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Abstract

Two fleets are operating in the Indian Ocean: the purse seine fleet targeting tropical tuna (yellowfin, skipjack and bigeye) and the longline fleet targeting swordfish. In 2005 a total of 20 purse seiners and 23 longliners operated in the area. Purse seiners' carrying capacity for most of the boats falls between 800 and 2,000 t. Longline vessels range from 27 to 42 meters in length. Spanish total catches in 2005 were as follows: 77,519 t of yellowfin (YFT), 94,312 t of skipjack (SKJ), 10,290 t of bigeye (BET), 48 t of albacore (ALB) and 5,079 t of swordfish (SWO), resulting in a grand total of 187,228 t. Purse seine catch in 2005 increased by 19% as a consequence of the important increase (by 30%) of the catch of skipjack. Tropical multispecies tuna sampling in 2005 has been carried out to a good level of coverage: 1,745 samples and 307,216 fish were measured. In 2003 a biological sampling program (including sex ratio and maturity) in the Seychelles cannery was started. For the longline fleet, in 2005, 19,443 swordfish have been measured (19% of the total landings) and sex at age for most spatio-temporal strata has been obtained through biological sampling.

Regarding research, two Spanish research Institutes (IEO and AZTI) are involved in the tropical tuna scientific groups, while IEO is also involved in swordfish research. Since the beginning of the 90's a Spanish expert on fisheries has been permanently based in Mahé. Scientists involved in these fisheries have actively participated in the meetings and activities of the WPB, WPTT, WPBy and the SC. This year 13 documents have been presented. Research programs are or will be conducted in order to implement the scientific recommendations, in particular: for collecting information on supply vessels and fishing on FADs. For this purpose a joint IEO-AZTI working plan has been established. To estimate the by-catch associated with the purse seine fishery, a total of 9 trips have been covered by observers in the Indian Ocean in 2004, 12 trips in 2005 and 9 in first ten months of 2006. Opportunistic tagging of swordfish and by-catch of longline catch have continued in 2005 with a total of 45 swordfish, 58 sharks and individuals from other by-catch species and one SWO was recaptured A experimental cruise by two Spanish longliners, with the permanent presence of scientific observers from IEO was carry out during 2005 and 75 tunas (mainly BET) have been tagged and two tagged BET have been recovered. Another research project was carry out in the Indian Ocean, with the participation of four Spanish fishing boats (two purse seiners and two supply vessels). This pilot action mainly aims to understand and decrease the impact of FAD fishing on the juveniles of non-target tuna species (YFT and BET). To this end, acoustic data will be collected using sonar and echosounders, and subsequently analysed to establish criteria that will enable a reduction in catches of juveniles of tropical tuna based on acoustic selectivity. At the same time, experiments will be undertaken with several prototypes of artificial floating objects and the behaviour of fish around them was studied, with the objective of finding a typology that will result in fewer entanglements of turtles without reducing the catch of the target species. The preliminary first result was presented at IOTC WPBy and WPTT.

1. General Fisheries Statistics

Since the beginning of the tropical tuna, purse seine, Spanish fishery in 1984, data of catch and effort have been collected by a logbooks system created to get information on the fleet in the Indian Ocean. Sampling of sizes landed has been conducted under the control of experts of the Instituto Español de Oceanografia (IEO) and Spanish Fishing Agency in close collaboration with the Seychelles Fishing Authorities (SFA) and the IRD's scientist team. Since the beginning of the 90's a Spanish expert on fisheries has been permanently based in Mahe, Seychelles Islands, in order to monitor "in situ" this fishery.

The Spanish surface longline fishery targeting swordfish (Xiphias gladius) started its activity in the Indian Ocean in the mid-nineties.The basic data for the scientific monitoring of this fleet have been collected by

logbooks and an observer program that provide detailed information on the activities of the fleet and biological information on the individual swordfish caught.

1.1. Purse seine fishery

1.1.1 Fishing vessels

Table 1 shows the carrying capacity (in tons) and number of boats by category of the Spanish purse seine fleet from 1984 to 2005, together with the number of supplies used in association with Spanish boats and the number of vessels fishing in association with supplies between 1984 - 2005. In 2005, 20 Spanish purse seiners fished in the area, same number that in 1998, 1999 and the precedent year (2004).

1.1.2 Fishing effort

Table 2 show the nominal effort in fishing days and searching days. After the higher level of the last nineties, since 2000 the nominal effort has been reduced and remind stable but in 2005 the fishing effort (4619 f.d.) was increased in 19% with relationship at the precedent year.

1.1.3 Catch

Table 3 shows the total yearly catches by species. The total catch in 2005 has reached 182,562 t (154,106 t in 2004), reaching the historical high catches. The catch by species was: yellowfin tuna, 77,519 t (80,810 t in 2004), skipjack 94,312 t (63,393 t in 2003) and 10,290 t for bigeye (8,634 t in 2004).

1.2. Longline fishery

1.2.1 Fishing vessels

Since five Spanish surface longline vessels began operating in the international waters of the Indian Ocean on the basis of the fishery prospecting cruises conducted in the West Indian Ocean in late 1993, one or two vessel continued fishing in the area (FAO51) until 1998. Since then the number of vessels fishing in the Indian Ocean have increased gradually to reach 24 units in 2004 and expanded the fishing area across the East Indian Ocean (FAO57).

In 2005 a total of 23 surface longline vessels continuing operating in the Indian Ocean, 11 of them in experimental activities. The type of gear used is the monofilament 'Florida style' fishing gear with slight variations.

1.2.2 Fishing effort

Figure 1 shows the spatial distribution of the mean nominal effort in number of hooks carried out during 2004 in all of the oceans where the Spanish surface longline fleet was operating.

The surface longline fishery was originally carried out in waters to the West of 80ºE at the start of the Spanish fleet's activity in the Indian Ocean. The fishing areas were later expanded to include zones in the South Central Indian Ocean and in 2002 they reached out as far as 95ºE. In the year 2003 during the course of a experimental fishery cruise the fishery zones extended across 110ºE, which were maintained during 2004.

At the end of the year 2005 two new experimental surveys operated in the Indian Ocean, in the southeast areas reaching 42º South and in Central areas of the Indian Ocean (5ºNorth-10ºSouth / 60º-95ºEast).

1.2.3 Catch

The catch levels of swordfish taken by the Spanish surface longline fleet have increased gradually over the past few years. During the year 2004 the total catch of swordfish obtained was 4,713 t (round weight), with an overall nominal yield per thousands hooks set of 920 kg round weigh (figure 2). In 2005 swordfish landings totalled 5,079 t, 108 t of them caught during experimental surveys.

2. Report on the implementation of recommendations of the Scientific Committee

All national research programs include as part of their objectives the main recommendations made by the Scientific Committee in research and statistics.

In particular, in 2004 a logbook system has been established for the supply vessels, in purse seiner fishery, in order to get detailed information on its activities and, in 2005, the collection of the logbook information has begun.

3. National Research Programs currently in place

3.1. Purse seine

The European Union has initiated a Data Collection and Management Programme for the period 2002 – 2006. This programme is aimed at procuring information on catch, effort and biological parameters of all the fisheries undertaken in European waters and/or by fleets flying the flags of community countries. Within this programme, a number of trips were covered by observers on tuna purse-seiners, both in the Indian and Atlantic oceans, so as to obtain information about tuna discards and species associated with these fisheries, namely cetaceans, sharks, swordfish, and turtles. Although the observer programmes are national, that is, performed independently by each country, the programme project: definition of forms, selection criteria, training course content, trip planning, etc, has been carried out in a coordinated fashion between both European countries with a tropical purse-seine fleet (France and Spain), and through their corresponding research institutes (IRD, IEO and AZTI).

In 2005 the collection of purse seine fishery and size data have continued as well as the biological sampling program (sex ratio, maturity) in the Seychelles cannery started in 2003.

To estimate the by-catch associated with the purse seine fishery, a total of 7 trips have been covered by observers in the Indian Ocean in 2003, 9 trips in 2004, 12 in 2005 and 9 in 2006 until now.

In 2005 a Pilot Action concluded in the Indian Ocean. In they participate four Spanish boats (two purse seiners and two supplies). It is a pilot project in which participate the shipowners' company ALBACORA S.A. and the Spanish Oceanographic Institute (IEO). This pilot action mainly aims to make progress in improving the mode of fishing over objects where the impact on stocks of the most sensitive species (bigeye and yellowfin) and the ecosystem (bycatches) is concerned. To this end, acoustic data will be collected using up-to-date devices (sonar and echosounders) and subsequently analysed to establish criteria that will enable a reduction in catches of juveniles tropical tuna (yellowfin, and essentially, bigeye), based on acoustic selectivity. At the same time, experiments will be undertaken with several prototypes of artificial floating objects and their behaviour will be studied, to find a typology that will result in fewer bycatches (particularly focussing on the exclusion of accessory catches of turtles) without reducing catches of target species. Data will be collected for six months, from May to November 2005.

3.2. Longline

The data to obtain tasks during 2005 continued to be gathered by means of surveys-samplings at the ports, through information provided by on-board scientific observers on long-distance vessels as well as other sources of voluntarily information. These combined sources of information are making possible –albeit with some technical difficulties- for us to carry out swordfish task II (catch, effort and size) in a 5ºx 5º-month-type format of the fleet which will be made available to the IOTC. Information on different by-catch species is been obtained and processed. Updates of already reported by-catch levels will be scientifically reported in a multi annual scope.

A total of around 19,443 swordfish specimens were size sampled, accounting for an overall coverage in size sampling of 19% of the total number of swordfish landed. The biological sampling of the swordfish has continued to obtain size-sex variables by spatial-temporal stratum as well as other biological parameters.

Traditional opportunistic tagging is still being carried out tentatively on both swordfish and other associated species by the voluntary tagging done by the commercial fleet and by the scientific observers on board. During the year 2005 a total of 103 fish were tagged and released, 45 of them were swordfish specimens and 58 bycatch fishes –mainly sharks- were tagged. One swordfish was recaptured.

In December 2005 concluded a experimental cruise by two Spanish longliners with the permanent presence of scientific observers from the Spanish Oceanographic Institute with two main objectives: to experiment with new hooks and different types of baits in order to reduce the marine turtle catches and to explore the

possibilities of developing a new longline fishery targeting on tropical tuna. In these experimental cruises, 539 fishing operations were carried out, 75 tunas (mainly BET) were tagged (opportunistic tagging) and 25 turtles were caught.

4. Any other relevant information

In 2006 thirteen documents have been presented to the different working parties, in those that diverse Spanish scientists participated:

Two papers were submitted to the Billfishes WGB IOTC (IOTC-2006-WPB-10, IOTC-2006-WPB-11, two documents were submitted to the Bycatch group (IOTC-2006-WPBy-04, IOTC-2006-WPBy-05 and nine papers were submitted to the Tropical Tunas Working Group (IOTC-2006-WPTT-04, IOTC-2006-WPTT-05, IOTC-2006-WPTT-06, IOTC-2006-WPTT-07, IOTC-2006-WPTT-15, IOTC-2006-WPTT-16, IOTC-2006-WPTT-24, IOTC-2006-WPTT-28 and IOTC-2006-WPTT-34.

Scientific statistical information on the activity of the commercial Spanish longline fleet is routinely reported to the different tuna RFOs (such as ICCAT, IOTC, IATTC and WCPFC) for different scientific purposes such as the correct interpretation of the indicators to define accurate models for assessment within these multilateral organizations.

Additionally, two papers with information about the Indian Ocean Spanish SWO fisheries, was presented to ICCAT: ICCAT-SCRS-2006-115 and ICCAT-2006-060. One paper includes plots and descriptive information of the activity of the Spanish surface longline fleet in different oceans during the year 2004, including Indian Ocean fishing areas **(**ICCAT- SCRS-2006/115). Another document to evaluate the importance of discards and other uses of the billfish in the Spanish fleet in different oceans, including the Indian Ocean areas, was presented to ICCAT (SCRS/2006/060). These two ICCAT papers can be provided by the authors upon request, or from ICCAT web site when published.

Table 1. Number of Spanish Purse seiners by category, carrying capacity in tons, number of supplies used in association with Spanish boat 1984 - 2005.

Class	50-400	401-600	601-800	801-1200	1201-2000	>2000	total	C.Cap.	Supp	VAS*
1984	-	-	2	5	5	0	12	5343	-	-
1985	-	-	2	5	7	0	14	9142	-	-
1986	-	-	2	5	3	0	10	8793	-	-
1987	-	-	2	4	6	0	12	10504	-	-
1988	-	-	2	6	8	0	16	14361	-	-
1989	-	-	3	8	9	0	20	20050	-	-
1990	-	-	3	8	9	0	20	17908	-	-
1991	0	0	3	6	8	0	17	16568	-	-
1992	0	0	1	6	11	0	18	16711	-	-
1993	0	0	1	6	11	1	19	18953	-	-
1994	0	0	2	4	11	1	18	18779	-	-
1995	0	0	2	5	11	1	19	20908	-	-
1996	0	0	2	6	13	1	22	24090	-	-
1997	0	0	2	6	14	1	23	26128	-	-
1998	0	0	2	6	12	0	20	21243	-	-
1999	0	0	2	6	12	0	20	20260	6	7
2000	0	0	1	7	9	0	17	19473	7	9
2001	0	0	1	7	9	0	17	20479	5	5
2002	0	0	1	6	10	1	18	20490	8	9
2003	0	0	1	6	9	2	18	21007	8	9
2004	0	0	1	4	10	5	20	23832	15	-
2005	0	0	1	4	10	5	20	29052	13	-

(*) Vessel associated with supply

Table 2. Nominal fishing effort in fishing days, searching days and standardized fishing days of the purse seine Spanish fleet (1984 – 2005).

YEAR	F.DAYS	S.DAYS
1984	1713	1432
1985	2846	2379
1986	2634	2161
1987	2938	2300
1988	3331	2613
1989	5164	4241
1990	5006	4205
1991	4325	3544
1992	4296	3591
1993	4565	3842
1994	4463	3771
1995	5221	4470
1996	5793	4925
1997	6407	5584
1998	5644	4888
1999	5224	4496
2000	4526	3825
2001	4940	4214
2002	4570	3889
2003	4468	3671
2004	4730	3891
2005	5808	4619

Table 3. Spanish purse seiners total catch by species in the Indian Ocean, 1984-2005.

TOTAL CATCH BY SPECIES					
YEAR	**YFT**	**SKJ**	**BET**	**ALB**	**TOTAL**
1984	11453	6393	759	197	18802
1985	18431	18643	1330	145	38549
1986	20030	19108	1845	0	40983
1987	26301	27936	4974	4	59215
1988	44948	39742	6810	65	91565
1989	41146	64003	5863	0	111012
1990	43728	47926	4867	145	96666
1991	44023	41790	6005	1066	92923
1992	37836	46694	3638	1461	89629
1993	47792	51272	5418	904	105385
1994	43128	61608	5924	1773	112433
1995	65143	69587	12233	561	147524
1996	59431	66276	11374	826	139134
1997	60977	62914	15897	1029	141025
1998	38565	58646	11245	269	108725
1999	51875	74285	16034	232	142426
2000	52070	77187	10769	410	140872
2001	47571	68346	7930	339	124389
2002	53205	91462	11096	217	156386
2003	78968	88035	8544	520	176200
2004	80810	64393	8634	76	154106
2005	77519	94312	10290	48	182562

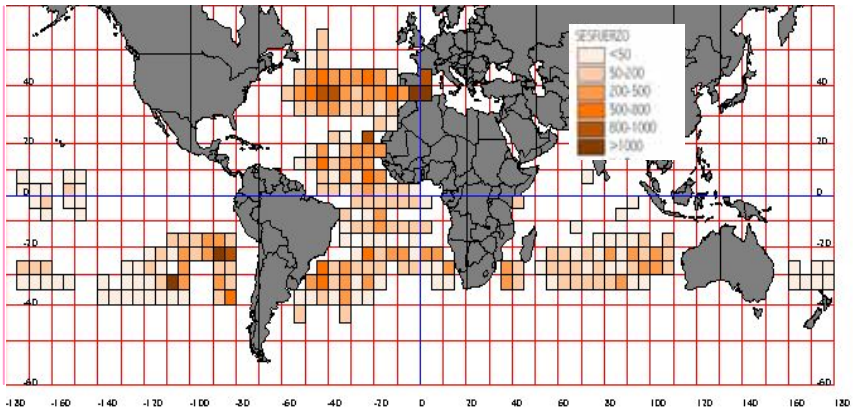

Figure 1. Nominal effort, in thousands of hooks, carried out by the Spanish surface longline fleet in the year 2004 (source ICCAT SCRS/2006/115).

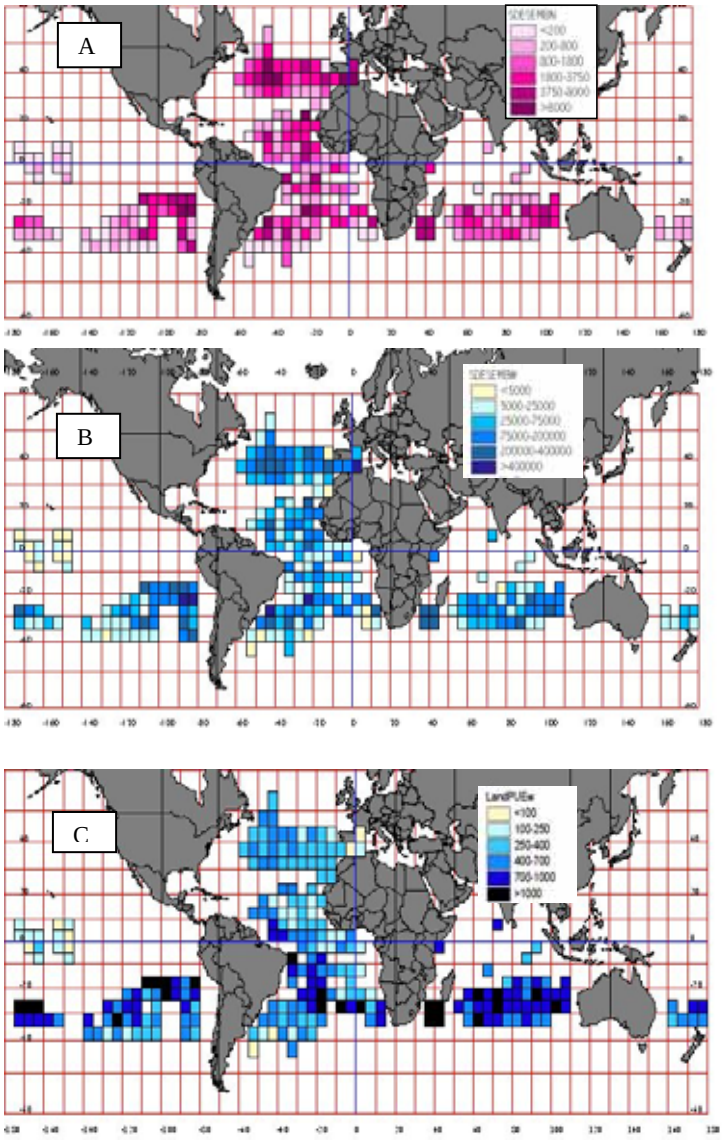

Figure 2. Number of swordfish landed (A), swordfish landings in kg of round weight (B) and nominal CPUE in kg of round weight of swordfish landed per thousand hooks set (C) by the Spanish surface longline fleet in the year 2004 (source ICCAT SCRS/2006/115).