Statistics of the Spanish Purse Seine Fleet in the Indian Ocean

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ABSTRACT

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

Introduction

The Spanish purse seine fleet started to fish in the Indian Ocean in 1984. This new fishery 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.

Since the beginning of the fishery, catch and effort data have been collected. The sampling of sizes landed was conducted under the control of experts of the Instituto Espanol de Oceanografia (IEO) in close collaboration with the Seychelles Fishing Authorities (SFA) and the IRD scientific team. Since the beginning of the 90's a Spanish fisheries expert has been permanently based in Mahé, Seychelles, in order to follow this fishery *in situ*. Significant improvement of the sampling coverage and of the accuracy of the Spanish statistics has been observed since that year. Two research programmes, funded by the European Commission and coordinated by the IEO and IRD, have also been conducted. The first was a two year (1995-1996) observer programme targeting knowledge of bycatch in the purse seine fisheries in the Atlantic and Indian Oceans. The second programme, 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 programme to analyse the fishing power increase of the purse seiners is projected.

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 in this document 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 primarily covers the Spanish flag, but statistical information on the purse seine fleets carrying other flags but belonging to Spanish companies is also given (as detailed statistics are also collected for 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 by most of the Spanish fleet, resulting in a very detailed and reliable database. In the Indian Ocean this system was establish at the beginning of the fishery using the Atlantic system adapted to this Ocean.

However, an important difference between those two oceans was noticed in

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

SPECIES COMPOSITION AND SIZES

Until 1998, the size distribution of catches was obtained from sampling in two steps that considered the set as primary unit of sampling and the fish as secondary unit. The samples were taking by species with equal sample size for all species.
ICCAT has shown in the Atlantic a systematic bias in the log book species composition of the catch. The main bias was related with the small yellowfin (partially declared as skipjack) and especially small bigeye (always declared as yellowfin or skipjack). After these analyses, ICCAT recommended the application of a statistical procedure to correct the species composition of tropical tuna catches. In the Indian Ocean, analyses made at the beginning of the fishery showed that a similar bias occurred. A procedure for counting the fish according their species composition (during unloading) was routinely established in order to correct the species composition of the catches.
During the last two years a large scale research programme 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 programme a new sampling procedure and a new statistical procedure to process the data has been proposed in order to improve the accuracy of statistics in both the Atlantic and Indian Oceans. This new procedure 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 the number of fish measured by species and fishing mode for the period 1985-1997. This number includes samples from the Spanish and “other flags” fleets. The sampling coverage improved as from 1993; in 1995 and 1996 the number of samples taken was twice the average number for 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 and in particular 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 fishing mode. 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 significant increase of catches after 1994 due to the spectacular increase of catches taken on FADs. On the other hand, catches taken on free schools have remained at quite a stable level since the end of the 80s. Catches by species, have been fluctuating, severely 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 and 1998; this year a total of 23 Spanish vessels fished in the area. Table 7 shows the nominal effort in fishing days as well as the nominal catch rate by species. Table 8 shows the total number of 1º by 1º degree squares explored by the Spanish fleet. Effort has remained level since 1989. Catch rates of bigeye have been increasing in the last four years.

MEAN WEIGHT

Table 9 and Figures 3-5 show the mean weight by species and fishing mode; as usual, catches on logs have a lower weight than catches on free schools. Mean weights of yellowfin from free schools change due to changes in fishing area; the movement of the fleet to the East (Chagos area) in the early 90s produce an significant increase in the mean weight. For the period considered we can see for the three species some decreasing trend in the weight of fishes caught on logs and mainly in skipjack.

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	5942	63	4223	32	2180	-	-
1986	33	1912	68	3939	9	508	-	-
1987	68	4016	102	6813	8	309	-	-
1988	201	10769	188	11962	61	3067	1	48
1989	132	6772	196	12593	50	1976	-	-
1990	154	8917	101	9033	53	1901	3	77
1991	209	21573	132	17485	123	5895	12	513
1992	135	13395	111	16628	76	3226	9	230
1993	298	35474	216	36507	207	7765	43	2137
1994	270	30747	233	37683	144	6070	55	2407
1995	416	59244	378	67806	320	34194	17	1052
1996	410	60500	350	50970	294	21926	23	1286
1997	280	41412	213	21139	192	19180	10	775
1998	337	27715	215	19109	234	12273	14	645

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

YEAR	YFT	SKJ	BET	ALB
1990	2902	15682	737	70
1991	23521	59581	6830	261
1992	16921	56157	2854	290
1993	37837	94439	7601	2336
1994	39225	74264	6210	3401
1995	80458	186245	26345	1597
1996	94131	181734	25548	2646
1997	109800	179084	36939	1184
1998	42269	101050	19340	763

Table 3. Spanish purse seiners total catch by species in the Indian Ocean, 1984-1998.

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	44962	40371	6485	1066	92883
1992	36275	45135	3461	1453	86323
1993	43944	48050	4935	843	97771
1994	40025	56811	5553	1733	104121
1995	62437	66618	11572	536	141162
1996	58201	63038	11126	818	133182
1997	56244	57985	14725	997	129950
1998	42251	44808	15382	265	102706

Table 4. Spanish purse seiners catch on log by species in the Indian Ocean, 1984-1998.

CATCH ON LOGS BY SPECIES					
YEAR	YFT	SKJ	BET	ALB	TOTAL
1984	2115	3142	281	0	5538
1985	5286	12465	686	0	18437
1986	5765	10187	1273	0	17225
1987	10644	14949	2766	0	28359
1988	13578	30148	3578	0	47304
1989	15995	37185	3820	0	57000
1990	11789	35320	2375	40	49524
1991	10620	32260	4674	55	47609
1992	13129	35588	2973	1	51690
1993	12979	34262	2588	0	49829
1994	12243	40160	3877	38	56319
1995	35352	54328	9842	29	99550
1996	25641	44887	8954	12	79494
1997	34883	49941	13550	63	98437
1998	25812	36530	12705	18	75065

Table 5. Spanish purse seiners catch on free schools by species in the Indian Ocean, 1984-1998.

CATCH ON FREE SCHOOL BY SPECIES					
YEAR	YFT	SKJ	BET	ALB	TOTAL
1984	9338	3251	478	197	13264
1985	13145	6178	644	145	20112
1986	14265	8921	572	0	23758
1987	15657	12987	2208	4	30856
1988	31370	9594	3232	65	44261
1989	25151	26818	2043	0	54012
1990	31939	12606	2492	105	47142
1991	34342	8111	1811	1011	45274
1992	23146	9547	488	1452	34633
1993	30965	13787	2347	843	47942
1994	27781	16651	1675	1695	47803
1995	27085	12290	1730	507	41612
1996	32560	18151	2172	806	53689
1997	21360	8044	1175	934	31513
1998	16439	8278	2677	247	27641

Table 6. Number of Spanish Purse seiners by category and carrying capacity in tonnes for 1997 and 1998.

Class	1997	1998
6	2	2
7	3	2
8	18	15
total	23	19
Carrying capacity	26551	22014

Class:

6	from	600	to	799	tonnes
7	from	800	to	1200	tonnes
8			>	1200	tonnes

Table 7. Nominal fishing effort (fishing days) of the Spanish purse seine fleet and catch rate by species.

YEAR	F.DAYS	NOMINAL CATCH RATE		
		YFT	SKJ	BET
1984	1699,3	6,7	3,8	0,4
1985	2819,5	6,5	6,6	0,5
1986	2632,4	7,6	7,3	0,7
1987	2897,5	9,1	9,6	1,7
1988	3307,1	13,6	12,0	2,1
1989	5144,1	8,0	12,4	1,1
1990	4967,2	8,8	9,7	1,0
1991	4289,6	10,5	9,4	1,5
1992	4105,7	8,8	11	0,8
1993	4237,5	10,4	11,3	1,2
1994	4158,2	9,6	13,7	1,3
1995	4891	12,8	13,6	2,4
1996	5454,6	10,7	11,6	2
1997	6053,9	9,3	9,6	2,4
1998	5302,8	8,0	8,4	2,9

Table 8. Number of 1x1 degree squares explored by the Spanish purse seine fleet.

YEAR	
1984	257
1985	359
1986	297
1987	290
1988	319
1989	350
1990	354
1991	370
1992	417
1993	411
1994	472
1995	443
1996	571
1997	624

Table 9. Mean weight by species and fishing mode.

	YFT		SKJ		BET	
YEAR	LOG	F. SCHOOL	LOG	F. SCHOOL	LOG	F. SCHOOL
1984	5.5	22.8	2.8	3.1	4.6	12.2
1985	4.5	25.0	3.0	3.2	5.1	12.5
1986	11.4	22.5	3.3	3.4	6.7	11
1987	10.2	25.8	3.3	4.3	6.8	11.7
1988	5.1	27.0	2.9	2.9	5.3	11
1989	8.0	15.0	3.2	3.2	5.3	9.4
1990	6.1	31.8	2.8	3.0	4.3	25.2
1991	7.9	37.4	2.8	2.7	5.2	23.3
1992	9.9	34.6	3.0	3.0	5.3	13.3
1993	10.8	39.3	2.7	3.0	4.4	16.9
1994	6.9	40.9	2.5	3.4	4.7	31.1
1995	9.7	28.0	2.4	3.0	5.3	22.3
1996	5.4	28.8	2.4	3.2	4.8	11.0
1997	4.9	29.1	2.3	3.2	3.8	13.6
1998	5.1	23.4	2.5	2.7	4.4	10.7

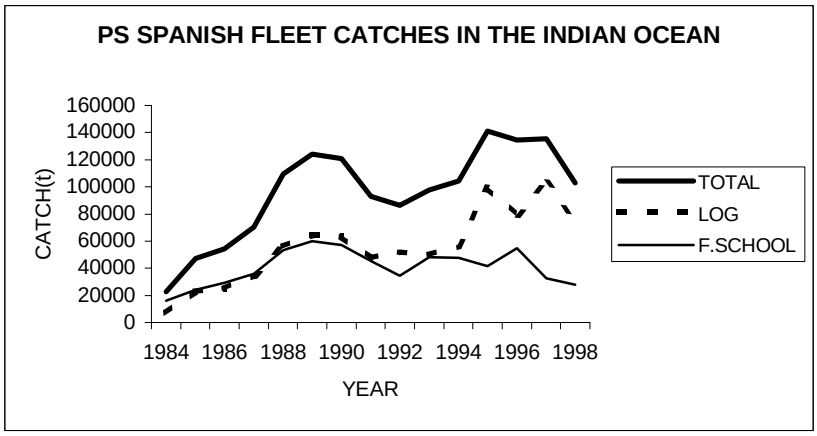

Figure 1. Total catch and catch by fishing mode (floating object and free school) of the Spanish purse seine fleet. Catches prior 1991 include other flags fleets.

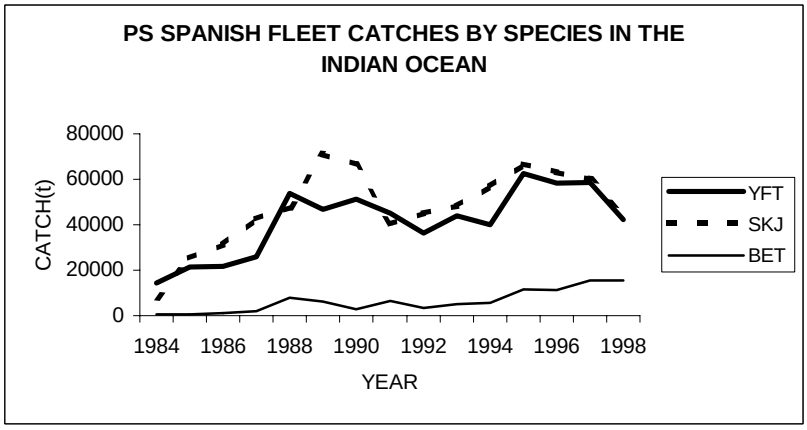

Figure 2. Catch by species of the Spanish purse seine fleet. Catches prior 1991 include other flags fleets.

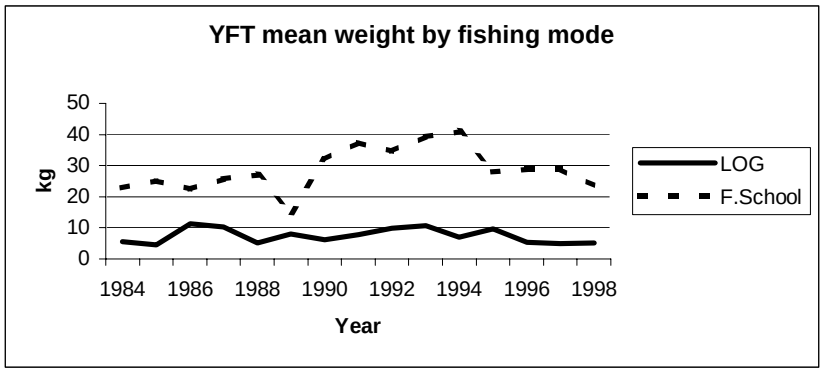

Fig. 3. Yellowfin mean weight by fishing mode (log and free school) for the period 1984-1998.

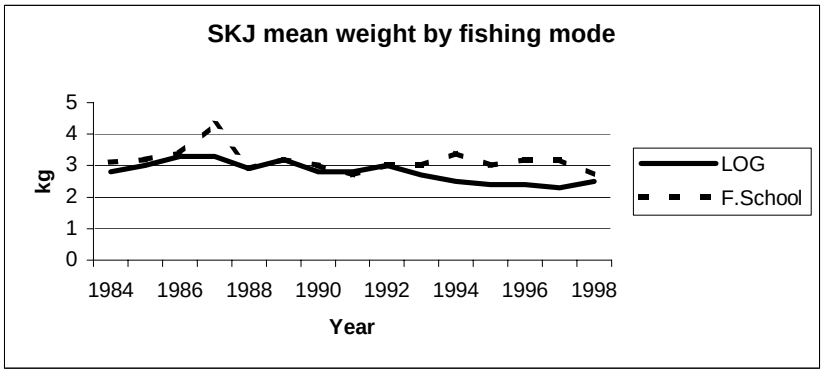

Fig. 4. Skipjack mean weight by fishing mode (log and free school) for the period 1984-1998.

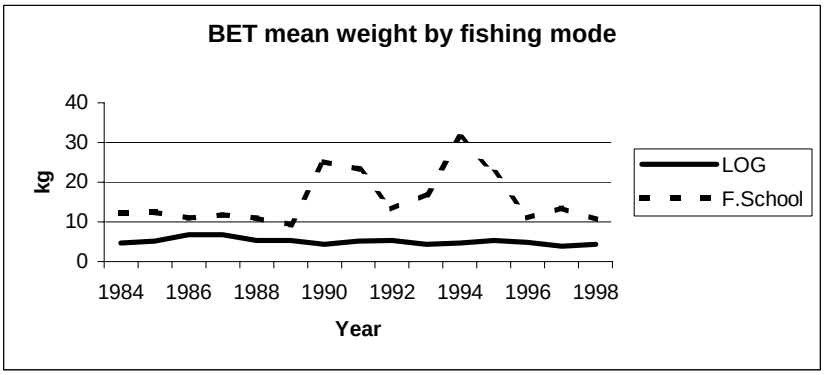

Fig. 5. Bigeye mean weight by fishing mode (log and free school) for the period 1984-1998.