PRESENT SHRIMP POPULATION CONDITIONS

One can judge about the influence of the Nile flow regulation on the shrimp population of the Mediterranean shelf of Egypt only if there is comparative information about the shrimp population before the 60-s when the historically established conditions were distrbed. All available data relating to this period are the official statistical data of the Fishery Department of Egypt about the shrimp yields for the periods 1952-1963 and the results of casual investigations of some areas of the shelf carried out by the Alexandria Institute of Hydrobiology and Fisheries (El-Zarka and Koura, 1965). They gave a general idea about the yield dynamics and furnished data about the shrimp species composition.

Accordin gto these data, during the period of 1952-1963 the shrimp fisheries were intensified as the number of fishing vessel increased and the work was mechanized.

In 1930 only 30 motor boats were available in Egypt (Wimpenny, 1934). In the period of 1953-19963 their number increased to 346-667 (El-Zarka and Koura, 1965), which resulted in an increase of the shrimp catch size from 5 t o85.5 thousand cent. As the main item of the shrimp fishery are *P. Penaeus* which have short life cycle (1-2 years) retention of the maximum catch level during several years 1962-1964 (Table 23) suggests high potentiality of the local shoal, *i.e.* the favourable habitation conditions in the above period.

TABLE 23.—SHRIMP CATCH YIELDS IN THE SOUTH-EASTERN SHELF OF THE MEDITERRANEAN SEA (*Source* : *Fishery Department of* EGYPT.

Species \ Year	1962	1963	1964	1965	1966	1967	1968	1969
M. monoceros	43.7	57.2	43.6	27.7	77.31	12.68	10.24	4.8
M. stebbingi	5.07	12 2	14.8	5.1	7.06	6 86	10. 84	3.05
Peraeides	22.5	15.1	15.7	8.9	6.47	5.86	4.51	3.06
Others	—	—	—	—	6.49	3.42	5.76	0.37
Total	72.3	85.5	71.1	41.7	37.33	28.82	41.35	11.28

As early as 1962 the first indications of the population composition disturbance appeared. They consisted in notable decrease of the percentage of large shrimps belonging to the Penaeus family and an increase of the percentage of smaller species (mainly, *M. stebbingi* and *T. curvirostris*). During this period the role or *M. monoceros* maintained invariable. If in 1962 the catck bulk was represented by shrimps of the *Penaeus* and *Metapenacus* families and the smaller species accounted for only 7 per cent of the total figure, in 1963 the percentage of the latter increased to 14 per cent and in 1964 to 20 per cent. During these years some Nile water was taken for intensification of the irrigation. However, as the total catch figures were not redued and the *M. stebbingi* yield even became three fold (5.7 thou. cent.* in 1962 and 14.8 thou cent. in 1964) it can be supposed that it had not affected the shrimps. Therefore, the noted change of the species percentage composition can be explained by the selective capacity of the fisheries in regard of larger specimens. The permanent disturbance of the species percentage composition during that period indicates a certain over-catch of larger species.

A notable change of the shrimp habitation conditions caused by the Nile flow regulation began in 1965. Our investigations carried out in 1966 (Drobisheva 1970) revealed a sharp increase of the role of *M. stebbingi, P. longirostris* and *T. curvirostris,* the percentage of which accounted for 50 per cent of the total catch yield. Along with this the total shrimp yields in 1966 decreased 3 times as compared with 1963 (the year of the maximum catch), amounting to 27.3 thou. cent. The decrease was observed in all species.

During the subsequent years the total shrimp yield figures continued to decrease amounting to only 11.3 thou. cent in 1969. The data obtained during the expedition 1970-1971 proved change in the biology and distribution of the main species.

a) To determine the reproduction behaviour of the shrimps in 1970-1971 the data of two Ichthyolog expeditions made in 1966 and 1970-1971 are compared (Fig. 74). The shrimp habitation conditions were very different. In 1966 they were almost normal, i.e. historically established conditions in the Nile mouth, while in 1970-1971 they suffered certain changes caused by 5-year flow reduction (see Chapters III and IV).

* One cent. = 100 kg.

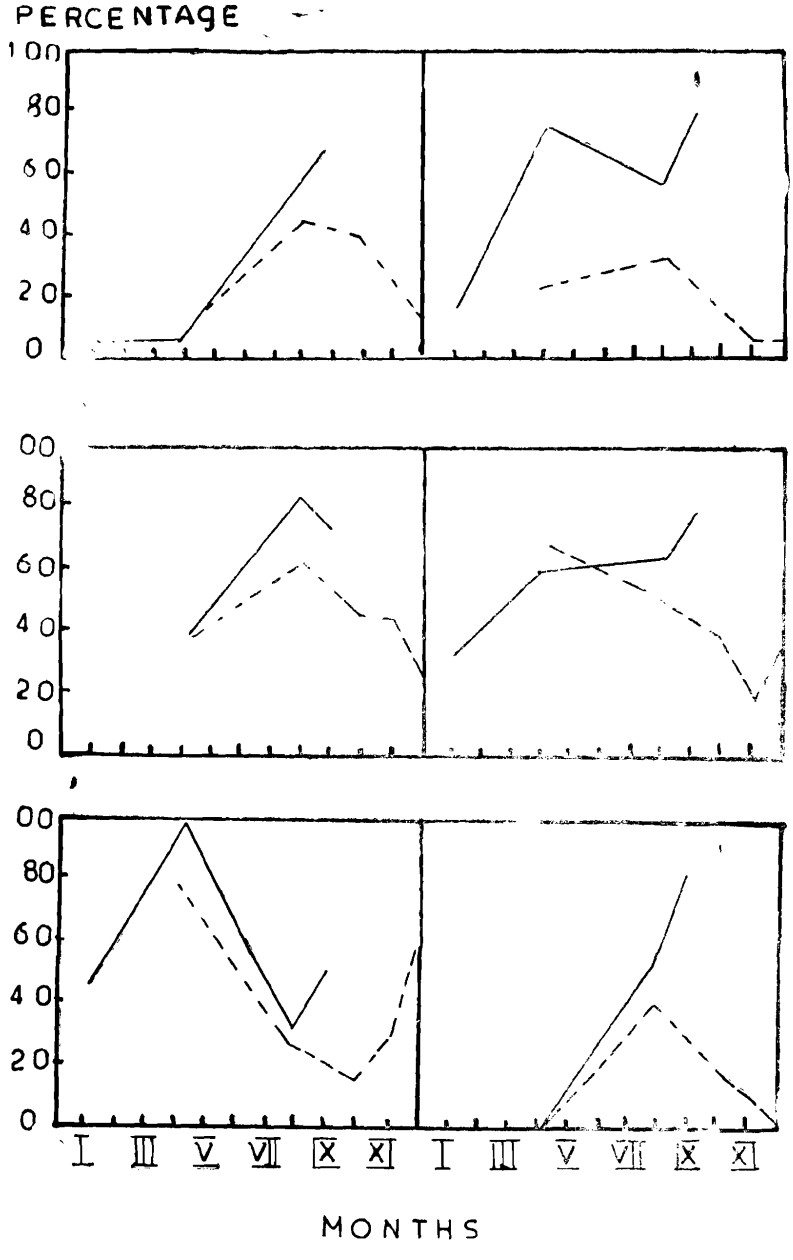

Fig. 74. Comparative percentages of female shrimps occurring in the prespawnnig condition (i.e. with the ovaries in maturity stages IV and V) in 1966 (solid line) and in 1971 (dashed line).
Left : *M. mpnoceros, M. stebbingi, P. semisulcatus* ;
Right : *P. trisulcatus, P. japonicus, T. curvirostris.*

All representatives of *Penaeus* family (*P. semisulcatus P. kerathurus* and *P. japonicus*) have long spawn period which begins in April and ends in autumn. In 1970 the spawn period was longer than in 1966 being still very intensive in September.

M. monoceros and *T. curvirostris* have their spawn period in late summer and autumn, *i.e.* August-September. In 1966 and 1970 it almost coincided.

There were some differences in the spawn periods of *P. longirostris* between 1969 and 1970 where in 1966 it occured in autumn lasting up to November while in 1970 it began to diminish a little bit earlier.

Notable differences were observed in case of *M. stebbingi.* In 1966 reproduction of this species took place in late autumn ending in winter.

b) It is known that the most dense shrimp accumulations are formed during the pre-spawning and spawning periods. The density of these accumulations depends, besides the species quantity, on the intensity of the accumulation formation. An indication of this is the sea phase period of the life cycle and the maturity rate of young specimens.

Being dependent on the above factors accumulations of *P. japonicus, P. semisulcatus* and *P. trisulcatus* cannot ensure accumulations of high density since the replenishment of their reserves by young specimens and the spawners develop gradually during the year. The main factor determining the density level of their accumulation is the population size. If it is sufficient they can be of commercial importance all the year round.

Having long sea phase *M. monoceros* are distinguished by rapid and steady autumn spawn which ensures a short but intensive concentration. Therefore, they can have great commercial importance but only during short period, which depends both on the population size and on the intensity of pre-spawning migrations.

M. stebbingi are characterized by short sea phase, rapid and steady off-shore migration due to which the accumulations of this species are characterized by being dense and short. Their commercial importance depends, to a great extent, on the pre-spawning migration rate.

The density of *P. trisulcatus* declined very sharply : in 1971 it was 10 times less than in 1966. This resulted in the reduction of their area.

On the other hand, the population size of *P. japonicus* increased somewhat due to which its accumulations, having density similar to 19966, began to ocupy larger area overing not only Borullos, but Damietta as well. Both species maintained their relation with lake Borullos.

The density of *M. monoceros* accumulations in the compared years showed 4 times decrease. Location of its main accumulations changes as ell. If before they were located in the western part of the Egyptian shelf (Rosetta zone), in 1971 the biggest concentrations of this species were found in the Borullos and Damietta regions.

The dynamics of the *M. stebbingi* population size suffered changes in regards of seasons : in 1971 its peak fell within April, in 1966 - in August. As a result of this, accumulation density in August of 1971 was 15 times less than in 1966 ; in April - 3 times less. In all other seasons it was somewhat less. but *M. stebbingi* area enlarged somewhat, thanks to exploration of bigger depths.

The density of *T. curvirostris* accumulations decreased 1.5-2 times ; they moves towards west which became especially notable in spring.

The location and the density of *P. longirostris* accumulations invariable main tained.

Summing up it can be said that in 1970-1971 the folowing changes occurred :

1. The number of al species except for *P. japonicus* and *P. longironstris* decreased. The number of *P. trisulcatus* and *M. monoceros* decreased to greater extent than that of *M. stebbingi* and *T. curvirostris.*

2. The accumulations of *P. japonious* moved to the east (beginning to be present in Borullos and Damietta area). The accumulations of *M. monoceros* maintained better in the east of the area (Borullos and Damietta), *T. curvirostris* - in the west (Abukir, Rosetta), & *M. scbbingi* penetrated deeper.

3. To the east of the investigated region (the border of Borullos) *M. monoceros, M. stebbingi* and *P. japonicus* had the greatest importance, but to the west it - *P. longirostris* and *T. curvirostris* prevail.

At present the location of the main shrimp mass coencides with the location of fresh water zone (see Chapter IV). Therefore the richest shelf areas are Borullos and Damietta where comparatively stable oceanographic conditions remained. This ensures preservation of the population size of the species inhabiting there.

The investigations carried out in 1970-1971 revealed a considerable changes in the shrimp quantitative distribution. It is explained, to a great extent, by a reduced density of their accumulations, which depended on alteration of the invironmental conditions among which change of salinity and transpareucy rated first.

It is known that certain species are found within certain depth range (El-Zarka and Koura, 1965; Drobisheva, 1970). In 1971 the habitation areas of most specimens of each species remained typical, as the following :

P. semisulcatus – 20-40 m
P. japonicus – 20-40 m
P. trisulcatus – 10-40 m
M. monoceros – up to 30 m
M. stebbingi – up to 20 m
T. curvirostris – 20-40 m
P. longirostria – 50-70 m.

As before, *M. monooceros* and *M. stebbingi* can be classed with the shallow water species; *P. penacus* - medium range species, *P. longirostris* - deep water species. That is why the noted change of the quantitative distribution occurred within stable areas. Due to influence of fishing and deterioration of the reproduction conditions the *P. semisulcatus* population size fell off sharply as early as in 1966 (according to the catch size) and in 1970-1971 its accumulations were not found.

According to the population size and peculiarities of the shrimp life cycle in 1970-1971 prevalence of certain species in different seasons was as follows :

In spring the greatest concentrations were formed on account of replenishment as the *M. stebbingi* and *P. japonicus* off-shore accumulations in the coastal zone of the Borullos region and on account of *P. longirostris* in the deep-water part of the shelf.

In summer the Penaeides had the greatest concentration on account of gradual off-shore migration of young specimens. However. their small population size in 1971 made impossible their extensive fishing.

In autumn shrimp accumulations were ensured by *M. monoceros* spawn concentrations and by penaeides in the shallow part of the Borullos and Damietta regions *M. monoceros* having primary importance. During this season *M. stebbingi* and *T. curvirostris* had also some importance due to their greater population size.

In winter shrimp accumulations were practically lacking. Only *P. Longirostris* and *P. japonicus* were fished in small quantities (Abukir and Damietta respectively).

Comparing the population size reduction degree of different species it can be observed that representative of *Penacus* and *M. monoceros* (which inhabit those sea areas where the zone of fresh and sea water mixing was found in the years of big flow; decreased in their number to greater extent.

As it was already stated in Chapter IV, in these areas intensive sedimentation of silt particles rich in organic matter took place. Now the above species happen to inhabit very poor water with high salinity. As the spawn of the shrimps take place here the above conditions are of great importance for larva survival and their change cannot be considered favourable. The cause of different reaction of *P. japonicus* and *P. trisulcatus* resides in the habitation conditions of young specimens.

Analysis of the size composition of these species has shown that the reproduction of the mature part of the *P. trisulcatus* shoal was insignificant in 1970-1971 while that of *P. japonicus* was sufficient. To explain these phenomena a detached investigation has to be carried out in the coastal lakes where young specimens would occur.

The shrimp habitation conditions in the coastal zone to a depth below 20 m have changed to a less degree. At present suspended and organic matters brought by river and lake waters are not carried far from the shore as before but settle down at lower depths (Chapter III part "Currents"). Accordingly, the habitation and reproduction conditions of *M. Stebbingi* are more favourable and its population size was diminishing to a far less extent than that of other Penacus shrimps. Expansion of the *M. stebbingi* area corresponds to the reduced gradient : if before the salinity difference within the 15-mile zone was great amounting to 4‰, now it does not exceed 0.6‰

Along with this, the population size of such important food species as *P. trisulcatus* and *M. monoceros* was affected by intensive fishing. The fishing area was reduced due to elimination of fishing eastern zones (to the east of Damietta) which resulted in concentration of fishing vessels in the Abukir-Damietta zone. In this connection the catch yield increased suddenly. One can judge about the influence of the fisheries on the penaeides population size in th above area by the fact that within the same depth rnage a small species — *T. curvirostris* was preserved which is a result of the selective fiherie.

P. longirotris, main accumulations of which were located on the shelf border where the flow fluctuation had no effect, happened to be in the most stable conditions.

The change of the conditions of some species population resulted in a change of the fishing situation. In 1970-1971 development of fisheries with a peak during summer and autumn was maintained on account of *P. japonicus* and *metapenaeides*. However, the fishing level was lower and the maximum catch yields were registered in spring being determined by *M. stebbingi* spring concentration. At present the main fishing areas are located in the coastal zones of Borullos and Damietta as well as on the western shelf slope in Abukir and Rosetta regions. This can be explained by relatively invariable habitation conditions for local species which ensure preservation of their population size.

The changes occurred in the shrimp population conditions affected the dynamics of processes which are taking place. Even now it can be seen that the reserves of small species are in better conditions. The reserves of penaeides which hav the highest commercial value are falling off rapidly. Ai the same time development of the above species is closely connected with coastal lakes which suggests that control and culture are quite feasible.

Artifical culture would be a reasonable compensation for the decrease of the natural resources and could represent a budgetary revenue item of the national economy.

CONCLUSIONS

1. At present the shelf of the southeastern Mediterranean Sea along Egypt is inhabited by 9 shrimp species belonging to family *Peanacidae*. Two species were determined by the Expedition for the first time.

2. Their quantitative distribution and the biological cycle in the conditions of 1970-1971, were studied.

(*a*) The results of the investigations have shown that the typical bathymetric distribution of different speceis remains invarable : *M. monoceros* and *M. stebbngi* being shallow water species, inhbit within the depth range 20 m ; penaeides are classed as species of the medium depth range (20-40 m) *P. longirostris* was found at a depth over 30 m. At the same time a displacement of main accumulations wthin this area was noted in 1970-1971. At present this area is characterized by the greatest shrimp population size which coresponds to the relatively invariable conditions.

(*b*) In 1970-1971 a difference in the intensive spawn periods as compared with 1966 was noted. The spawn of *M. monoceros* and *T. curvirostis* lasted till late autumn ; that of *M. stebbingi* changed to winter. The alteration of the spawn periods corresponds to disturbance of the seasonal character of the river flow. Only the spawn of *M. stebbingi* coincided with the maximum river flow.

The population size of different species changed to a different extent. The population size of *P. trisulcatus and M. monoceros* decreased most heavily as compared with 1966 ; 10 and 4 times respectively.

3. The basic importance in the formation of shrimp accumulations of commercial value in 1970-1971 belonged to *M. stebbingi, P. japonicus, M. monoceros* and *P. longirostris.*

4. Depending on their location, the fishing areas were located in 1971 on the western slopes of the shelf in the Abukir and Rosetta regions and in the narrow coastal band of the Borullos and Damietta regions.

5. In 1970-1971 seasonal development of fisheries was typical with an increase in the catch size during summer but its level was 5 times less and its peak changed from autumn to spring.

6. In spring of 1971 commercial reserves of shrimps within the range of 10-100 m. on the shelf part located between Abukir and Damietta amounted to 4177 cent which allows to have a yied not more than 2500 cent.

7. The actual fishing level is determined both by natural decrease of the shrimp population size and by overcatch. At present the most effective (productive) season is spring season in the coastal shallow water in the Borullos region. In summer fishing for penaeides would be the most reasonable, in autumn — metap enaeides at a depth of 20-40 m.

With the population decrease of basic commercial species (Penaeides) fishing for *P. longirostris* accumulations and shrimp artificial culture in lakes are gainngi an importance.

VII.—ICHTHYOLOGICAL STUDY

In order to solve one of the main tasks of this expedition, which is the determination of the industrial base of the Egyptian sea fishery and finding out the basic tendencies of its present changes, a seasonal level and composition of the 1970-71 catches near the Mediterranean coast of Egypt as well as the biological state, quantity and distribution of the main commercial fish of this area was analyzed. The volume of the material included a complete biological analysis of 2839 fish, measurement of 10381 and weighing of 7060 fish.

During the expedition of 1970-1971 there was noticed a more varied species composition of the shelf zone fish as compared to 1966. While 81 species were noticed earlier in the area of investigations (Pavlovskaya and Budnichenko, 1970), the catches at the time of the present expedition by the side trawl and conical trap net were represented by 118 fish species (See Appendix 9).

Since the replenishment of the fish species composition in the shelf zone was going on account of neritic and deep-sea species (*Capros aper*, *Peristedion cataphractum* and others), as well as on account of typical dwellers of the Red Sea (*Myliobatidae*, *Synodontidae*, *Apogonidae Acanthuridae*, *Denticidae*, *Platycephalidae* and *Monocantidae*), one can suppose that the reason for such a phenomenon was a remarkable salting of the coastal waters which allowed shifting of the neritic types habitats closer to the sea coast as well as facilitated penetration of the Red Sea types to the Mediterranean Sea.

a) Distribution of the Fish Catches and Their Species Composition in Different Seasons of the Year.

Autumn Period :

The distribution of the fish catches according to the results of the trawl survey is shown in Fig. 75. During the autumn period the catches of the bottom and pelagic fish were better than in other seasons. The average catch per trawling hour amounted to 7.7 kg. While comparing the correlation of commercial species one can see that the catch of sardines has considerably dropped ; 1.3 kg in 1966 against 0.4 kg per trawling hour in 1970.

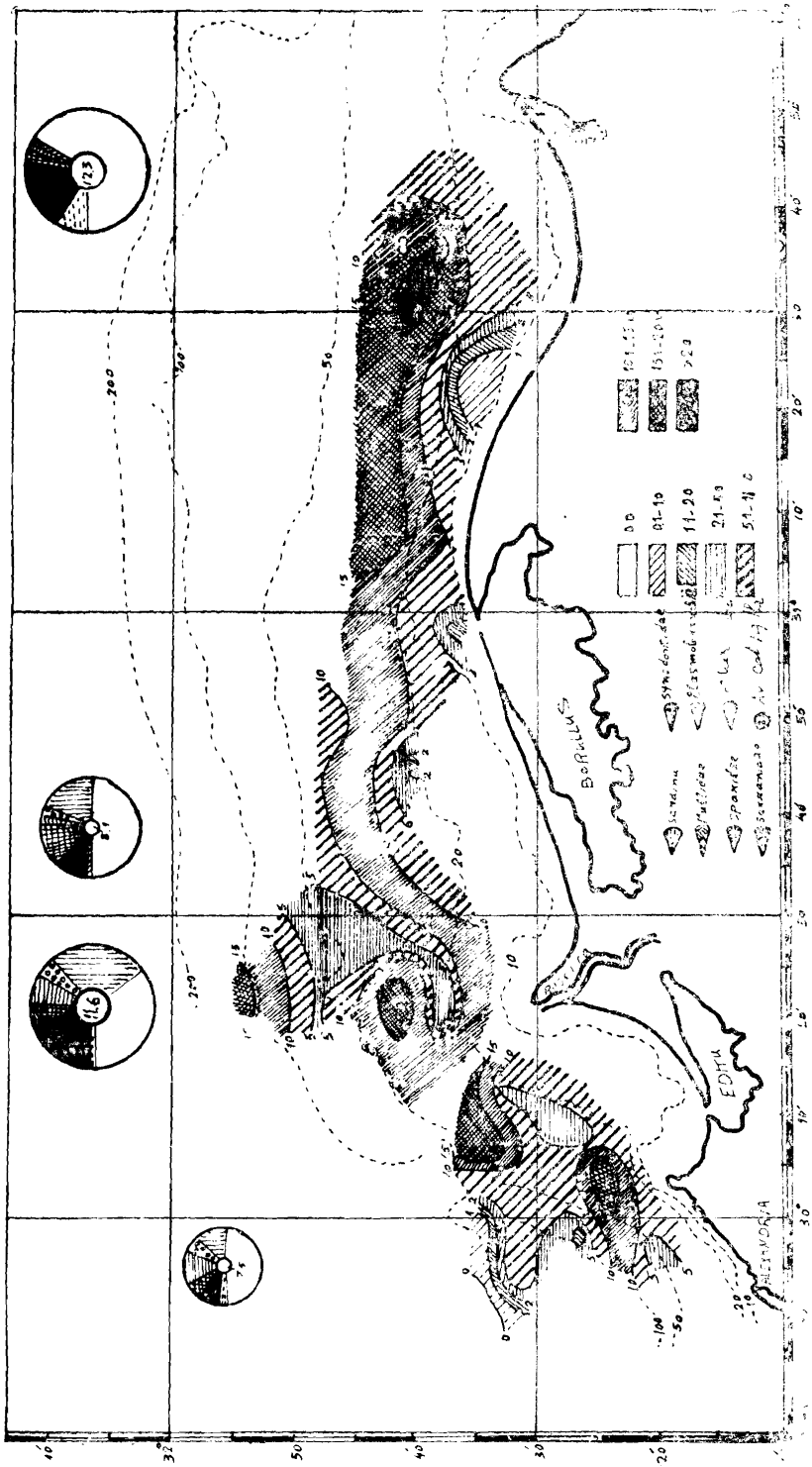

FIG. 75. Geographical distribution of the fish catches from Abu Kir Bay to Cape Damietta during the period from 6 to 27 September, 1970 (based on the "Ichthyolog" Survey).

The catch of (*Mullidae*) has also fallen to 1.4 kg against 2.0 kg in 1966. As can be seen from (Table 24) the qualitative composition of the catches and the size of the fish in the autumn period were changing with relation to regions and depths of trawling. Thus at the depths of 10-50 m there prevailed representatives of the family-*Mullidae* (13.1 % on the average) and those of the family *Synodontidae* (13.8 % on the average). The fish of the family *Synodontidae* occupied the dominant position only in the region of Rosetta (30.7 %), their average catch being 4.2 kg per trawling hour.

The best catches when working at the depths of 10-50 m were noticed in Rosetta and Damietta regions, where they amounted on the average to 13.9 kg and 11.4 kg per trawling hour; and to 9.0 and 8.1 kg respectively in Abukir and Borullos regions (Table 25).

At the depths of 51-100 m the average catch of all fish for 1-hour trawling in the region of Rosetta amounted to 16.8 kg, and in Abukir region to 4.7 kg. The prevailing types were : representatives of family *Mullidae* (75 %) in Rosetta region the average catch of which amounted to 12.6 kg per hour of trawling, and representative of family *Serranidae* (58.9%) in Abukir region.

At the depths of 101-200 m in Abukir bay, the average fish catch for 1 hour of trawling amounted to 5-7 kg, the representatives of the *Merluccius merlucius* (33.3 %), family *Serranidae* (30.7%) and family *Sparidae* (28.4%), dominating in the catch.

There were no catches in Abukir Bay within the depth of 200-400 m. According to the literature (El-Maghraby, 1960; Rifaat, 1960; El-Zarka and Koura, 1965; Aleem 1969) the basis of Egyptian fisheries up to 1966 was mainly sardines, the percentage of which in the total fish and shrimp catch ranged from 27.8 % to 68.5 % (48 % on an averge). The catch of sardines ranged normally between 10 thousand to 20 thousand tons per year. After 1964 when the Aswan High Dam was put into operation, the Nile flood waters were discharged into the Mediterranean Sea in a considerably less quantity as a result of which salinity increased from 32.4‰ in 1964 up to 39.4‰ in 1966 in Abukir bay, from 38.5‰ in 1964 up to 39.3 ‰ in 1966 in the Borullos region and from 37.7 ‰ in 1964 up to 39.1‰ in 1966 in the Damietta region. In 1970 the salinity was at the level of 1966 (all figures apply to the autumn period). Later on, the catch of sardines fell in the off-shore waters to 4.6 thousand tons in 1965 and to 0.5 thousand tons in 1966.

Before the control of the Nile discharge, sardines were caught in September-November. During the period of the present study in September 1970, all catches of herring fish (*Clupeidae*) both by bottom trawling and by light attraction amounted to quite a negligible part of the catches. The best catches of the herring fish by bottom trawls were noticed in the Damietta region at the depths of 10 m. to 50 m (0.9 kg per hour of trawling).

The species composition of the fish catches according to the results of the bottom trawling at the depths of 10 to 50 m in Abukir-Damietta region is shown in Table 26. At these depths, throughout the studied water area the average catch of the *Dussumieria acuta* amounted to 53.7%, *S. pilchardus*-22.3 %, *S. aurita*-18.4 % and *S. eba*-5.6 %. The herring distribution was not equal. Thus in the Damietta region the *Clupeidae* were represented mostly by *Dussumieria acuta* and the most valuable commercial species *S. aurita*. The former species was absent in Borullos region and Abukir Bay where *S. pilchardus* prevailed (74.4 % and 94.3 % correspondingly). In Rosetta region one could meet *D. acuta* together with *S. eba*.

When catching the pelagic fish at the light stations, Abukir region proved to be best with the maximum catch for one haul. amounting to 3.5 kg. The catch was represented by *S. pilchardus* and *D. acuta*.

The least catches occured in the Salloum Bay where they were represented by fish species of *Sardinella aurita*.

Thus the most valuable pelagic and bottom fish were concentrated in autumn time in the regions of Damietta and Rosetta.

Winter Period :

In January-February the trawling survey and the light stations were carried out in the same regions and when possible, at the same points as in the previous season (Fig. 76).

As compared to the autumn period the average catch per 1 hour of trawling fell down considerably both in the investigated area and in the different regions amounted to 4.3 kg. At the depths of 10-50 m the average catch totaled 5 kg.

According to the data of 1965-1966 expedition the average catch in winter was somewhat higher and amounted to 10.6 kg for one hour of trawling in the region of Abukir-Rosetta and 2.8 kg in the Borullos-Damietta region. The decrease in sardine catches, should be specially mentioned. Thus in winter of 1966, the average catch of sardines for one hour of trawling

TABLE 24. CATCHES OF VARIOUS FISH FAMILIES

Depth (m)	Region	No of trawling Operations	Duratiom of trawling (hrs)	Total catch of fish in kg. (% in paranthesis)	Includ-		
					Clupeidae	Carangidae	Mullidae
10—50	*Dumietta*	*12*	13	*146.13*	*11.95*	*8.41*	27.57
				(100)	(8.1)	(18.6)	(18.6)
	Borullos	8	8	64.90	0.42	3.56	7.18
				(100)	(0.6)	(5,5)	(11.2)
	Abukir	10	10	89.75	3.29	2.98	9.13
				(100)	(3.7)	(3.3)	(10.2)
	Rosetta	6	6	83.40	0.49	0.96	6.96
				(100)	(0.6)	(1.2)	(8.3)
	Total	36	37	386.18	16.6	15.92	50.84
				(100)	(4.2)	(4.1)	(13.1)
51—100	Abukir	4	4	19.01	0.04	0.22	0.89
	Rossetta	1	1	(100)	(0.2)	(1.2)	(4.7)
				(100)	(0.1)	(0.6)	(75.0)
	Total	5	5	35.83	0.06	0.32	13.49
				(100)	(0.2)	(0.9)	(37.8)
101—200	Abukir	2	2	11.53	—	0.01	—
				(100)	—	(0.1)	—
201—400	Abukir	2	2	0 (0)			

AT DIFFERENT DEPTHS (8 — 27 SEPTEMBER, 1970).

i n g

Sparidae	Serranidae	Elasmo-branchii	Synodontidae	Sphyraenidae	Leiognatidae	Gadidae	Other fishes
5.97	—	0.77	1.72	13.96	66.89	—	10.87
(4.0)	—	(0.5)	(1.2)	(9.4)	(45.2)	—	(7.3)
7.86	1.60	1.50	12.44	2.28	22.03	—	6.01
(12.1)	(2.5)	(2.3)	(19.1)	(3.5)	(33.9)	—	(9.3)
2.53	1.20	8.00	13.70	5.66	40.17	—	3.08
(2.8)	(1.3)	(8.9)	(15.3)	(6.3)	(44.8)	—	(3.4)
3.56	8.02	2.99	25.53	5.81	14.54	—	14.55
(4.4)	(9.6)	(3.6)	(30.7)	(6.9)	(17.3)	—	(17.4)
19.92	10.82	13.26	53.39	27.72	143.64	—	34.5
(5.1)	(2.8)	(3.4)	(13.8)	(7.2)	37.4)	—	(8.2)
0.96	11.08	0.0	1.14	0.15	1.71	0.23	2.4
(6.1)	(58.9)	(0.7)	(5.3)	(0.8)	(9.0)	(3.2)	(12.9)
0.94	—	1.26	—	—	—	0.41	14.8
(5.6)	—	(6.7)	—	—	—	(2.4)	(8.8)
19.0	11.08	1.40	1.14	0.15	1.71	0.64	3.94
(5.3)	(30.8)	(3.9)	(3.2)	(0.4)	(4.8)	(1.8)	(10.9)
3.27	3.54	—	—	—	—	3.85	0.86
(28.4)	(30.7)	—	-	—	—	(33.3)	(7.5)

TABLE 25.- AVERAGE CATCH/HOUR AT DIFFERENT DEPTHS (8-12 SEPTEMBER, 1970).

Depth (m)	Region	Average catch (kg)	Including										
			Clupeidae	Carangidae	Mullidae	Sparidae	Serranidae	Elasmobranchii	Synodontidae	Sphyraenidae	Leiognathidae	Gadidae	Other fishes
10-50	Damietta	11.4	0.9	0.6	2.1	0.5	—	0.1	0.1	1.1	5.2	—	0.8
	Borullos	8.1	0.1	0.4	0.9	1.0	0.2	0.2	1.6	0.3	2.7	—	0.7
	Abukir	9.0	0.4	0.4	0.9	0.3	0.1	0.8	1.4	0.6	4.0	—	0.3
	Rosetta	13.9	0.1	0.2	1.2	0.6	1.3	0.5	4.2	1.0	2.4	—	2.5
	Total	10.4	0.4	0.4	1.4	0.5	0.3	0.4	1.4	0.8	3.9	—	0.9
51-100	Abukir	4.6	+	0.1	0.3	0.2	2.8	—	0.3	+	0.4	0.1	0.6
	Rosetta	16.8	+	0.1	12.6	0.9	—	1.3	--	—	—	0.4	1.5
	Total	7.2	+	0.1	2.7	0.4	2.2	0.3	0.3	—	9.3	0.1	0.8
101-200	Abukir	5.7	—	+	—	1.6	1.8	—	—	—	—	1.9	0.4
201-400	Abukir	0											

+ Catch less than 0.1 kg

Table 26.—DISTRIBUTION OF CATCHES OF FAMILY CLUPEIDAE IN DIFFERENT REGIONS AT THE DEPTHS OF 10-50 M (*September* 8-27, 1970).

Regions		Total catch (kg)	Dussumieria acuta	Sardinella		Sardina pilchardus
				aurita	eba	
Damietta	kg	11.95	8.50	2.80	0.50	0.15
	%	100	71.0	23.5	4.2	1.3
Borullos	kg	0.42	—	0.06	0.04	0.32
	%	100	—	14.3	8.3	77.4
Rosetta	kg	0.49	0.19	0.03	0.26	0.01
	%	100	39.2	6.1	52.1	2.6
Abukir	kg	3.29	—	0.06	0.12	3.12
	%	100	—	2.0	3.7	94.3
For the entire water area	kg	16.16	8.69	2.95	0.92	3.60
	%	100	53.7	18.4	5.6	22.3

amounted to 5.6 kg in the Abukir-Rosetta region whereas in 1971 catches it amounted only to 0.2 kg. The catch of *Mullidae* fish somewhat increased and made 0.7 kg as against 0.1 kg in 1966.

It can be seen from Table 27 and Fig. 76 that at the depths of 10-50 m. representatives of the family *Synodontidae* (24.1%) prevailed, their average catch being equal to 1.2 kg. The commercial fish of the family *Serranidae* (14.1%) and *Mullidae* (13.7%) also constituted a considerable part.

Just as in the autumn the maximum average catches at the given depths were noticed in the regions of Damietta and Rosetta, where they totaled respectively 5.6 kg and 5.3 kg per one hour of trawling, and 4.7 and 4.0 kg correspondingly in the Borulloss and Abukir regions.

At the depths of 51-100 m the average catch of all fish in Rosetta region for one-hour trawling amounted to 4.6 kg and in Abukir region to 1.7 kg. Representatives of the family *Sparidae* (18.7 %) and family *Mullidae* (14.8% on an average) prevailed.

At the depths of 101-200 m in the Rosetta region the average catch of fish for one hour of trawling amounted to 2.1 kg. There prevailed *Elasmobranchia fish* (46.8 %), and *Sparidae* fish (17.7 %) as a commercial kind.

Within the depth range of 101-300 m in the Abukir region no fish was discovered (Table 28).

The average catch of herring per one-hour trawling at the depths of 10-50 m totaled 0.1 kg, i.e. 4 times less than in autumn. Deeper one could

TABLE 27. CATCHES OF VARIOUS FISH FAMILIES AT

Depth (m)	Region	No. of trawling operations	Duration of trawling (hr.)	Total catch of fish in kg, (% in parenthesis)	Elasmobranchii	clupeidae	carangidae
10–50	Damietta	13	12,51	72.26 (100)	— —	3.31 (4.6)	1.26 (1.7)
	Borullos	15	15	70.97 (100)	1.87 (2.6)	0.13 (0.2)	1.03 (1.4)
	Rosetta	7	7	37.22 (100)	14.81 (39.9)	0.48 (1.3)	0.33 (0.9)
	Abukir	5	5	19.83 (100)	0.86 (4.3)	1.92 (9.7)	0.54 (2.7)
	Total	40	39,51	200.28 (100)	17.54 (8.8)	5.84 (2.9)	3.16 (1.6)
51–100	Damietta	2	2	0.25 (100)	— —	— —	— —
	Rosetta	2	2	9.22 (100)	0.39 (4.2)	— —	0.04 (0.5)
	Abukir	2	2	3.30 (100)	— —	0.07 (2.1)	— —
	Total	6	6	12.77 (100)	0.29 (3.1)	0.07 (0.5)	0.04 (0.3)
101–200	Rosetta	1	1	2.09 (100)	0.96 (46.8)	— —	— —
	Abukir	1	1	— —	— —	— —	— —
	Total	2	2	2.09 (100)	0.96 (46.8)	— —	— —
201–300	Abukir	2	2	— —	— —	— —	— —

DIFFERENT DEPTHS (18—27 JANUARY, 1971)

Including

Mullidae	Sparidae	Serranidae	Synodontidae	Sphyraenidae	Pomatomidae	Leiognathidae	Soleidae	Other fishes
9.61	1.33	15.93	18.04	3.61	—	11.84	4.36	3.97
(11.9)	(1.8)	(22.1)	(25.0)	(5.0)	—	(16.4)	(6.0)	(5.5)
13.76	0.91	11.44	24.99	0.08	0.9	3.19	5.48	7.28
(19.2)	(1.3)	(16.1)	(35.2)	(0.1)	(1.3)	(4.5)	(7.7)	(10.3)
3.80	0.90	0.74	4.46	0.06	0.38	3.88	1.31	6.07
(10.2)	(2.4)	(2.0)	(12.0)	(0.1)	(1.0)	(10.4)	(3.5)	(16.3)
1.37	0.12	0.04	0.97	0.01	1.77	7.12	1.23	3.85
(6.9)	(0.6)	(0.2)	(4.9)	(0.2)	(9.0)	(35.9)	(6.2)	(19.4)
27.45	3.26	28.15	48.36	3.79	3.05	26.03	12.38	21 17
(15.7)	(1.6)	(14.1)	(24.1)	(1.8)	(1.5)	(13.0)	(6.2)	(10.6)
0.25	—	—	—	—	—	—	—	—
(100)	—	—	—	—	—	—	—	—
1.52	2.19	0.76	0.85	—	—	—	0.29	3.18
(16.5)	(23.8)	(8.2)	(9.2)	—	—	—	(3.1)	(34.5)
0.12	0·20	0 03	0.35	—	—	0.10	0.39	2.13
(3.6)	(6.1)	(0.9)	(10 6)	—	—	(0.3)	(11.8)	(64.6)
1.89	2.39	0.79	1.20	—	—	0.01	0.68	5.31
(14.8)	(18.7)	(6.2)	(9.4)	—	—	(0.1)	(5.3)	(14.6)
0.03	0.37	0.16	—	—	—	—	—	0.51
(4.3)	(17.7)	(77)	—	—	—	—	—	(24.6)
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
0.09	0.37	0.16	—	—	—	—	—	0.51
(4.3)	(17.9)	(7.7)	—	—	—	—	—	(24.6)
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—

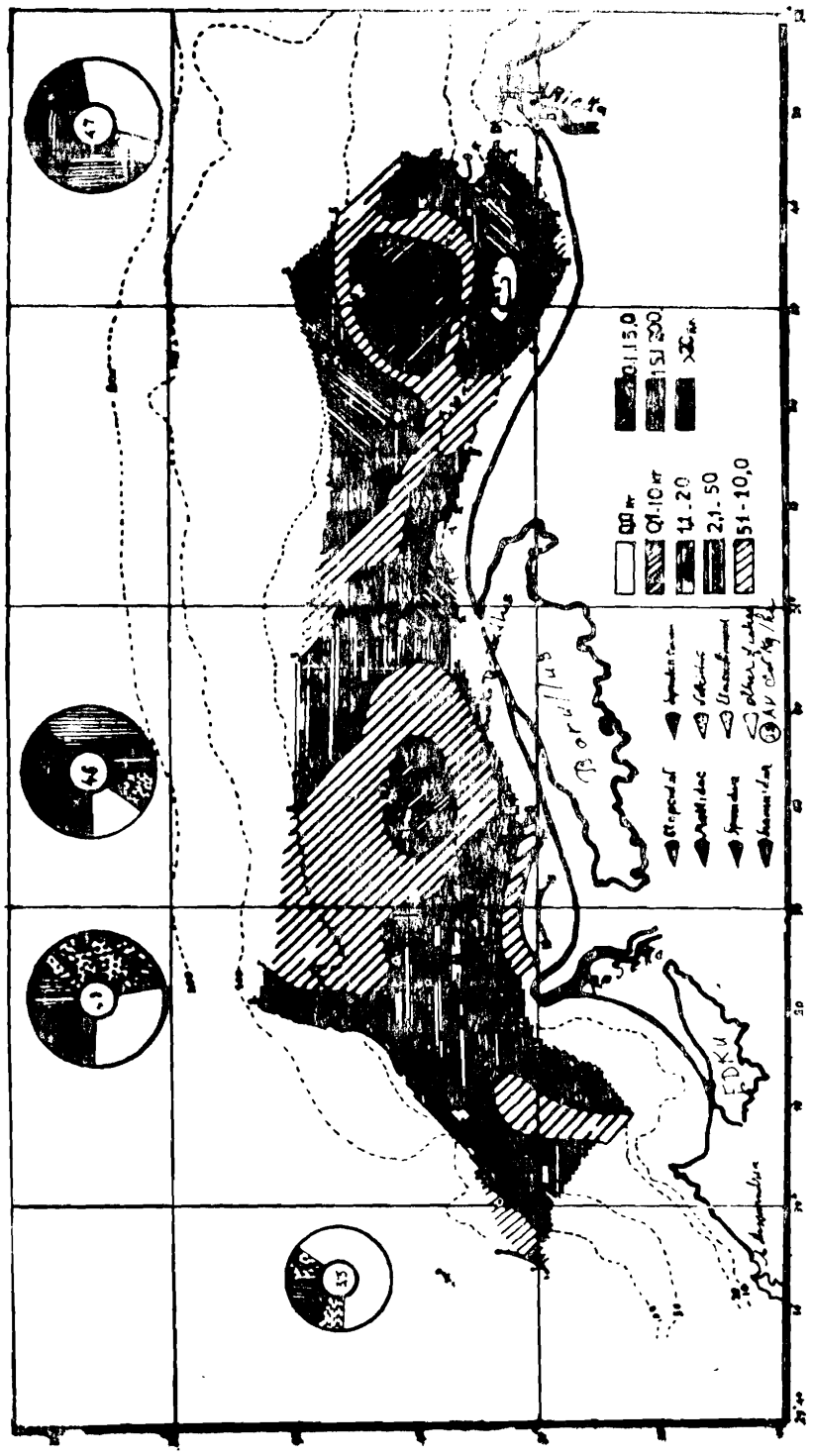

FIG. 76. Distribution of the fish catches during the period from 18 to 28 January, 1971.

TABLE 28.—AVERAGE CATCH/HOUR AT DIFFERENT DEPTHS (18-28 JANUARY, 1971)

Depth (m)	Region	Average catch (kg)	Including											
			Elasmobranchii	Clupeidae	Carangidae	Mullidae	Sparidae	Serranidae	Synodontidae	Sphyraenidae	Pomatomidae	Leiognathidae	Soleidae	Other fishes
	Damittae	5.6	—	0.3	0.1	0.7	0.1	1.1	1.4	0.3	—	0.9	0.4	0.3
	Borullos	4.7	0.1	+	0.1	0.9	+	0.8	1.7	+	+	0.2	0.4	0.5
	Rosetta	5.3	2.1	0.1	+	0.6	0.1	0.1	0.6	+	+	0.6	0.6	0.9
	Abukir	4.0	0.2	0.4	0.1	0.3	+	+	0.2		0.4	1.4	0.2	0.8
	Total	5.0	0.4	0.1	0.1	0.7	0.1	0.7	1.2	0.1	+	0.8	0.3	0.5
	Damietta	0.1	—	—	—	0.1	—	—	—	—	—	—	—	—
	Rosetta	4.6	0.2	—	+	0.8	1.1	0.4	0.4	—	—	—	0.1	1.6
	Abukir	1.7	—	+	—	0.1	0.1	0.0	0.2	—	—	+	0.2	1.1
	Total	2.1	0.1	+	+	0.3	0.4	0.1	0.2	—	—	+	0.1	0.9
	Rosetta	2.1	1.0	—	—	0.1	0.4	0.1	—	—	—	—	—	0.5
	Abukir	0	—	—	—	—	—	—	—	—	—	—	—	—
	Total	1.0	0.5	—	—	+	0.2	—	—	—	—	—	—	0.3
	Abukir	0	—	—	—	—	—	—	—	—	—	—	—	—

find just species of herring fish, *S. pilchardus* prevailing. The *Sardinella and Dussumieria* representatives were almost absent (Table 29).

TABLE 29.—DISTRIBUTION OF CATCHES OF FAMILY CLUPEIDAE IN VARIOUS REGIONS AT THE DEPTH OF 10-50 M (*January* 18-28, 1971).

Regions		Total each (kg)	Dussumieria acuta	Sardinella		Sardina pilchardus
				aurita	eba	
Damietta	kg	3.31	—	0.08	0.3	3.2
	%	100	—	2.1	1.0	96.6
Borullos	kg	2.0	0.02	—	0.02	0.16
	%	100	10.1	—	10.0	80.0
Rosetta	kg	0.48	—	—	0.04	0.44
	%	100	—	—	8.3	91.7
Abukir	kg	1.96	0.03	—	0.03	1.90
	%	100	1.5	—	1.5	97.0
For the entire water area	kg	5.95	0.05	0.08	0.12	5.70
	%	100	0.8	1.3	2.0	95.9

At thl light stations the pelagic fish was caught only in the Borullos region where the maximum catch for a haul totaled 1.7 kg and was represented by the following species : *Sardina pilchardus, Engraulis encreasicholus, Trachurus mediterraneus.*

The maximum share of the catch falls upon *Engraulis encrasicholus* 79.3%. No fish was noticed at the light stations in the Rosetta region.

Thus in the winter season one could observe a reduction in the catches for all the regions though in the Damiietta and Rosetta regions the catches remained at a higher level in comparison with the other regoins. As different from the observatoins of 1966 - at the same season in JanuarytFebruary of 1971 the pelagic fish was not much in number, a fact that testifies the stock of such important fish for the Egyptian fishing industry.

Spring Period ;

At this season (in April) the average fish catch per one hour of trawling was th?e lowest for all the regions and totaled 2.5 kg. As can be seen from Tables (30 & 31) and Fig. 77 the distribution of the fish per region was relatively equal, however there were differences in the catches in relation tc the depth. At depths up to 50 m. the average catch amounted to 2.3 kg

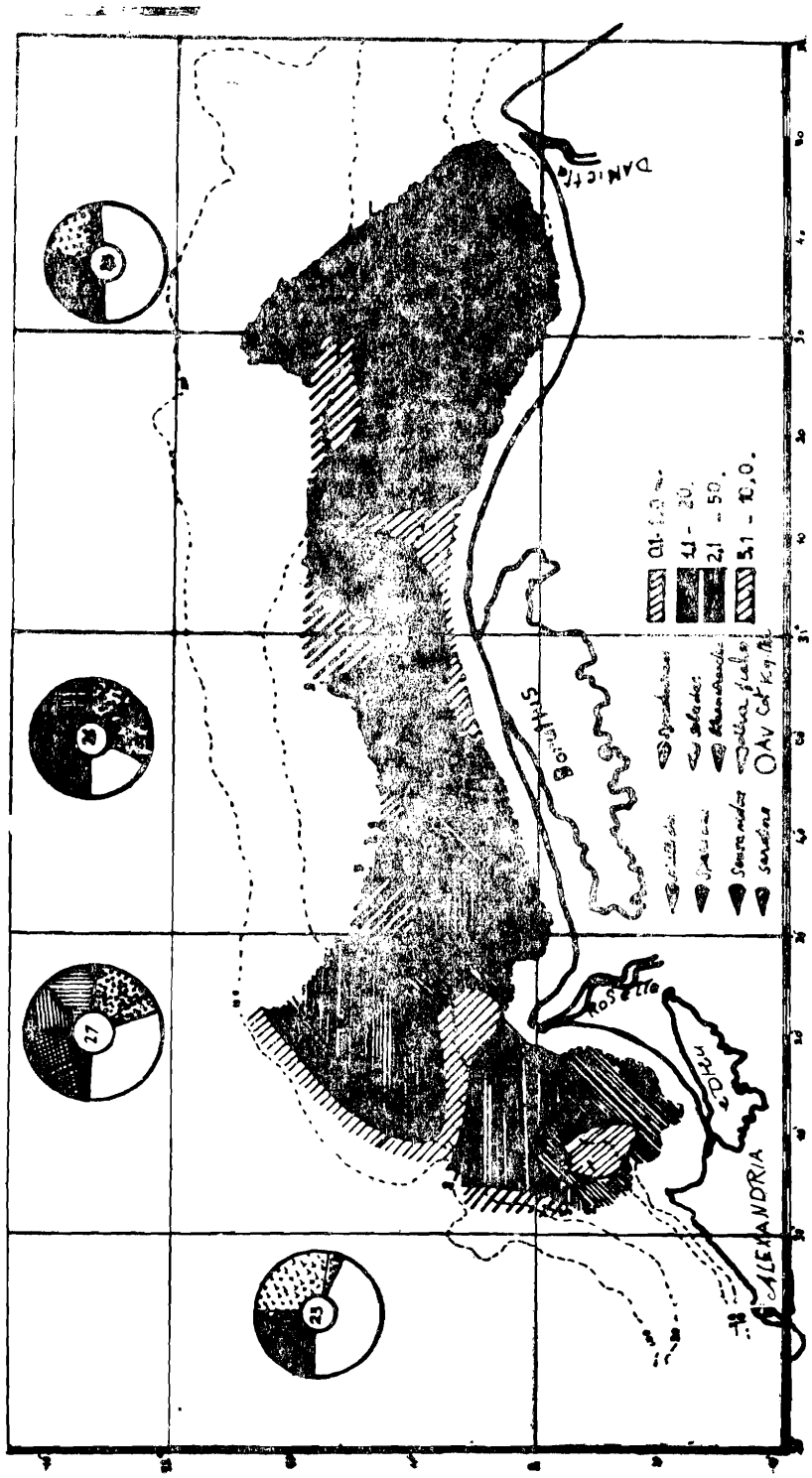

FIG. 77. Distribution of the fish catches during the period from 20 to 28 April, 1971,

TABLE 36. CATCHES OF VARIOUS FISH FAMILIE

Depth (m)	Region	No. of trawling operations	Duration of trawling (hr.)	Total catch of fish in kg. (%in parenthesis)	Incl		
					Clupeidae	Carangidae	Mullidae
10–50	Damietta	13	13.40	26,21 (100)	7.78 (3.0)	0.24 (1.0)	1.44 (5.5)
	Borullos .	14	14	35.99 (100)	0.19 (0.5)	0.46 (1.3)	1.76 (4.0)
	Rosetta .	8	8	24.71 (100)	0.13 (0.5)	0.63 (2.6)	0.32 (1.3)
	Abukir .	8	7.25	13.89 (100)	0.82 (5.9)	—	0.27 (1.8
	Total . .	43	43.05	100.8 (100)	1.91 (1.9)	1.33 (1.3)	3.89 (3.8)
51–100	Damietta	2	2	8.28 (100)	0.07 (0.8)	0.43 (5.2)	0.08 (1.0)
	1	1	1	2.74 (100)	— —	— —	0.15 (5.5)
	Abukir .	1	1	7.35 (100)	— —	— —	1.16 (a5.8)
	Total . .	4	4	18.37 (100)	0.07 (0.4)	0.43 (2.3)	1.39 (7.6)
101–200	Rosetta .	1	1	0.16 (100)	— —	— —	— —

AT DIFFERENT DEPTHS (20–28 APRIL, 1971).

ding

Sparidae	Serranidae	Synodontidae	Elasmobranchii	Engraulidae	Pomatomidae	Leiognathidae	Soleidae	Triglidae	Other fishes
0.76	0.34	2.79	0.81	0.47	0.45	5.83	4.27	4.64	2.39
(2.9)	(1.3)	(10.6	(3.1)	(1.8)	(1.7)	(22.2)	(20.1)	(17.7)	(9.1)
3.71	7.16	5.06	6.04	0.13	0.6	0.76	4.75	3.09	2.29)
(10.3)	(19.9)	(14.0)	(16.8)	(0.3)	(1.7)	2.1)	13.2)	(8.6)	(6.4)
6.17	3.16	3.16	1.79	0.12	2.4	0.31	1.34	1.73	3.45
				(0.5)	(9.7)	(1.2)	(5.4)	(7.4)	(13.9)
1.45	0.02	0.28	0.5	1.38	1.1	0.97	2.81	2.4	1.89
(10.5)	(0.2)	(1.8)	(3.6)	(10.0)	(8.0)	(7.0)	(20.3)	(17.3)	(13.6)
12.9	10.68	11.29	9.14	2.1	4.55	7.87	14.17	11.86	10.02
(12.1)	(10.7)	(11.3)	(9.2)	(2.1)	(4.6)	(7.9)	(14.2)	(11.9)	(10.0)
1 16	0.11	0.68	0.66	—	—	0.13	0.34	0.75	3.87)
(14.0)	(1.3)	(8.2)	(8.0)	—	—	(1.6)	(4.1)	(9.1)	(46.7)
0.02	0.37	0.3	1.78	—	—	—	—	—	0.12
(0.7)	(13.5)	(10.9)	65.0)	—	—	—	—	—	(4.4)
0.48	0.04	0.84	—	—	—	—	2.77	0.35	1.71
(6.5)	(0.5)	(11.1)	—	—	—	—	(37.8)	(4.7)	(23.3)
1.66	0.52	1.82	2.44	—	—	0.13	3.11	1.10	5.7
(9.0)	(2.80)	(9.9)	(13.3)	—	—	(0.7)	(17.0	(6.0)	(31.0)
0.03	–	–	–	–	–	0.01	–	0.12	—
(18.7)	—	—	—	–	–	(6.3)	–	(75.0)	—

TABLE 31. AVERAGE CATCH / HOUR AT DIFFERENT DEPTHS (20 — 28 APRIL, 1971)

Depth (m)	Region	Average catch (kg)	Including												
			Clupeidae	Carangidae	Mullidae	Sparidae	Serranidae	Synodontidae	Elasmobranchii	Engraulidae	Pomatomidae	Leiognathidae	Soleidae	Triglidae	Other fishes
10—50	Damietta	1.9	0.1	+	0.2	+	+	0.2	0.1	+	+	0.4	0.4	0.3	0.2
	Borullos	2.6	+	+	0.1	0.4	0.5	0.4	0.4	+	+	0.1	0.3	0.2	0.2
	Rosetta	3.1	+	0.1	0.1	0.8	0.4	0.4	0.2	+	0.3	+	0.2	0.2	0.4
	Abukir	1.9	0.1	—	+	0.2	+	+	0.1	0.2	0.2	0.1	0.4	0.3	0.3
	Total	2.3	+	+	0.1	0.3	0.3	0.3	0.2	+	0.1	0.2	0.3	0.3	0.2
51—100	Damietta	4.1	+	0.2	+	0.6	0.1	0.3	0.3	—	—	0.1	0.2	0.4	1.9
	Rosetta	2.7	—	—	0.1	+	0.4	0.3	1.8	—	—	—	—	—	0.1
	Abukir	7.4	—	—	1.2	0.5	+	0.8	—	—	—	—	2.8	0.4	1.7
	Total	4.6	+	0.1	0.3	0.4	0.2	0.5	0.6	—	—	+	0.8	0.3	1.4
101—200	Rosetta	0.2	—	—	—	+	—	—	—	—	—	+	—	0.1	—

\+ Catch less than 0.1 kg.

per one hour trawling, and deeper than 50 m. the average catch amounted to 4.5 kg. The same picture of the catch increase with depth was observed in 1966.

The qualitative composition of the catch also somewhat increased. There prevailed in the catches of the bottom trawl representatives of families *Soleidae* and *Sparidae* as well as those of the *Synodontidae* and *Serranidae*. At the depths over 100 m in the Rosetta region the average fish catch for one hour of trawling was equal to 0.2 kg and 75% of the catches being formed by fish of family *Triglidae*.

The herring and other pelagic fish were found in the catches in quite negligible quantities. The average catch of herring per one hour of trawling in all the areas and at all depths totaled less than 0.1 kg (Table 32). The maximum catch of the pelagic fish for one haul of the side trawl in the Damietta region amounted to 0.7 kg.

Thus one can see that in the spring season fish catches fell down sharply in all the studied regions. According to the data of the expedition of 1965-1966 the lowest fish catches were observed within the period from March 30 up to May 4. Thus the average catch for one hour of trawling in Abukir-Rosetta amounted to 3.1 kg and in Borullos-Damietta region to 1.0 kg.

In our opinion the spring season cannot be considered as feasible for fisheries in Egypt.

Table 32.– Distribution of the fish catches of Family Clupeidae in various regions at the depths of 10-50 m.
(*April* 20-28, 1971)

Regions		Total catch (kg)	Dussumieria acuta	Sardinella		Sardina pilchardus
				aurita	eba	
Damietta	kg	0.79	0.06	0.03	—	0.70
	%	100	7.6	3.8	—	88.6
Borullos	kg	0.27	0.11	0.02	0.01	0.13
	%	100	40.8	7.4	3.7	48.1
Rosetta	kg	0.14	0.03	—	—	0.11
	%	100	21.4	—	—	78.6
Abukir	kg	0.81	0.14	—	—	0.67
	%	100	17.3	—	—	82.7
For the entire water area	kg	2.01	0.34	0.05	0.01	1.61
	%	100	16.9	2.6	0.6	79.9

Summer Poriod ;

In August the average catch per one hour of trwaling was larger than in spring and totaled 5.9 kg. Comparing with the results of the observations carried out in 1966 a reduction in catches should be noted both on the whole and according to separate commercial types. Thus the average catch in August of 1966 amounted to 8.0 kg. including that of sardines (1.2 kg) and *Mullidae* (21 kg) per one hour of trawling.

At the time of our observations the average catch of *Mullidae* was somewhat lower (1.6 kg) and the catch of sardines per one hour of trawling (0.2 kg) was considerably lower. There was noticed an increase of catches with the decrease of depth. Thus the average catch at the depth of 10-50 m. amounted to 6.3 kg ; at the depths of 51-100 m. - to 4.8 kg. and deeper than 100 m. it amounted to 1.0 kg. (Table 33 & Fig. 78) per one hour of trawling. The share of *Mullidae* amounted to 24.3% of the catches.

The share of non-commercial fish *Leiognathus klunshingeri* which is of little value is 22.1%, the maximum catch of it amounting to 10.5 kg (the Rosetta region) (Table 34), while fishing at the depths of 101-200 m. the average catch for one hour of trawling amounted to 1.0 kg. Half of all the fish caught at the given depths was composed of *Sauridae* (28%) and *Mullidae* (25.8%).

In Abukir bay, when trawling within the depth of 201-300 m. no fish was caught.

The increase in the quantity of the herring fish both in trawling catches and in conical net catches was not observed. The average catch of herring to the east of Alexandria did not exceed 0.2 kg. There prevailed *Sardina pilchardus and Sardinella aurita. Dussumieria acuta* and *Sardinella eba* were met in smaller quantities (Table 35).

In Salloum bay three light statoins were used for catching pelagic fish by a side trap. The maximum catch for a haul weighed 25 kg, the other two stations caught 3.5 and 0.2 kg respectively. The species composition of the pelagic fish was represented only by *Sardinella aurita.*

Hence in the summer period the catches somewhat increased mainly on acount of *Mullidae,* but *L. Klunsingeri* is of little value.

Mullidae fish was found at the depth of 10.120 m. Sardines were found in the eastern parts in very insignificant quantities and separate small shoals were noticed in the Salum bay.

TABLE 33. AVERAGE CATCH / HOUR AT DIFFERENT DEPTHS (AUGUST 23 — SEPTEMBER 8, 1971)

Depth (m)	Region	Average catch (kg)	Including													
			Clupeidae	Engraulidae	Carangidae	Mullidae	Sparidae	Serranidae	Synodontidae	Pomatomidae	Sphyraenidae	Uiognathidae	Soleidae	Triglidae	Elasmobranchii	Other fishes
10–50	Damietta	4.9	0.1	+	0.2	1.1	0.2	0.1	0.4	+	0.2	0.9	0.4	0.2	0.1	0.1
	Borullos	6.5	0.2	+	0.1	1.3	0.3	1.0	0.4	0.1	0.1	1.5	0.2	0 1	0 3	4.0
	Rosetta	9.2	0.2	0.1	0.3	1.8	0.6	0.2	0.9	0.5	0.6	1.8	0.6	0.2	0.3	1.2
	Abukir	7.2	0.2	0.1	0.2	1.4	1.0	0.5	0.4	0.1	+	1.8	0.4	+	0.7	0.4
	Total	6.3	0.2	+	0.2	1.6	0.4	0.5	0.5	0.1	0.2	1.4	0.3	0.1	0.3	0.5
51–1	Damiett	1.2	0.1	—	—	0.1	0.1	—	0.4	—	0.1	—	—	0.2	0.1	0.7
	Bosetta	7.5	—	—	—	1.0	1.1	0.7	2.8	—	—	—	0.1	0.2	—	1 1
	Abukir	5.1	0.1	—	0.2	+	+	+	1.8	—	—	—	1.6	0.4	0 2	0 5
	Total	4.8	0.1	—	0.1	0.3	0.3	0.2	1.7	—	+	—	0.9	0.3	0 1	0 8
101–200	Rosetta	0.2	—	—	—	—	0.2	—	—	—	—	—	—	+	—	—
	Abukir	1.4	0.2	—	0.4	0.4	0 2	—	—	—	—	—	+	0.1	—	+ +
	Total	1 0	0.1	—	0.3	0.3	0.2	—	—	—	—	—	+	0.1	—	+ +
201–300	Abukir	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—

+ Catch less than 0.1 kg.

TABLE 34. CATCHES OF VARIOUS FISH FAMILIES AT DIFFERENT DEPTHS (AUGUST

Depth (m)	Region	No. of trawling operations	Duration of trawling (hr.)	Total catch of fish in kg. (% in parenthesis)	Clupeidae	Engraulidae	Carangidae
10–50	Damietta	14	14	55.8 (100)	1.81 (3.2)	0.37 (0.7)	2.37 (4.3)
	Borullos	14	14	90.15 (100)	2.97 (3.3)	0.4 (0.4)	1.68 (1.9
	Rosetta	8	8	73.32 (100)	1.16 (1.6)	0.56 (0.8)	2.81 (3.8)
	Abukir	8	8	57.79 (100)	1,64 (2.8)	0.72 (1.2)	1.52 (2.6)
	Total	44	44	277.1 (100)	7.6 (2.7)	2.0 (0.7)	8.4 (3.2)
51–100	Damietta	1	1	1.21 (100)	0.07 (6.2)	— —	— —
	Rosetta	1	1	7.49 (100)	— —	— —	— —
	Aboukir	2	2	100.27 (100)	0.21 (2.1)	— —	— (3.6)
	Total	4	4	19.0 (100)	0.3 (1.6)	— —	0.4 (2.1)
101–100	Rosetta	1	1	0.23 (100)	— —	— —	— —
	Aboukir	2	2	2.76 (100)	0.47 (17.2)	— —	0.84 (30.2)
	Total	3	3	2.99 (100)	0.5 (15.8)	— —	0.8 (28.0)
201–300	Aboukir	1	1	00 00	— —	— —	— —

23 – SEPTEMBER 8, 1971).

Including

Mullidae	Sparidae	Serranidae	Syondontidae	Pomatomidae	Sphyraenidae	Leiognathidae	Soleidae	Triglidae	Elasmobranchii	Other Fishes
15.89 (28.5)	2.08 (3.6)	1.59 (2.9)	6.07 (10.7)	0.37 (0.7)	1.76 (3.2)	12.62 (22.6)	5.73 (10.3)	2.44 (4.4)	0.98 (1.8)	1.71 (3.1)
25.91 (28.7)	4.47 (5.5)	13.44 (14.9)	5.05 (5.6)	0.76 (0.8)	1.64 (1.8)	20.78 (23.1)	2.42 (2.7)	1.32 (1.5)	3.45 (3.8)	5.85 (6.5)
14.39 (19.5)	5.02 (6.9)	1.75 (2.4)	7.07 (9.7)	3.89 (5.3)	4.53 (6.2)	14.15 (19.3)	3.73 (5.1)	1.60 (2.2)	2.95 (4.0)	9.69 (13.2
11.24 (19.4)	8.32 (14.4)	4.15 (7.2)	3.67 (6.3)	0.88 (1.5)	0.16 (0.3)	14.15 (24.5)	2.29 (5.2)	0.43 (0.7)	5.54 (9.6)	3.07 (5.3)
67.4 (24.3)	19.9 (7.2)	21.0 (7.6)	21.9 (7.9)	5.9 (2.1)	8.1 (2.9)	61.7 (22.1)	14.2 (5.1)	5.8 (2.1)	12.9 (4.7)	20.3 (7.4)
0.13 (10.3)	0.14 (11.6)	— —	0.45 (37.2)	— —	0.04 (2.9)	— —	— —	0.24 (20.2)	0.08 (6.6)	0.06 (5.0)
1.04 (13.8)	1.11 (14.8)	0.73 (9.8)	2.76 (37.0)	— —	— —	— —	0.07 (0.9)	0.26 (3.5)	— —	1.51 (20.2
0.02 (0.2)	0.04 (0 3)	0.1 (1.0)	3.61 (35.1)	— —	— —	— —	3.29 (32.1)	0.72 (7.2)	0.49 (4.7)	1.42 (31.7)
1.2 (6.3)	1.3 (6.9)	0.8 (4.2)	6.8 (35.8)	— —	— —	— —	3.4 (18.0)	1.2 (6.3)	0.6 (3.2)	3.0 (15.6)
— —	0.22 (98.0)	— —	— —	— —	— —	— —	— —	0.01 (2.0)	— —	— —
0.77 (28.0)	0.3 (10.8)	— —	— —	— —	— —	— —	0.06 —	0.26 (9.4)	— —	0.06 (2.2)
0.8 (25.8)	0.5 (17.5)	— —	— —	— —	— —	— —	0.1 (2.0)	0.3 (8.9)	— —	0.1 (2.0
— —	— —	— —	— —	— —	— —	— —	— —	— —	—	— —

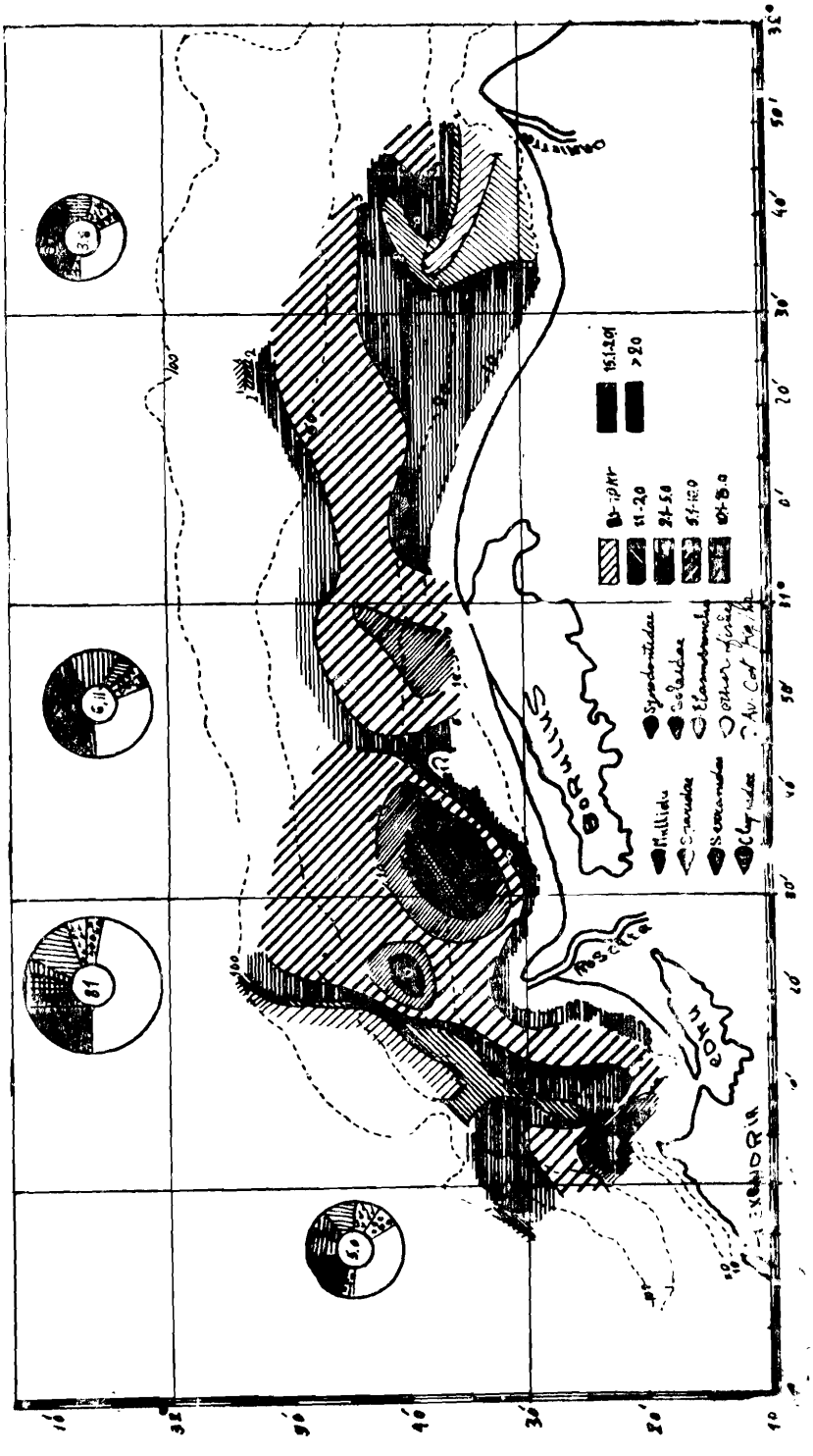

FIG. 78. Distribution of the fish catches during the period from 23 August to 8 September, 1971.

(b) **Biological Characteristics of the main Commercial Fish :**

Family Clupeidae : Representatives of family *Culpeidae* are of the most essential kinds for catching in the western part of the Mediterranean. In the off-shore waters of Italy, France and Spain (Ben-Tuvia, 1958) fishery is based on it. According to the expedition of AzCherNiRo 1958-1959, working in the off-shore waters of Albany, S. *Pilchardus* fish was numerous in the coastal zone of the Adriatic and Aegean Seas where it formed commercial stocks.

For fisheries in Egypt, *S. pilchardus* and *S. aurita* were of the greatest importance. During the present expedition, in the trawl catches, as well as in the catches by conical nets and side traps, one could meet sometimes *S. pilchardus* and *S. aurita* representatives and more rarely *S. eba* and *D. acuta* fish which is of no commercial importance.

TABLE 55. — DISTRIBUTION OF THE CATCHES OF THE CLUPEIDAE FISH AT THE DEPTHS OF 10-50 M IN VARIOUS REGIONS.
(*August* 23-*September* 8, 1971)

Regions		Total catch (kg)	Dussumieria acuta	Sardinella		Sardina pilchardus
				aurita	eba	
Damietta	kg	1.43	0.18	0.98	0.04	0.23
	%	100	12.6	68.5	2.8	16.1
Borullos	kg.	2.97	0.04	0.82	0.37	1.74
	%	100	1.3	27.6	12.5	58.6
Rosetta	kg	1.16	0.52	0.24	0.08	0.32
	%	100	44.8	20.7	6.9	27.6
Abukir	kg	1.64	0.22	0.07	0.1	1.25
	%	100	13..	4.5	6.1	76.2
For the entire water area	kg	7.2	0.96	2.11	0.59	3.54
	%	100	13.3	29.3	8.2	49.2

In 1966 the Ichthyolog expedition noted just the insignificant concentration of *S. pilchardus*. According to the data of 1970-71 this kind of sardines did not form any stocks and was met throughout the year in negligible quantities (tables 26, 29, 32, & 35) *S. pilchardus* was caught in small quantities in winter. In trawling catches this kind formed 95.9% among the herring fish. In other season it was of smaller significance (Table 36 & Fig. 79).

S. pilchardus is heat-loving fish, neverthless it avoids overheated water. There is an opinion (Furnestin, 1957 and Ben Tuvia, 1958) that it lives at a temperature not exceeding 22°C and its shoals are formed at a temperature, not less than 20°C. At the same time it is worth mentioning that at the time of the present studies, in summer, sardines could be found, though in small quantities, at a temperature up to 28.4°C.

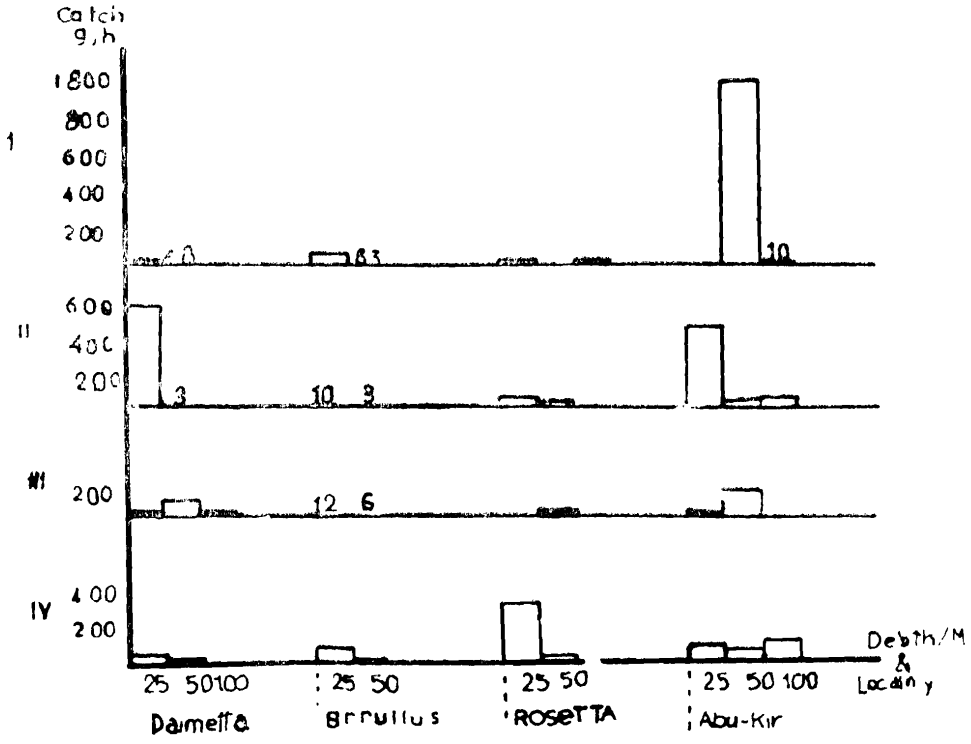

FIG. 79. Catches of *S. pilchardus* in the various depths of the area surveyed during September (I), January (II), April — May (III), of 1970 and August—September (IV) of 1971.

As for their concentration — no such concentrations of the fish was discovered at a temperature below 20°C in witner time. Most probably a reduction of its stocks was telling here.

Sardines of bigger sizes could be met with in January and April. In winter sardine's sizes varied from 8 to 13 cm (mean sizes were-9.0 cm in Abukir bay and 9.8 cm in the Damietta region). In spring one could meet fish of the length from 9 up to 12.5 cm in the Damietta region (the mean size being 10.9 cm) and from 9 up to 10.5 cm in Abukir bay (the mean size being 10.1 cm). The size of *S. pilchardus* increases with depth, but the catch of this fish decreases. In Abukir bay the sizes of sardines in summer at the depth of 120 m varied from 9 up to 13 cm, their average length being 11.5 cm and the average weight amounting to 15.3 g (Table 37 & Figs. 80 & 81).

TABLE 36.—SEASONAL CATCH VALUE (gm) OF SARDINA PILCHARDUS IN DIFFERENT REGIONS OF THE INVESTIGATED AREA (1970—1971)

Month	Depth / Region	10-25m	26-50m	51-100m	101-200m
September	Damietta	18	5	—	—
	Borullos	53	8	—	—
	Rosetta	21	—	18	—
	Abukir	—	1·000	10	—
January	Damietta	560	3	—	—
	Borullos	10	3	—	—
	Rosetta	43	38	—	—
	Abukir	458	35	38	—
April-May	Damietta	28	90	34	—
	Borullos	12	6	—	—
	Rosetta	—	26	—	—
	Abukir	25	146	—	—
August-September	Damitta	25	21	—	—
	Borullos	75	—	—	—
	Rosetta	322	18		
	Abukir	71	63	93	—

TABLE 37.—SIZE VARIATION OF SARDINA PILCHARDUS (BODY LENGTH AND WEIGHT) IN THE SOUTH-EASTERN MEDITERRANEAN (1970.1971).

Region	Date	Body Length in cm.														Total number	$\bar{l}$	$\bar{w}$
		6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13			
Damietta	Sep. n.	—	1	6	68	24	1	—	—	—	—	—	—	—	—	100	8.0	5.0
	Sep. w.	—	4.0	4.4	4.7	5.4	7.0	—	—	—	—	—	—	—	—			
	January	—	—	—	—	—	15	78	112	36	20	5	2	1	1	270	9.8	—
	April	—	—	—	—	—	—	1	2	11	16	11	5	1	—	47	10.9	13.8
	April	—	—	—	—	—	—	9.0	11.2	11.7	13	15.2	17.1	20.5	—			
Borullos	April	3	4	4	—	—	1	—	—	—	—	—	—	—	—	12	6.7	—
	August.	—	—	28	162	66	12	—	1	—	—	—	—	—	—	269	8.0	4.6
	Sep.	—	—	3	4.6	5.3	—	—	—	—	—	—	—	—	—			
Abusir	Sep.	—	1	97	271	247	21	1	3	1	—	—	—	—	—	642	7.6	5.5
	Sep.	—	—	4.0	5.1	5.8	6.2	—	—	11.5	—	—	—	—	—			
	January	—	—	—	—	1	2	21	11	6	3	2	2	1	1	100	9.0	8.8
	January	—	—	—	—	7.0	7.3	8.4	9.6	11.3	12.6	15.0	16.5	18.0	20.0			
	April	—	—	—	—	—	—	2	19	13	—	—	—	—	—	34	10.1	9.8
	April	—	—	—	—	—	—	7.7	9.3	10.7	—	1	—	—	—			
	August	—	5	19	21	106	9	6	12	4	1	—	—	—	—	193	8.3	5.4
	Sep.	—	—	4.5	4.7	5.5	6.7	—	—	—	—	—	—	—	—			
	August	—	—	—	—	—	—	1	2	4	—	8	6	4	4	31	11.5	15.3
	Sep.	—	—	—	—	—	—	8.6	9.5	11.0	12.3	14.8	16.6	19.0	21.1			

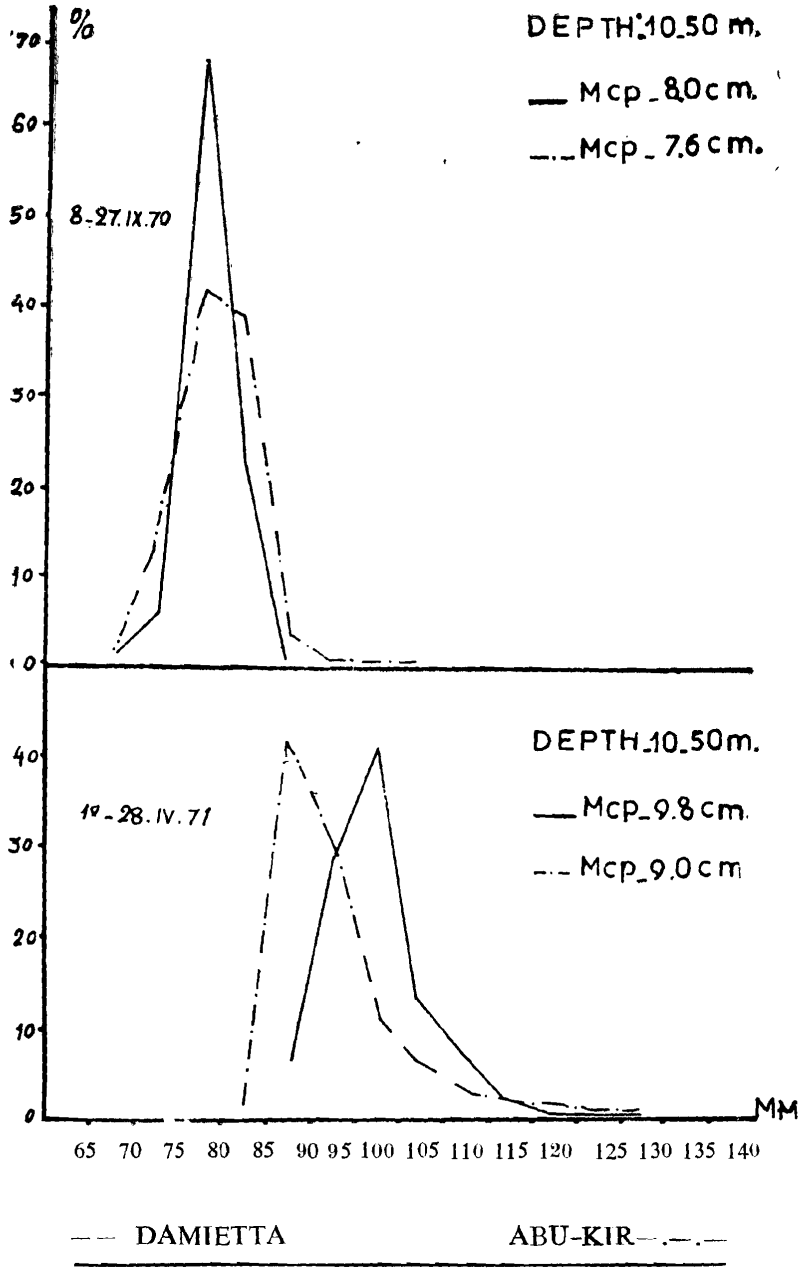

Fig. 80. Size Composition of *S. pilchardus* in the south-eastern Mediterranean during 1970-1971.

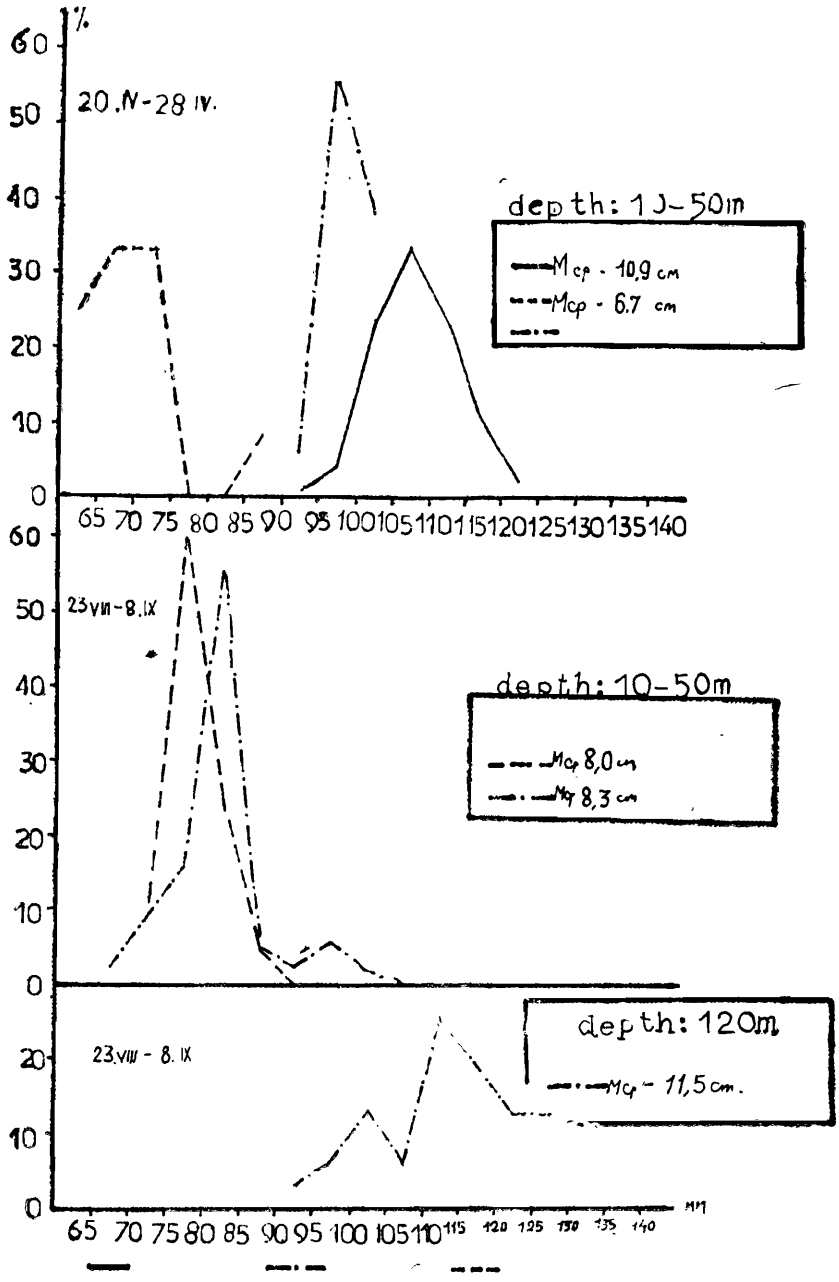

FIG 81. Size composition of *S. Pilchardus* at various depths in Abu-Kir-Damietta region in 1971.

In summer season the ratio between males and females was 1:4. During the other seasons the ratio between males and females was approximately 1:1. Mature fish was found in January with 78.7% of female fish had gonads at stage V, 71.7% of male fish had gonads at stage IV. In the other seasons the majority of sardines of both sexes had the maturity stage II. In summer and in autumn a high percentage of species at small depths were found to be at the juvenile stage (Table 38 & Fig. 82).

Due to the absence of *S. pilchardus* concentrations as well as its small sizes, this specie i of little commercial value in the invetigated area.

One of the most important species of fisheries in Egypt is *Sardinella aurita*. It was known from the litterature (El-Zarka and Koura, 1965) that in September a considerable increase in quantity of sardines in the off-shore Egyptian waters of the Mediterranean is noticed. The catch reaches the maximum target in October, then it somewhat decreases in November and is finished in December (Table 39).

During the period of the present studies the share of *S. aurita* in the bottom trwal catches was very insignificant. In August and September it reached the maximum percentage among the herring fish in all regions, however no concentrations of this fish on a commercial scale were discovered in Abukir-Damietta region. In September 1971, when, studying the Salloum bay schools of *S. aurita* were recorded for the first time.

Beginning from 1958 there was noticed a decrease in the average length of *S. aurita*. In 1958 its average length was 17 cm. while in 1966 the length of the majority of the fish was 10-13 cm. (Pavlovskaya and Budnichenko, 1970).

During the period of our observations the average size of *S. aurita* in the Damietta and Borullos regions were 9.6 cm. and 10.2 cm. respectively. In the Salloum region its average size was 14.7 cm. and the average weight was 25.8 g. (Table 40 & Fig. 83).

TABLE 38. –GONADS MATURITY STAGES OF SARDINA PILCHARDUS (1970 –1971)

Date	Region		juv	♀ II	II-III	III	III, IV	IV	IV.V	V	VI.II	Σ	n	♂ II	II.III	III	III, IV	IV	IV.V	V	VI.II	Σ	n
September	Damietta	%	97 0	100	—	—	—	—	—	—	—	100	2	100	—	—	—	—	—	—	—	100	1
	Abukir	%	45.0	100	—	—	—	—	—	—	—	00	3	00	—	—	—	—	—	—	—	00	27
	Total	No.	14 2	30	—	—	—	—	—	—	—	—	—	28	—	—	—	—	—	—	—	—	—
		%	71.0	10	—	—	—	—	—	—	—	100	9	1.0	—	—	—	—	—	—	—	100	28
January	Abukir	No.	—	—	—	4	—	3	1	37	—	100	47	—	—	3	—	38	—	12	—	1 0	53
		%	—	—	—	2 1	—	17.1	2.1	78.7	—	—	—	—	—	5.7	—	71.7	—	2.6	—	—	—
April	Damietta	%	1.2	97.3	2.7	—	—	—	—	—	—	100	37	12 5	—	5 0	—	2.5	—	—	—	100	8
	Abukir	%	—	—	—	—	—	—	—					—	—	—	3.1	59.4	—	34.4	3.1	100	32
	Total	No.	2	36	1	—	—	—	—	—	2	1003	9	1	—	2	1	24	—	11	1	00	0
		%	—	92.3	2.5	—	—	—	—	—	5.1	—	—	2.6	—	5 0	2.5	60.0	—	27.5	2.5	—	—
August-September	Abukir	No.	50	22	1	—	—	—	—	—	2	100	25	1	2	—	—	—	—	—	—	100	6
		%	61.8	88.0	4.0	—	—	—	—	—	8 0	—	—	36.7	33.3	—	—	—	—	—	—	—	—

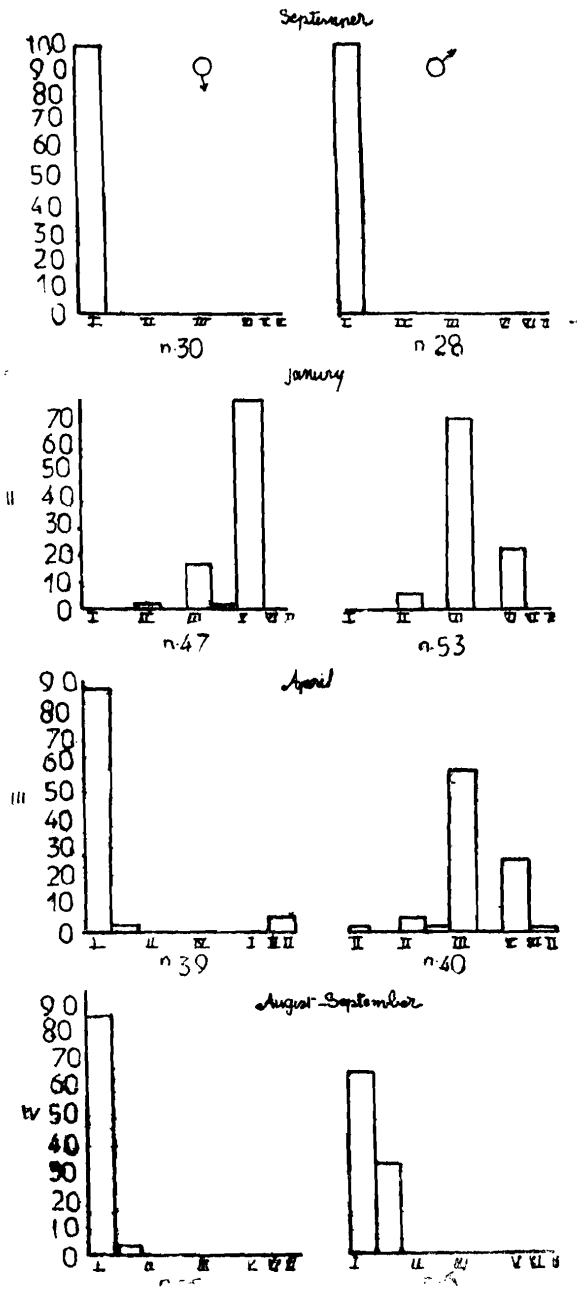

Fig. 82 Percentage frequency of the gonad maturity stages in *S. pilchardus* from the area surveyed during 1970 and 1971.

TABLE 39.—MONTHLY CATCHES OF *Sardinella aurita in the* MEDITERRANEAN SEA ALONG THE COAST OF EGYPT

(AFTER EL-ZARKA & KOURA 1965)

Month	Catch (kg)	%
January	27400	0.15
February	1500	0.01
March	68100	0.37
April	121500	0.67
May	122000	0.67
June	237500	1.31
July	111400	0.63
August	70200	0.39
September	6460000	35.56
October	8098400	44.58
November	2736100	15.06
December	112000	0.62
Total	18166100	100.0

According to the survey of El-Maghraby, (1960), *S. aurita* spawns in summer. Spawning period lasts from the end of May till September with the peak in July and August.

Sexual composition of *S. aurita* was studied in Salloum bay in September, 1971 and correlation of sexes in catches was approximately 1 :1. The bulk of fishes have gonads in VI and IV-V stage of maturity and some individuals-V and VI-II. Due to the presence of sardine which was ready for spawning in September as well as sardine which already finished its spawning, the spawning of sardine takes place in September too (Table 41). In other months the quantity of sardine is very small, therefore its biological analysis was not carried out and there are no data about its biological condition in other months.

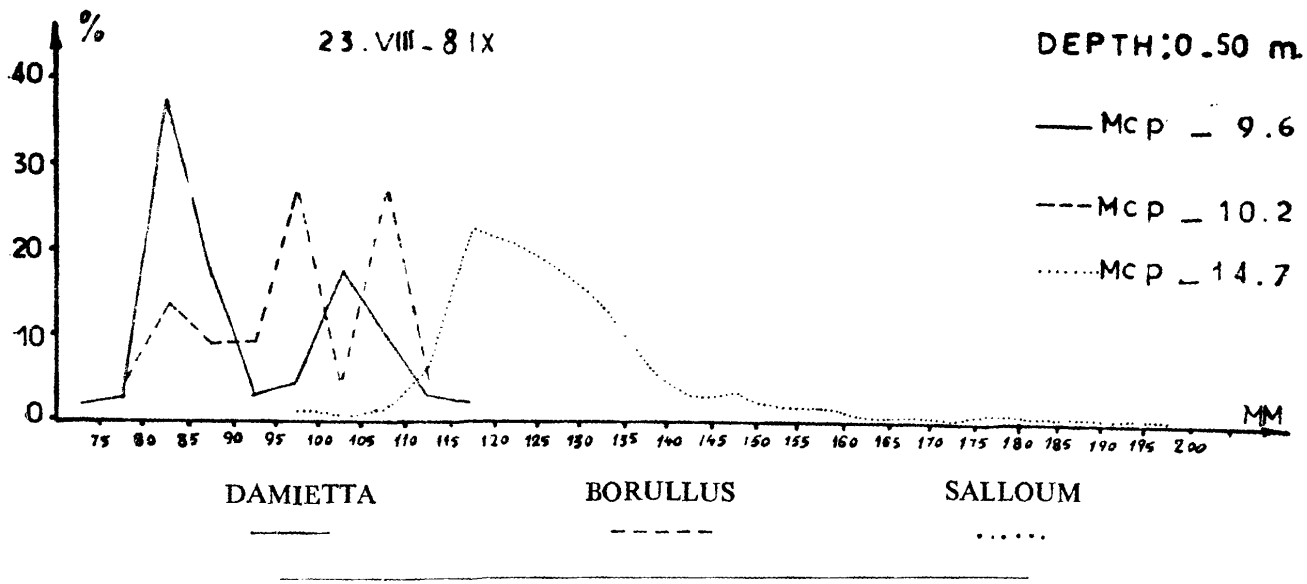

Fig. 83. Size composition of *Sardinella aurita* from the Salloum — Damietta region in August — September, 1971.

TABLE 40.— SIZE VARIATION OF SARDINELLA AURITA (BODY LENGTH AND

Region	Depth (m)		Body length 7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5
Damietta	18—31		2	3	41	18	3	5	19	11	3	2	—	—	—
Borullos	36	No	—	1	3	2	2	6	1	6	1	—	—	—	—
		w.	—	5.0	5.7	7.5	8.0	9.5	10.0	13.4	15.0	—	—	—	—
Salloum	light station	No	—	—	—	—	—	4	2	5	25	85	78	67	51
		w.	—	—	—	—	—	—	—	14.8	16.7	19.1	21.4	24.5	27.2

WEIGHT) IN THE SOUTH-EASTERN MEDITERRANEAN (AUGUST-SEPTEMBER 1971).

in cm.

14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20	20.5	n	$\bar{l}$	$\bar{w}$
—	—	—	—	—	—	—	—	—	—	—	—	—	—	107	9.6	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	22	10.2	9.9
—	—	—	—	—	—	—	—	—	—	—	—	—	—			
25	11	12	6	4	1	1	—	2	1	2	—	1	—	383	14.7	25.8
31.3	36.2	38.3	43.1	47.5	55.0	60.0	—	67.5	70.0	77.5	—	105,	—			

Table 41.— GONADS MATURITY STAGE OF SARDINELLA AURITA IN SALLOUM BAY
(*August-September* 1971)

Region	sex	Stages of maturity	II	II–III	III	III–IV	IV	IV–V	V	VI–II	n
Salloum	♀♀	No	1	—	—	5	13	15	4	3	41
		%	2 .4	—	—	12.2	31.6	36.7	9.8	7.3	100
	♂♂	No	1	1	3	3	39	12	—	—	59
		%	1.7	1.7	5.1	5.1	66.0	20.4	—	—	100

Family Engraulidae :

During the year anchovy (*Engraulis encrasicholus*) was caught in small quantities. The highest catches (in average 0.2 kg) were obtained in Abukir bay in spring. During the rest of seasons the catches did not exceed 0.1 kg in average. Anchovy was caught mainly at the depths up to 50 m. The sizes ranged from 4 to 9.5 cm. In September, 1970 in Abukir bay at the depth of 85-100 m anchovy was represented by individuals with the length from 5 to 10 cm (average 7.0 cm). In August the appearance of anchovy fingerlings in rather big quantities with the length of 5-8 cm (average length 8.1 cm) and weight 1.8 gm was observed (Table 42 & Fig. 84).

According to the data of the "Ichthyolog" expedition in 1966 the mass spawning of anchovy takes place in May-June. Due to the small number of anchovy in recent years and its small sizes this type of fish cannot be of commercial importance for Egypt.

Family Mullidae :

This family is represented by five species. *Mullus barbatus* is one of the main commercial types in the Egyptian shelf although its quantity has somewhat reduced in comparison with 1966. It was met in the catches of bottom trawl up to 200 m depth. The highest catches of *Mullidae* were obtained in summer and autumn similar to the situation in 1966.

In September 1970 the average catch at the depth of 10-50 m amounted to 1.4 kg per trawling hour, in August and September of 1971 - 1.6 kg at the same season of 1966 - 2.2 kg per trawling hour (Table 43 & Fig. 85). The maximum catch in Rosetta region in September was 10.4 kg per trawling hour. In winter period catches of *Mullidae* were reduced in average to 0.7 kg. At that time in Rosetta region some increase in catches was noticed at the depth of more than 50 m. In spring the catches at small depths reduced to a minimum average of 0.1 kg. In Abukir bay the average catch was less than 0.1 kg, but at depths of more than 50 m it was 1.2 kg. Apparently, in winter - spring period, *Mullidae* migrate to bigger depths for winter stay.

The sizes of *Mullidae,* caught at the depth of 10-50 m in winter ranged from 7 to 15.5 cm. Its average size: in Damietta region - 8.5 cm (average weight 9.6 gm), Borullos region - 11.0 cm (average weight 19.4 gm), Abukir bay - 9.8 cm. In spring time the sizes of *Mullidae* ranged from 8.5 cm to 14.5 cm with an average length of 11.2. cm and average weight of 21.8 cm. at 70 m. depth it was represented by individuals with the length of 10-18 cm (average length - 15.4 cm and average weight 58.1 gm).

Table 42.—SIZE VARIATION OF BODY LENGTH AND WEIGHT OF ENGRAULIS ENCRASICHOLUS IN SOUTH-EAST PART OF THE MEDITERRANIAN (1970-1971)

Region	Time	Fish body length (cm)															n	$\bar{l}$	$\bar{w}$
		4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5			
Borullos	April	—	—	1	2	3	6	19	7	4	1	—	—	—	—	—	43	7.2	—
	August-September	—	—	1	15	48	57	28	5	1	—	—	—	—	—	—	155	6.5	—
	September	1	19	63	51	16	5	—	1	—	—	—	—	—	—	—	156	5.3	—
Abukir	September	—	—	1	38	87	78	30	24	17	12	7	2	—	—	—	296	7.0	—
	January	—	4	4	8	32	81	51	6	2	1	—	—	—	—	—	189	6.7	—
	April	—	—	—	2	—	4	13	22	28	14	1	—	—	—	1	85	7.7	—
	August	—	—	16	72	101	24	10	2	—	—	—	—	—	—	—	—	—	—
	September	—	—	1.4	1.6	1.8	2.1	2.8	4	—	—	—	—	—	—	—	225	6.1	1.8

n = total number
l = average length
w = average weight

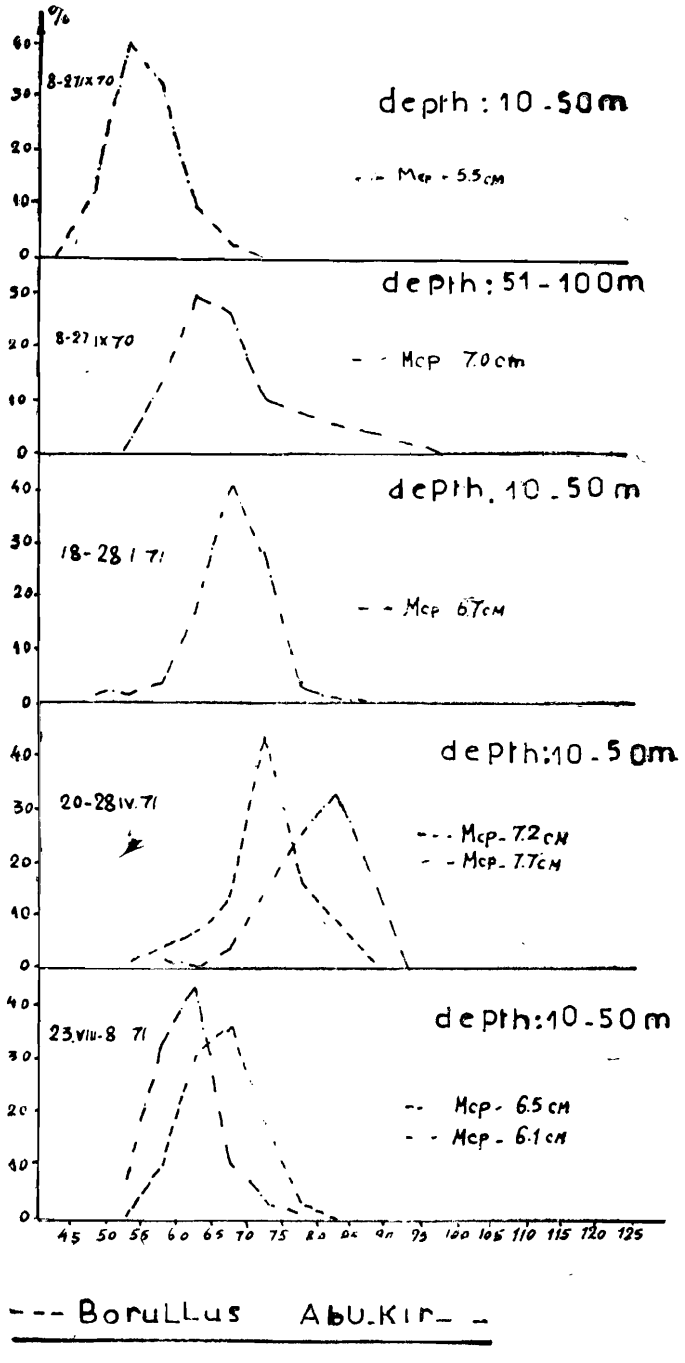

FIG. 84. Size Composition of *Engraulis encrasicholus* from the different depths in the region of AbuKir—Borullos during 1970—1971.

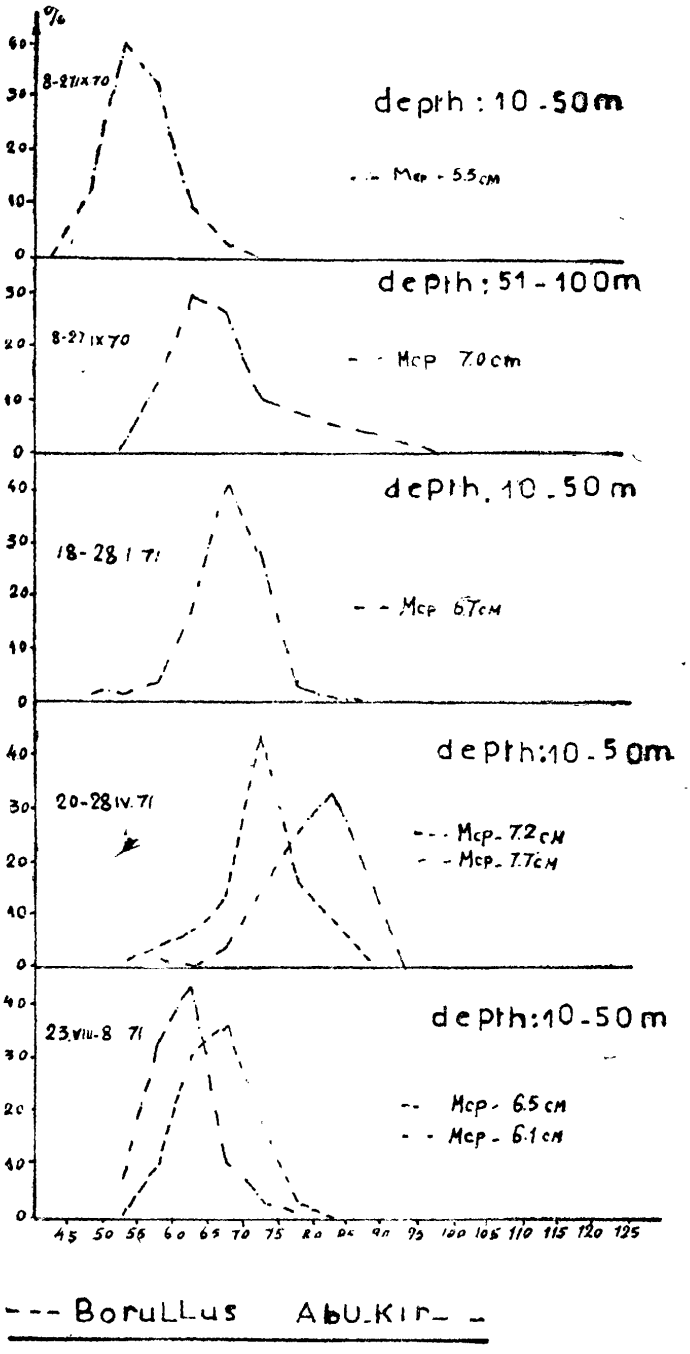

FIG. 84. Size Composition of *Engraulis encrasicholus* from the different depths in the region of AbuKir—Borullos during 1970—1971.

Table 43.—Seasonal catch of *M. barbatus* (gm) in different Regions of Investigated area

Month	Region	Depth			
		10–25 m	26–50 m	15–100 m	101–200 m
September	Damietta	603	490		
	Borullos	532	620		
	Rosetta	433	258	10.368	
	Abukir	392	435	20	
January	Damietta	606	249	250	
	Borullos	845	799		
	Rosetta	198	437	750	
	Abukir	338		28	
April-May	Damietta	64	153	39	
	Borullos	17	197		
	Rosetta	9	27	90	
	Abukir				
August September	Damietta	802	746	0	
	Borullos	1.418	2.044		
	Rosetta	1.449	1.613		
	Abukir	170	870		292

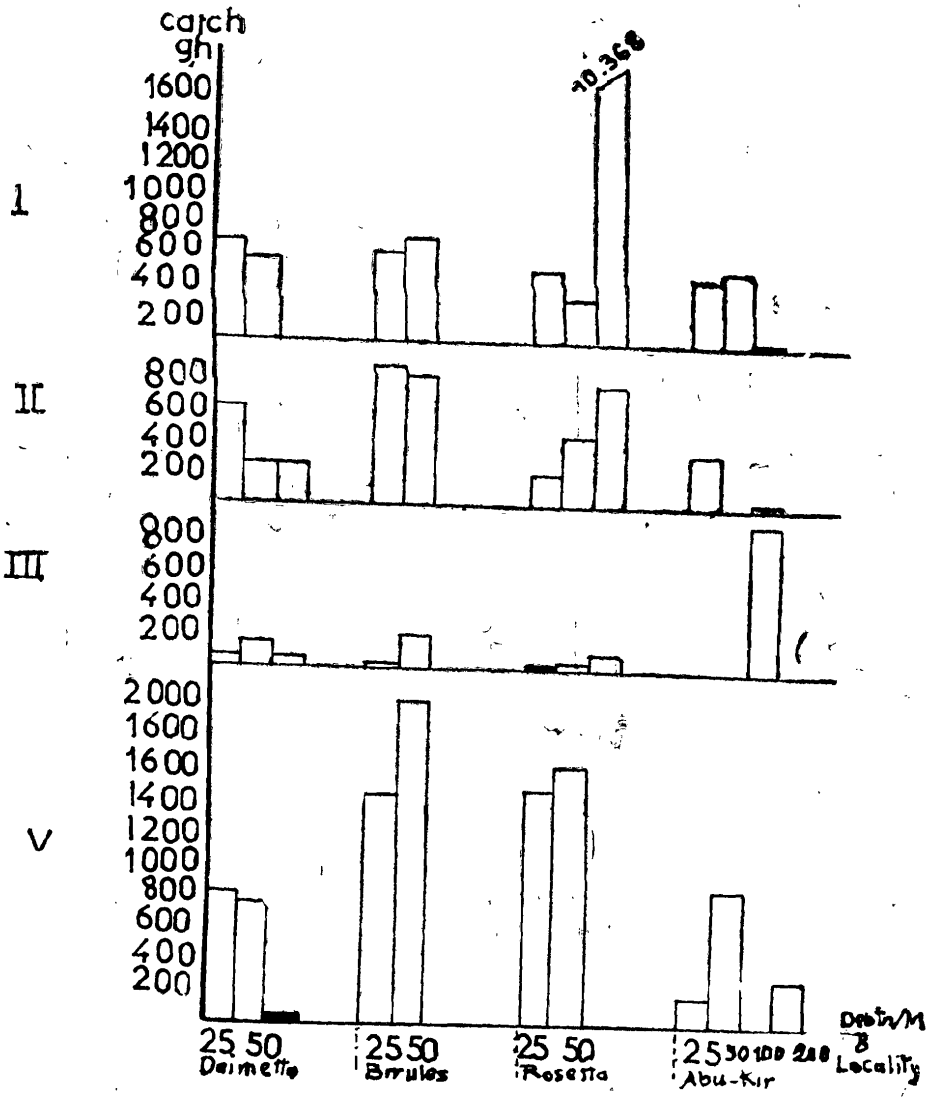

FIG. 85. Histograms showing the catches of *M. barbatus* (gm) in the different depths in the region of AbuKir-Damietta during 1970–1971.

TABLE 44.—SIZE VARIATION OF MULLUS BARABATUS (BODY LENGTH

Region	Date	Body length							
		5	5.5	6	6.5	7	7.5	8	8.5
Damietta	September					2	8	16	15
		—	—	—	—	6.5	6.5	8.2	9.4
	January	—	—	—	—	—	10	53	98
							6.0	6.8	7.8
	April	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—
	August —	2	11	27	72	140	219	262	169
	September	1.5	2.3	2.7	3.6	4.8	5.8	7.1	8.6
Boraullos	September	2	11	27	50	62	35	32	24
		—	3.0	3.4	5.1	5.4	6.6	8.0	9.7
	January	—	—	—	—	—	—	4	7
		—	—	—	—	—	—	—	8.3
	April	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—
	August —	1	6	17	35	79	89	139	123
	September	—	3.2	3.8	4.6	5.5	6.7	8.0	7.8
Rosetta	September	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—
	April	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—
	August —	2	2	10	31	70	97	151	143
	September	1.7	3.0	3.5	3.9	5.0	6.2	7.6	8.8
Abukir	September	—	—	1	2	2	6	10	13
		—	—	—	—	—	—	—	—
	January	—	—	—	—	—	—	2	1
		—	—	—	—	—	—	—	—
	April	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—
	August —	2	—	5	7	46	31	124	74
	September	2.7	—	4.0	4.4	5.7	6.8	8.0	10.0
	August —	—	—	—	—	—	—	—	—
	September	—	—	—	—	—	—	—	—

AND WEIGHT) IN THE SOUTH-EASTERN MEDITERRANEAN (1970–1971)

in cm.

9	9.0	10	10.5	11	11.5	12	12.5
36	10	7	7	3	1	—	—
11.0	13.4	16.3	17.0	19.8	25	—	—
97	42	22	17	12	12	4	3
8.9	11.1	13.8	16.1	19.2	20.1	20.3	20.0
2	3	1	6	2	1	4	4
11.5	13.0	17.0	17.5	19.5	22.0	21.5	33.7
137	108	79	36	20	6	4	4
10.3	11.8	13.9	17.1	19.2	22.1	30.7	30.0
6	5	1	—	—	—	—	—
12.5	13.7	—	—	—	—	—	—
17	14	23	36	35	20	35	17
10.0	11.5	14.6	17.3	19.5	26.0	26.2	25.0
—	6	6	4	12	10	7	5
—	11.1	14.0	17.2	19.0	21.8	26.6	31.0
114	83	93	61	55	27	20	2
11.6	14.1	16.1	18.9	23.3	25.7	29.2	32.0
—	—	—	—	3	4	7	8
—	—	—	—	—	—	26.9	36.0
1	—	1	4	1	—	1	1
12.0		16.0	15.8	25.0	—	25.0	25.0
116	5	45	27	19	5	3	2
11.1	13.2	16.4	18.8	21.9	27.2	29.3	34.0
13		3	—	—	1	1	—
—	—	—	—	—	—	—	—
7	14	20	15	15	5	1	—
—	—	—	—	—	—	—	—
—	—	—	1	—	—	4	—
—	—	—	15.0	—	—	26.8	—
105	49	51	24	20	11	1	1
11.0	13.2	15.3	18.4	20.4	23.5	32.0	27.0
—	—	—	1	1	—	9	7
—	—	—	18.0	19.5	—	26.4	30.1

TABLE 44

Region	Date	Body length							
		13	13.5	14	14.5	15	15.5	16	16.5
Damietta	September	—	—	—	—	—	—	—	—
		1	—	—	—	—	—	—	—
	January	23.0	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—
	April	—	—	—	1	—	—	—	—
		—	—	—	55.0	—	—	—	—
	August–September	—	—	—	—	—	—	—	—
Borullos	September								
	January	20	8	8	9	7	2	—	—
		25.8	42.5	40.0	—	—	—	—	—
	April	2	1	4	1	—	—	—	—
		36.0	42.0	45.0	47.0	—	—	—	—
	August–September	2	—	—	—	—	—	—	—
		37.0	—	—	—	—	—	—	—
Aosetta	September	41	15	43	23	28	12	20	8
		38.0	43.6	49.8	55.0	55.0	65.7	70.9	84.0
	April	—	1	1	—	—	—	—	—
		—	37.0	45.0	—	—	—	—	—
	August–September	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—
Abukir	September								
	January								
	April	—	—	—	—	—	—	—	—
		1	1	—	—	—	—	1	1
	August–September	31.0	31.0	—	—	—	—	66.0	76.0
		1	—	—	—	—	—	—	—
		32.0	—	—	—	—	—	—	—
		1	1	—	—	—	—	—	1
		30.0	30.5	—	—	—	—	—	70

(Conted.)

in cm.								n	$\bar{l}$	$\bar{w}$
17	17.5	18	18.5	19	19.5	20	22			
—	—	—	—	—	—	—	—	100	8.5	11.0
—	—	—	—	—	—	—	—	336	8.5	9.6
—	—	—	—	—	—	—	—			
—	—	—	—	—	—	—	—	23	11.1	20.1
—	—	—	—	—	—	—	—	1297	7.8	8.5
—	—	—	—	—	—	—	—			
—	—	—	—	—	—	—	—	250	6.6	6.3
—	—	—	—	—	—	—	—	262	11.0	19.4
—	—	—	—	—	—	—	—			
—	—	—	—	—	—	—	—	58	11.2	23.2
—	—	—	—	—	—	—	—			
—	—	—	—	—	—	—	—	946	8.4	11.1
—	—	—	—	—	—	—	—			
9	1	—	—	1	—	—	—	223	14.3	54.3
—	—	—	—	—	—	—	—	11	11.3	22.0
—	—	—	—	—	—	—	—			
—	—	—	—	—	—	—	—	774	8.1	9.6
—	—	—	—	—	—	—	—	56	8.3	—
—	—	—	—	—	—	—	—	99	9.8	—
2	2	3	—	—	—	—	—	16	15.4	58.1
73.5	92.0	90.6	—	—	—	—	—			
—	—	—	—	—	—	—	—	552	8.6	10.9
—	—	—	—	—	—	—	—			
—	—	—	—	—	—	—	1	22	12.4	35.2
—	—	—	—	—	—	—	156.2			

In August and September the sizes of *Mullidae* were also different at various depths. At the depths from 10 to 50 m the sizes ranged from 4 to 14.5 cm. The average length in Damietta was 7.8 cm (in summer) and 8.5 cm (in autumn); in Borullos - 8.4 (in summer) and 6.6 cm (in autumn); in Rosetta - 8.1 cm, in Abukir bay - 8.6 cm (in summer) and 8.3 cm (in autumn). Decrease in the average length in comparison with winter - spring period was due to the appearance of young fish in the catches.

At the depths from 50 to 100 m the size of *Mullidae* ranged from 10.5 to 19 cm (average length - 14.3 cm, average weight - 54.3 gm), and at the depth of 120 m (Abukir bay) - from 10 to 22 cm (average length - 12.4 cm, average weight - 35.2 gm) (Table 44 & Fig. 86).

According to the data given by the Institute of Oceanography and Fisheries, Alexandria, young individuals of *Mullidae* prevailed in the catches during autumn-winter period. In september, 1970 half of the fish caught was represented by fingerlings and the rest of the fish by the generation of 1969, 1968, 1967. In winter, 92.5 % of *Mullidae* were fingerlings and the rest of them were one year old (Table 45). This is a clear evidence of a good generation of *Mullidae* in 1970. This is also proved by increased catches of *Mullidae* in august and september of 1971.

As it can be seen from Table 46, & Fig. 87, the spawning of *Mullidae* begins in April and stops in July. Correlation of male and female individuals during spawning period was approximately 1:3. In August from the total quantity of analyzed fishes, 45.8 % were young fishes. Female fishes constituted the bulk of the catches of *Mullidae* during the period after spawning. In some areas they constituted 100 %. Male fishes stayed at larger depths and constituted 80 % at the depth of 120 m. On this basis, it is possible to suppose that after spawning male and female fishes stay at different depths.

Thus the presence of a great quantity of fingerlings in 1971 is a clear evidence of favourable conditions for young fish and a possibility for some increase in the population of *Mullidae* in the next years.

In our opinion in order to preserve the quantity of *Mullidae* it is better to catch it in summer and autumn at larger depth. This will help to preserve young fish which usually distributes at shallow areas.

Family Synodontidae :

The most widely distributed species of the family is *S. undosquamis*. At present this fish takes an important place of the total catch. It can be met with at the depth of 100 m. If you analyse the dynamics of the catches, it is possible to trace changes in the correlation between the catches obtained at different depths and in different seasons (Table 47 & Fig. 88.). In autumn and specially winter *S. undosquamis* gathers mainly in shoals at depths up to 50 m. In January the average catch per trawling hour at these depths was 1.2 kg, while at bigger depths it totaled only 0.2 kg. In spring when it becomes warmer the fish migrates to larger depths and in August the average catch per trawling hour at depths of 50 - 100 m was 1.7 kg. At smaller depths the average catch was 0.5 kg per trawling hour.

Fish of the biggest size was caught in August and September and it was represented by individuals with the length of 13 - 30 cm (Table 48) In winter-spring period the size was a little bit smaller but it was mainly due to the appearance of young *Saurida* fish with an average length of 16.9 cm, which was caught in Abukir bay at the depth of 70 m. (Table 49 & Fig. 89).

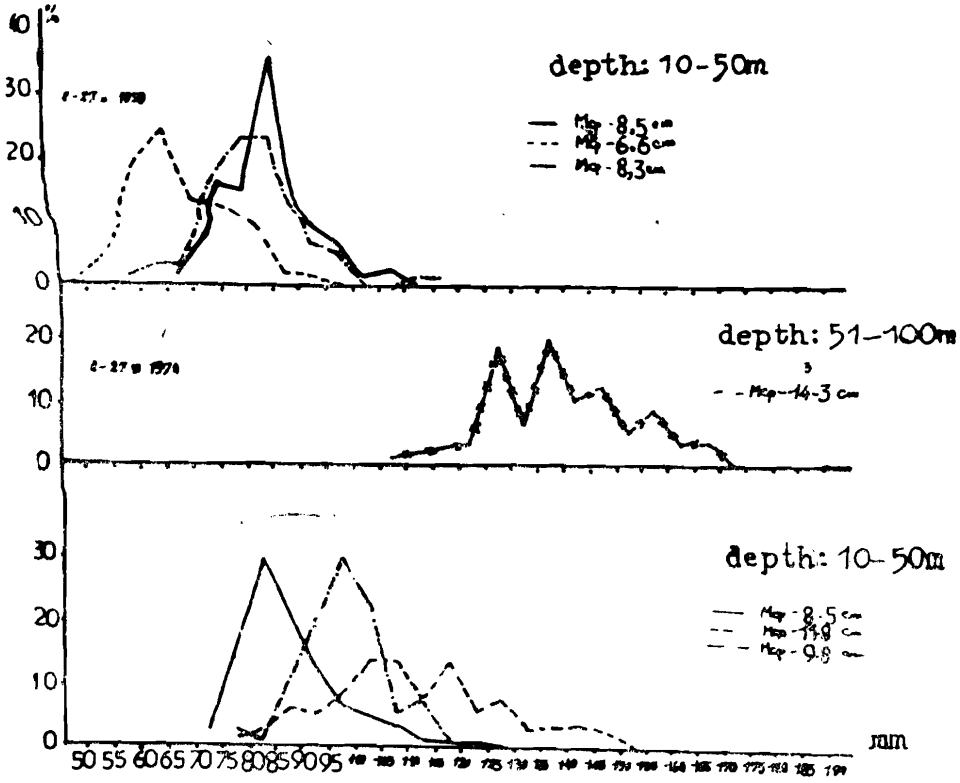

Fig. 86. size composition of *M. barbatus* from the different depths in the region of AbuKir-Damietta in 1970-71.

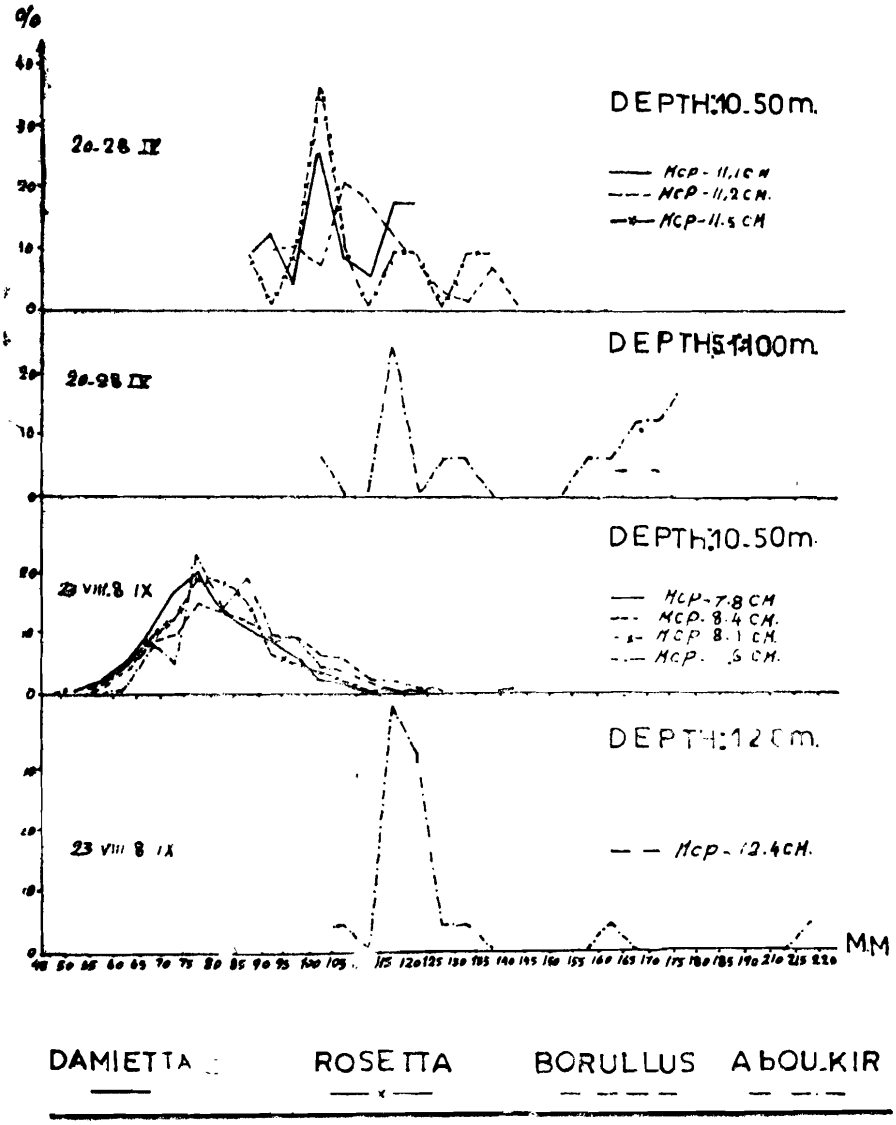

Fig. 36. (Continued).

Table 45.—Age composition of some species of fish in the South-Eastern Mediterranian (1970-1971)

Species	Date of sampling		Age of Fish						n	Σ
			0	I	II	III	IV	V		
Saurida	January	No	1	8	24	17	11	3	64	100
undosquamis	1971	%	1.6	12.5	37.4	26.6	17.2	4.7	—	
	September	No	85	31	42	14	—	—	172	100
Mullus	1970	%	49.5	18.0	24.4	8.1	—	—	—	—
barbatus	January	No	61	5	—	—	—	—	66	100
	1971	%	92.5	7.5	—	—	—	—	—	—
Temnodon	January	No	27	—	—	—	—	—	27	100
saltator	1971	%	100	—	—	—	—	—	—	—

TABLE 46.—GONADS MATURITY STAGES OF MULLUS BARBATUS (1970 - 1971)

Date	Region	Juv	♀ II	II-III	III	III-IV	IV	IV-V	V	VI-II
September	Damietta %	—	100	—	—	—	—	—	—	—
	Roestta %	—	69.8	25.6	4.6	—	—	—	—	—
	Total No.	—	79	11	1	—	—	—	—	—
	%	—	35.0	12.0	3.0	—	—	—	—	—
January	Damietta No.	5	26	16	7	—	—	—	—	—
	%	6.7	53.1	32.6	14.3	—	—	—	—	—
April	Damietta %	—	—	—	15.0	20.0	5.0	5.0	55.0	—
	Borullos %	—	—	—	—	2	9	2	82.9	
	Rosetta %	—	—	—	—	—	—	—	100	—
	Abukir %	—	—	—	—	—	8.4	—	91.	—
	Total No.	—	—	—	3	5	4	2	64	3
	%	—	—	—	3.	6.2	4.9	2.5	9.0	3.
August-September	Damietta %	25.8	39.4	1,9	—	—	—	—	—	58.
	Barul'os %	44.8	74.0	—	—	—	—	—	—	26.0
	Rosetta %	40.8	100	—	—	—	—	—	—	—
	Abukir %	31.2	95.5	—	—	—	—	—	—	4.5
	Total No.	203	222	2	—	—	—	—	—	100
	%	45.8	68.5	0.7	—	—	—	—	—	30.8

(August-September, April, January, September)

		♂									
ϵ	n	II	II-III	III	III-IV	IV	IV-V	V	VI-II	ϵ	n
100	49	100	—	—	—	—	—	—	—	100	51
100	43	54.3	12.3	33.4	—	—	—	—	—	100	57
100	92	82	7	19	—	—	—	—	—	100	108
		76.0	6.4	17.5	—	—	—	—	—		
100	49	11	3	7	—	—	—	—	—	100	21
		52.4	14.3	33.3	—	—	—	—	—		
100	20	—	—	—	—	—	—	100	—	100	3
100	41	—	—	—	—	5.0	20.0	75.0	—	100	20
100	8	—	—	—	—	—	—	3	—	100	3
100	12	—	—	—	—	52.0	—	75.0	—	100	4
100	81	—	—	—	—	2	4	24	—	100	30
		—	—	—	—	6.7	13.3	80.0	—		
100	104	23.4	—	—	—	—	—	—	76.6	100	17
100	138	—	—	—	—	—	—	—	—	—	—
100	16	—	—	—	—	—	—	—	—	—	—
100	66	5.5	—	—	—	—	—	—	94.5	100	18
100	324	5	—	—	—	—	—	—	30	100	35
		14.3	—	—	—	—	—	—	85.7		

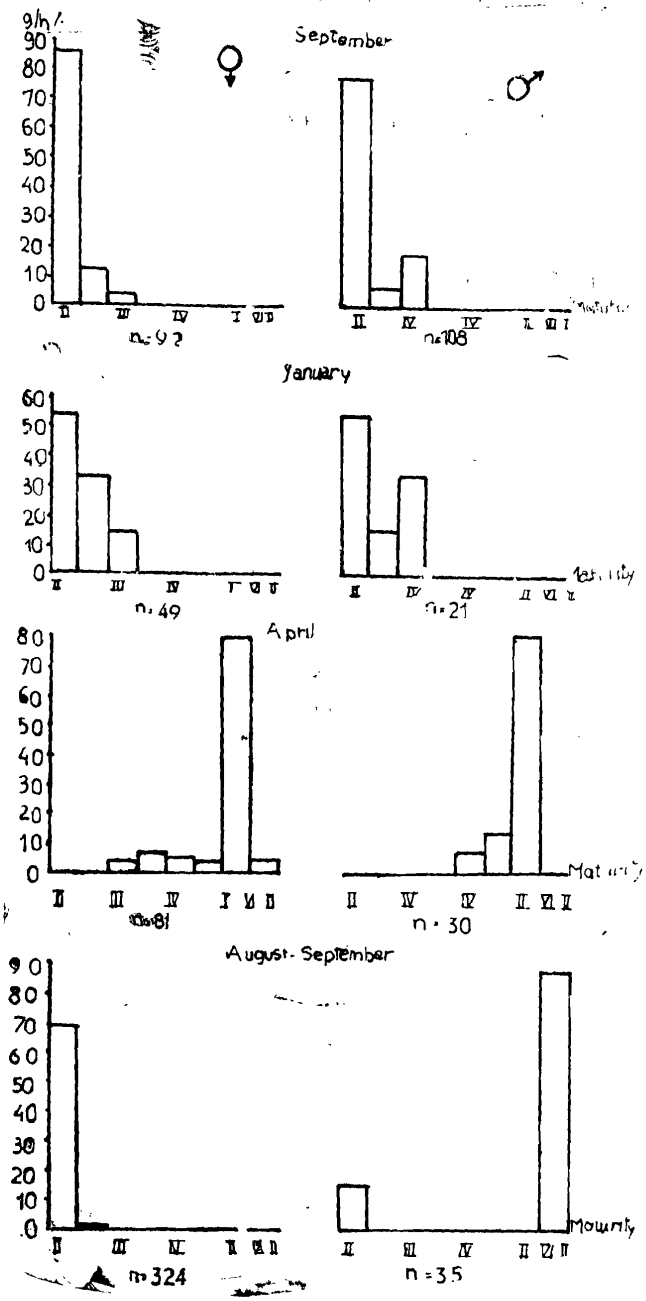

Fig. 87. Percentage distribution of the gonad maturity stages of *M. barbatus* from the area surveyed in 1970–1971.

TABLE 47.—SEASONAL CATCH (gm.) OF *S. undosquamis* IN DIFFERENT REGIONS OF THE INVESTIGATED AREA 1970-1971.

Month	Region	Depth			
		10-25 m	26-50 m	51-100 m	101-200 m
September	Damietta		155		
	Borullos	438	2.540		
	Rosetta	1.040	4.020		
	Abukir	32	985	285	
January	Damietta	1.051	2.080		
	Borullos	995	2.492		
	Rosetta	358	1.010	425	
	Abukir	108	535	175	
April-May	Damietta	60	450	340	
	Borullos	141	582		
	Rosetta	150	640	300	
	Abukir		68	840	
August-September	Damietta	52	1.405	450	
	Borullos	222	583		
	Rosetta	37	680	800	
	Abukir	32	716	181	

TABLE 48.—AVERAGE LENGTH OF S. UNDOSQUAMIS IN DIFFERENT REGIONS AND SEASONS

Regions	Septebmer 970	January	April	August-September
Damiette	—	15.8	14.4	18.5
Borullos	19.2	16.3	15.4	19.9
Rosetta	18.2	17.4	15.7	20.1
Abukir	17.1	—	16.9	16.4

TABLE 49.– SIZE VARIATION OF SAURIDA UNDOSQUAMIS (BODY LENGTH

	Date	Body length										
		9	10	11	12	13	14	15	16	17	18	19
DAMIETTA	January . .	—	—	—	2	6	34	59	74	62	34	23
		—	—	—	—	—	22.0	25.4	28.2	34.9	41.1	49.1
	April	1	2	6	7	7	6	14	18	7	2	5
		—	—	—	10.0	18.0	19.5	20.0	31.7	22.0	47.0	52.7
	August —. .	—	—	—	—	—	—	1	9	17	18	9
	September .	—	—	—	—	—	—	—	40.2	47.1	50.7	65.0
BORULLOS	September .	—	—	—	—	—	—	—	1	13	22	21
		—	—	—	—	—	—	—	—	52.8	47.6	58.0
	January . .	—	—	1	3	12	21	24	30	24	31	16
		—	—	8.0	14.3	17.7	21.1	26.4	31.2	37.6	46.1	54.5
	April	—	—	3	1	6	17	32	22	15	10	9
		—	—	8.5	—	14.0	20.4	25.7	30.3	37.0	41.0	53.5
	August —. .	—	—	—	—	—	—	—	1	—	1	2
	September .	—	—	—	—	—	—	—	—	—	—	—
ROSETTA	September .	—	—	—	—	—	—	1	9	55	43	20
		—	—	—	—	—	—	—	36.4	42.2	49.2	59.2
	January . .	—	—	—	—	4	2	1	4	4	2	2
		—	—	—	—	—	—	—	—	—	—	—
	April	—	—	1	1	2	6	13	16	9	7	4
		—	—	10.0	12.0	17.0	21.0	26.6	32.8	39.6	52.0	59.0
	August —. .	—	—	—	—	—	—	—	—	3	9	6
	September .	—	—	—	—	—	—	—	—	—	—	—
ABUKIR	August —. .	—	—	—	—	—	—	—	—	1	3	—
	September .	—	—	—	—	—	—	—	—	34.0	45.0	—
	September .	—	—	—	—	—	1	5	6	8	7	1
		—	—	—	—	—	—	—	—	—	—	
	April . . .	—	—	—	—	—	—	6	2	2	3	3
		—	—	—	—	—	—	10.1	30.0	40.5	50.7	53.3
	August— . .	—	—	—	—	—	—	6	11	10	1	4
	September .	—	—	—	—	—	—	32.0	36.7	41.8	54.0	65.0
	August— . .	—	—	—	—	—	—	—	3	4	5	6
	September .	—	—	—	—	—	—	—	33.0	41.0	50.4	57.8

AND WEIGHT) IN THE SOUTH-EASTERN EDITERRANEAN (1970–1971)

in cm.											n	$\bar{l}$	$\bar{w}$
20	21	22	23	24	25	26	27	28	29	30			
5	3	—	—	1	—	—	—	—	—	—	304	15.2	5.97
—	150.0	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	1	—	—	1	—	—	76	14.4	31.6
—	—	—	—	—	—	—	—	—	—	—	—	—	—
9	9	4	2	2	2	—	1	—	—	—	82	18.5	63.1
76.4	81.0	89,7	—	114.0	137.0	—	215.0	—	—	—	—	—	—
19	10	10	6	—	—	—	1	—	—	1	104	19.2	72.0
12	2	2	3	4	1	—	—	—	—	—	199	16.3	39.6
62.0	79.5	83.0	82.7	113.7	124.0	—	—	—	—	—	—	—	—
3	—	2	—	—	1	—	—	—	—	—	120	15.1	32.1
7570	—	82.0	—	—	124.0	—	—	—	—	—	—	—	—
3	6	2	1	—	—	—	—	—	—	—	16	19.9	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
16	26	11	5	1	—	—	—	—	—	—	197	18.2	58.1
68.8	79,6	87.8	104.0	—	—	—	—	—	—	—	—	—	—
2	1	3	1	1	1	—	—	—	—	—	29	17.4	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
1	1	1	—	1	—	—	—	—	—	—	63	15.7	34.2
—	—	—	—	123.0	—	—	—	—	—	—	—	—	—
1	7	4	5	2	2	—	1	—	—	—	40	10.2	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
1	-	3	4	3	—	—	—	—	—	—	15	20.9	76.1
51.0	—	84.3	87.5	106.3	—	—	—	—	—	—	—	—	—
5	—	2	—	1	—	—	—	—	—	—	36	17.7	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	2	—	—	—	—	—	—	—	28	16.9	44.9
—	—	—	97.5	—	—	—	—	—	—	—	—	—	—
2	3	—	—	—	—	—	—	—	—	—	37	16.4	46.5
715	83_7	—	—	—	—	—	—	—	—	—	—	—	—
9	13	7	—	1	2	—	—	—	—	—	50	19.4	70.5

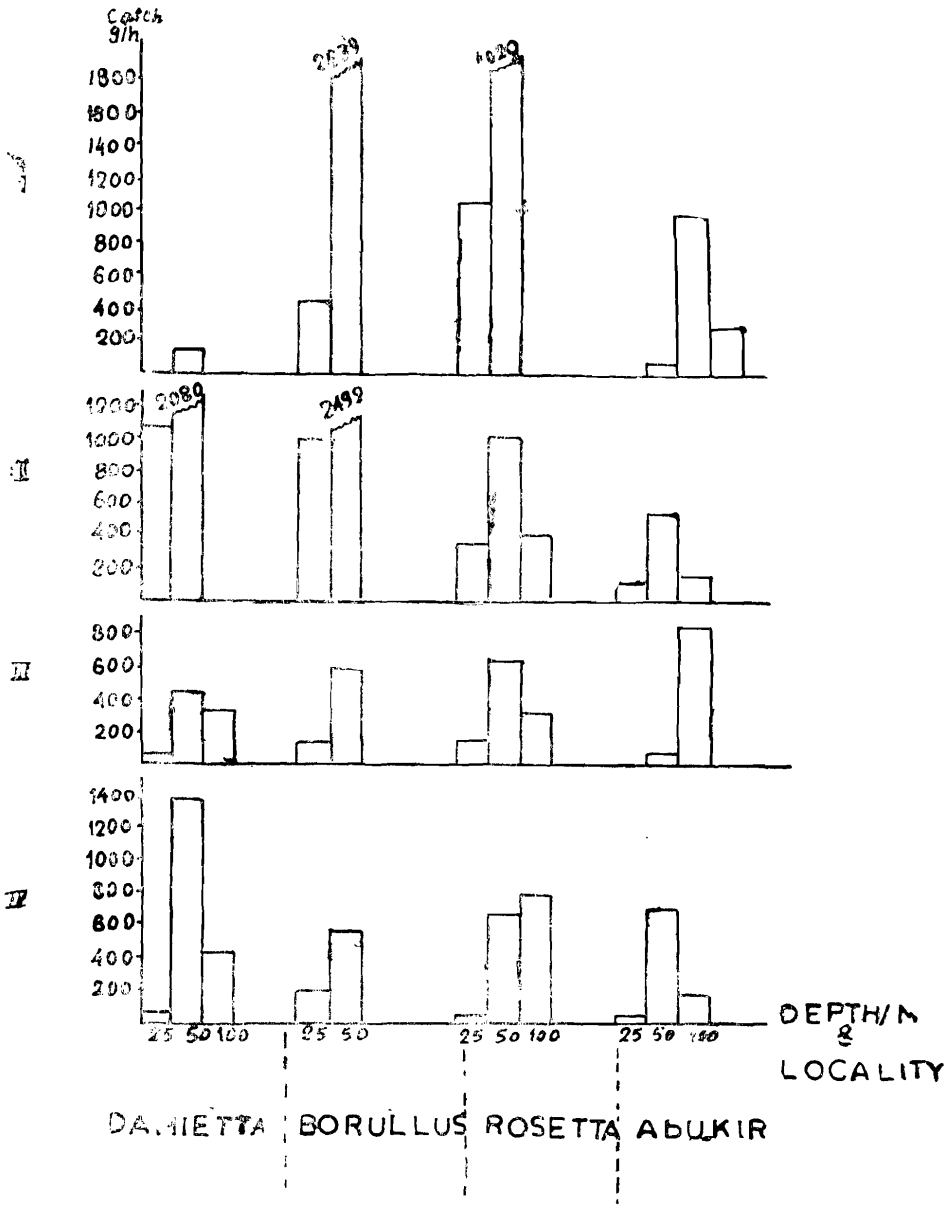

FIG 88. The Catches of *S. undosquamis* (gm) from the different depths in the region of Abukir-Damietta in 1970–1971.

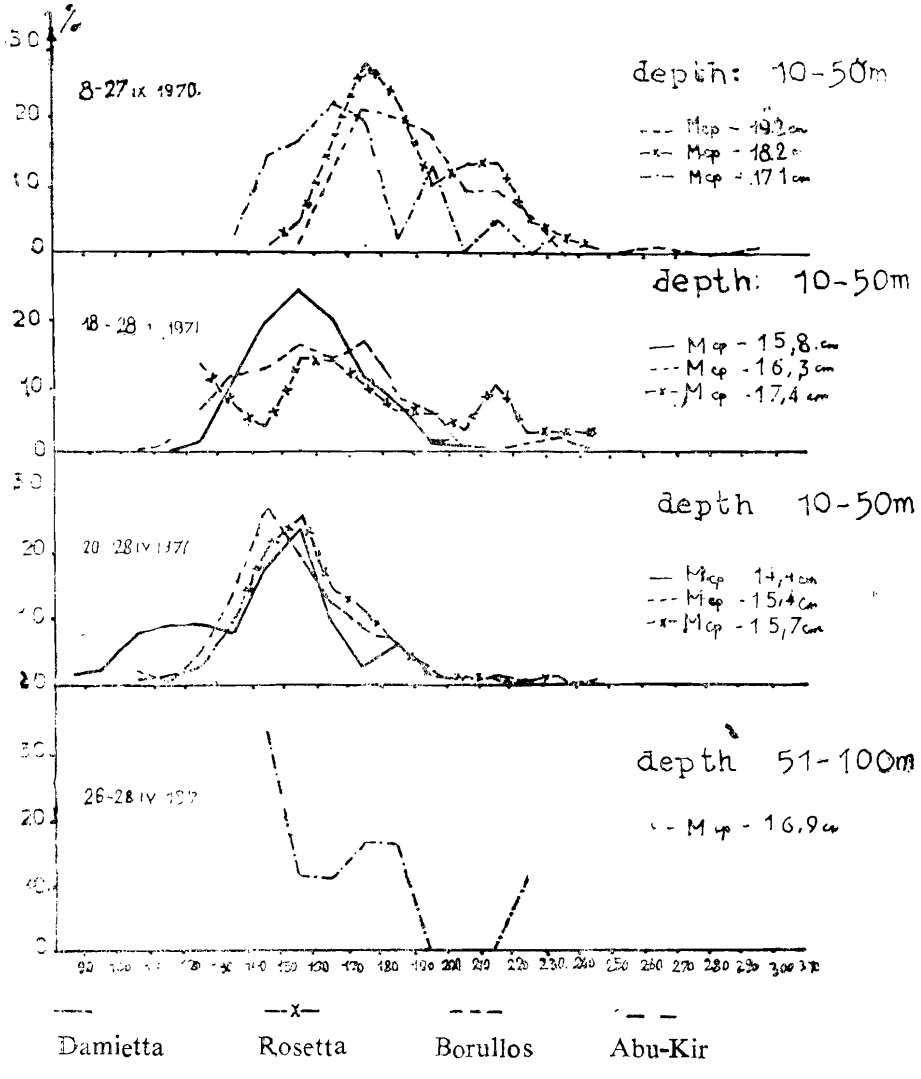

FIG. 89. Size Compositon of *S. undosguamis* from the region of Abnkir-Damietta in 1970–1971.

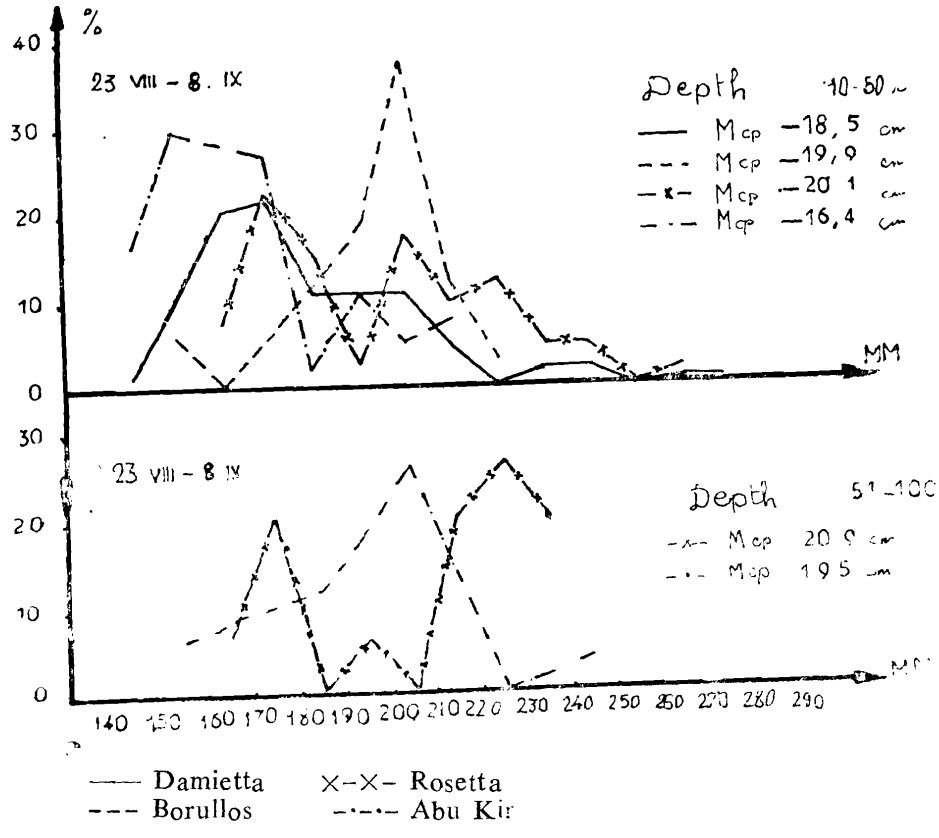

Fig. 89, (Continued)

According to the data of the Institute of Oceanography and Fisheries, Alexandria, in January 1971, a shoal of fish was composed of six generations (1965-1970). Two, three and four year old fishes were predominant, *i.e.* fishes born in 1968, 1967 and 1966. The 1970 generation was represented by single fishes (Table 49). According to the survey of Chernomor Azov-Scientific Institute of Oceanography (Budnichenko, 1970) saurida's spawning is portional and probably takes place in the Indian ocean during the whole year.

The present survey proved that the spawning of *S. undosquamis* in the Mediterranean waters along the coast of Egypt begins in January, when a considerabe quantity of female and male fishes with gonads in maturity stage (VI-II) appear in the catches, however in autumn a considerable quantity of fish with the gonads maturity stages (IV-V) appeared too (Table 50 & Fig. 90).

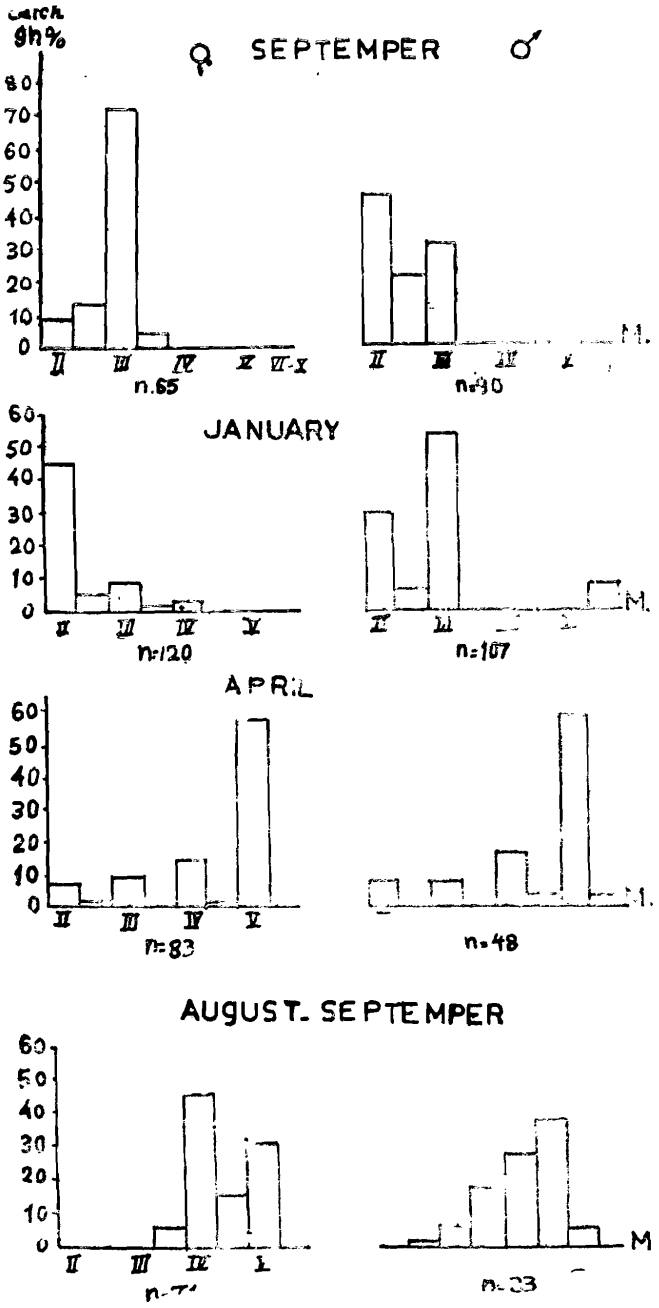

FIG. 90. Percentage frequency of the various maturity stages in *S. undosguamis* from the regions of Abukir-Damietta in 1970-1971.

TABLE 50.—GONADS MATURITY STAGES OF

Date	Region	juv.	♀							
			II	II-III	III	III-IV	IV	IV-V	V	VI-II
September	Borullos % .	—	5.0	—	95.0	—	—	—	—	—
	Rosetta % .	—	10.8	19.6	63.1	6.5	—	—	—	—
	Total No . .	—	6	9	57	3	—	—	—	—
	% .	—	9.2	14.8	72.4	4.6	—	—	—	—
January	Damietta% .	—	40.0	—	13.3	—	6.7	—	—	40.0
	Borullos % .	9.6	45.5	6.7	7.8	2.2	1.1	—	—	36.7
	Total No . .	1	53	6	11	2	3	—	—	45
	% .	7.0	44.1	5.0	9.2	1.7	2.5	—	—	37.5
April	Damietta% .	12.5	10.0	—	—	—	30.0	—	60.0	—
	Borullos % .	7.8	15.7	2.6	21.1	—	18.5	—	39.6	2.6
	Rosetta % .	7.2	—	—	—	—	6.9	3.5	72.4	17.2
	Abukir % .	—	—	—	—	—	—	—	100	—
	Tatoal No. .	10	5	1	8	—	84	6	12	1
	% .	7.1	8.5	1.2	9.6	—	14.5	1.2	57.8	7.2
August-Septemer	Damietta% .	—	—	—	—	23.8	57.2	19.0	—	—
	Rosetta % .	—	—	—	—	—	90.0	10.0	—	—
	Abukir % .	—	—	—	—	—	32.6	15.2	52.2	—
	Total No . .	—	—	—	—	5	36	12	24	—
	% .	—	—	—	—	6.5	46.7	15.6	31.2	—

SAURIDA UNDOSQUAMIS (1970-1971)

♂											
Σ	n	II	II-III	III	III-IV	IV	IV-V	V	VI-II	Σ	n
100	19	91.7	—	8.3	—	—	—	—	—	100	36
100	46	18.5	35.2	46.3	—	—	—	—	—	100	54
—	65	43	19	28	—	—	—	—	—	—	90
100	30	47.8	21.1	31.1	—	—	—	—	—	—	100
100	90	44.5	—	48.1	—	—	—	—	7.4	100	27
100	—	25.0	8.8	57.5	—	—	—	—	8.7	100	80
—	120	32	7	59	—	—	—	—	9	—	107
100	—	30.0	6.5	55.1	—	—	—	—	8.4	100	—
100	10	25.0	—	—	—	50.0	25.0	—	—	100	4
100	38	13.6	—	13.6	—	18.3	—	54.5	—	100	22
100	29	—	—	—	—	—	10.0	70.0	20.0	100	10
100	6	—	—	8.3	—	16.7	—	75.0	—	100	12
—	83	4	—	4	—	8	2	28	2	—	48
100	—	8.3	—	8.3	—	16.7	4.2	58.3	4.2	100	—
100	21	—	2.7	—	8.1	37.9	43.2	8.1	—	100	37
100	10	—	—	—	40.0	20.0	40.0	—	—	100	5
100	46	—	—	14.6	24.4	22.0	34.2	4.8	—	100	41
—	77	—	1	6	15	24	32	5	—	100	83
100	—	—	1.2	2.7	18.2	28.9	38.5	6.0	—	100	—

In spring there was not a great number of fishes which finished their spawning, and 7.1% of examined fishes had gonads maturity stage juv.

In summer mainly *S. undosquamis* in a state [illegible] was caught. As saurida in the Egyptian waters of the Mediterranean is [illegible] every new mass time it is [illegible] pay special attention to the biological study of this valuable fish.

Family Pomatomidae :

According to the data given by El-Zarka and Koura, (1965) *Temnodon saltator,* a representative of this family, is one of the valuable species of commercial fish. The biggest catches are received in summer in Abukir-Rosetta region.

During our observations, this fish was met in all examined regions during all the seasons at the depths up to 50 m. The greatest quantities were caught in Rosetta and Abukir regions. The maximum catches per trawling hour were received in Rosetta 1.4 kg — in January and 2.9 kg — in August. Average catches in Abukir-Rosetta regions were 0.2 kg per trawling hour in spring up to 0.5 kg in summer.

In 1966 the average catch of *T. saltator* totaled to 1.4 kg per trawling hour. Thus, since 1966 to 1971 there was 3-4 times reduction of the quantity of this fish.

Sizes of *T. Saltator* changed depending on the season (Table 51 and Fig. 91). The biggest fishes with full gonads were met with in summer, their length was from 19 to 24 cm (average length 21.6 cm, average weight 137.1 gm). In winter this fish was smaller. For example, in Abukir region the fish was represented by individuals with the size of 14.18 cm, average length 15.8 cm. and average weight 50.2 gm. This reduction aws due to the appearance of young fishes with gonads, maturity stages juv. and II. According to the data of the Institute of Oceanography and Fisheries, Alexandria, in January *T. saltator* was represented by fingerlings (1970 generation) (Table 52). Winter stay of *T. sultator* takes place in the East in Tina-El-Arish (according to the data of Azov-Chernomor Scientific Research Institute of Oceanography expedition in 1966) *i.e.* outside the area of our survey. Therefore it is impossible to give any information about the biological condition of grown-up fishes during this period. In spring, there were mainly female fishes in the catches with the gonads maturity stages in IV, IV-V and V (Table 52). It is possible that spawning continues in Autumn. In order to avoid over-fishing of *T. soltator* while organizing fishery of this valuable fish, it is necessary to take into consideration all its biological particulars and its distribution in different seasons.

Table 51.—Size variation of *T. saltator* (body length and weight) in the South-Eastern Mediterranean 1971

Region	Time	Fish body length (cm)										n	m	pcp.
		15	16	17	18	19	20	21	22	23	24			
Borullos	January	—	—	4	4	2	1	—	—	—	—	11	17.6	—
Rosetta	April	—	—	1	6	3	8	3	1	—	—	22	19.0	84.0
		—	—	57.0	65.3	78.7	91.6	104.3	121.0	—	—			
	August	—	—	—	—	—	1	4	9	6	1			
		—	—	—	—	—	104.0	125.5	137.3	146.5	158.0	2	21.6	13.0
Abukir	January	3	15	8	1	—	—	—	—	—	—			
		42.6	47.1	57.8	60.6		—	—	—	—	—	27	15.8	50.0

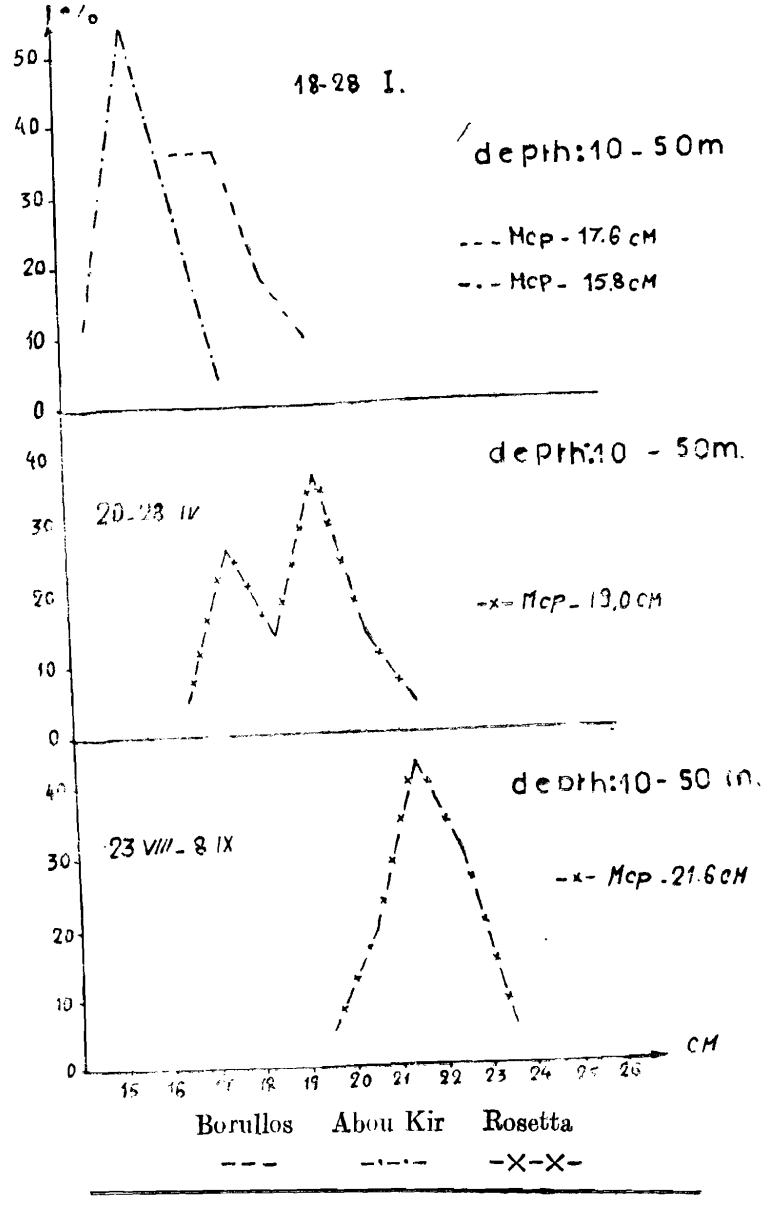

Fig. 91. Size composition of *Temnodon saltator* in the region of Abukir-Damietta in 1971.

Family Soleidae :

The most precious of this family is *Solea vulgaris,* which forms one of the main commercial fishes. This species at present has been transplanted in lake Qarun in which it has been successfuly acclimatized and now accounts for about 36 per cent of the total catch. Catches of *Solea vulgaris* in the lake are even bigger than in the sea (Aleem, 1969). During the present investigations catches of this fish amounted to an average of 0.3 kgs for one hour of trawling excluding the Autumn season, when only individuals of *solea vulgaris* were encountered in the catch. The maximum catch registered during the season was 0.2 kg. Taking into account average catches of fish in 1966 (0.6-0.7 kg. per hour of trawling) it is possible to maintain that nowdays the quanity of *solea vulgaris* has reduced twofold.

The size of fish differed both seasonal and with depth. A two-peak curve was noted in the spring time (Table 53 & Fig. 92). The first size group included the fish of 5 to 8 cm long, the other one from 9 to 26 cm. In the summer period the size curve of fish was represented also by two peaks although with a trend to size increase. The junior group had the size of 6 to 11 cm, while the major one-12 to 22 cm. Evidently there were two age groups the smaller of which was the junior. In the Bay of Abukir the size of *Solea vulgaris* differed with regard to depth. For example the fish caught at the depth of more than 50 m, its size rate fluctuated from 13 to 26 cm with an average length of 17.8 cm and average weight of 66.6 gm.

I, Evaluation of the sea Fisheries potential :

Seasonal investigations of the marine fishing reserves on the Mediterranean shelf of Egypt in 1970-71 showed the following typical features of fishing :

1. The most satisfactory catch was registered in the Autumn period and the average fish catches for a trawling hour amounted to 10.0 kg.

2. Fishing was mainly done at the depth of up to 50 m. Greater depths had significance only in spring and summer.

3. Catches at small depths were represented by the following fish : *Mullidae, Synodontidae* and *Leiognathidae;* while at the depths greater than 50 m *Soleidae* was of great significance.

4. The best catches of bottom fish were in the regions of Damietta and Rosetta.

5. Commercial fishing of pelagic fish was actually negligible.

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5. Commercial fishing of pelagic fish was actually negligible.

TABLE 52.—GONADS MATURITY STAGES OF TEMNODON SALTATOR (1971)

Date	Region	Juv.	♀										♂									
			II	II-III	I III	III-IV	IV	IV-V	V	VI-II	E	n	II	II-III	III	III-IV	IV	IV.V	V	VI.II	E	n
January	No.	16	9	—	—	—	—	—	—	—	100	9	2	—	—	—	—	—	—	—	100	2
	Abukir %	59,1	10.0	—	—	—	—	—	—	—	—	—	100	—	—	—	—	—	—	—	—	—
April	No.	3	9	—	9	—	—	—	—	—	100	18	1	—	—	—	—	—	—	—	100	1
	Rosetta %	13,6	50.0	—	50_0	—	—	—	—	—	—	—	100	—	—	—	—	—	—	—	—	—
August	No.	—	—	—	—	—	1	3	9	—	100	13	—	—	—	2	2	—	4	—	100	8
	Rosetta %	—	—	—	—	—	7,7	23,1	69,2	—	—	—	—	—	—	25.0	25,0	—	20,0	—	—	—

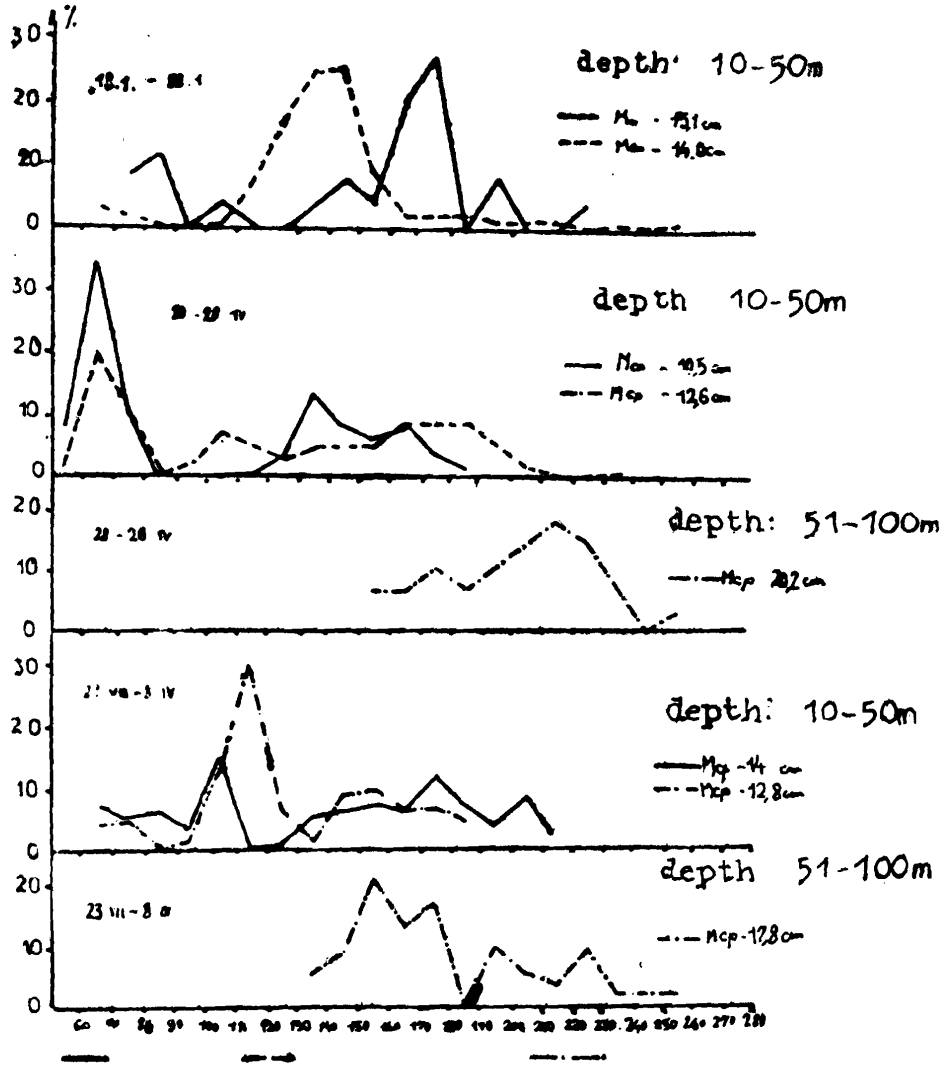

Fig. 92. Size composition of *Solea vulgaris* from the region Abukir - Damietta in 1970–1971

TABLE 53. SIZE VARIATION OF SOLEA VULGARIS (BODY LENGTH AND

Region	Date	Body length									
		6	7	8	9	10	11	12	13	14	15
Damietta	January	—	—	2	3	—	1	—	—	1	2
		—	—	—	—	—	—	—	—	—	—
		11	48	14	—	—	—	—	—	—	—
	April	[illegible]							20.0	24.6	30.0
	August	—	7	5	6	3	14	—	1	5	6
	September	—	3.0	5.0	5,0	—	10.0	—	—	—	30.0
Borullos	January	—	3	2	—	—	1	7	17	25	25
		—	—	—	—	—	—	—	—	—	—
	April	2	19	11	—	2	7	5	3	5	5
		5.0	5.4	6.9	—	12.5	15.7	21.6	28.3	32.5	83.7
Abukir	April	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—
	August	—	3	3	—	1	8	18	4	1	5
	September	—	—	—	—	—	—	—	—	—	—
	August	—	—	—	—	—	—	—	—	3	5
	September	—	—	—	—	—	—	—	—	28.3	35.0

WEIGHT) IN THE SOUTH-EASTERN MEDITERRANEAN (1970 - 1971)

in cm.												n	$\bar{l}$	$\bar{w}$
16	17	18	19	20	21	22	23	24	25	26				
1	5	7	—	2	—	—	1	—	—	—		25	15.1	—
—	—	—	—	—	—	—	—	—	—	—				
9	11	6	2	—	—	—	—	—	—	—		137	10.5	19.9
34.1	45.8	53.3	—	—	—	—	—	—	—	—				
7	6	11	7	4	8	2	—	—	—	—		92	14.1	42.3
25.0	27.0	39.1	43.0	56.0	62.0	80.0	—	—	—	—				
9	2	2	2	1	1	1	1	1	—	1		100	14.0	—
—	—	—	—	—	—	—	—	—	—	—				
5	8	8	8	5	2	—	—	1	—	—		96	12.6	38.0
41.0	50.0	59.4	68.0	86.0	100.0	—	—	155.0	—	—				
2	2	3	2	3	4	5	4	2	—	1		28	20.2	98.7
45.0	53.0	63.3	73.5	93.6	103.7	114.2	124,0	137.5	—	165.0				
6	4	4	3	—	—	—	—	—	—	—		60	12.8	—
—	—	—	—	—	—	—	—	—	—	—				
11	7	9	—	5	3	2	5	1	1	1		53	17.8	66.0
41.6	50.4	65.5	—	75.0	90.0	97.2	120,0	135.0	165.0	175.0				

Comapring these results with the nature of fishing at the beginning of the sixties, when fish catches reached their maximum, it becomes evident, that the changes were caused by the sharp reduction of *Clupeidae catches* (Table 54).

In the remote past, *Sardinella* was the most important commercial fish accounted for up to 48 per cent of the total catch and it defined the site level and seasonabillity of the marine fishing in Egypt. The intensity of exploitation of the reserves, started in the fifties when the number of fishing boats increased from 30 to 574 (El-Zarka & Koura, 1965) had an absolutely adverse effect on the quantity of sardine and produced the trend to its decrease. The catch from 1962 to 1965, dropped more than two times, from 18 to 7.5 thousand tons.

TABLE 54.—CATCHES OF COMMERCIAL FISHES (INCLUDING CLUPEIDAE) IN COMPARISON WITH THE CHANGES IN THE NILE OUTFLOW AND THE INCREASED FISHING INTENSITY ALONG THE DELTA.

Year	Total catch (Tons)	Catch of Clupeidae		No. of motorized Boats	Nile outflow (km^3)
		Tons	Total catch .%		
1962	37.829	18.166	48.02	574	44.0
1963	32.969	12.981	39.45	562	43.6
1964	25.975	7.372	28.38	552	63.7
1965	24.686	7.635	30.93	548	35.9
1966	15.044	1.233	8.19	569	13.2
1967	12.212	812	6.65	546	21.5
1968	13.588	463	2.95	406	5.9
1969	8.521	600	7.03	—	3.6
1970	8.100	580	7.20	—	4.0

Even at that period reasonable regulation of fishing became a necessity to replenish the local shoal. However, the number of fishing vessels remained at the earlier level.

In 1966 a sharp environmental change was added to the previous factor *i.e.* the Nile flow regulation (see Chapter IV). It is known that the biology of the sardine (reproduction cycle, feeding period, migration etc.) is closely linked with the Nile flow (Aleem, 1969; El-Zarka and Koura, 1965).

Powerful Autumn floods of the Nile contributed to the intensive development of the feeding material for the sardine (phytoplankton) in the shelf zone. This factor determined the season, site and intensity of feeding migrations and accumulations of the sardine.

The regulation of the flow brought about sharp reduction in the intensity of Autumn "blooming" which as far back as 1966 was approximately ten times less than at the beginning of the sixties (Halim, 1967, & Savich 1970) and dropped still further according to the latest information (Appendix 9).

This affected the conditions of sardine feeding, which could be detrimental to the changes in distribution and reproduction. The results of the expeditions of 1966 and 1970-71 showed that great accumulations of sardine after 1965 were not available either near the shore or in the off-shore areas of the shelf (Pavlovskaya and Budnichenko, 1970). This makes it possible to suppose that the local shoal of sardine has witnessed considerable reduction during these years. The proof of it, is the progressing decrease of the average size of sardine, which was 17 cm in 1958 (Rifaat, 1960), 10-13 cm in 1966 (Pavlovskaya and Budnichenko, 1970) and not more than 9.6-10.2 cm in 1970-1971. These facts point out the upset of the natural correlation between age groups which suggests that replenishment of the shoal is insufficient.

At the same time the probability of sardine scattering over the shelf since the decrease in autumn "blooming" weakened the action of trophic stimulus, contributing to the sardine approaching the shore and forming concentrations.

Oceanographic data obtained during the expedition of 1970-71 make it possible to believe that there might be certain improvement in the biological productivity of the shelf zone in future and hence improvements in commercial fishing. This assumption was confirmed by the results of fishing in 1971. In the vicinity of Alexandria (Bay of Abukir) 1083 ton of sardine were caught which is almost two times more than in 1970. However the increase in catch size at present is not due to the increase in the quantity of the principal commercial species, but due to the conditions of fishing. The main mass of sardine was caught in May-September far from the shore and at the depth of 20 m, thus significantly differing from the previous fishing conditions. For fishing with a cone shape net, fish was attracted to a source of light, a method which had not previously positive results because of the muddiness of water.

Therefore, a certain increase in the biological productivity of shelf waters, fishing of a new variety of sardine and the possibility of employing new methods of fishing indicates that increase in sardine catches is feasible. However its prospects are not yet clear. They are dependant on the level of biological productivity, which will be formed within the shelf after stabilizing oceanographic conditions disturbed by the decrease in the river flow.

Besides, fishing of a new variety as well as redistribution of feeding zones of sardine within the shelf (see Chapt. IV) requires a strict control over the location of fishing areas.

At present, bottom fish is mainly fished in the waters off the shores of Egypt. Among the fishes there are traditional marine species (*Mullidae* and *Soleidae*) and the new species (*S. undosquamis*).

Moreover a considerable percentage of catch for the recent years has been accounted for the species which where considered previously as non-commercial such as *Leiognathus klunsingeri*. Their catch sizes are quite big (18 kg per trawling hour) and may be used for commercial purposes.

On the basis of the fisheries reports for 1970-71 we have determined the total commercial reserves of bottom living fishes in the Mediterranean shelf of Egypt (Table 55). This makes it possible to define more precisely the scope of fishing to-day and compare it with the previous years. The method of direct counting employed in 1966 was used in calculations. (Pavlovskaya and Budnichenko, 1970).

TABLE 55.—CALCULATIONS OF RELATIVE RESERVES OF BOTTOM FISH (THOUSAND CENTNERS) BY SEASONS AND REGIONS IN 1971.

Region	Depth	Fishery area (mile²)	Autumn			Winter			Spring			Summer		
			Average catch/trawling operation (kg)	Reserve of bottom fish		Average catch/trawling hour (kg.)	Reserve of bottom fish		Average catch/trawling hour (kg.)	Reserve of bottom fish		Average catch/trawling hour (kg.)	Reserve of bottom fihs	
				Without the calculation of trawl catchibility coefficient	With the calculation of trawl catchibility coefficient (thou. and cent)		Without the cal ulation of trawl catchibility coefficient (thousand cent)	With the calculation of trawl catchibility coefficient (thousand cent)		Without the calculation of trawl catchibility coefficient (thousand cent)	With the calculation of trawl catchibility coefficient (thousand cent)		Without the calculation of trawl catchibility coefficient (thousand cent)	With the calculation of trawl catchibility coefficient (shousand cent)
Abukir	10–200	375.2	7.31	1.6	8.1	1.4	0.3	1.7	2.4	0.6	2.8	5.7	1.3	6.3
Rosetta	10–105	450.6	14.2	3.8	18.9	4.8	1.3	6.8	2.7	0.8	3.9	8.0	2.1	10.6
Borullos	10–100	665.4	8.1	3.2	15.8	4.7	2.4	9.8	2.6	1.1	5.3	6.2	2.4	12.2
Damietta	10–100	813.0	10.5	5.0	25.0	4.8	2.0	12.1	2.2	1.1	5.5	3.7	1.8	8.8
Total		2304.3	—	13.6	67.8	—	6.0	30.4	—	3.6	17.5	—	7.6	37.9

* Centner = 100 Kg.

Evaluation of the reserves of the bottom fish was done in the following way :

1. Area of trawling S_1 = alt,

where : a — speed of trawling, m/sec.

t — time of trawling/sec.

l — horizontal opening of the trawl in metres.

2. Knowing the area of trawling S_1 and the fishing area S_2, the number of possible trawlings may be determined :

$$N = \frac{S_2}{S_1}$$ N = mimber of possible trawlings

3. On the basis of the average catch size (P) in a certain area , reserves (G) in kg were calculated :

$$G = P.N.$$

4. The above formula does not enable us to define the total fishing reserves, since it does not take account of the trawl catchibility. Taking the catchibility coefficient of a 20-meter bottom trawl as 0.2 may calculate the total reserve.

$$Q = \frac{G}{K}$$

where : K - trawl catchibility coefficient.

The results characterize the commercial reserves of fish in the shelf area with the depths from 10 to 100 m in the regions of Rosetta and from 10 to 120 m in the region of Abukir. It has been established that the maximum quantity of bottom fish was registered in the autumn of 1970 and 1971, and amounted to 67.8 thousand centners, and the minimum in the spring time, amounted to 17.5 thousand centners. The permissible catch size must not exceed 30 per cent of the total reserve. Therefore fishing in the waters of the Mediterranean shelf of Egypt must not, at present, be over 20 thousand centners in autumn and 10 thousand centner weight in winter and summer.

ompared to the catch sizes for the previous years this figure shows a drop which declined two times from 1962 to 1970 (Table 54).

p to 1965 the fishery level of bottom fish remainld practically un- eable within the limits of 17.20 thousand tons in spite of its intensifica- Regulation of the Nle waters hda also adverse efflct on the bottom although its effect was considerably smaller than on the pelagic fishes he total catch was not reducld to less than 11.14 thousand tons. This vas maintained during 1966-1968. However due to the actual elimina- f fishing area to the east of the Damietta region in 1969, the Egyptian ; fllet was dislocated and concentrated in the shelf zone from the f Abukir to hte Damietta region. Starting from this year the area has ntensively exploited since the number of fishing vessels was not grlatly d and was maintained at the level of 400. As a rlsult, overfishing has nveitable which is evident from the fact that young specimens preva- catchls of *Mullus barbatus*.

Thus, the decrease in the total catch of bottom fish in recent years was l both by the reduced areas of fishing and the decreasl in the fish es in the exploited areas. Hence, rational fishing rlquires reasonable tino of fishing vessels. Provided this is taken into consideration, it sible to expecu incrlased fishing as the bottom fish reserves are not dependant on the river flow and their replenihment is more or less ctory even with the condition of flow-rlgulation.

II, SUMMARY

. Inchthyofauna of the Mediterranean Egyptian waters are represented esent by 118 fish species belonging to 50 families. Among them, apart dwellers of the coasta shelf, there are immigrants from the Red Sea, ell as pelagic specils from the off-shore waters of the Mediterranean

2. The most effective trawl fisheries with an average catch of 10 kg ne hour of trawling took place during the autumn season ; the llast ive fish catches took place in 1970-1971 and were caught in the regions mietta and Rosetta.

3. According to the data of this lxpedition it can be mentioned that bottom fishes are of the main significance in fisheries nowdays. Among them are representatives of mailies most commonly met, such as : *Mullidae, Synodonitdae, Serranidae* and *Solediae.*

4. In 1970-1971 the maximum stock of bottom fishes was noted during the autumn season and was equal to 67.8 thousand centners and the minimum stock of 17.5 thousand centners took place in spring. The possible autumn catch is equal to 20 thousand centners ; the winter and summer catch-10 thousand centners. In spring it is economically not expedient.

5. Lately the catches of sardines have greatly reduced. However, in 1971 its catch grew twice as much as compared to 1970 and reached 1083 tons. In 1971 fisheries in the Bay of Abukir took place at a great depth during the summer months which greatly differed from fisheries of previous years.Based on the data of expedition, the species of *pilchardus,* is becoming of great significance.

6. There is a direct ecological relationship between the sardine stocks and the volume of river discharge. The discharge reduction is the main reason for the drop of the sardine population, since the reproducing conditions of the main commercial species *S. aurita are* upset. However, the expected inprovement of the chemical base in the shelf area may lead to an expected increase in the sardine population.

In the following years an increase in the population of the main species, adequate fishlries of *pilchardus* and utilization of new fishery methods (light trap) can help for an increase in catches of this valuable commercial item of the Egyptian marine fisheries.

7. At present a reduction of the bottom fish catches is mainly caused by intensive fisheries. The decrease of commercial areas due to the exclusion of areas east of the Damietta region has caused the concentration of the whole of the fishing fleet in the regoin of Abukir-Damietta. In order to carry out rational fisheries, it is necessary to limit the number of fishing vessels on a reasonable and admissible basis.

III Conclusion

The population of marine organisms in the Mediterranean Sea near the Egyptian coast has much reduced lately. The stock of sardines, and shrimps has prominently decreased, those being the main fishery items in the area under investigation. Accordingly, the catch of sardines dropped, from 182 thousand centners in 1962 to 6 thousand centners in 1969, and consequently the catch of shrimps decreased from 72.3 to 11.3 thousand centners.

The joint Soviet-Egyptian investigations carried out in the Southeast Mediterranean Sea in 1966 and 1970-1071 allowed to conclude that there exist two main reasons for the decrease of fishery items along the Egyptian coast, such as :

1. fishing influence.

2. sharp reduction of the Nile discharge.

The influence of the first factor is evident in upsetting the age structure of fishes (especially that of sardines), and changing the species relationship among shrimps (the share of big species decreased) a fact which adversely affected the total population of the main fishery items. Thus, the catch of sardines and shrimps in 1965 was reduced almost 2.5 times as compared to that in 1962.

During the last period the main reason which adversely affected the biological productivity of the area under investigation was the Nile discharge control. This resulted in a sharp river discharge reduction and changed its intra-year distribution in principle.

During the years preceeding the Nile control the average annual discharge was equal to 43.5 km^3. At present it equals only 4.4 km^3. Such a sharp reduction of the discharge greatly influenced the oceanographic regime north of the Nile Delta. In the greater part of the area under investigation there was an increase in salinity as compared to the figures of 1964 by an average of 2-3%. Transparency in the mouth area, except for the narrow coast belt, increased to 10-20 m. The stability of sea water in the layer of 0-10 m. noticeably decreased. Due to the decrease in the force of the horizontal pressure gradient caused by a sloping level near the Delta, the sea current velocity decreased substantially and its direction to the east became more

pronounced. Because of the sharp decrease of the discharge the vertical hydrological structure of waters in the area under investigation substantially changed. The surface water mass of lower salinity which was observed in this area before the Nile control is non-existent now. The most prominent changes have taken place in the distribution of hydrochemical characteristics. At present the quantity of silicates getting into the sea is 80 times les and that of phosphates is 100 times less than during the years of the normal discharge; the water saturation with oxygen also greatly reduced. As a result of this the quantity of phyto-and-zooplankton and the chemical base of bilogical productivity substanially deteriorated. As a result of this the quantity of phyto-zooplankton decreased. The condition of phyto-plankton has especially deteriorated where its quantity at present being 100 times less than before the Nile waters control. The plankton biomass has decreased to a lesser degree, being at the level of 50 gm/m^3 at present.

According to the data of trawl catches of 1970-1971, at present, the stock of commercial items on the Egyptian shelf is negligible and provides 6.2 kg of fish and 0.5 kg of shrimp at an average for an hour of trawling.

The changes of living conditions of marine organisms on the Egyptian shelf have adversely affected the population, distribution and biology of the majority of fishery items.

First of all the changes of living conditions affected the population of pelagic fishes in general and mainly the sardines.

With the decrease of the "bloom" intensity, the feeding conditions of sardines have sharply deteriorated resulting in stoping mass sardine travel, as previously observed, into the coastal zone. In 1970 the catches of the main sardine species *S. aurita* dropped three times as compared to the maximum catch of 1962. At present, pelagic fishes play a negligible role in the marine fisheries of Egypt and account for not more than 7 per cent of the total catch. At present, bottom fishes are the basic catch among which the traditional fishery items are still of significance (*Mullidae* and *Soleidae*) with a growing role of new species (*Synodontidae* and *Leognathidae*). However, the catch of bottom fishes has greatly reduced from 18 thousand centners in 1962 to 8 thousand centners in 1970.

At present, the stocks of *Mullidae* and *Sauridae* are in the most favourable condition. However, the stock of red mullets has begun to decrease.

Judging from the data, the main fishery season remains to be Autumn.

According to the data of quantitative assessment undertaken from board the expeditionary vessel "Ichthyolog" in 1970-1971, the Autumn fish stock of the area surveyed equal 67.8 thousand centners which allows for 30 thousand centners catch.

Lately the population of commercial crustaceans, i.e. shrimps, has substabtially reduced. In the area under investigation they are represented by seven species of the family *Penaeidae*. Their biology and distribution are closely connected with the historically formed living conditions in the Delta part of the Egyptian shelf. The decrease of the river discharge affected spawning periods, the timing of formation of spawning concentrations and caused some redistribution of shrimps in the area of investigation. In accordance with the shift of the maximum Nile water discharge to the winter months, the spawning of mass spieces of shrimps "*Penaus*", usually prohibited during the summer months in 1971 was delayed to embrace the autumn months. and for *M. stebbingi*, - even the winter. This excluded any mass formations of summer concentrations of the main species of shrimps.

The changes of the quantitative distribution of shrimps are expressed in the comparison with 1966 commercial species concentrations, where *P. japonicus* and *M. monoceros* shifted east and situated at present in the regions of Borullos and Damietta. Since these regions were always inhabited by the main mass of small species *T. curvirostris* and *M. stebbingi*, they were the place of the main shrimp concentrations. Now the largest quantity of shrimps dwells in the most diluted section of the shelf.

Violation of the reproduction cycle and the living conditions of shrimps caused depopulation. The stocks of *P. trisulcatus* and *M. monoceros* dwelling at a depth of 20-50 m were greatly reduced on account of the most significant changes of the oceanographic regime existing there. Their population decreased 10 times and 4 times respectively.

Stock of the *M. stebbingi* species dwelling near to the narrow coastal strip suffered to a lesser degree. The population of *P. japonicus* remained quite unchangeable, a species which is closely connected with the coastal lagoons in its development.

As a result of changes that took place in the composition and the population of shrimps of the coastal part of the Egyptian shelf ,the relationship of the species living there sharply changed : the significnace of big

shrimps of the *Penaeus* genus diminished, whereas the role of small species grew (*M. stebbingi, T. curvirostris* and *P. longirostris*).

In 1971 the content of prawn catches was as follows. *M. monoceros* and *M. stebbingi* accounted for 32 per cent ; *P. trisulcatus ; P. japonicus* accounted for 33 per cent, and the small commercial species accounted for 35 per cent.

At present, the following species have the biggest commercial effect : *M. stebbingi, P. japonicus, M. monoceros* and *P. longirostris.*

The total shrimp stock in 1971 dropped three times in comparison with 1966. Based on the data of quantitative assessment in 1970-1971, within the area of investigation the shrimp stock equals 4.2 thousand centners Considering the preservation of resources this makes it possible to catch 2.5 thousand centners each year.

The present-day fishery of shrimps retains a typical yearly pattern with an increase of catch in the warm season of the year. However, in 1971 the peak catch happened to be in autumn, not in spring.

The level of the river discharge and the hydrological regime of the area under study have not yet finally stabilized. Therefore, at péesent it is difficult to judge of all the changes of the oceanographic regime brought about by the Nile control.

At the same time, in recent years there have developed certain processes which to a certain extnt make up for the deterioration of living conditions of marine life brought about by the discharge decrease.

In particular, the role of convection intermixing has increased and the inflow of diluted waters into the sea from the coastal lakes has grown.

Hoping that after the final filling of lake Nasser the river discharge will increase and this will increase the supply of nutritive salts into the coastal part of the sea. The growing role of the factors mentioned makes it possible that a gradual improvement of the biochemical base of the biological productivity of the area under study and as a result, feeding conditions of pelagic fishes takes place. In particular, it has been observed that a more intensive development of phytoplankton on the shelf slope in the mouth area on account of a more active vertical mixing, thus the surface layers have been enriched by nutritive salts. This seems to explain the increase in the sardine catch in 1971 as compared to the catches of this fish in the preceding years. At present

the cost price of this fish may be cut by means of fishing operations with electrical light. An effective utilization of this more developed fishergy method has become possible only due to an increase in the salinity brought about by the Nile discharge drop. Now it is difficult to state that the supposed improvement of the living conditions and reproduction of marine organisms will result in an increase of their population as a whole.

For the purpose of restoration of fish and crustacean stocks, firstly it is necessary to rationally implement fisheries. Before 1967 the Egyptian fishing fleet worked mainly in the area between Alexandria and El-Arish. At present a smaller area of the shelf is exploited for fisheries, — from the Arabs Bay to the cape of Damietta. The concentrations of fishing vessels in the area under study enhance an adverse effect of fisheries on the marine life resources.

Speaking about prospectives of Egyptian fisheries in the Mediterranean Sea, it is necessary to point out the possibility to utilize coastal ponds (lakes) and in the first place, lakes Edku, Manazala and Borullos for the purpose of developing such valuable fishery items as mullet and prawns. In order to organize adequately brackish lagoon fisheries it is necessary to study in all detail the living conditions and biology of the said species in the course of their dwelling in these lagoons.

Shrimp and fish culture will compensate for the marine fisheries decrease along the Mediterranean Coast of Egypt.

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APPENDIX 1.—Data of Trawling Operations by R/V
(August 1970–October 1971)

Date	Station No.	Region	Latitude	Longitude	Depth (m)	Length of wire (m)	start of trawling
1	2	3	4	5	6	7	8
8.9.1970	1	Damietta	31°43′0 N	31°37′0 E	47	225	14 20
8.9.1970	2	,,	31 43 0	31 32 2	40	225	16 00
8.9.1970	3	,,	31 39 0	31 34 0	30	175	17 45
9.9.1970	4	,,	31 35 2	31 32 0	14	150	07 50
9.9.1970	5	,,	31 32 4	31 30 0	18	150	09 25
9.9.1970	6	,,	31 36 4	31 20 9	18	175	11 55
9.9.1970	7	,,	31 43 0	31 14 2	30	200	19 10
9.9.1970	8	,,	31 42 1	31 24 7	30	225	21 27
10.9.1970	9	,,	31 42 0	31 38 4	30	225	09 14
10.9.1970	10	,,	31 36 5	31 45 0	17	150	11 40
10.9.1970	11	,,	31 38 1	31 41 0	22	225	19 08
10.9.1970	12	,,	31 39 5	31 29 5	22	225	21 35
10.9.1970	13	,,	31 30 5	31 33 1	14	100	00 05
12.9.1970	14	Borullos	31 38 5	31 07 0	15	150	19 00
12.9.1970	15	,,	31 41 6	31 02 5	20	225	21 00
12.9.1970	16	,,	31 44 3	30 52 8	31	250	23 00
13.9.1970	17	,,	31 41 2	30 48 1	20	200	08 40
13.9.1970	18	,,	31 37 2	30 57 8	12	100	11 25
13.9.1970	19	,,	31 40 5	30 44 5	23	225	18 55
13.9.1970	20	,,	31 44 0	30 41 0	40	250	20 55
13.9.1970	21	,,	31 47 5	30 47 8	46	275	23 00
15.9.1970	22	Abukir	31 33 4	30 17 5	13	100	10 55
15.9.1970	23	,,	31 32 0	30 12 0	23	200	19 05
15.9.1970	24	,,	31 29 0	30 06 9	24	225	21 00
15.9.1970	25	,,	31 27 7	30 03 2	32	250	22 50
16.9.1970	26	,,	31 25 0	30 04 2	27	225	08 45
16.9.1970	27	,,	31 25 9	30 07 4	22	175	10 55
16.9.1970	28	,,	31 34 2	30 07 0	34	250	18 55
16.9.1970	29	Rosetta	31 40 2	30 12 5	45	275	21 00
16.9.1970	30	,,	31 38 2	30 18 7	26	225	23 10