

**SWORDFISH (*Xiphias gladius*, LINNAEUS) FISHING EXPERIMENT IN MADEIRA EEZ**

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A fishing experiment on swordfish using drift surface longline was carried out in Madeira waters from September, 1989, to May, 1990. The main catches occurred in March with a CPUE of 533.48 kg/1000 hooks.

The swordfish length distribution ranged from 77 cm to 210 cm LJFL, with modes being in the length range of 120-125 cm. Sex identification was done on 130 fish and a qualitative analysis of the stomach contents was carried out.

**RESUME**

Une expérience de pêche à l'espadon à la palangre dérivante de surface a été menée dans les eaux de Madère de septembre 1989 à mai 1990.

Les principales captures ont été effectuées en mars avec une CPUE de 533,48 kg/1000 hameçons.

La distribution de taille des espadons allait de 77 à 210 cm de longueur maxillaire-fourche, les modes se situant dans la gamme des 120-125 cm.

L'identification du sexe a porté sur 130 poissons, et une analyse qualitative des contenus stomacaux a été effectuée.

**RESUMEN**

Desde el mes de septiembre 1989 hasta el mes de mayo de 1990 se llevó a cabo en Madeira un experimento de pesca de pez espada con palangre de superficie a la deriva.

La mayor captura se obtuvo en marzo, con una CPUE de 533.48 kg/1000 anzuelos.

La distribución de tallas del pez espada estaba en un rango de 77 a 210 cm LJFL, con modas en el rango de tallas de 120-125 cm.

Se identificó el sexo de 130 peces y se llevó a cabo un análisis cualitativo de los contenidos de estómagos.

**1. INTRODUCTION**

Since long time ago, swordfish has been caught incidentally in Madeira, mainly by traditional deep longlines targetting the black scabbardfish (*Aphanopus carbo*). Japanese tuna longliners also record significant amounts of swordfish in this area. A small number of specimens are sporadically caught by the sport fishing gears operating during summer time around the islands (Fig.1).

The landings occur all the year round, increasing during winter season.

All these reasons motivated the Regional Directorate for Fisheries to plan a fishing experiment in order to evaluate if the resource could be exploited by local fishermen as a new fishery alternative.

The experiment was performed with the aim of estimating the CPUE and the mean weight in the catch for the area. Fishing operations took place in waters of the Regional EEZ, usually close to the islands (3 to 6 nautic miles off shore). They were carried out from September 1989 up to mid-May 1990. A trip operation made in January 1991 was also included in this analysis.

The fishing gear used was the drifting surface longline conducted on board of a medium size vessel equipped for the purpose.

A sampling program carried out on board provided information on swordfish length and weight distribution, sex composition and stomach contents.

**2. FISHING METHOD AND OPERATION**

One used the Spanish pelagic longline gear built under the coordination of a Spanish fisheries technician. The main line was composed by twisted polyethylene (PE Ø 3.0 mm) suspended from the surface by float lines of 5-7 fathoms long of twisted polyethylene (PE Ø 6.0 mm). The snoods were spaced at regular intervals along the main line (16 fth) and were made of monofilament (Ø 1.8 mm) with a straight barble hook with plate (17/0) on the end.

The longline was set at dusk and retrieved at dawn. The setting operation took 2-3 hours while the hauling one usually took 6-8 hours, depending on the catch and weather conditions.

The number of sets during the experiment were 22 and varied from 300 to 875 hooks per set (1 set=1 operation day). The gear was baited with spanish mackerel (*Scomber japonicus*) and occasionally with squid (*Ommastrephes bartrami*).

### 3. CATCH, EFFORT AND CPUE

A total of 4,237.8 Kgs (dressed weight) of swordfish were caught during the experimental period, using 13,785 hooks in 22 operation days. Monthly catch and number of hooks used are shown in Tabel I and Figure 2.

The catch per unit of effort (CPUE) was expressed in dressed weight of swordfish (Kgs) per 1000 hooks (Tab. I ;Fig. 3). Analysing the CPUE per month, one observed that main values were achieved from January to April 1990, with a maximum value in March (533.48 Kgs). The catch rate obtained in January 1991 (310.43 Kgs) is also important, considering the former period.

These catch rates are comparables to the ones obtained by spanish longline fishery in NE Atlantic (Mejuto and Garcés, 1987; Rey et al., 1987).

### 4. ASSOCIATED SPECIES

Other species caught in this fishery were usually sharks and batoid fishes (Fig. 4). The number of swordfish caught was 20% of total capture. Common species in the catch were:

- Blue shark (*Prionace glauca*) with 71%;
- Mako shark (*Isurus oxyrinchus*), 2%;
- Stringay sp. (*Dasyatis violacea*), 2%;

Some specimens of thresher shark (*Alopias* sp.), smooth hound (*Mustelus mustelus*), bigeye tuna (*Thunnus obesus*) and lancet-fish (*Alepisaurus ferox*) also included the catch in small number.

### 5. SIZE CATCH DISTRIBUTION

The length frequency distribution of swordfish (LJFL) for the most significant months and total period is shown in

Tabel II and Figure 5. The species length distribution ranged from 77 to 210 cm LJFL. When analysing the monthly length frequencies a displacement of the modal value is observed from 125 cm in January to 140 cm in March.

### 6. ANALYSIS OF THE MEAN WEIGHT IN THE CATCH

The mean weight in the catch (dressed in Kgs) by month is presented in Figure 6. Initially there is mean weight fluctuation between 20 and 40 Kgs, with a slight increase up to April. In this particular month the value was around 60 Kgs, in accordance with the capture of larger specimens. During the following months these values decreased to the same level of the initial period, performing 30% of the highest value obtained.

### 7. SEX COMPOSITION

Sex identification was done on 130 swordfish caught after mid-January 1990. From these 61.5% were females, 36.2% males and 2.3% indetermined (Fig. 7).

The females size classes ranged from 78 to 210 cm showing a polimodal distribution with higher frequencies at 120, 130 and 175 cm LJFL. The males length frequencies are observed from 90 to 185 cm with higher values at 105, 120 and 140 cm LJFL.

Sex-ratio by length is shown in Figure 7. Females are predominant in almost all size classes. For the range 110-150 cm there is a slight fluctuation around 50%. Maximum values are observed for smaller and larger length class intervals.

### 8. STOMACH CONTENTS

The major species identified in the stomachs sampled were the spanish mackerel (*Scomber japonicus*) with 54% of the total (Fig. 8). It should be pointed out that this species was also used as bait in this experiment.

Other species included in the swordfish diet were the needlefish (*Belone belone*) with 8%, the shrimps, several species of squid (*Loligo vulgaris* and *Ommastrephes caroli*), the horse mackerel (*Trachurus picturatus*) each one with 6%, the snipe fish (*Macroramphosus scolopax*) 5% and the boarfish (*Capros aper*) with 5%.

## 9. CONCLUSIONS

The information obtained in the course of the fishing experiment is still scarce. As a result of limitations on weather conditions and of operational difficulties of the research boat, there was a low number of fishing operations and number of months covered by this experiment.

The CPUEs achieved from January to April have shown good perspectives for the development of this particular fishery.

The swordfish length distribution shows a modal displacement of 15 cm from January to March. This may mean that larger specimens could be caught from March onwards but such hypothesis requires further experimentation to be confirmed.

The results of this experiment motivated some of the local fishermen to initiate this fishery, on a small scale.

## ACKNOWLEDGEMENTS

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## REFERENCES

- Mejuto, J., González-Garcés, 1987 - Gráficos de CPUEs y peso médio por cuadrícula 5x5 grados de la flota española de pez espada, *Xiphias gladius*, anos 1982-1985. ICCAT, Coll. Vol. Sc. Papers, vol. XXVII:287-297.
- Rey, J.C., Mejuto, J., Iglesias, S., 1987 - Evolucion histórica y situación actual de la pesquería española de pez espada, *Xiphias gladius*. ICCAT, Coll. Vol. Sc. Papers, vol. XXVII:202-213.

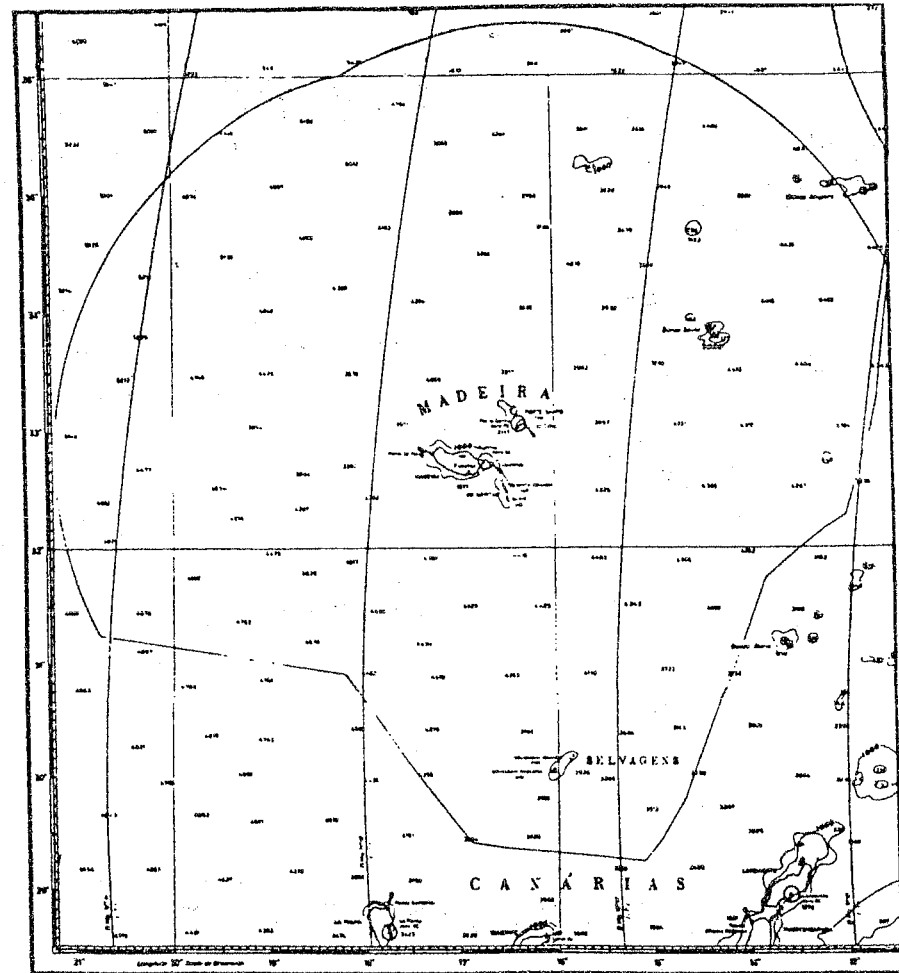


Fig. 1 - Geographical location of Madeira EEZ.

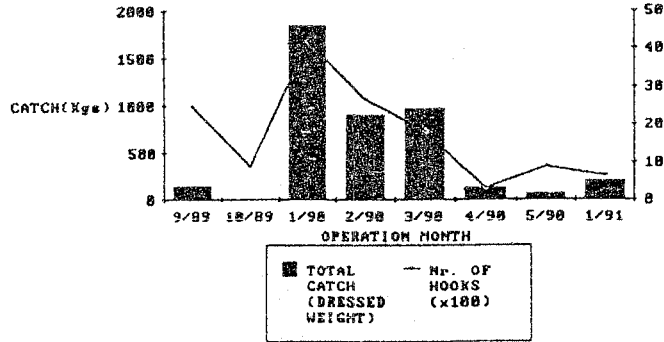


Fig. 2 - Total swordfish catch and number of hooks used per month during the fishing experiment carried out in Madeira EEZ.

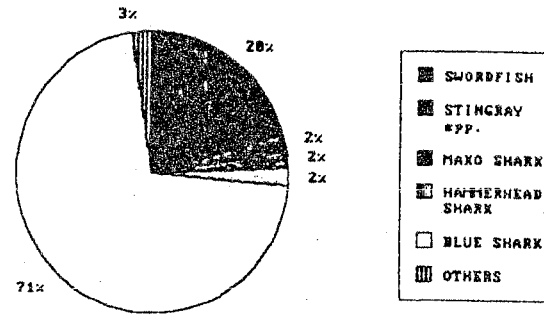


Fig. 4 - Percentage of total catch (in number) of swordfish and associated species caught by drift surface longline used in Madeira.

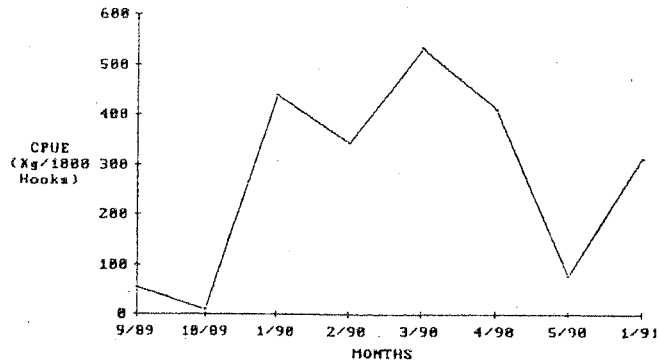


Fig. 3 - Catch per unit of effort (dressed weight) of the swordfish caught during the fishing experiment in Madeira EEZ.

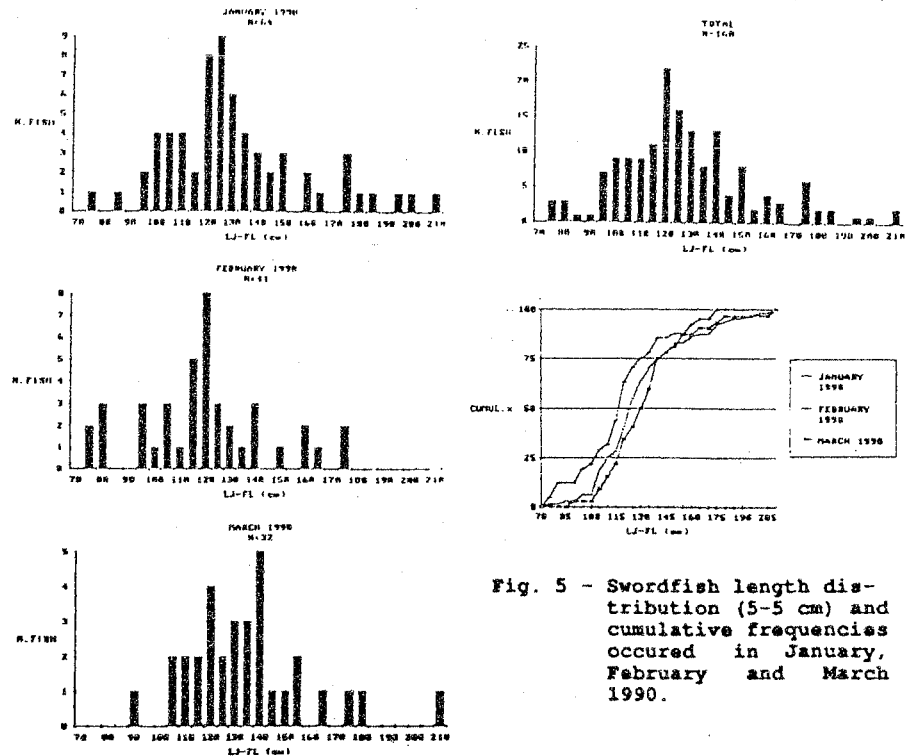


Fig. 5 - Swordfish length distribution (5-5 cm) and cumulative frequencies occurred in January, February and March 1990.

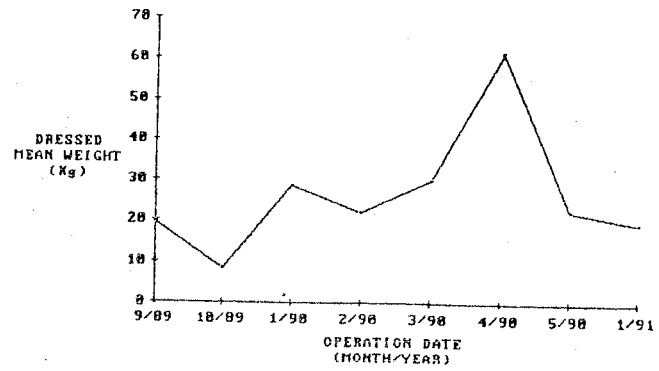


Fig. 6 - Monthly mean weight of the swordfish caught during the fishing experiment in Madeira.

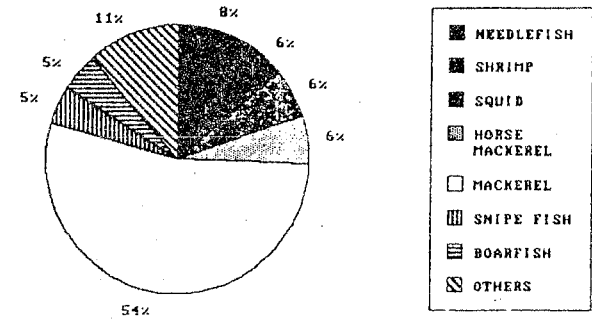


Fig. 8 - Stomach contents of the swordfish caught during the fishing experiment in Madeira.

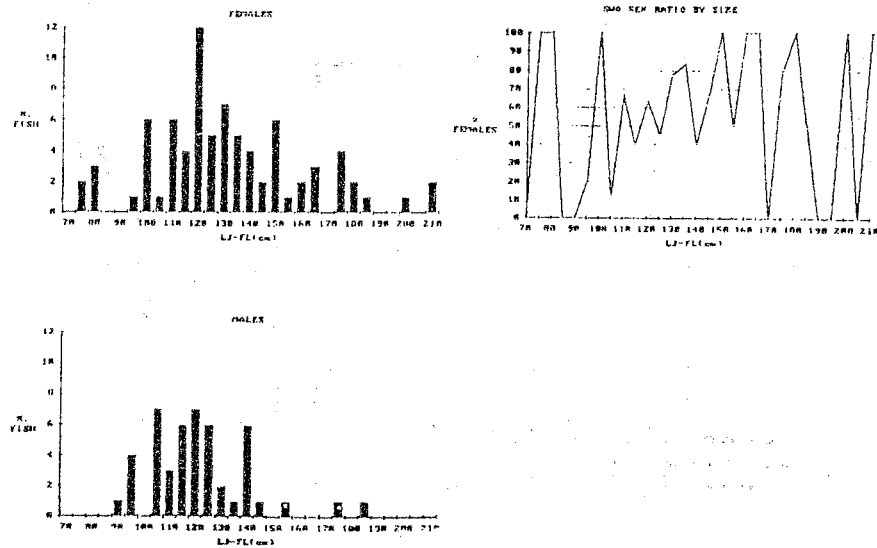


Fig. 7 - Swordfish length distribution by sex and sex-ratio by size, Madeira fishing experiment.

MONTH	TRIPS (Nr.)	D/Wt (Kgs)	FISH NO. Nr.	HOURS Nr.	MEAN WT (Kgm)	CPUE Kgs/1000 H
SEP/89	3	133.44	7	2450	19.06	54.47
OCT/89	1	8.30	1	870	8.3	9.54
JAN/90	7	1841.06	64	4200	28.76	438.35
FEB/90	4	903.50	41	2633	22.03	343.14
MAR/90	3	964.00	32	1807	30.12	533.48
APR/90	1	123.00	2	300	61.5	410
MAY/90	2	68.00	3	892	22.66	76.23
JAN/91	1	196.50	10	633	19.6	310.43
TOTAL	22	4237.80	160	13785	26.49	307.42

Tab. I - Monthly swordfish catches (dressed weight - D/Wt), effort (number of hooks), mean weight of the catch and CPUE obtained per month during the fishing experiment in Madeira.

LJ-FL (cm)	SEP/89	OCT/89	JAN/90	FEB/90	MAR/90	APR/90	MAY/90	JAN/91	TOTAL
70.0-74.9	0	0	0	0	0	0	0	0	0
75.0-79.9	0	0	1	2	0	0	0	0	3
80.0-84.9	0	0	0	3	0	0	0	0	3
85.0-89.9	0	0	1	0	0	0	0	0	1
90.0-94.9	0	0	0	0	1	0	0	0	1
95.0-99.9	0	1	2	3	0	0	0	1	7
100.0-104.9	2	0	4	1	0	0	0	2	9
105.0-109.9	0	0	4	3	2	0	0	0	9
110.0-114.9	0	0	4	1	2	0	0	2	9
115.0-119.9	1	0	2	5	2	0	0	1	11
120.0-124.9	1	0	8	8	4	0	1	0	22
125.0-129.9	1	0	9	3	2	0	0	1	16
130.0-134.9	1	0	6	2	3	0	1	0	13
135.0-139.9	0	0	4	1	3	0	0	0	8
140.0-144.9	1	0	3	3	5	0	1	0	13
145.0-149.9	0	0	2	0	1	0	0	1	4
150.0-154.9	0	0	3	1	1	1	0	2	8
155.0-159.9	0	0	0	0	2	0	0	0	2
160.0-164.9	0	0	2	2	0	0	0	0	4
165.0-169.9	0	0	1	1	1	0	0	0	3
170.0-174.9	0	0	0	0	0	0	0	0	0
175.0-179.9	0	0	3	2	1	0	0	0	6
180.0-184.9	0	0	1	0	1	0	0	0	2
185.0-189.9	0	0	1	0	0	1	0	0	2
190.0-194.9	0	0	0	0	0	0	0	0	0
195.0-199.9	0	0	1	0	0	0	0	0	1
200.0-204.9	0	0	1	0	0	0	0	0	1
205.0-209.9	0	0	0	0	0	0	0	0	0
210.0-215.9	0	0	1	0	1	0	0	0	2
TOTAL	7	1	64	41	32	2	3	10	160

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Tab. II - Length composition of the swordfish caught during the fishing experimental period (per month and total), Madeira.

TL-FL (cm)	MALES	FEMALES	IND.TOTAL	% FEM.
70.0-74.9	0	0	0	0.0
75.0-79.9	0	2	1	3 100.0
80.0-84.9	0	3	0	3 100.0
85.0-89.9	0	0	1	1 0.0
90.0-94.9	1	0	0	1 0.0
95.0-99.9	4	1	1	6 20.0
100.0-104.9	0	6	0	6 100.0
105.0-109.9	7	1	0	8 12.5
110.0-114.9	3	6	0	9 66.7
115.0-119.9	6	4	0	10 40.0
120.0-124.9	7	12	0	19 63.2
125.0-129.9	6	5	0	11 45.5
130.0-134.9	2	7	0	9 77.8
135.0-139.9	1	5	0	6 83.3
140.0-144.9	6	4	0	10 40.0
145.0-149.9	1	2	0	3 66.7
150.0-154.9	0	6	0	6 100.0
155.0-159.9	1	1	0	2 50.0
160.0-164.9	0	2	0	2 100.0
165.0-169.9	0	3	0	3 100.0
170.0-174.9	0	0	0	0 0.0
175.0-179.9	1	4	0	5 80.0
180.0-184.9	0	2	0	2 100.0
185.0-189.9	1	1	0	2 50.0
190.0-194.9	0	0	0	0 0.0
195.0-199.9	0	0	0	0 0.0
200.0-204.9	0	1	0	1 100.0
205.0-209.9	0	0	0	0 0.0
210.0-215.9	0	2	0	2 100.0
<b>TOTAL</b>	<b>47</b>	<b>80</b>	<b>3</b>	<b>130</b>

Tab. III - Swordfish length composition by sex and sex-ratio obtained during the fishing experiment in Madeira.