UPDATED AND RETROSPECTIVE ESTIMATES OF SHORTFIN MAKO (*ISURUS OXYRINCHUS*) LANDINGS BY THE SPANISH SURFACE LONGLINE FISHERY TARGETING SWORDFISH IN AREAS OF THE ATLANTIC OCEAN DURING THE 1950-2015 PERIOD

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SUMMARY

*Landings of shortfin mako (*Isurus oxyrinchus*) by the Spanish surface longline fleet targeting swordfish in Atlantic areas were estimated for the period 1950-2015 combining different sources of information. An approximation to the magnitude of landings during the 1950-1982 period was estimated by the retrospective application of the ratio between shortfin mako and the target species (swordfish) landings observed at the beginning of the 1980s in this fishery. Landings for the period after 1982 were estimated either by reports available in literature for some of the years or by means of trip reports for the periods in which data were not previously available. A new data set was generated for the nine-year period 1988-1996 applying a data mining approach to trips during that period. Additionally, a revision of the Task I data available in the ICCAT data base 1997-2015 was carried out. Information from all these sources was combined to propose a new set of figures for landings by stock. The authors recommend using post-1982 estimates for stock assessment.*

RÉSUMÉ

*Les débarquements de requin-taupe bleu (*Isurus oxyrinchus*) réalisées par la flottille espagnole de palangriers de surface ciblant l'espadon dans l'Atlantique ont été estimées pour la période de 1950 à 2015 en combinant différentes sources d'informations. Les débarquements de la période 1950-1982 ont été obtenus en appliquant rétrospectivement le ratio entre les débarquements de requin-taupe bleu et de l'espèce cible (espadon) observés au début des années 80 dans cette pêcherie. Les débarquements après 1982 ont été estimés à partir des rapports de la littérature scientifique pour quelques années, ou au moyen de rapports de sorties des périodes pour lesquelles aucune donnée n'était disponible préalablement. Un nouveau jeu de données a été généré pour la période de neuf ans 1988-1996, en appliquant une approche d'exploration de données pour les sorties de cette période. De plus, une révision des données de la tâche I disponibles dans la base de données de l'ICCAT 1997-2015 a été effectuée. L'information de toutes ces sources a été combinée pour réviser les données disponibles et proposer un nouveau jeu de chiffres pour les débarquements par stock pour la période 1950-2015.*

RESUMEN

*Los desembarcos de marrajo dientuso (*Isurus oxyrinchus*) realizados por la flota española de palangre de superficie dirigida al pez espada en áreas del Atlántico fueron estimados para el periodo 1950-2015 combinando diferentes fuentes de información. Los desembarcos del periodo 1950-1982 fueron obtenidos aplicando retrospectivamente la ratio entre las capturas del marrajo dientuso y de la especie objetivo (pez espada) observada a inicios de los años ochenta en esta pesquería. La estimación de desembarcos para el periodo posterior a 1982 fue realizada bien a partir de descriptivas disponibles en la literatura, o mediante datos por marea para periodos de los cuales previamente no de disponía de datos. Un nuevo conjunto de datos fue generado para nueve años entre 1988-1996 usando minería de datos de mareas realizadas durante ese periodo. Adicionalmente, fue realizada una revisión de la Tarea I disponible en la base de datos de ICCAT del periodo 1997-2015. El conjunto de informaciones permitió reconstruir y proponer para esta flota un nuevo conjunto de datos de desembarcos por stock para el periodo 1950-2015.*

KEYWORDS

Shortfin mako, sharks, catches, longline

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1. Introduction

The shortfin mako shark (*Isurus oxyrinchus*) (SMA) is a very active and highly migratory species with horizontal migrations recorded of several thousand nautical miles during short periods. Large and extensive migrations and mixing, at least into each hemisphere of the Atlantic, have been described in literature from conventional tagging programs carried out over a number of decades (e.g. Casey and Kolher 1992, Kolher *et al.* 1998, Mejuto *et al.* 2005) and also from electronic tagging experiments conducted in more recent years describing both the horizontal and vertical migrations at depths of up to eight hundred meters within a wide range of sea temperatures (Abascal *et al.* 2011, Vaudo *et al.* 2016). The conclusions about their horizontal movements seem to be conditioned to some extent by the tagging scheme applied by each tagging programme or experiment, and the reporting criteria applied by each fleet.

Abundant information about SMA is available online, including videos, websites, etc. However, extensive descriptions of worldwide SMA fisheries are rarely included in literature considered relevant. Scant details about fisheries are regularly taken into consideration with no mention of information from commercial or recreational fisheries where this species is, or has been, a target or bycatch species (see e.g. Castro *et al.* 1999, Compagno 2001, Stevens 2008). There is, in some cases, conflicting information among authors about the key biological parameters of this species, stock structures suggested or state of the stocks diagnoses. Available ICCAT information, papers and assessment results are regularly omitted in most sources consulted. In recent decades some researchers have provided detailed fishery descriptions, accurate reports of landings, standardized CPUE trends over time, better taxonomic identification of this species in landings from different geographical regions-oceans, among other improvements regularly also omitted (e.g. Adams *et al.* 2016, Anon. 2013, Campana *et al.* 2005, Domingo *et al.* 2015, Green *et al.* 2009, Mejuto and Garcés 1984, Mejuto *et al.* 2009, Semba, and Yokawa 2014, Sosa-Nishizaki *et al.* 2014, etc.).

SMA is probably the second most abundant epipelagic shark species, after the blue shark, in most temperate, subtropical and tropical oceanic areas of the Atlantic Ocean, although seldom in waters with SST below 16ºC. Historical FAO catch-landing statistics for this and many other fish species are in some cases partial because, among other reasons, artisanal-coastal and recreational fisheries data were regularly misreported. SMA is a very popular and prized trophy in many recreational fisheries, but is also a precious food resource in many coastal developing countries all over the world (e.g. Ngom Sow 2013). In some cases, old records of SMA landings could have been reported as Lamnidae or misreported as other species because of similar shapes or the common names used in some countries or local communities (Fernández-Costa and Mejuto 2010). So, a scientific revision of landing data and other information available is called for.

Owing to the medium-level prevalence of this species in most temperate, subtropical and tropical oceanic areas where the fisheries targeting tuna and tuna-like species of the ICCAT area have regularly operated, it is highly likely that the landing data of this species, regularly caught as bycatch, are better reported at species level or mixed in some cases with data on other similar taxonomic species. The SMA has been historically observed and reported as a medium-prevalent bycatch shark species of most longline fisheries targeting tuna and tuna-like species in oceanic areas of the Atlantic (Valeiras and Abad 2009) and other oceans. This species has also been reported in driftnets targeting different species (Ngom Sow 2013), but it seems to be less prevalent in other fishing gears such as purse seiners targeting tropical tuna where *Carcharhinus spp*. and other shark species are regularly the most prevalent shark bycatch (Chassot, *et al*. 2009, Hall and Roman 2013).

Specific research and training efforts have been made during recent decades in many fleets to obtain more reliable information about Lamnidae at species level in order to improve the statistics for scientific purposes. Since the mid-nineties ICCAT have improved the landing information for this and other shark species and have carried out several full assessments of the status of SMA stocks.

The Spanish longline fishery targeting swordfish, like most fisheries targeting tuna and/or swordfish, have historically reported this species as valuable bycatch in the North Atlantic areas (see Buencuerpo 1998, Garcés and Rey 1983, Mejuto and Garcés 1984, Mejuto 1985, Moreno 1995). Its presence has also been described in oceanic regions of the South Atlantic (Castro *et al.* 2000), Pacific (Mejuto *et al.* 2007) and Indian Oceans (Ramos-Cartelle *et al.* 2008), covering a huge range of sea temperatures-habitats. Several studies conducted recently within the framework of research projects have led to the scientific estimation of landing levels pertaining to this fishery targeting swordfish in the oceans where this fleet operates. Thanks to these efforts, started in the mid-nineties, for the study of shark species associated with tuna and tuna-like species, the ICCAT has gathered more accurate scientific estimates for the landing of this species after the mid-nineties on a regular basis, as well as other scientific information. However, limited information is available on catches of this species prior to the mid-nineties. Data

for the species in that period have been available for some years for the Spanish longline fleet targeting swordfish, covering a highly significant part of total fishing activity during those years (see Garcés and Rey 1983, Mejuto and Garcés 1984, Mejuto 1985), including catch rates, size by sex, and length-weight relationships by sex among other information. Another important point to be considered is that SMA had historically been a valuable bycatch species which was fully retained on board in this fishery, so landings and catches can be considered as equivalent concepts in the case of this species-fleet.

The aim of this study is to combine different sources of information to provide: (a) A revision of the annual Atlantic Task I data by stock of this species-fleet. Data reported to ICCAT was reviewed for the period 1997-2015 when more detailed scientific information and catch data of this species began to be recorded, based on the ICCAT recommendations and national scientific projects. (b) A retrospective analysis to estimate landings prior to that period. Landings for the period 1988-1996 were reconstructed based on data-mining in collaboration with the fleet. (c) Additionally, a retrospective estimation of the magnitude of the landing back to 1950 is also proposed as approximation.

2. Methods

The time series of SMA landings in round weight for the period 1950-2015 was reviewed or reconstructed by tapping into different information sources.

Period 1997-2015: Two sources of information were used and compared. (a) First Task I (T1) data available from ICCAT was considered[2]. These data were reported to ICCAT as T1 by the National Authority and/or taken from scientific estimates included in previous SCRS documents and subsequently incorporated as T1. (b) Secondly, the most up to date scientific information currently available for the period was reviewed, including statistical corrections and revisions carried out. The two sources of information were compared to identify any possible discrepancies and quantify possible deviations.

Period 1988-1996: The information used comes from data per trip compiled retrospectively via data mining to reconstruct data for this period. This information allows us to complete data for the years 1988-2015, with the addition of nine years more than the series previously available from ICCAT.

Period 1986-1987: The average ratio observed in annual SMA/SWO catches for each stock in the period 1988-1991 [$SMA/SWO_{1988-1991}$] was applied retrospectively to catches of the target stock species to estimate SMA landings for 1986-1987.

Period 1983-1985: Figures for 1983-1984 were reconstructed using sources of information available in the literature. (a) On the one hand, previous studies (Mejuto and Garcés 1984, Mejuto 1985) provided information including landing data, nominal effort, nominal CPUE, etc. for a representative section of the fleet fishing in those years. (b) On the other hand, Rey *et al*. (1988) provided information regarding nominal effort for the whole North Atlantic area for the years 1983-1984. The combination of the two sources of information allowed us to estimate annual landings of SMA and those of SWO, the target species. The average ratio of the two years [$SMA/SWO_{(1983-1984)}$] was applied to the catch of the target species in 1985 to estimate the catch of SMA in the year.

Period 1950-1982: The level of annual SMA landings was estimated retrospectively assuming a constant ratio for [$SMA/SWO_{(1983-1984)}$]. Therefore it was assumed that the behaviour of the fleet and the ratio between the two species considered for the retrospective estimates were similar during the earliest period with relatively low or moderate fishing activity (1950-1982). Only estimations for the North Atlantic stock were included for this period because entry to the South Atlantic stock areas occurred in 1986.

3. Results and discussion

Period 1997-2015: **Table 1** presents a comparative analysis of the two sources of information available. Generally the comparison between the sources was very satisfactory, as no substantial differences were detected between T1 and the most recent scientific estimates (RSE) available for the period. For the years analysed the overall differences between RSE and T1 were +0.05% and -1.47%, for stocks in the North and South Atlantic, respectively. These differences could be probably explained by minor statistical revisions carried out for some of

[2] Vers. T1nc_all_20161114.xlsx

the years which may not have reached ICCAT because of malfunctions in the data communication process. Most of the differences were minor and probably due to updates in years after they were first reported. In other cases we find a duplicate record in T1 (2004 as unkn and BIL94A), a possible typographical error for 2005 (BIL96) and the allocation of the whole South Atlantic catch to a single BIL area in 2007, although this does not modify the total estimated for South Atlantic stock. Details of the comparison between RSE and T1, and the likely reasons for some of the discrepancies between sources are shown in **Table 1**.

Period 1988-1996: **Table 1** shows the reconstruction based on data mining of catches by BIL area for the period 1988-1996. Estimated landings for the period ranged from 1,078 to 3,294 t (average = 1,959 t/year) and 327 to 1,482 t (average = 709 t/year), for North and South stocks, respectively.

Period 1983-1985: **Table 2** summarises the information contained in the scientific literature mentioned above, referring to the years 1983-1984. The details provided by these documents allow us to estimate that the fishing effort compiled by the authors for those years reached 61% and 78% of the total nominal effort applied by the fleet in the years 1983 and 1984, respectively. The CPUE data used to estimate catches in those two years could be considered quantitatively representative of all fishing activity and valid to give an approximate estimate of landings in 1983-1984 and to define the annual ratio of SMA to the target species, which may be applicable to other years.

Complete period 1950-2015: **Table 3** summarises estimated annual landings of SWO and SMA in North and South Atlantic stocks and the ratios obtained or applied for each year. It also includes informative notes on the estimation method for each year. **Figure 1** shows estimated catches of SMA per stock for the whole reconstructed series.

The SMA/SWO catch ratio by weight in the North Atlantic for the years 1983 and 1984 was relatively homogeneous, fluctuating within the range of 0.085 and 0.062, with a mean value of 0.0735. By applying this mean ratio to annual SWO catches, the SMA catches for 1985 were estimated, and estimates were made of the retrospective catch of this species for the period from 1950 to 1982.

The assumption of a constant SMA/SWO ratio for the early historical period 1950-1982 has certain limitations. A historical overview of the Spanish surface longline fishery targeting swordfish shows that in 1983-1984 most fishing took place in oceanic areas off NW Spain and only part of fishing activity (around 34% of swordfish catches) was carried out by the fleet located in the South of Spain with priority fishing grounds near Africa, the Canary Islands, the Straits of Gibraltar, etc. (González-Garcés and Rey 1984, Moreno 1995, Rey *et al.* 1988), where SMA catches would be expected with a different prevalence form those in the areas located off the NW of Spain. However, in the initial period of this fishery the largest fleet component was mostly based in ports in the South of Spain (Rey and González-Garcés 1982, Garcés and Rey 1983). Hence, after applying the retrospective estimate to the earliest historical decades, the mean estimated ratio for the eighties could be expected to yield a possibly biased estimation for SMA landings during those early periods. The results are in keeping with the magnitude of catches that would be expected in view of the different stages through which this Spanish surface longline fishery has historically evolved in the North Atlantic, with periods of initial activity, development, major expansion and fishing regulation of the nominal effort. Additionally, the assessments should use more recent decades, so possible bias in the estimation of landings for the earliest period would probably have minor or nil impact on the results. For these reasons the authors recommend using only post-1982 estimates for the North Atlantic stock assessment.

Estimations from years prior to 1983 may be considered to belong exclusively to region BIL94B, where this fishery was operating in the above historical periods according to previous authors. Estimates for 1983 may also be considered to pertain to the same BIL region and those for 1984 belong mostly to this region as well, according to the areas of activity described for this fleet in the pertinent reference documents. In the period 1985-1987 most of the catches would also be allocated to region BIL94B, but a small portion of these catches may have been made within BIL94A because of the westward expansion of the fleet at that time. Catch data for the period 1988-2008 are already summarized by BIL area for the North and South Atlantic stocks, respectively (**Table 1**).

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Table 1. Scientifically revised landing estimates of shortfin mako (tons round weight) by BIL regions, and ICCAT Task I database (tons round weight), for the period 1997-2015. A new set of landing estimates (tons round weight) is provided for the period 1988-1996.

	Scientific estimations (metric tons RW)							ICCAT t1nc_all_20161114.xlsx (metric tons RW)										
Year/Area	BIL92	BIL94A	BIL94B	BIL96	BIL97	**North**	**South**	BIL92	BIL94A	BIL94B	BIL96	BIL97	unkn	**North**	**South**	**DifNorth**	**DifSouth**	**Note**
1988	0	422.482	1428.832	0	378.147	1851.314	378.147	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1989	0	360.602	717.941	34.265	774.617	1078.543	808.882	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1990	0	261.609	1275.602	107.451	444.674	1537.211	552.125	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1991	0	244.06	1146.019	133.727	193.681	1390.079	327.408	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1992	0	520.546	1624.891	181.963	239.288	2145.437	421.251	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1993	0	508.161	1455.909	533.592	238.631	1964.07	772.223	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1994	0	752.920	1410.639	255.571	296.576	2163.559	552.147	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1995	0	933.055	1276.426	756.87	327.165	2209.481	1084.035	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1996	0	631.613	2662.155	559.11	922.549	3293.768	1481.659	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1997	0	765.781	1649.77	528.192	827.809	2415.551	1356.001	0	765.781	1649.770	528.192	827.809	0	2415.551	1356.001	0.000	0.000	
1998	0	1022.647	1200.403	388.06	596.093	2223.050	984.153	0	997.490	1201.962	424.978	716.061	0	2199.452	1141.039	23.598	-156.886	1
1999	0	988.315	1062.567	320.185	541.118	2050.882	861.303	0	988.315	1062.567	320.185	541.118	0	2050.882	861.303	0.000	0.000	
2000	0	784.854	775.8	257.257	832.413	1560.654	1089.670	0	784.524	781.063	267.729	932.520	0	1565.587	1200.249	-4.933	-110.579	1
2001	0	636.721	1047.749	460.589	774.027	1684.470	1234.616	0	636.721	1047.749	460.589	774.027	0	1684.470	1234.616	0.000	0.000	
2002	0	1010.415	1036.168	381.032	429.48	2046.583	810.512	0	1010.415	1036.440	381.032	429.480	0	2046.855	810.512	-0.272	0.000	1
2003	0	1267.511	800.085	560.657	597.571	2067.596	1158.228	0	1267.511	800.085	560.657	597.571	0	2067.596	1158.228	0.000	0.000	
2004	0	1316.370	771.278	440.876	261.826	2087.648	702.702	0	1316.370	771.278	440.876	261.826	1316.370	2087.648	702.702	0.000	0.000	2
2005	0	1323.263	428.038	307.538	276.066	1751.301	583.604	0	1323.263	428.038	307.568	276.066	0	1751.301	583.634	0.000	-0.030	3
2006	24.751	1390.361	502.905	415.557	248.81	1918.017	664.367	24.751	1390.361	502.905	415.557	248.810	0	1918.017	664.367	0.000	0.000	
2007	0	1406.451	407.104	346.592	307.277	1813.555	653.869	0	1408.278	407.278	653.869	0.000	0	1815.556	653.869	-2.001	0.000	4
2008	3.015	1295.463	596.779	369.015	258.983	1895.257	627.998	3.015	1295.463	596.779	369.015	258.983	0	1895.257	627.998	0.000	0.000	
2009	0	1553.023	663.148	471.482	450.499	2216.171	921.981	0	1553.023	663.148	488.282	450.499	0	2216.171	938.781	0.000	-16.800	5
2010	0	1468.271	622.473	385.240	806.919	2090.744	1192.159	0	1468.271	622.473	385.240	806.919	0	2090.744	1192.159	0.000	0.000	
2011	0	1276.186	390.943	506.463	1028.966	1667.129	1535.429	0	1276.186	390.943	506.463	1028.966	0	1667.129	1535.429	0.000	0.000	
2012	0	1833.519	474.473	443.604	763.539	2307.992	1207.143	0	1833.519	474.473	443.604	753.570	0	2307.992	1197.174	0.000	9.969	5
2013	0	1001.489	507.34	373.520	709.118	1508.829	1082.638	0	1001.489	507.340	373.520	709.118	0	1508.829	1082.638	0.000	0.000	
2014	0	1035.381	445.551	444.497	632.402	1480.932	1076.899	0	1035.381	445.551	444.497	632.402	0	1480.932	1076.899	0.000	0.000	
2015	0	1018.203	343.517	312.721	548.854	1361.720	861.575	0	1018.203	343.517	312.721	548.854	0	1361.720	861.575	0.000	0.000	

Notes. 1: Updated-revised data. 2: Record duplicated in ICCAT database (unkn=BIL94A), (Unkn omitted for total North). 3: Possible keypunch error in ICCAT database. 4: Possible misallocation of BIL areas in ICCAT database. 5: Reported-updated Task I data have probably not reached ICCAT.

Table 2. Sampling data (catch in kg round weight, nominal effort in thousand hooks, CPUE) by sex and sex combined, obtained for the years 1983-1984 from the Spanish longline fishery targeting swordfish in the Northern Atlantic areas (described in Mejuto and Garcés 1984, Mejuto 1985). Catch estimation (kg round weight) for years 1983-1984 expanded to the annual nominal effort (in thousand hooks) of this fishery (described in Rey *et al.* 1988).

Sampling data

	M+F	Male	Female		M+F	Male	Female
YR	Catches	Catches	Catches	effort	CPUE	CPUE	CPUE
1983	365726	280147	85580	13539	27.01	20.69	6.32
1984	303836	220616	83220	17344	17.52	12.72	4.80

Raised data

		M+F	Male	Female
YR	total effort	Catches	Catches	Catches
1983	22232	600548	460021	140528
1984	22215	389167	282575	106592

Table 3. Retrospective estimations of landings (tons round weight) of *Isurus oxyrinchus* for the early periods 1950-1987 and scientific estimations for recent periods 1988-2015 caught as bycatch in the Spanish surface longline fishery targeting swordfish in the Atlantic stocks. Annual ratio (estimated or observed) between this species and swordfish is provided. See Table 1 and text for details and BIL-area allocation.

	ICCAT data base		Sci. Estim.						ICCAT data base		Sci. Estim.				
	Xiphias gladius		*Isurus oxyrinchus*		Ratio	Ratio			Xiphias gladius		*Isurus oxyrinchus*		Ratio	Ratio	
Year	ATN	ATS	ATN	ATS	ATLN	ATLS	Note	Year	ATN	ATS	ATN	ATS	ATLN	ATLS	Note
1950	1445	0	105.630	0	0.073	*	1	1985	7431	0	543.211	0	0.073	*	1
1951	966	0	70.615	0	0.073	*	1	1986	9712	66	2097.430	5.563	0.216	0.084	3
1952	966	0	70.615	0	0.073	*	1	1987	11134	0	2404.529	0	0.216	0.084	3
1953	1203	0	87.940	0	0.073	*	1	1988	9600	4393	1851.314	378.147	**0.193**	**0.086**	4
1954	305	0	22.296	0	0.073	*	1	1989	5696	7725	1078.543	808.882	**0.189**	**0.105**	4
1955	619	0	45.249	0	0.073	*	1	1990	5736	6166	1537.211	552.125	**0.268**	**0.090**	4
1956	374	0	27.340	0	0.073	*	1	1991	6506	5760	1390.079	327.408	**0.214**	**0.057**	4
1957	1000	0	73.101	0	0.073	*	1	1992	6351	5651	2145.437	421.251	0.338	0.075	4
1958	832	0	60.820	0	0.073	*	1	1993	6392	6974	1964.070	772.223	0.307	0.111	4
1959	1100	0	80.411	0	0.073	*	1	1994	6027	7937	2163.559	552.147	0.359	0.070	4
1960	722	0	52.779	0	0.073	*	1	1995	6948	11290	2209.481	1084.035	0.318	0.096	4
1961	1700	0	124.271	0	0.073	*	1	1996	5519	9622	3293.768	1481.659	0.597	0.154	4
1962	2300	0	168.132	0	0.073	*	1	1997	5133	8461	2415.551	1356.001	0.471	0.160	5
1963	1000	0	73.101	0	0.073	*	1	1998	4079	5832	2223.050	984.153	0.545	0.169	5
1964	1800	0	131.581	0	0.073	*	1	1999	3993	5758	2050.882	861.303	0.514	0.150	5
1965	1433	0	104.753	0	0.073	*	1	2000	4581	6388	1560.654	1089.670	0.341	0.171	5
1966	2999	0	219.229	0	0.073	*	1	2001	3967	5789	1684.470	1234.616	0.425	0.213	5
1967	2690	0	196.641	0	0.073	*	1	2002	3954	5741	2046.583	810.512	0.518	0.141	5
1968	3551	0	259.580	0	0.073	*	1	2003	4585	4527	2067.596	1158.228	0.451	0.256	5
1969	3502	0	255.998	0	0.073	*	1	2004	5373	5483	2087.648	702.702	0.389	0.128	5
1970	3160	0	230.998	0	0.073	*	1	2005	5511	5402	1751.301	583.604	0.318	0.108	5
1971	3384	0	247.373	0	0.073	*	1	2006	5446	5300	1918.017	664.367	0.352	0.125	5
1972	3210	0	234.653	0	0.073	*	1	2007	5564	5283	1813.555	653.869	0.326	0.124	5
1973	3833	0	280.195	0	0.073	*	1	2008	4366	4073	1895.257	627.998	0.434	0.154	5
1974	2893	0	211.480	0	0.073	*	1	2009	4949	5183	2216.171	921.981	0.448	0.178	5
1975	3747	0	273.908	0	0.073	*	1	2010	4147	5801	2090.744	1192.159	0.504	0.206	5
1976	2816	0	205.851	0	0.073	*	1	2011	4885	4700	1667.129	1535.429	0.341	0.327	5
1977	3309	0	241.890	0	0.073	*	1	2012	5620	4852	2307.992	1207.143	0.411	0.249	5
1978	3611	0	263.966	0	0.073	*	1	2013	4082	4184	1508.829	1082.638	0.370	0.259	5
1979	2582	0	188.746	0	0.073	*	1	2014	3750	4113	1480.932	1076.899	0.395	0.262	5
1980	3810	0	278.513	0	0.073	*	1	2015	4013	5059	1361.720	861.575	0.339	0.170	5
1981	4013	0	293.353	0	0.073	*	1								
1982	4554	0	332.900	0	0.073	*	1								
1983	7100	0	600.486	0	**0.085**	*	2								
1984	6315	0	389.167	0	**0.062**	*	2								

Notes. 1: Assuming the mean ratio for 1983-84. 2: Estimated from CPUEs (Mejuto & Garcés 1984, Mejuto 1985) and annual effort (Rey *et al.* 1988). 3: Using the mean ratio of the period 1988-1991 of the present paper. 4: New figures. 5: Revised values (see Table 1 for details of the period 1988-2015). (*): No fishery started in the South Atlantic stock.

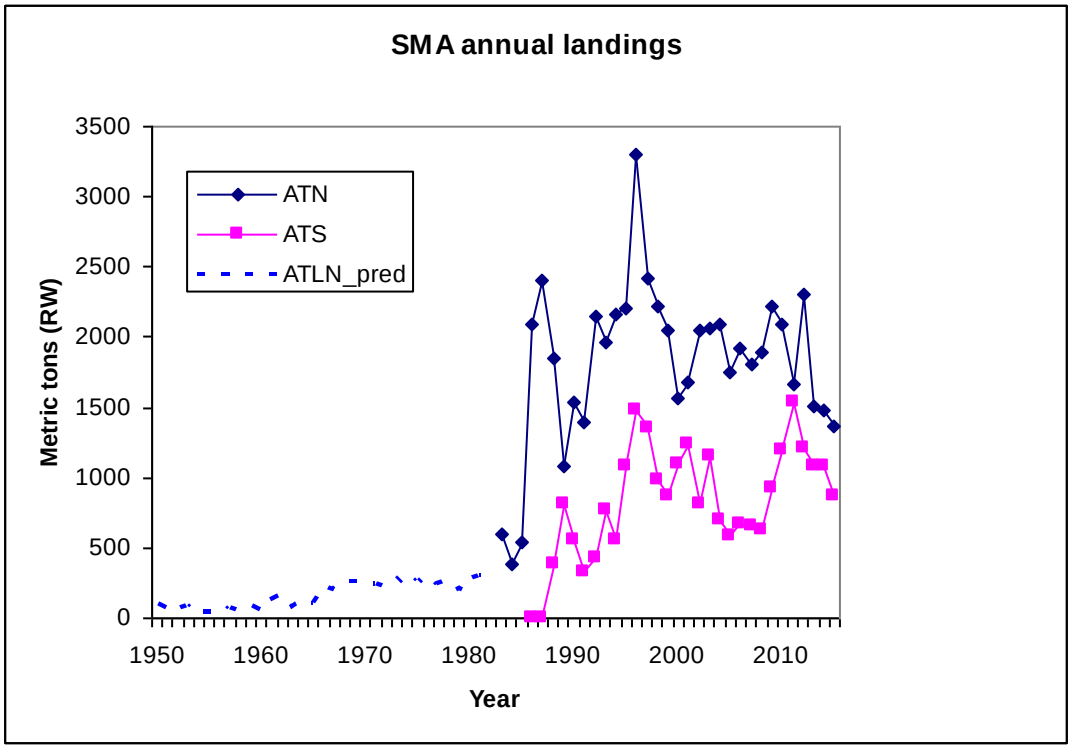

Figure 1. Overview of estimated shortfin mako (*Isurus oxyrinchus*) landings (tons round weight) in each Atlantic stock, caught as bycatch of the Spanish surface longline fishery targeting swordfish during the period 1950-2015. Period before 1983 should only be considered as approximation to the magnitude of the landings.