SOME OBSERVATIONS ON THE FISHERY BIOLOGY OF RED MULLET (MULLUS BARBATUS, L.) IN ABUKIR-ROSETTA REGION DURING 1969-1970

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INTRODUCTION

The regulation of the Nile flood by the construction of the Aswan High Dam (1964-1966), resulted in a serious change of the ecological conditions in the South-Eastern part of the Mediterranean Sea,. This affected too much the Sardine fishery, as well as the catch of shrimp and some other fishes. However, the fishery of Mullidae and some other fishes have been improved

Exploratory bottom trawling surveys were carried out in Abukir-Rosetta Region during 1969-1970, for the purpose of gaining information on the biology, distribution, and abundance of the economically important fish inhabiting this area. The present study is therefore focused on the Red Mullet (*Mullus barbatus*, L.) in a hope that it may contribute in managing the trawling fishery of these fishes.

MATERIAL AND METHODS

Bottom trawling surveys were carried out in Abukir-Rosetta region by the research vessel "Faras El-Bahr" of the Alexandria Institute of Oceanography and Fisheries. The fishing gears used were two Italian trawls having nearly similar dimensions with a cod-end of 25 and 28 mm. stretched mesh-size (Hashem, 1972).

The fishing operations were carried out in the period from May, 1969 to January, 1970. During this period four cruises were made, representing the spring, summer, autumn and winter. A total number of 104 successful trawling operations were conducted in the area at differnt depths ranging from 10 to 200 m. in the first and second cruises, and from 10 to 100 m. in the other cruises. Apart from Leiognathidae (a small fish of non-economic importance), a total catch of about 967 kg of fish and shrimp were obtained during the four cruises, of which Mullidae contributed 213 kg, that represented 22 % of the total catch.

The catch from each haul was sorted on deck into species. The total weight of each species (M. barbatus) was recorded by two spring balances with the capacity of 2 and 15 kg for the small and big amounts of fish respectively. Fishes were measured for length frequency distribution and fish scales were taken for age determination.

Abundance of Mullidae in the Commercial Catch.

The analysis of the statistical data of fish production in 1962 (El-Zarka and Koura, 1965) showed that the largest catch of Mullidae was landed from the area between Alexandria and Rosetta, as well as from the area east of Port-Said, where 47.6 and 41.8 percent of the catch were recorded. As regards the seasonal fluctuation of the landings, it was found that the production of Mullidae was high during the month of August, as well as From November through April, with maximum value in March, while the lowest value was recorded in July.

The Egyptian fishery statistics from 1962 to 1970 (Table 1) show that in 1962, the Muillidae represented 2.84 % of the Egyptian Mediterranean fish yield. In 1963, these fishes contributed 2.37% of the catch, while in 1964 the percentage increased to 3.30. This percentage contribution continued to increase in the following years, reaching 5.75 and 12. 80 in 1965 and 1966 respectively, inspite of the continuous decrease in the total fish yield of the Egyptian Mediterranean waters. From 1967 to 1970, the catch of Mullidae decreased, mostly as a result of the Middle-East conflict, and the absence of fishing in the eastern part of the Egyptain Mediterranean coast, rich in Mullidae (Egyptian Fishery statistics, 1962-1970).

TABLE 1.—Total fish yield and the catch of Mullidae from the Egyptian waters of the Mediterranean sea during 1962–1970.

Year	Total Fish yield (tons)	Catch of Mullidae	
		Tons	%
1962	37 832	1074	2.84
1963	32 909	779	2.37
1964	25 975	858	3.30
1965	24 686	1419	5.75
1966	15 045	1926	12.80
1967	12 213	1237	10.13
1968	13 586	1524	11.21
1969	8 521	1077	12.64
1970	8 119	938	11.55

Abundance of Mullidae in the Experimental catch.

Fishes of Mullidae were abundant in most of the catches obtained from the trawling surveys carried out during 1969-1970 in Abukir-Rosetta Region. The relative abundance of these fishes are well illustrated by the catch rates in kg/hr. for the different months and at various depths in Table (8), (9) and (10) of the study published by the author in volume II of the Bulletin of the Institute of Oceanography and Fisheries, 1972.

At 10-50 m. depth, the Mullidae were abundant in August and November (2.162 and 2.792 kg/hr. respectively), while of less importance in other months. At 51-100 m, these fishes were dominant in August (4.123 kg/hr.), while abundant in all other months (from 0.964 to 0.675 kg/hr.). At 101-200 m, these fishes were abundant in May (2.173 kg/hr.), and of less importance in August (0.519 kg/hr.).

In most of the investigated months, other Mullidae species (Mullus surmuletus & Upeneus moluccensis) were present together with *M. barbatus*, However, the catches of *M. surmuletus* were insignificant, while *Upeneus moluccensis* was occasionally found to constitute a considerable percentage of the catch in November, when it gave 15.25% and 22.01% of the total catch at 10-25 and 26-50 m. depth respectively.

Percentage Composition of M. barbatus in the Experimental catch.

In the Experimental catch, *Mullus barbatus* was the most prominent species of Family Mullidae. In the period from May 1969 to January 1970, the percentage contribution of Mullidae was found to be 16.63 while that of *M. barbatus* was 14.41 of the total catch. (Tables 2 and 3).

Mullus barbatus represented a considerable percentage of the catch in summer and autumn, while in winter and spring this species was present in less percentages. From Table (3) it is clear that the biggest percentage of *M. barbatus* was obtained in August and November, 1969 (27.91 % and 26.55 % respectively), while in May, 1969 and January, 1970, the catch of this species was relatively small (10.56% and 6.51% respectively).

TABLE 2.– The catch-compostion of the different items in kg. from Abukir-Rosetta Region during 1969–1970.

Month	May 1969	August 1969	November 1969	January 1970	Average
Depth trawled (m)	10–200	10–200	10–100	10–100	
Time of trawling (hr)	49.0	37.3	33.5	14.7	33.5
Fishes	kg	kg	kg	kg	kg
Cartilagerous fishes	44.450	11.680	13.250	15.000	21.095
Mullidae	39.597	87.360	79.415	6.250	53.155
Sparidae	92.587	34.863	14.028	23.250	41.182
Synodontidae	15.870	31.490	27.300	18.250	23.228
Gadidae	48.550	7.900	1.180	2.250	14.970
Triglidae	57.390	34.850	13.830	6.300	26.592
Soleidae	9.910	14.842	8.965	3.000	9.179
Serranidae	11.875	21.770	2.315	15.000	12.718
Carangidae	5.845	6.495	1.225	—	3.391
Clupeidae	10.228	14.640	4.270	—	7.285
Other fishes	13.545	9.655	8.060	4.150	2.853
Shrimp	29.080	31.275	17.315	2.500	20.042
Total catch (kg.)	372.857	306.820	191.153	95.950	241.690
Catch/effort (kg/hr.)	7.609	8.226	5.703	6.774	7.251

TABLE 3.—Percentage-composition of *M. barbatus* in the catch of Abukir-Rosetta Region, by different months and at different depths during 1969-1970.

Month	May		August		November		January	
Depth range (m.)	kg	%	kg	%	kg	%	kg	%
10 — 25	2.550	2.03	31.500	32.71	23.530	30.28	3.750	13.49
26 — 50	6.500	8.15	25.000	32.33	23.000	30.62	1.000	2.64
51 — 100	5.000	10.20	28.550	28.24	4.200	10.97	1.500	3.71
101 — 150	22.000	22.51	1.300	5.88	—	—	—	—
151 — 200	3.000	16.68	0.150	1.15	—	—	—	—
Total	29.050	10.56	86.500	27.91	50.730	26.55	6.250	6.51

The relative abundance of *M. barbatus* in the catch of different months, according to depth, is given in Table (3). In spring (May, 1969) this species while representing a small percentage of the catch at small depths, their percentage increased with depth till it reached maximum value at 101-150 m depth, after that it decreased with more depths.

In summer and autumn (August and November, 1969), an opposite picture was noticed. The largest percentage was found at small depths. This percentage decreased with the increase of depth reaching minimum values in deeper waters. The appearance of big amounts of small fishes in the catch of shallow waters was due to the entrance of a new generation in the catch of these months.

In winter (January, 1970) the percentage distribution of this fish with depth was not clear as in other months. The fish was abundant at 10-25 m., while at 26-50 m, it was of less abundance, and at 51-100 m. the percentage contribution slightly increased. This irregularity in distribution may be due to the small number of trawling carried out during that month.

For the purpose of fishery development the catch rates obtained for the investigated region must be compared with those obtained in previous investigations. Such comparsion is difficult to make, because of the considerable differences in trawling boats, equipments and general techniques, which may cause profound differences in the catching power. However, the data of the catch per hour collected by "Faras-el-Bahr" in 1969-1970, when compared with those previously collected by the same vessel in 1960-1961 (Gorgy, 1966) or by "Ichthyolog" in 1966 (Pavlovskaya & Budnichenko, 1970) give an understanding of the present state of the demersal fish (Mullidae) in Abukir-Rosetta Region.

At 10-50 m. depth, the annual catch of Mullidae per unit effort at Abukir-Rosetta Region in 1960-1961 was 4.3 kg/hr. An erratic decline in abundance after 1961 reduced the catch per unit effort to only 0.97 kg/hr. in 1966, while in 1969-1970 the catch per unit effort increased to 1.43 kg/hr. This increase of the catch per unit effort in the last survey may be due to the favourable living conditions created for Mullidae in the South-eastern part of the Mediterranean Sea after the regulation of the Nile flood (1964-1966).

At other depth ranges, the annual catch per hour in 1960-1961 was from three to seven times higher than in 1969-1970 (Table 4).

Size Composition of M. barbatus in the Experimental Catch.

When taking the different months in consideration (Table 5, and Fig. 1), we found that in May, 1969, the catch of *M. barbatus* ranged in size from 9.0 to 24.0 cm, with an average length of 13.8 cm. and average weight of 28.9 gm. The smallest average size appeared in August as a result of the entrance of a new generation in the catch. The average size increased from 9.3 cm in August to 13.0 cm in November and to maximum value (14.1 cm.) in January 1970.

As regarding different depths, the size of this species generally increases with the increase of depth. Taking the month of August as example (Table 6 and Fig. 2), we found that fishes caught at 10-25 m. depth varied in size from 4.5 cm. to 15.5 cm. with an average length of 8.3 cm. and average weight of 6.0 gm. At higher depths, the size range was gradually shifted towards bigger sizes, with an average length of 9.5, 12.2, 14.7 and 16.5 cm. at the subsequent depth ranges respectively.

TABLE 4.—Average catch rate of Mullidae in kg/hr. from Abukir-Rosetta Region during different surveys (1960–1970)

Depth range (m.)	1960-1961			1966			1969-1970		
	Total Catch kg/hr	Catch of Mullidae		Total Catch kg/hr	Catch of Mullidae		Total Catch kg/hr	Catch of Mullidae	
		kg/h	%		kh/h	%		kg/h	%
10 — 50	38.7	4.3	11.11	10.9	0.97	9.45	6.40	1.43	22.34
50 — 100	41.2	5.6	13.59	—	—	—	9.57	1.67	17.45
100 — 200	49.0	9.5	19.39	—	—	—	9.43	1.35	14.32

TABLE 5.—Length frequency distribution of *Mullus barbatus* from Abukir-Rossetta Region in different months during 1969–1970

Length Range (mm.) \ Month	May 1969	August 1969	November 1969	January 1970
41 — 50	—	7	—	—
51 — 60	—	24	—	—
61 — 70	—	162	—	—
71 — 80	—	276	—	—
81 — 90	—	249	—	—
91 — 100	1	234	3	—
101 — 110	14	154	34	3
111 — 120	63	106	113	29
121 — 130	90	65	135	65
131 — 140	110	48	148	35
141 — 150	59	22	67	23
151 — 160	43	8	29	13
161 — 170	27	7	5	13
171 — 180	13	5	1	1
181 — 190	7	5	2	6
191 — 200	3	5	4	8
201 — 210	2	3	—	9
211 — 220	1	1	—	3
221 — 230	2	—	1	—
231 — 240	1	—	—	—
No. of fish	436	1281	542	208
Av. length (mm.)	137.7	93.0	129.7	141.0
Av. weight (gram)	28.9	9.2	26.6	32.0

When comparing these data with those obtained from the survey of "Ichthyolog" in August 1966, and inspite of the differences in the fishing gear used, we find that the size range of *M. barbatus* in 1969 was from 4.5 to 21.5 cm., while in 1966, it was from 4.5 to 17.5 cm., and the average size caught at various depths in 1969 was somewhat larger than that obtained at the corresponding depths in 1966 (Pavlovskaya & Budnichenko, 1970).

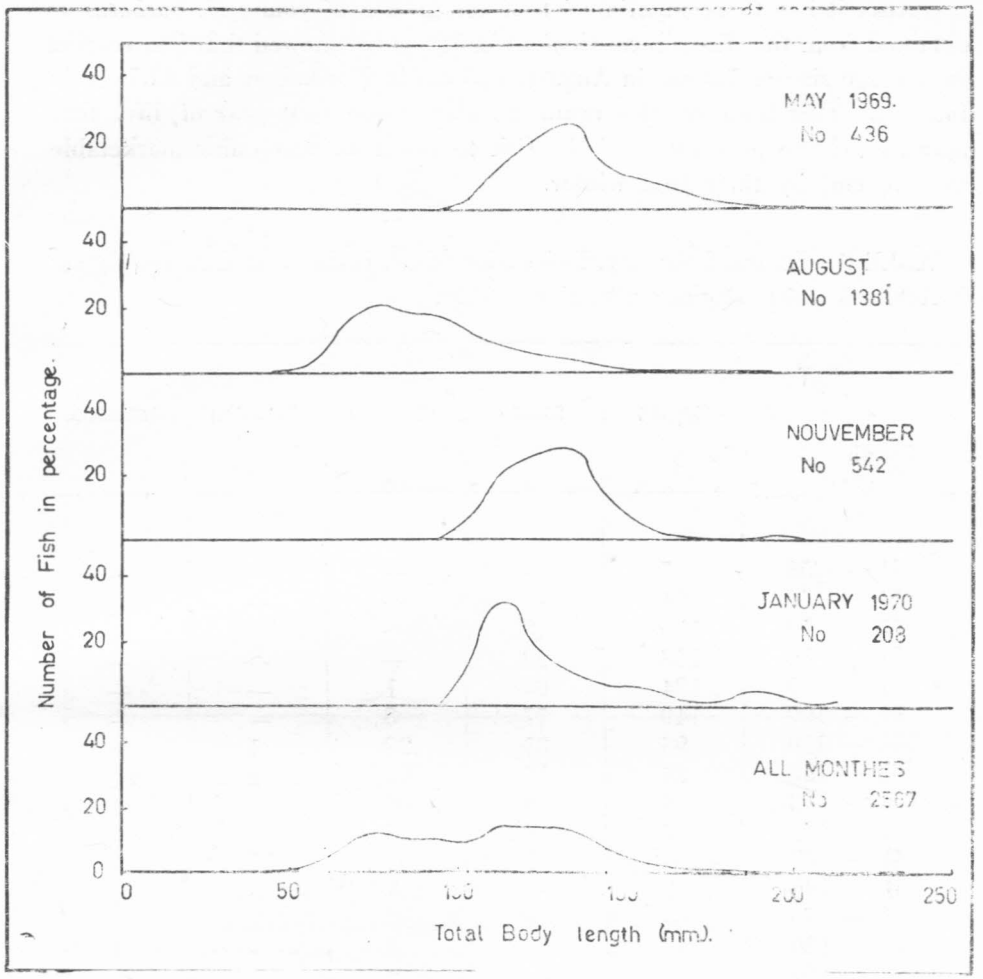

FIG. 1.—Length Frequency Distribution of *Mullus barbatus* from Abukir-Rosetta Region in different months during 1969-1970.

Also, it has to be mentioned that the growth of young *M. barbatus* as obtained from the direct measurement in 1969-1970 showed that fish reaches an average size of 7.2 cm in August, 10.5 cm in November, and 11.7 cm in January. This indicates the rapid growth of the first year of life, that permits a large percentage of the fish to reach an acceptable marketable size (10 cm) by their first winter.

TABLE 6.—Length frequency distirbution of *M. barbatus* at different depths in Aubkir-Rosetta Region during *August*, 1969.

Depth (m) / Length range (mm)	10—25	26—50	51—100	101—150	151—200
41 — 50	7	—	—	—	—
51 — 60	24	—	—	—	—
61 — 70	159	3	—	—	—
71 — 80	248	28	—	—	—
81 — 90	184	64	1	—	—
91 — 100	149	77	8	—	—
101 — 110	93	31	29	1	—
111 — 120	26	16	62	2	—
121 — 130	4	9	46	5	1
131 — 140	2	4	26	13	3
141 — 150	—	1	9	10	2
151 — 160	1	—	3	3	1
161 — 170	—	2	3	2	—
171 — 180	—	—	4	—	1
181 — 190	—	—	2	1	2
191 — 200	—	—	—	2	3
201 — 210	—	—	—	2	1
211 — 220	—	—	—	1	—
221 — 230	—	—	—	—	—
231 — 240	—	—	—	—	—
No. of fish	897	235	193	42	14
Av. length (mm.)	82.5	94.8	122.4	146.6	165.0
Av. weight (gram)	6.0	10.0	21.8	35.9	40.7

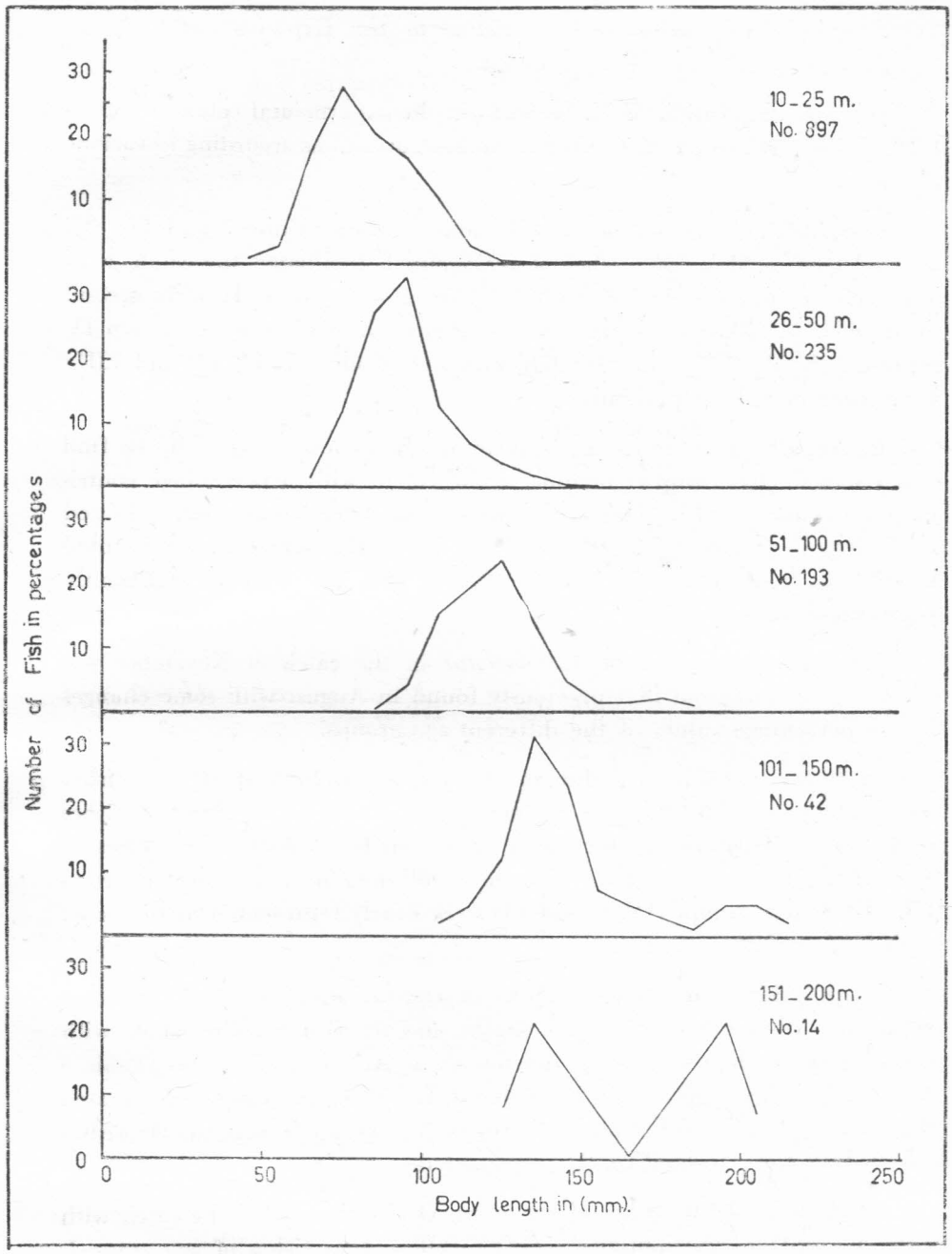

Fig. 2.—Length Frequency Distribution of Mullus barbatus at different depths in Abukir-Rosetta Region during *August* 1969.

Age-Composition of M. barbatus in the Experimental Catch.

The age-composition of *M. barbatus* in the expermental catch of 1969—1970, varied according to the different months, as well as according to various depths. .

When taking different months in consideration (Table 7 and Fig. 3), we find that in May, 1969 fishes of age group I dominated the catch, with a percentage contribution of 41.28. Fishes of age group II were second in abundance, followed by those of age group III. Fishes of age group IV represented only 5.27 % of the catch, while age groups (V, VI, VII and VIII) were insignificantly represented.

In August, and due to the appearance of a new generation, we find that fishes of age group O dominated the catch, with a percentage contribution of 56.70. Fishes of age I were second in abundance, followed by fishes of age group II. Fishes of age group III were only represented by 2.10 %, while older age groups (IV, V and VI) were insignificantly represented in the catch.

The age composition of *M. barbatus* in the catch of November was more or less similar to that previously found in August with some changes in the percentage values of the different age groups.

In January, 1970, "and due to the consideration that all the fishes have to be passed into the next age group on January 1," we find that fishes of age group I dominated the catch and contributed 39.90 %. Fishes of age group II were second in abundance, followed by fishes of age group III. Older age groups (IV, V and VI) were nearly represented in the catch with 5 % each.

When taking the various depths in consideration, we find that the young fish always keep in small depths and the fish becomes older with the increase of depth. Taking the month of August as example (Table 8 & Fig. 4) we find that; at 10-25 m. depth, fishes of age group O dominated the catch (73.91%), followed by fishes of age group I, while older fishes (II & III) were insignificantly represented.

At 26-50 m. depth, fishes of age group O also dominated the catch with a less percentage contribution (57.06%), followed by fishes of age group I. Fishes of age group II were third in abundance, while older age groups (III & IV) were insignificantly represented.

TABLE 7.– Age composition of *M. barbatus* in the catches of Abukir — Rosetta Region during 1969–1970. (Percentage in parentheses).

Age Group \ Month	May 1969	August 1969	November 1969	January 1970
0	—	873 (56.70)	218 (40.22)	—
I	180 (41.28)	398 (28.82)	159 (29.34)	83 (39.90)
II	145 (33.26)	150 (10.86)	126 (23.25)	57 (27.40)
III	74 (16.97)	29 (2.10)	31 (5.72)	36 (17.31)
IV	23 (5.27)	11 (0.80)	4 (0.74)	10 (4.81)
V	8 (1.83)	7 (0.51)	3 (0.55)	13 (6.25)
VI	3 (0.69)	3 (0.22)	—	9 (4.33)
VII	2 (0.46)	—	1 (0.18)	—
VIII	1 (0.23)	—	—	—
Total number of fishes	436	1381	542	208

At 51-100 m. depth, fishes of age group O were totally absent. Fishes of age grotp II dominated the catch with a percentage contribution of 47.67, while fishes of age group I were second in abundance, followed by those of age group III. Older age groups (IV & V) were insignificantly represented in the catch.

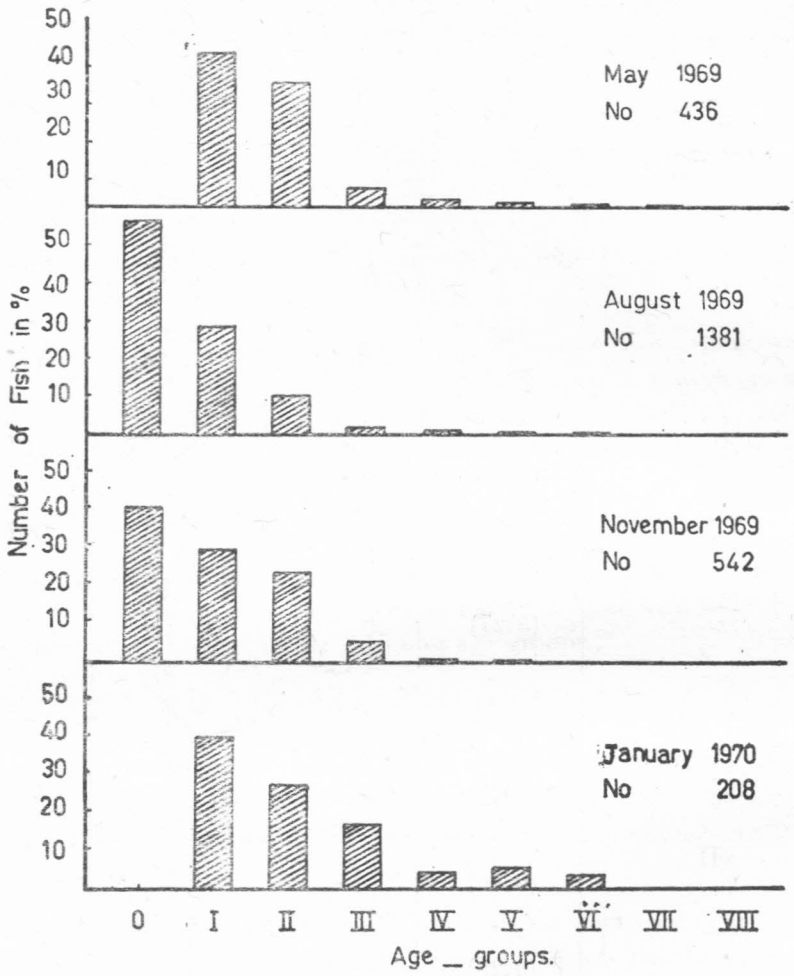

Fig. 3.—Age-Composition of *Mullus barbatus* in the catches of Abu-kir Rosetta Region during 1969-1970.

TABLE 8.—Age-composition of *M. barbatus* in the catches of Abukir-Rosetta Region during *August* 1969, in accordance todepth ranges (Percentage in parentheses)

Depth range (m) / Age-groups	10–25	26–50	51–100	100–150	151–200
0	663 (73.91)	120 (57.06)	—	—	—
I	220 (24.53)	91 (38.72)	84 (43.52)	3 (7.14)	—
II	13 (1.45)	20 (8.51)	92 (47.67)	21 (50.00)	4 (28.57)
III	1 (0.11)	3 (1.28)	12 (6.22)	10 (23.81)	3 (21.43)
IV	—	1 (0.43)	4 (2.07)	3 (7.14)	3 (21.43)
V	—	—	1 (0.52)	3 (7.14)	3 (21.43)
VI	—	—	—	2 (4.76)	1 (7.14)
Total number of fish	897	235	193	42	14

At 101-150 m. depth, fishes of age group O were totally absent. Fishes of age group II dominated the catch and contributed 50%. Fishes of age group III were second in abundance, followed by those of age groups (I, IV & V) which were equally represented in the catch and each contributed 7.14 %. This was followed by age group VI, which contributed only 4.76 % of the catch.

At 151-200 m. depth, fishes of age group O & I were totally absent. Fishes of age group II dominated the catch and contributed 28.57 %, while fishes of either age groups III, IV or V were second in abundance and each contributed 21.43 %. Fishes of age group VI were only represented by 7.14 % of the catch.

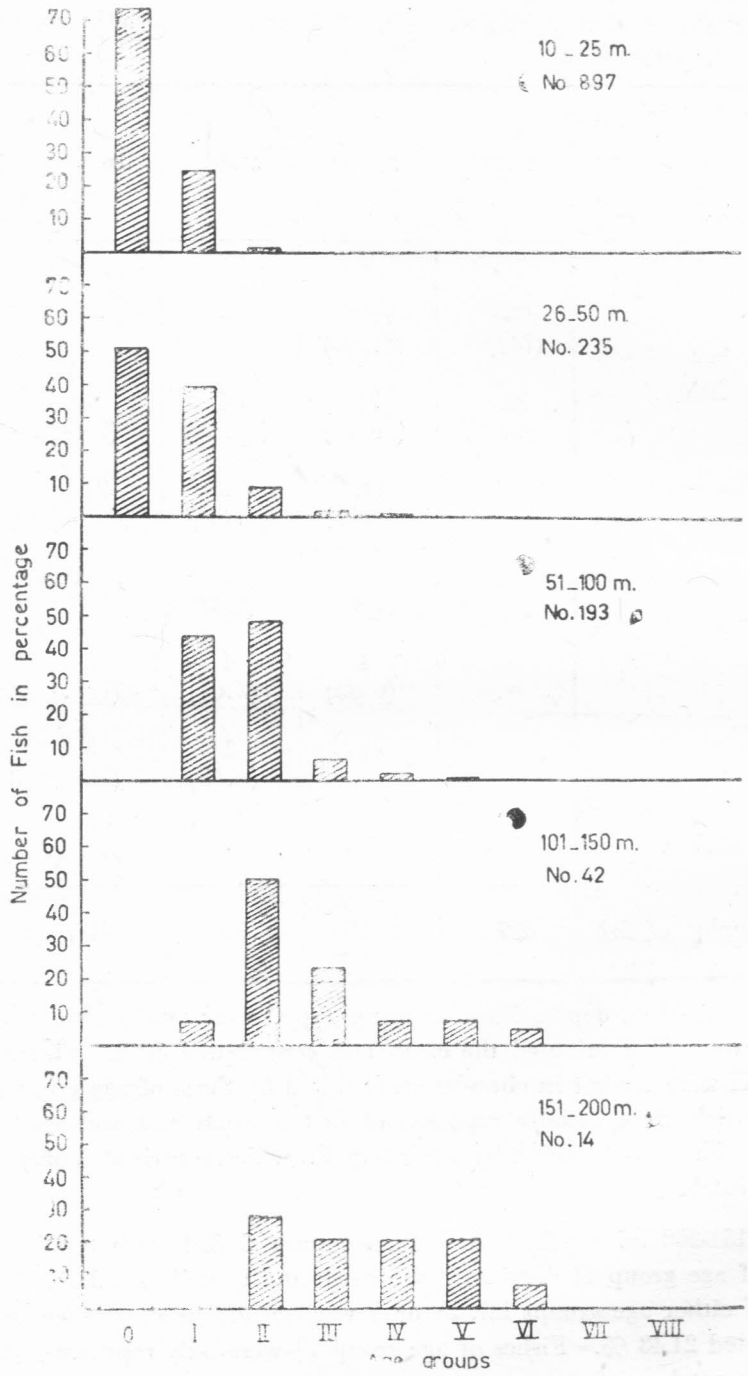

FIG. 4.—Age-Composition of Mullus barbatus in the catches of Abukir-Rosetta Region during *August* 1969, in accordance to depth-ranges.

Therefore, the average age of the fish increases with the increase of depth. The O age group was found only in small depths (less than 50 m) ; while fishes older than age group III were only found in deep waters (more than 50 m.).

CONCLUSION

The analysis of the size distribution of *M. barbatus* in the trawl fishery shows that most of the catch during Autumn and Winter were over 10 cm in total length, while in summer the majority were of small sizes. If these small fishes are not taken in the Summer months, they will reach an acceptable marketable size by the early winter. So, bottom trawls have to be carefully studied, in order to find the best mesh size able to release fishes of less than 10 cm., the acceptable marketable size.

SUMMARY

Inspite of the continuous decrease in the total fish yield of the Egyptian Mediterranean waters, the percentage composition of Mullidae has been increased from 2.84 in 1962 to 12.80 in 1966 and it remained nearly at this high percentage in the subsequent years.

In the experimental catches, *Mullus barbatus* was the most predominant species. Its average annual contribution was about 14.41% of the total catch. Fishes of this species were abundant in summer (27.9%) and Autumn (26.55%), while of less abundance in winter (6.51%) and spring (10.56%).

The general distribution of *M. barbatus*, according to depth can be summarized as follows; In winter and spring, this species while representing a small precentage of the catch at small depths, its percentage increased with depth reaching maximum values at 100-150 m depth. In summer and autumn an opposite picture was noticed, the largest percentage was found at small depths and this is due to the entrance of the new generation in the catch.

The comparison of catch rates obtained in the different investigations revealed that at 10-50 m depth, the annual catch of Mullidae per unit effort in 1960-1961 was 4.3 kg/hr. and after 1961 an erratic decline in abundance reduced the catch per unit effort to only 0.96 kg/hr. in 1966, while in 1969-1970, the catch rate increased to 1.43 kg/hr. This increase in the catch rate during the last survey may be due to the favourable living conditions created for Mullidae in the South-Eastern part of the Mediterranean Sea after the regulation of the Nile flood.

The total body length recorded for *M. barbatus* in the investigated area during 1969-1970 was from 4.5 to 24.0 cm. The smallest average size (9.3 cm) appeared in August due to the entrance of the new generation in the catch. The average size increased to 13.0 cm in November and to maximum values of about 14.0 cm in January and May. As regards various depths, the size composition of this species generally increases with the increase of depth.

The maximum age found for *M. barbatus* from the investigated area was VIII, but fishes older than VI were of rare occurrance in the catch of 1969-1970. In all the investigated months young fishes dominated the catch, while older age groups were of less importance. As regards various depths, the young fish always keep in small depths (less than 50 m.), and the fish become older with the increase of depth.

The bottom trawls have to be carefully studied in order to find the most siutable mesh size, that is able to release fishes of less than 10 cm, the acceptable marketable size.

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