

A DESCRIPTION OF THE ACTIVITY OF THE SPANISH SURFACE LONGLINE FLEET TARGETING SWORDFISH (*XIPHIAS GLADIUS*) IN THE INDIAN OCEAN WITH SPECIAL REFERENCE TO THE YEAR 2001

B. García-Cortés, J. Mejuto, A. Ramos-Cartelle (*)

(*) Instituto Español de Oceanografía.

P.O. Box 130, 15080 A Coruña. España.

e-mail: tunidos.corunha@co.ieo.es

ABSTRACT

*This document presents a descriptive analysis of the activity of the Spanish surface longline fleet targeting swordfish (*Xiphias gladius*) carried out in 2001 in waters of the SW Indian Ocean (FAO51). Data on catch, effort and CPUE is summarized in a 5x5 degree/month format. A total of 10 longline spanish vessels fished in the Indian Ocean during the year 2001. The total nominal catch was 1,860.2 tons round weight. Only two of these vessels carried out activity in this ocean all year round while the rest of the vessels alternated between these waters and other oceans. For descriptive purposes, graphs and plots are presented showing annual catches, annual nominal effort, and nominal CPUEs by year and semester in a 5x5 degree square format. The information presented also updates previous papers.*

1. Key words: swordfish, catch, nominal CPUE, longline, tagging.

INTRODUCTION

The Spanish surface longline fishery targeting the swordfish (*Xiphias gladius*) in the Indian Ocean began fairly recently with a total of 5 vessels that started prospecting this resource in international waters of the SW Indian Ocean (FAO51) from September, 1993 until August, 1994. From 1995 until 1997, there were one or two Spanish vessels fishing sporadically in different areas and during different time periods. During the period from 1998 until the year 2000, the number of vessels that carried out fishing activity in the Indian Ocean increased to between 8 and 11, although most of them have alternated their activity between this ocean and others. Only two of these vessels have made continued fishing activity in the Indian Ocean over the course of these years. In addition, two vessels started a new fishery prospecting survey in international waters (FAO51) in October 1999 at around 60° E, which lasted until January 2000. In 2001 roughly 10 Spanish vessels continued their activity in waters of the Indian Ocean, but most of these vessels alternated between this and other oceans to carry out their fishery.

The basic data for the scientific monitoring of this fleet in this ocean since the beginning of the fishing activity have been collected by the RIM (Information and Sampling Network) of the Spanish Oceanography Institute (IEO). At the same time, the observer program on board commercial vessels was extended to cover the Indian for compiling more complete information *in situ* on the activities of these periods-areas where fishing takes place and for getting biological information of the individuals swordfish caught. Most of the basic scientific information comes from fishery logbooks designed by the IEO specifically for scientific purposes. These logbooks, prepared for long distance surface longliners, are voluntarily filled in by the fleet.

The data combined from the different fleets could be very useful in the interpretation of basic aspects of the biology

and behavior of this species (*Xiphias gladius*). Several studies have highlighted the great spatial and temporal variability of this species causing enormous variations in the catch rates obtained average weight of the catch (size-sex composition), etc. In other hand, some indicators of the fishery can be affected by changes in fishing zones through the time or because the effort was concentrated on areas having higher or lower population densities with geographical expansions of the fishery over time or changes in target species. Therefore, these descriptions are essential for the correct interpretation of the basic parameters used in resource assessment. In future studies, this information will have to be added to the standardized CPUE analyses when possible, taking in consideration the availability of not aggregated data.

MATERIAL AND METHODS

The basic data used in the scientific monitoring of the Spanish fleet in the Indian Ocean were taken from the fishery log books voluntarily filled in by the fleet. These log books provide basic data (catch, effort, position, etc.). In addition, the individual weights of each fish caught is reported. This information is combined with other data taken from other sources, such as, landings, transfers, etc., and biological data provided by the on-board scientific observers for scientific purposes.

Taking advantage of the commercial fishery operations, we decided to also carry out opportunistic tagging on the swordfish and other by-catch species. This was done by both the skippers and the on-board scientific observers.

In 2001 only one scientific prospecting survey was carried out on board a commercial vessel, following the same protocol as applied in previous observations, based on a census of the catches taken in and on computerizing this information into related data bases. General information

regarding the basic characteristics of the vessel, the trip, and the set is recorded along with biological data for the overall swordfish catch and each individual specimen, sometimes including species associated with this catch, as well. This information is analyzed specifically and is included in the preparation of the basic tasks 5°x5° squares.

The standard size (lower jaw-fork length LJFL) is measured on board recording to the lowest centimetre, before processing the catch into dressed weight (emptying the body cavities and gills, removing the fins, tails and head) to be stowed. The dressed weight is obtained based on the size using the size(LJFL)-dressed weight (DW) relationship (TURNER 1987). A conversion factor is later applied to obtain the round weight (RW) (MEJUTO *et al.* 1988). The size distributions are calculated from the individual sizes after grouping into 5 cm size classes. The label of each size class represent the lower bound of each class.

All the information was processed using the standardized methodology recommended for these types of long distant fleets (MIYAKE 1990), in the same final format as reported within the ICCAT and the IATTC. So, as in previous years, the basic data were processed in a final format of 5°x5°/month and sent to the IOTC with information on catches (number and round weight), catch-at-size by class (LJFL: 50-350 cm), nominal effort (thousands of hooks) and number of fish sampled.

The overall annual nominal CPUE was calculated using the overall catch and effort data, as well as the mean nominal CPUE from each stratum of 5°x5° area and month.

Archview © software was used to prepare descriptive plots which include the nominal fishing effort, catch levels (in number and round weight) by 5°x5° squares. In addition, the nominal CPUEs (in number and round weight) by 5°x5° squares and semester (S1: January + February + March + April + May + June; S2: July + August + September + October + November + December) were also plotted.

RESULTS AND DISCUSSION

A total number of 10 Spanish vessels carried out fishing activity in the Indian Ocean (10°-30° S/30°-70°E) during year 2001. Eight boats were fishing seasonally, alternating their fishing operations between the Indian and other oceans. The vessels ranged from 27 to 42 meters in length and their technical characteristics averaged 210 TRB and 693 HP.

The gear used at the beginning of the fishing activity in waters of the Indian Ocean was the "traditional" historical Spanish longline style. However, during the year 2001 the boats have been changing to the "american" style longline, a slightly modified version of the "Florida style" longline (HOEY *et al.* 1988). The mean number of hooks used per set was 1151, which are more hooks than reported in the standard Florida Style gear and considerably fewer than the number of hooks used in the "traditional" Spanish longline style.

Figure 1 gives a summary of the nominal fishing effort and catch rate per thousands of hooks obtained with the "traditional" Spanish longline gear, combining data for the

1993-2000 period. An example of these data based on the geo-referenced information for the year 2001 is also provided. Figure 2 gives a summary of total nominal effort, total landings in number of specimens and kg of round weight for the year 2001. Figure 3 represents the nominal annual CPUE (in number and kg of round weight) and the nominal CPUE in weight per semester (S), obtained with the "american" style gear during the year 2001. The highest nominal catch rates can be observed in longitudes above 60° E during the second half of the year (S2).

The catch rates per thousand hooks obtained for the "traditional" Spanish longline style was relatively low in almost all the 5°x5° squares, despite the fishing effort carried out during the 1993-2000 period (figure 1) (GARCÍA-CORTÉS & MEJUTO 2000). This low CPUEs contrast with the high catch rates reached during year 2001 as a result of the change in the type of longline used. (Figure 3)

Table 1 and figure 4 summarize the information available on the Spanish fleet for the year 2001, included by month and annual totals. The swordfish catch harvested by the Spanish fleet in 2001 was 1,860.2 tons. The 9,877 specimens sampled (size or individual weight) accounted for 30.6% of the individuals caught by this fleet in 2001. The size distribution ranged 95-300 cm LJFL and the overall mean weight of the catch was 57.6 kg (RW). The nominal fishing effort amounted to 1.7 million hooks, with a sampling coverage related to the fishing effort of 86.7% and a nominal CPUE (overall) of 18 individuals and 1,050.5 kg of round weight per one thousand hooks set (table 1).

The mean nominal CPUE in weight (including experimental fisheries) for the squares into the region FAO51 as a whole was 993.5 kg per thousand hooks (CI90%: 921.9-1,075.2). In general terms, this CPUE in number and weight shows levels that are somewhat higher than those found in the SW Atlantic and SE Pacific areas (MEJUTO *et al.* 2000; MEJUTO & GARCÍA-CORTÉS *in press*). The monthly values obtained of the nominal CPUE for the year 2001 show a slight increase in the last two months of the year (figure 4).

Figure 5 shows the annual landings (tons RW) made by the Spanish surface longline fleet, the mean weight (kg RW) and the annual fluctuations observed in the overall nominal CPUE (kg RW) in the Indian Ocean during the 1993-2001 period. The highest CPUE observed in year 2001 may be attributed to the fact that the fleet ceased to use the "traditional" style longline gear, replacing it with the new "american" style longline which offers greater catchability per hook (HOEY *et al.* 1988; WARD *et al.* 2000). A similar effect on the CPUE was also seen in other oceans when the CPUE is measured in relation to the number of hooks set. These differences, however, seem to disappear or diminish substantially when the CPUE is measured per number of sets done or per milles set (MEJUTO & GARCÍA-CORTÉS *in press*).

Taken into consideration and following the recommendations of the Report of the 2nd Session of the WPB (ANONYMOUS, 2001), it seems to be recommended to explore the not aggregated information available and to

undertake the first steps of standardizing the CPUE owing to the great importance of this indicator in stock assessment, even though the activity of this fleet is recent and it is a relatively minor player in the fishery.

The number of fishes tagged by scientific observers from 1993 until 2002 amounted to 134 swordfishes, 9 billfishes and 182 sharks. The number of fishes tagged voluntarily by the fleet was 22 swordfishes, 2 billfishes and 30 sharks. Out of a total of 384 fishes tagged, only 5 sharks, which had

been tagged by the scientific observers, have been recaptured. The recovery rate for shark species as a whole was 2.3%.

ACKNOWLEDGEMENTS

We would like to thank to all the staff of the IEO Tuna Program, Scientific Observers, as well as all the skippers and sailors who have collaborated with us.

LITERATURE CITED

- ANONYMOUS (2001): "Report of the 2nd Session of the IOTC Working Party on Billfish". IOTC-SC-01-07.
- GARCÍA-CORTÉS, B., J. MEJUTO (2000): "A general overview on the activity of the Spanish surface longline fleet targeting swordfish (*Xiphias gladius*) in the Indian Ocean for the period 1993-1998". IOTC Proceedings no.3 (2000): 140-153, WPB00-01.
- HOEY, J.J., J. MEJUTO, S. IGLESIAS, R. CONSER (1988): "A comparative study of the United States and Spanish longline fleet targeting swordfish in the Atlantic Ocean, north of 40° latitude. ICCAT. Col. Vol. Sci. Pap. Vol. XXVII: 230-239.
- MEJUTO, J., S. IGLESIAS, J.C. REY, E. ALOT Y B. GARCÍA (1988): "Relaciones talla-peso del pez espada (*Xiphias gladius* L.) En las áreas BIL 94 y BIL 95, por estratos espacio-temporales". ICCAT. Col. Vol. Sci. Pap. Vol. XXVII: 214- 221. (SCRS/87/37).
- MEJUTO, J., B. GARCÍA, J.M. DE LA SERNA (2000): "Activity of the Spanish surface longline fleet catching swordfish (*Xiphias gladius*) in the year 1998". ICCAT Col. Vol. Sci. Pap. Vol. LI (CD vers. SCRS/99/75).
- MEJUTO, J., B. GARCÍA-CORTÉS (*in press*): "Actualización de la Información Científico-técnica sobre la actividad de la flota Comunitaria (Española) de palangre de superficie de Pez Espada (*Xiphias Gladius*) en el Pacífico S.E., con especial referencia al año 2001". ++Doc. BSTC/2003.
- MIYAKE, M. (1990): Field Manual for statistics and sampling Atlantic tunas and tuna-like fishes. ICCAT, third edition.
- TURNER, S. (1987): "Length to Weight and Weight to Length Conversions for Swordfish in the Western North Atlantic and Gulf of Mexico". Doc. Presented at the SEFC Swordfish Assessment. Workshop 86/11.
- WARD, P., J. M. PORTER, S. ELSCOT (2000): "Broadbill swordfish: status of established fisheries and lessons for developing fisheries". Blackell Science Ltd. FISH and FISHERIES, 2000, 1, 317-336.

Table 1. Monthly summary of the activity of the Spanish surface longline fleet (EU) for swordfish (*Xiphias gladius*) in the Indian ocean (FAO51) during 2001, using the new 'american' longline style.

MONTH	02	03	04	05	06	07	08	09	10	11	12	TOTAL
HOOKS*1000	23,200	15,210	237,516	81,272	225,299	90,247	123,996	189,514	155,197	208,722	420,607	1770,780
TRIPS	1	1	3	8	13	7	14	6	7	8	7	75
LAND #fish	546	358	3680	1315	3549	1545	1915	2631	2949	4916	8890	32294
LAND kg RW	21772	14274	221759	72853	207622	95870	105317	157435	166467	269267	527599	1860235
# SAMPLED	0	311	718	1226	1667	1437	1325	666	974	954	599	9677
Ave.Weight	39,9	39,9	60,3	55,4	58,5	62,1	55,0	59,8	56,4	54,8	59,3	57,6
CPUE _n	24	24	15	16	16	17	15	14	19	24	21	18
CPUE _w	938,4	938,5	933,7	896,4	921,5	1062,3	849,4	830,7	1072,6	1290,1	1254,4	1050,5
LJFL _{cm}												
T050												
T055												
T060												
T065												
T070												
T075												
T080												
T085												
T090												
T095	63	41	72	44	45		37	20	10	86	67	485
T100	0	0	0	0	1		1	0	0	0	0	2
T105	0	0	0	5	7	1	16	30	17	7	0	83
T110	32	21	58	37	38	26	33	56	12	80	109	502
T115	23	15	51	27	40	12	54	70	12	77	84	465
T120	49	32	127	75	116	34	80	116	165	363	432	1589
T125	31	20	98	43	107	34	59	94	36	106	188	816
T130	50	33	198	86	209	86	122	153	270	454	627	2288
T135	32	21	143	74	159	51	111	137	26	94	202	1050
T140	55	36	350	133	350	147	132	126	282	550	1037	3198
T145	18	12	137	70	166	55	132	151	20	143	269	1173
T150	43	28	334	79	347	165	174	180	428	474	842	3094
T155	21	14	149	55	141	82	115	133	36	138	340	1224
T160	15	10	291	59	286	136	127	116	330	471	804	2645
T165	23	15	92	39	83	35	65	137	30	136	235	890
T170	20	13	250	72	254	113	82	142	313	393	653	2305
T175	8	5	76	41	91	33	58	120	26	75	166	699
T180	15	10	284	67	277	115	78	123	241	401	733	2344
T185	9	6	86	44	72	33	67	69	37	75	175	673
T190	5	3	213	56	206	92	72	119	152	269	547	1734
T195	5	3	94	32	71	44	51	96	34	47	162	639
T200	0	0	226	43	192	93	68	107	174	181	491	1575
T205	5	3	49	27	49	16	26	88	31	32	90	416
T210	12	8	121	32	100	56	41	102	110	82	226	890
T215	6	4	22	19	20	16	23	40	10	17	42	219
T220	3	2	72	23	59	31	30	49	44	63	156	532
T225	3	2	27	12	14	13	12	26	5	15	43	172
T230	0	0	29	14	24	14	23	3	37	40	82	266
T235	0	0	0	3	1	0	8	11	2	10	4	39
T240	0	0	20	0	12	8	4	6	27	18	39	134
T245	0	0	7	2	6	3	3	3	2	7	15	48
T250	0	0	2	1	2	1	1	0	15	14	17	53
T255	0	0	1	1	0	0	0	0	0	0	0	2
T260	0	0	2		3	1	4	0	4	3	6	23
T265	0	0			0		0	2	0	0		2
T270	0	0			1		0	2	10	0		13
T275	0	0			0		0	0		0		0
T280	0	0			0		0	0		2		2
T285	2	1			0		0	0				3
T290					0		1	3				4
T295					0							0
T300					1							1
T305												
T310												
T315												
T320												
T325												
T330												
T335												
T340												
T345												
T350												
TOTAL	548	358	3681	1315	3550	1546	1910	2630	2948	4923	8883	32292

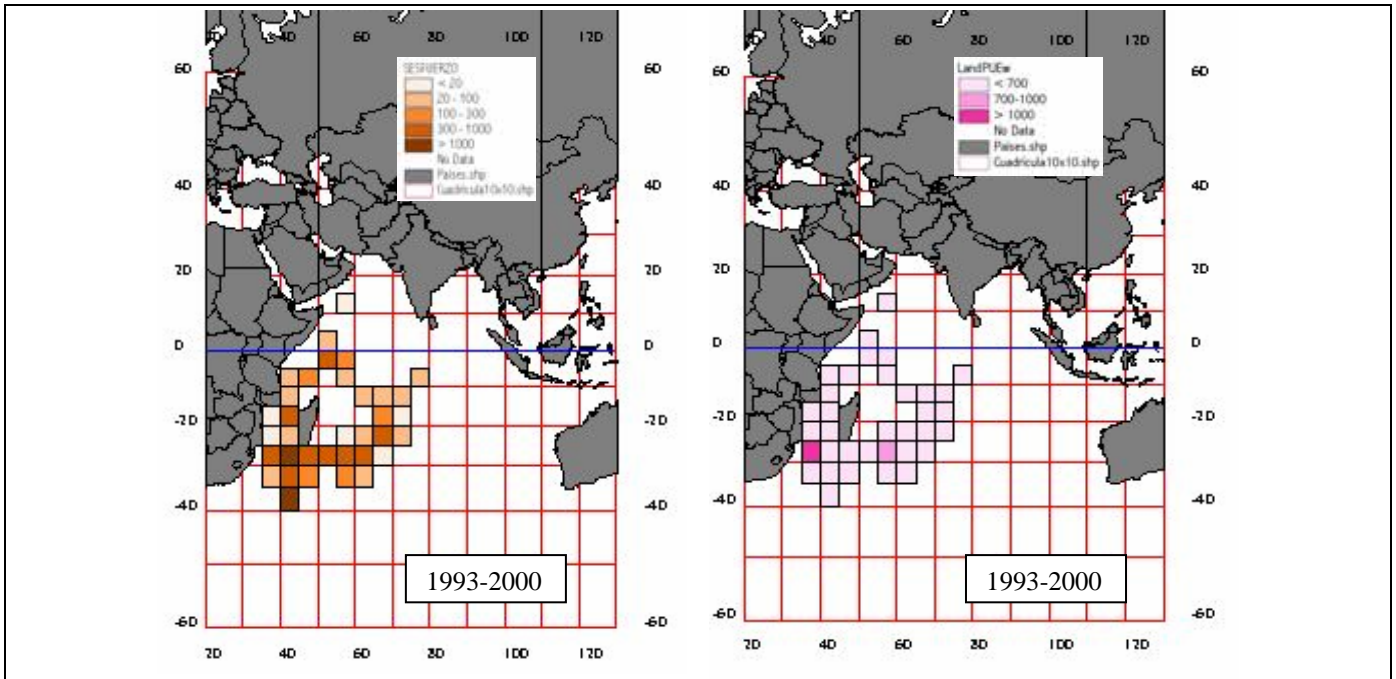


Figure 1. Nominal effort (in thousand of hooks) and nominal CPUE in weigh (kg RW) per 5°x5° square, for swordfish caught by the Spanish longline fleet using the 'traditional' longline style, for the period 1993-2000 combined.

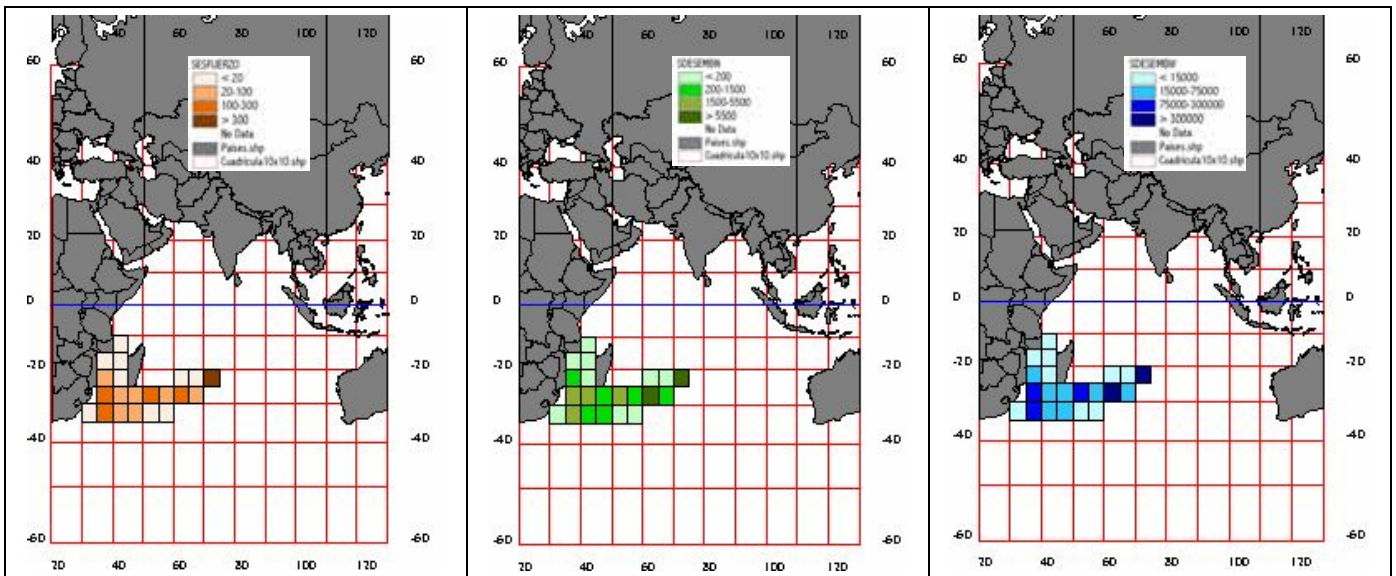


Figure 2. Nominal effort (in thousand of hooks) and landings in number and weight (kg RW), per 5°x5° square, for the swordfish caught by the Spanish longline fleet using new longline 'american style', during the year 2001.

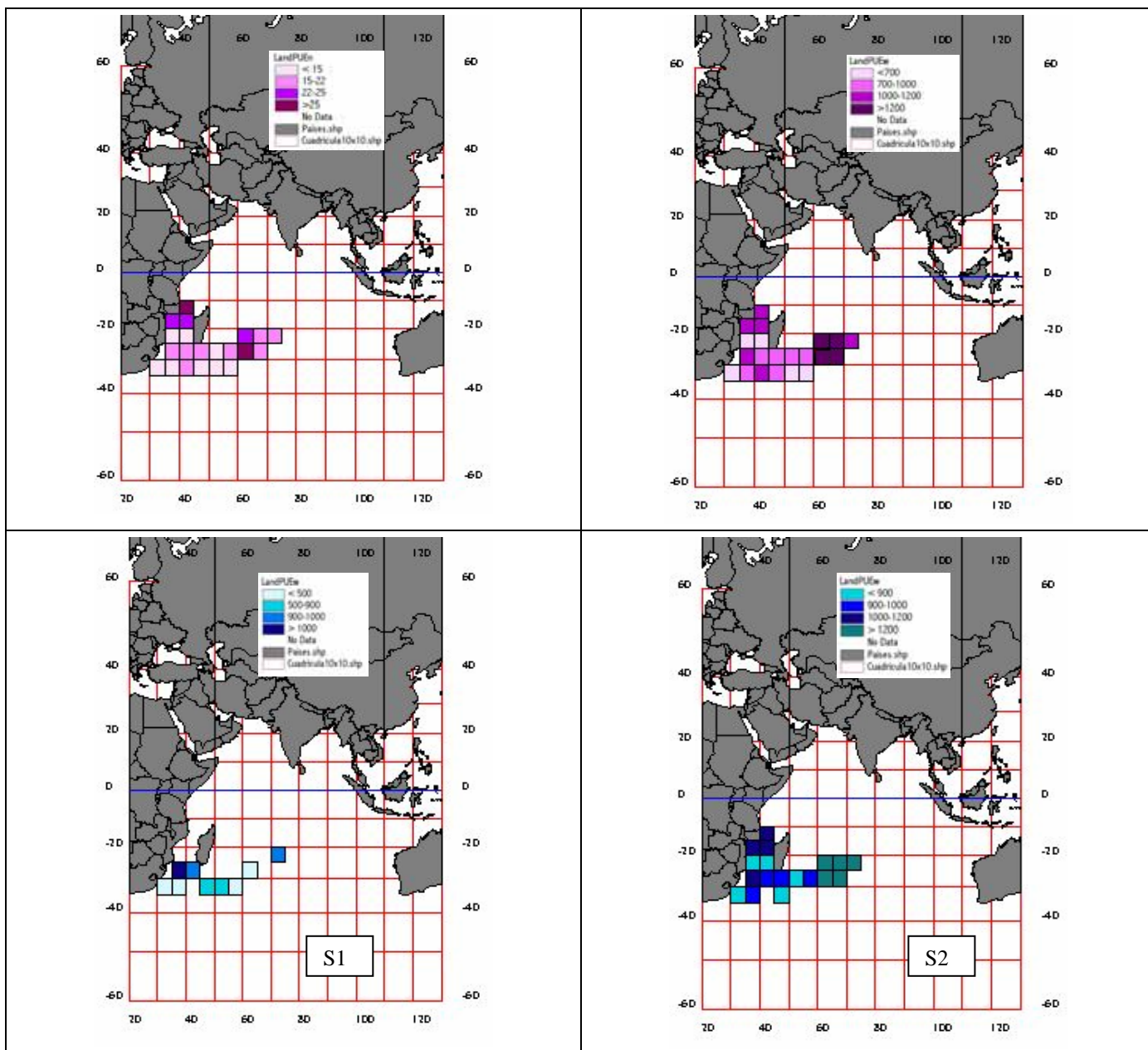


Figure 3. Nominal CPUE in number of swordfish and in kg round weight, and nominal CPUE (kg RW) by semester (S) of the Spanish longline fleet, using new 'american' longline style, during the year 2001. (S1: January-June; S2: July-December)

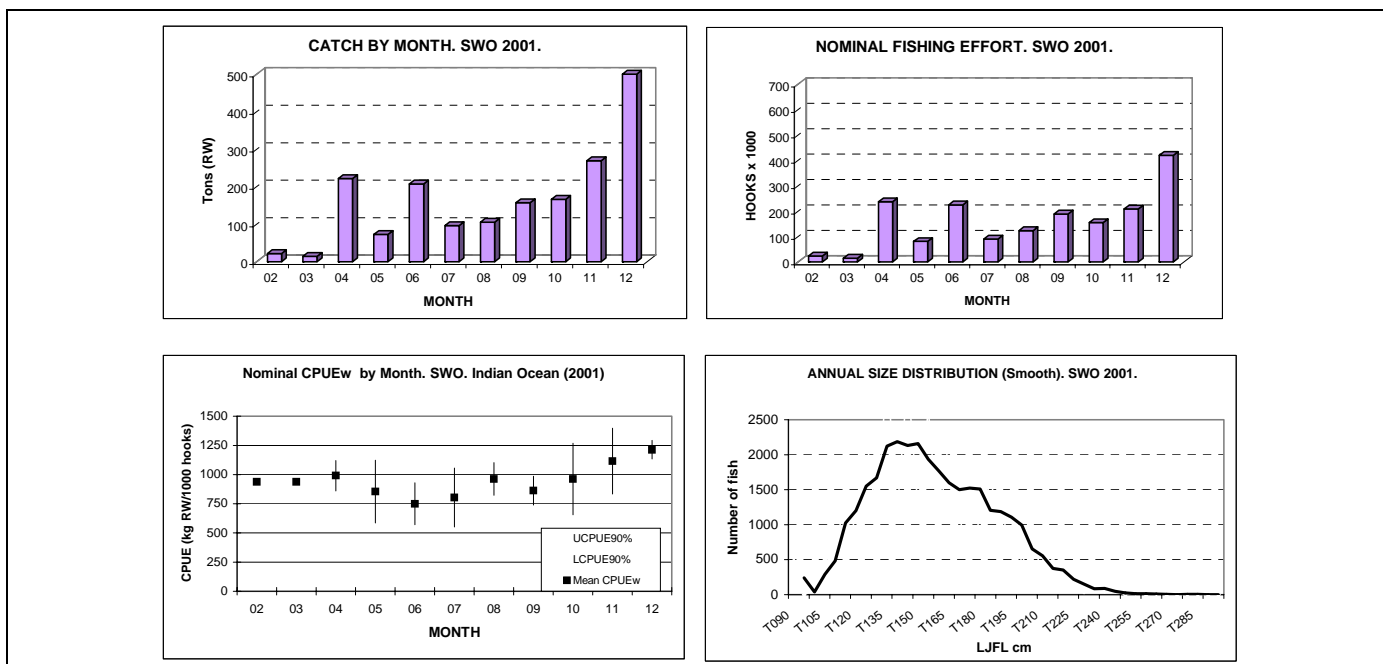


Figure 4. Landings of swordfish in tons (RW), nominal effort (in thousands of hooks), nominal CPUE (kg RW) and smooth size distribution of swordfish caught by the Spanish longline fleet using new 'american' longline style in the Indian Ocean, during the year 2001.

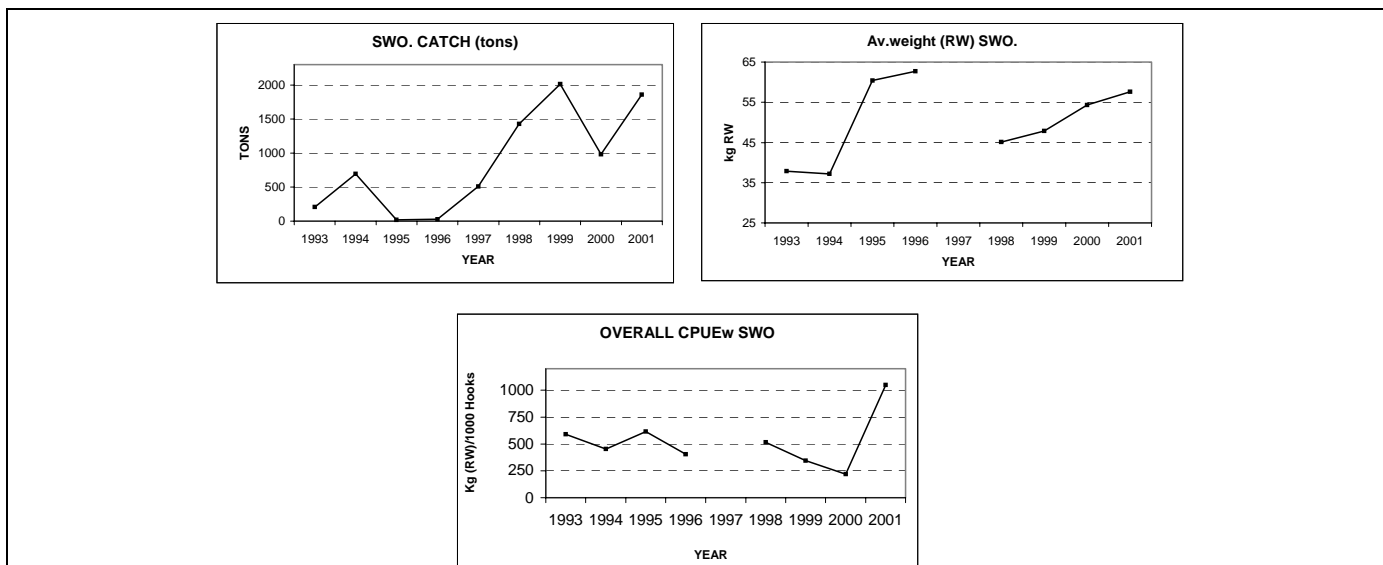


Figure 5. Annual landings in tons (RW), average weight (RW) and overall nominal CPUE in weight (kg, RW) of swordfish caught by the Spanish longline fleet during the period 1993 to 2001 (1997: missing information). Note that the CPUE of 2001 represents a new 'american' longline style.