PRELIMINARY SCIENTIFIC ESTIMATIONS OF BY-CATCHES LANDED BY THE SPANISH SURFACE LONGLINE FLEET IN 1999 IN THE ATLANTIC OCEAN AND MEDITERRANEAN SEA

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SUMMARY

*This paper is an up-date of the information available for 1999 based on preliminary scientific estimates of landings of species caught as by-catches in the fishery of the Spanish surface longline fleet targeting the swordfish (*Xiphias gladius*), in the Atlantic Ocean and Mediterranean Sea.*

The group of large pelagic sharks accounted for 95% of the total landings in weight from catches considered to be by-catches to this fishery, obtained in the Atlantic Ocean. Of this group of large pelagic sharks, Prionace glauca *stands out, comprising 88.6% of the catch along with* Isurus oxyrhinchus*, which constituted 8.9%.*

In the Mediterranean Sea, landings of pelagic sharks accounted for 42% of the weight of the by-catches landed by this fleet.

RÉSUMÉ

*Le présent document actualise l'information disponible pour 1999 à partir des estimations scientifiques préliminaires des débarquements d'espèces capturées en tant que prise accessoire par la pêche palangrière espagnole de surface qui vise l'espadon (*Xiphias gladius*) dans l'Atlantique et la Méditerranée.*

Le groupe des grands requins pélagiques constituait 95% du poids total débarqué de captures jugées être des prises accessoires de cette pêche dans l'Atlantique. Le Prionace glauca *prédomine dans le groupe des grands requins pélagiques, et représente 88,6% des prises, avec l'*Isurus oxyrhinchus *qui représentait 8,9%.*

Dans la Méditerranée, les débarquements de requins pélagiques ont donné 43% du poids débarqué de prises accessoires de cette flottille.

RESUMEN

*En este documento se actualiza la información disponible del año 1999 basada en estimaciones científicas preliminares sobre desembarcos de especies asociadas a la pesquería española de palangre de superficie de pez espada (*Xiphias gladius*), que opera en el O. Atlántico y Mar Mediterráneo.*

El grupo de grandes tiburones pelágicos representó el 95% del total de desembarcos en peso procedentes de capturas consideradas accesorias a esta pesquería obtenidas en el O. Atlántico. Dentro de este grupo de grandes tiburones pelágicos, destaca el Prionace glauca *con el 88.6% y el* Isurus oxyrhinchus *con el 8.9%.*

En el Mar Mediterráneo, los tiburones pelágicos desembarcados representaron el 42% en peso de las capturas accesorias desembarcadas por esta flota.

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INTRODUCTION

Following the recommendations of the Subcommittee on Accidental Catches of the ICCAT (Anonymous, 1997), the Spanish Oceanography Institute has developed, over the last few years, a research project aimed at assessing the level of landings of the so-called by-catch species carried out by the Spanish fleet and caught while targeting the swordfish with surface longline gear.

This research project, completed at the end of 2000, has provided the SCRS of the ICCAT with scientific estimates by species of the landings in weight carried out in 1997 and 1998. The purpose of this document is to update the information by presenting estimates for the year 1999, which has been previously included as preliminary Task I, by species or groups of species.

In addition to the target species *Xiphias gladius* (SWO) from the very start, the Spanish surface longline fleet has been catching other species such as billfishes, tunas, and pelagic sharks, the latter being of great importance in recent years owing both to its abundance and increasing economic status (Mejuto & González-Garcés, 1984; Mejuto, 1985).

The by-catch of large pelagic sharks is mainly comprised of specimens from the family Carcharhinidae (primarily *Prionace glauca*), followed by the family Lamnidae (primarily *Isurus oxyrhinchus*), Sphyrnidae and lastly, Alopiidae.

Prionace glauca (PGO) has always been an extremely abundant species and has even been predominant in the catches of a number of longline fleets. However, owing to the fact that it held little economic interest, the statistical records of the past decades were scarce and inaccurate. In recent years, the Spanish fleet has changed its fishing effort and directed it at this fishery, and this by-catch, on occasion, has become the target species of the fleet (Mejuto & de la Serna, 2000). This change in the direction of the fishing effort has been affected by favorable changes in the international market, now more open to pelagic sharks and their derivatives, along with the implementation of highly restrictive measures regulating swordfish catches, based on TAC and quota systems, established in the Atlantic Ocean.

MATERIAL AND METHODS

The information analyzed from 1999 in this paper is based on the specific protocols set up in the RIM (Information and Sampling Network) of Spanish Oceanography Institute, which compiles diverse information collected by informers-samplers operating in the major landing ports. Data include declaration of landings per trip, interviews with the skippers, samples at the market and fishery logbooks filled out voluntarily by the fleet, in addition to information provided by the Scientific Observers on board commercial vessels.

The information collected was originally set down in formats of 5ºx5º/month, according to the methodology recommended for distant longline fleets (Miyake, 1990). In order to obtain a summary of the results, the data were finally grouped according to the definition of the BIL areas of the ICCAT applicable to the swordfish. Therefore, both the definition of the North Atlantic (BIL94A+BIL94B) and South Atlantic (BIL96+BIL97) used in this document are separated by parallel 5º North latitude and BIL95 corresponds to Mediterranean Sea.

The original weight records were transformed, when necessary, to units of round weight (RW) by applying different conversion factors depending on the processing and handling undergone by the fishes on board.

Prionace glauca (PGO)	Round weight (RW)= Gutted weight (GW) * 1.1938
	Round weight (RW)= Dressed weight (DW) * 2.4074

Isurus oxyrhinchus (IOO) Round weight (RW)= Gutted weight (GW) * 1.151
Round weight (RW)=Dressed weight (DW) * 1.4541

And the other pelagic sharks (OthSHK): Round weight (RW)= Gutted weight (GW) * 1.15
Round weight (RW)= Dressed weight l (DW) * 1.4

Similarly, the landings in round weight (RW) have been estimated for the other associated species. The TUN group includes a set of tuna species (tribu thunnini) commonly made up of catches of the species *Thunnus obsesus* (BET), *Thunnus albacares* (YFT*), Thunnnus alalunga* (ALB) and *Katsuwonus pelamis* (SKJ). The group known as BIL includes species from the family Istiophoridae. The specific break-down of these basic groups is given per species in a specific SCRS document. The OTH group includes several species, which sometimes were not identified (generally of little commercial value) or identified at the species level but only caught sporadically.

Due to the economic importance and the volume of landings of large pelagic sharks, this group of species has been classified further under the general label (SHK) for descriptive purposes.

RESULTS AND DISCUSSION

The landings of species considered to be by-catches of the fishery of the swordfish *(Xiphias gladius*) are comprised mainly of large pelagic sharks whose percentage in landed weight in 1999 accounted for 74% and 3.7% of the total landings made by the Spanish surface longline fleet in the Atlantic Ocean and Mediterranean Sea, respectively, (including the target species, the swordfish). Regarding to the total by-catch landed, the percentage landed of large pelagic sharks (SHK) was 95.4% in the Atlantic Ocean and 42.6 in the Mediterranean Sea.

In 1999 the total levels of the SHK landings, in terms of weight, from the entire West Atlantic dropped slightly in the North Atlantic as compared to 1997 and 1998 (Castro et al., 2000) and underwent a small increase in the South Atlantic. The volume of landings of the SHK group from the Mediterranean Sea dwindled to less than one third of the landings recorded in 1997 (Fig. 1). This decrease in the Mediterranean was attributed to the fact that fishing effort was reduced in the area of the Alboran Sea because of the restrictions and a change in the operating strategy of this fleet. As had been observed in previous years, the percentage of PGO (primarily) and of IOO in the specific composition of the catches is considerably higher in this area of the Alboran as compared to the values obtained in the rest of the area of the Mediterranean Sea where the Spanish surface longline fleet carries out its fishing activity.

Tables 1, 2 and 3 show the scientific estimates in round weight of the landings from 1999, listed by species for those BIL zones defined by the ICCAT for the swordfish where the Spanish fleet operates to a greater or lesser extent.

The SHK group exhibited similar landings in weight with regard to the total number of species known as by-catch, and exceeded 94% in areas BIL94A, BIL94B and BIL97, with the exception of BIL96 which barely attained 73%, which caused the total percentage of landings of the SHK group in the South Atlantic (87.3%) to be lower in comparison to the North Atlantic (98.6%).

Table 4 offers a summary of the levels of landings in round weight by species in the total Atlantic Ocean. The by-catch of large pelagic sharks from the Atlantic Ocean was primarily comprised of: *Prionace glauca* (88.7%), Isurus spp. (8.6%), Sphyrna spp. (1.4%), Carcharhinus spp. (0.47%) and Alopias spp. (0.28%). In the Mediterranean the composition was completely different: *Prionace glauca* (27.2%), *Alopias vulpinus* (9%) and *Isurus oxyrhinchus* (6.4%) (Table 3).

For the total Atlantic Ocean the landings in weight of the SHK group came preferentially from the North Atlantic (74.4%), while the landings originating from the South Atlantic were more modest (25.6%). The high percentage found in the North Atlantic is probably due to the gradual change in the fishing strategy observed in this fleet in recent years, which has led to a clear bi-specific fishing strategy (Mejuto & de la Serna, o.c.). For this reason, noteworthy in the North Atlantic are the landings of *Prionace glauca*, which account for 88% of the total landings in weight of the by-catches and 90% of the landings of the SHK group of this geographic region. (Table 1).

In the South Atlantic, where the bi-specific activity has begun, but to a lesser extent than in the North Atlantic, the landings of *Prionace glauca* (PGO) in weight with respect to the total by-catches amounted to over 75% and in the SHK group the value was 86% (Table 2).

In the Mediterranean, *Prionace glauca* (PGO) accounts for 27% of the weight of the groups of associated species and 63.9% of the SHK group (Table 3). The levels of *Prionace glauca* (PGO) landings in gutted weight (GW) for1999 by 5ºx5º square are depicted in figure 2.

The second most important species in terms of landings of the SHK group of pelagic sharks is *Isurus oxyrhinchus* (IOO). In 1999 this species accounted for 8.3%, 9.0% and 6.4% of the by-catches landed in the North Atlantic, South Atlantic and Mediterranean, respectively. IOO landings in round weight (RW) by 5ºx5º squares are shown in figure 3.

In the geographic distribution of the landings of the principle species of SHK (Fig. 4), the most noteworthy are those pertaining to *Prionace glauca* in the North Atlantic that were higher than those in the South Atlantic and Mediterranean.

Figure 5 presents a comparison of the levels of landings in relative percentages between the years 1997, 1998 (Castro et al., o.c.) and those obtained in 1999 for the most important species of the SHK group (PGO, IOO) and other pelagic sharks (OthSHK) by wide geographic regions (North Atlantic, South Atlantic, Mediterranean Sea). There was a slight drop in landings of the SHK species in 1999 in the North Atlantic as compared to the previous years. The relative percentage of PGO landings in the South Atlantic underwent a gradual increase over the 3 years and there was a decrease in the other species (IOO and other SHK). In the Mediterranean there was a drop in the relative landings of PGO in 1998 and 1999 and of IOO in 1999; they remained stable, however, in the rest of the SHK species.

This decline in PGO and IOO catches from the Mediterranean in recent years with the corresponding increase in the relative percentage of other pelagic sharks (OthSHK) may be attributed to the reduction in the fishing effort in the Alboran Sea, as mentioned earlier. As can be seen in the specific composition of the catches from previous years, this area is characterized by a greater abundance of PGO and IOO as compared to the rest of the general fishing zone of the Spanish fleet. There was a simultaneous increase in the percentage of fishing effort in the rest of the general fishing zone, where the greater heterogeneity of vessels, gears and fishing strategies, carrying out activity in the Mediterranean Sea, would appear to increase the catchability of a greater number of species of SHK and OTH. This would also probably reflect the spatial-temporal differences in biodiversity, owing to environmental, oceanographic and ecological differences between the Alboran and the area around the Balearic Archipelago. Moreover, the changes observed in commercial dynamics have led to a certain rise in landings at Mediterranean ports that do not have informers-samples from the RIM program, that may have produced some bias in the specific identification of some of the catches, with some PGO and IOO landings being included in the OTH category.

Figures 6 and 7 show the landing levels per unit of effort in 5ºx5º squares for species *Prionace glauca* (GW: gutted weight) and *Isurus oxyrhinchus* (RW: round weight) respectively.

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Table 1. Scientific estimates of landings per species in kg of round weight (RW), from the North Atlantic (BIL94A and BIL94B) carried out by the Spanish surface longline fleet in 1999.

By-catch landings. Kg (RW). Year 1999. North Atlantic.

	Species	BIL94A	BIL94B	NORTH ATLANTIC
SHK	*Alopias* spp.	13715	18593	32308
SHK	*Alopias superciliosus*	6518	37188	43706
SHK	*Alopias vulpinus*	2732	12443	15175
SHK	*Carcharhinus falciformis*	1004	0	1004
SHK	*Carcharhinus longimanus*	63	639	702
SHK	*Carcharinus* spp.	23795	59010	82805
SHK	*Galeocerdo cuvier*	2691	1216	3907
SHK	*Isurus oxyrhinchus*	988315	1062567	2050882
SHK	*Isurus paucus*	9088	11421	20509
SHK	*Lamna nasus*	2762	15353	18115
SHK	*Prionace glauca*	12586247	9225025	21811272
SHK	*Sphyrna* spp.	50357	190127	240484
SHK	*Sphyrna zygaena*	1014	61	1075
	Barracuda	26	0	26
	Brama spp	0	1690	1690
	Coriphaena hipurus	16	734	750
	Galeorhinus galeus	0	478	478
	Lampris guttatus	0	417	417
	Lepidocibium flavobruneum	29233	34063	63296
	Mobula mobula	0	132	132
	Mola mola	0	305	305
	Ruvettus pretiosus	912	872	1784
	OTH	9125	2961	12086
	TUN+BIL	111985	153740	265725
SHK	**Total SHK**	**13688301**	**10633643**	**24321944**
	(% SHK)	98,91	98,20	98,59
	TOTAL	13839598	10829035	24668633

Table 2. Scientific estimates of landings per species in kg of round weight (RW), from the South Atlantic (BIL96 and BIL97) carried out by the Spanish surface longline fleet in 1999.

By-catch landings. Kg (RW). Year 1999. South Atlantic.

	Species	BIL96	BIL97	SOUTH ATLANTIC
SHK	*Alopias* spp.	4138	0	4138
SHK	*Carcharhinus falciformis*	96	65	161
SHK	*Carcharhinus longimanus*	271	969	1240
SHK	*Carcharinus plumbeus*	0	53	53
SHK	*Carcharinus* spp.	30702	44032	74734
SHK	*Galeocerdo cuvier*	72	196	268
SHK	*Isurus oxyrhinchus*	320185	541118	861303
SHK	*Isurus paucus*	2340	10389	12729
SHK	*Lamna nasus*	0	1537	1537
SHK	*Prionace glauca*	1888836	5284538	7173374
SHK	*Sphyrna* spp.	44881	190916	235797
SHK	*Sphyrna zygaena*	818	5408	6226
	Galeorhinus galeus	0	425	425
	Lepidocibium flavobruneum	6711	4543	11254
	Ruvettus pretiosus	59	80	139
	OTH	3340	458	3798
	TUN+BIL	841412	364844	1206256
SHK	**Total SHK**	**2292339**	**6079221**	**8371560**
	(% SHK)	72,91	94,26	87,26
	TOTAL	3143861	6449571	9593432

Table 3. Scientific estimates of landings per species in kg of round weight (RW), from the Mediterranean Sea (BIL95) carried out by the Spanish surface longline fleet in 1999.

By-catch landings. Kg (RW). Year 1999. Mediterranean Sea		
	Species	**BIL95**
SHK	*Alopias vulpinus*	6712
SHK	*Isurus oxyrhinchus*	4747
SHK	*Prionace glauca*	20276
	Barracuda	12
	Brama spp.	3880
	Coriphaena hipurus	8198
	Galeorhinus galeus	14
	Seriola dumerili	28
	OTH	684
	TUN+BIL	29968
SHK	**Total SHK**	**31735**
	(% SHK)	42,59
	TOTAL	74519

Table 4. Scientific estimates of landings per species in kg of round weight (RW), from the Atlantic Ocean (North and South) carried out by the Spanish surface longline fleet in 1999

By-catch landings. Kg (RW). Year 1999. ATLANTIC OCEAN.				
	Species	**NORTH ATL.**	**SOUTH ATL.**	**ATLANTIC OCEAN**
SHK	*Alopias* spp.	32308	4138	36446
SHK	*Alopias superciliosus*	43706	0	43706
SHK	*Alopias vulpinus*	15175	0	15175
SHK	*Carcharhinus falciformis*	1004	161	1165
SHK	*Carcharhinus longimanus*	702	1240	1942
SHK	*Carcharinus plumbeus*	0	53	53
SHK	*Carcharinus* spp.	82805	74734	157539
SHK	*Galeocerdo cuvier*	3907	268	4175
SHK	*Isurus oxyrhinchus*	2050882	861303	2912185
SHK	*Isurus paucus*	20509	12729	33238
SHK	*Lamna nasus*	18115	1537	19652
SHK	*Prionace glauca*	21811272	7173374	28984646
SHK	*Sphyrna* spp.	240484	235797	476281
SHK	*Sphyrna zygaena*	1075	6226	7301
	Barracuda	26	0	26
	Brama spp	1690	0	1690
	Coriphaena hipurus	750	0	750
	Galeorhinus galeus	478	425	903
	Lampris guttatus	417	0	417
	Lepidocibium flavobruneum	63296	11254	74550
	Mobula mobula	132	0	132
	Mola mola	305	0	305
	Ruvettus pretiosus	1784	139	1923
	OTH	12086	3798	15884
	TUN+BIL	265725	1206256	1471981
SHK	**Total SHK**	**24321944**	**8371560**	**32693504**
	(% SHK)	98,59	87,26	95,42
	TOTAL	24668633	9593432	34262065

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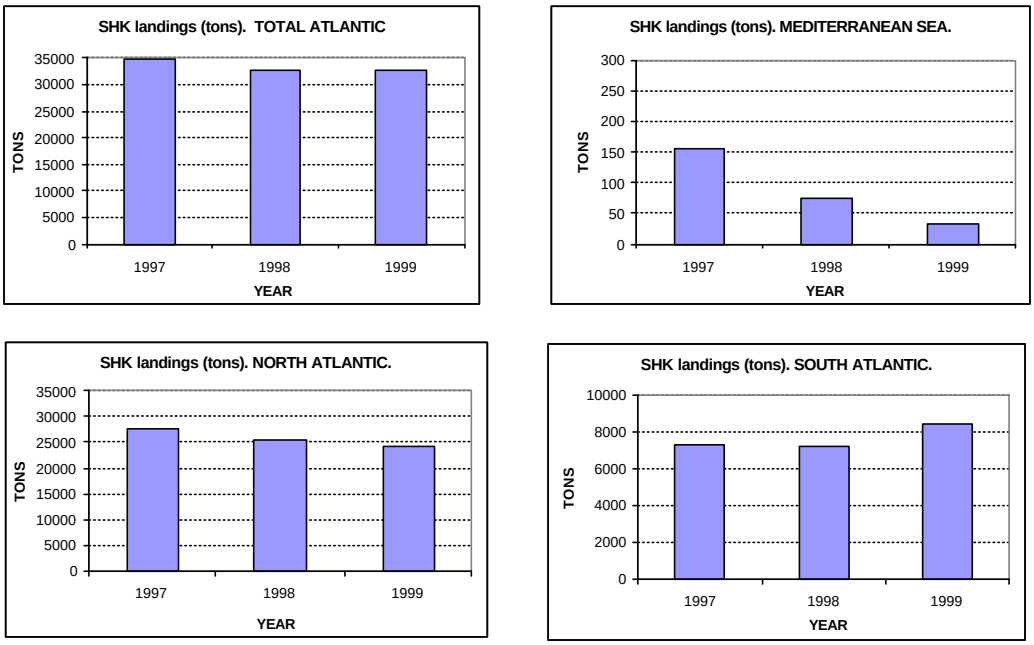

Fig. 1. Landings in round weight (kg. RW) from the Total Atlantic Ocean, Mediterranea Sea, North and South Atlantic, corresponding to the group of large pelagic sharks (SHK), for the years 1997, 1998 and 1999

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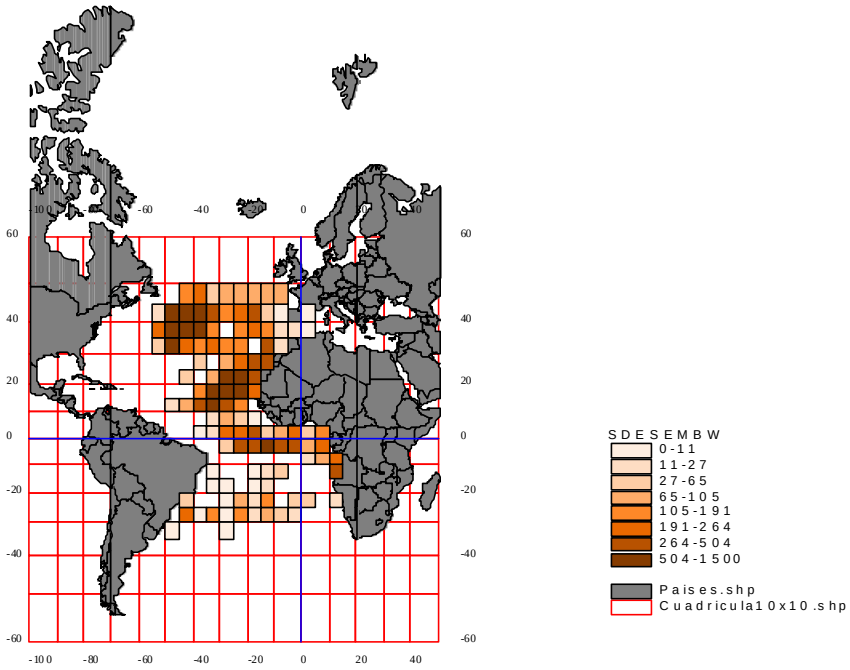

Fig. 2. Levels of landings in gutted weight (tons GW) of *Prionace glauca* (PGO) by 5ºx5º squares, carried out in 1999.

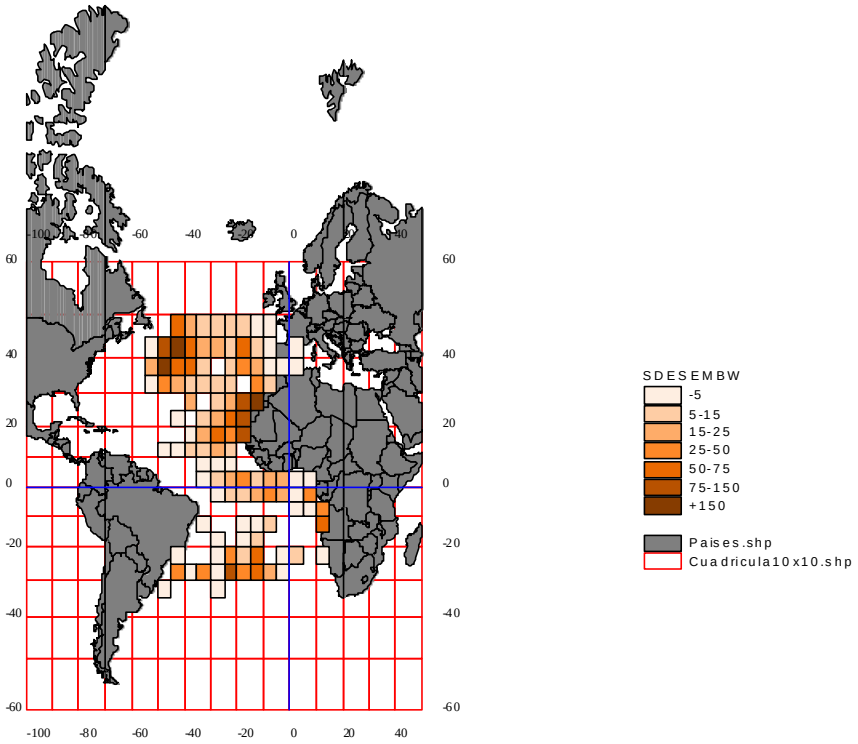

Fig. 3. Levels of landings in round weight (tons, RW) , of *Isurus oxyrhinchus* (IOO) by 5ºx5º squares carried out in 1999.

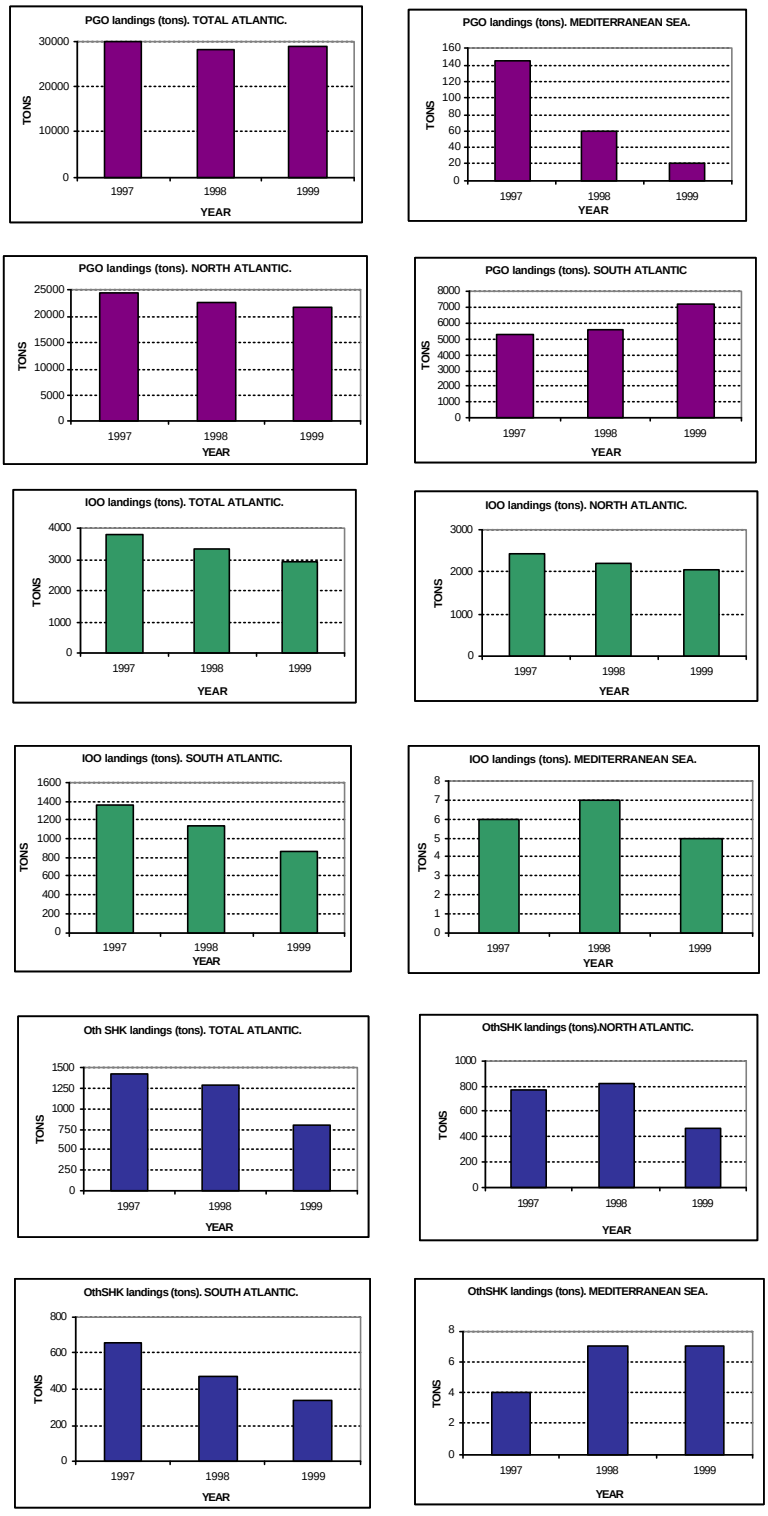

Fig. 4. Scientific estimates of landings in kg of round weight (RW) of PGO (*Prionace glauca*), IOO (*Isurus oxyrhinchus*) and OthSHK (other species of pelagic sharks) from the Total Atlantic, North and South Atlantic and Mediterranean sea carried out by the Spanish surface longline fleet in 1999.

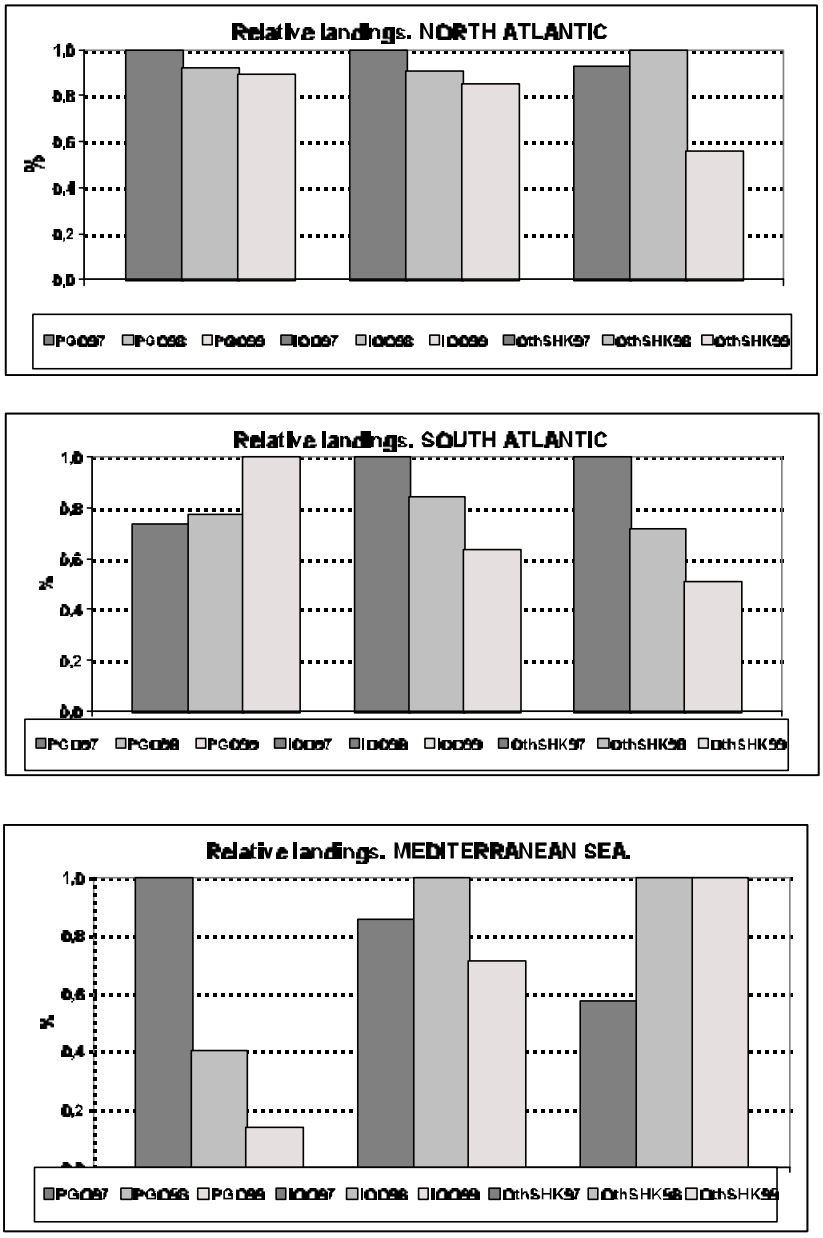

Fig. 5. Relative landing of PGO (*Prionace glauca*), IOO (*Isurus oxyrhinchus*), and OthSHK (other species of pelagic sharks) from the North Atlantic, South Atlantic and Mediterranean Sea for the years 1997, 1998 and 1999.

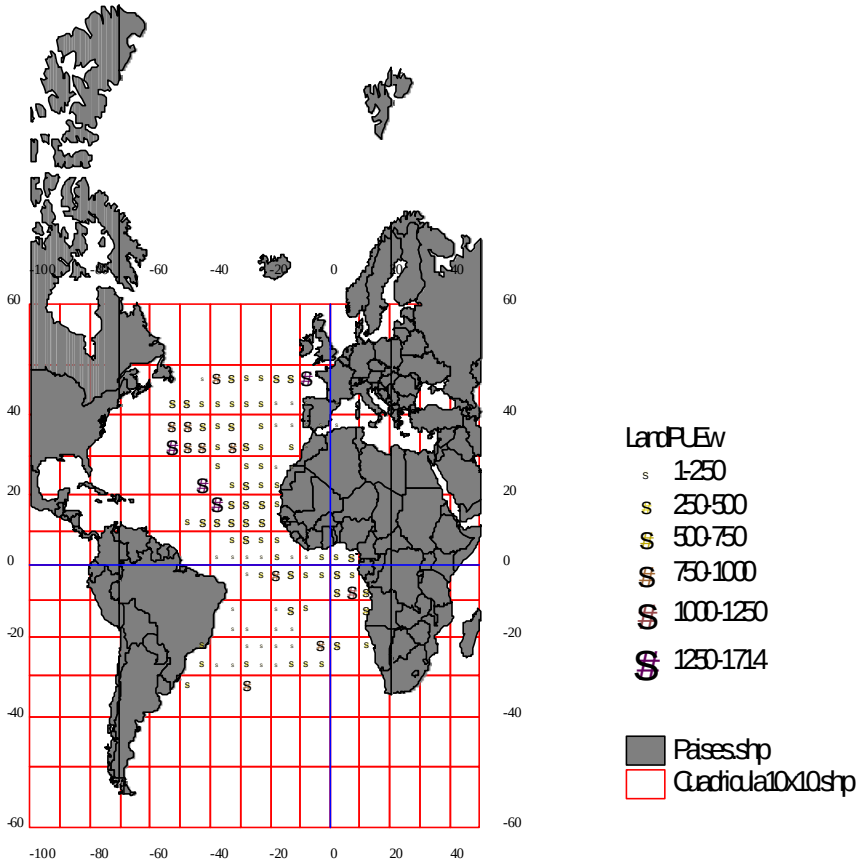

Fig. 6. Landing per unit of effort (Kg GW / thousand hooks) of *Prionace glauca* (PGO) by 5ºx5º square, year 1999.

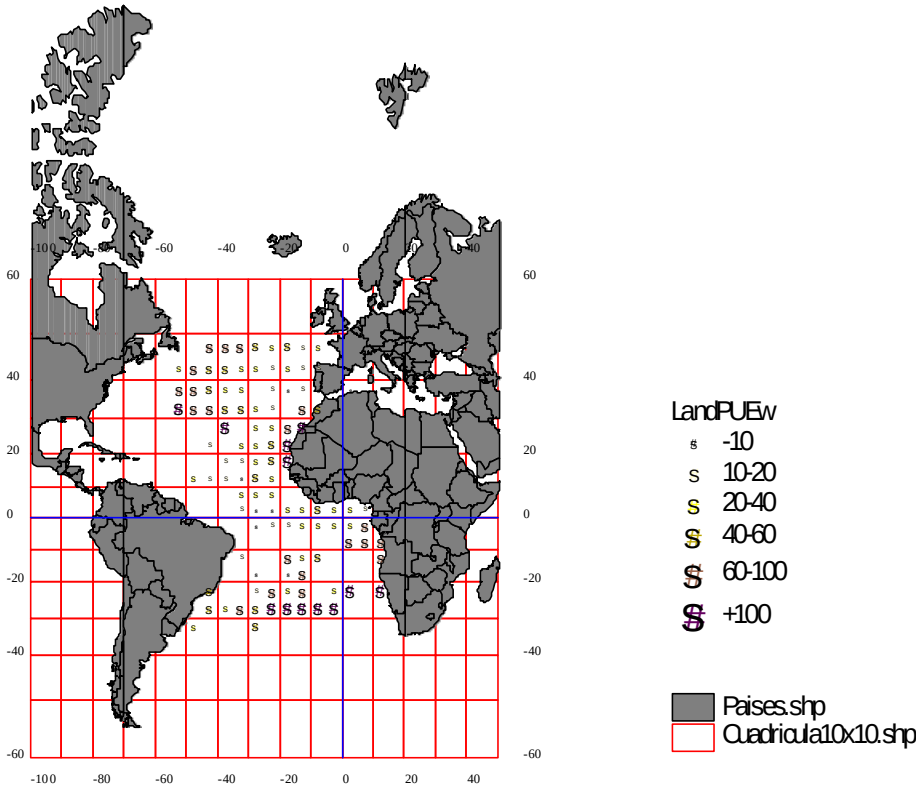

Fig. 7. Landing per unit of effort (kg RW / thousand hooks) of *Isurus oxyrhinchus* (IOO) by 5ºx5º square, year 1999.