

TREND OF SWORDFISH FISHERY IN A NORTHERN IONIAN PORT IN THE YEARS BETWEEN 1978 AND 1997

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SUMMARY

Data are reported concerning swordfish catch, effort and mean weight. These data were collected over a 20-year span of time at a port in the Gulf of Taranto (northern Ionian Sea), although small, is highly representative. Surveys carried out in this fishing area in the years between 1978 and 1997 permitted to follow the development of the fleet, both in terms of boat characteristics and fishing gear.

Longline had always been the traditional fishing gear, but starting in 1992, some boats at this port introduced driftnets. Catch and effort data collected in the 20 years under study showed fluctuations as far as longlines are concerned, whereas in the case of driftnets, after a rapid increase in the first three years, effort remained almost stable until 1997. The total catches and CPUE, on the other hand, underwent a certain decrease in the last four years. Starting in 1987, the average weight of the fish caught by longline showed a constant, decreasing trend, whereas the average weight of fish caught by driftnet remained almost constant from 1992 to 1997, albeit with a some fluctuation.

RÉSUMÉ

Des données sont fournies sur la prise, l'effort et le poids moyen de l'espadon ; ces données ont été rassemblées pendant 20 ans dans un port du Golfe de Tarente (dans le nord de la Mer Ionienne) qui, bien qu'il s'agisse d'un petit port de pêche, est très représentatif. Les enquêtes menées dans cette zone de pêche entre 1978 et 1997 ont permis de suivre l'évolution de la flottille en termes des caractéristiques des bateaux comme des engins de pêche.

La palangre a toujours été l'engin traditionnel, mais à partir de 1992 quelques bateaux de ce port ont commencé à pêcher au filet dérivant. Les données de capture et d'effort recueillies pendant 20 ans d'étude montrent des fluctuations en ce qui concerne les palangres, alors que celles sur les filets dérivants, après un essor rapide les trois premières années, sont restées pratiquement stables jusqu'en 1997; la prise et la CPUE globales, en revanche, ont quelque peu diminué depuis quatre ans. A partir de 1987, le poids moyen des poissons capturés à la palangre a montré une tendance décroissante constante, alors que le poids moyen des poissons pris au filet dérivant est demeuré presque constant de 1992 à 1997, bien qu'avec quelques fluctuations.

RESUMEN

Se presentan datos sobre la captura de pez espada, esfuerzo y peso medio. Estos datos fueron obtenidos en un período de veinte años en un puerto del Golfo de Taranto (norte del Mar Jónico) y aunque escasos, son muy representativos. Las encuestas realizadas en esta zona de pesca entre 1978 y 1997 permitió seguir la evolución de las características de los barcos y de los artes.

El palangre ha sido el arte tradicional, pero a partir de 1992, algunos de los barcos con base en este puerto iniciaron el uso de la red de deriva. Los datos de captura y esfuerzo recogidos en los veinte años del estudio, mostraban fluctuaciones en el palangre, mientras que el esfuerzo de las redes de deriva, tras un rápido aumento en los tres primeros años, permaneció estable hasta 1997. El total de capturas y la CPUE, por otro lado, experimentó un cierto aumento durante los cuatro últimos años. A partir de 1987, el peso medio de los peces capturados con palangre mostraban una constante tendencia al descenso, mientras que el peso medio de los capturados con redes de deriva permaneció casi constante entre 1992 y 1997, con algunas fluctuaciones.

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Introduction

The port of Porto Cesareo, located in the Taranto Gulf, is the oldest in the Northern Ionian Sea for swordfish (*Xiphias gladius* L.) fishing activities. In this port, the local fishermen's interest in this species was already apparent by the beginning of the '70s when the other local resources were beginning to show some signs of difficulty (De Metrio *et al.* 1981). Although, in this area systematic research on the fishery biology of the swordfish began only in 1984, first through national projects funded by the Italian government (Three-year Fishery Projects), and later through EU projects (MA 1 1011G FAR; XIV/MED/91-012), some research on swordfish fishing had already been made as from 1978 (De Metrio *et al.* 1981) and the first series of data collected between 1978 and 1986 were described in a paper (De Metrio e Megalofonou, 1987) presented in June 1987 at the "Fifth Technical Consultation on Stock Assessment in the Adriatic and Ionian Seas" of the GFCM.

Thanks to national and Community funding, research in this area has never since been interrupted, except in 1989, and the report of the historical series of data on catch and effort in this field may hence be of some interest, as well as of the evolution the fishing fleet and equipment have undergone in the last twenty years.

Materials and methods

In the course of various research projects on the fishery biology of large pelagic fish since 1978 in the Porto Cesareo port, daily data were collected on the number of vessels used for swordfish fishing, their size and characteristics, the fishing equipment used, the quantities (number and size) of swordfish caught and the number of days taken with the aid of observers at landing and on board. Calculation of the fishing effort and of the CPUE was made with the following formulae:

$$\text{For the long-line} \quad \text{Effort (E)} = 1/1000 \times \sum_{i=1}^n H_i \times D_i$$

where:

H_i = average number of hooks operated daily by each of the n boats;

D_i = number of fishing days for each of the n boats ($i=1, \dots, n$);

n = number of sampled boats;

1000 hooks = unit of effort.

$$\text{for the drift net} \quad \text{Effort (E)} = 1/1000 \times \sum_{i=1}^n N_i \times D_i$$

where:

N_i = average net length (m) operated daily by each of the n boats;

1000 m of net = unit of effort.

$$\text{CPUE(kg)} = \text{kg of fish/E}$$

$$\text{CPUE(N)} = \text{N. of fish/E}$$

Data were also obtained on the fishing season and areas.

Results and discussion

Fleet

The characteristics of the fleet are reported in Table 1.

The number of vessels that fished for swordfish during the twenty years under study ranged from a minimum of 8, registered in 1992, to a maximum of 21, registered in 1997. Stable until 1984, these rapidly increased in 1985 and except for sporadic dips between 1987 and 1992, then again remained stable with a further increase in 1997.

The length of the vessels varied between 10 and 14 m until 1994 and then increased slightly as from 1995, as new and more capacious vessels replaced some of the older ones.

The power of the engines also increased markedly over the years, passing from about 100HP to 117.3HP to reach 141.6 HP later.

Gears

Long-line

From 1978 to 1991, the only equipment used for swordfish fishing, in this port was the long-line. Until 1983, a mean of 700 hooks were used, which increased to 1,000 as from 1984 and then gradually attained the present figure of 1,600-1,700 hooks. These hooks are 10 cm in length.

Drift-net

The drift net was introduced in 1992 by 4 of the 8 vessels working during that year. It then increased rapidly; by the next year 7 vessels had drift nets, 10 in 1995 and 15 in 1997. All the vessels have now been converted.

Fishing period

The fishing season generally starts at the beginning of May but can exceptionally begin in April. Until ten years ago, it ended at the end of August but since 1988 there has been a tendency to carry on activities into the Autumn.

In any case, maximum activity is concentrated in the months of July and August.

The beginning of the fishing season is generally determined; by the marine weather conditions and the results of fishing trials made by a few vessels.

Up to ten years ago, the end was conditioned by the drop in catches and, above all, by the start of the albacore fishing season. In recent years, however, since albacore fishery has been concentrated particularly in the months of October and November, some vessels have protracted their swordfish fishing activities until the end of September or later (Fig. 1).

Fishing area

The fishing area is situated in the Gulf of Taranto at a distance of 20-40 miles from the coast, approximately between the isobaths 550 and 750 m.

Fishing effort and CPUE

The data on effort, catch and CPUE, for both long-line and drift net fishing are summarized in Table 2.

Long-line

The trend of the fishing effort, in terms of the total number of hooks and total catches, is reported in Fig. 2. Marked fluctuations can be observed during the

twenty years under study, with minimum values in 1982-83, 1992 and 1995-97. These fluctuations in effort are generally due firstly to the marine weather conditions but in this port they can also be due to the more or less favourable trend of their fishing activities.

The low values for long-line effort recorded as from 1992 are probably due to the introduction of drift nets by some vessels.

The trend of values for total catches is clearly correlated with the effort values; this is particularly evident up to 1984. After this year, total catches show a change in trend which, although parallel to the total effort, remains characterized by lower values.

The figures for CPUE present very slight fluctuations over the years, with values ranging from 1.50 in 1981 to 3.93 in 1988. A strong peak can be observed in 1985, with values of 8.24.

Overall, the trend appears parallel to the x axis. On the contrary, as regards biomass, despite some fluctuations, the CPUE shows a constant tendency towards decrease, passing from a maximum of 98.30 in 1980 to a minimum of 30.58 in 1994 (Fig. 3)

Drift net

As has already been mentioned, the historical series of data on drift net fishery is more reduced than the one on long-line. In addition it only refers to the 1992-1997 period. The data on catch and effort show a concordant tendency towards increase up to 1994, after which the data have remained more or less constant, despite slight fluctuations (Fig. 4)

In the course of the six years, the values for effort varied from a minimum of 458 (x1000) in 1992 to a maximum of 1,864(x1000) in 1994.

The total catches varied from a minimum of 5.3 MT in 1992 to a maximum of 16.5 MT in 1994.

Unlike the long-line data, both CPUE (N) and CPUE (kg) values registered some slight fluctuations thus showing a consistent downward trend (Fig. 5).

Average weight

For the long-line the maximum average weight (48.2 kg) was recorded in 1980 and the minimum value (10.5 kg) in 1997 (Tab. 2).

For a more in-depth analysis of the yearly variations it would seem advisable to consider the drop in 1980 as an occasional one and examine the curve starting from 1981 (De Metrio et. al, 1987).

For the drift-net the maximum average weight (30.5 kg) was recorded in 1996 and the minimum one (18.0 kg) in 1993.

Fig. 6 and Fig. 7 show the trend of the average weight of the animals caught with the long-line and with the drift-net respectively.

Length frequency distribution

The study on size distributions was carried out from 1985 to 1997. The data of the 1994-1997 period are reported in this paper. For the 1985-1988 period see the Final Reports submitted to the Ministry of the Merchant Navy and for the 1990-1993 period see the Final Reports of the EC projects "MA 1 101 IG FAR" and "XIV/MED/91-012".

Fig. 8 shows the size distributions of the animals caught by the drift net and by the long line over the 1994-1997 period.

The animals with a LJFL<120 cm accounted for 66.5% to 92% for the long line and 41.8% to 69% for the drift net.

Conclusions

On the basis of the results of the investigations carried out we can conclude that swordfish fishing in this port of the Northern Ionian Sea has undergone a certain evolution. The operating fleet has remarkably developed both in terms of number and size of the vessels. The fishing gears, first the long line, and then, starting from 1992, the drift net, even though almost untouched in their structures, have changed their dimensions. Even if the long-line fishing period and the relevant operating vessels have remained almost unchanged and the long-line dimensions have steadily increased, the effort values of this gear have been fluctuating with a certain downward trend.

On the contrary, after a first upward trend, drift-net effort values have remained steady over time.

Both the long-line and the drift-net catch values seemed to be overlapping their relevant effort ones, but after this first period the trend of total catches, though remaining parallel to that of the effort, has been characterized by lower values. (Fig.2).

The average weight of the animals caught with the long line has constantly been decreasing as from 1980. This decreasing trend is also confirmed by an almost steady trend of the CPUE (N) versus an evident negative trend of the CPUE (kg) for this gear.

The animals caught with the drift net always had an average weight higher than the ones caught with the long line.

Length frequency distribution data have always shown, at least for the long line, high percentages of animals with a LJFL<120 cm.

Acknowledgments

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Tab. 1 - Characteristics of the fleet and of the gear used for the swordfish fishery carried out at Porto Cesareo in the time period 1978-1997.

Year	N Boats			Mean GRT (t)	Length (m)	HP
	Total	Long-line	drift-net			
1978	10	10	-	9	10-14	90-105
1979	10	10	-	9	10-14	90-105
1980	10	10	-	9	10-14	90-105
1981	10	10	-	9	10-14	117.3
1982	10	10	-	9	10-14	117.3
1983	10	10	-	9	10-14	117.3
1984	9	9	-	9	10-14	117.3
1985	16	16	-	9	10-14	117.3
1986	15	15	-	9	10-14	117.3
1987	13	13	-	9	10-14	117.3
1988	12	12	-	9	10-14	117.3
1990	15	15	-	9	10-14	141.6
1991	14	14	-	9	10-14	141.6
1992	8	4	4	9	10-14	141.6
1993	14	7	7	9	10-14	141.6
1994	16	9	7	9	10-14	141.6
1995	17	7	10	9	10-16	141.6
1996	14	7	7	9	10-16	141.6
1997	21	12	15	9	10-16	141.6

Tab. 2 - Swordfish fishery data collected at Porto Cesareo by on board and at landing observers in the time period 1978-1997.

Year	Long-line					
	Effort (x 1000 hooks)	Catch (MT)	Catch N°	Average weight kg	CPUE kg	CPUE N°
1978	491.17	32.646	1375	23.7	66.50	2.80
1979	451.50	40.047	1387	28.9	88.90	3.10
1980	559.50	53.888	1118	48.2	98.30	2.00
1981	256.94	14.805	397	37.3	57.80	1.50
1982	150.10	11.632	325	35.8	77.50	2.20
1983	116.25	6.340	192	33.0	54.20	1.70
1984	232.80	18.200	660	30.5	78.18	2.83
1985	334.40	19.674	1084	19.5	58.83	8.24
1986	264.75	10.871	476	24.1	41.07	1.80
1987	452.40	21.450	1178	18.2	47.40	2.60
1988	316.90	21.109	1247	16.9	66.60	3.93
1990	454.50	29.025	1702	17.1	63.86	3.74
1991	535.40	29.300	1701	17.2	54.73	3.18
1992	116.40	4.690	284	16.5	40.30	2.40
1993	394.33	20.074	1385	14.5	50.91	3.51
1994	250.60	7.663	306	15.1	30.38	2.02
1995	171.30	5.727	510	11.2	33.43	2.98
1996	93.20	3.052	197	15.5	32.74	2.11
1997	212.40	8.520	813	10.5	40.11	3.83
Year	Drift-net					
	Effort (x 1000m)	Catch (MT)	Catch N°	Average weight kg	CPUE kg	CPUE N°
1992	458.00	5.337	273	19.6	11.00	0.55
1993	868.00	10.008	555	18.0	11.53	0.64
1994	1864.00	16.482	772	21.3	8.84	0.41
1995	1638.00	92.49	402	23.0	5.64	0.24
1996	1266.50	77.89	255	30.5	6.15	0.20
1997	1677.0	10.379	540	19.2	6.19	0.32

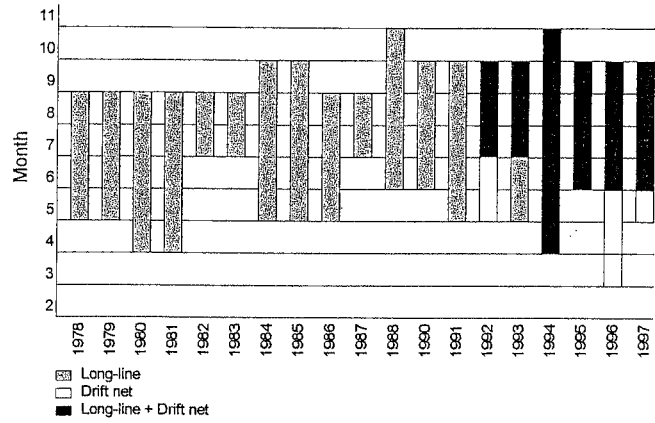


Fig. 1 - Period of swordfish fishery operates by the fleet of P. Cesareo during 1978-1997.



Fig. 3 - CPUE in biomass and in number of specimens of swordfish captured by long-line during the period 1978-1997.

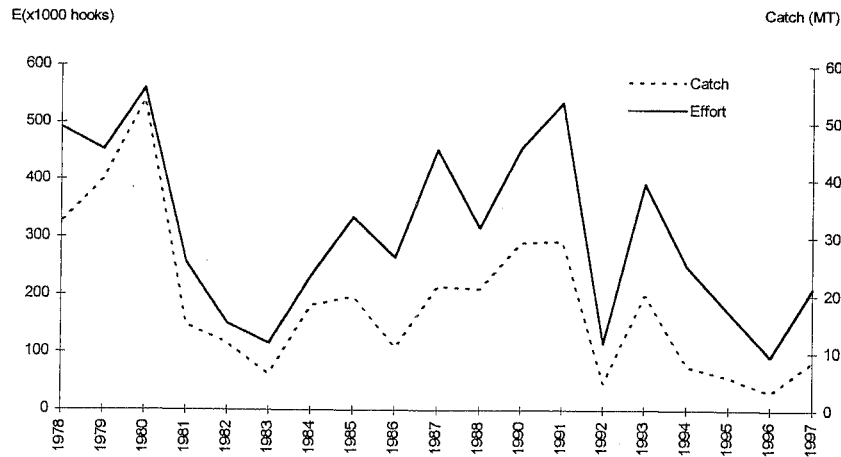


Fig. 2 -Catches and fishing effort for swordfish caught by long-line during the period 1978-1997.

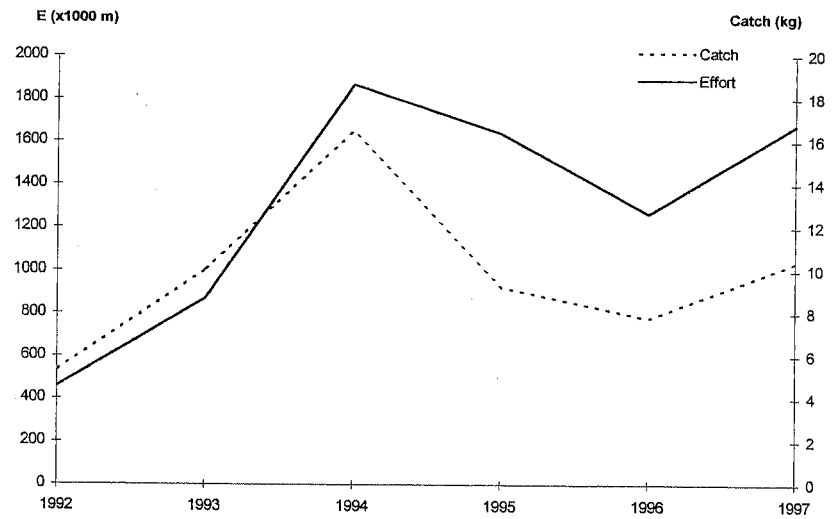


Fig. 4 - Catches and fishing effort for swordfish caught by drift-net during the period 1978-1997.

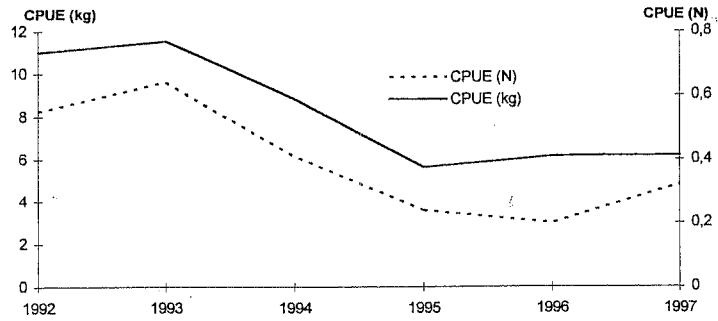


Fig. 5 - CPUE in biomass and in number of specimens of swordfish captured by drift net during the period 1978-1997.

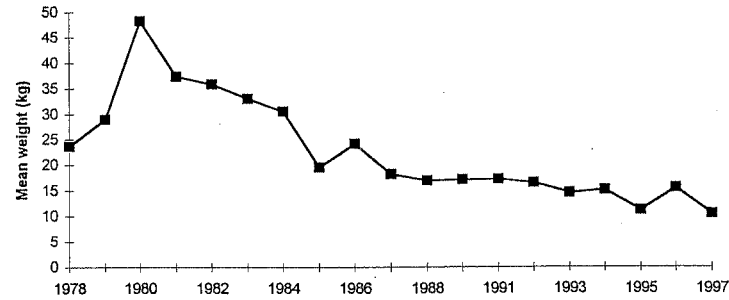


Fig. 6 - Annual variations of average weight of swordfish captured by long-line.

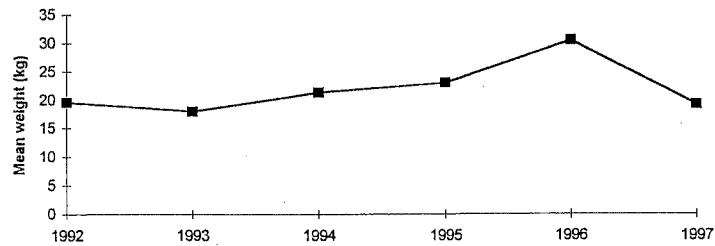


Fig. 7 - Annual variations of average weight of swordfish captured by drift-net.

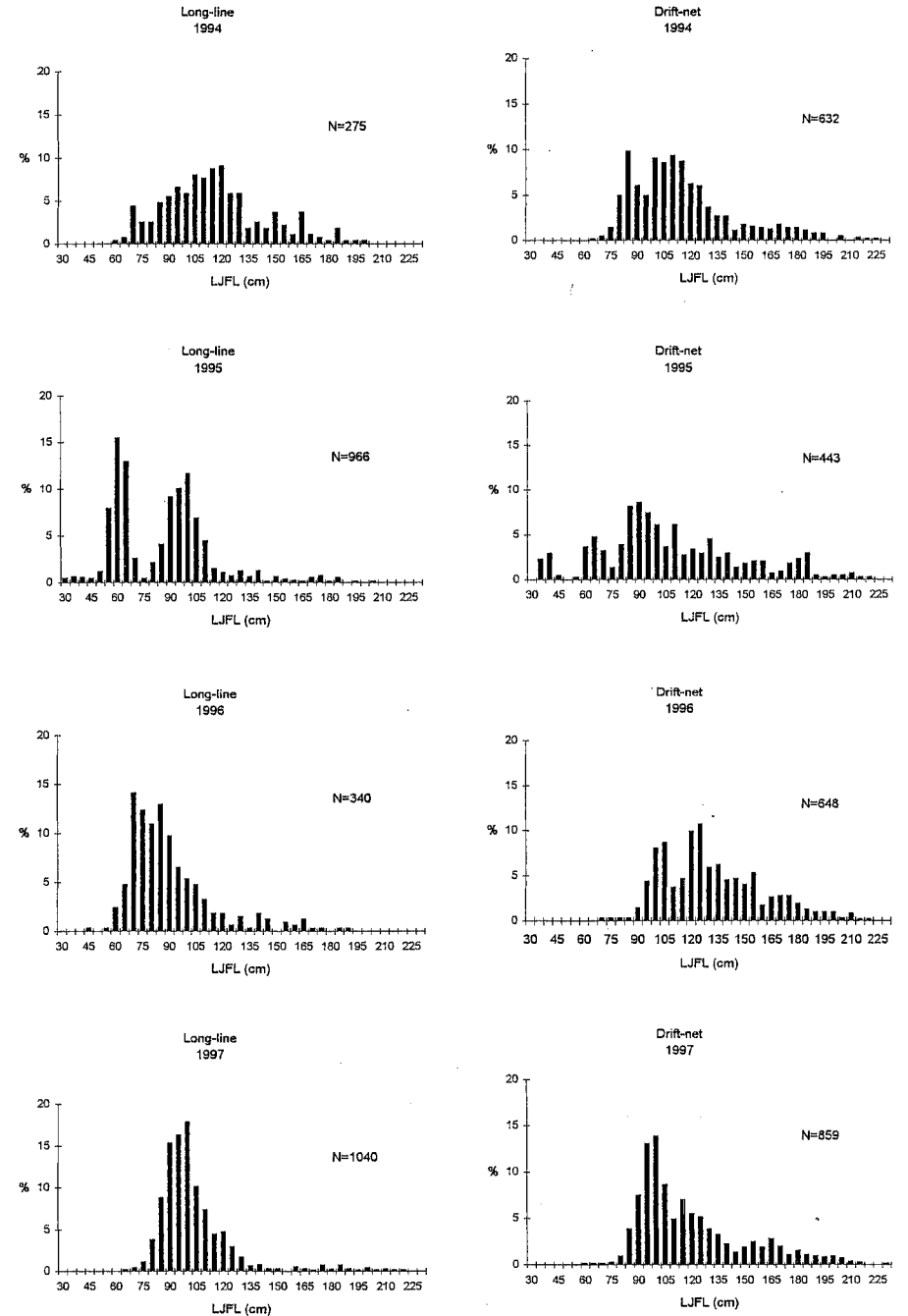


Fig. 8 - Length frequency distribution of swordfish caught by long-line e drift-net during the period 1994-1997.