

**COMMERCIAL FISHERIES OF PURSE SEINE (SHANSHOULLA)
ALONG THE EGYPTIAN MEDITERRANEAN COAST.**

M. T. HASHEM, A.A. ALSAYES and I.A.SOLIMAN

Inst. Oceanography and Fisheries, Alexandria.

ABSTRACT

The present study is a part of the research programme carried out during 1976, 77 and 78, for investigating the fisheries of sardine and other pelagic fish along the Egyptian Mediterranean Coast from Rashid to El-Sallum.

The construction of the fishing gear (Shanshoulla) was mentioned and the fishing technique was explained.

The catch of shanshoulla working in the area from Abu-Qir to El-Alamean was statistically analysed by the sampling method.

The monthly commercial catch of shanshoulla during the three fishing seasons (1976, 77 and 78) was generally analysed according to the abundance of different fish species. The catch of 1978 was rather investigated for the Eastern and Western areas of Alexandria.

The monthly variation in species composition of the sardine in comparisons with the total sardine catch of shanshoulla during 1976 and 77, as well as that from the Eastern and Western areas of Alexandria during 1978 was represented.

The catch per fishing trip of shanshoulla was estimated during 1976 and 1977, as well as for the Eastern and Western areas of Alexandria during 1978.

Comparison of all shanshoulla catch during the three fishing seasons was made and the catch per fishing effort was calculated and discussed.

INTRODUCTION

The Egyptian marine fisheries faced a considerable decline in the last few years as a direct result of the construction of Aswan High Dam (1966). The cessation of flow of the fertile Nile water into the Mediterranean

Sea during the flood season has resulted remarkable changes in the ecological conditions of the South-eastern Mediterranean from Alexandria eastwards (El-Hehiawy, 1974; Al-Kholy and El-Wakeel, 1975 and Gerges, 1976). This greatly affected the Sardine fishery along the Egyptian Mediterranean Coast. The Sardine catch drastically decreased from 18 thousand tons in 1962 to less than one thousand ton in 1972 (El-Zarka, 1965; Hashem, 1972; Year-Book of Fishery Statistics 1962-1972).

To compensate the loss in fish production, particularly that of Sardine, it was essential to use a new fishing technique for catching the Sardine and other pleagic fish along the Egyptian Mediterranean coast. The development of Sardine fisheries by purse seines, using light attraction started in Egypt in the early seventieth to compensate the loss in Sardine production.

The present study is a part of the work concerned with the project; "Fisheries Investigations of the Sardine and Other Pelagic Fish, along the Egyptian Mediterranean Coast from Rashid to El-Sallum", carried out during the period from July 1976 to November 1978 under the supervision of Prof. Dr. M.T. Hashem. All the data are present in the technical report No.2/3 (1979) and the final report No III (1983), presented to the Alexandria Institute of Oceanography and Fisheries.

MATERIAL AND METHODS

In the Egyptian Mediterranean waters the purse seines usually start fishing in the early Spring and continue till Autumn, carrying out monthly regular fishing operations only during the dark nights. The number of fishing nights, fishing ships and fishing operations per month varied from one year to the other according to the climatic conditions prevailed as well as the abundance of the pelagic fish schools. Commercial fishing lasted for seven months in 1976 and in 1977, while it lasted for nine months in 1978.

During the period from April to November 1976, and 1977, the fisheries investigations were confined to statistical analysis of the commercial catch landed at the Anfoushy fishing centre in Alexandria. All the catch of the shanshoulla fishing units, working in the area from Abu-Kir to El-Alameen passes through that centre. This fish landing centre was visited in most days of the fishing period. To estimate the catch by sampling method, the total number of fish boxes of each fishing unit (ship) was recorded, and the daily number of fishing trips were also obtained.

During the three fishing seasons of 1976, 1977 and 1978, representative random samples were taken from fish boxes, which were previously sorted into fish kinds and size categories. These samples were investigated and analysed to get information about species constituent, length distribution, sex-ratio and other biological data necessary for studying such fish resource.

During 1978, it was possible to varyify two fishing areas of the commercial fishing of shanshoulla one to the east of Alexandria and the second to the west. The commercial catch was therefore classified according to the fishing area. It was easy to decide whether the purse seiner was fishing in either the eastern or western area by recording the direction of the ship when it starts sailing from the Eastern Harbour. Moreover, it was possible to find out whether the ship was fishing near or far from Alexandria either to the east or to the west by recording the time of its return to the harbour in the morning.

Local Purse Seine (Shanshoulla)

The shanshoulla net used in the commercial fishery of the Egyptian Mediterranean waters is usually manufactured from nylon webbing of twines Td 210/12. The stretched mesh size of the webbing is 1.8 cm. The shanshoulla is about 240 meters in length and 60 meters in depth. Cylindrical floats made of synthetic material are used to sustain the head rope on water surface. The floats are 8.8 cm in length and 6.6 cm in diameter. The distance between the floats of the head rope is 12.5 cm. On the other hand, the lead rope is furnished with lead pieces (9 pieces in a meter) each weighing 75 gm., fastened to the foot rope through which a rope is threaded to close the bottom of the net to form the purse.

Once the shanshoulla fishing vessel reaches the fishing area, two or three small rowing boats ancore about 500 meters apart, lighted to hanged kerosine or butane-gas lamps (ranging from 3000 to 6000 foot candle) for about 5 hours till the fish aggregate towards the lighted area. When a suitable amount of fish aggregates near the surface, the fishing operation starts. The fishing vessel circles the small lighted boat, while shooting the shanshoulla net (Ring-net). Once a circle of about 100 meters in diameter is completed, the messenger ropes holding the leading edges are pulled aboard the fishing vessel and brings the wings with them. Then the net's cable is attached to the winch, which starts to lift the closed net. The fish are collected to the middle of the net, and the net is completely lifted aboard. The fish are then picked out of the net on the deck of the vessel, immediately graded and preserved with ice.

Commercial Fishing of Shanshoulla

The commercial catch of shanshoulla along the Egyptian Mediterranean coast from Abu-Kir to El-Alameen during the three fishing seasons of 1976, 1977 and 1978, are present in the technical and final reports of ElSallum project (Anon. 1979 and 1983). The total landing of fish as well as the total catch of each of the most dominant fish species during the three fishing seasons is graphically represented in histograms as shown in Fig. (1).

During 1976, the Sardine dominated the catch (64.5%), followed by the

B. boops (19.8%), Anchovy (5.7%), *T. mediterraneus* (3.9%), *S. japonicus* (2.0%), *T. saltator* (1.6%), *E. alletteratus* (1.4%), *Lichia glaucus* (1.3%) and *S. sphyraena* (0.7%).

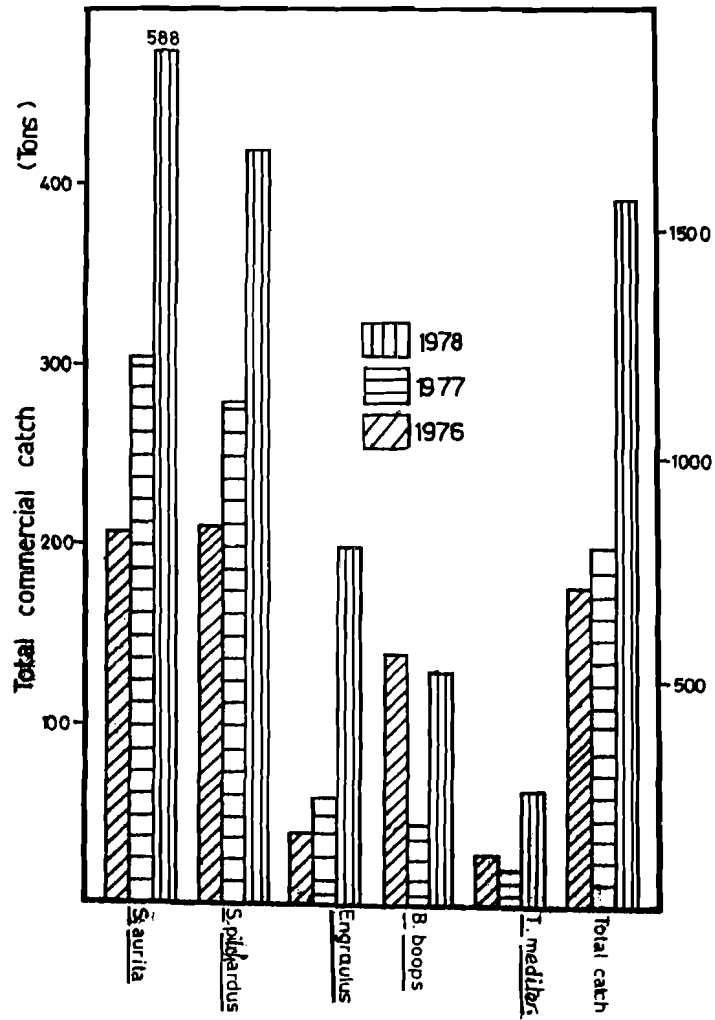


Fig. 1. The total catch of the dominant species of shanshoulla during the fishing seasons 1976, 77 and 78.

During 1977, the Sardine dominated the catch (78.2%), followed by the Anchovy (7.4%), **B. boops** (5.6%), **T. mediterraneus** (2.7%), **T. saltator** (2.1%), **S. japonicus** (1.4%), **S. sphyraena** and **L. glaucus** (1.0%) and **E. alletteratus** (0.5%).

During 1978, the Sardine dominated the catch (67.59%), followed by the Anchovy (12.83%), **B. boops** (8.27%), **T. mediterraneus** (4.23%), **S. japonicus** (2.56%), **T. saltator** (1.28%), **L. glaucus** and **S. sphyraena** (1.51%), **Dussumeria** (0.95%) and **E. alletteratus** (0.58%).

Generally, it was observed that the Sardine dominated the catch during all the fishing seasons. It constitutes 64.5%, 78.2% and 69.54% during the three seasons, respectively. The catch of **Boops boops** followed that of Sardine (19.8%) during 1976, while Anchovy was the second category in the catch of 1977, and 1978 (7.4% and 12.83%). Other pelagic fish species (**Trachurus mediterraneus**, **Scomber japonicus**, **Temnodon saltator**, **Lichia glaucus** and **Sphyraena sphyraena**) situated variable positions next to such dominating species in the commercial catch.

As regards the monthly variation, it was observed that the highest landed catch of Sardine was in June, July, August and September during 1976 and 1977, while such higher catch was recorded in May, June, August and September during 1978. As for **Boops boops**, it was obvious that higher catch landed usually at the beginning of the fishing season. The Anchovy (**Engrewlis sp.**) appeared in the catch with comparatively high percentages during June in the three fishing seasons.

The monthly variation in species composition of the Sardine in comparison with the total Sardine catch of Shanshoulla during April-October 1977, and from February to November 1978, are shown in Tables (1 and 2).

It was obvious that **S. aurita** was represented in the catch of all fishing months. It dominated the catch in all seasons, comprising 48.6% and 54.68% in 1977 and 1978 fishing seasons, respectively. **S. pilchardus** was the second category in the landed catch of Sardine, representing 45.38% and 38.52% during 1977 and 1978, respectively. The percentages of **S. maderensis** and **Dussumieria** in the catch of Sardine were however unrespected ranging from 4.4% to 5.4% for **S. maderensis** and from 1.4% to 1.6% for **Dussumieria**.

Commercial Fishing During 1978

The total commercial catch of Shanshoulla from both the eastern and western areas during the fishing season of 1978 is illustrated in Fig. (2). It can be observed that:

(1)- The most dominant fish in the catch was **S. aurita** followed by **S. pilchardus** with a total catch of about 600 tons and 400 tons, respectively.

Table (1)
 Monthly variations in species composition of Sardine
 in comparison with the total sardine catch of
 Shanshoulla during April - October 1977.

MONTH	SPECIES <i>Sardinella aurita</i>	<i>Sardine pilchardus</i>	<i>Sardinella maderensis</i>	<i>Dussumieria acuta</i>	TOTAL (kg).
April	6643 100%	-	-	-	6643 1.1%
May	72489 98.4%	1216 1.6%	-	-	73705 11.8%
June	86640 38.5%	135505 60.2%	2604 1.2%	242 0.1%	224991 36.0%
July	41025 31.8%	65300 50.6%	19157 14.8%	3488 2.7%	128970 20.6%
August	55897 48.7%	50496 44.0%	5306 4.6%	3061 2.7%	114760 18.3%
September	31077 48.6%	29587 46.3%	159 0.2%	3144 4.9%	63967 10.2%
October	10410 81.3%	2275 17.8%	-	115 0.9%	12800 2.0%
All Months	304181 48.6%	284379 45.4%	27226 4.4%	10050 1.6%	625836 100%

Less catch of *S. aurita* was taken from the west as compared with the east of Alexandria. On the other hand, most of *S. pilchardus* was caught from the east. *Engraulis* was the third constituent in the catch with a total of about 200 tons. Most of the catch of *Engraulis* was caught from the eastern area.

(2)- *S. Pilchardus* and *Engraulis* are usually caught from the east and negligible amounts are caught from the west. *S. aurita* is caught from the east as well as the west of Alexandria, but more than 70% of *S. aurita* is caught from the east.

(3)- *Boops boops*, *Trachurus mediterraneus* and *S. maderensis* represented 8.27%, 23% and 3.71% of the total catch with a yield of about 130 tons, 66.5 tons and 58.3 tons respectively. These fish were mainly caught from the west. *Boops boops* is considered to be the second category in the catch of the west next to *S. aurita*.

Table (2)
 Monthly variations in the species composition of Sardine
 in comparison with the total sardine catch of
 Shanshoulla during 1978 fishing season.

SPECIES DATE	S. aurita	S. maderen- sis.	S. pfiche- rus.	Dussumeria	TOTAL
28 Feb. to 18 March, 1978.	736 (89.97)	-	82 (10.03)	-	818 (0.08)
29 March to 17 April, 1978.	10899 (14.14)	-	66168 (85.86)	-	77067 (7.16)
27 April to 18 May, 1978.	86267 (73.27)	-	31479 (26.73)	-	117746 (10.93)
27 May to 17 June, 1978	239824 (77.28)	1932 (0.62)	68498 (22.07)	69 (0.02)	310323 (28.81)
25 June to 16 July, 1978.	109308 (49.98)	30063 (13.75)	76322 (34.89)	3012 (1.38)	218705 (20.31)
25 July to 14 August, 1978.	36537 (54.42)	19374 (28.86)	7958 (11.85)	3265 (4.86)	67134 (6.23)
24 August to 13 September, 1978.	54675 (55.63)	6890 (7.01)	28955 (29.46)	7760 (7.89)	98280 (9.13)
15 September to 13 October, 1978.	50323 (27.45)	52 (0.03)	132067 (72.04)	892 (0.49)	183334 (17.02)
23 October to 10 November, 1978.	285 (7.93)	-	3307 (92.07)	-	3592 (0.33)
TOTAL 1978	588854 (54.68)	58311 (5.41)	414836 (38.52)	14998 (1.39)	1076999

(4)- *Scomber japonicus*, *Temnodon saltator* and *Lichia* sp. constituted lower percentages in the catch (2.56%, 1.28% and 1.10% respectively). *Scomber japonicus* as well as *Temnodon saltator* were mainly caught from the west, but *Lichia* sp. catch was more or less from the east.

Therefore, it can be generally demonstrated that the Sardine is the main fish dominating the catch of Shanshoulla during 1978 constituting 67.59% of the total catch, most of which was caught from the east of Alexandria. The other fish species - except *Engraulis* - were caught mainly from the west, specially *Boops boops* which is usually getting an economic importance as a pelagic fish.

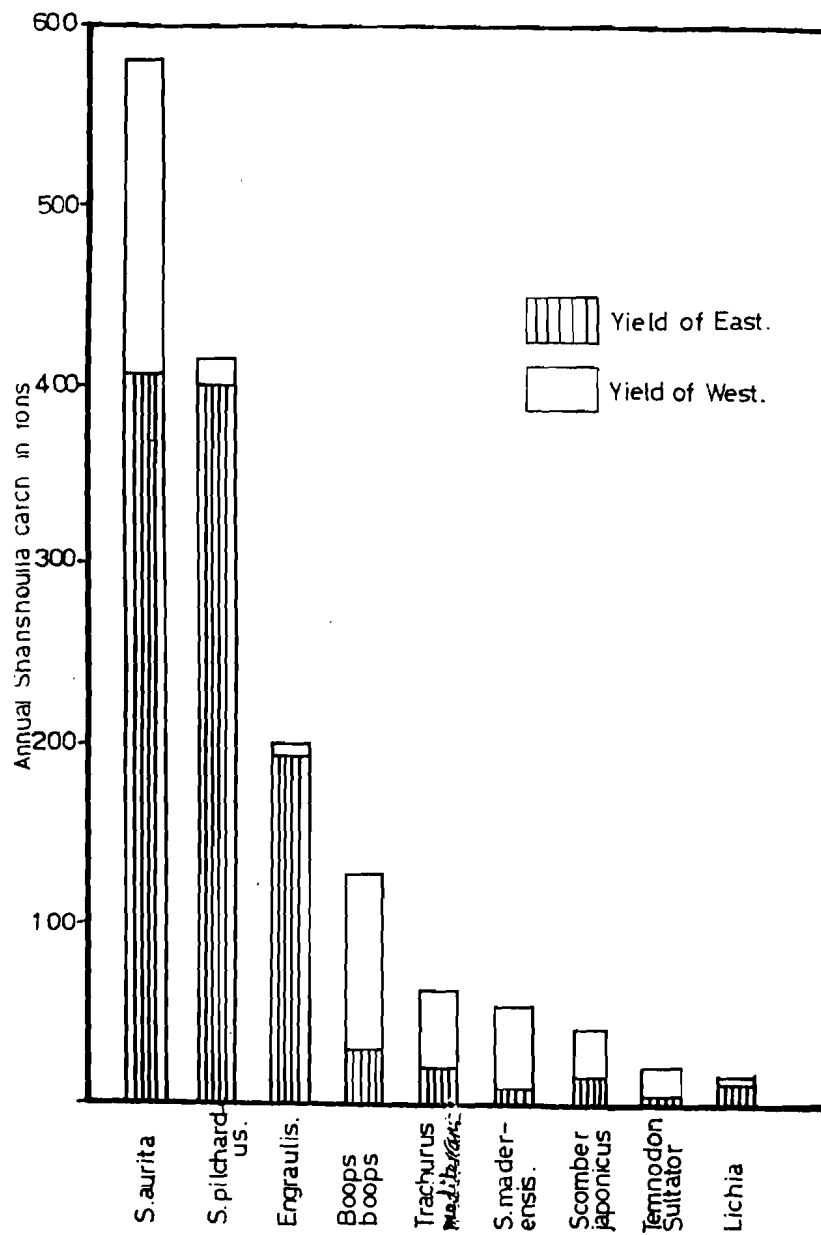


Fig. 2. The species composition of the annual catch of shanshoulla during the fishing season 1978.

Catch Per Fishing Effort

The catch per trip of shanshoulla is calculated in the present work from the recorded statistical data of the total catch and number of trips carried out in the three fishing seasons (1976, 77 and 78), Table (3). It is often taken as a basic assumption work that catch per unit effort is proportional to abundance. Therefore, the catch per trip of the various fish species caught by shanshoulla may give a more reasonable index about the abundance of these fish species in the fishing areas during the fishing seasons.

It is interesting to mention that shanshoulla usually operate one fishing operation per trip, this means that catch per trip of purse seine corresponds usually to catch per fishing operation or in other words corresponding to catch per unit effort with the assumption that purse seines operations are carried out with more or less similar gears.

Table (3)
Comparative data about fishing operations and
the commercial catch of Shanshoulla
during 1976, 1977 and 1978
fishing seasons.

ITEMS	FISHING SEASONS		
	1976	1977	1978
Number of fishing months	7	7	9
Actual number of fishing days	120	116	147
Summation of the monthly operating fishing units during the season	82	42	109
Maximum number of fishing units per month	20	11	25
Minimum number of fishing units per month	3	1	2
Average number of fishing units per month	11.7	6	12.1
Total number of fishing trips during the season	872	656	1647
Total fishing landing (in tons) during the whole season	711.6	800.7	1571.3
Average catch per trip (in kg.)	816	1220	954
Average catch per fishing unit (tons) throughout the whole season	60.9	133.5	129.9

1

It is clear that the total landed fish by shanshoulla increased gradually during the three successive seasons. A sharp increase in the landed fish is observed in 1978 (1371.3 tons) as compared with the two previous seasons of 1976 (711.6 tons) and 1977 (800.7 tons).

It is interesting to refer, in this respect, to the average number of fishing units per month during the three seasons, which was on the average of 12.1 ships during 1978, and 6.0 ships during 1977, while it was 11.7 ships in 1976. Therefore, the average catch per fishing unit throughout the whole season was 129.9 tons in 1978, as compared with 133.5 tons in 1977, and 60.9 tons in 1976.

On the other hand, the number of fishing periods was only seven months in the first and second years, but in the third year (1978) the fishing season lasted for nine months. Therefore, the number of fishing days was 120 and 116 days in 1976 and 1977 increasing to 147 days in 1978. The number of fishing trips was also a maximum of 1647 trips in 1978 and a minimum of 656 trips in 1977, while it was 816 trips in 1976.

It is logic therefore to expect a maximum total fish landing during the fishing season of 1978 due to the higher fishing effort carried out during this season in comparison with 1976 and 1977.

On this basis it was expected to have a minimum fish landing in 1977, as the fishing effort during 1977 was less than that of 1976, but the landed fish in 1977 was more than in 1976, inspite of the less effort performed in 1977 as compared with that of 1976.

Therefore, it is essential to suppose that other factors may affect the catchability of shanshoulla in the investigated areas.

Such factors may be: a) abundance of various pelagic migrating fish species caught by shanshoulla, b) the experience of the fishermen. It is well known that the local fishermen started fishing with light attraction during the last few years.

Such assumption may help in explaining the indirect proportionality between the fishing effort and the total landed fish by shanshoulla in Alexandria during 1976, 1977 and 1978.

Concerning the total landed fish of the various species, it can be concluded that the most abundant fish in the catch throughout the three fishing seasons was the *S. aurita*, where as the *S. pilchardus*, *Engraulis*, *Boops boops* and *T. mediterraneus* were respectively next in abundance . It is also obvious that the total landed fish of *B. boops* was maximum and more than that of *Engraulis* during 1976.

Therefore, the general sequence of the different landed fish species by

shanshoulla is the same during the three successive years of 1976, 1977 and 1978 and there is no significant difference in the species composition of the catch from one year to the other.

Total Catch Per Fishing Trip Of Shanshoulla During 1976, 1977 and 1978

The total catch per trip is monthly calculated during the three fishing season and graphically represented by Fig.(3). This graphical representation

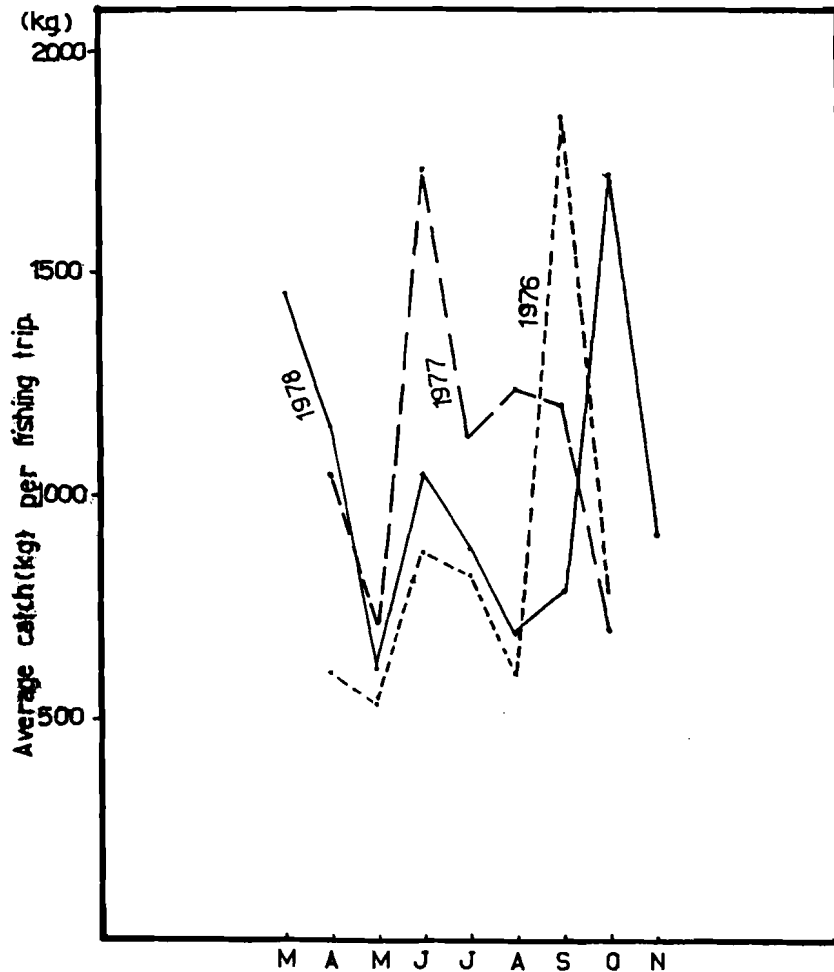


Fig. 3. The average total catch per trip of shanshoulla during 1976, 77 and 78.

shows that the monthly mode of fluctuations in the total catch is more or less similar during the three years. This may lead to the conclusion that the seasonal fluctuations in the abundance of pelagic fish caught do not vary much from one year to the other. It is also obvious that the catch per fishing trip was relatively high at the beginning of the season, decreasing to a minimum value during the next one or two months. This decrease may be due to the movement of some fish species away from the fishing grounds. These minimum values were usually followed by another increase in the catch per fishing trip. The second maximum value of catch per trip took place at the end of the fishing season. The catch per trip used to decrease sharply in the last fishing period during 1976, 1977 and 1978 fishing seasons. This last decrease is mostly due to unfavourable weather conditions specially that of water temperature.

However, the seasonal fluctuations in the shanshoulla catch per fishing trip are greatly related to the abundance of the migratory pelagic fish caught by such net. The abundance of such sensitive fish is affected on the other hand by the climatic conditions prevailing in the fishing area, with special reference to water temperature and current influencing the water transparency.

The catch per fishing trip in the eastern and western areas as well as the average catch per trip are also given in the technical and final reports of El-Sallum Project (Anon, 1979 and 1983).

It was observed that the most abundant fish in the eastern area were *S. aurita* and *S. pilchardus*, the average catch per trip of these two fish species was about half a ton. *Engraulis* was less abundant in this area with a catch of 225 kgs. per trip, but it can be still considered of the abundant fish in the east. The other fish species constituted a negligible amount in the pelagic fisheries of the eastern area.

As for the abundance of fish in the western area it was observed that the most abundant fish was *S. aurita* constituting about half the total catch per trip. *Boops boops* was also an abundant fish in the west if compared with the other fish species in this area or with the abundance in the eastern area: The average catch per fishing operation of *Boops boops* being 39 kg in the east and 121 kg in the west. *Trachurus mediterraneus* may be considered as one of the abundant fish in the west of Alexandria, having an average catch of 63 kg per fishing operation.

It may be generally concluded that the main abundant pelagic fish species in the two areas of investigation were *S. aurita*, *S. pilchardus*, *Engraulis* and *Boops boops* with average catch rates of 357 kg, 252 kg, 122 kg and 79 kg per trip respectively.

Analysis of the monthly catch per fishing trip of the three abundant fish species (*S. aurita*, *S. pilchardus* and *Boops boops*) in the Eastern and Western areas of Alexandria during 1978 gave the following observations;

(1) *S. aurita* was more abundant in the east than in the west. The catch per fishing trip in the east was comparatively low during April and May, increasing to maximum during June. The catch per fishing trip was minimum in November. A sharp increase in the abundance of *S. aurita* was observed in the beginning of the fishing season while a sharp decrease was observed during the end of the fishing season.

(2) The abundance of *S. pilchardus* was opposite to that of *S. aurita*. It is obvious that *S. pilchardus* was rare in the west having an average catch rate of 11.7 kg., while the average catch rate of this fish in the east was about half a ton per trip. The maximum catch rate of *S. pilchardus* in the east was 1106 kg during April while the minimum was 122 kg. during August. The catch per trip started to increase during the fishing periods next to August.

It is worth mentioning that *S. pilchardus* lives at a temperature not exceeding 22°C and that its schools are formed at a temperature not less than 20°C (Furnestin, 1957; Ben-Tuvia, 1958). The relatively less abundance of *S. pilchardus* in the shanshoulla fisheries may be attributed to this opinion. April and October may be the most favourable months for the abundance of *S. pilchardus* due to the climatic conditions prevailing during these months.

(3) *Boops boops* seems to be more abundant in the west of Alexandria in comparison with the eastern area. The catch per trip of *Boops boops* had a maximum unusual value in the west during March (1182 kg), average catch per trip of *Boops boops* was 39 kg in the east and 121 kg in the west of Alexandria.

CONCLUSION

The present investigation is considered to be the first approach on the commercial catch of Shanshoulla; the main recent fishing gear for sardine and other pelagic fish along the Egyptian Mediterranean coast. The following can be concluded from the present work;

1)- The actual number of fishing days in the first two years was more or less equal (120 days in 1976 and 116 days in 1977), while it was 147 days in 1978.

2)- The total number of fishing trips in 1976 was 872 trips, while it was 656 trips in 1977 and 1647 trips in 1978. This means that a comparatively high fishing effort was done in 1978.

3)- The average number of fishing units per month during the three seasons was on the average (11.7 ships in 1978), (6.0 ships in 1977) and (12.1 ships in 1978).

4)- The total landed fish was maximum (1571 tons) during 1978 and minimum (711 tons) during 1976. Although the fishing effort was minimum in 1977,

the shanshoulla yielded 800 tons, which is slightly higher than the fish landed in 1976.

5)- The average catch per trip was maximum (1220 kg) during 1977 and minimum (816 kg) during 1976, while it was (954 kg) during 1978.

6)- The average catch per fishing unit (ship) throughout the whole season was maximum (133.5 tons) during 1977 and minimum (60.9 tons) during 1976, while it was (129.9 tons) during 1978.

7)- The most abundant fish in the catch throughout the three seasons was the sardine (specially *S. aurita*), followed by *Engraulis*, *Boops boops* and *Trachurus mediterraneus*, respectively.

8)- There is no significant difference in the general species composition of the shanshoulla catch during the three successive years.

9)- *S. aurita* was more abundant in the east than in the west of Alexandria. On the other hand, the abundance of *S. pilchardus* was in an opposite manner to that of *S. aurita*. *B. boops* seems to be more abundant in the west of Alexandria.

ACKNOWLEDGEMENT

Thanks are due to Dr. W.F. wadie, Mr. S.N. Faltas, Miss. S. Allam, Mr. M. Wageh and Mr. S. Rezkallah for their assistance in the field work during the collection of data.

REFERENCES

- Al-Kholy, A.A. and S.K. El-Wakeel (Ed.) 1957. Fisheries of the South-Eastern Mediterranean Sea along the Egyptian coasts. Soviet-Egyptian Expedition, 1970-1971. *Bull. Inst. Ocean. Fish.*, V.
- Anonymus (1962 - 1972): Year Book of Fishery Statistics. Alex. Inst. Oceanogr. Fisheries. A.R.E.
- Anonymus (1979 and 1983): Technical Report No. 2/3 (1979) and Final Report No. III, (1983): Fisheries Investigations of the Sardine and Other Pelagic Fish, along the Egyptian Mediterranean Coast from Rashid to El-Sallum. Alex. Inst. Oceanogr. and Fish., A.R.E.
- Ben-Tuvia, A. 1958. Some studies on *Sardina pilchardus* from the East of Israel. *Fish. Coun. for the Medit.*, 5, 1958.
- El-Mehiawi, M.E. 1974. Changes in salinity and landing of six fish species in the shelf, north to the Nile Delta. *Bull. Inst. Ocean. Fish.*, IV.
- El-Zarka, S. and R. Koura 1965. Seasonal fluctuations in the production of the important food fishes of the U.A.R. waters of the Mediterranean Sea. *Alex. Inst. Ocean. Fish., Notes and Memoires*, 74.
- Furnestin, I. 1957. Premiers observations sur la biologie de la Sardine marocaine. *Rapp. et Proc. Verb. des reunions. Conc. Perm. Explor. Mer.*, V. 76, 1957.

- Gerges, M.A., 1976 a. The damming of the Nile River and its effects on the hydrographic conditions and circulation pattern in the south-eastern Mediterranean and the Suez Canal. Proceedings of the Symposium in the Eastern Mediterranean, Malta 1973, *Acta Adriatica*, XVIII, 11, pp.177-191.
- Hashem, M.T., 1972. Bottom trawling surveys for Abu-Kir / Rosetta Region during 1969-1970. *Bull. Inst. Ocean. Fish.*, 11.