

Statistics of the European Union and associated flags purse seine fishing fleet targeting tropical tunas in the Indian Ocean 1981-2012

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SUMMARY

In 2012, the European Union and associated flags purse seine fishing fleet of the Indian Ocean was composed of 37 vessels of individual carrying capacity >800 t, which all represented a total carrying capacity of more than 45,000 t. The total cumulated nominal effort was about 9,500 and 7,800 fishing and searching days, respectively. The total number of fishing sets was about 9,000, with about 5,600 realised on FAD-associated schools (i.e. >60%). Overall, the capacity and nominal effort of the fleet have remained stable during the recent years while the total catches have significantly dropped from more than 260,000 t during 2009-2011 to less than 230,000 t in 2012. The decline in catch is mainly explained by a combination of a major decrease in the number of sets per day and catch rates of skipjack on FAD-associated schools, the catch of skipjack per positive set being the lowest observed since 1984, i.e. 15 t set⁻¹. Catch rates of skipjack on free-swimming schools also strongly decreased, which resulted in an overall decrease of skipjack catch by more than 40% between 2009-2011 and 2012. Meanwhile, catch rates of yellowfin on both FAD-associated and free-swimming schools increased in the recent years, resulting in a total catch of yellowfin that increased in 2012 to 130,000 t. The strong reduction in the number of FAD sets resulted in a total catch of bigeye that reached 16,500 t in 2012.

KEYWORDS: fish aggregating device, *Katsuwonus pelamis*, *Thunnus albacares*, *Thunnus obesus*

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1. Introduction

European Union and associated flags (EUAF) purse seiners operating in the Indian Ocean target yellowfin (*Thunnus albacares*), skipjack (*Katsuwonus pelamis*), and bigeye tuna (*Thunnus obesus*) through two major fishing modes that result in different species and size composition of the catch: fish aggregating device-associated (FAD) and free-swimming schools (FSC). Statistical data for the EUAF purse seine fishing fleet have been collected by the “Institut de Recherche pour le Développement” (IRD), the “Instituto Español de Oceanografía” (IEO), and the Seychelles Fishing Authority (SFA) since the arrival of the first purse seiners in the Indian Ocean in the early 1980s. The fleet activities are described through a suite of fisheries indicators that provide information on fishing capacity and effort, catch, catch rates, size structure, and mean weight in the catch for the principal market tropical tunas, with a particular focus on the year 2012. Here, the acronym “FAD” encompasses any type of drifting floating object to which tuna schools can associate. This definition includes “natural” objects (e.g. logs, palm branches) and anthropogenic floating objects, such as man-made bamboo rafts equipped with radio-range beacons, satellite transmitters and scanning sonars.

2. Fishing capacity and effort

In 2012, a total of 37 EUAF purse seiners operated in the Indian Ocean, among which 34 were in activity for more than 6 months (Fig. 1 and Table 1). The fleet was composed of 15 medium sized vessels (carrying capacity between 800 t and 1200 t) and of 22 large vessels, including 6 vessels > 2,000 t (Table 2). The total capacity, weighted by the months of activity for each vessel, has remained stable during 2009-2012 and was 67,000 m³ in 2012, corresponding to more than 45,000 t of fish hold volume.

Similarly to the fleet capacity, the nominal fishing effort of the fleet has remained stable during 2009-2012, with an overall effort in 2012 of about 9,500 and 7,800 fishing and searching days, respectively (Fig. 2 and Table 3). The fishing grounds of the fleet were concentrated in 2012 in the Western Indian Ocean, i.e. west of 70°E (Fig. 3). The mean annual number of squares explored by each vessel has decreased from about 185 (SD = 17) in 2009 to 170 (SD = 18) in 2012, but it remains at high levels with regards to the temporal trend observed over the last 3 decades (Fig 4). The total number of fishing sets has been stable during 2009-2012 and was close to 9,000 in 2012 (Fig. 5 and Table 5). The number of sets on FAD-associated schools decreased from about 7,000 in 2011 to about 5,600 in 2012 (-18%) while the number of sets on free-swimming schools increased by 25% to reach more than 3,300 (Table 5). Consequently, the percentage of sets on free-swimming schools strongly increased from an average of 26% during 2009-2011 to 37% in 2012.

3. Fisheries production

The total catch of the fleet in 2012 was about 230,000 t, which corresponded to the smallest catch in the fishery observed since 1993 (Figs. 6). The catch was composed of 130,000 t (57%), 80,000 t (35%), and 17,000 t (7%) of yellowfin, skipjack, and bigeye, respectively (Table 6). The large increase in the proportion of fishing sets on free-swimming schools combined with the increase in the proportion of yellowfin in FAD catches (43% in 2012 vs. 36% in 2011) resulted in 2012 in an overall increase of yellowfin in the

total catch by 17%. By contrast, skipjack catches decreased by more than 35% between 2011 and 2012 and reached the lowest value observed since 1987. The catch of bigeye which predominated on FADs decreased by more than 20% in 2012 due to the strong decrease of the FAD-associated catch and despite a 16% increased catch on FSC. The low catches of the FAD-fishery in 2012 were mainly explained by the decrease in the number of sets on FADs per day, i.e. from more than 0.9 during 2010-2011 to 0.7 in 2012, combined with the decrease in the total catch per positive set, from about 33 t set⁻¹ during 2010-2011 to less than 30 t set⁻¹ in 2012 (Fig. 7 – Left panel). The small catch of skipjack per set appeared due to a reduction in the number of fishes caught combined with a reduction in the mean weight from about 2.4 kg during 2009-2011 to 2.2 kg in 2012 (Fig. 15b).

Bigeye catch per positive set decreased by 20% in 2012, this decrease being partly explained by their reduction in median size from 50 cm during 2007-2011 to 48 cm in 2012 (Fig. 13) and an associated decrease in mean weight in the FAD catch from >3.7 kg during 2009-2011 to 3.2 kg in 2012 (Fig. 15c). Overall, the year 2012 was characterized by the smallest catch rates of skipjack (15 t set⁻¹) observed on FADs since 1983, when no artificial FADs were in use in the fishery. Since the decrease in the number of FADs used by the fleet in the recent years is not likely, these nominal catch rates would indicate both a decrease in the number of tuna schools associated with the FADs drifting in the Western Indian Ocean and a decrease in the mean biomass of skipjack and bigeye associated with each object. By contrast, the catch per positive set of yellowfin on FADs increased over the recent years to reach more than 12.5 t set⁻¹ in 2012. Overall, the total catch rates expressed in t per searching day decreased from more than 28 t d⁻¹ during 2009-2011 to less than 20 t d⁻¹ in 2012, suggesting a substantial decrease of the biomass available to the FAD fishery (Table 12).

By contrast, the number of sets on free-swimming schools per searching day and the associated catch of large yellowfin per positive set both increased between 2011 and 2012 (Fig. 7 – Right panel). Yellowfin caught on FSC in 2012 were larger than during previous years, i.e. they were characterized by a median fork length of 126 cm (i.e. 40 kg) compared to 120 cm (i.e. 35 kg) during 2007-2011 (Fig. 13). Indeed, the mean weight of yellowfin in FSC catch increased from an average of 25 kg during 2009-2011 to more than 30 kg in 2012 (Fig. 15a). This resulted in an overall increase of yellowfin and total catch per searching day on FSC by 75% and 44%, respectively (Table 13). On the opposite, the catch of skipjack per positive set on FSC decreased from more than 6.5 t set⁻¹ during 2009-2011 to less than 2 t set⁻¹ in 2012, i.e. the lowest catch rate observed in the fishery since 1981. The size structure of the skipjack catch on FSC was very similar between 2007-2011 and 2012 (Fig. 13), indicating that the decrease in catch rate was due to a decrease in the number of fishes in the schools. The total FSC catch of skipjack was less than 4,000 t in 2012, representing less than 5% of the catch of the FSC fishery (Table 8).

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4. Figures

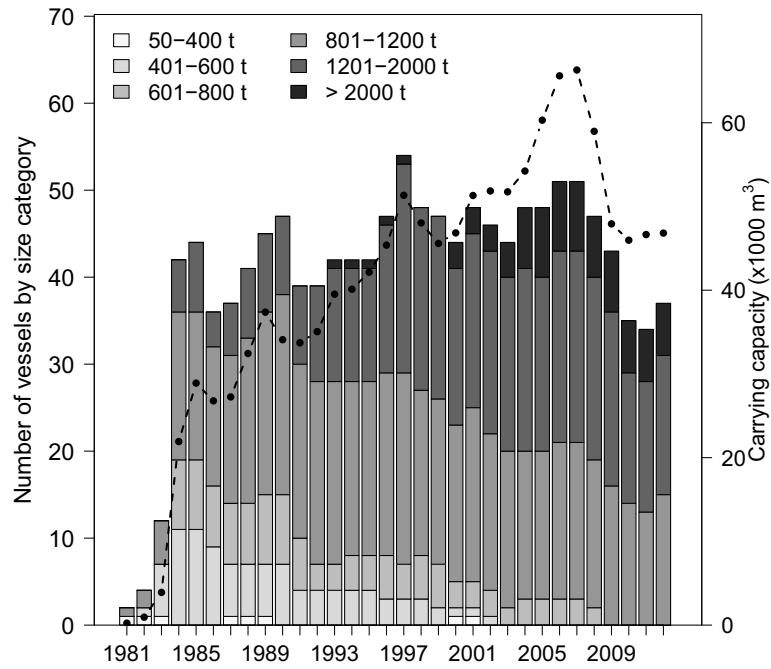


Figure 1: Fishing capacity of the European Union and associated flags purse seine fishing fleet in the Indian Ocean. Annual changes in the number of purse seiners by size category (barplots) and total carrying capacity (solid line with circles) during 1981-2012. Capacity was weighted by the vessel-specific proportion of the year at sea (in months). The vessel size category (t) was computed as 0.7 times the capacity expressed in m^3

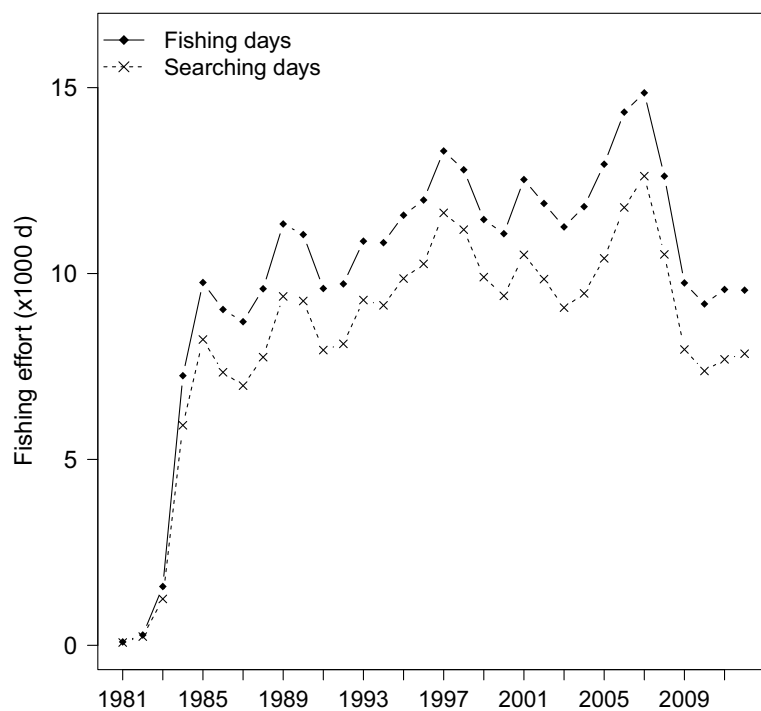


Figure 2: Changes in nominal effort over time. Annual total number of fishing and searching days for the European Union and associated flags purse seine fishing fleet in the Indian Ocean during 1981-2012

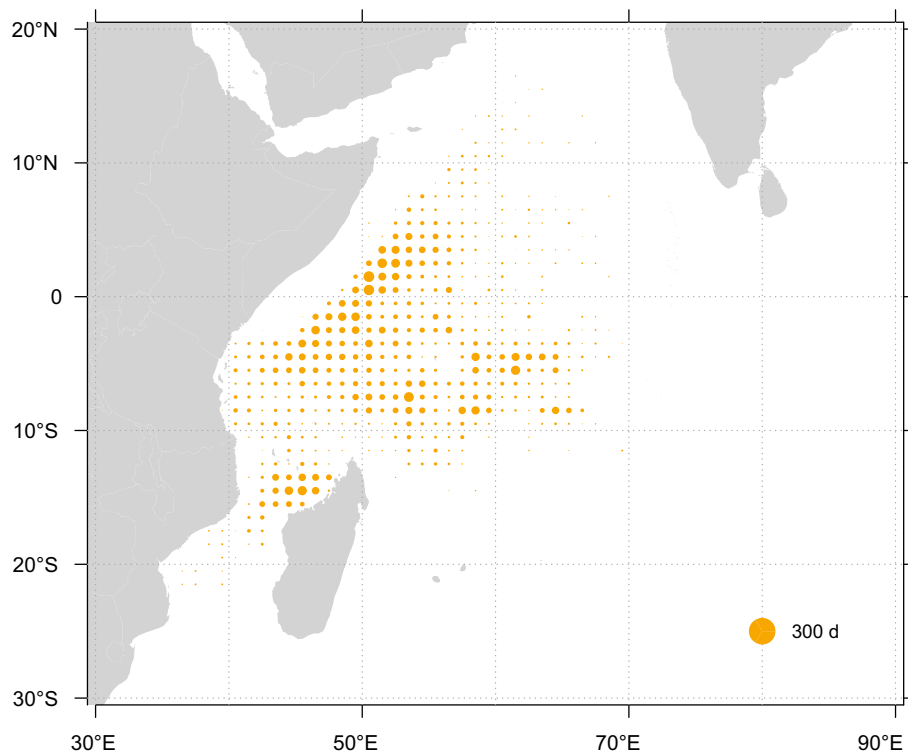


Figure 3: Fishing grounds. Spatial distribution of fishing effort (in searching days) of the European Union and associated flags purse seine fishing fleet in 2012

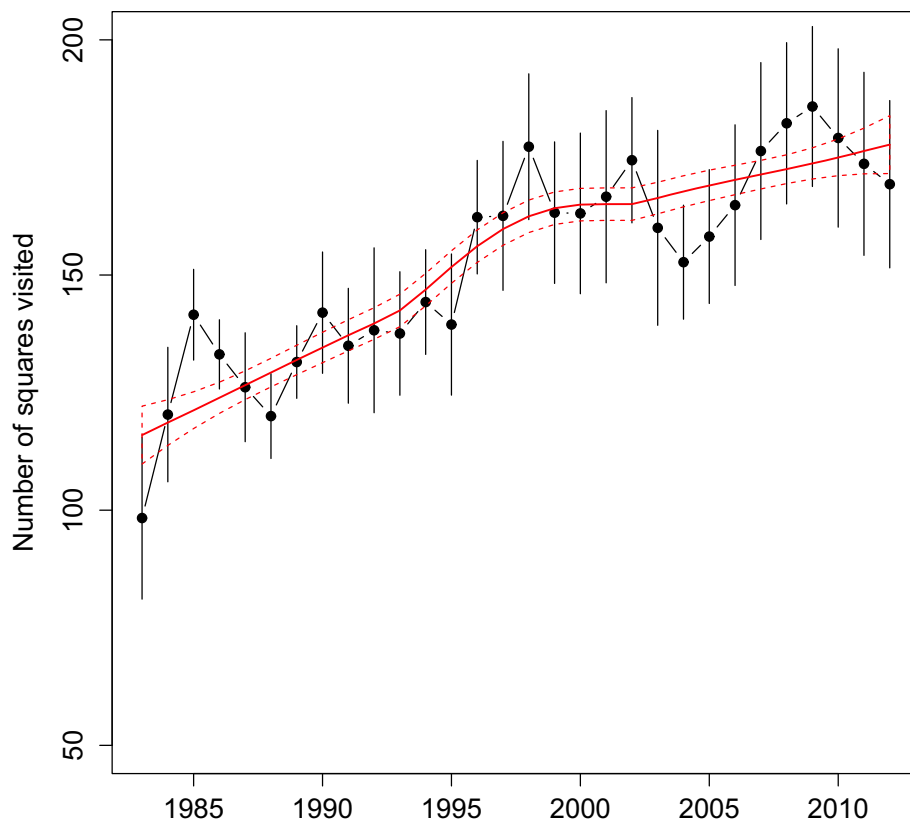


Figure 4: Changes in spatial extent of the fishery over time. Mean annual number of 1-degree squares explored by each vessel of the European Union and associated flags purse seine fishing fleet during 1981-2012. Solid line indicates standard deviation. Only vessels in activity during 12 months were selected. A loess function was fitted to the data to illustrate the trend

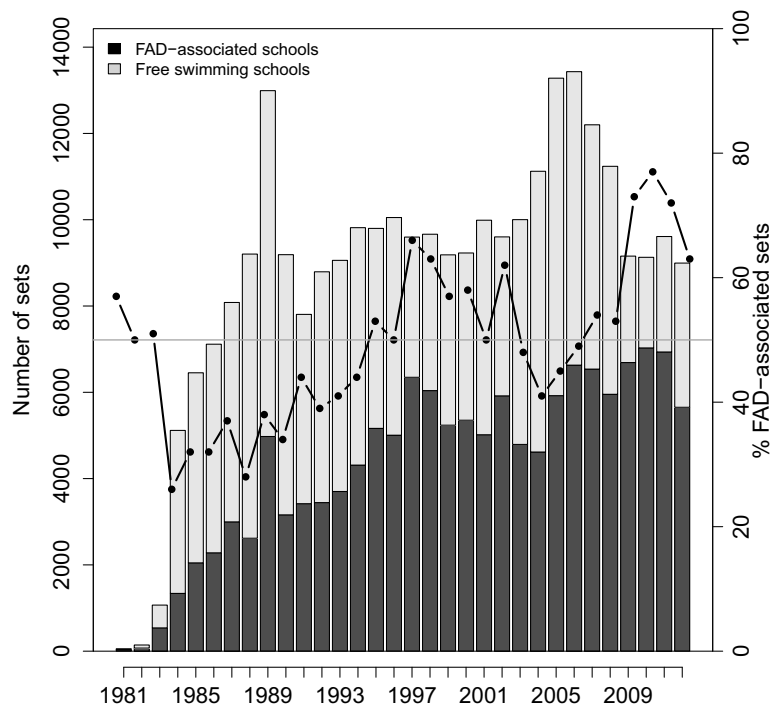


Figure 5: Fishing operations. Annual number of fishing sets made by the European Union and associated flags purse seine fishing fleet on FAD-associated and free-swimming schools during 1981-2012. Line with solid circles indicates the percentage of sets made on FAD-associated schools over free-swimming schools. Grey solid line indicates the 50% value

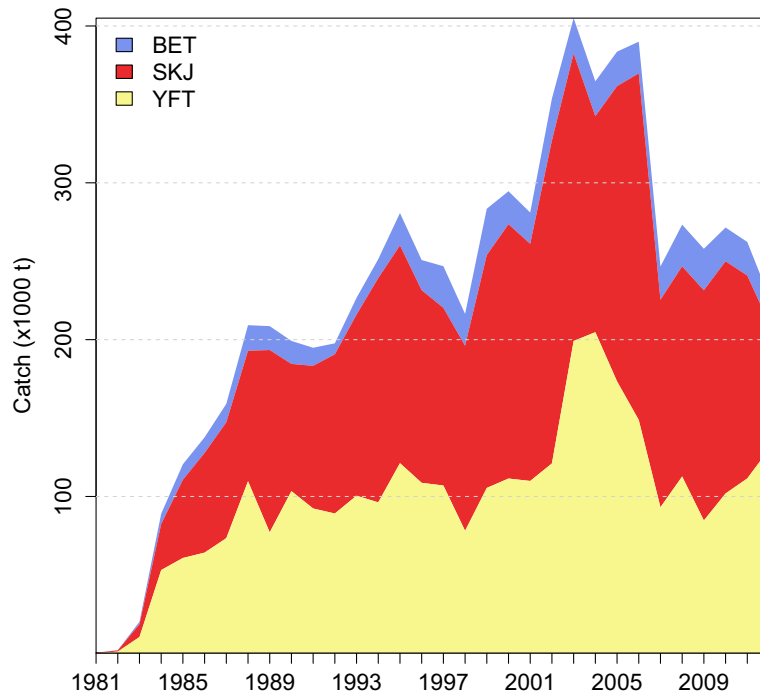


Figure 6: Total fishery production. Catch by species of the European Union and associated flags purse seine fishing fleet during 1981-2012

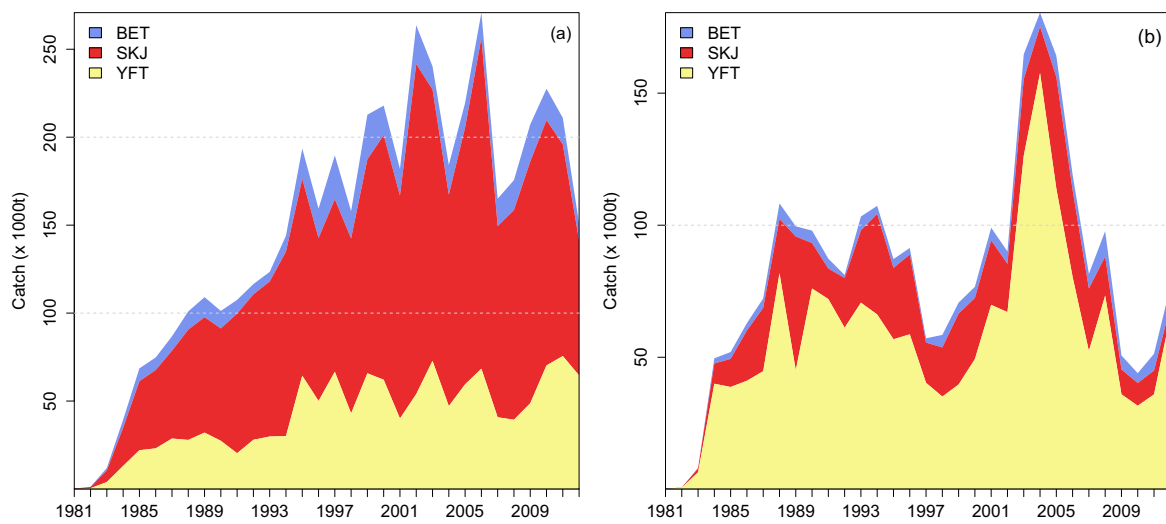


Figure 7: Fishery production by major fishing mode. Catch by species of the European Union and associated flags purse seine fishing fleet on (a) FAD-associated and (b) free-swimming schools during 1981-2012

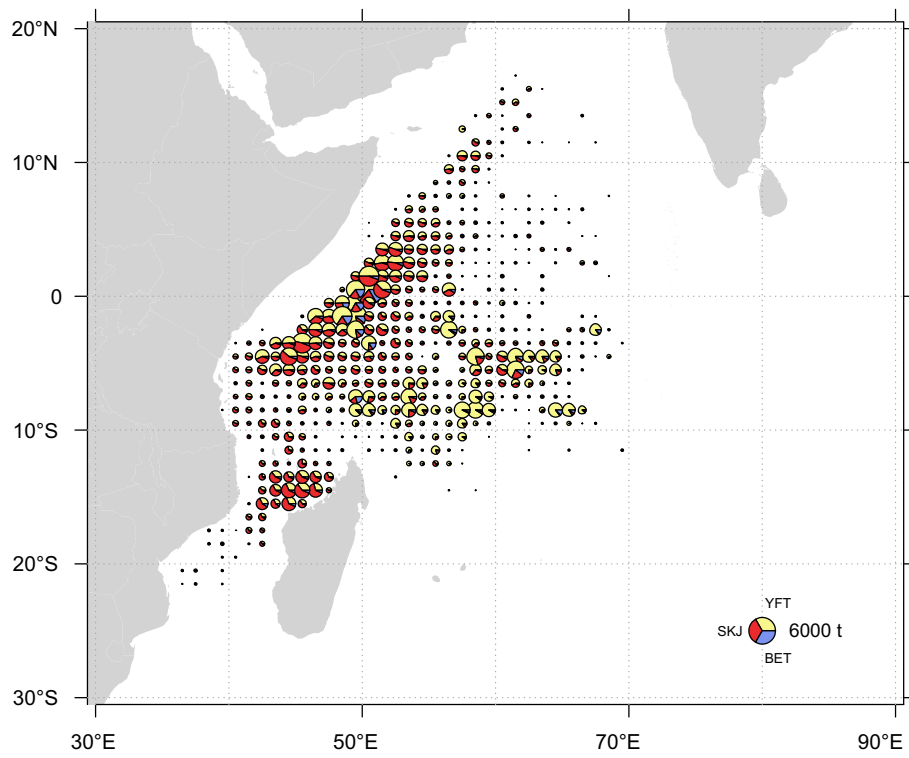


Figure 8: Spatial distribution of tuna catches of the European Union and associated flags purse seine fishing fleet in 2012

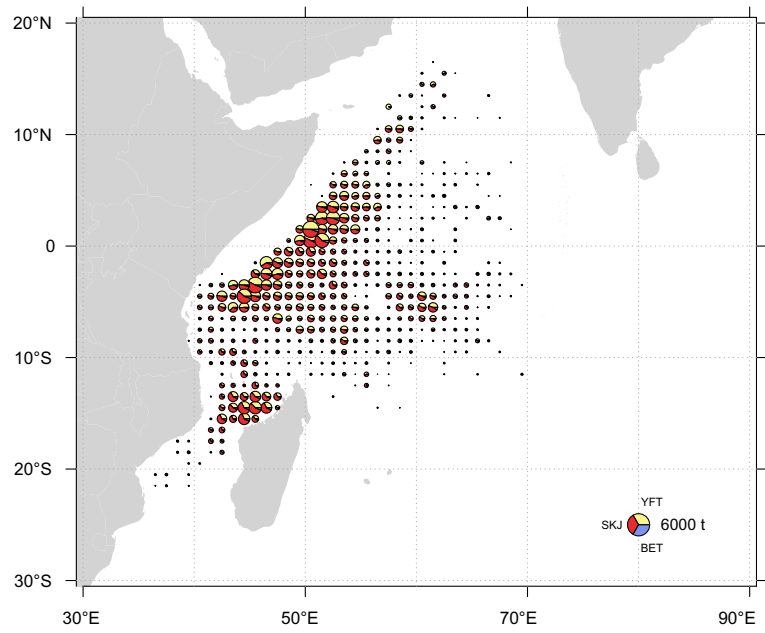


Figure 9: Spatial distribution of tuna catches of the European Union and associated flags purse seine fishing fleet made on FAD-associated schools in 2012

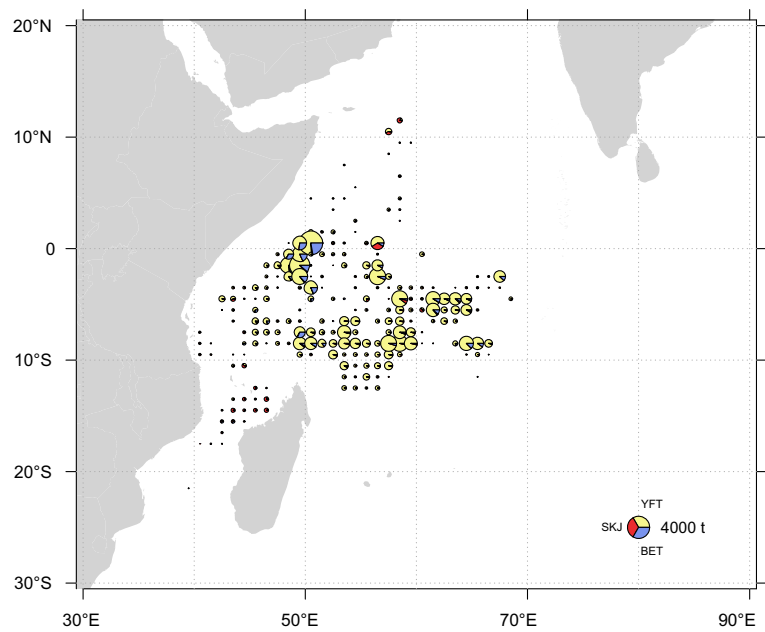


Figure 10: Spatial distribution of tuna catches of the European Union and associated flags purse seine fishing fleet made on FSC-associated schools in 2012

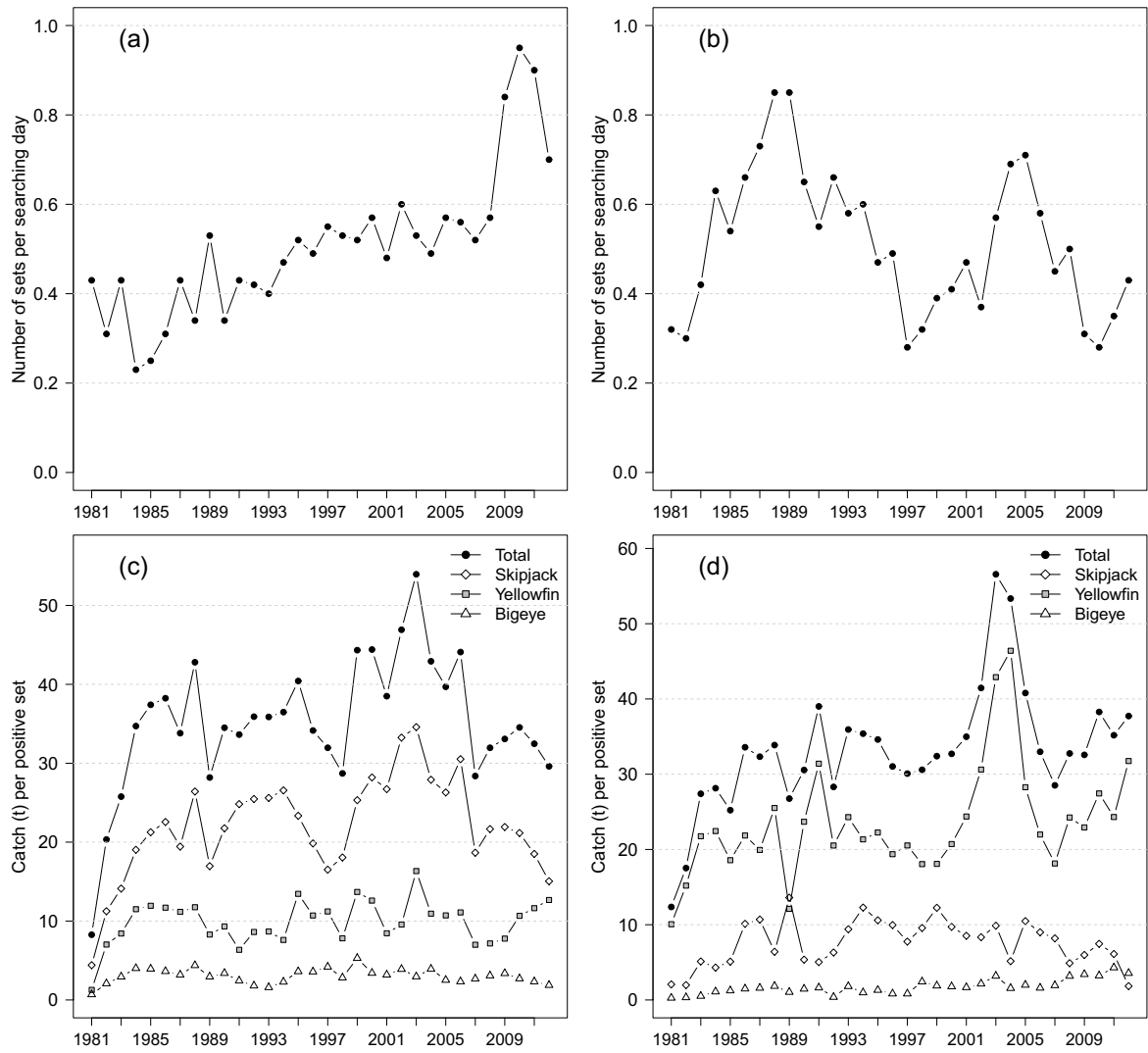


Figure 11: (a-b) Annual number of sets per searching day and (c-d) catch per positive set on (left panel) FAD-associated and (right panel) free-swimming schools for the European Union and associated flags purse seine fishing fleet in the Indian Ocean during 1981-2012

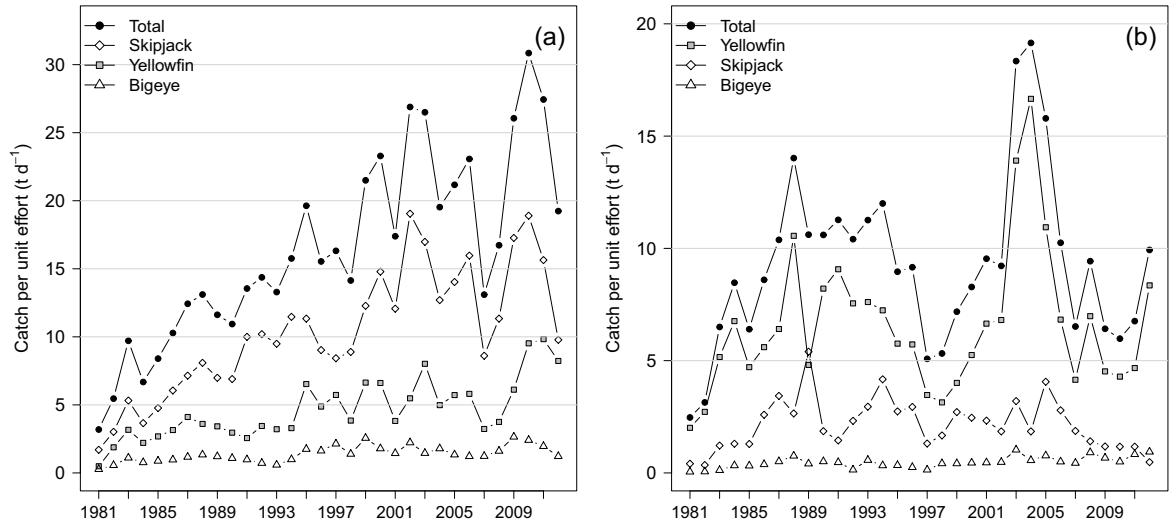


Figure 12: Annual catch rates (in t per searching day) of the European Union and associated flags purse seine fishing fleet on (a) FAD-associated and (b) free-swimming schools in the Indian Ocean during 1981-2012

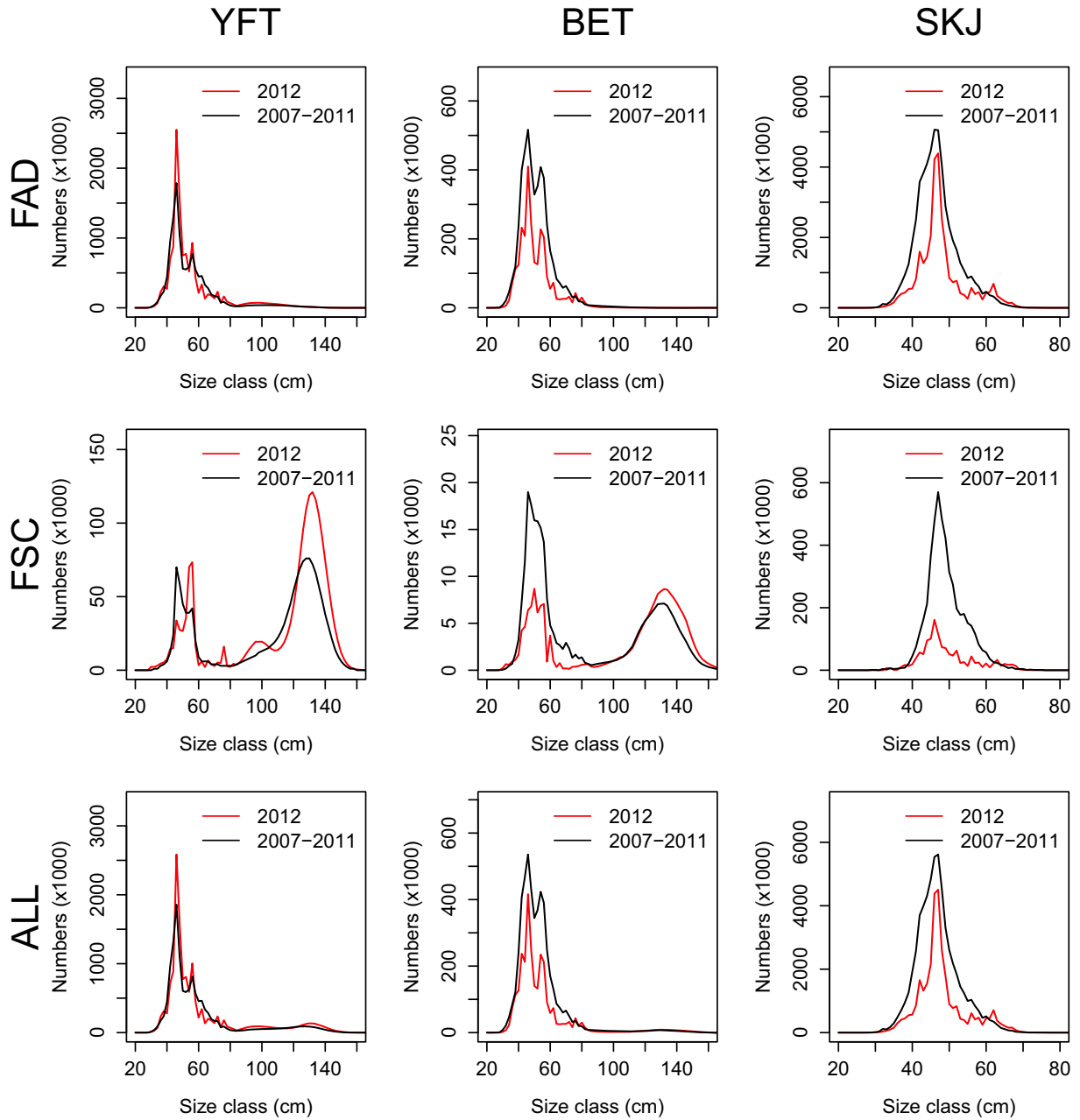


Figure 13: Size structure of the catch. Size distribution (in numbers) of the species-specific catch for the European Union and associated flags purse seine fishing fleet in 2012 (red line) and for an average year representing the period 2007-2011 (black line)

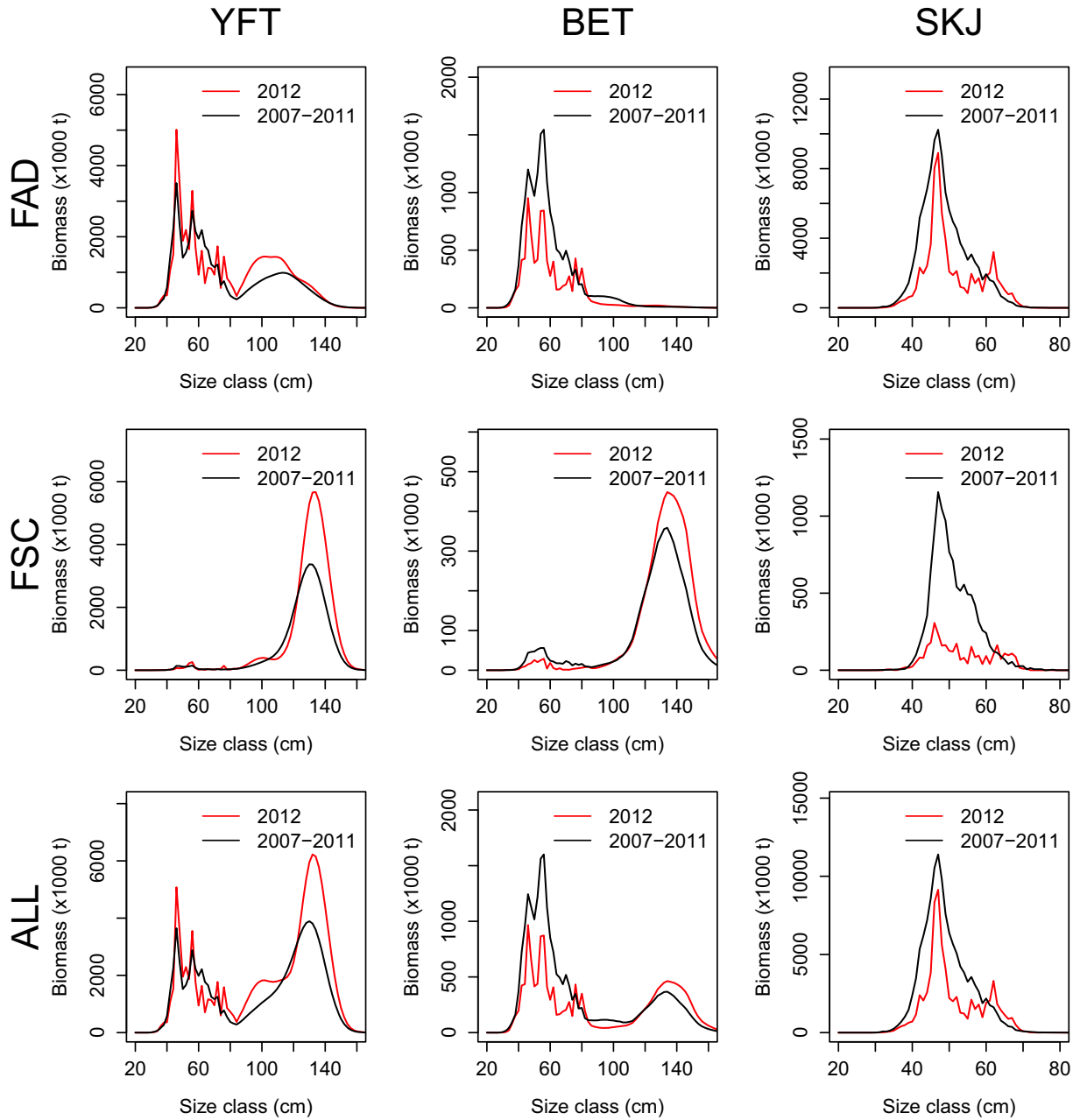


Figure 14: Size structure of the catch. Size distribution (in biomass) of the species-specific catch for the European Union and associated flags purse seine fishing fleet in 2012 (red line) and for an average year representing the period 2007-2011 (black line)

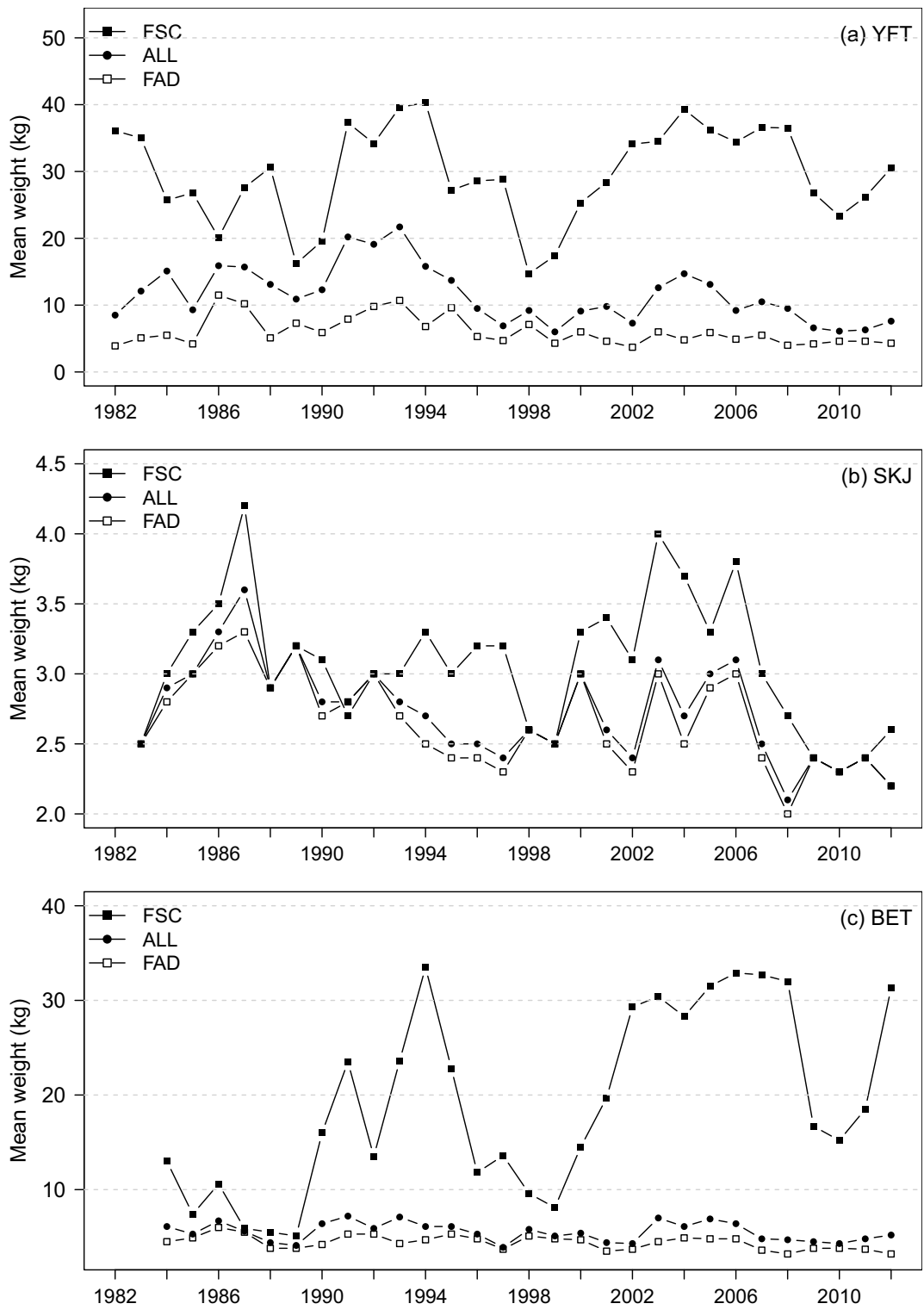


Figure 15: Annual time series of mean weight (kg) for (a) yellowfin, (b) skipjack, and (c) bigeye tuna for each fishing mode during 1982-2012

5. Tables

Table 1: Annual number of vessels by flag for the European tropical tuna purse seine fishing fleet of the Indian Ocean during 1981-2012. FRA = France, FRAT = France Overseas Territories, ESP = Spain, CIV = Ivory Coast, PAN = Panama, SYC = Seychelles, MLT = Malte, VCT = Saint Vincent, IRN = Iran, ITA = Italy, BEL = Belize

Year	FRA	FRAT	ESP	CIV	PAN	SYC	MLT	VCT	IRN	ITA	BEL	TOTAL
1981	2	0	0	0	0	0	0	0	0	0	0	2
1982	4	0	0	0	0	0	0	0	0	0	0	4
1983	12	0	0	0	0	0	0	0	0	0	0	12
1984	26	0	14	0	1	0	1	0	0	0	0	42
1985	26	0	16	0	1	0	1	0	0	0	0	44
1986	22	0	12	0	1	0	1	0	0	0	0	36
1987	21	0	14	0	1	0	1	0	0	0	0	37
1988	21	0	18	0	1	0	2	0	0	0	0	42
1989	21	0	21	0	1	0	2	0	0	0	0	45
1990	21	0	21	0	3	0	2	0	0	0	0	47
1991	18	0	17	0	3	0	1	0	0	0	0	39
1992	17	0	18	0	3	0	1	0	0	0	0	39
1993	17	0	19	0	4	0	2	0	0	0	4	46
1994	17	0	18	0	3	0	0	0	0	0	4	42
1995	17	0	19	0	3	0	1	0	0	0	4	44
1996	17	0	22	0	3	0	0	0	0	0	4	46
1997	19	0	23	0	4	0	0	0	0	1	5	56
1998	16	0	20	0	2	0	0	0	0	1	4	47
1999	15	0	20	0	2	0	0	0	0	1	4	46
2000	15	0	17	0	1	1	0	0	0	1	5	45
2001	18	2	17	0	1	6	0	0	0	1	5	54
2002	16	2	18	0	1	6	0	0	0	1	0	48
2003	14	0	18	0	1	11	0	0	0	1	1	50
2004	15	0	20	0	1	13	0	0	1	1	0	52
2005	16	0	20	0	0	11	0	0	0	1	0	48
2006	17	1	22	0	0	10	0	0	0	1	0	51
2007	17	2	21	0	0	10	0	0	0	1	0	51
2008	17	2	17	0	0	10	0	0	0	1	0	47
2009	15	3	15	0	0	10	0	0	0	1	0	44
2010	8	5	13	0	0	9	0	0	0	0	0	35
2011	8	5	13	0	0	8	0	0	0	0	0	34
2012	10	5	14	0	0	8	0	0	0	0	0	37

Table 2: Annual number of purse seiners by size category and total carrying capacity of the European tropical tuna purse seine fishing fleet of the Indian Ocean during 1981-2012. Total carrying capacity (CC) was weighted by the proportion of the year at sea (in months)

Year	50-400	401-600	601-800	801-1200	1201-2000	>2000	Total	CC
1981	1	0	0	1	0	0	2	233
1982	1	1	0	2	0	0	4	945
1983	1	6	0	5	0	0	12	3907
1984	0	11	8	17	6	0	42	21924
1985	0	11	8	17	8	0	44	28904
1986	0	9	7	16	4	0	36	26784
1987	1	6	7	17	6	0	37	27252
1988	1	6	7	19	8	0	41	32443
1989	1	6	8	21	9	0	45	37379
1990	0	7	8	23	9	0	47	34089
1991	0	4	6	20	9	0	39	33723
1992	0	4	3	21	11	0	39	35055
1993	0	4	3	21	13	1	42	39521
1994	0	4	4	20	13	1	42	40113
1995	0	4	4	20	13	1	42	42153
1996	0	3	5	21	17	1	47	45384
1997	0	3	4	22	24	1	54	51336
1998	0	3	5	19	21	0	48	48036
1999	0	2	5	19	21	0	47	45583
2000	1	1	3	18	18	3	44	46844
2001	1	1	3	20	20	3	48	51313
2002	0	1	3	18	21	3	46	51856
2003	0	0	2	18	20	4	44	51751
2004	0	0	3	17	21	7	48	54234
2005	0	0	3	17	20	8	48	60309
2006	0	0	3	18	22	8	51	65605
2007	0	0	3	18	22	8	51	66302
2008	0	0	2	17	21	7	47	58975
2009	0	0	0	16	20	7	43	47925
2010	0	0	0	14	15	6	35	45975
2011	0	0	0	13	15	6	34	46648
2012	0	0	0	15	16	6	37	46824

Table 3: Annual nominal fishing effort of the European Union and associated flags purse seine fishing fleet expressed in fishing and searching days during 1981-2012. Searching days was derived from the total time spent at sea corrected for periods of damage, route towards port, and purse seine operation

Year	Fishing days	Searching days
1981	91	75
1982	277	235
1983	1582	1247
1984	7252	5918
1985	9758	8225
1986	9033	7344
1987	8704	6984
1988	9590	7750
1989	11333	9384
1990	11048	9261
1991	9598	7941
1992	9721	8108
1993	10870	9286
1994	10830	9144
1995	11569	9864
1996	11977	10259
1997	13296	11631
1998	12791	11180
1999	11453	9903
2000	11072	9400
2001	12528	10502
2002	11885	9849
2003	11254	9082
2004	11799	9464
2005	12940	10407
2006	14341	11776
2007	14860	12619
2008	12619	10514
2009	9747	7956
2010	9182	7378
2011	9571	7691
2012	9552	7842

Table 4: Annual number of 1-degree squares explored by the European Union and associated flags purse seine fishing fleet during 1981-2012. #sets indicates squares where a least 1 fishing set was made.

Year	TOTAL	#sets	Catch >0	Effort > 1 d	Effort > 5 d
1981	73	26	25	18	
1982	133	47	40	53	10
1983	257	112	101	137	60
1984	654	314	293	408	220
1985	533	395	377	420	330
1986	445	338	327	370	270
1987	441	355	341	362	254
1988	460	352	340	366	263
1989	479	387	369	405	284
1990	505	420	407	424	311
1991	486	416	403	402	293
1992	498	438	429	431	330
1993	498	411	407	425	302
1994	564	477	467	482	348
1995	537	457	453	466	326
1996	679	535	527	548	395
1997	761	581	561	596	411
1998	991	767	757	795	516
1999	805	634	619	618	401
2000	742	574	556	556	368
2001	600	515	503	507	383
2002	718	586	567	557	409
2003	639	523	508	507	351
2004	660	505	487	508	340
2005	639	525	505	508	365
2006	737	610	592	585	409
2007	711	587	571	586	415
2008	707	610	594	569	436
2009	837	644	634	628	418
2010	695	582	569	547	364
2011	671	547	541	530	344
2012	635	522	504	495	340

Table 5: Number of positive and null sets by fishing mode made by the European Union and associated flags purse seine fishing fleet in the Indian ocean during 1981-2012. FAD = Fish Aggregating Device; FSC = Free-Swimming School

	ALL			FAD			FSC		
	Total	Positive	Null	Total	Positive	Null	Total	Positive	Null
1981	56	44	12	32	29	3	24	15	9
1982	143	105	38	72	63	9	71	42	29
1983	1068	766	302	540	470	70	528	296	232
1984	5117	2940	2177	1339	1144	195	3778	1796	1982
1985	6452	3932	2520	2047	1846	201	4405	2086	2319
1986	7115	3855	3260	2280	1974	306	4835	1881	2954
1987	8082	4811	3271	2997	2568	429	5085	2243	2842
1988	9204	5580	3624	2618	2373	245	6586	3207	3379
1989	12992	7591	5401	4976	3869	1107	8016	3722	4294
1990	9190	6148	3042	3160	2937	223	6030	3211	2819
1991	7806	5493	2313	3419	3199	220	4387	2294	2093
1992	8793	6227	2566	3444	3246	198	5349	2981	2368
1993	9058	6350	2708	3701	3441	260	5357	2909	2448
1994	9816	7051	2765	4313	3949	364	5503	3102	2401
1995	9799	7343	2456	5164	4790	374	4635	2553	2082
1996	10051	7732	2319	5006	4669	337	5045	3063	1982
1997	9598	7904	1694	6348	5940	408	3250	1964	1286
1998	9664	7514	2150	6040	5567	473	3624	1947	1677
1999	9186	7178	2008	5238	4906	332	3948	2272	1676
2000	9229	7310	1919	5353	4930	423	3876	2380	1496
2001	9989	7608	2381	5017	4744	273	4972	2864	2108
2002	9602	7834	1768	5918	5643	275	3684	2191	1493
2003	10002	7405	2597	4792	4461	331	5210	2944	2266
2004	11123	7704	3419	4616	4307	309	6507	3397	3110
2005	13281	9579	3702	5923	5550	373	7358	4029	3329
2006	13432	9820	3612	6630	6162	468	6802	3658	3144
2007	12200	8709	3491	6538	5823	715	5662	2886	2776
2008	11238	8528	2710	5954	5503	451	5284	3025	2259
2009	9157	7836	1321	6690	6267	423	2467	1569	898
2010	9129	7743	1386	7029	6590	439	2100	1153	947
2011	9611	7978	1633	6935	6500	435	2676	1478	1198
2012	8995	7283	1712	5653	5220	433	3342	2063	1279

Table 6: Catch by species for the European Union and associated flags purse seine fishing fleet of the Indian ocean during 1981-2012

Year	YFT	SKJ	BET	ALB	OTH	TOTAL
1981	188	158	23	0	56	425
1982	1081	792	145	0	0	2018
1983	10400	8153	1536	0	136	20225
1984	53083	29350	6528	469	228	89659
1985	60791	49895	9870	620	483	121659
1986	64208	63563	9965	208	693	138637
1987	73421	73907	11750	217	43	159338
1988	109696	83232	16293	242	732	210194
1989	77147	116231	15249	6	0	208633
1990	103406	81119	14666	207	61	199459
1991	92353	90945	11529	2216	39	197081
1992	89152	101507	6994	3254	0	200908
1993	100500	115469	10727	1261	0	227958
1994	96242	143002	12074	2526	0	253844
1995	121250	138832	20634	1231	0	281947
1996	108710	122804	19247	1490	1221	253473
1997	106990	113310	26519	1880	201	248901
1998	78110	118042	20250	1152	0	217554
1999	105448	148483	29535	509	18	283992
2000	111446	162145	21042	1090	1045	296768
2001	109895	151193	19932	1233	574	282827
2002	121065	205888	26690	707	1293	355644
2003	199137	183295	22573	1476	736	407217
2004	204762	137736	22201	240	1098	366036
2005	173396	188214	22009	169	848	384635
2006	148791	220989	20202	1358	1017	392357
2007	93139	132322	21147	714	285	247606
2008	112736	133997	26582	1391	304	275010
2009	84700	146780	26465	422	65	258431
2010	101899	148056	21527	207	56	271746
2011	111514	129349	21439	725	37	263064
2012	130071	80516	16903	1206	56	228752

Table 7: Catch by species made on FAD-associated schools for the European Union and associated flags purse seine fishing fleet of the Indian ocean during 1981-2012

Year	YFT	SKJ	BET	ALB	OTH	TOTAL
1981	37	128	20	0	56	240
1982	442	709	131	0	0	1282
1983	3959	6637	1381	0	136	12114
1984	13102	21672	4572	0	191	39537
1985	22050	39250	7278	14	459	69051
1986	23102	44527	7157	0	693	75478
1987	28688	49925	8179	0	20	86812
1988	27890	62689	10387	0	602	101567
1989	32057	65605	11389	0	0	109051
1990	27383	63896	9958	35	61	101333
1991	20330	79392	7785	54	25	107585
1992	27970	82686	5852	15	0	116523
1993	29831	88113	5469	9	0	123422
1994	30043	104900	9043	89	0	144076
1995	64433	111808	17298	50	0	193589
1996	50022	92611	16732	94	0	159459
1997	66665	98073	24896	187	0	189822
1998	42994	99425	15519	121	0	158058
1999	65776	121612	25385	108	16	212896
2000	62128	139023	16798	103	877	218930
2001	40064	126767	15141	125	548	182644
2002	53970	187619	21989	16	1200	264795
2003	72833	154242	13185	6	420	240686
2004	47120	120195	16902	2	617	184835
2005	59498	145979	13984	20	802	220282
2006	68380	188082	14350	0	901	271713
2007	40774	108675	15581	7	248	165284
2008	39377	119219	16972	35	294	175897
2009	48720	137402	21116	26	64	207328
2010	70259	139456	17805	42	56	227617
2011	75582	120319	15088	45	37	211071
2012	64570	76718	9552	59	18	150916

Table 8: Catch by species made on free-swimming schools for the European Union and associated flags purse seine fishing fleet of the Indian ocean during 1981-2012

Year	YFT	SKJ	BET	ALB	OTH	TOTAL
1981	151	31	4	0	0	185
1982	638	83	14	0	0	736
1983	6441	1516	155	0	0	8111
1984	39981	7678	1956	469	37	50122
1985	38741	10645	2592	606	24	52608
1986	41106	19036	2809	208	0	63159
1987	44733	23982	3571	217	23	72526
1988	81806	20543	5906	242	130	108626
1989	45090	50626	3860	6	0	99583
1990	76023	17223	4708	172	0	98126
1991	72023	11553	3744	2162	14	89496
1992	61182	18821	1142	3240	0	84385
1993	70669	27357	5258	1252	0	104536
1994	66199	38102	3031	2437	0	109768
1995	56817	27024	3337	1181	0	88359
1996	58688	30193	2515	1396	1221	94014
1997	40325	15238	1622	1693	201	59079
1998	35116	18617	4732	1032	0	59496
1999	39672	26871	4150	401	2	71096
2000	49317	23122	4244	987	168	77838
2001	69831	24427	4790	1108	26	100183
2002	67095	18269	4701	691	93	90849
2003	126304	29053	9389	1470	316	166532
2004	157642	17541	5299	238	481	181201
2005	113898	42234	8025	149	46	164353
2006	80411	32908	5852	1358	116	120644
2007	52365	23647	5566	707	37	82322
2008	73360	14779	9610	1355	10	99113
2009	35980	9379	5349	396	0	51104
2010	31641	8601	3722	166	0	44129
2011	35932	9030	6351	680	0	51992
2012	65501	3798	7351	1147	38	77836

Table 9: Number of sets per searching on FAD-associated (FAD) and free-swimming schools (FSC) for the European Union and associated flags purse seine fishing fleet of the Indian ocean during 1981-2012

Year	FAD	FSC
1981	0.43	0.32
1982	0.31	0.30
1983	0.43	0.42
1984	0.23	0.63
1985	0.25	0.54
1986	0.31	0.66
1987	0.43	0.73
1988	0.34	0.85
1989	0.53	0.85
1990	0.34	0.65
1991	0.43	0.55
1992	0.42	0.66
1993	0.40	0.58
1994	0.47	0.60
1995	0.52	0.47
1996	0.49	0.49
1997	0.55	0.28
1998	0.53	0.32
1999	0.52	0.39
2000	0.57	0.41
2001	0.48	0.47
2002	0.60	0.37
2003	0.53	0.57
2004	0.49	0.69
2005	0.57	0.71
2006	0.56	0.58
2007	0.52	0.45
2008	0.57	0.50
2009	0.84	0.31
2010	0.95	0.28
2011	0.90	0.35
2012	0.70	0.43

Table 10: Catch per unit of effort (in t per positive set) on FAD-associated schools for the European Union and associated flags purse seine fishing fleet of the Indian ocean during 1981-2012

Year	YFT	SKJ	BET	ALB	TOTAL
1981	1.28	4.41	0.69	0.00	8.27
1982	7.02	11.25	2.08	0.00	20.34
1983	8.42	14.12	2.94	0.00	25.77
1984	11.50	19.03	4.01	0.00	34.71
1985	11.94	21.26	3.94	0.01	37.41
1986	11.70	22.56	3.63	0.00	38.24
1987	11.17	19.44	3.18	0.00	33.81
1988	11.75	26.42	4.38	0.00	42.80
1989	8.29	16.96	2.94	0.00	28.19
1990	9.32	21.76	3.39	0.01	34.50
1991	6.36	24.82	2.43	0.02	33.63
1992	8.62	25.47	1.80	0.00	35.90
1993	8.67	25.61	1.59	0.00	35.87
1994	7.61	26.56	2.29	0.02	36.48
1995	13.45	23.34	3.61	0.01	40.42
1996	10.71	19.84	3.58	0.02	34.15
1997	11.22	16.51	4.19	0.03	31.96
1998	7.81	18.06	2.82	0.02	28.71
1999	13.69	25.32	5.29	0.02	44.33
2000	12.60	28.20	3.41	0.02	44.41
2001	8.45	26.72	3.19	0.03	38.50
2002	9.56	33.25	3.90	0.00	46.92
2003	16.33	34.58	2.96	0.00	53.95
2004	10.94	27.91	3.92	0.00	42.92
2005	10.72	26.30	2.52	0.00	39.69
2006	11.10	30.52	2.33	0.00	44.09
2007	7.00	18.66	2.68	0.00	28.38
2008	7.16	21.66	3.08	0.01	31.96
2009	7.77	21.92	3.37	0.00	33.08
2010	10.66	21.16	2.70	0.01	34.54
2011	11.63	18.51	2.32	0.01	32.47
2012	12.67	15.05	1.87	0.01	29.61

Table 11: Catch per unit of effort (in t per positive set) on free-swimming schools for the European Union and associated flags purse seine fishing fleet of the Indian ocean during 1981-2012

Year	YFT	SKJ	BET	ALB	TOTAL
1981	10.07	2.07	0.27	0.00	12.36
1982	15.19	1.98	0.33	0.00	17.53
1983	21.76	5.12	0.52	0.00	27.40
1984	22.45	4.31	1.10	0.26	28.14
1985	18.57	5.10	1.24	0.29	25.22
1986	21.85	10.12	1.49	0.11	33.58
1987	19.94	10.69	1.59	0.10	32.33
1988	25.51	6.41	1.84	0.08	33.87
1989	12.11	13.60	1.04	0.00	26.76
1990	23.68	5.36	1.47	0.05	30.56
1991	31.40	5.04	1.63	0.94	39.01
1992	20.52	6.31	0.38	1.09	28.31
1993	24.29	9.40	1.81	0.43	35.94
1994	21.34	12.28	0.98	0.79	35.39
1995	22.25	10.59	1.31	0.46	34.61
1996	19.37	9.96	0.83	0.46	31.03
1997	20.53	7.76	0.83	0.86	30.08
1998	18.05	9.57	2.43	0.53	30.59
1999	18.08	12.25	1.89	0.18	32.40
2000	20.72	9.72	1.78	0.41	32.71
2001	24.38	8.53	1.67	0.39	34.98
2002	30.62	8.34	2.15	0.32	41.46
2003	42.90	9.87	3.19	0.50	56.57
2004	46.41	5.16	1.56	0.07	53.34
2005	28.27	10.48	1.99	0.04	40.79
2006	21.98	9.00	1.60	0.37	32.98
2007	18.14	8.19	1.93	0.24	28.52
2008	24.25	4.89	3.18	0.45	32.76
2009	22.93	5.98	3.41	0.25	32.57
2010	27.44	7.46	3.23	0.14	38.27
2011	24.31	6.11	4.30	0.46	35.18
2012	31.75	1.84	3.56	0.56	37.73

Table 12: Catch per unit of effort (in t per searching day) on FAD-associated schools for the European Union and associated flags purse seine fishing fleet of the Indian ocean during 1981-2012

Year	YFT	SKJ	BET	ALB	TOTAL
1981	0.49	1.70	0.27	0.00	3.19
1982	1.88	3.02	0.56	0.00	5.46
1983	3.17	5.32	1.11	0.00	9.71
1984	2.21	3.66	0.77	0.00	6.68
1985	2.68	4.77	0.88	0.00	8.40
1986	3.15	6.06	0.97	0.00	10.28
1987	4.11	7.15	1.17	0.00	12.43
1988	3.60	8.09	1.34	0.00	13.11
1989	3.42	6.99	1.21	0.00	11.62
1990	2.96	6.90	1.08	0.00	10.94
1991	2.56	10.00	0.98	0.01	13.55
1992	3.45	10.20	0.72	0.00	14.37
1993	3.21	9.49	0.59	0.00	13.29
1994	3.29	11.47	0.99	0.01	15.76
1995	6.53	11.34	1.75	0.01	19.63
1996	4.88	9.03	1.63	0.01	15.54
1997	5.73	8.43	2.14	0.02	16.32
1998	3.85	8.89	1.39	0.01	14.14
1999	6.64	12.28	2.56	0.01	21.50
2000	6.61	14.79	1.79	0.01	23.29
2001	3.82	12.07	1.44	0.01	17.39
2002	5.48	19.05	2.23	0.00	26.89
2003	8.02	16.98	1.45	0.00	26.50
2004	4.98	12.70	1.79	0.00	19.53
2005	5.72	14.03	1.34	0.00	21.17
2006	5.81	15.97	1.22	0.00	23.07
2007	3.23	8.61	1.23	0.00	13.10
2008	3.75	11.34	1.61	0.00	16.73
2009	6.12	17.27	2.65	0.00	26.06
2010	9.52	18.90	2.41	0.01	30.85
2011	9.83	15.64	1.96	0.01	27.44
2012	8.23	9.78	1.22	0.01	19.24

Table 13: Catch per unit of effort (in t per searching day) on free swimming schools for the European Union and associated flags purse seine fishing fleet of the Indian ocean during 1981-2012

Year	YFT	SKJ	BET	ALB	TOTAL
1981	2.01	0.41	0.05	0.00	2.47
1982	2.72	0.35	0.06	0.00	3.14
1983	5.16	1.22	0.12	0.00	6.50
1984	6.76	1.30	0.33	0.08	8.47
1985	4.71	1.29	0.32	0.07	6.40
1986	5.60	2.59	0.38	0.03	8.60
1987	6.41	3.43	0.51	0.03	10.38
1988	10.56	2.65	0.76	0.03	14.02
1989	4.81	5.40	0.41	0.00	10.61
1990	8.21	1.86	0.51	0.02	10.60
1991	9.07	1.45	0.47	0.27	11.27
1992	7.55	2.32	0.14	0.40	10.41
1993	7.61	2.95	0.57	0.13	11.26
1994	7.24	4.17	0.33	0.27	12.00
1995	5.76	2.74	0.34	0.12	8.96
1996	5.72	2.94	0.25	0.14	9.16
1997	3.47	1.31	0.14	0.15	5.08
1998	3.14	1.67	0.42	0.09	5.32
1999	4.01	2.71	0.42	0.04	7.18
2000	5.25	2.46	0.45	0.10	8.28
2001	6.65	2.33	0.46	0.11	9.54
2002	6.81	1.85	0.48	0.07	9.22
2003	13.91	3.20	1.03	0.16	18.34
2004	16.66	1.85	0.56	0.03	19.15
2005	10.94	4.06	0.77	0.01	15.79
2006	6.83	2.79	0.50	0.12	10.25
2007	4.15	1.87	0.44	0.06	6.52
2008	6.98	1.41	0.91	0.13	9.43
2009	4.52	1.18	0.67	0.05	6.42
2010	4.29	1.17	0.50	0.02	5.98
2011	4.67	1.17	0.83	0.09	6.76
2012	8.35	0.48	0.94	0.15	9.93