French purse-seine tuna fisheries statistics in the Indian Ocean, 1981-2003

Pianet R. [1], V. Nordstrom [2] and P.Dewals [3]

Résumé

Ce document présente un résumé des principales activités de la flottille des senneurs français dans l'océan Indien depuis 1981 : efforts, prises par espèces et type de pêche (bancs sur objet, bancs libre et combinés), captures par unité d'effort, échantillonnages et poids moyen de la capture des principales espèces.

Abstract

This document presents a summary of the main general French purse-seiners activities in the Indian Ocean since 1981: effort, catch by species and fishing type (log and free swimming schools), catch per unit of effort, sampling and mean weights for the main species.

[1] Centre de Recherche Halieutique Méditerranéenne et Tropicale, BP 171, 34 203 Sète Cedex - France

[2] IRD aux Seychelles, BP 570 – Victoria, Seychelles.

[3] IRD aux Seychelles, BP 570 – Victoria, Seychelles.

INTRODUCTION

The fleet concerned with this study is made of the purse-seiners under French flag in the Indian Ocean. The ships of French armaments under another flag are gathered within European fleet known as "EU-NEI".

This fleet is followed by IRD scientists since the arrival in 1981 of the first tuna boats, in co-operation with the SFA (Seychelles Fishing Authority). The procedures of follow-up of catches and sampling were described and presented at the Working Party on Data Collection and Statistics in 1999. The processing was carried out for 2002 according to the traditional procedure.

The data concerning the former period (1981-1990) correspond to that which had been presented to the Tropical Tunas Working Party in 2000 (WPTT-00-20). They are under final revision to be presented to the WPDCS in December.

EFFORTS

Fleet

The evolution by gross registered tonnage categories of the fleet is shown in Table 1 and Figure 1a. The total number and composition of the French fleet remained stable these 10 last years. In 2003, the number of French purse seiners decreased from 16 to 14 (-13%), with a slight reduction (4%) of its total carrying capacity.

Fishing effort

Fishing (raw and standardized) and searching efforts as well as the carrying capacity of the fleet are presented in Table 2 and Figure 1c.

The fishing effort remained generally stable for the various indices since 1991, and exhibits a slight decrease for both fishing (-14%) and searching (-18%) days in 2003, as a direct consequence of the lower number of boats.

Number of visited and exploited squares

The evolution of the number of visited 1 degree squares is reported in Table 3 and Figure 1b according to various cases: total number explored, number with a presence higher than 12 and 60 fishing hours (that is to say the equivalent of 1 and 5 fishing days), number having been the object of at least one set (positive or not) and the number with a catch, all these indices varying in fact rather in parallel.

In 2003, all indices decreased quite significantly (-22% to -28%), coming back to the level observed at the beginning of the 90s. This is well shown on the fishing maps (Figures 6 and 7) for both log and free schools catches.

Number of sets

The evolution of the number of sets (total, positive and null) according to the fishing mode (free schools, log schools or combined) is presented in Table 4 and on Figures 2a-c for the number of positive sets; the total number of sets and the percentage of null ones is illustrated on Figure 1d for both log and free sets.

The total number of sets remains quite stable around 4000 sets since the beginning of the fishery. In 2003, the total number slightly increased (+5%) in spite of the reduction of the number of boats. However, the major fact is the strong increase of the number of free school sets (+36%) while the number of log sets diminished (-19%), with a higher rate of negative sets in both cases, especially on log sets. In2002, the percentage of successful FADs sets was the highest observed (95%) since the beginning of the log fishing; in 2003, it returns at former levels.

The sizes distribution of sets is exhibited in Table 5 according to the fishing mode; it shows very similar profiles for the three fishing modes, with a majority of sets in a 10-50 tons range, and a significant proportion (17%) of sets of less than 10 tons and more than 50 tons (23%). This result in an average weight of sets very similar between the two fishing modes (37 tons in 2002): in fact, only the proportions of null sets distinguish definitely sets on logs (5-15%) from those on free schools (40-55%).

The main observation in 2003 is a lesser number of sets with a small catch (< 50 t) and a higher number of sets with a large catch, particularly for free school ones.

CATCHES AND CATCHES PER UNIT OF EFFORT

Total catches and catches by species

The evolution of the catches according to the fishing mode is presented in Table 6 and Figure 2.

After a decline in the total catches between 1994 and 1998 – mostly linked to the decrease of the nominal effort in term of fishing days and number of purse-seiners – catches have increased regularly since then. In 2003, they reached the higher level ever observed for the French fishery, a little over 108,000 tonnes. This is the result of a remarkable increase of the yellowfin catch (over 63,000 tonnes, +74% compared with 2002), while catches of skipjack ands bigeye decreased notably (respectively -28% and -27%).

This is largely the result of the significant catches made on free schools of large yellowfin in an area extending from the equator to 10°S and the African coast until 65°E. Presently we do not have any clear explanation of this phenomenon observed for all the purse seine fleet. Albacore catches were relatively high, probably as a result of the importance of the free school sets.

The catches according to FAO areas 51 and 57 are presented in Table 7. After a maximum in 1998 when they exceeded 10.000 tons, the eastern Indian Ocean catches fell to some 100 tons in 2000 and remains null since then.

Catches per unit of effort

The catches per unit of effort for both fishing modes and combined are shown in Table 8 and Figures 3 (catches by fishing days) and 4 (catches by positive sets). In a general way, both indices show the same tendencies that those noted for catches because of a nominal effort which remains relatively stable.

In terms of catches per fishing days, the total cpue in 2003 was exceptionally high, the higher value since the beginning of the fishery. This is by far the result of free shool sets on large yellowfin, with cpues about 3 times the mean one observed on the 10 last years. All fishing modes combined, the yellowfin cpue is more than twice this average, while skipjack and bigeye cpues remains close to this value.

In term of catch by positive sets, the tendencies are the same ones, with a catch per set high for FAD and exceptionally high (51 t) on free schools, exceeding the maxima ever observed.

Space-time distribution of catches and efforts

The spatial distribution of the catches by species and fishing mode (free and log schools) is illustrated on Figure 6a and 6b, while Figure 7a and 7b shows the distribution of total catches and fishing effort (expressed as fishing days), year 2003 being compared with an average situation over the period 1998-2002.

The most striking fact in 2003 is the concentration of the fishery in a relatively restricted area as compared with the mean distribution of the 1998-2002 period, for both fishing modes. However, one should keep in mind that this period includes 1998 when the fishery was significantly operating in the eastern Indian Ocean.

SIZE AND SPECIES COMPOSITION OF THE CAPTURE

The sampling effort (sizes and specific composition) is presented in Table 9 for all European fleets (France, Spain and NEI).

The species composition of the catches is estimated after correcting the logbooks information to the species composition sampling within preset strata according to procedures' previously described (WPDCS/99/09 and WPDCS/00/10).

In 2003, sampling of the purse seine fleets was satisfactory, allowing a traditional data processing to estimate the species composition of the catches as well as their demographic structure for the main species (yellowfin, skipjack, bigeye and albacore tuna).

Average weights of the main species (yellowfin, skipjack, bigeye and albacore tuna, combined and for both fishing modes) are presented in Table 10 and Figure 5; these results from the standard procedure, except for the period 1998-1999 were a specific one had to be implemented due to the weakness of the sampling.

Size distribution of the French purse seine fleets catches of yellowfin, skipjack and bigeye in 2003 and for the average 1998-2002 period are presented in Figures 6a (in numbers) and 6b (in weight).

Yellowfin

The specificity of the yellowfin catches in 2003 compared with the mean 5 years preceding period is well exhibited of these figures. If the log catches show a rather classical size distribution, the free school ones are very different with the quasi absence of small fishes (40-60 cm), an atypical mode in intermediate sizes (90 cm) and an unusually large one on fishes from 110 to 140 cm.

After a regular decline since 1993, the yellowfin tuna average weight increased from 1999 to 2001, dropped again in 2002 from 12.0 to 8.3 kg, and then increased in remarkably in 2003, reaching 17,2 kg. This results from an increase of the average weight of log catches (6.9 kg), but especially of those on free schools (35.9 kg). A clear increasing trend of mean weight on free schools can be observed since 1999.

Bigeye

The major fact is the relatively little catch of small fishes on log schools, as well as the very little catch of small fishes (40-60 cm) on free schools (as observed for yellowfin) and a relatively important catch of large fishes (110-150 cm).

The bigeye average weight remained stable, with a slight increase in 2003 resulting mainly from the free school catches, which mean weight leaps to 40 kg.

Skipjack

Catches on log schools exhibit a rather larger size distribution than the mean one (50-60 cm), and on free school the same absence of the classical mode (40-50 cm) can be observed, replaced with larger fishes (50-60 cm).

For skipjack, the average weights declined significantly since the beginning of the 90s, and fluctuate since 2000. However, a clear increase is observed on both fishing modes in 2003.

Albacore

Lastly, the albacore average weights are still very stable, between 25-30 kg.

CONCLUSION

After 2002, 2003 was again an exceptionally good year, with the higher total catch rates ever observed since the beginning of the fishery. However the reasons are completely opposite: while the results of 2002 came from very large FAD catches (58% of the total number of sets, and some 70% of the total catch), mainly made of skipjack, the situation was totally opposite

in 2003 with high catches on free schools (57% of the total number of sets, and some 50% of the total catch), mainly made of large yellowfin. The two other remarkable points were the geographical concentration of the fishery, and the very little amount of small fishes caught on free schools.

The same phenomenon was observed for the other purse seine fisheries. Apparently, these high catches of large yellowfin continue in 2004.

Table 1 : Purse seiners number according to their GRT category and total carrying capacity of the French fleet

Year	50-400	401 600	601 800	801 1200	1201 2000	> 2000	Total	Carrying capacity
1981	1	0	0	1	0	0	2	129
1982	1	1	0	2	0	0	4	820
1983	1	6	0	5	0	0	12	3 729
1984	0	11	6	9	0	0	26	14 061
1985	0	11	6	9	0	0	26	15 679
1986	0	9	5	8	0	0	22	14 281
1987	1	6	5	9	0	0	21	13 598
1988	1	6	5	9	0	0	21	14 534
1989	1	6	5	9	0	0	21	14 177
1990	0	7	5	9	0	0	21	12 762
1991	0	4	3	9	2	0	18	12 943
1992	0	4	2	9	2	0	17	14 220
1993	0	4	2	9	2	0	17	14 180
1994	0	4	2	9	2	0	17	13 743
1995	0	4	2	9	2	0	17	14 199
1996	0	3	2	10	2	0	17	13 341
1997	0	3	2	10	4	0	19	14 013
1998	0	3	2	8	3	0	16	13 074
1999	0	2	2	8	3	0	15	12 523
2000	1	1	2	8	3	0	15	12 736
2001	1	1	2	10	5	0	19	13 436
2002	0	1	2	8	5	0	16	14 657
2003	0	0	1	8	5	0	14	14 103

Table 2 : Fishing effort expressed as carrying capacity (GRT), fishing days, searching days and standardized fishing days

Year	Carrying capacity	Fishing days	Searching days	Standardized fishing days
1981	129	84		
1982	820	256	221	236
1983	3 729	1 461	1 142	1 295
1984	14 061	4 914	3 930	4 433
1985	15 679	5 823	4 869	5 250
1986	14 281	5 424	4 304	4 962
1987	13 598	4 892	3 844	4 509
1988	14 534	5 245	4 184	4 732
1989	14 177	5 069	4 241	4 627
1990	12 762	4 628	3 825	4 424
1991	12 943	4 309	3 516	4 309
1992	14 220	4 599	3 683	4 599
1993	14 180	4 711	3 891	4 711
1994	13 743	4 649	3 774	4 649
1995	14 199	4 831	3 942	4 831
1996	13 341	4 574	3 784	4 574
1997	14 013	4 603	3 883	4 603
1998	13 074	4 330	3 676	4 330
1999	12 523	3 838	3 178	3 838
2000	12 736	3 896	3 200	4 710
2001	13 436	4 071	3 360	4 071
2002	14 657	4 062	3 316	4 062
2003	14 103	3 489	2 721	3 489

Table 3 : Total number of one degree squares explored, with at least one set, with catches and with an effort greater than 1 and 5 fishing days

Year	Number of one degree squares				
	Explored	With at least one set	With catches	With an effort > 1 fishing day	With an effort > 5 fishing days
1981	66	24	23	65	8
1982	115	47	40	55	11
1983	223	112	101	142	60
1984	508	262	248	320	181
1985	459	339	322	386	266
1986	396	309	297	336	219
1987	402	330	305	327	203
1988	392	281	267	304	208
1989	442	315	303	355	226
1990	429	337	321	355	212
1991	411	334	321	333	203
1992	404	345	333	342	199
1993	414	333	325	329	218
1994	438	356	348	366	232
1995	445	367	362	371	232
1996	522	405	392	409	247
1997	524	415	392	422	259
1998	755	551	528	557	245
1999	611	426	411	421	196
2000	498	359	343	364	201
2001	456	355	339	354	220
2002	551	408	387	411	242
2003	410	313	302	295	186

Table 4 : Number of sets (total, positives and null) by fishing mode.

Years	Combined			Log schools			Free swimming schools		
	Total	Positives	Null	Total	Positives	Null	Total	Positives	Null
1981	43	33	10						
1982	143	105	38	72	63	9	71	42	29
1983	1 068	766	302	548	467	81	520	299	221
1984	3 564	2 257	1 307	1 060	900	160	2 504	1 357	1 147
1985	3 769	2 333	1 436	1 345	1 208	137	2 424	1 125	1 299
1986	4 433	2 425	2 008	1 684	1 400	284	2 749	1 025	1 724
1987	4 402	2 795	1 607	1 937	1 675	262	2 465	1 120	1 345
1988	4 815	2 822	1 993	1 326	1 187	139	3 489	1 635	1 854
1989	3 583	2 243	1 340	1 597	1 386	211	1 986	857	1 129
1990	4 126	2 527	1 599	1 188	1 092	96	2 938	1 435	1 503
1991	3 630	2 448	1 182	1 622	1 538	84	2 008	910	1 098
1992	4 602	2 980	1 622	1 708	1 569	139	2 894	1 411	1 483
1993	4 164	2 764	1 400	1 811	1 612	199	2 353	1 152	1 201
1994	4 332	3 099	1 233	2 326	2 068	258	2 006	1 031	975
1995	4 486	3 066	1 420	2 276	2 052	224	2 210	1 014	1 196
1996	3 956	2 883	1 073	2 221	1 956	265	1 735	927	808
1997	3 607	2 714	893	2 301	2 035	266	1 306	679	627
1998	3 328	2 454	874	2 117	1 828	289	1 211	626	585
1999	3 240	2 371	869	1 750	1 553	197	1 490	818	672
2000	3 429	2 526	903	1 838	1 568	270	1 591	958	633
2001	3 385	2481	904	1 548	1404	144	1 837	1077	760
2002	3 469	2673	796	1 939	1835	104	1 530	838	692
2003	3 651	2464	1187	1 568	1404	164	2 083	1060	1023

Table 5 : Set size distribution according to the fishing mode (combined, log schools and free swimming schools)

Catch	0.1 10	10.1 20	20.1 30	30.1 40	40.1 50	50.1 60	60.1 70	70.1 80	80.1 90	90.1 100	>100
Combined											
1981											
1982	41	27	13	6	8	3	1	0	4	1	1
1983	151	168	127	63	54	62	38	29	24	8	42
1984	416	482	341	207	221	141	94	95	70	43	147
1985	464	519	345	237	169	148	88	89	45	48	181
1986	429	515	381	252	207	159	80	77	63	47	215
1987	487	650	433	322	190	168	138	90	73	48	196
1988	393	606	449	319	246	185	114	125	93	63	229
1989	380	462	346	231	187	145	87	73	55	47	230
1990	462	563	444	326	175	135	88	89	48	35	162
1991	323	495	434	311	248	143	130	65	66	65	168
1992	479	655	517	356	271	171	126	87	70	45	203
1993	435	613	457	286	244	160	126	93	90	57	203
1994	376	722	542	392	267	194	140	94	80	49	242
1995	525	663	550	336	278	164	126	128	74	52	170
1996	522	668	515	336	230	155	101	94	82	43	137
1997	572	649	457	330	207	132	98	86	40	29	114
1998	569	658	404	263	186	96	68	58	35	27	89
1999	453	515	346	252	187	112	119	80	56	43	208
2000	464	561	401	263	193	147	97	92	67	40	201
2001	501	590	376	278	172	137	111	70	55	37	154
2002	446	607	428	259	208	161	102	86	67	54	255
2003	380	507	337	249	184	158	98	86	73	54	335
Log schools											
1981											
1982	24	18	9	0	3	2	1	0	4	1	1
1983	113	125	83	35	26	22	24	15	6	4	14
1984	168	210	127	90	80	46	31	39	26	16	67
1985	223	253	*171*	123	84	78	42	49	25	30	130
1986	233	302	244	137	110	99	43	43	38	28	123
1987	304	427	273	212	104	95	54	34	37	19	116
1988	147	274	210	124	92	81	42	47	39	26	105
1989	251	300	232	164	125	92	45	40	23	22	92
1990	188	252	205	151	73	47	40	36	23	15	62
1991	188	332	303	222	150	91	70	36	37	30	79
1992	243	370	269	159	139	92	67	48	37	23	122
1993	243	376	268	175	141	98	64	63	51	29	104
1994	248	511	388	288	193	119	82	51	45	21	121
1995	353	466	369	224	179	103	91	73	51	41	102
1996	363	445	352	233	153	105	66	66	56	32	85
1997	438	504	347	248	149	96	65	61	32	22	73
1998	423	492	302	211	137	73	50	49	26	12	53
1999	274	321	214	182	115	87	88	58	34	33	147
2000	279	352	252	162	105	84	62	62	46	29	135
2001	271	380	209	166	88	67	51	35	24	23	90
2002	293	441	299	187	127	111	73	62	47	29	166
2003	248	328	200	136	96	78	46	51	39	22	157

Table 5 (continuation) : Set size distribution according to the fishing mode
(combined, log schools and free swimming schools)

Catch	0.1 10	10.1 20	20.1 30	30.1 40	40.1 50	50.1 60	60.1 70	70.1 80	80.1 90	90.1 100	>100
Free swimming school											
1981											
1982	17	9	4	6	5	1	0	0	0	0	0
1983	38	43	44	28	28	40	14	14	18	4	28
1984	248	272	214	117	141	95	63	56	44	27	80
1985	241	266	174	114	85	70	46	40	20	18	51
1986	196	213	137	115	97	60	37	34	25	19	92
1987	183	223	160	110	86	73	84	56	36	29	80
1988	246	332	239	195	154	104	72	78	54	37	124
1989	129	162	114	67	62	53	42	33	32	25	138
1990	274	311	239	175	102	88	48	53	25	20	100
1991	135	163	131	89	98	52	60	29	29	35	89
1992	236	285	248	197	132	79	59	39	33	22	81
1993	192	237	189	111	103	62	62	30	39	28	99
1994	128	211	154	104	74	75	58	43	35	28	121
1995	172	197	181	112	99	61	35	55	23	11	68
1996	159	223	163	103	77	50	35	28	26	11	52
1997	134	145	110	82	58	36	33	25	8	7	41
1998	146	166	102	52	49	23	18	9	9	15	36
1999	179	194	132	70	72	25	31	22	22	10	61
2000	185	209	149	101	88	63	35	30	21	11	66
2001	230	210	167	112	84	70	60	35	31	14	64
2002	153	166	129	72	81	50	29	24	20	25	89
2003	132	179	137	113	88	80	52	35	34	32	178

Table 6: Catches by species (metric tons) and effort (as fishing days and positive sets number) according to the fishing mode (combined, log schools and free swimming schools)

Year	YFT	SKJ	BET	ALB	Others	Total	Fishing days	Positive sets number
Combined								
1981	199	163	10	0	0	372	87	33
1982	1 028	1 027	8	0	0	2 063	263	105
1983	10 505	9 366	218	0	0	20 089	1 475	766
1984	36 735	27 271	2 325	256	0	66 587	4 936	2 257
1985	39 143	29 837	4 340	497	0	73 817	5 858	2 333
1986	43 301	36 086	7 059	171	0	86 617	5 442	2 425
1987	46 801	35 577	6 950	235	0	89 563	4 929	2 795
1988	59 913	36 054	6 167	201	0	102 335	5 293	2 822
1989	38 375	43 096	3 591	6	0	85 068	5 106	2 243
1990	45 323	29 040	4 592	35	0	78 990	4 659	2 527
1991	38 135	39 388	5 441	875	0	83 838	4 309	2 448
1992	45 282	45 048	3 822	1 403	0	95 555	4 599	2 980
1993	39 539	48 192	5 016	310	0	93 057	4 711	2 764
1994	35 819	58 430	5 367	292	0	99 908	4 649	3 099
1995	39 635	48 652	7 280	350	0	95 918	4 831	3 066
1996	35 577	40 056	6 908	391	0	82 933	4 574	2 883
1997	31 227	31 276	7 824	539	0	70 866	4 603	2 714
1998	22 382	30 340	6 389	460	0	59 571	4 330	2 454
1999	30 799	42 665	8 517	154	0	82 135	3 838	2 371
2000	37 694	39 935	6 673	350	172	84 824	3 896	2 526
2001	34 077	36 261	5 453	660	174	76 624	4 071	2 481
2002	36 399	54 357	7 325	264	116	98 461	4 062	2 673
2003	63 281	38 902	5 335	608	31	108 157	3 489	2 464

Table 6 (continuation) : Catches by species (metric tons) and effort (as fishing days and positive sets number) according to the fishing mode (combined, log schools and free swimming schools)

Year	YFT	SKJ	BET	ALB	Others	Total	Fishing days	Positive sets number
Log schools								
1981	62	123	10	0	0	195	87	20
1982	391	912	8	0	0	1 311	263	63
1983	3 444	7 715	212	0	0	11 371	1 475	467
1984	6 692	19 804	1 491	0	0	27 987	4 936	900
1985	15 021	26 524	3 803	20	0	45 368	5 858	1 208
1986	16 318	28 413	5 663	0	0	50 394	5 442	1 400
1987	22 385	22 891	5 156	4	0	50 436	4 929	1 675
1988	14 659	25 993	4 031	0	0	44 683	5 293	1 187
1989	15 363	26 976	2 765	0	0	45 104	5 106	1 386
1990	10 488	21 689	2 582	0	0	34 759	4 659	1 092
1991	8 886	36 896	3 858	0	0	49 640	4 309	1 538
1992	13 014	39 286	3 112	9	0	55 421	4 599	1 569
1993	12 111	40 582	2 769	5	0	55 467	4 711	1 612
1994	13 340	45 866	4 314	23	0	63 543	4 649	2 068
1995	19 001	39 380	5 933	17	0	64 331	4 831	2 052
1996	16 944	33 741	5 975	70	0	56 730	4 574	1 956
1997	18 173	26 882	7 390	67	0	52 511	4 603	2 035
1998	12 680	25 599	5 173	13	0	43 464	4 330	1 828
1999	17 389	31 759	6 691	103	0	55 942	3 838	1 553
2000	17 699	32 142	4 960	43	172	55 016	3 896	1 568
2001	9 966	29 588	4 070	223	174	44 021	4 071	1 404
2002	13 816	47 472	6 302	0	116	67 705	4 062	1 835
2003	16 379	34 463	3 172	0	31	54 045	3 489	1 404
Free swimming schools								
1981	137	40	0	0	0	177	87	13
1982	637	115	0	0	0	752	263	42
1983	7 061	1 651	6	0	0	8 718	1 475	299
1984	30 043	7 467	834	256	0	38 600	4 936	1 357
1985	24 122	3 313	537	477	0	28 449	5 858	1 125
1986	26 983	7 673	1 396	171	0	36 223	5 442	1 025
1987	24 416	12 686	1 794	231	0	39 127	4 929	1 120
1988	45 254	10 061	2 136	201	0	57 652	5 293	1 635
1989	23 012	16 120	826	6	0	39 964	5 106	857
1990	34 835	7 351	2 010	35	0	44 231	4 659	1 435
1991	29 248	2 492	1 583	875	0	34 198	4 309	910
1992	32 268	5 762	710	1 394	0	40 134	4 599	1 411
1993	27 428	7 611	2 246	305	0	37 590	4 711	1 152
1994	22 479	12 564	1 053	269	0	36 365	4 649	1 031
1995	20 634	9 272	1 348	333	0	31 587	4 831	1 014
1996	18 633	6 315	933	321	0	26 203	4 574	927
1997	13 054	4 394	434	472	0	18 355	4 603	679
1998	9 702	4 742	1 215	448	0	16 107	4 330	626
1999	13 410	10 906	1 826	51	0	26 193	3 838	818
2000	19 995	7 793	1 713	307	0	29 808	3 896	958
2001	24 111	6 673	1 383	437	0	32 604	4 071	1 077
2002	22 583	6 886	1 024	264	0	30 756	4 062	838
2003	46 902	4 439	2 163	608	0	54 112	3 489	1 060

Table 7: Catches by species (metric tons) and efforts (fishing days and positive sets number) according to the FAO area (51 and 57)

Year	YFT	SKJ	BET	ALB	Others	Total	Fishing days	Positive sets number
West (FAO 51)								
1981	199	163	10	0	0	372	87	33
1982	1 028	1 027	8	0	0	2 063	263	105
1983	10 505	9 366	218	0	0	20 089	1 475	766
1984	36 735	27 271	2 325	256	0	66 587	4 938	2 257
1985	39 143	29 837	4 340	497	0	73 817	5 858	2 333
1986	43 301	36 086	7 059	171	0	86 617	5 442	2 425
1987	46 801	35 577	6 950	235	0	89 563	4 929	2 795
1988	59 913	36 054	6 167	201	0	102 335	5 293	2 822
1989	38 375	43 096	3 591	6	0	85 068	5 106	2 243
1990	45 323	29 040	4 592	35	0	78 990	4 659	2 527
1991	38 135	39 388	5 441	875	0	83 838	4 309	2 448
1992	45 282	45 048	3 822	1 403	0	95 555	4 599	2 980
1993	39 539	48 192	5 016	310	0	93 057	4 711	2 764
1994	35 819	58 430	5 367	292	0	99 908	4 649	3 099
1995	39 635	48 652	7 280	350	0	95 918	4 831	3 066
1996	35 573	40 038	6 904	391	0	82 905	4 564	2 882
1997	30 329	30 466	7 658	539	0	68 993	4 545	2 675
1998	19 024	25 525	3 886	460	0	48 895	3 554	2 044
1999	30 318	42 057	8 361	154	0	80 890	3 761	2 341
2000	37 675	39 862	6 657	350	172	84 717	3 887	2 516
2001	34 077	36 261	5 453	660	174	76 624	4 071	2 481
2002	36 399	54 357	7 325	264	116	98 461	4 060	2 673
2003	63 281	38 902	5 335	608	31	108 157	3 489	2 464
East (FAO 57)								
1981	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0
1984	1	2	0	0	0	3	34	1
1985	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0
1996	5	19	4	0	0	28	10	1
1997	898	810	166	0	0	1 873	58	39
1998	3 358	4 815	2 503	0	0	10 676	776	410
1999	481	608	156	0	0	1 245	78	30
2000	19	73	16	0	0	107	9	10
2001	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	2	0
2003	0	0	0	0	0	0	0	0

Table 8: Catch per unit of effort (as tons per fishing days and by positive set) according to the fishing mode (combined, log schools and free swimming schools)

Year	CPUE (tons per fishing day)						CPUE (tons per positive set)					
	YFT	SKJ	BET	ALB	Others	Total	YFT	SKJ	BET	ALB	Others	Total
Combined												
1981	2.29	1.87	0.11	0.00	0.00	4.28	6.03	4.94	0.30	0.00	0.00	11.27
1982	3.91	3.90	0.03	0.00	0.00	7.84	9.79	9.78	0.08	0.00	0.00	19.65
1983	7.12	6.35	0.15	0.00	0.00	13.62	13.71	12.23	0.28	0.00	0.00	26.23
1984	7.44	5.52	0.47	0.05	0.00	13.49	16.28	12.08	1.03	0.11	0.00	29.50
1985	6.68	5.09	0.74	0.08	0.00	12.60	16.78	12.79	1.86	0.21	0.00	31.64
1986	7.96	6.63	1.30	0.03	0.00	15.92	17.86	14.88	2.91	0.07	0.00	35.72
1987	9.50	7.22	1.41	0.05	0.00	18.17	16.74	12.73	2.49	0.08	0.00	32.04
1988	11.32	6.81	1.17	0.04	0.00	19.33	21.23	12.78	2.19	0.07	0.00	36.26
1989	7.52	8.44	0.70	0.00	0.00	16.66	17.11	19.21	1.60	0.00	0.00	37.93
1990	9.73	6.23	0.99	0.01	0.00	16.95	17.94	11.49	1.82	0.01	0.00	31.26
1991	8.85	9.14	1.26	0.20	0.00	19.46	15.58	16.09	2.22	0.36	0.00	34.25
1992	9.85	9.80	0.83	0.31	0.00	20.78	15.20	15.12	1.28	0.47	0.00	32.07
1993	8.39	10.23	1.06	0.07	0.00	19.75	14.30	17.44	1.81	0.11	0.00	33.67
1994	7.70	12.57	1.15	0.06	0.00	21.49	11.56	18.85	1.73	0.09	0.00	32.24
1995	8.20	10.07	1.51	0.07	0.00	19.85	12.93	15.87	2.37	0.11	0.00	31.28
1996	7.78	8.76	1.51	0.09	0.00	18.13	12.34	13.89	2.40	0.14	0.00	28.77
1997	6.78	6.79	1.70	0.12	0.00	15.40	11.51	11.52	2.88	0.20	0.00	26.11
1998	5.17	7.01	1.48	0.11	0.00	13.76	9.12	12.36	2.60	0.19	0.00	24.28
1999	8.02	11.12	2.22	0.04	0.00	21.40	12.99	17.99	3.59	0.06	0.00	34.64
2000	9.68	10.25	1.71	0.09	0.04	21.77	14.92	15.81	2.64	0.14	0.07	33.58
2001	8.37	8.91	1.34	0.16	0.04	18.82	13.74	14.62	2.20	0.27	0.07	30.88
2002	8.96	13.38	1.80	0.06	0.03	24.24	13.62	20.34	2.74	0.10	0.04	36.84
2003	18.14	11.15	1.53	0.17	0.01	31.00	25.68	15.79	2.17	0.25	0.01	43.89
Log schools												
1981	0.71	1.41	0.11	0.00	0.00	2.24	3.10	6.15	0.50	0.00	0.00	9.75
1982	1.49	3.47	0.03	0.00	0.00	4.98	6.21	14.48	0.13	0.00	0.00	20.81
1983	2.33	5.23	0.14	0.00	0.00	7.71	7.37	16.52	0.45	0.00	0.00	24.35
1984	1.36	4.01	0.30	0.00	0.00	5.67	7.44	22.00	1.66	0.00	0.00	31.10
1985	2.56	4.53	0.65	0.00	0.00	7.74	12.43	21.96	3.15	0.02	0.00	37.56
1986	3.00	5.22	1.04	0.00	0.00	9.26	11.66	20.30	4.05	0.00	0.00	36.00
1987	4.54	4.64	1.05	0.00	0.00	10.23	13.36	13.67	3.08	0.00	0.00	30.11
1988	2.77	4.91	0.76	0.00	0.00	8.44	12.35	21.90	3.40	0.00	0.00	37.64
1989	3.01	5.28	0.54	0.00	0.00	8.83	11.08	19.46	1.99	0.00	0.00	32.54
1990	2.25	4.66	0.55	0.00	0.00	7.46	9.60	19.86	2.36	0.00	0.00	31.83
1991	2.06	8.56	0.90	0.00	0.00	11.52	5.78	23.99	2.51	0.00	0.00	32.28
1992	2.83	8.54	0.68	0.00	0.00	12.05	8.29	25.04	1.98	0.01	0.00	35.32
1993	2.57	8.61	0.59	0.00	0.00	11.77	7.51	25.17	1.72	0.00	0.00	34.41
1994	2.87	9.87	0.93	0.00	0.00	13.67	6.45	22.18	2.09	0.01	0.00	30.73
1995	3.93	8.15	1.23	0.00	0.00	13.32	9.26	19.19	2.89	0.01	0.00	31.35
1996	3.70	7.38	1.31	0.02	0.00	12.40	8.66	17.25	3.05	0.04	0.00	29.00
1997	3.95	5.84	1.61	0.01	0.00	11.41	8.93	13.21	3.63	0.03	0.00	25.80
1998	2.93	5.91	1.19	0.00	0.00	10.04	6.94	14.00	2.83	0.01	0.00	23.78
1999	4.53	8.27	1.74	0.03	0.00	14.58	11.20	20.45	4.31	0.07	0.00	36.02
2000	4.54	8.25	1.27	0.01	0.04	14.12	11.29	20.50	3.16	0.03	0.11	35.09
2001	2.45	7.27	1.00	0.05	0.04	10.81	7.10	21.07	2.90	0.16	0.12	31.35
2002	3.40	11.69	1.55	0.00	0.03	16.67	7.53	25.87	3.43	0.00	0.06	36.90
2003	4.69	9.88	0.91	0.00	0.01	15.49	11.67	24.55	2.26	0.00	0.02	38.49

Table 8 (continuation): Catch per unit of effort (as tons per fishing days and by positive set) according to the fishing mode (combined, log schools and free swimming schools)

Year	CPUE (tons per fishing day)						CPUE (tons per positive set)					
	YFT	SKJ	BET	ALB	Others	Total	YFT	SKJ	BET	ALB	Others	Total
Free swimming school												
1981	1.57	0.46	0.00	0.00	0.00	2.03	10.54	3.08	0.00	0.00	0.00	13.62
1982	2.42	0.44	0.00	0.00	0.00	2.86	15.17	2.74	0.00	0.00	0.00	17.90
1983	4.79	1.12	0.00	0.00	0.00	5.91	23.62	5.52	0.02	0.00	0.00	29.16
1984	6.09	1.51	0.17	0.05	0.00	7.82	22.14	5.50	0.61	0.19	0.00	28.45
1985	4.12	0.57	0.09	0.08	0.00	4.86	21.44	2.94	0.48	0.42	0.00	25.29
1986	4.96	1.41	0.26	0.03	0.00	6.66	26.32	7.49	1.36	0.17	0.00	35.34
1987	4.95	2.57	0.36	0.05	0.00	7.94	21.80	11.33	1.60	0.21	0.00	34.93
1988	8.55	1.90	0.40	0.04	0.00	10.89	27.68	6.15	1.31	0.12	0.00	35.26
1989	4.51	3.16	0.16	0.00	0.00	7.83	26.85	18.81	0.96	0.01	0.00	46.63
1990	7.48	1.58	0.43	0.01	0.00	9.49	24.28	5.12	1.40	0.02	0.00	30.82
1991	6.79	0.58	0.37	0.20	0.00	7.94	32.14	2.74	1.74	0.96	0.00	37.58
1992	7.02	1.25	0.15	0.30	0.00	8.73	22.87	4.08	0.50	0.99	0.00	28.44
1993	5.82	1.62	0.48	0.06	0.00	7.98	23.81	6.61	1.95	0.26	0.00	32.63
1994	4.84	2.70	0.23	0.06	0.00	7.82	21.80	12.19	1.02	0.26	0.00	35.27
1995	4.27	1.92	0.28	0.07	0.00	6.54	20.35	9.14	1.33	0.33	0.00	31.15
1996	4.07	1.38	0.20	0.07	0.00	5.73	20.10	6.81	1.01	0.35	0.00	28.27
1997	2.84	0.95	0.09	0.10	0.00	3.99	19.23	6.47	0.64	0.70	0.00	27.03
1998	2.24	1.10	0.28	0.10	0.00	3.72	15.50	7.58	1.94	0.72	0.00	25.73
1999	3.49	2.84	0.48	0.01	0.00	6.82	16.39	13.33	2.23	0.06	0.00	32.02
2000	5.13	2.00	0.44	0.08	0.00	7.65	20.87	8.13	1.79	0.32	0.00	31.11
2001	5.92	1.64	0.34	0.11	0.00	8.01	22.39	6.20	1.28	0.41	0.00	30.27
2002	5.56	1.70	0.25	0.06	0.00	7.57	26.95	8.22	1.22	0.32	0.00	36.70
2003	13.44	1.27	0.62	0.17	0.00	15.51	44.25	4.19	2.04	0.57	0.00	51.05

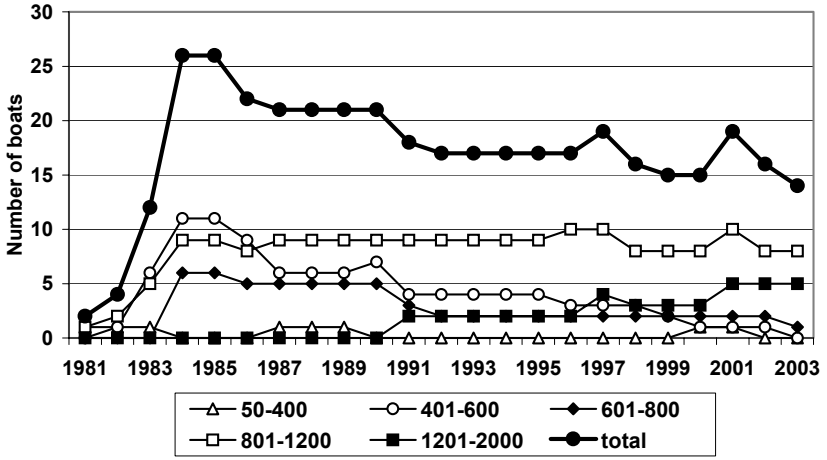
Table 9: Number of samples and number of measured fishes by species for all "European purse seiner fleets" in the Indian Ocean

Year	Sample number	Number of measured fishes				
		Yellowfin	Skipjack	Bigeye	Albacore	Total
1981						
1982	58	1 561	1 639			3 200
1983	70	1 515	2 132			3 647
1984	215	11 224	9 228	434		20 886
1985	458	23 608	28 257	4 283		56 148
1986	436	15 372	25 690	3 556		44 618
1987	508	23 460	36 685	4 304		64 449
1988	805	46 658	40 220	10 309	48	97 235
1989	541	37 377	45 409	5 442		88 228
1990	585	49 424	35 297	10 351	136	95 208
1991	598	64 456	48 508	20 599	1 656	135 219
1992	514	72 538	69 496	18 461	2 467	162 962
1993	380	58 013	46 789	14 882	858	120 542
1994	325	53 958	61 161	13 305	2 433	130 857
1995	429	106 815	115 979	36 528	2 112	261 434
1996	295	85 028	53 721	32 301	2 355	173 405
1997	202	55 369	26 332	28 684	685	111 070
1998	170	12 426	27 429	4 363	59	44 277
1999	205	17 173	49 757	5 893	184	73 007
2000	294	21 201	35 625	4 743	388	61 957
2001	850	80 389	32 790	21 509	2 031	136 719
2002	1 028	93 219	43 147	24 079	449	160 894
2003	1 909	133 716	40 890	18 519	3 010	196 135

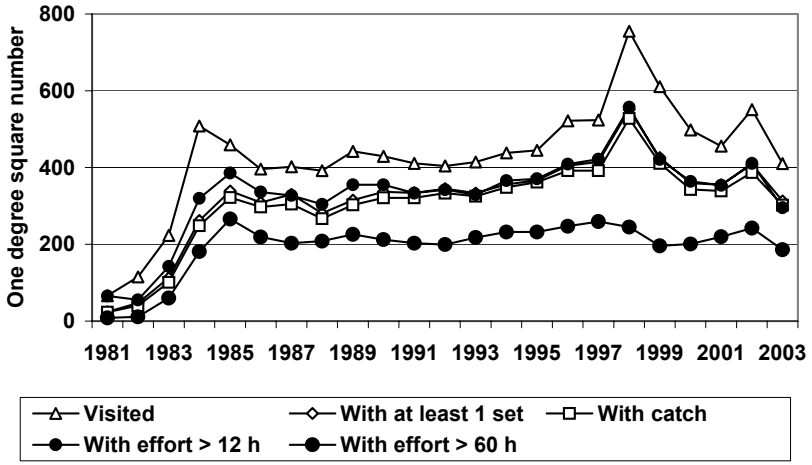
Table 10: Mean weight by species according to the fishing mode (combined, log schools and free swimming schools) of the French purse seiners in the Indian Ocean

Species	YFT			SKJ			BET			ALB		
Year	Log	Free	Total	Log	Free	Total	Log	Free	Total	Log	Free	Total
1981												
1982	4.7	27.4	9.7									
1983	10.2	18.4	14.6	3.0	2.9	3.0						
1984	5.5	22.8	14.3	2.8	3.1	2.8	4.6	12.2	6.2			
1985	4.5	25.0	9.7	3.0	3.2	3.0	5.1	12.5	5.9			
1986	11.4	22.5	16.7	3.3	3.4	3.3	6.7	11.0	7.4			
1987	10.2	25.8	15.4	3.3	4.3	3.4	6.8	11.7	7.9			
1988	5.1	27.0	12.6	2.9	2.9	2.9	5.3	11.0	6.8			
1989	8.0	15.0	11.1	3.2	3.2	3.2	5.3	9.4	6.1			
1990	6.1	31.8	15.1	2.8	3.0	2.8	4.3	25.2	7.0			
1991	7.8	37.5	19.9	2.8	2.7	2.8	5.2	27.5	6.8		31.4	31.4
1992	9.8	34.6	20.1	3.0	3.1	3.0	5.3	16.1	6.0	30.3	29.9	29.9
1993	10.6	39.1	21.5	2.8	3.0	2.8	4.4	26.5	7.0	30.6	30.6	30.6
1994	7.7	40.4	15.6	2.5	3.2	2.6	4.5	33.3	5.5	30.5	30.4	30.4
1995	9.2	27.9	14.1	2.4	3.0	2.5	5.3	27.1	6.2	29.1	28.7	28.7
1996	5.3	29.7	9.3	2.3	3.3	2.4	5.0	13.4	5.4	28.3	30.0	29.7
1997	4.9	33.5	7.7	2.3	3.3	2.4	3.9	13.3	4.1	27.5	27.4	27.4
1998	7.2	14.8	9.3	2.6	2.9	2.6	5.2	10.1	5.7	27.4	29.5	29.4
1999	4.2	16.4	6.2	2.5	2.5	2.5	4.6	8.1	5.1	28.3	25.6	27.4
2000	6.0	28.4	10.3	2.9	3.4	3.0	4.5	18.7	5.6	27.8	26.1	26.3
2001	4.9	30.6	12.0	2.5	4.3	2.7	3.8	23.3	4.8	26.4	25.4	25.7
2002	3.8	33.2	8.2	2.3	3.1	2.4	3.9	21.9	4.4		27.6	27.6
2003	6.9	35.9	17.2	2.8	4.3	3.0	4.4	40.2	6.9		27.3	27.3

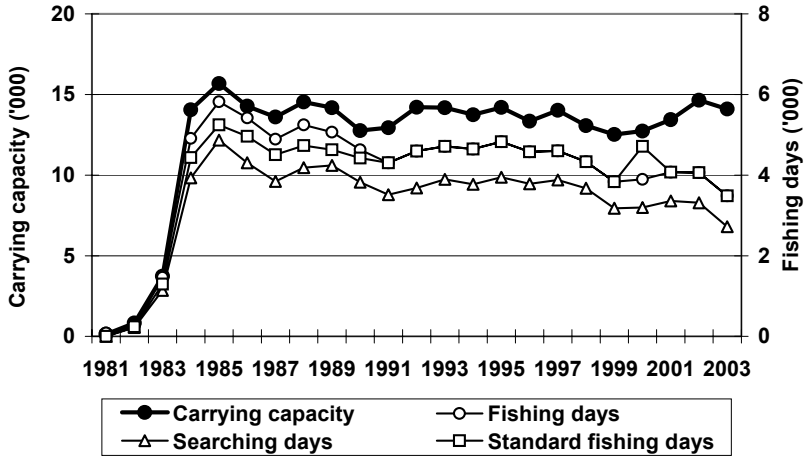
1 a – Purse seiners number according to their GRT category



1 b – Number of one degree squares visited



1 c – Carrying capacity, fishing and searching days



1 d – Number of sets (log and free) and percentage null ones

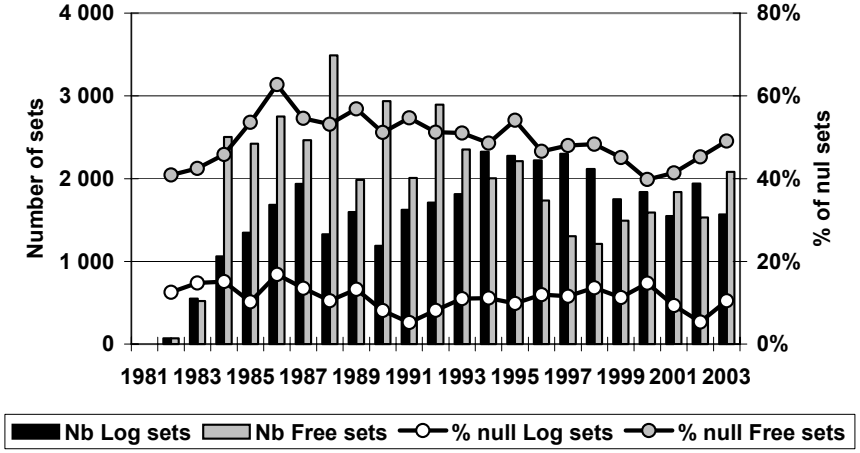


Figure 1: Fishing effort of the French fleet : Purse seiners number by GRT category (1 a); Number of one degree squares visited for different levels of effort (1 b); Carrying capacity, fishing and searching days (1 c); Number of sets and percentage of null sets for both log and free schools (1 d)

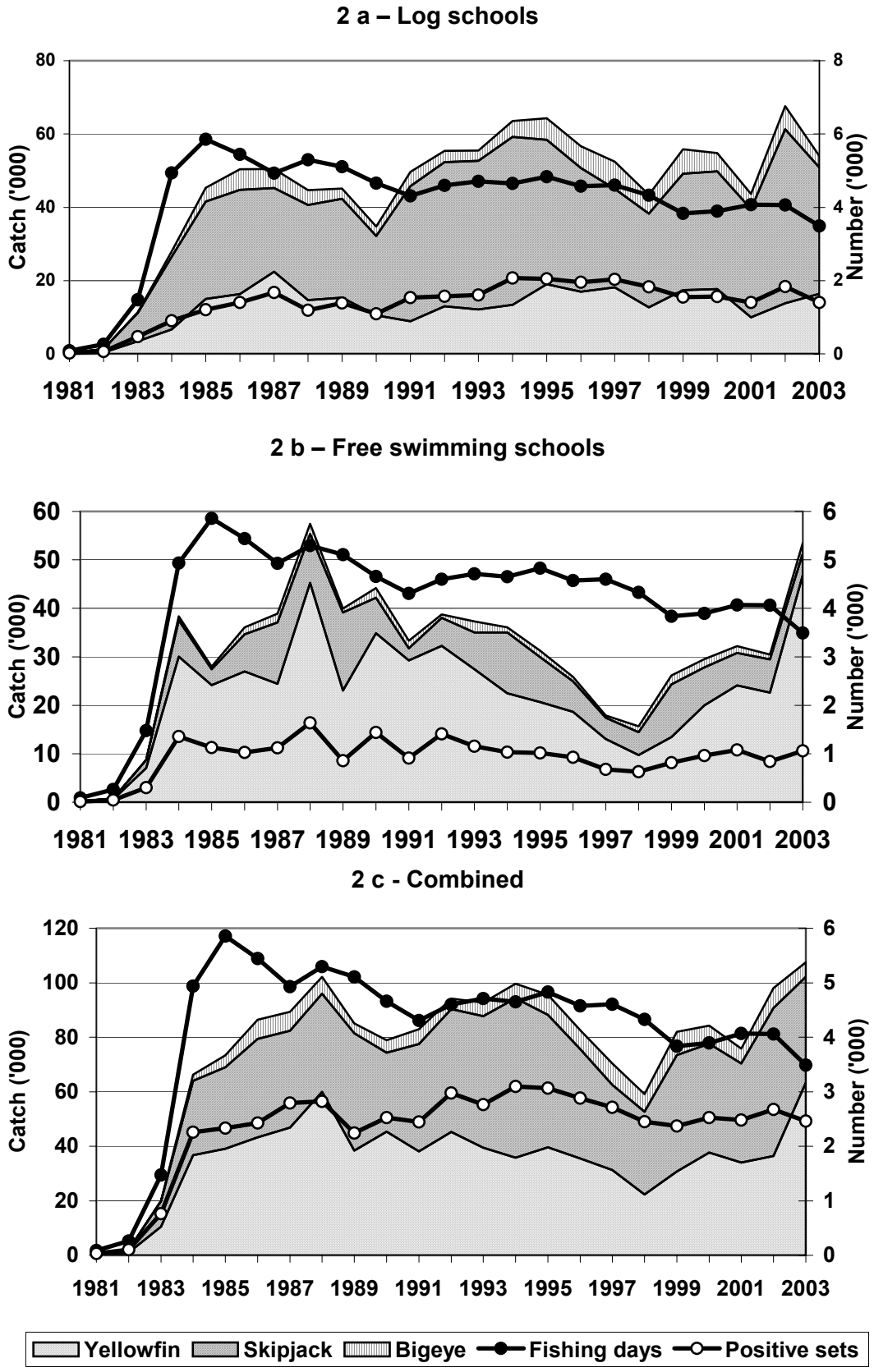


Figure 2 : Catches by species and fishing effort according to the fishing mode

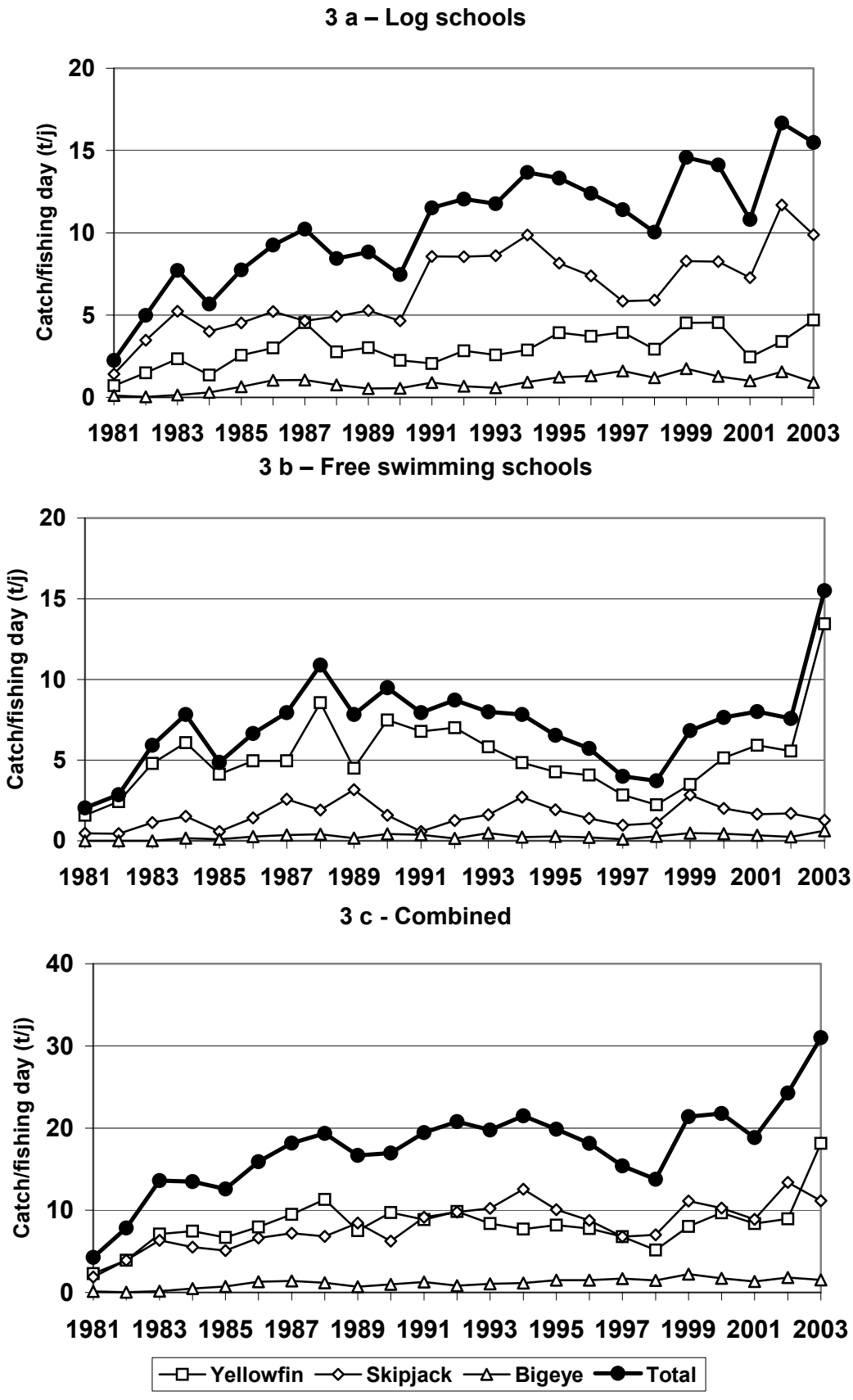


Figure 3 : Catches per unit of effort (tons by fishing day) according to the fishing mode

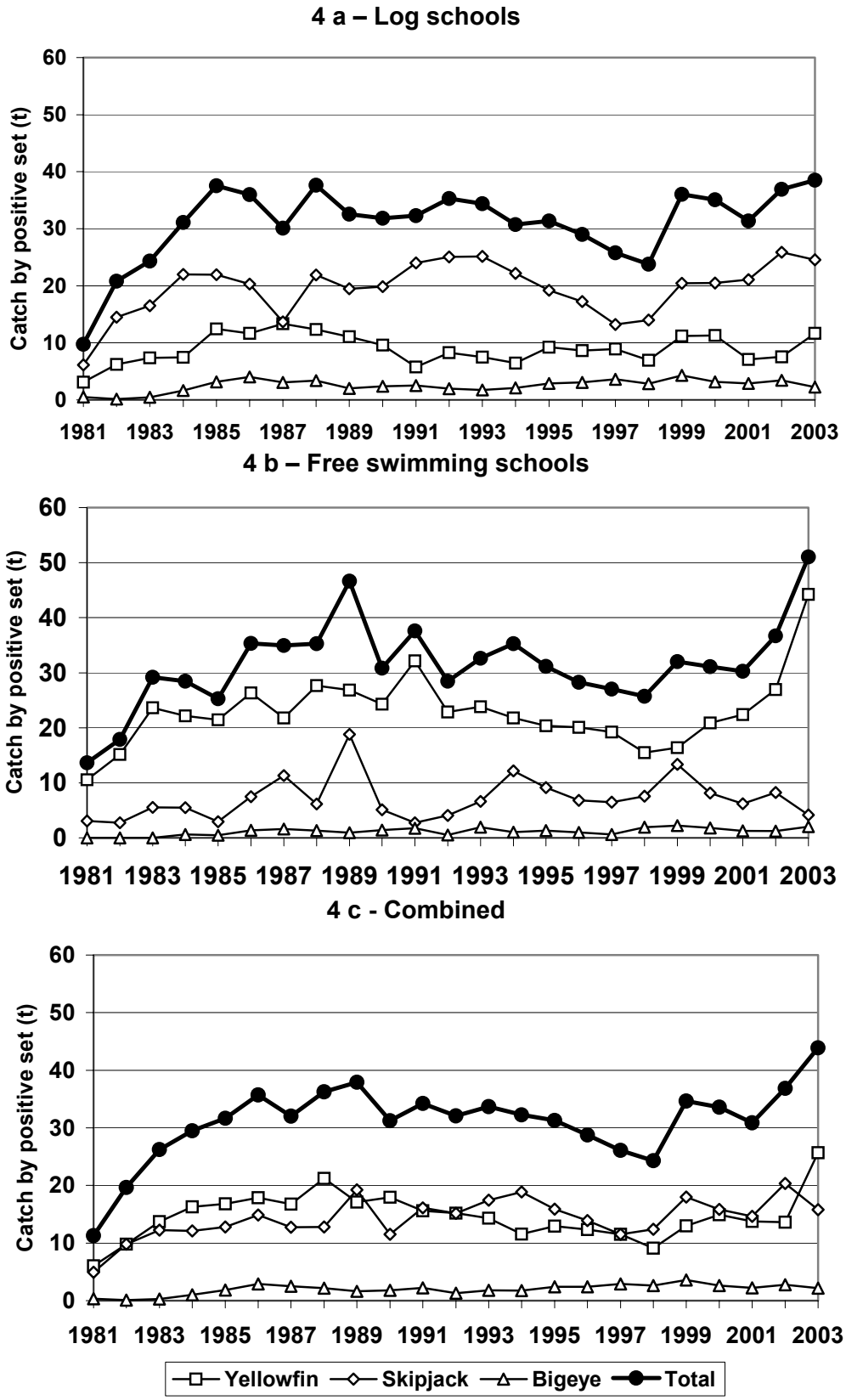


Figure 4 : Catches per unit of effort (tons by positive set) according to the fishing mode

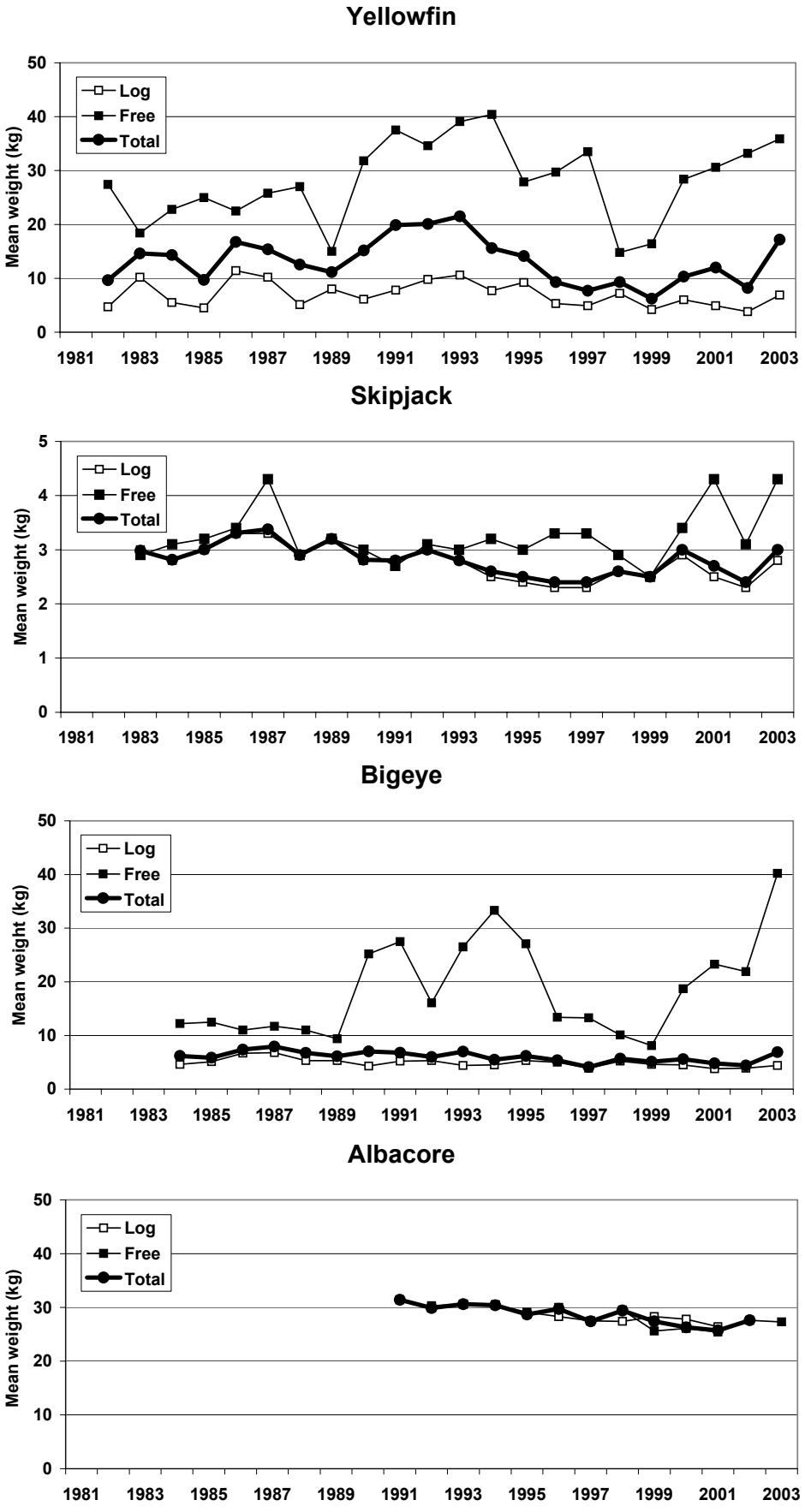


Figure 5 : Mean weights of catches by species and fishing mode

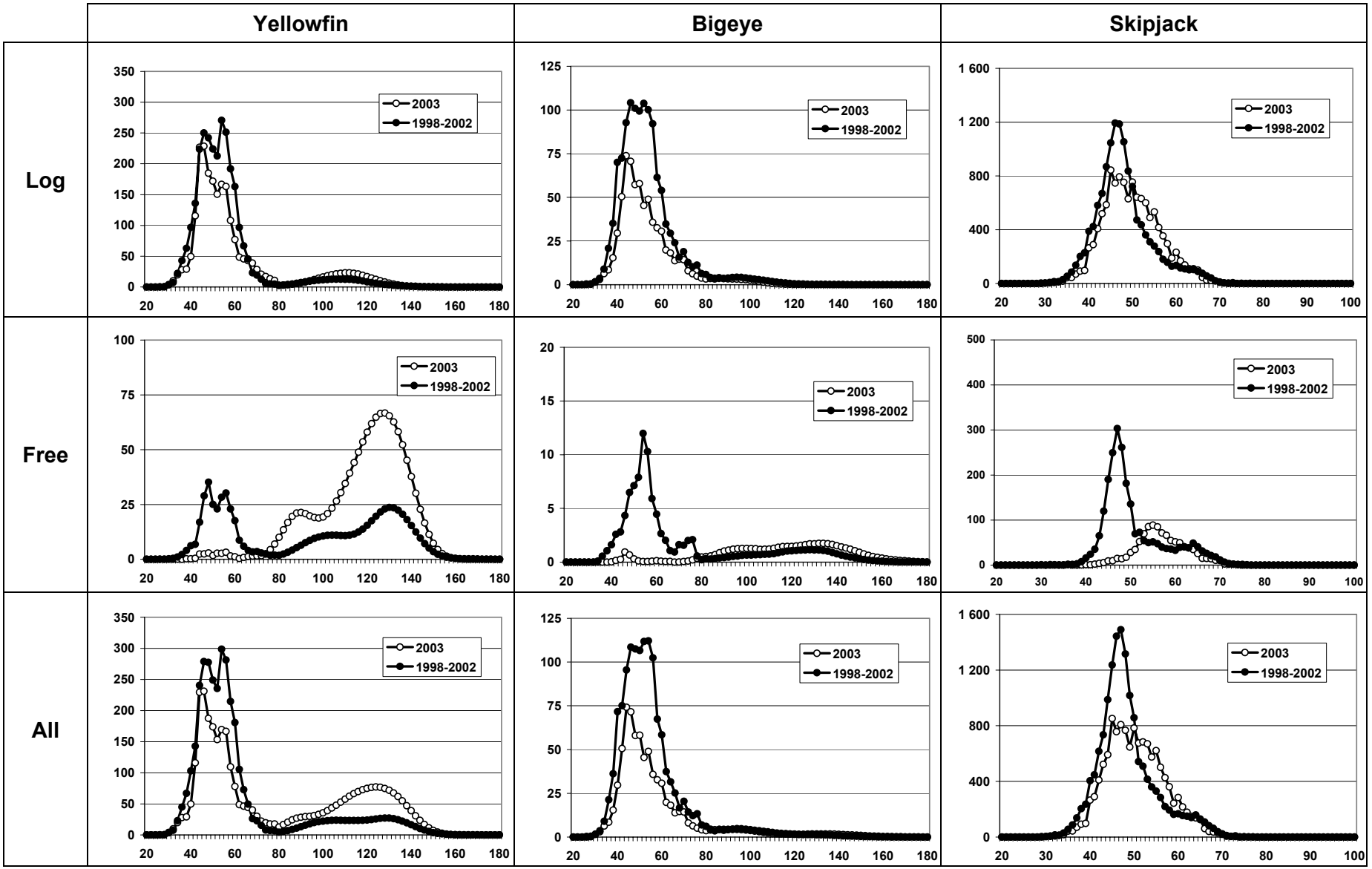


Figure 6a: Size distribution (in numbers) of the French purse seine fleets catches by species in 2003 and for the average 1998-2002 period

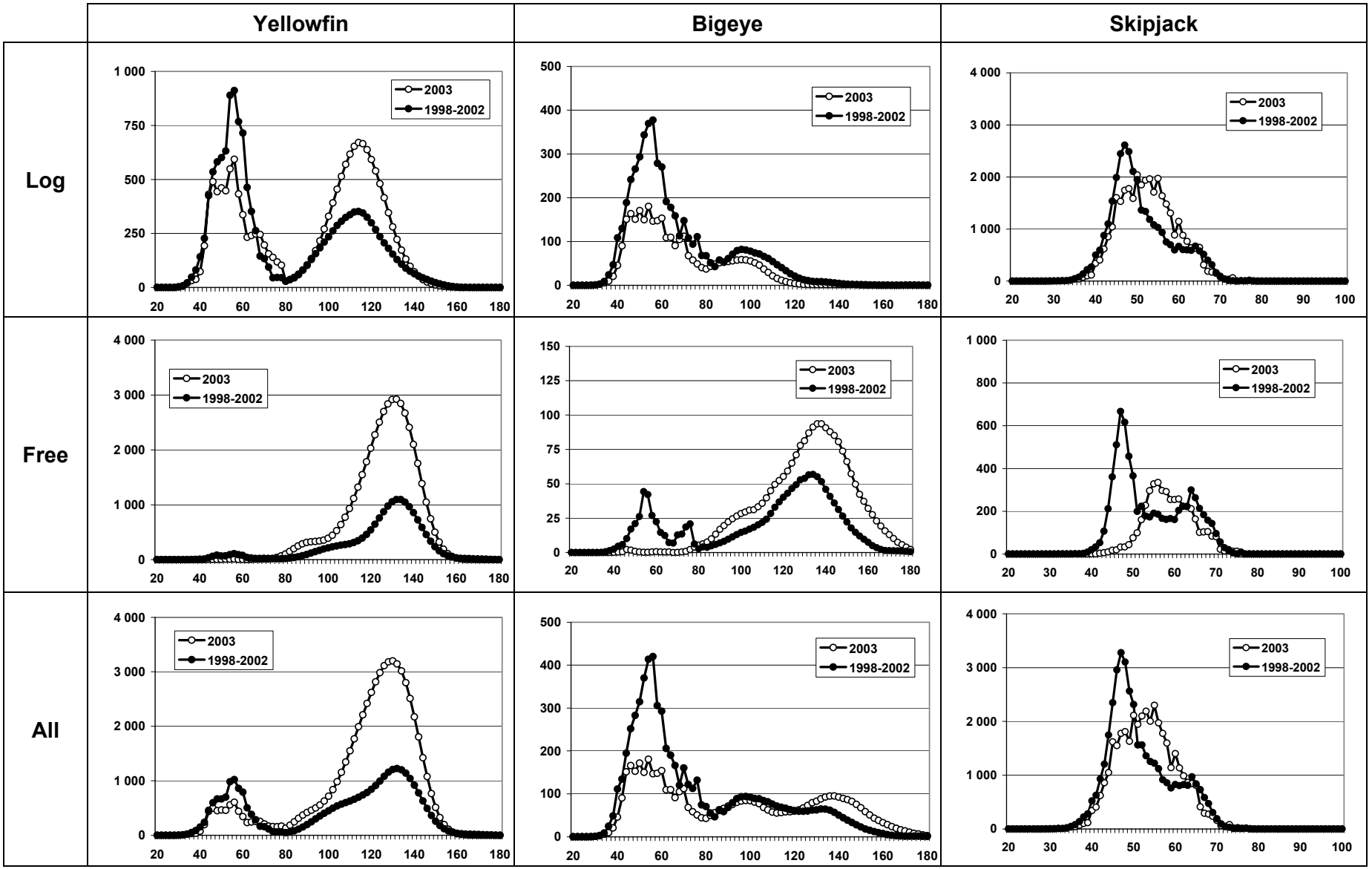
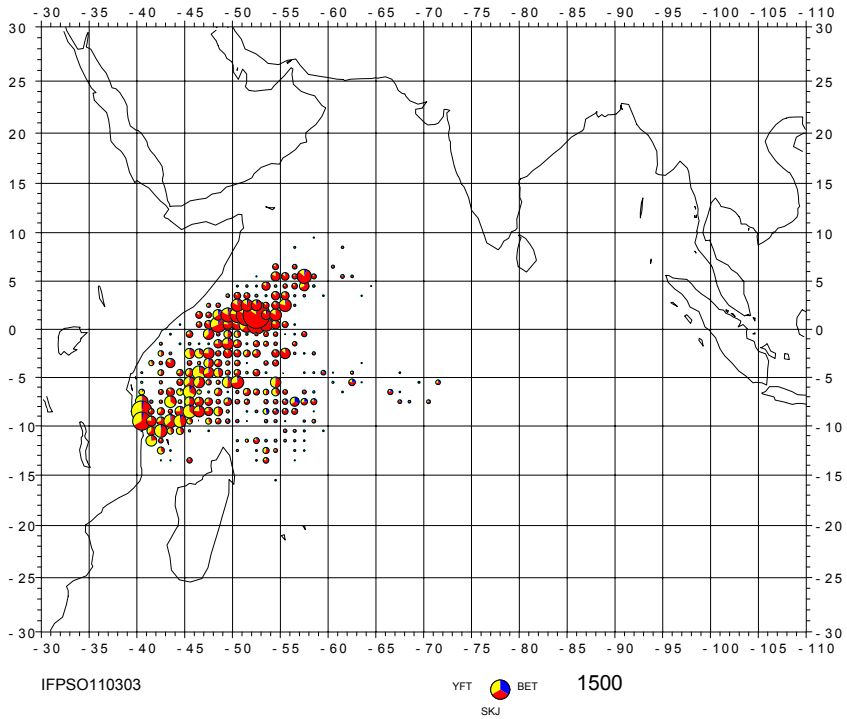


Figure 6b: Size distribution (in weight) of the French purse seine fleets catches by species in 2003 and for the average 1998-2002 period

Log schools, 2003



Log schools, 1998-2002

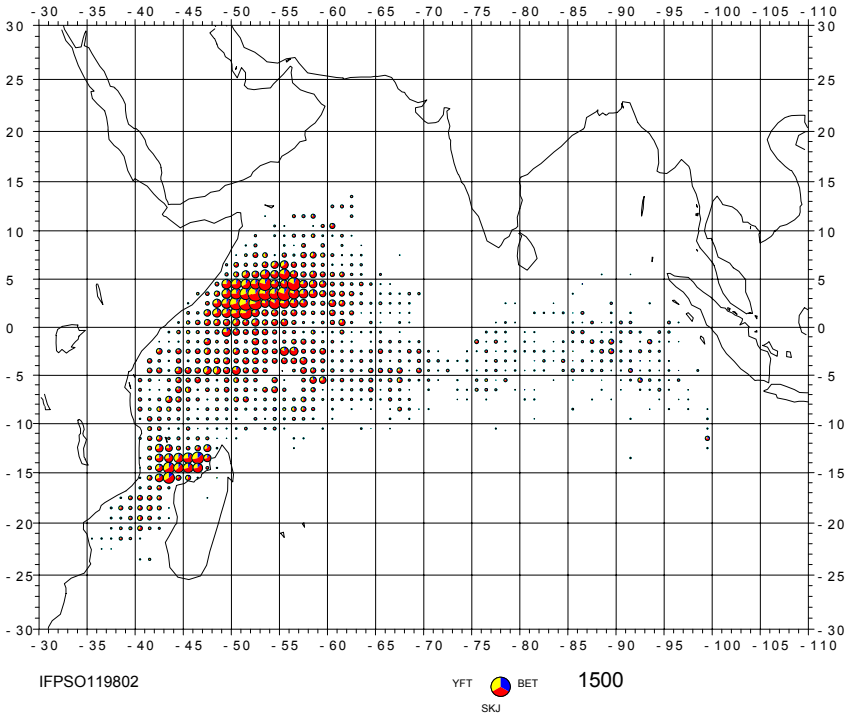
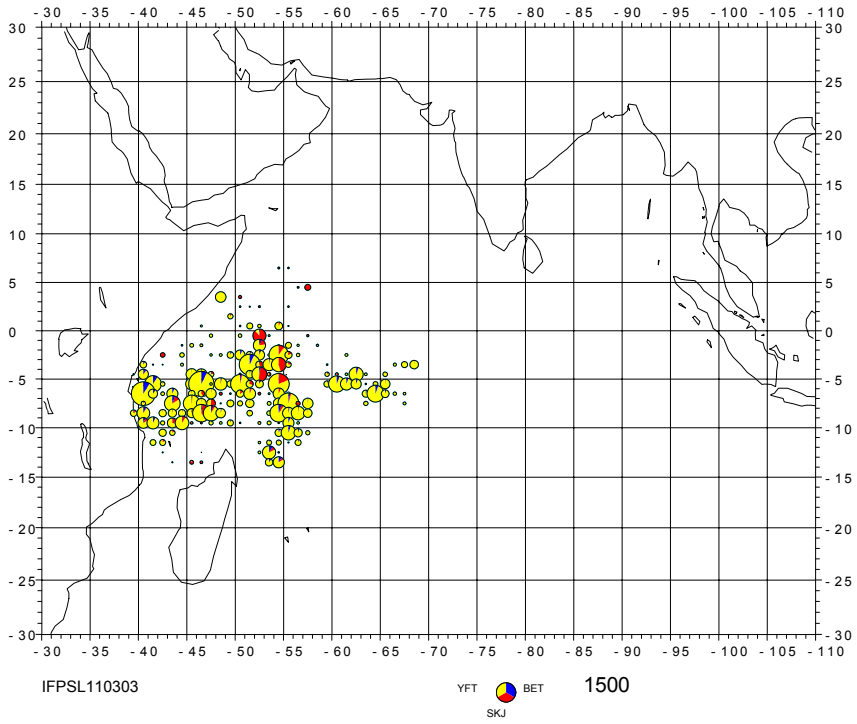


Figure 6a: Spatial distribution of the French fleet catches on log schools in 2003 and for the average situation over the period 1998-2002

Free swimming schools, 2003



Free swimming schools, 1998-2002

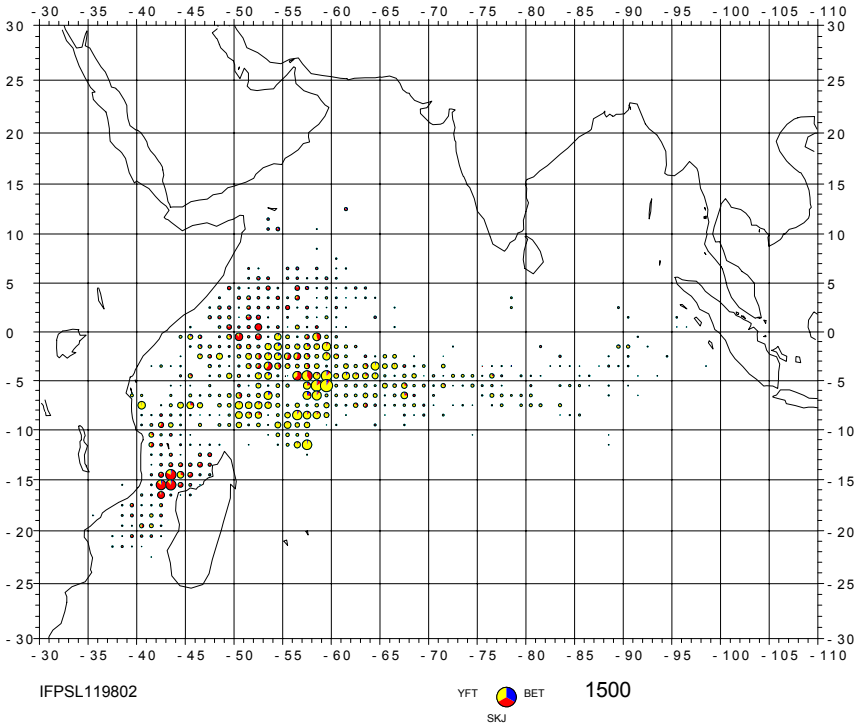
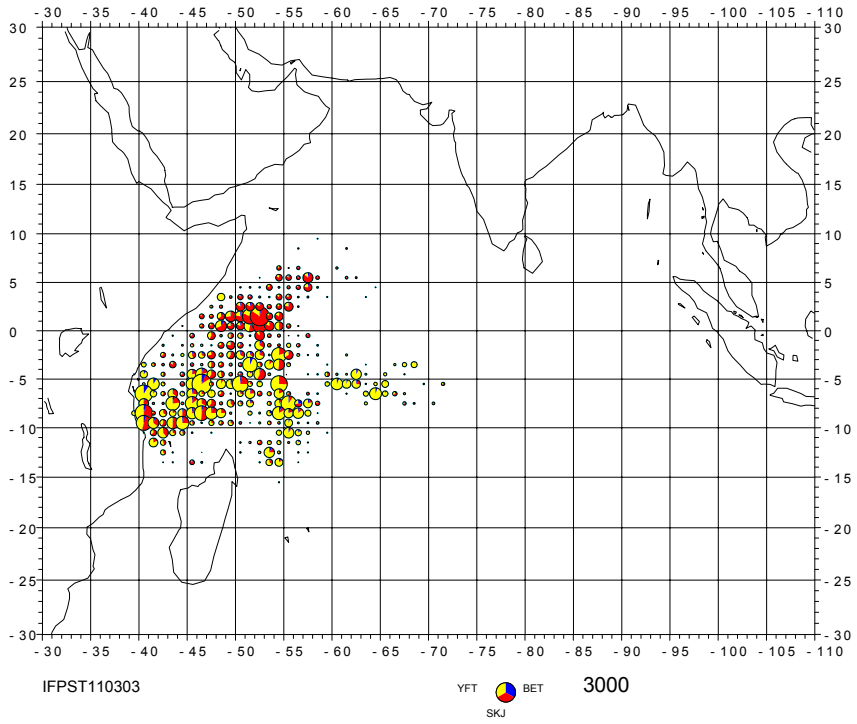


Figure 6b: Spatial distribution of the French fleet catches on free swimming schools in 2003 and for the average situation over the period 1998-2002

Total catches, 2003



Total catches, 1998-2002

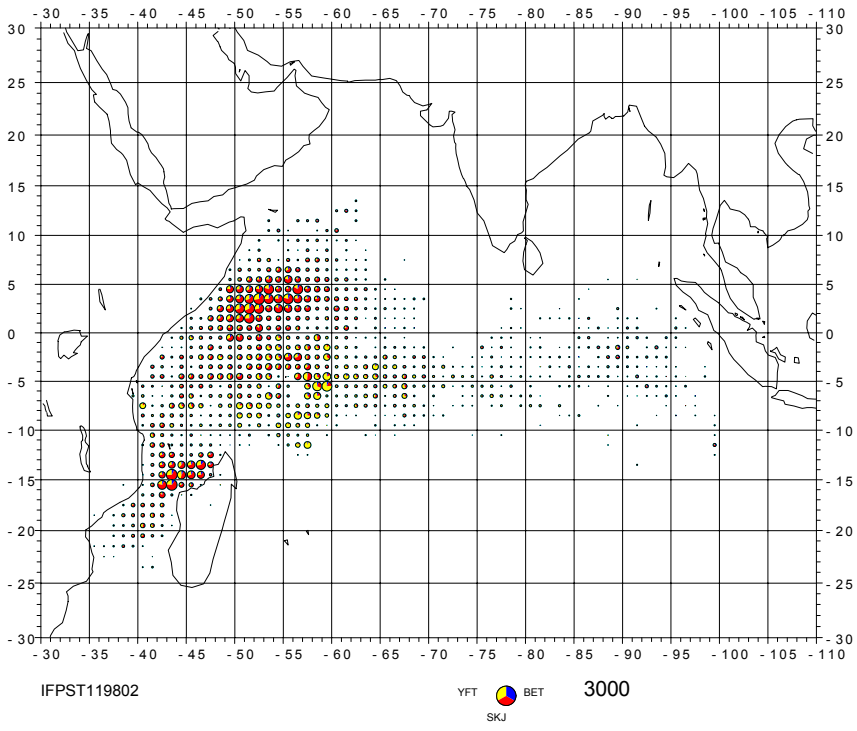
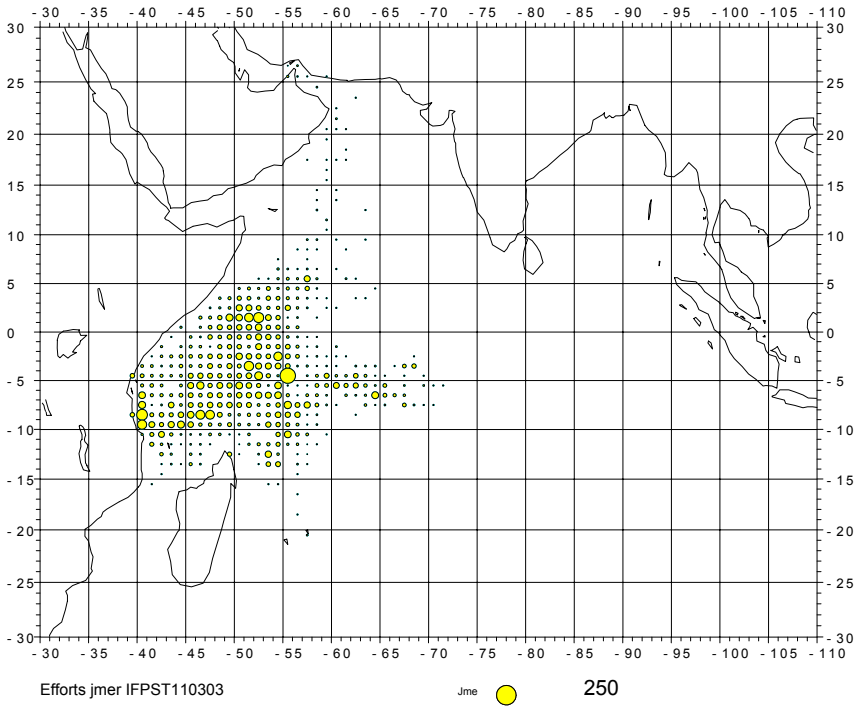


Figure 7a: Spatial distribution of the French fleet total catches in 2003 and for the average situation over the period 1998-2002

Effort, 2003



Effort, 1998-2002

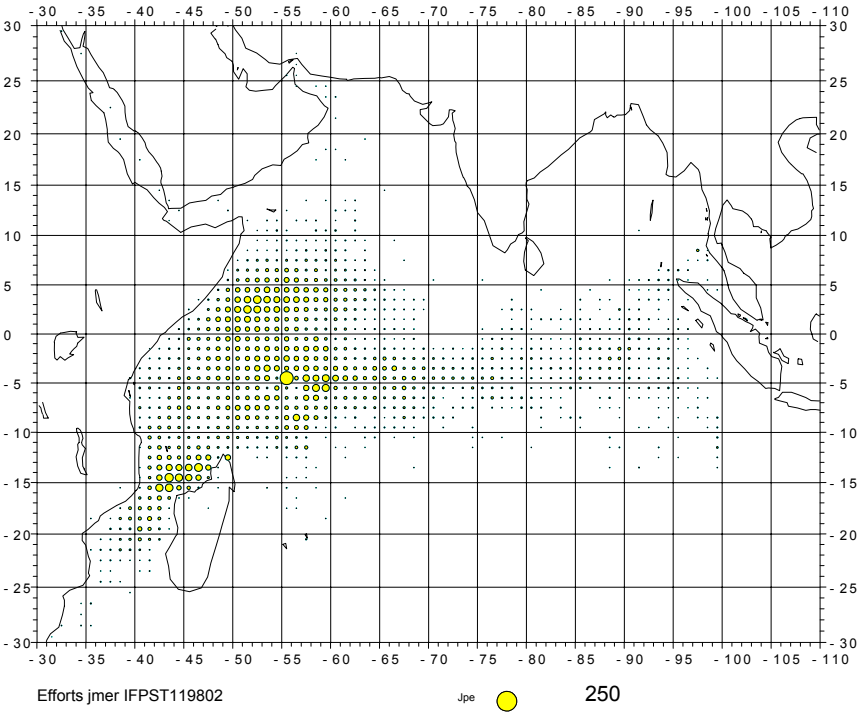


Figure 7b: Spatial distribution of the French fleet total effort (fishing days) in 2003 and for the average situation over the period 1998-2002