SCRS/2008/045

SCIENTIFIC ESTIMATIONS OF BYCATCH LANDED BY THE SPANISH SURFACE LONGLINE FLEET TARGETING SWORDFISH (*Xiphias gladius*) IN THE ATLANTIC OCEAN WITH SPECIAL REFERENCE TO THE YEARS 2005 AND 2006 .

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ABSTRACT

This document provides an overview of the bycatch levels by species landed by the Spanish surface longline fleet targeting swordfish (Xiphias gladius) in the Atlantic Ocean and Mediterranean Sea from 1997 to 2004. This information has also been updated for the years 2005 and 2006, the most recent data available. The three most prevalent species in the catch, Xiphias gladius, Prionace glauca and Isurus oxyrhinchus represented, on average 94.2% and 96.1% of the total Atlantic and Mediterranean landings in weight during the last two years, respectively.

During the years 2005-2006 the species assumed to be bycatch accounted for 71.7% of the total landings in weight from the Atlantic areas –large pelagic sharks, 67.4; tunas, 2.2 %; billfish,1.2% and other species, 0.9%–. In the Mediterranean Sea, the reported bycatch amounted to around 7.0% of the total landings in weight –large pelagic sharks,4.6%; tunas, 1.6%; other species, 1.3% and billfish close to 0%.

As far as bycatch species are concerned, large pelagic sharks were the most prevalent, comprising an average of 94.0% of the bycatch in weight, whereas tunas accounted for 3.1%; billfish,1.7% and other species, 1.2% in the Atlantic. In the Mediterranean, large pelagic sharks amounted to 51.8%, tunas, 23.0; other species,25.2% and billfish,0.1%.. Prionace glauca and Isurus oxyrhinchus were the most important species within the group of large pelagic sharks, reaching prevalences of 88.2% and 9.5%, respectively in the Atlantic –very similar to levels observed in other oceans–. The prevalences of these species within the group of large pelagic sharks in the Mediterranean sea were 77.3% and 6.0% , respectively.

Key words: bycatch, sharks, surface longline, statistics.

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INTRODUCTION

The Spanish surface longline fleet has been historically targeting swordfish *Xiphias gladius* (SWO) in the Atlantic areas, although other species are also caught simultaneously, consisting mostly of large pelagic sharks and, to a lesser extent, tunas, billfish, etc., as in other oceans (GARCÍA-CORTÉS & MEJUTO 2000, 2001, 2002, MEJUTO *et al*. 2000, 2002a, 2002b, 2003, 2006).

The fishing gear used by Spanish surface longline vessels from the beginning of their activity in the Atlantic until the late 1990s was mostly the 'traditional Spanish longline', equipped with a plurifilament main line and clips. However since then, the monofilament 'American style' –Florida style modified– longline gear has been introduced in most of the vessels of the Spanish fleet operating in the Atlantic Ocean, with a mean deployment of around 1,100-1,500 hooks per set.

The objective of this paper is to review the historical series of scientific bycatch data from the Spanish surface longline fishery operating in the Atlantic Ocean and Mediterranean Sea, provided previously, which included information, from 1997 to 1998 (CASTRO *et al*. 2000), for the year 1999 (MEJUTO *et al*. 2002a) and from 2000 to 2004 (MEJUTO *et al.* 2006), as well as to update bycatch landings for the most recent years 2005 and 2006. Moreover, this paper aims to provide knowledge on the annual bycatch landings associated with this fishery, to the most detailed taxonomic level possible and to define the relative global prevalence among species. This information could help us determine the consistency of the estimations over the years. It would also be useful to different ICCAT working groups, including several assessment groups and the subcommittee of ecosystem recently created.

MATERIAL AND METHODS

The information provided in this paper is based on declarations of landings per trip, interviews with skippers at the ports and information filled out voluntarily by the fleet, among other sources, obtained from 1997 to 2006. It also includes data provided by the scientific observers on board commercial vessels during regular fishing activities targeting swordfish and daily sampling in the ports. The breakdown into species of the most prevalent bycatch landed, such as *Prionace glauca* (BSH) and *Isurus oxyrinchus* (SMA), was generally carried out using the information provided by the each individual fleet in their voluntary scientific reports and the sampling in the ports, since the routine taxonomic identification of these species is usually easy and reliable. However, the identification at the level of species belonging to some less prevalent groups such as SHK (pelagic sharks), BIL (billfish species), TUN (tuna species) and OTH (other species) was fundamentally based on the information provided by on-board observers who have a limited spatial-temporal coverage and sampling upon arrival at the port. Due to the wide geographic areas covered by Spanish vessels in the Atlantic Ocean, in certain cases a satisfactory breakdown of the landings was not reliable. Consequently, the reported landings of combined species with a low prevalence could, in some cases, be assigned or allocated to a single species.

For descriptive purposes, the species related to large pelagic sharks were classified into the SHK group, which is made up mainly of specimens of the family Carcharhinidae (fundamentally *Prionace glauca:* BSH), followed by the family Lamnidae (mainly *Isurus oxyrhinchus:* SMA), Sphyrnidae and finally, Alopiidae. The TUN group includes different tuna species among which *Thunnus obesus* (BET), *Thunnus alalunga* (ALB) and *Thunnus albacares* (YFT) are the most important. The group of billfish was labelled as BIL and includes species from the family Istiophoridae. The group OTH includes several species, which have not been identified in certain cases (generally with low commercial value) or which have been identified in terms of species but whose catch is very rare (table 1).

The row data were geographically compiled, recorded and raised by spatial-temporal strata according to the methodology described for distant longline fleets (MIYAKE 1990), and later combined into ICCAT BIL areas. The records that were originally based on gutted or dressed weight were converted, where

necessary, to units of round weight (RW) by applying different conversion factors according to the species or group of species, depending on the manipulation process applied to the fish on board. Conversion factors were defined for different species and presentations: *Prionace glauca* (BSH): Round weight (RW)= Dressed weight (DW) * 2.4074. Others species of Carcharhinidae: Round weight (RW) = Dressed weight (DW) * 2.0. *Isurus oxyrhinchus* (SMA): Round weight (RW) = Dressed weight (DW) * 1.4541. The other pelagic sharks (other SHK): Round weight (RW) = Dressed weight (DW) * 1.4. All species included in the group of billfish (BIL): Round weight (RW) = Dressed weight (DW) * 1.2. The conversion factors applied to each species within the group of tuna (TUN) were: Round weight (RW) = Gutted weight (GW) * 1.1 and Round weight (RW)= Dressed weight (DW) * 1.25.

RESULTS AND DISCUSSION

Table 2 shows the total landings in weight per species by ICCAT BIL areas for the 1997-2006 period where the revised and updated landings are highlighted in grey. The group including the three most prevalent species in the catch, which are also those of highest commercial interest for human consumption (SWO+BSH+SMA), represent 94.2% and 96.1% of the total landings in the Atlantic and Mediterranean, respectively. Similar levels were observed for regions of the SE Pacific and the Indian Ocean for the same group of species and estimated to be around 91% and 90%, respectively (MEJUTO & GARCÍA-CORTÉS 2005, GARCÍA-CORTÉS & MEJUTO 2005, MEJUTO *et al*. 2007).

Table 3 shows the scientific estimations of landings of the target species and combined bycatch obtained by the Spanish surface longline fishery in 2005 and 2006. The group of species considered to be bycatch of the swordfish surface longline fishery from the total catch landed in weight during 2005 and 2006, accounted on average for 71.7 % in the Atlantic and 7.0 % in the Mediterranean. These percentages are similar to previous observations (CASTRO *et al.* 2000, MEJUTO *et al.* 2002a, 2006).

During the years 2005 and 2006 the bycatch in the Atlantic consisted mainly of large pelagic sharks (SHK) accounting, for all the species combined, for 67.4% in weight of the total catch landed, as was expected in view of the activities targeting both BSH and SWO carried out in certain areas of the Atlantic (MEJUTO & DE LA SERNA 2000). The landing of the tuna group (TUN) had a mean value in weight of 2.2% of the total catch landed. The volume of billfish (BIL) amounted to 1.2% of the total landed catch and finally, the group of species with the lowest economic value (OTH) represented around 0.9% of the total yearly landings (figure 1). In the Mediterranean the average bycatch landed in 2005 and 2006 for large pelagic sharks (SHK) accounted for 4.6%, 1.6% for tunas (TUN), 1.3% for other species (OTH) and 0% for billfish (BIL**)** (figure 2).

The volume of landings in weight per group of species in relation to those assumed to be bycatch, as a whole (excluding the swordfish) during 2005 and 2006, amounted to 94.0 % for the SHK group, 3.1% for the TUN group, 1.7% for the BIL group and 1.2% for the OTH group in the Atlantic (table 4, figure 1**).** As expected, the amount of SHK was much more prevalent as compared to the other groups. Similar results were obtained previously for the SHK group, which represented between 95% and 99% of the bycatch, depending on the year of observation (CASTRO *et al.* 2000, MEJUTO *et al* 2002a, 2006). In the Mediterranean the SHK group accounted for 51.8%; tunas,23.0%; other species, 25.2% and the BIL group, 0.1% (table 4, figure 2).

The bycatch analyzed during this period was made up fundamentally of BSH, with an average landing of 82.9% of the total bycatch species followed by the SMA with 8.9% for the Atlantic. In the Mediterranean the average landing was 47.3% for BSH and 3.7% for SMA. In the Atlantic, during 2005 and 2006 the average figures for the other SHK group were 2.2% of the total bycatch species. As far as the species of the TUN group are concerned, the species ALB, BET and YFT represented 1.7%, 0.8% and 0.4%, respectively. The volume of landed species of the BIL group always remained below 1.2% of the total bycatch. It must be noted that the percentage in weight obtained in the OTH group for the species

Lepidocibium flavobrunneun represented 1.0% of the total bycatch landed. In the Mediterranean, other SHK landings were 10.2%, for the TUN group, with BFT reaching 11.9%; LTA , 4.8% and ALB, 4.4%. In the OTH group, *Coriophaena hippurus* (CHO) was the most prevalent species (10.4%). Prevalence was close to 0% for BIL species.

In the Atlantic during the period 2005-2006, considering only the SHK group, the BSH species accounted for most of the average catches (88.2%), followed by SMA (9.5%). These rates or prevalence between these two species are almost identical to those observed by the Spanish surface longliners in previous years as well as in other oceans. The prevalence of BSH is clearly predominant and remarkably higher as compared to the group of other bycatch species and, of course, within the SHK group. Considering the TUN group only, the species ALB and BET represented 55.0% and 26.3%, respectively. Within the BIL group, 68.4% was identified as SAI, 12.7% as WHM and 12.4% as BUM. Within the OTH group, 80.5% was represented by the species *Lepidocibium flavobrunneun*, which was very frequent in all the oceans observed. ALB and SAI are more easily identified by the skippers than other species tuna or billfish species, respectively, so both are frequently recorded specifically. This praxis could result in larger catch estimations within its group after the raising and substitution procedures. In the Mediterranean within the SHK group, the BSH species amounted to 77.3% and SMA to 6.0%. Within the TUN group, the species BFT and LTA represented 56.3% and 22.8%, respectively with ALB accounting for 20.8%. Within the OTH group, 58.8% was represented by the species CHO. During this period only one sailfish and one white marlin were recorded.

In the majority of world fisheries, there are many difficulties involved in accurately estimating the bycatch levels. This problem raised when the taxonomic level is very demanding. The classification of the catch on board usually follows commercial criteria rather than scientific norms. So this problem also frequently occurs in many of the oceanic fisheries of large pelagic fish. In the fleets targeting tuna, this problem could affect not only the bycatch species, but also the species-sizes of the target species that have a similar appearance and price, which are included in the same commercial category. For this reason, it is essential that scientific procedures be applied in order to obtain annual catch estimates at the species level, or a proxy taxonomic level, that would be considered more reliable than those of the commercial records.

Information on bycatch species from most of the distant-water longline fleets operating all over the world could be also affected by this problem. Moreover, the taxonomic identification of some of these bycatch species is not always easy and requires continuous efforts to carry out information dissemination campaigns and the training of crew members, as well as establishing more detailed routine procedures for skippers to record their catch. So, the taxonomic identifications are often inaccurately recorded in the commercial catch records, especially in the case of less prevalent species. This problem often limits the availability of reliable catch records on these species and/or their correct taxonomic identification for scientific purposes. The problem is aggravated when the number of taxonomic levels aimed to be recorded is increased. Therefore, this issue must be approached realistically from a technical stance, taking into consideration the possibilities that the quality of the information will provide and trying to incorporate routine procedures that will allow us to gradually reduce these limitations. In this sense, we consider it essential to give top priority to annual landing estimations for the different species that may be captured. To try and put together data that are geographically and temporally more desegregated would amount to nothing more than simulations affected by the substitution criteria used. In this document we have succeeded in estimating, by BIL regions, the annual landings of as many as 48 different taxonomical levels, although the prevalence of only three species combined often exceeds 90% of the landings made.

ACKNOWLEDGEMENTS

We would like to thank to all the scientific observers, the skippers and sailors who have collaborated with us, as well as all the staff of the IEO projects SWOATL and SHKLL: E. Alot, A. Carroceda, J.L. Cebrián, I. González, J. Lorenzo, E. Majuelos, M. Marín, M. Quintáns, M. Quinzán and J.L. Torres.

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Table 1. List of species codes used and their scientific names by codes.

GROUP	CODE	SCIENT. NAME
BIL	BLM	*Makaira indica*
BIL	BLZ	*Makaira mazara*
BIL	BUM	*Makaira nigricans*
BIL	MLS	*Tetrapturus audax*
BIL	MSP	*Tetrapturus belone*
BIL	SAI	*Istiophorus albicans*
BIL	SHP	*Tetrapturus angustirostris*
BIL	SPF	*Tetrapturus pfluegeri*
BIL	WHM	*Tetrapturus albidus*
OTH	WAH	*Acantocibium solandri*
OTH	BRO	*Brama spp.*
OTH	CHO	*Coriphaena hippurus*
OTH	GGO	*Galeorhinus galeus*
OTH	LFO	*Lepidocibium flavobrunneum*
OTH	LGO	*Lampris guttatus*
OTH	OTH	*Other species*
OTH	RPO	*Rubetus pretiosus*
OTH	SBO	*Sphyraena spp.*
OTH	SDO	*Seriola dumerili*
OTH	TLO	*Taractichthys longipinnis*
SHK	ALO	*Alopias spp.*
SHK	ASO	*Alopias superciliosus*
SHK	AVO	*Alopias vulpinus*
SHK	BSH	*Prionace glauca*
SHK	CAO	*Carcharhinus spp.*
SHK	CBO	*Carcharhinus limbatus*
SHK	CFO	*Carcharhinus falciformis*
SHK	CGO	*Carcharhinus galapagensis*
SHK	CLO	*Carcharhinus longimanus*
SHK	COO	*Carcharhinus obscurus*
SHK	CPO	*Carcharhinus plumbeus*
SHK	CSO	*Carcharhinus signatus*
SHK	GCO	*Galeocerdo cuvier*
SHK	IPO	*Isurus paucus*
SHK	LNO	*Lamna nasus*
SHK	PKO	*Pseudocarcharias kamoharai*
SHK	PTO	*Alopias pelagicus*
SHK	SLO	*Sphyrna lewini*
SHK	SMA	*Isurus oxyrinchus*
SHK	SPO	*Sphyrna spp.*
SHK	SZO	*Sphyrna zygaena*
SWO	SWO	*Xiphias gladius*
TUN	ALB	*Thunnus alalunga*
TUN	BET	*Thunnus obesus*
TUN	BFT	*Thunnus thynnus*
TUN	BKO	*Gasterochisma melampus*
TUN	LTA	*Euthynnus alletteratus*
TUN	SKJ	*Katsuwonus pelamis*
TUN	YFT	*Thunnus albacares*

Table 2. Scientific estimation of landings by species (kg of round weight –RW–) of the bycatch considered in the Spanish surface longline fishery by areas BIL(ICCAT), for the years 1997-1998.

Group	Year Species	1997 BIL94A	1997 BIL94B	1997 BIL95	1997 BIL96	1997 BIL97	1998 BIL94A	1998 BIL94B	1998 BIL95	1998 BIL96	1998 BIL97
BIL	BLM	0	0	0	0	0	0	0	0	0	0
BIL	BLZ	0	0	0	0	0	0	0	0	0	0
BIL	BUM	1489	3965	667	31718	84939	31687	4345	0	79504	79664
BIL	MLS	0	0	0	0	0	0	0	0	0	0
BIL	MSP	0	329	2332	0	0	0	454	2557	0	0
BIL	SAI	13473	6953		16849	30698	0	3227	0	41707	12095
BIL	SHP	0	0	547	0	0	0	0	0	0	0
BIL	SPF	0	0		131	1163	0	0	0	326	8649
BIL	WHM	8293	80442	785	3394	1065	1037	90181	808	8798	996
OTH	WAH	0	0	0	0	43	0	0	0	0	0
OTH	BRO	0	1393	2384	0	0	0	1594	3420	0	0
OTH	CHO	0	540	5704	0	31	0	3609	6823	0	0
OTH	GGO	0	0	452	0	0	0	236	666	0	0
OTH	LFO	19138	89308	0	130	1940	25076	62850	851	141	1088
OTH	LGO	0	0	0	0	0	0	0	0	0	0
OTH	OTH	5395	32221	5228	23066	8718	15051	38252	3452	10437	8747
OTH	RPO	2811	4784	140	0	0	2228	4711	1363	0	0
OTH	SBO	0	0	0	0	4	0	1037	0	0	0
OTH	SDO	0	31	31	0	0	0	0	0	0	0
OTH	TLO	0	0	0	0	0	0	0	0	0	0
SHK	ALO	78	24688	0	0	7849	24742	26904	0	2002	912
SHK	ASO	9140	138442	0	535	0	9760	103617	170	0	51
SHK	AVO	134	26605	3484	0	0	1239	36884	7002	0	0
SHK	BSH	12314910	12182521	146492	1716548	3555869	12963129	9541133	59163	1935150	3638795
SHK	CAO	3448	144294	0	87948	84589	12320	157776	0	26802	60189
SHK	CBO	0	0	0	0	0	0	0	0	0	0
SHK	CFO	0	0	0	85	505	0	10435	0	0	894
SHK	CGO	0	0	0	0	0	0	0	0	0	0
SHK	CLO	0	0	0	1138	2870	0	1930	0	0	7528
SHK	COO	0	0	0	0	0	0	130	0	0	162
SHK	CPO	0	0	0	72	124	0	0	0	0	103
SHK	CSO	0	0	0	0	0	0	2447	0	0	0
SHK	GCO	1352	1312	0	101	56	2716	2670	0	20	31
SHK	IPO	1188	6843	0	11588	13859	2582	5657	0	2386	12819
SHK	LNO	2715	22486	0	0	2257	9097	15589	0	526	1298
SHK	PKO	0	0	0	0	0	0	0	0	0	8
SHK	PTO	0	0	0	0	0	0	0	0	0	0
SHK	SLO	0	0	0	0	0	0	2646	0	0	151
SHK	SMA	765781	1649770	5833	528192	827809	997490	1201962	6751	424978	716061
SHK	SPO	29202	353291	529	122998	299058	46601	343792	0	101210	244611
SHK	SZO	0	0	0	892	20910	0	2816	0	0	11683
TUN	ALB	3756	26321	34847	162414	27699	7623	97393	1813	12377	7552
TUN	BET	32486	52029	0	122679	61217	35328	43566	339	182691	122716
TUN	BFT	0	0	101412	0	0	0	0	25424	0	0
TUN	BKO	0	0	0	0	0	0	0	0	0	0
TUN	LTA	0	0	0	0	0	0	0	0	0	0
TUN	SKJ	127	11	0	0	50	0	98	10	0	181
TUN	YFT	0	17213	0	34136	19743	18342	22157	0	23022	17658

Note: shaded figures are revisions in relation to previously reported or updated information.

Table 2 (cont.). Scientific estimation of landings by species (kg of round weight –RW–) of the bycatch considered in the Spanish surface longline fishery by areas BIL(ICCAT), for the years 1999-2000.

Group	Year Species	1999 BIL94A	1999 BIL94B	1999 BIL95	1999 BIL96	1999 BIL97	2000 BIL94A	2000 BIL94B	2000 BIL95	2000 BIL96	2000 BIL97
BIL	BLM	0	0	0	0	0	0	0	0	0	0
BIL	BLZ	0	0	0	0	0	0	0	0	0	0
BIL	BUM	11212	3930	0	32436	77269	17125	7478	0	77907	37565
BIL	MLS	0	0	0	0	0	0	0	0	0	0
BIL	MSP	0	0	412	0	0	0	0	2266	0	0
BIL	SAI	0	301	156	6772	19350	0	456	0	14397	7862
BIL	SHP	0	302	0	0	0	0	0	0	0	0
BIL	SPF	1897	1428	0	21872	27521	2876	2629	0	46847	11340
BIL	WHM	29405	44122	213	28237	16561	44459	72069	1438	60799	7405
OTH	WAH	0	0	0	0	0	0	0	0	0	0
OTH	BRO	0	1690	3880	0	0	0	1078	5644	0	0
OTH	CHO	16	734	8198	0	0	764	2391	6908	0	0
OTH	GGO	0	478	14	0	425	0	0	0	0	0
OTH	LFO	29233	34063	0	6711	4543	60972	68494	0	2491	3564
OTH	LGO	0	417	0	0	0	96	930	0	0	0
OTH	OTH	9125	2961	684	3340	458	9918	13304	2921	1969	3917
OTH	RPO	912	872		59	80	427	1508	0	40	2
OTH	SBO	26	0	12	0	0	1403	419	0	0	0
OTH	SDO	0	0	28	0	0	0	0	221	0	0
OTH	TLO	0	0		0	0	0	0	0	0	0
SHK	ALO	13715	18593	0	4138	0	15975	22590	0	3740	6112
SHK	ASO	6518	37188	0	0	0	6729	16416	0	0	0
SHK	AVO	2732	12443	6712	0	0	2380	3086	4605	0	0
SHK	BSH	12586247	9225025	20276	1888836	5284538	14775957	9335960	30943	2756419	4194285
SHK	CAO	23795	59010	0	30702	44032	44182	94675	0	42885	68705
SHK	CBO	0	0	0	0	0	0	0	0	0	0
SHK	CFO	1004	0	0	96	65	0	0	0	940	61
SHK	CGO	0	0	0	0	0	0	0	0	0	0
SHK	CLO	63	639	0	271	969	0	24	0	1473	1040
SHK	COO	0	0	0	0	0	0	0	0	0	0
SHK	CPO	0	0	0	0	53	0	0	0	0	0
SHK	CSO	0	0	0	*0*	0	0	0	0	0	0
SHK	GCO	2691	1216	0	72	196	7664	533	0	191	0
SHK	IPO	9088	11421	0	2340	10389	12332	3674	0	2570	1158
SHK	LNO	2762	15353	0	0	1537	4737	8420	0	6938	0
SHK	PKO	0	0	0	0	0	0	0	0	0	0
SHK	PTO	0	0	0	0	0	0	0	0	0	0
SHK	SLO	0	0	0	0	0	0	0	0	0	0
SHK	SMA	988315	1062567	4747	320185	541118	784524	781063	2914	267729	932520
SHK	SPO	50357	190127	0	44881	190916	57353	311878	381	50146	163704
SHK	SZO	1014	61	0	818	5408	234	1376	0	843	2763
TUN	ALB	36632	48907	706	691923	178924	115496	98293	1537	232042	49522
TUN	BET	28900	29254	247	33258	24787	41877	69852	0	455722	30307
TUN	BFT	0	8414	28234	0	0	0	3327	22444	0	0
TUN	BKO	0	0	0	0	0	0	0	0	0	0
TUN	LTA	0	0	0	0	0	0	0	0	0	0
TUN	SKJ	132	29	0	863	332	45514	14192	77	775	654
TUN	YFT	3808	17052	0	26051	20102	22714	7556	0	125264	15641

Note: shaded figures are revisions in relation to previously reported or updated information.

Table 2 (cont.). Scientific estimation of landings by species (kg of round weight –RW–) of the bycatch considered in the Spanish surface longline fishery by areas BIL, during the years 2001-2002.

Group	Year / Species	2001 BIL94A	2001 BIL94B	2001 BIL95	2001 BIL96	2001 BIL97	2002 BIL94A	2002 BIL94B	2002 BIL95	2002 BIL96	2002 BIL97
BIL	BLM	0	0	0	0	0	0	0	0	0	0
BIL	BLZ	0	0	0	0	0	0	0	0	0	0
BIL	BUM	4391	4883	0	14538	9106	55	1229	0	2283	24845
BIL	MLS	1308	0	0	0	0	0	0	0	0	0
BIL	MSP	0	0	1119	0	0	0	0	1811	0	0
BIL	SAI	69439	73166	0	284242	77237	75031	96371	153	374124	113126
BIL	SHP	1888	0	0	0	0	0	0	0	0	0
BIL	SPF	2791	0	0	9963	8875	87	444	0	4742	5275
BIL	WHM	12381	25769	85	9719	0	0	4018	302	0	1481
OTH	WAH	830	0	0	0	0	0	0	0	0	0
OTH	BRO	0	569	2891	0	0	0	49	1347	0	0
OTH	CHO	348	4119	15279	1184	0	573	1827	884	1577	844
OTH	GGO	0	39	0	0	0	0	16	0	0	0
OTH	LFO	88731	81539	0	20941	8966	59587	71149	0	45204	29488
OTH	LGO	302	2052	122	0	0	150	1477	0	0	0
OTH	OTH	6577	15248	917	16178	12924	6917	7577	175	36237	11735
OTH	RPO	1035	729	0	0	0	812	477	0	214	0
OTH	SBO	1827	1628	0	800	233	5172	1404	0	3957	915
OTH	SDO	0	154	297	22	0	0	0	130	0	0
OTH	TLO	0	16	0	0	0	0	16	0	0	0
SHK	ALO	12348	57118	0	2553	0	1509	1518	0	593	0
SHK	ASO	26633	35351	0	0	0	4520	38004	0	0	0
SHK	AVO	3410	16564	4467	0	560	1740	9123	2305	0	0
SHK	BSH	9403709	7958025	5606	3447996	4294588	8507098	7158810	3116	2140048	3228034
SHK	CAO	19590	95243	0	34400	139773	13700	75745	0	17030	27932
SHK	CBO	0	27	0	0	0	0	0	0	0	11510
SHK	CFO	0	780	0	98	0	0	0	0	151	29768
SHK	CGO	0	0	0	0	0	0	3959	0	0	0
SHK	CLO	129	3685	0	1166	1739	0	95	0	201	300
SHK	COO	0	0	0	0	0	0	0	0	0	2256
SHK	CPO	0	0	0	0	0	0	0	0	0	0
SHK	CSO	0	25	0	0	0	0	0	0	0	9117
SHK	GCO	3915	777	0	73	0	2217	1331	0	41	218
SHK	IPO	22173	15884	0	5183	8015	29122	23508	0	6946	4933
SHK	LNO	2588	21522	0	0	505	5158	49196	0	1127	1344
SHK	PKO	22	23	0	0	0	0	0	0	0	0
SHK	PTO	0	0	0	0	0	0	0	0	0	0
SHK	SLO	74	0	0	131	0	0	0	0	0	232
SHK	SMA	636721	1047749	1839	460589	774027	1010415	1036440	1666	381032	429480
SHK	SPO	55128	248726	0	75901	93163	65750	363299	0	50763	40423
SHK	SZO	985	3784	0	2459	2600	600	1149	0	29	10129
TUN	ALB	110896	86288	3488	463933	94864	125212	110958	1892	768910	60224
TUN	BET	62225	89797	48	57120	6804	48135	87460	0	148433	35025
TUN	BFT	0	3800	36508	0	0	0	400	20856	0	0
TUN	BKO	0	0	0	1936	0	0	0	0	0	0
TUN	LTA	0	0	321	0	0	0	0	1070	0	0
TUN	SKJ	0	4841	0	5966	5434	0	1738	8	0	22377
TUN	YFT	40395	11252	0	57345	5806	22701	26432	0	139883	15561

Note: shaded figures are revisions in relation to previously reported or updated information.

Table 2 (cont.). Scientific estimation of landings by species (kg of round weight –RW–) of the bycatch considered in the Spanish surface longline fishery by areas BIL, during the years 2003-2004.

Group	Year / Species	2003 BIL94A	2003 BIL94B	2003 BIL95	2003 BIL96	2003 BIL97	2004 BIL94A	2004 BIL94B	2004 BIL95	2004 BIL96	2004 BIL97
BIL	BLM	2776	0	0	0	0	0	0	0	0	0
BIL	BLZ	0	0	0	0	5362	0	0	0	0	0
BIL	BUM	4113	1538	0	6233	0	4531	22507	0	23640	0
BIL	MLS	0	0	0	0	2340	0	0	0	0	0
BIL	MSP	0	36	322	0	0	0	0	0	0	0
BIL	SAI	29520	60724	0	166935	122645	56566	80233	54	124597	68125
BIL	SHP	0	0	0	1606	0	0	0	0	0	0
BIL	SPF	4514	0	0	2073	0	0	0	0	0	0
BIL	WHM	7258	11548	424	1775	1395	8116	11289	54	44994	0
OTH	WAH	97	21	0	0	0	158	97		0	
OTH	BRO	5	220	795	0	0	10	557	1741	1579	15
OTH	CHO	2908	3401	2343	1228	914	2330	2281	15723	3359	0
OTH	GGO	0	0	0	0	0	0	20	38	0	0
OTH	LFO	73982	62204	318	27383	31879	86810	114436	0	62328	0
OTH	LGO	442	1565	111	0	0	395	1909	0	520	10
OTH	OTH	2195	245	2465	7326	190	10494	6886	145	36656	19481
OTH	RPO	916	386	0	364	46	541	889	0	3237	0
OTH	SBO	1838	405	0	2140	1880	3290	1963	0	1903	817
OTH	SDO	0	0	0	0	0	0	0	0	0	0
OTH	TLO	0	17	0	0	0	0	0	0	0	0
SHK	ALO	2879	1133	0	139	2544	1009	6469		74	0
SHK	ASO	4154	17505	193	0	0	1083	37399	0	0	0
SHK	AVO	5094	7459	566	0	0	1699	15564	2153	0	0
SHK	BSH	10269285	5705256	3458	2874869	3751240	11223267	6090626	4883	4282706	3083599
SHK	CAO	21600	86391	0	16037	61484	30839	92616	0	22372	26614
SHK	CBO	0	0	0	0	0	0	0	0	0	0
SHK	CFO	52	0	0	0	0	0	4287	0	0	0
SHK	CGO	0	0	0	0	0	0	0	0	0	0
SHK	CLO	143	0	0	972	0	0	0	0	0	0
SHK	COO	0	0	0	0	0	0	0	0	0	0
SHK	CPO	0	0	0	0	0	0	0	0	0	0
SHK	CSO	0	0	0	0	0	0	142	0	0	0
SHK	GCO	2475	210	0	126	146	4557	102	0	200	58
SHK	IPO	27767	24251	0	3708	6154	19312	28020	0	1690	2210
SHK	LNO	2075	24444	0	152	8587	5108	5958	0	273	3443
SHK	PKO	0	0	0	0	0	0	0	0	0	0
SHK	PTO	0	0	0	0	0	0	0	0	0	0
SHK	SLO	45	21	0	0	0	0	2153	0	270	0
SHK	SMA	1267511	800085	2091	560657	597571	1316370	771278	1768	440876	261826
SHK	SPO	55668	231423	0	29318	62776	82993	363522	35	18464	34866
SHK	SZO	562	0	0	0	0	115	12459	0	0	0
TUN	ALB	3040	9282	1178	99587	83833	3026	6874	1764	70588	11494
TUN	BET	163631	263657	0	502763	295703	176604	182343	0	172657	98070
TUN	BFT	923	319	18942	0	0	0	3911	13296	0	0
TUN	BKO	0	0	0	0	0	0	0	0	0	0
TUN	LTA	0	0	1524	0	0	0	0	1214	0	0
TUN	SKJ	11	0	0	4926	0	0	0	21	0	4151
TUN	YFT	37935	90510	0	6922	39562	44621	3662	0	19019	13096

Note: shaded figures are revisions in relation to previously reported or updated information.

Table 2 (cont.). Scientific estimation of landings by species (kg of round weight –RW–) of the bycatch considered in the Spanish surface longline fishery by areas BIL, during the years 2005-2006.

Group	Year / Species	2005 BIL94A	2005 BIL94B	2005 BIL95	2005 BIL96	2005 BIL97	2006 BIL92	2006 BIL94A	2006 BIL94B	2006 BIL95	2006 BIL96	2006 BIL97
BIL	BLM	0	0	0	0	0	0	2542	0	0	0	0
BIL	BLZ	0	0	0	0	0	0	0	0	0	0	0
BIL	BUM	12187	0	0	4636	7289	0	10173	12903	0	24373	43955
BIL	MLS	0	0	0	8807	0	0	0	0	0	17053	2722
BIL	MSP	0	0	0	0	0	0	0	0	0	0	0
BIL	SAI	68517	88588	16	44896	88644	0	40238	34553	0	107898	165587
BIL	SHP	5432	0	0	0	0	0	0	0	0	0	0
BIL	SPF	0	0	0	5421	2533	0	0	919	0	14360	1934
BIL	WHM	25363	26192	21	6387	6782	0	16780	13035	0	15891	8170
OTH	WAH	401	0	0	476	439	0	314	417	0	1600	78
OTH	BRO	53	510	6119	0	0	0	10	468	897	0	0
OTH	CHO	9029	2289	7150	1176	1372	0	8295	3235	8042	11636	1601
OTH	GGO	0	51	0	0	0	0	0	19	1263	0	0
OTH	LFO	90239	84714	0	56553	56221	337	74065	57492	0	63897	45418
OTH	LGO	312	1149	0	0	0	0	395	275	0	0	0
OTH	OTH	5625	221	980	9355	13237	0	2077	15881	1373	11774	3808
OTH	RPO	1008	437	0	46	300	0	2902	313	0	1256	1219
OTH	SBO	2079	2582	0	847	1144	0	1150	92	0	3431	1339
OTH	SDO	0	0	0	0	0	0	0	0	0	0	0
OTH	TLO	0	0	0	0	0	0	0	0	0	0	0
SHK	ALO	0	0	0	0	0	0	0	0	0	0	0
SHK	ASO	4577	63699	0	1726	0	197	13420	78292	0	333	0
SHK	AVO	13834	23692	2032	161	0	188	6451	14440	12954	18	0
SHK	BSH	10568376	4437701	8152	2983463	3426667	121057	11895970	3446598	61216	4579290	4145088
SHK	CAO	0	0	0	0	0	0	0	0	0	0	0
SHK	CBO	0	0	0	0	0	0	0	0	0	0	0
SHK	CFO	24153	34053	0	1934	0	0	3458	8552	0	208	4442
SHK	CGO	0	0	0	0	0	0	0	545	0	0	0
SHK	CLO	0	0	0	5545	39441	0	4160	10943	0	3612	10026
SHK	COO	0	0	0	0	0	0	0	0	0	0	0
SHK	CPO	0	0	0	2260	0	0	0	2017	0	0	5780
SHK	CSO	2597	35882	0	0	0	0	0	0	0	0	0
SHK	GCO	1490	175	0	137	0	0	6240	266	0	62	0
SHK	IPO	34257	15520	0	990	4548	0	48040	6881	0	5601	7307
SHK	LNO	7430	6516	0	232	0	0	8854	24698	0	2627	0
SHK	PKO	0	0	0	0	0	0	0	0	0	0	11
SHK	PTO	0	0	0	0	0	0	0	0	0	0	0
SHK	SLO	0	0	0	0	0	0	673	651	0	0	28
SHK	SMA	1323263	428038	1749	307568	276066	24751	1390361	502905	3679	415557	248810
SHK	SPO	88411	215289	0	7735	47631	0	53748	78178	0	16937	59946
SHK	SZO	479	893	0	0	0	0	714	8577	0	1274	0
TUN	ALB	123257	97015	497	114516	160086	0	39680	43345	5964	212023	147707
TUN	BET	23629	56923	0	9981	15108	955	134704	66201	0	49785	91338
TUN	BFT	281	2273	7669	0	0	0	9705	8759	9785	0	0
TUN	BKO	0	0	0	0	0	0	0	0	0	0	0
TUN	LTA	0	0	1298	0	0	0	0	0	5781	0	0
TUN	SKJ	7221	0	0	0	8079	0	0	992	0	34242	856
TUN	YFT	3120	4870	0	955	9816	993	59188	23905	0	55355	88844

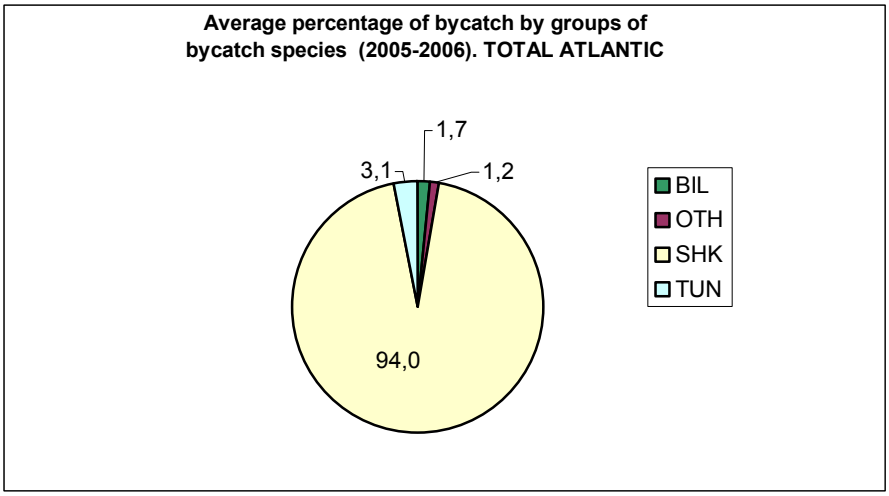
Note: shaded figures are revisions in relation to previously reported or updated information.

Table 3. Scientific estimation of landings (tons of round weight –RW–) of the target species (*Xiphias gladius*) *vs.* combined bycatch species and prevalence of the bycatch obtained by the Spanish surface longline fishery in the Atlantic ocean and Mediterranean sea during 2005-2006.

AREA	Species/Year	2005	2006
ATLANTIC	SWO	10913	10746
	Bycatch	25817	29185
	TOTAL	36730	39931
	% Bycatch	70.3	73.1
MEDIT.	SWO	760	1060
	Bycatch	36	111
	TOTAL	796	1171
	% Bycatch	4.5	9.5

Table 4. Scientific estimation of bycatch landings (kg of round weight –RW–) by group, made by the Spanish surface longline fishery in the Atlantic Ocean and Mediterranean Sea and prevalences of the total bycatch by group during 2005-2006.

Year	Area	BIL	OTH	SHK	TUN
2005	North Atl.	226280	200699	17330325	318589
	South Atl.	175396	141166	7106103	318542
	Tot ATL.	401676	341865	24436428	637131
	%	1.6	1.3	94.7	2.5
2006	North Atl.	131144	167737	17761827	388426
	South Atl.	401942	147057	9506958	680150
	Tot ATL.	533086	314794	27268784	1068576
	%	1.8	1.1	93.4	3.7
	Ave. % ATL.	1.7	1.2	94.0	3.1
2005	Medit.	37	14249	11933	9464
	%	0.1	39.9	33.4	26.5
2006	Medit.	0	11575	77849	21530
	%	0.0	10.4	70.2	19.4
	Ave. % MED.	0.1	25.2	51.8	23.0



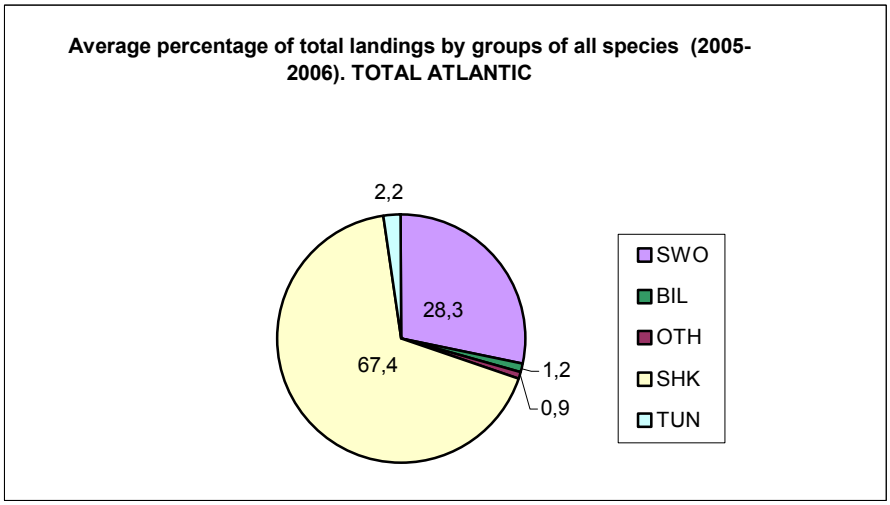
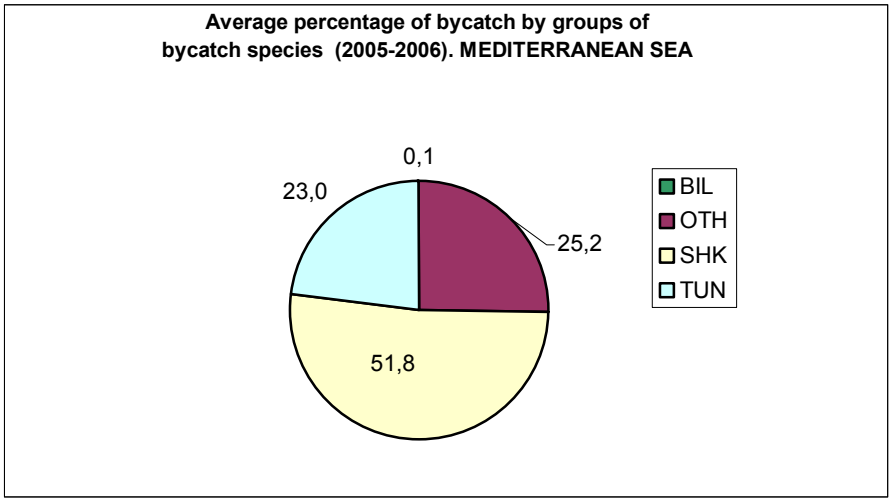


Figure 1. Scientific estimation of the percentage of landings by group within the bycatch species and of the percentage of the total landings (relative prevalence) by group (target and by-catch species) in the Spanish surface longline fishery in the Atlantic Ocean, during 2005–2006. Note: decimals are in Spanish (, = .)



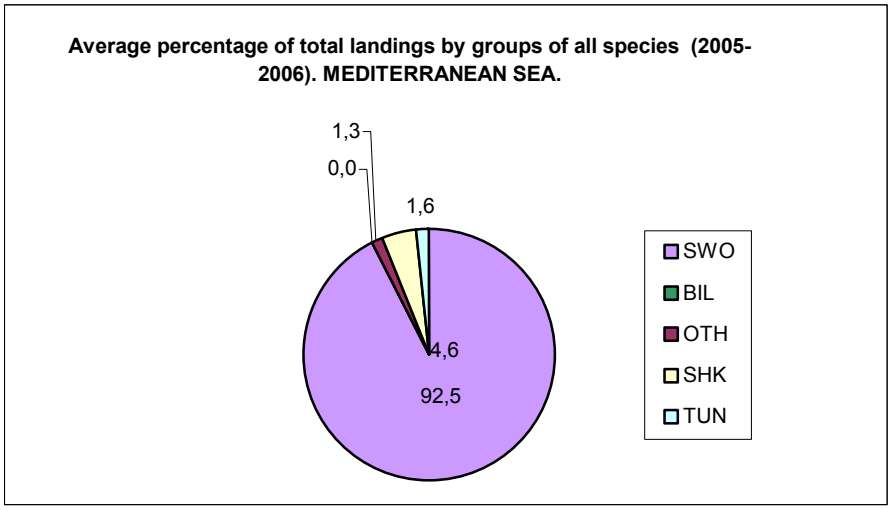


Figure 2. Scientific estimation of the percentage of landings by group within the bycatch species and of the percentage of the total landings (relative prevalence) by group (target and by-catch species) in the Spanish surface longline fishery in the Mediterranean sea, during 2005–2006. Note: decimals are in Spanish (, = .)