STATISTICS OF THE SPANISH PURSE SEINE FLEET IN THE INDIAN OCEAN

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ABSTRACT

This document contents summary statistics of the purse seiner Spanish fleet fishing in the Indian Ocean, as well as some information about how the data are collected. The sampling scheme, the coverage of sampling, maps and diagrams representing the fishing pattern of this fleet by time and area strata.

Introduction

The Spanish purse seine fleet started to fish in the Indian Ocean in 1984. This new fishery was developed within the first four years, with a constant increase in number of boats and catches until 1988. After that year, the nominal fishing effort of the fleet stabilized and its catches fluctuated without trend.

Data on catch and effort have been collected since the beginning of the fishery. Sampling of the sizes landed was conducted under the control of the Instituto Espanol de Oceanografia (IEO) in close collaboration with the Seychelles Fishing Authorities (SFA) and ORSTOM's scientific team. At the beginning of the 90s a Spanish expert on fisheries has been permanently based in Mahé, Seychelles Islands, in order to follow this fishery "*in situ*". A significant improvement of sampling coverage and accuracy of the Spanish statistics was observed since that year. Two research programs, funded by the European Commission and coordinated by the IEO and ORSTOM, have also been conducted. The first was a two year (1995-1996) observer program to study bycatch in the purse seine fisheries in the Atlantic and Indian Oceans. The second program, developed in 1996 and 1997, had as goal the improvement of the tropical tuna sampling scheme and data processing. For the next two years a new program has been proposed to analyse the increase in fishing power of the purse seiners.

In this document, we present a quick overview of the fishery since its beginning in 1984, with special emphasis given to the most recent years. We also include some information about how the data were collected and a brief description of the sampling scheme used. Finally, we present catch and effort statistics, as well as information on size distribution. Fishing maps and diagrams representing the fishing pattern of this fleet by time and area are also given. This paper covers primarily the Spanish flag strata, but various statistical information on the purse seine fleet flying other flags but belonging to Spanish companies are also given (detailed statistics are also collected on this fleet).

Data collection

Catch-and-effort

Catch-and-effort data were collected through logbooks. This system, established in the Atlantic Ocean at the end of the 70s has been implement systematically by most of the Spanish fleet, resulting in a very good and detailed data base. In the Indian Ocean, this system was established at the beginning of the fishery using an adaptation to this Ocean of the Atlantic system. However, a major difference between those two oceans was noticed in relation with the large quantities of tunas taken under logs in the Indian Ocean. This mode of association was then taken into account in the Indian Ocean data processing.

The experience of the skippers in filling detailed logbooks in the Atlantic was a key factor in collecting accurate catch and effort Spanish statistics in the Indian Ocean. Since 1984 the logbooks have been obtained with nearly 100 % coverage. The basic information of the logbooks is raised trip by trip by landings data.

Species composition and sizes

Until 1998, the size distribution of catches was obtained using monospecific sampling. The sampling scheme used involved two steps that considered the set as primary unit of sampling and the fish as secondary unit. The samples were taking by species. The sample size was the same for all species.

ICCAT has shown in the Atlantic a systematic bias in the logbook species composition. The main bias was related with the small yellowfin (partially declared as skipjack) and especially small bigeye (always declared as yellowfin or skipjack). After those analyses, the ICCAT recommended a statistical procedure that should be applied in order to correct the species composition of the tropical tuna catches. In the Indian Ocean, an analysis conducted at the beginning of the fishery showed that there was a similar bias. In consequence, a procedure for determining the species composition (during the unloading) was routinely established in order to correct the species composition of the catches.

Furthermore, during the last two years, a large scale research program has been conducted to analyse the tropical tuna sampling schemes, funded by the European Commission and coordinated by the IEO and ORSTOM. At the end of this program, new sampling and statistical procedures to process the data have been proposed in order to improve the accuracy of statistics in the Atlantic and Indian Oceans. This new data processing system will be used to process data since 1991. Detailed information on this new system is included in other documents presented to this group.

Table 1 shows the yearly number of samples and of fish measured by species and fishing mode for the period 1985-

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1997. These numbers include samples of both the Spanish and other flag fleets. There was a noticeable improvement in the sampling coverage starting in 1993; in 1995 and 1996 the number of samples taken was twice the average number of the early 90s.

Table 2 shows the number of fish counted to estimate the species composition of the catch. We can also see an increasing trend since 1994, especially in the last three years.

Statistics

Catch

Table 3 and Figure 1 show the total yearly catches by species; Tables 4-5 and Figure 2 show catches by set type. Although the series are not entirely comparable due to the fact that catches prior to 1990 include boats of various flags managed by Spanish companies, we can see the important increase of catches after 1994 due to the spectacular increase of the catches taken on artificial floating logs. On the other hand, the catches taken on free schools have remained at quite a stable level since the end of the 80s. Catches by species have been fluctuating dramatically in the case of skipjack, but without any clear trend.

Effort

Table 6 shows the number of boats by category of the Spanish fleet in 1997, when a total of 23 Spanish vessels fished in the area. Table 7 shows the estimated effort in standardized fishing days (Spanish class 6 purse seiner); the effort was maintained at the same level in the first half of the 90s, increasing after 1994.

Size distribution

Table 8 shows the mean weight by species and fishing mode; as usual, fish caught on logs have a lower weight than on free schools. For the period considered, there was some decreasing trend in the weights of the three species caught on logs. Figures 3-5 show the size distribution, in number of fishes, of catches by species and set type. Figures 6-8 represent the same distribution in weight. The catch of yellowfin presents a large range of sizes (30-180 cm), with three modes at 55, 110 and 130 cm, skipjack sizes are between 30 and 78 cm, with only one mode close to 50 cm, bigeye sizes range from 30-164 cm, with a clear dominance of small fishes. The distributions in weight show a quite different figure.

Fishing area and seasonality

Figures 9-12 represent maps of effort and catches by fishing mode and 1°x1° square. Most of the catches on logs are taken in two areas: West of Seychelles and NW of the Equator. On the other hand, catches on free schools are taken in a large area between the Equator and 10° S. Figure 13 shows the distribution of catches by species, area, month and fishing mode. Figure 14 shows the areas considered in the previous figure. We can see the strong seasonality of both fishing modes with an important spatio-temporal interaction.

Table 1. Number of samples and fish measured for the Spanish Purse Seiner fishery (1985 – 1997).

YEAR	YFT		SKJ		BET		ALB	
	Nº samp.	Nº fishes	Nº samp.	Nº fishes	Nº samp.	Nº fishes	Nº samp.	Nº fishes
1985	73	5,942	63	4,223	32	2,180	-	-
1986	33	1,912	68	3,939	9	508	-	-
1987	68	4,016	102	6,813	8	309	-	-
1988	201	10,769	188	11,962	61	3,067	1	48
1989	132	6,772	196	12,593	50	1,976	-	-
1990	154	8,917	101	90,33	53	1,901	3	77
1991	209	21,573	132	17,485	123	5,895	12	513
1992	135	13,395	111	16,628	76	3,226	9	230
1993	298	35,474	216	36,507	207	7,765	43	2,137
1994	270	30,747	233	37,683	144	6,070	55	2,407
1995	416	59,244	378	67,806	320	34,194	17	1,052
1996	410	60,500	350	50,970	294	21,926	23	1,286
1997	280	41,412	213	21,139	192	19,180	10	775

Table 2. Number of fish counted to estimate the species composition of the catch.

YEAR	YFT	SKJ	BET	ALB
1990	2,902	15,682	737	70
1991	23,521	59,581	6,830	261
1992	16,921	56,157	2,854	290
1993	37,837	94,439	7,601	2,336
1994	39,225	74,264	6,210	3,401
1995	80,458	186,245	26,345	1,597
1996	94,131	181,734	25,548	2,646
1997	109,800	179,084	36,939	1,184

Table 3. Total catch by species in the Indian Ocean, 1984-1997 for Spanish purse seiners. (*) Catches prior to 1991 include other flags.

YEAR	YFT	SKJ	BET	ALB	TOTAL
1984*	14,280	7,755	585	242	22,862
1985*	21,449	25,267	480	166	47,362
1986*	21,684	31,365	1,241	8	54,298
1987*	25,876	42,413	2,108	4	70,401
1988*	53,832	47,695	7,944	67	109,538
1989*	46,762	71,098	6,331	-	124,191
1990*	51,260	66,339	2,934	283	120,816
1991	47,474	37,576	6,722	1,066	92,838
1992	42,494	39,160	3,749	1,486	86,889
1993	54,849	44,845	4,709	850	105,253
1994	42,940	54,213	5,224	1,733	104,110
1995	69,068	60,618	10,900	536	141,122
1996	63,368	57,503	11,505	819	133,195
1997	61,570	56,495	14,500	919	133,484

Table 4. Spanish purse seiners catch on log by especies in the Indian Ocean, 1984-1997. (*) Catches prior 1991 include other flags.

YEAR	YFT	SKJ	BET	ALB	TOTAL
1984*	2,391	4,288	329	-	7,008
1985*	5,209	17,576	327	-	23,112
1986*	4,634	19,661	712	-	25,007
1987*	6,648	26,304	1,370	-	34,322
1988*	15,868	36,221	4,175	-	56,264
1989*	17,968	42,093	4,025	-	64,086
1990*	9,534	52,250	1,604	157	63,545
1991	13,321	29,281	4,443	55	47,100
1992	18,999	29,476	3,089	-	51,564
1993	21,079	29,148	2,593	5	52,825
1994	14,866	36,394	3,613	19	54,892
1995	41,745	48,161	9,115	29	99,050
1996	30,147	39,084	9,336	12	78,579
1997	39,504	48,147	13,117	63	100,831

Table 5. Catches on free schools by species in the Indian Ocean, 1984-1997 for Spanish purse seiners. (*) Catches prior 1991 include other flags.

YEAR	YFT	SKJ	BET	ALB	TOTAL
1984*	11,889	3,467	256	242	15,854
1985*	16,240	7,691	153	166	24,250
1986*	17,050	11,704	529	8	29,291
1987*	19,228	16,109	738	4	36,079
1988*	37,964	11,474	3,769	67	53,274
1989*	28,794	29,005	2,306	0	60,105
1990*	41,726	14,089	1,330	126	57,271
1991	34,153	8,295	2,279	1,011	45,738
1992	23,495	9,683	660	1,486	35,324
1993	33,770	15,697	2,117	845	52,429
1994	28,074	17,818	1,611	1,714	49,217
1995	27,323	12,457	1,784	507	42,071
1996	33,221	18,418	2,169	806	54,614
1997	22,067	8,348	1,383	856	32,654

Table 6. Number of Spanish Purse seiner by category and carrying capacity in tons for 1997.

Class	Nº	Carrying capacity (t)
6	2	600-799
7	14	800-1,200
8	7	>1,200
total	23	
Total Capacity	25,750	

Table 7. Nominal fishing effort of the Spanish purse seine fleet.

YEAR	EFFORT (F.DAYS)
1991	57,803
1992	55,724
1993	56,631
1994	56,057
1995	65,270
1996	73,004
1997	79,768

Table 8. Mean weight by species and set type

	YFT		SKJ		BET	
YEAR	LOG	F.SCHOOL	LOG	F.SCHOOL	LOG	F.SCHOOL
1995	9.6	28.2	2.4	2.9	5.3	13.9
1996	5.5	24.1	2.3	2.9	4.5	8.8
1997	4.3	27.7	2.3	3	3.6	17

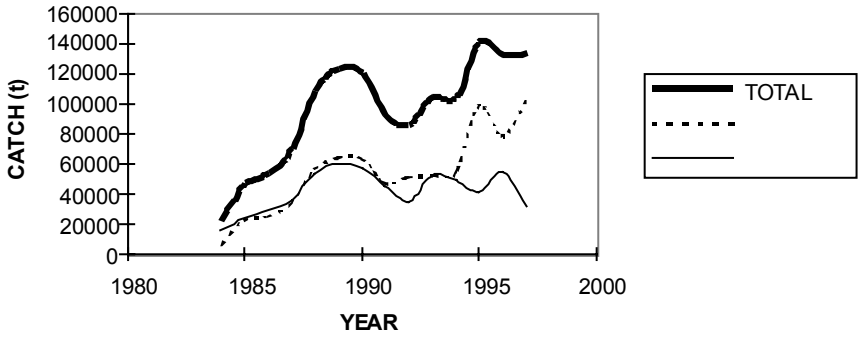

Figure 1. Total catch and catch by set type prior 1991 include other flags.

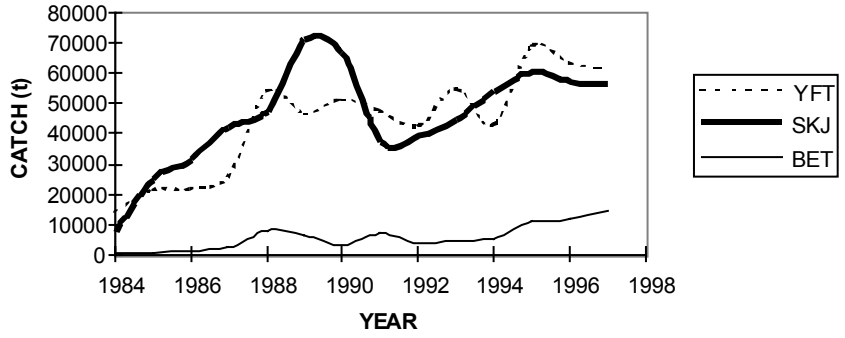

Figure 2. Catch by species of the Spanish purse seine fleet. Catches prior 1991 include other flags fleets.

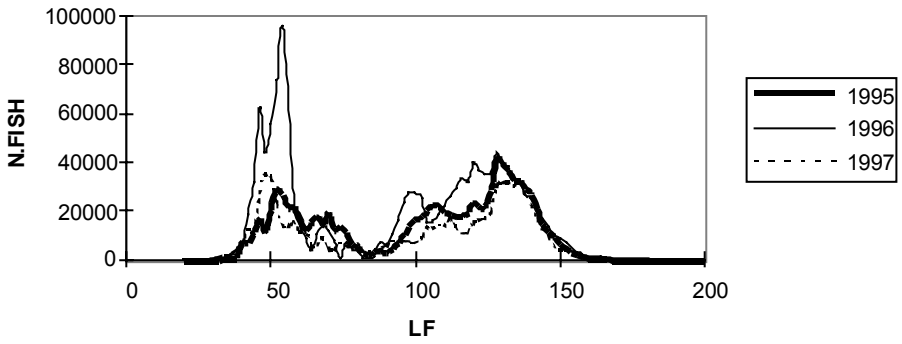

Figure 3. Size distribution, in number of fishes, of Spanish yellowfin catch.

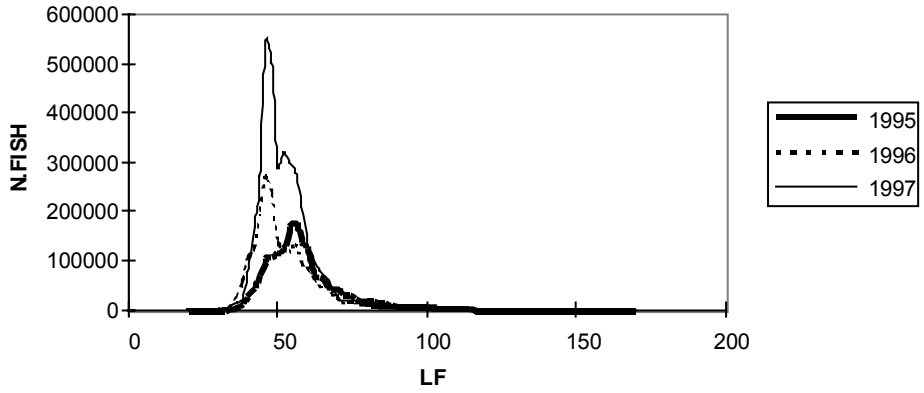

Figure 4. Size distribution, in number of fishes, of Spanish bigeye catch.

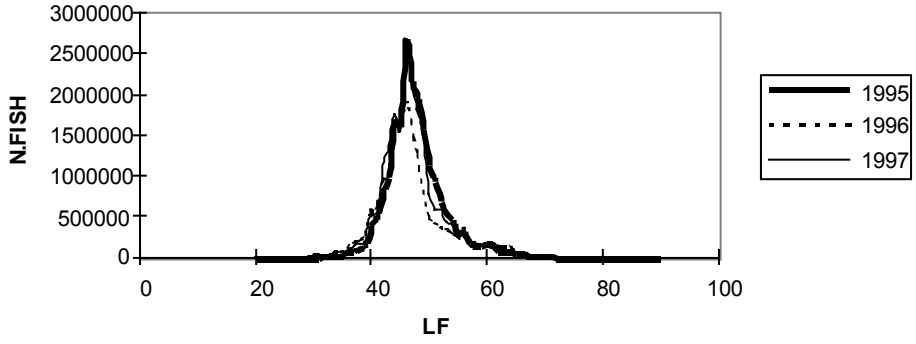

Figure 5. Size distribution, in numbers of fishes, of Spanish skipjack catch.

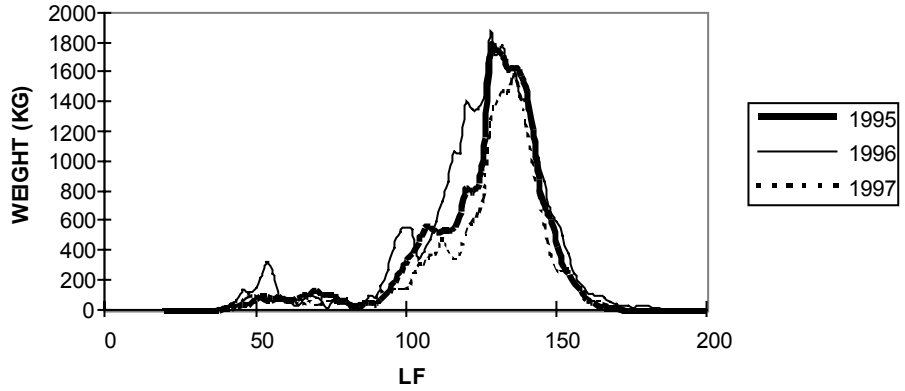

Figure 6. Size distribution, in weight, of Spanish yellowfin catch.

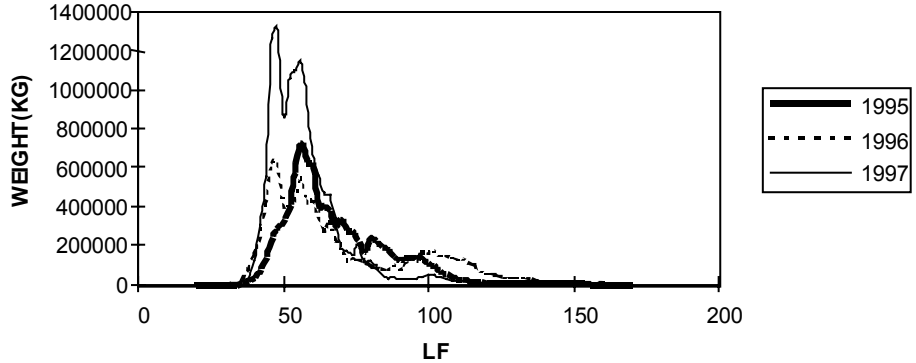

Figure 7. Size distribution, in weight, of Spanish bigeye catch.

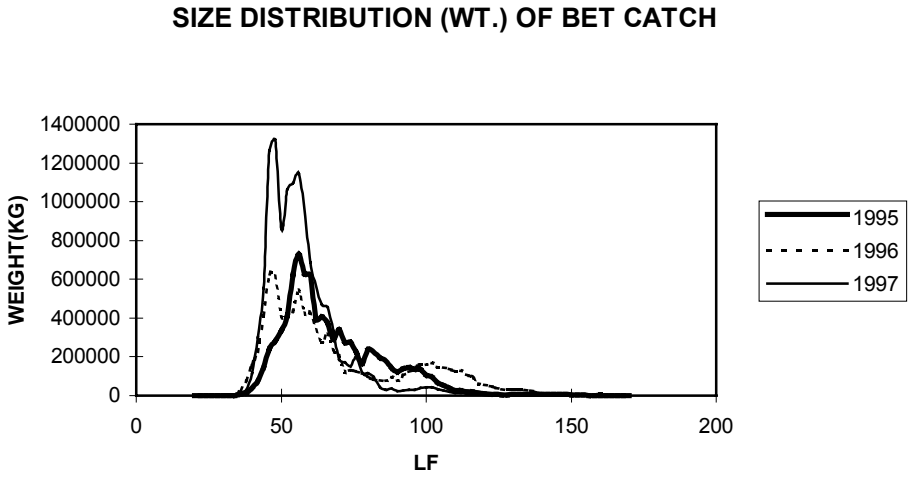

Figure 8. Size distribution, in weight, of spanish skipjack catch.