

## LONGLINE SWORFISH FISHERY IN THE LIGURIAN SEA: EIGHT YEARS OF OBSERVATIONS ON TARGET AND BY-CATCH SPECIES

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### SUMMARY

The swordfish fishery in the Ligurian Sea has been studied since 1990 thanks to the funding by the Italian Ministry for Agricultural Policy (Ministero per le Politiche Agricole), within the framework of the Italian Fishery Act 41/82, and the European Community.

At present, in the Ligurian Sea the longline fishery produces about 50-150 MT per year. There are 52 boats operating in a rather constant way and another 14 vessels have irregular activity. The gear used is floating longline and the fishing operations have a daily rhythm with an average number of hooks of 750. Since 1994, a "Ligurian tuna longline" is sometimes used instead of the swordfish longline (when the by-catch of tuna is abundant, i.e. coinciding with the full moon in July or for a few days in the fall).

From two sampling points, the ports of Imperia and Sanremo, landing, effort and relative CPUE data are recorded both for swordfish and for by-catch species, including sharks, which are considered a commercial product. Swordfish CPUE declined until 1992 and then slowly increased again. A similar increasing trend was reported for the by-catch species.

Finally, from on-board observations, the presence and the importance of the discarded species were also analyzed. This type of study is important in the area because a cetacean sanctuary has been established since 1990 with a unilateral and provisional fishery act of the Italian Government.

### RÉSUMÉ

La pêche à l'espadon en Mer Ligure est étudiée depuis 1990 grâce au financement du Ministère de la Politique Agricole (dans le cadre du décret italien sur la pêche 41/82) et de la Communauté Européenne.

A l'heure actuelle, la pêche à l'espadon en Mer Ligure donne 50 à 150 TM par an. Les bateaux concernés de façon plus ou moins régulière sont au nombre de 52 ; 14 autres pêchent de façon sporadique. L'engin est la palangre flottante, et la pêche suit un rythme quotidien avec 750 hameçons en moyenne. Depuis 1994, on utilise parfois une "palangre thonière ligurienne" au lieu de la palangre à espadon (ceci lorsque la prise accessoire de thons est importante, à l'occasion de la pleine lune en juillet ou pendant quelques jours en automne).

On a enregistré dans deux points d'échantillonnage, les ports d'Imperia et Sanremo, les débarquements, l'effort et la CPUE relative de l'espadon et des espèces accessoires, y compris les requins qui sont jugés être d'importance commerciale. La CPUE de l'espadon a baissé jusqu'en 1992, puis est lentement remontée. Une hausse de même ordre a été enregistrée en ce qui concerne les espèces accessoires.

En dernier lieu, la présence et l'importance des espèces rejetées ont aussi été analysées d'après les observations effectuées à bord. Ce type d'étude est important dans la zone, du fait qu'une réserve de cétacés y existe depuis 1990 aux termes d'un décret unilatéral et provisoire du gouvernement italien.

### RESUMEN

La pesquería de pez espada en el Mar de Liguria ha sido estudiada desde 1990 gracias a la financiación del *Ministero per le Politiche Agricole* (en el marco de la ley sobre pesquerías italianas 41/82) y de la Comunidad Europea.

Actualmente, la pesquería palangrera de pez espada en el Mar de Liguria produce entre 50 y 150 t anuales. Se compone de unos 52 barcos con actividad regular y de otros 14, de forma irregular. El arte empleado es el palangre flotante y las operaciones son diarias con una media de 750 anzuelos. Desde 1994, en ocasiones se emplea un "palangre ligure para túnidos" en lugar del palangre para pez espada (cuando la captura fortuita de túnidos es abundante, es decir, coincidiendo con la luna llena de julio o unos cuantos días en otoño).

En los dos puertos de muestreo, Imperia y Sanremo, se han registrado los desembarques, esfuerzos y CPUE relativa, tanto para el pez espada como para las especies de captura fortuita, incluyendo el tiburón, que se consideran productos comerciales. La CPUE del pez espada descendió hasta 1992 y desde entonces aumentó lentamente. Se registró un incremento similar en el caso de las especies de captura fortuita.

Finalmente, y en base a observaciones a bordo, se analizó la presencia e importancia de las especies descartadas. Este tipo de estudio es importante en la zona ya que en 1990 se creó allí un santuario de cetáceos por una ley de pesquerías unilateral y provisional del Gobierno de Italia.

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At present in the Ligurian Sea the longline swordfish fishery produces about 50 – 150 metric tons per year (Tab. 1); in the most recent season the estimated total quantity of Ligurian landings, including those derived by driftnets, was 195 metric tons.

The boat involved in a rather constant way are 52; other 14 have an irregular activity. In respect of other Italian swordfish fleets this one have a rather artisanal character in the sense that more than 30% of the boats have a small size (less than 10 m). Moreover the fishing operations have a daily rhythm and the number of hooks per haul is usually 600 – 1200, with an average of 750.

Table 1 – Swordfish longline fishery in the Ligurian Sea, 1990 - 1997

	Estimated catches of the Ligurian Sea (metric tons)	Observed catches at Imperia and Sanremo	Observed effort (n° of hooks x 1000)	Average weight of fish kg	Number of fish	Observed by-catch (metric tons)
1990	150	38.840	300.15	22.156	1753	0.96
1991	94	29.870	354.119	24.22	1233	3.358
1992	44	12.265	189.128	25.6	479	2.881
1993	100	26.159	312.9	19.89	1315	1.212
1994	184	71.391	785.812	18.99	3759	7.209
1995	107	43.02	431.062	19.7	2184	7.393
1996	135.52	62.696	526.19	26.3	2383	9.567
1997	138.9	61.21	517.195	25.06	2442	9.256

The gear is the floating longline. The main line is a monofilament nylon, 1.4 mm ø, about 5000 m long per 100 hooks; it bears 100 branchlines of double monofilament nylon 1 mm ø with hooks number 2 - 3, three flagpole units and 50 floating devices (bottles and balls).

Usually the gear is cast during 3 hours, then drifts in its complete form during 3 - 4 hours and after the hauling begins which has an overall duration of 5 - 8 hours. We have observed the fishing on board vessels of Western Ligurian Sea (from Imperia and Sanremo). Given the currents which characterise the area the sea surface covered by the gear is very important. Fig. 1 shows two cases of drifting of a single set of longlines and Fig. 2 the coverage due to a single boat during a fishing season.

Thanks to the daily contact of the boats with the fish market some by catch items as sharks, which in other situations could be discarded, are almost regularly landed.

We have established two sampling point, in Imperia and Sanremo harbours, and we have recorded landings and efforts (Tab. 1) from which the following CPUE (kg per 1000 hooks) were calculated (Tab. 2).

Table 2 – Annual mean CPUE (kg/1000 hooks) of swordfish and by catch species registered for swordfish longline in Imperia and Sanremo landings points.

	Swordfish	Bluefin	Sharks	Billfishes	Dolphin fish	Pomfret	Other species
1990	129.4	1.7	1.9	0.1	0.55	0.45	0.05
1991	84.35	2	8	-	0.15	0.2	0.05
1992	64.85	1.6	7.5	0.02	-	0.01	0.05
1993	83.6	3	1.4	0.2	0.3	0.1	0.5
1994	90.85	7.15	2.55	0.2	0.75	0.2	0.5
1995	99.8	7.6	5.75	1.3	1.6	0.1	0.45
1996	119.15	19	5.25	0.7	0.37	0.1	0.65
1997	118.35	11.8	2.2	2.3	0.8	0.9	0.35
Average	98.8	6.73	4.3	0.6	0.57	0.26	0.3

The general trend of swordfish CPUE (Tab. 2) seems to reflect that of the Mediterranean total catches according ICCAT (1997) and FAO (Fiorentini et al. 1997) (Fig. 3). In fact a maximum was registered in the eighties (1988) in coincidence with the maximal diffusion of driftnets; in the following period catches suddenly declined till 1991 and then slowly increased again.

The sizes (LJFL) of the sampled fish are shown in Fig. 4. It is interesting to note that in autumn 1994 we recorded a great abundance of young fish (the same was verified for age 0 bluefin) and both this cohort and that of the following year form in the 1997 the bulk of the catches. In fact the range of length 110 - 140 cm LJFL corresponds to male age 2 (110.5 cm LJFL) and 3 (cm 126 LJFL) plus female age 2 (114 cm LJFL) and age 3 (132 cm LJFL), according the growth curves obtained in the area (Orsi Relini et al. 1996), plus the growth of these fishes from July onward during the fishing season (July - November).

In relation to the abundance of tuna in 1994 some fishermen of Imperia and Sanremo developed a new floating longline specifically addressed to tuna. In respect of swordfish longline, this gear has branchlines closer each other and smaller hooks; in fact in the Ligurian Sea the most abundant biomasses of tuna are represented by age 1+ - 2+ - 3+ and 4+ (Liorzou & Bigot 1991; Orsi Relini et al. 1997). This gear is therefore very different both from longlines for large fish used particularly in southern Italian seas, and from the albacore longline which has smaller hooks.

This "Ligurian tuna longline" is used instead of the swordfish longline only when tuna are abundant; this event in the observed period 1994 - 1997 occurred in coincidence with the full moon of July or for few days in autumn.

Bluefin is the first of the by-catch species of the swordfish longline with a CPUE of 6.73 and becomes obviously the first in the catches of tuna longline. The sizes of fish caught with both the gears are shown in Fig. 5. The above mentioned age groups 1+, 2+, 3+ and 4+ are clearly evidenced.

The second rank of by-catch species (CPUE = 4.3) is represented by sharks: *Prionace glauca* forms about 95% of number caught, the rest of commercial product being *Alopias vulpinus*, *Isurus oxyrinchus*, *Lamna nasus* and *Carcharhinus plumbeus*.

Other teleost fishes as *Tetrapturus* sp.p, *Coriphaena hippurus*, *Brama brama*, *Thunnus alalunga*, *Sarda sarda*, *Polyprion americanus*, *Auxis* sp., represent occasional by-catch for a total CPUE of about 1.8 kg.

Observers on board allowed to complete the data about the longline catches registering also the discards. An observed effort of 36450 hooks gave a catch of 334 individuals, 249 of which of commercial value (Fig. 6): *Xiphias gladius* (187), *Thunnus thynnus* (24), *Prionace glauca* (11), *Carcharhinus plumbeus* (1), *Brama brama* (9), *Coriphaena hippurus* (6), *Sarda sarda* (2), *Polyprion americanus* (5).

Discarded specimens were *Dasyatis violacea* (85), *Caretta caretta* (2), *Mobula mobular* (1), *Mola mola* (1), the last three released alive after the cut of the branchlines.

The study of discards is important in the area because a cetacean sanctuary was established since 1990 - 1992 with unilateral and provisional fishery acts of the Italian Government (Italian driftnetting was banned in an area of 20000 km<sup>2</sup> in the Central Western Ligurian Sea). In the meantime work is in progress for the enforcing of an international marine reserve.

The impact of longline fisheries on protected species, such as turtles and especially cetaceans resulted of minor importance, if not null, in respect of that of driftnets previously studied in the area (Di Natale et al. 1992).

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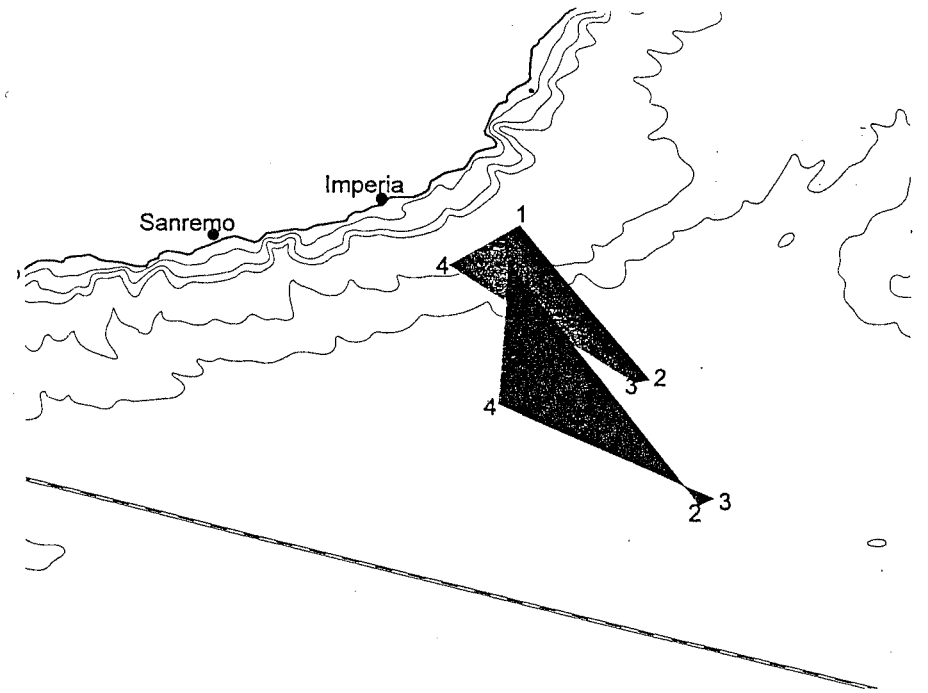


Fig. 1 - Two example of longline setting: figures indicate the drifting of the gear.

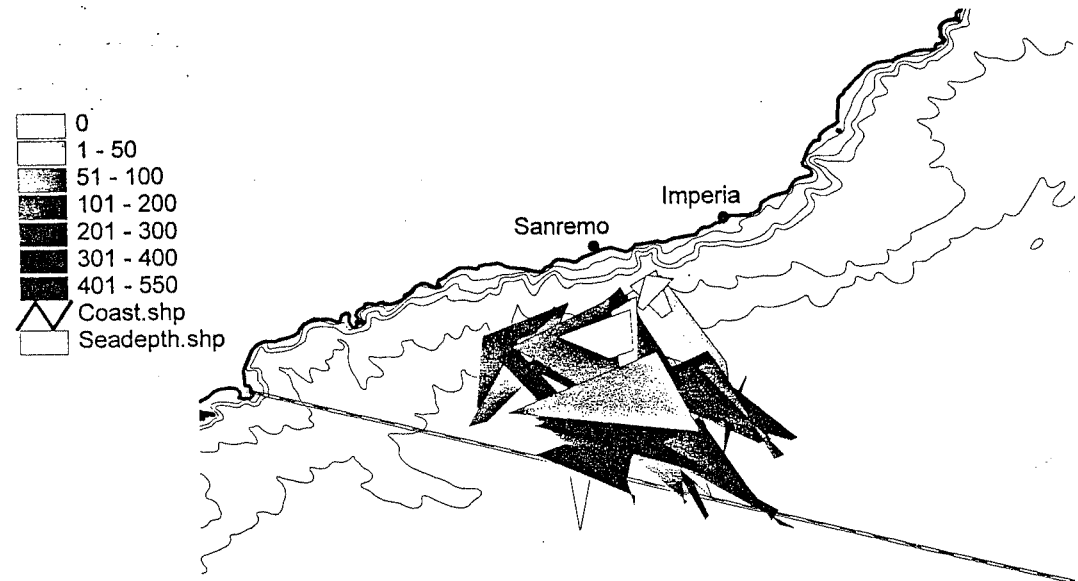


Fig. 2 - Sea surface covered by the longlines operated by a single boat during a fishing season. Various shades of grey indicate the swordfish CPUE obtained in each fishing day (kg x 1000 hooks)

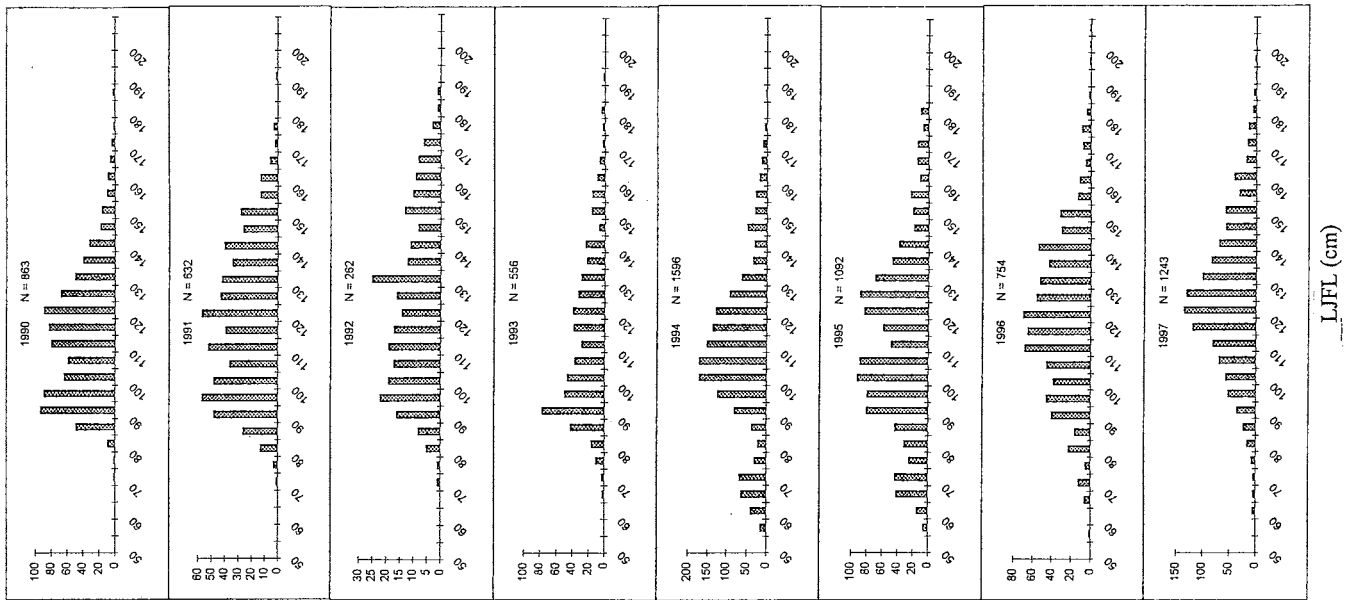


Fig. 4 - Length/frequency distributions of swordfish caught by longline in the Western Ligurian Sea

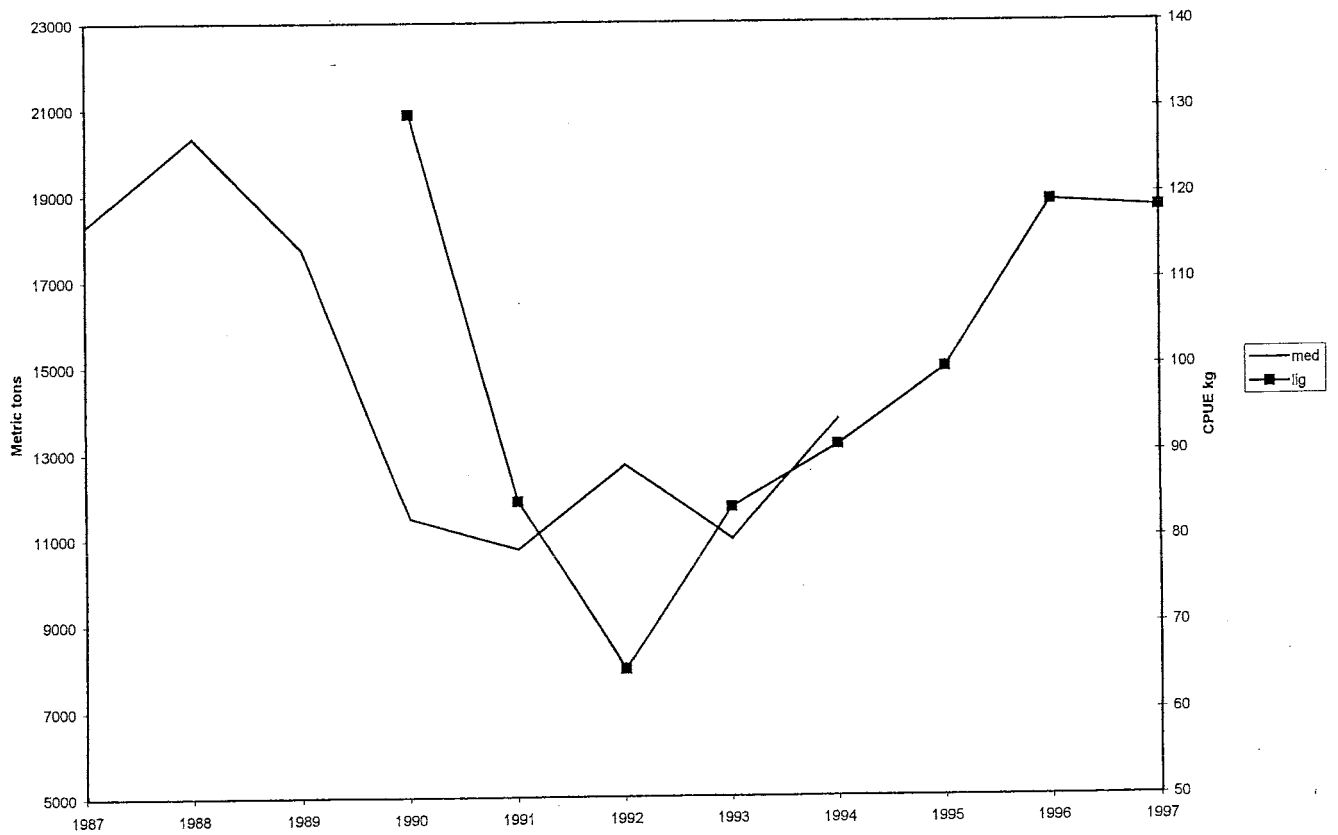


Fig. 3 - Trends of total Mediterranean catches of swordfish (metric tons) according ICCAT (1997) and the Ligurian longline fishery CPUE (Kg)

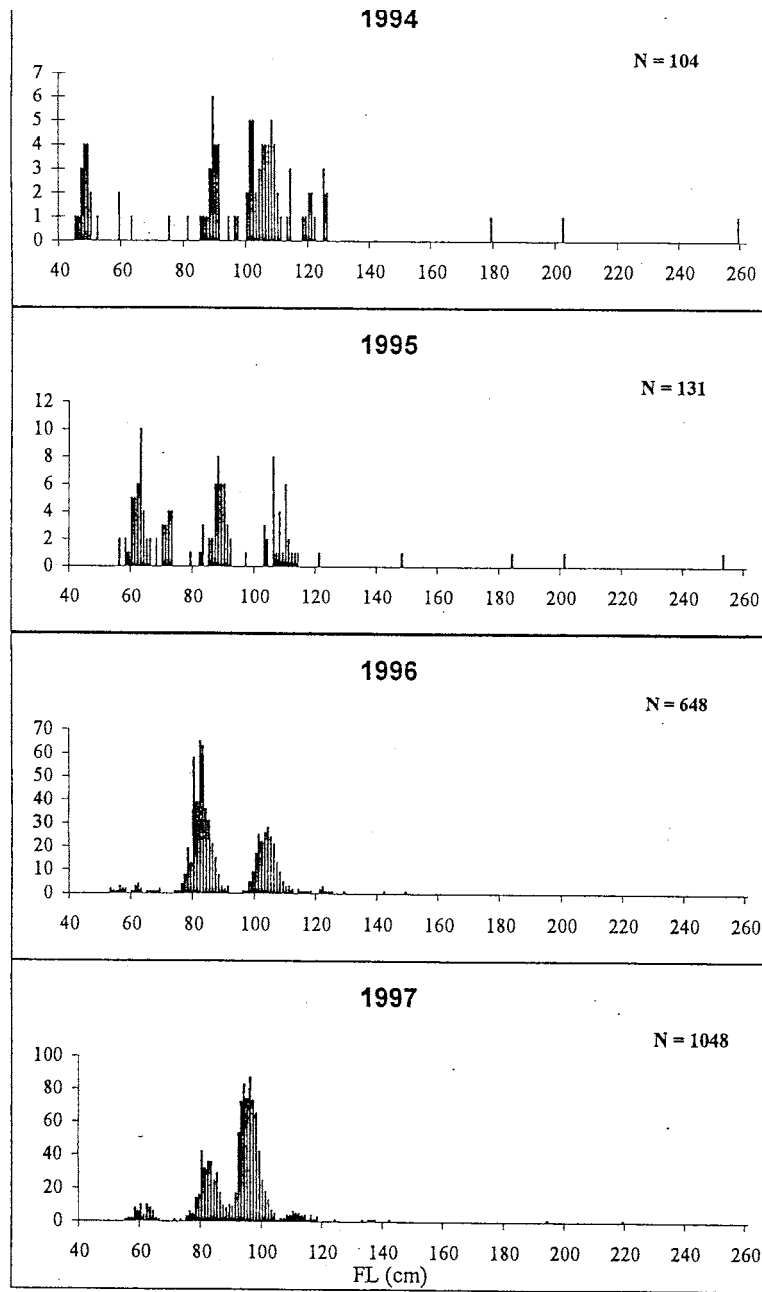


Fig. 5 - Length/frequency distributions of bluefin tuna caught by swordfish and tuna longline in the Western Ligurian Sea.

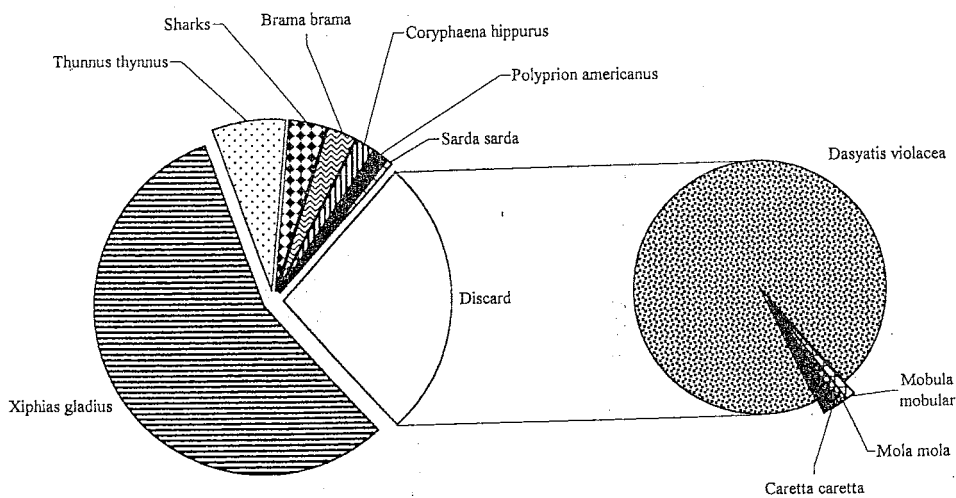


Fig. 6 - Composition of the catches of longline observed on board. Fishing operations: 60; n° caught = 334 with an effort of 36450 hooks. On the right detail of discarded species (N = 89)