

**GREEK SWORDFISH FISHERY; SOME TRENDS IN THE SIZE COMPOSITION
OF THE CATCHES**

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SUMMARY

Lower Jaw Fork Length (LJFL) measurements taken from 5688 swordfish individuals landed at the ports of Chania and Kalymnos (Cretan and Aegean Seas, respectively) from 1986 to 1991 are analyzed to identify possible trends considering the size of the fished animals. The results show that the main component of the catches is comprised of animals less than 120 cm LJFL and this phenomenon is stronger in the area exploited by the Chania fleet. Differences among the annual size distributions are highly significant in both ports, but in Kalymnos the pattern of the size composition of the catches is more stable, at least since 1988.

RESUME

De 1986 à 1991, les mensurations de longueur maxillaire-fourche (LMF) relevées sur 5.688 espadons débarqués dans les ports de Chania et Kalymnos (Mer de Crète et Egée respectivement) ont été analysées pour identifier les tendances éventuelles en tenant compte de la taille des animaux pêchés. Les résultats montrent qu'une grande partie des prises se composent d'animaux de LMF inférieures à 130 cm et ce phénomène est plus marqué dans la zone exploitée par la flottille de Chania. Les différences entre les distributions de taille annuelles sont très fortes dans les deux ports mais à Kalymnos, le schéma de la composition par taille des prises est plus stable, du moins depuis 1988.

RESUMEN

Se analizan mediciones mandíbula inferior-longitud a la horquilla (LJFL) tomadas de 5.688 ejemplares de pez espada desembarcados en los puertos de Chania y Kalymnos (Mar de Creta y Mar Egeo, respectivamente), de 1986 a 1991, para identificar las posibles tendencias, considerando el tamaño de los animales capturados. Los resultados muestran que la mayor parte de las capturas se compone de animales con una LJFL interior a 130 cm, y este fenómeno es aún más patente en el área explotada por la flota de Chania. Las diferencias entre las distribuciones de talla anuales son altamente significativas en ambos puertos, pero en Kalymnos la pauta de la composición por talla es más estable, por lo menos desde 1988.

Introduction

Swordfish fishing is an expanding activity in Greece and it is estimated that around 400 boats operating from 70 ports are currently involved in the fishery. The last five years records show that the annual production of the Greek fleets fluctuates from 900 to 1700 tons and Greece is considered to be the third most important producer in the Mediterranean (Anonymous, 1991).

Fishing is carried out using drifting longlines throughout most of the Aegean sea, off the west coast of Greece in the Ionian sea, and occasionally in the Levant sea toward Cyprus. The peak of the fishing season is from May to September and since 1988 a closed season has been implemented from 1 October to 31 January.

The two main fishing fleets for swordfish in Greece are based in Kalymnos, in the south-eastern Aegean Sea and in Chania, on the island of Crete. Both fleets are using identical fishing methods but they are working in different areas (Fig. 1). Together, they account for more than 50% of the total annual Greek production and more or less up to 80% of the production in the Aegean sea.

The aim of the present work is to analyze size data taken from animals landed at the above-mentioned ports from 1986 to 1991 and to identify, if possible, some trends considering the swordfish fishery in the area.

Materials and methods

Measurements of lower jaw fork length (LJFL) were taken to the nearest cm for 5688 animals landed at the ports of Kalymnos and Chania from June to September of the years 1986, 1987, 1988, 1990 and 1991.

Summary statistics, such as, mean, standard deviation and median, as well as the percentage length frequency and cumulative distributions were calculated for each annual sample separately for each port.

Differences among the annual distributions of the samples taken from each port were tested for significance on the 0.05 level by means of a Kruskal-Wallis one way analysis of variance by ranks (Siegel & Castellan, 1989).

Results

Summary statistics for all collected samples are presented on Table 1.

Fig. 2 and 3 indicate the percentage length frequency and cumulative distributions for the samples taken from the two ports.

Results of the Kruskal-Wallis test indicate that differences among distributions were highly significant in both ports (test statistic 443.37, $P < 0.001$ and 68.26, $P < 0.001$ in Kalymnos and Chania correspondingly).

Discussion

Results demonstrate that the main proportion of the fished animals by the two fleets have a LJFL less than 130 cm and animals of this size form in some cases, as in Chania in 1988 and 1990, up to 80% of the total catch (Fig. 2).

Consequently, according to growth studies carried out by several authors (Berkeley & Houde, 1983; Megalofonou *et al.*, 1990; Tsimenides & Tserpes 1989), it can be concluded that the majority of the fished animals are less than 3 years old and this phenomenon is stronger in the area fished by the Chania fleet.

Therefore annual variations in recruitment can highly affect the fishery and it can be speculated that they are responsible for the annual differences observed in the size distribution patterns of the catches. This may also explain the fact that these differences are much more distinct in Chania where the percentage of small animals in the catch is higher than in Kalymnos.

In the latter port the situation seems to be more stable at least since 1988. Although the fishery is again based on juveniles it is not so much depending on 0 and 1 age groups.

Our results are based on data collected only during the summer months and the situation may appear different if full annual data were available. Unfortunately full data are available only from the port of Kalymnos in 1991 which show that the average length of animals fished from February to May was 130.60 cm and the median 126. However, these values are only slightly higher than the ones presented above for the summer months and they virtually do not alter the general exploitation pattern of that year.

It seems that the general exploitation pattern it is quite similar with the ones reported for other Mediterranean areas where it has also been found that the main bulk of swordfish catches is composed of juveniles (Di Natale 1990, 1991, Rey *et al.* 1987).

Stock assessment studies conducted for the Atlantic by the ICCAT demonstrated that the juvenile swordfish stock size has shown a general increasing trend from 1978 to present while there is a consistent decreasing trend in stock size of adults (Anonymous, 1991). The same author also states that it is unlikely that recruitment will continue to increase. Cushing (1981) states that usually recruitment in pelagic fish stocks tend to show rising or falling trends.

Although Greek catches do not show a decreasing trend and our results demonstrate that the percentage of juveniles in the catches is higher after 1987, the present data are not adequate to show if the situation in the eastern Mediterranean is as described in the Atlantic. Moreover, since recent studies tend to support the hypothesis that Mediterranean swordfish individuals belong to

the same stock (A. Magoulas, Univ. of Crete, Lab. of Genetics, personal communication) data from all Mediterranean areas should be combined and analyzed for a series of years in order to obtain reliable estimates for the stock parameters and their trends.

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Table 1. Summary statistics of the samples.

YEAR	KALYMNOS				CHANIA			
	Size	Mean	Std	Median	Size	Mean	Std	Median
1986	566	133.36	25.66	128	292	124.66	30.96	123
1987	754	147.21	23.08	144	322	121.13	35.75	115
1988	783	120.75	31.47	115	537	110.96	32.20	105
1990	531	128.43	30.29	124	809	115.44	22.81	108
1991	1086	124.73	29.39	119	-	-	-	-
Total	3728				1960			

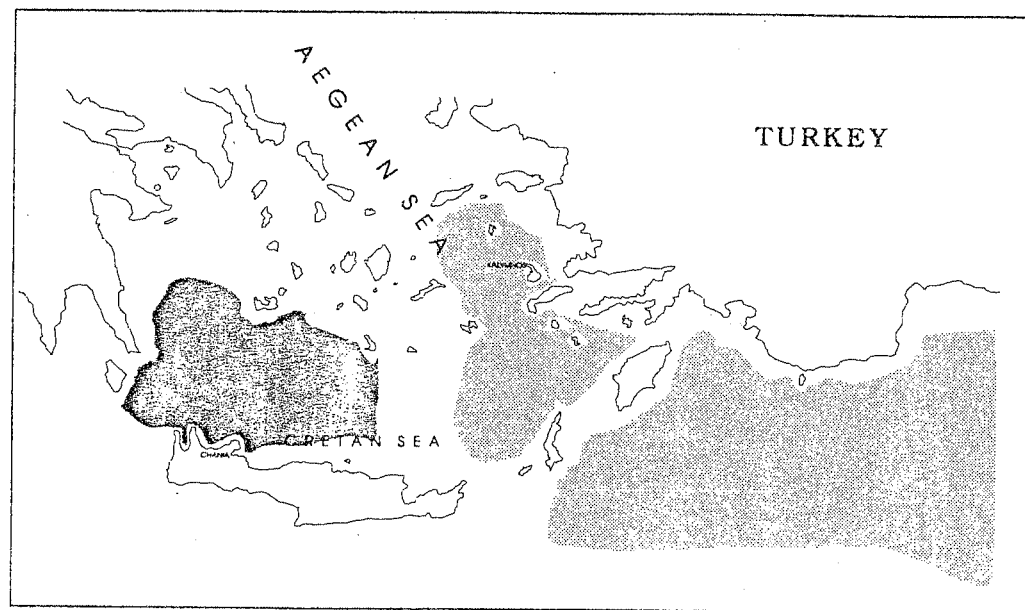


Fig. 1. Graph indicating the areas fished by the Chania (darker shade) and Kalymnos fleets.

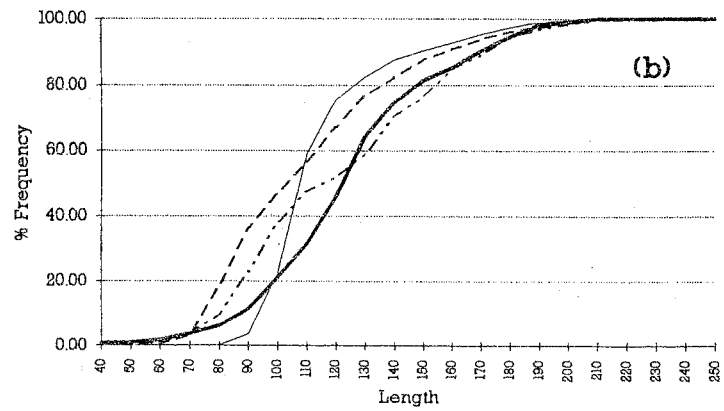
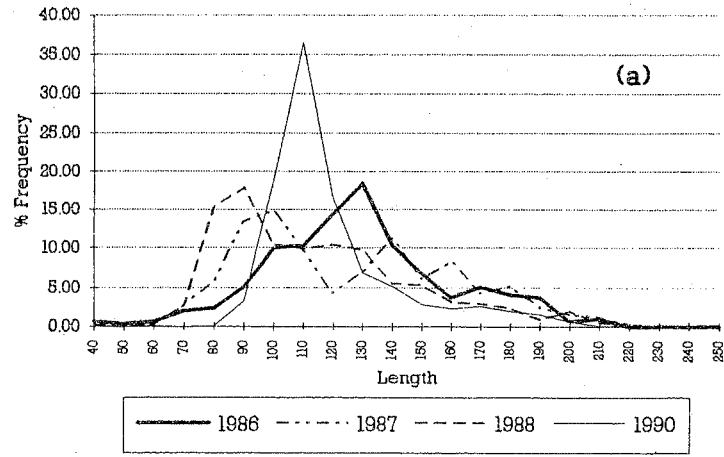


Fig. 2. Percentage length frequency (a) and cumulative distribution (b) of animals sampled in the port of Chania.

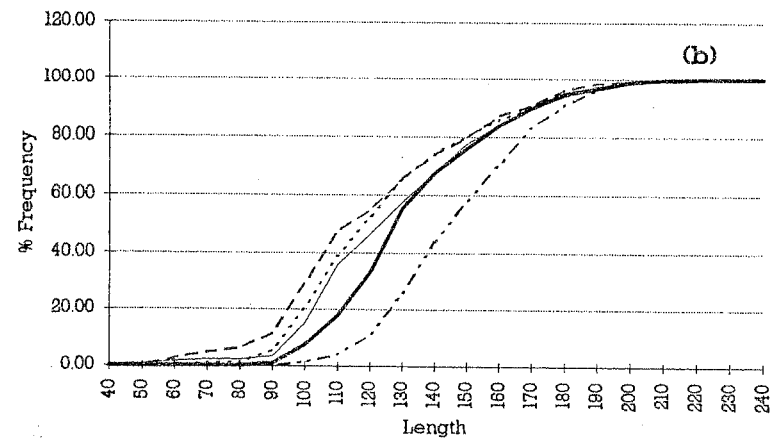
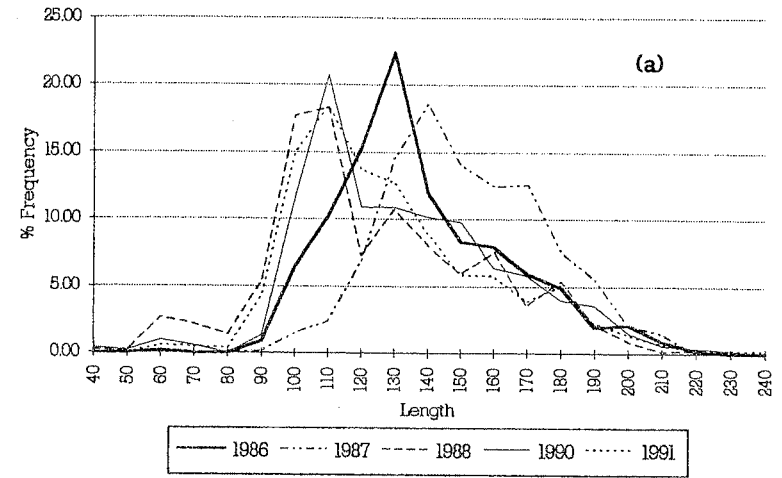


Fig. 3. Percentage length frequency (a) and cumulative distribution (b) of animals sampled in the port of Kalymnos.