "degree of well-being" of these fishes, and can be used in comparing the state of different populations of this species inhabiting different environmental localities.

The comparison between the mean values of (K) of B. bynni from Lake Nasser (1.20) with that from the Nozha-Hydrodrome (1.12) reported by Hashem & Fayek (1977), revealed that fishes from the first area were relatively heavier.

2- Growth in length:

The study of growth in length for B.bynni was based on both actual lengths measured during the sampling period, and calculated lengths computed from the anterior scale-radii.

The measured lengths of fish at the time of capture varied not only in the different age-groups, but also in one and the same age-group (Table 4), It is noticed, from this table, that the range in standard length within a single age-group varied from 6.0 cm. for age-group IV to 11.0 cm. for age-group III, with intermediate ranges for the remaining age-groups. This points to the varying degrees of overlapping between the standard lengths of fishes of the successive ages. The mean lengths of the various age-groups indicated a progressive increase in the successive years of life. Thus, the means of standard lengths for age-groups from I to VI were: 17, 23, 33, 37, 42, and 48 cms., respectively.

One of the most important methods of determining the rate of growth of a fish is to calculate its length at previous ages from the relative positions of annuli on the

scales (Ezzat et al., 1981). The preceding establishment of the linear relationship between the standard length of the fish and its anterior scale radius suggested the validity of the direct-proportion method of "Dahl-Lea" for the calculation of lengths at the different years of life. Therefore, the length at age (n) was obtained by the formula :

$$L_n = R_n \cdot L / R \quad \ldots\ldots\ldots (6)$$

Where L_n = calculated length of fish at the end of n^{th} year, L = standard length at capture, R_n = scale radius corresponding to n^{th} year and R = total scale radius.

Data for the mean calculated lengths at the end of each year of life, together with the annual increments, were computed and are given in table (5). It must be noted that no separation of sexes was done in the treatment of data. From this table (5), it is clear that the most rapid growth in length occurred during the first year of life (11.6 cm), after which the annual increments gradually decreased from 10.0 cm in the second year to 5.5 cm in the sixth year of life.

This result agreed reasonably well with the studies of many authors (Latif and Shenouda, 1972 & 1985; El-Maghraby et al., 1973; Hashem, 1973 - a,b & c ; Bishai and Labib, 1973; Ezzat et al., 1977 & Wadie et al., 1981, 1985 & 1989).

On the whole, the increase in length in the successive years of life showed a tendency to decrease with the increase in age. The actual and calculated lengths, together with the average annual increments for the different age-groups are graphically represented in figure (3).

3- Growth in weight:

The rate of growth in weight, as in length, differs in different fishes and also in one and the same species according to the different environmental conditions.

Thus, El-Bolock (1972) stated that the minimum increase of growth in weight for Clarias lazera, in Serow Experimental ponds, was noticed in the first year of life, whereas the maximum value was attained in the fifth year. Also, Latif and Shenouda (1972) found that the lowest growth in weight for Rhonciscus striatus, in the Gulf of Suez, was attained in the first year of life, after which the annual weight increments gradually and progressively increased. The weight increment in the first year of life for Sphyraena chrysotaenia, in the Southeastern Mediterranean Sea, is high and in subsequent years it steadily diminishes (Wadie et al., 1989).

The increment in weight for Saurida undosquamis from the Gulf of Suez is the highest from age-group II to age-group III (Latif & Shenouda, 1985).

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The growth rate in weight for Mullus barbatus in the Southeastern part of the Mediterranean Sea, was slow in the first three years, then became faster later on (Wadie et al., 1985).

Many authors recorded a higher increment in weight in later years of life (Jobes, 1952; Cable, 1956; Smith, 1956; El-Zarka, 1959 & Bishai, 1981).

The study of growth in weight for B.bynni, in the Nozha-Hydrodrome, showed that the smallest growth increment was found during the first year and a marked increase was obtained during the second and subsequent years, with the largest growth increment during the middle ages (Hashem and Fayek, 1977).

In the present study, the actual weights of B.bynni from Lake Nasser are shown in table (4). They more clearly reflect the same picture as did the actual lengths, since for any particular age-group there was a wide range of weight. The range of actual weight within a single age-group varied from 270 gm. for age-group I, to 1600 gm. for age-group VI, with intermediate ranges for the remaining age-groups. The overlapping degrees between weights in the successive age-groups were more clear than those between lengths. These data revealed that the mean actual weights for the successive age-groups from I to VI were 138, 305, 657, 1030, 1450 and 1910 gms,respectively.

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By applying the length-weight equation (3) to the mean calculated standard lengths shown in table (5), the calculated weights at the end of each year of life could be obtained, and thus table (6) was constructed. These data are graphically represented in figure (4). It was remarked that the mean values of the calculated weights for any age-group were, in general, much lower than those of the actual weights. This was mainly attributed to the wide ranges of the actual weights within any of these age-groups, as previously stated. The mean calculated weights for the different successive age-groups from I to VI showed that they were 19.2 , 123.7 , 341.8 , 640.5 , 1012.3 and 1441.6 gms., respectively. The annual increment in weight between the successive age-groups showed a tendency for increasing with the increase in age, being 104.5 , 218.1 , 298.7 , 371.8 and 429.3 gms., respectively.

Very interesting results were obtained when the annual increments were converted into percentages of increase in weight in relation to the calculated mean weights of the different age-groups. The maximum value appeared between age-group I and II reaching more than five times the mean weight of age-group I (544.3%), followed by that between age-group II and III being 176.3% i.e. more than 1.5 times the mean weight of age-group II. After that, the percentages of annual increments decreased and became less than the mean calculated weights of the remaining age-groups, in a gradual manner.

Taking into consideration that the majority of fishes of the present species reach the first sexual maturity during the second year of life (Length between 25 and 28 cms. and spawn in the Spring time; unpublished data), the foremen-tioned results suggest that the suitable time for fish capturing lies after completion of the second year of life at a standard length not less than 28.0 cm.

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CONCLUSIONS

The results of the present study of age and growth for B.bynni, from Lake Nasser led to the following conclusions:

1- The annulus is laid on the scales once in the year and in a definite time, from December to February, indicating that they are suitable for this study.

2- The scales grow in direct proportion to the length, which means that the past growth calculations by the direct proportion method are valid.

3- The population of the present species was composed of six age-groups, of which representatives of age-group III were dominating in the catch.

4- The increase in weight of these fishes nearly follows the cube of length.

5- The comparison between the mean values of the coefficient of condition for the present species, from Lake Nasser, with that from the Nozha-Hydrodrome revealed that fishes from the first area were, relatively, heavier.

6- The most rapid growth in length occurred during the first year of life, then gradually decreased.

7- The increase in the calculated lengths between the successive age-groups showed a tendency to decrease with increasing age.

8- The annual weight increments between the different age-groups appeared to increase with the increase in age. However, if these increments are regarded as percentages of the mean calculated weights of these age-groups, so it will be found that their values were much high between age-groups I and II, followed by that between age-group II and III. After that, they were less than the mean calculated weights of the subsequent age-groups, when they sharply decreased between age-groups III and IV. Then, a gradual decrease takes place up to the sixth age-group.

9- It is advised to capture fishes of the present species after the completion of the second year of life, at a standard length not less than 28 cm. .

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Table (1) :- Relation between the standard length of B.bynni , from Lake Nasser , and the anterior magnified (X40) scale-radius .

Length-interval (mm.)	Mean length (L) in mm.	Av.Scale radius (S) "x 40 "	L/S	No. of Fish (N)
130 - 159	135	160	0.844	60
160 - 189	170	200	0.850	100
190 - 219	200	236	0.848	188
220 - 249	230	250	0.920	123
250 - 279	250	280	0.900	130
280 - 309	300	330	0.900	146
310 - 339	325	350	0.930	192
340 - 369	350	360	0.970	153
370 - 399	380	385	0.987	181
400 - 429	410	410	1.00	110
430 - 459	440	440	1.00	87
Total and average			0.923	1470

Table (2) :- Age-composition of the landed catch of B.bynni from Lake Nasser (Oct.1990-Sept.1991) according to their length-intervals .

Tot.Length-intervals (mm.)	Age - group						No. of Fish	%
	1	2	3	4	5	6		
160 - 189	24						24	2.0
190 - 220	50						50	4.1
250	54	16					70	5.8
280	20	50					70	5.8
310	14	52	10				76	6.3
340		20	30				50	4.1
370		18	120				138	11.3
400			144				144	11.8
430			28	60			88	7.2
460			14	172	8.		194	16.0
490				42	46		88	7.2
520					76	12	88	7.2
550					24	36	60	4.9
580						62	62	5.1
						14	14	1.2
Total	162	156	346	274	154	122	1216	—
Percentage	13.32	12.83	28.45	22.53	12.67	10.20	—	100.0

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Table (3) :- Relation of length to weight , beside the coefficient of condition for B.bynni,from Lake Nasser(Approx. to nearest 0.5 cm.) .

Total length (cm.)	Weight (gm.) Range	Mean	Calc.	No. of Fish	Coef. of cond.
13	22 - 30	26	26.0	50	1.18
14	30 - 36	32	32.5	60	1.17
15	32 - 42	37	40.0	38	1.10
16	40 - 50	45	49.0	32	1.10
17	50 - 80	69	58.0	36	1.10
18	65 - 84	71	69.0	56	1.20
19	65 - 85	74	82.0	20	1.08
20	70 - 100	86	95.0	24	1.00
21	80 - 110	96	110.0	24	1.10
22	110 - 130	118	127.0	28	1.11
23	140 - 200	158	145.0	58	1.30
24	130 - 170	150	165.0	64	1.23
25	190 - 230	198	186.0	44	1.27
26	190 - 235	207	205.0	76	1.18
27	200 - 330	252	235.0	38	1.28
28	220 - 310	262	262.0	86	1.20
29	270 - 330	297	292.0	74	1.22
30	290 - 320	303	323.0	42	1.10
31	320 - 430	389	385.5	26	1.30
32	380 - 470	455	392.0	20	1.30
33	410 - 530	458	430.5	32	1.27
34	500 - 590	538	471.0	22	1.37
35	460 - 590	557	514.0	30	1.30
36	500 - 700	597	600.0	56	1.28
37	530 - 760	610	607.0	62	1.20
38	630 - 850	680	658.0	50	1.24
39	630 - 800	690	710.0	60	1.16
40	600 - 900	762	769.0	70	1.20
41	670 - 950	832	828.0	58	1.22
42	710 -1400	914	889.0	40	1.23
43	670 -1325	978	955.0	36	1.32
44	920 -1400	1123	1023.0	54	1.28
45	910 -1500	1167	1094 0	34	1.24
46	1130 -1400	1210	1159.0	24	1.20
47	1120 -1600	1255	1247.0	42	1.17
48	1120 -1500	1290	1330.0	46	1.24
49	1300 -1850	1459	1416.0	20	1.20
50	1315 -1900	1511	1503.0	28	1.16
51	1380 -1700	1540	1598.0	24	1.13
52	1460 -1800	1590	1694.0	16	1.17
53	1700 -1800	1732	1795.0	22	1.10
54	1680 -1850	1742	1897.0	14	1.06
55	1450 -1850	1764	2004.0	10	1.08
56	1740 -2150	1913	2116.0	16	1.20
57	2000 -2430	2188	2234.0	18	1.10
58	2009 -2300	2220	2350.0	12	1.25
59	2200 -2800	2557	2477.0	10	1.28
60	2500 -2900	2760	2606.0	10	1.22
61	2400 -2800	2775	2735.0	16	1.17
62	2550 -2900	2800	2911.0	8	1.20

Table (4) :- Ranges and means of actual lengths and weights for the different age-groups of B.bynni , from Lake Nasser .

Age - group	stand.length(cm.)		Body weight(gm.)		Fish No.
	Range	Mean	Range	Mean	
I	13 - 22	17	40 - 310	138	162
II	19 - 28	23	140 - 590	305	156
III	25 - 36	33	290 - 1400	657	346
IV	34 - 40	37	600 - 1600	1030	274
V	37 - 46	42	910 - 1850	1450	154
VI	42 - 51	48	1300 - 2900	1910	124

Table (5) :- Calculated lengths for the different age-groups of B.bynni , from Lake Nasser .

Age - group	Mean calculated standard length at the end of each year						Fish No.
	I	II	III	IV	V	VI	
I	11.7						36
II	14.0	24.3					51
III	9.5	18.0	30.0				111
IV	10.8	21.2	29.2	37.2			279
V	12.5	22.6	32.4	39.0	45.1		84
VI	11.0	22.0	30.5	36.7	42.5	49.3	93
Mean length	11.6	21.6	30.5	37.6	43.8	49.3	654
Increment	10.0	8.9	7.1	6.2	5.5		

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Table (6) :- Calculated weights for the different age-groups of B.bynni , from Lake Nasser , as computed by the length-weight equation .

Age - group	Mean calculated weight at the end of each year					
	I	II	III	IV	V	VI
I	18.9					
II	32.5	171.2				
III	10.1	69.3	322.9			
IV	14.9	113.5	297.7	617.3		
V	23.1	137.6	407.2	711.7	1102.5	
VI	15.7	126.9	339.4	592.6	921.	1441.6
Mean weight	19.2	123.7	341.8	640.5	1012.3	1441.6
Increment		104.5	218.1	298.7	371.8	429.3
% of increment		544.3	176.3	87.4	58.0	42.4

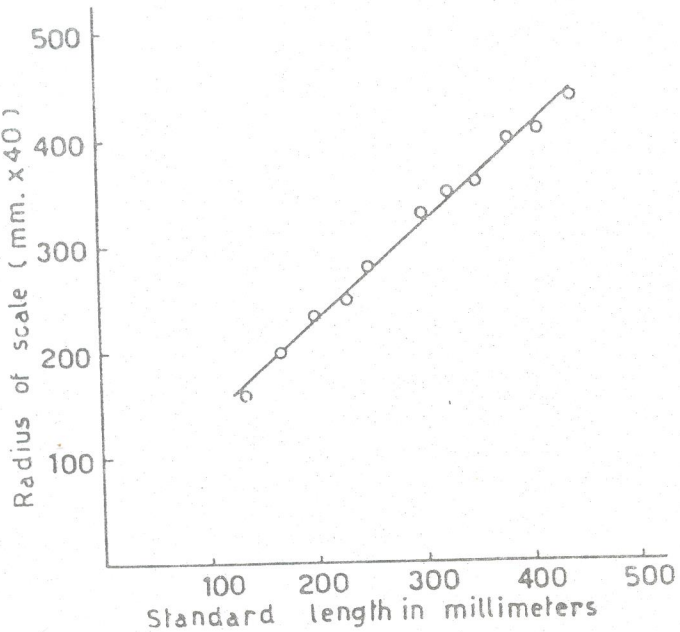

Fig. (1) : Length - Scale (X 40) relationship , for B.bynni , from Lake Nasser .

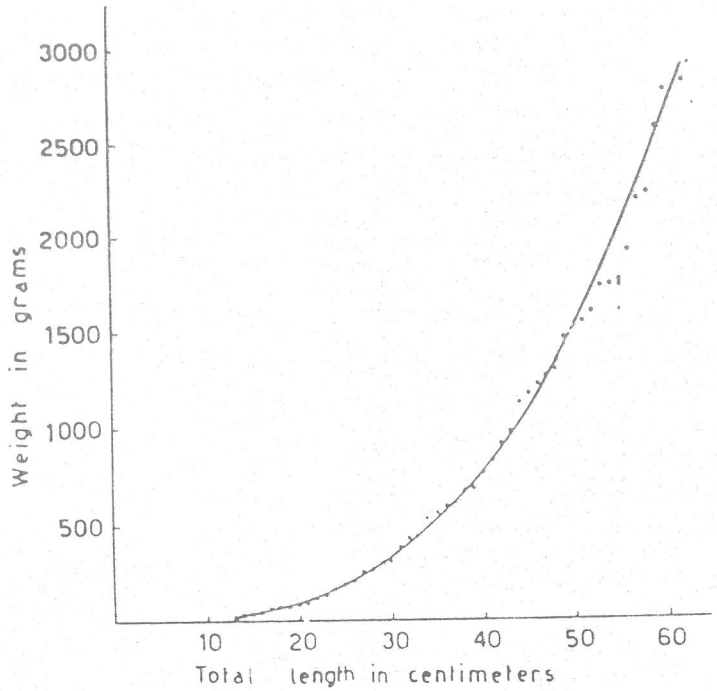

Fig. (2) : Length - weight relationship , for B.bynni , from Lake Nasser .

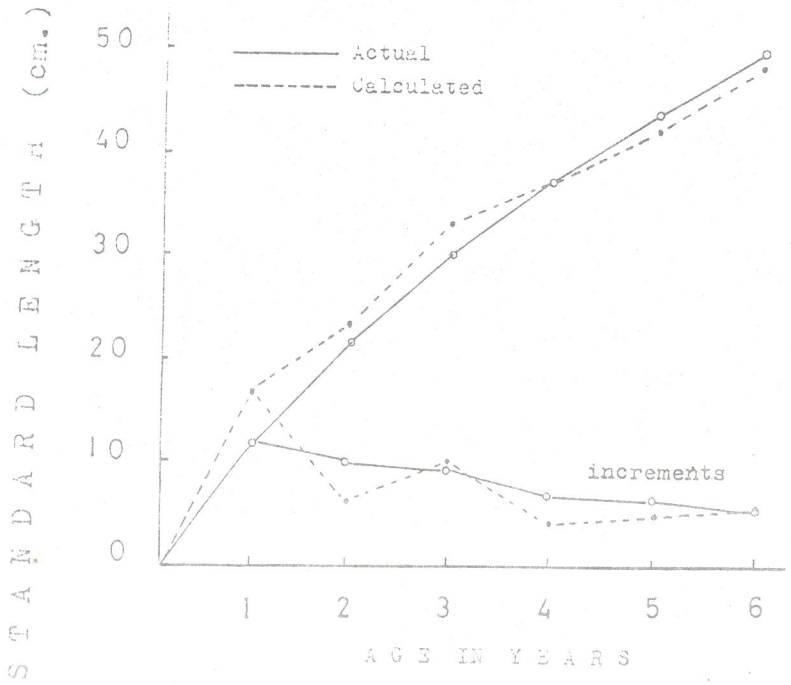

Fig. (3) : Growth in length and the annual increments for B.bynni , from Lake Nasser .

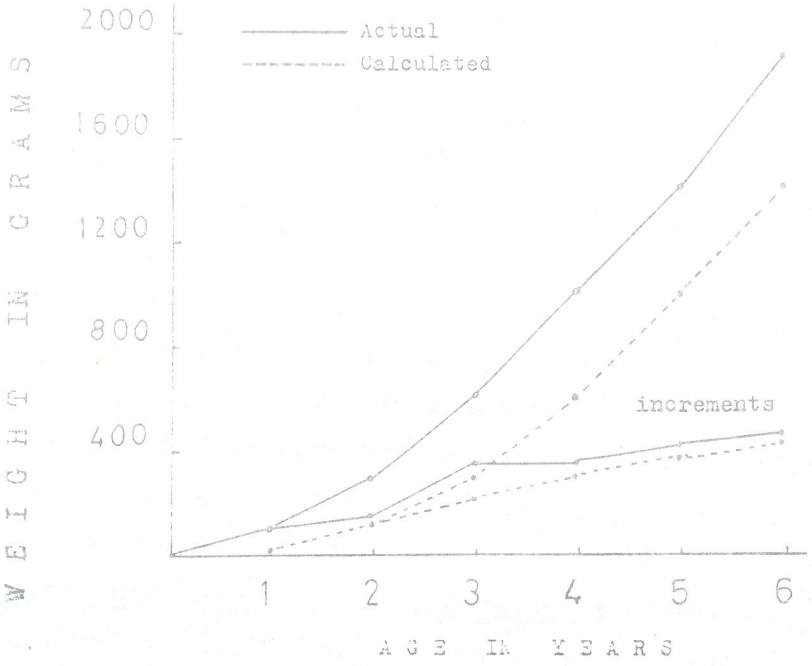

Fig. (4) : Growth in weight and the annual increments for B.bynni , from Lake Nasser .

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REFERENCES

1- Ananiadis, C., 1949: Study on the biology of the red-mullet Mullus barbatus (Rond.), Forma typica (Fage) in the Aegean Sea. Praktica of the Hellenic Hydrobiol. Inst., 8 (2), Athens.

2- Beckman, W.C., 1948: The length-weight relationship, factors for conversions between standard and total lengths and coefficient of condition for seven Michigan fishes. Trans. Amer. Fish. Soc., 75 (1945), 237-256.

3- Bilton, H.T. and Ludwig, S.A.M., 1966: Times of annulus formation on scales of Sockeye, Pink and Chum Salmon in the Gulf of Alaska. J. Fish. Res. Bd. Canada, 23 (9), 1403-1410.

4- Birman, I.B., 1960: Times of formation of annuli on the scales of Pacific Salmon and the rate of growth of Pink Salmon. Doklady Akad. NauK. USSR, 132 (5), 1187-1190. (Transl. Fish. Res. Bd. Canada, No. 327).

5- Bishai, H.M. and Labib, W., 1973: Age and growth of Mirror Carp (Cyprinus carpio L.) at Serow fish farm. Bull. Inst. Ocean. Fish, ARE, 3, 395-418.

6- Bishai, R.M., 1981: The age and growth of the tiger fish Hydrocynus forskalii (Cuv.). IBID, 7 (3), 352-365.

7- Bougis, P., 1952: Recherches biometriques sur les Rougets (Mullus barbatus L., Mullus surmuletus L.). Achieves des ecologie Experimentale et Generale, 89 (2), Paris.

Delta J. Sci 16 (2) 1992

8- Cable, L.E., 1956: validity of age-determination from scales and growth of marked Lake Michigan Lake Trout. Fish. Bull., 57 (122), 1-59.

9- Carlander, K.D., 1945: Growth, length-weight relationship and population fluctuations of the tullibee Leucichthys artedi tullibee (Richardson), with reference to the commercial fisheries Lake of the Woods, Minnesota. Trans. Amer. Fish. Soc., 73 (1943), 125-136.

10- El-Bolock, A.R., 1972: The use of vertebrae for determining age and growth of the Nile catfish Clarias lazera (Cuv. & Val.) in the A.R.E. Bull. Inst. Ocean. Fish., 2, 51-82.

11- El-Maghraby, A.M.; Hashem, M.T. and El-Sedfy, H.M., 1973: Some biological characters of Mugil capito (Cuv.) in Lake Borollus. IBID, 3, 55-82.

12- El-Zarka, S.E., 1959: Fluctuations in the population of Yellow Perch (Perca flavescens Mitchill) in Saginaw Bay Lake Huron. Fish. Bull., 59 (151), 365-413.

13- ---------- , 1961: Tilapia fisheries investigations in Egyptian lakes. Min. Agr. Hydrobiol. Dept. Alex. Inst. Hydrobiol. Notes & Mem. No. 66.

14- Ezzat, A.; El-Maghraby, A.M.; Hashem, M.T. and Zaki, M., 1977: Age and growth of Mugil capito (C.&V.) in Nozha-Hydrodrome, Alexandria, A.R.E. Bull, Inst. Ocean. Fish., 7 (1), 191-206.

Delta J. Sci 16 (2) 1992

15- Ezzat, A.; Wadie, W.F.; Mikail, M.Y. and Hashem, M.T., 1981: Age and growth of Epinephelus aeneus in the Egyptian Mediterranean waters. Bull. Inst. Ocean. Fish., 7 (3), 395-406.

16- Gottlieb, M.E., 1956: Age et al Croissance du Rouget (Mullus barbatus L.) dans les eaux israeliennes, 1953-1955. Sea Fish. Res. Sta. Bull., 12, Haifa.

17- Hashem, M.T., 1972: The age, growth and maturity of Labeo niloticus Forsk., from the Nozha-Hydrodrome in 1968-1970. Bull. Inst. Ocean. Fish., 2, 83-102.

18- ----------, 1973 (a): Some biological studies on the Goat-fish (Mullus surmuletus L.) in the Egyptian Mediterranean waters. IBID, 3, 95-115.

19- ----------, 1973 (b): Age, growth and maturity of the Goat-fish (Mullus barbatus L.) in Abukir-Rosetta. IBID, 3, 163-182.

20- ----------, 1973 (c): Some biological studies of the Nile-Perch (Lates niloticus C.&V.) in the Nozha-Hydrodrome. IBID, 3, 363-394.

21- ----------, 1977: Age determination and growth studies of Bagrus bayad in the Nozha-Hydrodrome. IBID, 7 (1), 225-245.

22- Hashem, M.T. and Fayek, S., 1977: Age determination and growth studies on the Barbus bynni Forsk. of the Nozha-Hydrodrome. IBID, 7, 153-177.

Delta J. Sci 16 (2) 1992

23- Hile, R., 1936: Age and growth of Cisco Leucichthys artedi (Le Sueur) in the lakes of the North-Eastern Highlands, Wisconsin, Bull. U.S. Bur. Fish., 48 (19), 211-317.

24- Hile, R. and Jobes, F., 1941: Age, growth and production of the yellow perch (Perca flavescens Mitchill) of Saginaw Bay. Trans. Amer. Fish. Soc., 70 (1940).

25- Jensen, A.O., 1965: A standard terminology and notation for otolith readers. Res. Bull. ICNAF, 2, 5-7.

26- Jobes, F.W., 1952: age, growth and production of yellow perch in Lake Erie. U.S. Fish. Bull., 52, 205-266.

27- June, F.C. and Raithmayer, C.N., 1960: Determining age of Atlantic Menhanden from their scales. IBID, 60 (171), 323-342.

28- Khallaf, E.A., 1988: Short communications - Effect of impoundment on the growth and fishery of Bagrus docmac in Lake Nasser. Regulated Rivers, Res. & Management, 2, 547-552.

29- Latif, A.F.A., 1974: Fisheries of Lake Nasser. Aswan Regional Planning, Lake Nasser Development Centre, 1-235.

30- Latif, A.F.A. and Khallaf, E.A., 1974: Studies on Nile perch Lates niloticus L., from Lake Nasser. Bull. Inst. Ocean. Fish., Vol. 4, 131-164.

31- Latif, A.F.A. and Shenouda, Th.S., 1972: Biological Studies on Rhonciscus striatus (Fam. Pomadasyidae), from the Gulf of Suez. IBID, 2, 108-134.

32- Latif, A.F.A. and Shenouda, Th.S., 1985: Age and growth studies of the lizard fish Saurida undosquamis (Richardson) Fam. Synodontidae, from the Gulf of Suez. Delta J. Sci., 9 (2), 517-538.

33- Le Cren, E.D., 1951: The length-weight relationship and seasonal cycle in gonad weight and condition in the perch Perca fluviatilis. J. Anim. Ecol., 20, 201- 219.

34- Massoud, A.A.; Shenouda, Th.S. and Wadie, W.F., 1985: Biological study of the tiger fish Hydrocynus forskalii Cuv., from Lake Nasser. Delta J. Sci., 9 (2), 537-562.

35- Numann, W., 1955: Orientierende Untersuchungen an Meerbarben Mullus barbatus, Mullus surmuletus, Mulloidichthys auriflamma . Insbesondere Berechnungen uber die Notwendigkeit einer Einfuhung von fischereilichen Schonmassnahmen in den turkischen Gewässern. Publ. Hydrobiol. Res. Inst. Univ. Istanbul, Series B, 3 (1), Istanbul.

36- Planas, G.A. and Vives, F., 1956: Notes preliminaries Sobre la biologia del Salmonete Mullus barbatus L., Invest. Pesq., 3.

37- Rounsefell, G.A. and Everhart, W.H., 1953: Fishery Science: Its methods and applications. John Wiley and Sons. Inc., New York, London, 1-444.

38- Scaccini, A., 1949: L'accrescimente et al proporzione dei sessi nella popalazione adriatica di Mullus barbatus Rond. Note Lab. Biol. Mar. Panc., 1.

Delta J. Sci 16 (2) 1992

39- Semko, R.S., 1954: The stocks of west Kamchatka salmon and their commercial utilization. Izvestia Tikho-Okeanskovo Nauchno-Issledovatelskovo Inst. Ribnovo Khazaistovo & Okeanogr., 41, 3-169. (Trans. Fish. Res. Bd. Canada, No. 288).

40- Shenouda, Th.S., 1969: Biological studies on Saurida undosquamis (Richardson), from the Gulf of Suez. M.Sc. Thesis, Faculty of Science, Cairo University.

41- ----------, 1986; Fecundity of Barbus bynni Forskal (F. Cyprinidae), from Lake Nasser. Delta J. Sci., 10 (1), 422-436.

42- Smith, S.H., 1956: Life history of lake herring of Green Bay, Lake Michigan. Fish. Bull. Fish. Wildl. Serv., U.S., 57 (109), 87-138.

43- Thompson, S.J., 1904: The periodic growth of scales in Gadidae as an index of age. M.B.A. Journal, N.S., 7,1-109.

44- Van Oosten, J., 1923: The white fishes (Coregonus clupeaformis). A study of the scales of white fishes of known ages. Zoologica, 11 (17), 380-412.

45- ----------, 1929: Life history of lake herring (Leucichthys artedi Le Sueur) of Lake Huron as revealed by its scales, with a critique of scale method. Bull. U.S. Bur. Fish., 44 (1928), 265-428.

46- Vedensky, A.P., 1954: Age of pink salmon and pattern of their fluctuations in abundance. Izvestia Tikho-Okeanskovo Nauchno-Issledovatelskovo Inst. Ribnovo Khazaistovo & Okeanogr., 41, 111-195. (The Israel program for scientific translations, PST. Cat., No. 12).

47- Wadie, W.F.; Hashem, M.T.; Mikail, M.Y. and Ezzat, A.A., 1981: Age and growth of Epinephelus alexandrinus in the Egyptian waters. Bull. Inst. Ocean. Fish., ARE., 7 (3), 559-574.

48- Wadie, W.F.; Reskalla, S.I. and Dowidar, N.M., 1989: Age and growth studies of the Sphyraenidae family in the Southeastern Mediterranean based on otolith measurements. Folia Morphologica, 37, 38-56.

49- Wadie, W.F.; Shenouda, Th.S. and Massoud, A.A., 1985: Age-composition and growth of Mullus barbatus L. (F. Mullidae) from the Southeastern part of the Mediterranean Sea. Delta J. Sci., 9 (1), 218-235.

دراسة العمر والنمو لأسماك "البنى" فى بحيرة ناصـــــــــــر

ثروت صادق شنـــــــــــوده
كلية التربية ـ كفـــــر الشيخ ـ جامعـــــة طنطـــــا

نوقشت فى هذا البحث خصائص القشور الدائرية التى تغطى أجســـام هذه الأسماك ، ومواصفات الحلقة السنوية وزمن تكوينهـــا ودرجة الاعتماد عليها ، وقد وجد أنها تتكون مـــرة واحدة سنويا أثناء فصل الشتاء (ديسمبر ـ فبراير) وبالتالى فهـــى صالحة لهذه الدراسة.

يتناسب نمو القشور تناسبا طرديا مع طول الجسم والعلاقة بينهمـــــا علاقة خطية. يتكون مجتمع اسماك البنى فى بحيرة ناصر من ٦ سنوات ـ علـــى الأقل ـ تسود فيه أسماك المجموعة الثالثة من العمـــــر.

كمـــا تبين من دراسة العلاقة بين الأطوال والأوزان أن الزيادة فى الوزن تتبع ـ تقريبا ـ مكعب الطول.

هذا ، وقد اتضح من دراسة معدل النمو أن أكبر زيادة فى الطول تتـــم خلال العام الأول ثم تتناقص تدريجيـــا ، ويزداد متوسط الأوزان مع الزيادة فى العمـــــر.

أظهرت دراسة قيم النسب المئوية للزيادة في الوزن بالنسبة لقيم متوسطات الأوزان فى الأعمار المختلفة أن أكبر قيمة كانت بين المجموعتين الأولى والثانية حيث بلغت أكثر من خمسة أضعاف متوسط أوزان المجموعة الأولى من العمـــر ، تليها قيمة النسبة بين المجموعتين الثانية والثالثة حيث بلغت أكثر من (١ر٥) مرة قيمة متوسط أوزان المجموعة الثانية من العمر ، تناقصت هذه النسبة بشدة بين المجموعتين الثالثة والرابعة ثم تدريجيا حتى نهاية العام السادس من العمر.

ولذلك يقترح صيد هذه الأسماك من بحيرة ناصر بعد نهاية العـــام الثانى من العمـــر وبحيث لا يقل الطول عن (٢٨ سم).