STATISTICS OF THE FRENCH PURSE SEINE FISHING FLEET TARGETING TROPICAL TUNAS IN THE ATLANTIC OCEAN (1991-2022)

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SUMMARY

This document presents an up-to-date summary of the French purse seine fleet targeting tropical tunas in the Atlantic Ocean. It contains information about dFAD data that will be incorporated into a specific section of the ICCAT statistics report. The statistics cover the period 1991-2022 and focus in this document on the fishing activities of 2022.

RÉSUMÉ

Ce document présente un résumé actualisé de la flottille de senneurs français ciblant les thonidés tropicaux dans l'océan Atlantique. Il contient des informations sur les données des DCPd qui seront incorporées dans une section spécifique du rapport statistique de l'ICCAT. Les statistiques couvrent la période 1991-2022 et se concentrent dans le présent document sur les activités de pêche de 2022.

RESUMEN

Este documento presenta un resumen actualizado de la flota francesa de cerqueros que pesca túnidos tropicales en el océano Atlántico. Contiene información sobre los datos del DCPd que se incorporará a una sección específica del informe estadístico de ICCAT. Las estadísticas cubren el periodo 1991-2022 y en este documento se centran en las actividades pesqueras de 2022.

KEYWORDS

Tuna fisheries, purse seining, fishery statistics, tuna landings, tuna discards, bycatch, logbooks, Katsuwonus pelamis, Thunnus albacares, Thunnus obesus, *Drifting FAD*

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1. Introduction

French tuna purse seiners have been fishing yellowfin tuna (*Thunnus albacares*, YFT), skipjack tuna (*Katsuwonus pelamis*, SKJ), and bigeye tuna (*Thunnus obesus*, BET) in the Atlantic ocean since the early 1960s. Tuna schools are harvested through two fishing modes that result in different species and size composition of the catch, i.e., tunas in Free-Swimming tuna Schools (FSC) and tunas associated with drifting Floating OBjects (FOB) now predominated by artificial Fish Aggregating Devices (FAD) deployed by fishing vessels. The French purse seine fishery has been monitored by the French National Research Institute for Sustainable Development (IRD, France) since the late 1960s in collaboration with the 'Centre de Recherches Océanologiques' (CRO, Ivory Coast) and the 'Centre de Recherches Océanographiques de Dakar-Thiaroye' (CRODT, Senegal). Observers have been deployed on board to monitor tuna discards and bycatch since 2005.

In this report, we summarize the fishing activities of the French purse seine fleet during the period 1991-2022 based on the collection of logbooks, landing reports, sampling operations conducted at ports during unloading for target species (i.e., BET, SKJ, YFT), and data collected by onboard observers. Catches were estimated with the T3 process (described in Duparc et al., 2018).

2. Material and methods

2.1 Fishing data declared by professionals

Logbooks and landing reports were collected in collaboration with fishing companies and covered 100% of the fishing trips that occurred during 1991-2022. For each trip, at unloading, the shipment was sorted by species (and by commercial categories) and weight at the cannery. For each set, the purse seine skippers report in the logbook all information on vessel's activities including:

- Catch weight, visually assessed
- Raw species composition of the sets, visually assesse
- Date, time and position of sets
- Effort in fishing hours
- Activities and details on floating objects (mainly FAD), since 2014

2.2 Fishing data collected by onboard observers

Since 2005, observers are deployed on board French purse seine vessels to monitor fishing activities, with the purpose of monitoring tuna discards and bycatch to complement data declared by professionals. Observers' data have been collected through 3 programs: 'Data Collection Framework' (DCF) funded by EU, 'ICCAT Moratorium' funded by ICCAT and 'Observateur Commun Unique Permanent' (OCUP) funded by the fishing industry. For each fishing set, observers collect:

- Tuna discards weight by species
- Retained and discarded bycatch numbers (utlimately converted to weights)
- Size measurements of tunas (only discards) and bycatch
- Date, time and position of sets
- Activities and details on floating objects

The observer coverage (based on the number of sets) had to be ensured for at least 5% of the fishing effort of purse seiners (Rec. 10-10; Rec. 16-14) in the ICCAT competence area. Throughout 2005-2022, observer coverage has ranged from 6 to 100% and was 99% in 2022. Discarded tunas and bycatch species (retained and discarded) counted by observers are converted to weights and ultimately raised to the total tuna production using the bycatch/tuna catch ratio method described in Amandè et al. (2010).

2.3 Sampling at port

In 2022, 299 well samples were collected at the unloading of French vessels in the ports of Abidjan and Dakar. These samples were used to estimate the size and species composition of the catch following a sampling and processing protocol common with purse seiners flying the flag of Spain and other flags associated with the French purse seine fleet (Pallarès and Petit, 1998). A total of about 97 000 tunas counted and measured were used in the T3 (Tropical Tuna Treatment, Fortran version) processing of the French purse seine fishery data for 2022 Data were collected in the framework of the 'Data Collection Framework' (DCF, Reg 2017/1004 and 2016/1251) funded by both IRD and the EU.

2.4 Fishing effort

Nominal fishing effort was computed from logbooks data (location and activity) and expressed in fishing days or searching days. The fishing time (day) is defined as the period of the day where vessels can carry out their fishing activities (searching for school, hauling, taking catch onboard). Therefore, activities preventing fishing activities are not accounted for (example: landing, damage repairs or moving to port). Searching time corresponds to the period during which vessels are considered to be searching for fish schools, and was calculated by the difference between the fishing time and the catch time (estimation based on its relationship with the set size). Efforts are expressed in day, which corresponds to the period of the day where the daylight is sufficient to enable fishing activities and is equal to 12 hours in the Atlantic Ocean (instead of 24h).

2.5 Drifting FADs data collection

2.5.1 dFADs deployment data

Locations and times for drifting FAD (dFAD) deployments are available in French logbook data from 2013 onward. The term 'dFAD' is referring to the entire device consisting of the floating object (FOB) itself and the attached GPS buoy. Given that GPS buoys can be exchanged on FOBs encountered at sea, this document contains information regarding the number of deployments for both GPS buoys and floating objects.

2.5.2 dFADs position data

The GPS locations of satellite-transmitting tracking buoys attached to dFADs used by the French and associated (Mauritius, Italy, Seychelles, Belize) purse-seine and support vessels operating in the Indian and Atlantic oceans are available from 2007 onward through a collaborative agreement between the French National Research Institute for Sustainable Development (IRD) and the French frozen tuna producers' organization ORTHONGEL. This large dataset, comprising of tens of millions of positions, was stored in a PostgreSQL relational database (version 12.13) with the PostGIS extension for geospatial data (version 3.2.3).

Buoy location data are transmitted with a periodicity that varies along the buoy trajectory, typically emitting between 2 and 4 positions per day. Raw position data was processed following previously published literature. Briefly, aberrant positions were filtered and removed following the methodology described in Maufroy et al. (2015) and all positions were classified to separate onboard FAD positions from in water positions using a Random Forest (onboard versus at sea) classification algorithm based primarily on buoy speed and speed variability (Imzilen et al. 2022).
In this document, we used data of dFAD positions covering the last decade 2013–2022 in the Atlantic Ocean. this Dataset consists of ~25 million positions representing a total of 24,507 distinct buoys.

3. Results and interpretation

3.1 Fleet capacity

In 2022, 10 French purse seiners (**Figure 1**) operated in the eastern Atlantic Ocean and conducted a total of 82 fishing trips with an average duration of 29 days (**Table 2**). The fleet was composed of 1 vessel of a carrying capacity (CC) of 600-800 t, 7 vessels of a CC of 800-1200 t, and 2 vessels of a CC > 1200 t (**Table 1**). The total carrying capacity weighed by the months of vessels' activities is 10 006 t. The total carrying capacity in 2022 increased by 2.6% in comparison with that of 2021 but remained in the range values of the last years.

3.2 Effort

The total nominal effort in 2022 for fishing and searching was respectively 2338 and 1902 days (**Figure 2, Table 2**), fishing effort continuing to decrease since 2014. The total annual number of fishing sets in 2022 reached 2042 (1804 positive sets and 238 null sets). A total of 1123 sets were associated with FOBs (mainly FADs) and 718 sets associated to FSC sets (**Table 3**). The proportion of positive sets is 97% on FOBs and 78% in FSC sets. In 2022, the percentage of FOB sets is 55% (**Figure 3**).

3.3 Spatial distribution of fishing operations

Spatial extent used by vessels decreased in 2022 compared to 2021 but in the continuity of the trend of decreasing since 2018 (**Figure 4, Table 6**). Most of the fishing ground in 2022 remained similar to that of the previous years with a withdrawal from the extreme northern and southern parts rich in skipjack tuna (**Figure 5, Figure 6 and Figure 8**).

3.4 Deployment of FADs

In the Atlantic Ocean, the number of deployments of dFADs has increased continuously over the last decade, except for the years 2019 and 2020 when the number of deployments decreased. This may be related to the consequences of COVID-19. (**Table 4, Table 5**).

Major areas of dFAD deployments spanned the whole fishing grounds of the French and associated flags purse seine fishery (**Figure 20**). dFADs were deployed all along the coast of West Africa, from Mauritania down to Angola with the most intense activity being observed along the equator and off the coasts of Gabon and Angola for the whole period, but also off the coast of Mauritania in 2019-2020.

3.5 dFAD densities

Maps of the number of dFAD passages in each 1°×1° grid cell clearly identify hotspots for dFAD locations (**Figure 21**). In 2022, the dFAD density map roughly follow the spatial distribution of fishing effort (in searching days), with areas of high density found in the Gulf of Guinea, the coast of Angola and along the equator in the eastern side of the basin.

3.6 Production, specific composition, and size distribution

Total catch of tropical tuna in the eastern Atlantic Ocean was marked since 1991 by a huge drop between 2003 and 2008 mainly due to the departure of 8 vessels for Indian Ocean. For instance, the French fleet was composed of 14 vessels in 2003 and only 6 in 2007. In 2022, landings of the principal market tunas by the French purse seine fleet operating in the Atlantic ocean reached a total of 42 729 t close to the catch levels previous to the drop in 2020-2021 due to a lower fishing activity during the COVID-19 pandemic (**Table 7, Figure 9**). Those landings are composed of 38.4%, 49.4%, 8.2%, 0% and 4% of YFT, SKJ, BET, ALB and other small tuna (**Table 8**), respectively.

Note that the catch of SKJ was higher to the YFT ones for the third time (in 2019 and 2021) since 1991. Catch composition on FSC was usually dominated by YFT whereas it was dominated by SKJ on FOB (**Figure 10**). In 2022, catches on FSC, YFT represented 81.3% of the total while SKJ and BET represented 7.7% and 10.7% of catches, respectively (**Table 9, Table 10**). Catches on FOB were predominated by SKJ tuna representing 73.9% of the catch while YFT and BET tunas represented 13.3% and 6.7% of catches, respectively. Finally, species composition values were quite similar to last year's species composition whatever the school type (**Table 11, Table 12**).

The size frequency distributions for the three species collected in 2022 for both FOB and all fishing mode combined sets are quite similar to the average frequency distribution observed for the period 2016-2020 (**Figure 12, Figure 13**).

3.7 Yield and nominal catch per unit of effort (CPUE)

Historically, the number of sets for FOB by searching day was between 0.2 and 0.3 until 2009, except around 1995 for which the rate peak to 0.38 (**Table 15**). Since 2009, the number of sets for FOB by searching day leapt above 0.4 and continued to slightly increase (**Figure 14**). Regarding the FSC, this rate describes a bell-shaped curve starting around 0.5 in the 90's, peaking at 0.79 in 2008 before returning to 0.5 in 2018 (**Figure 15**). The year 2022 remained in these two trends with an increase of number of sets by searching day on FOB (0.59), the higher value registered ever, and a value around 0.5 for FSC (0.48). Regarding the mean catch per set, values remained on the range of the last years (**Table 16, Table 17 and Figure 17**). Nominal CPUE regarding the fishing time in 2022 to catch per set patterns increased compare to 2021 for FOB (except for YFT) and increased for FSC, except for BET (**Table 18 and Table 19, Figure 18 and Figure 19**).

3.8 Tuna discards

Tunas are discarded when individuals are damaged and are therefore not suitable for human consumption. In 2022, all tunas were discarded dead. Discards of major tunas were estimated by observers to 106 t of SKJ, 25 t of YFT, 2 t of BET and 0 t of ALB (**Table 13**). For minor tunas such as *Euthynnus alletteratus* (LTA), *Auxis thazard* (FRI) and *Auxis rochei* (BLT), discards were estimated to respectively 8 t, 13 t and 0 t (**Table 13**).

3.9 Bycatch (retained and discarded)

Bycatch monitored by onboard observers were composed of billfishes, various bony fishes, as well as endangered, threatened and protected (ETP) species such as sharks, rays, turtles and cetaceans in 2022 (**Table 14**). The total amount of bycatch caught was estimated to 569 t of which 313 t were retained onboard and 256 t discarded at sea, the latter representing 45% of the bycatch (in t).

The most abundant bycatch species in total weight in 2022 (apart from whales that are always released before the brailing operations) were *Elagatis bipinnulata* (RRU) with 138 t, *Canthidermis maculata* (CNT) with 110 t caught, *Carcharhinus falciformis* (FAL) with 65 t, *Caranx crysos* (RUB) with 57 t, *Makaira nigricans* (BUM) with 45 t, *Acanthocybium solandri* (WAH) with 43 t, *Coryphaena hippurus* (DOL) with 26 t, and *Sphyraena barracuda* (GBA) with 6 t (**Table 14**).

Billfishes and other bony fishes are generally retained onboard to be sold on local markets and to some extent for crew consumption, but it largely varies among species. For example, only 19% of BUM were discarded, 52% of CNT, 3% of GBA, 24% of RRU, 38% of RUB, and 6% of WAH (**Table 14**).

Sharks, rays, turtles, and cetaceans are always discarded following ICCAT Recommendations, which was the case in 2022 with very rare exceptions (3% of *Pteroplatytrygon violacea* retained; **Table 14**). Efforts are made by the fishermen so the sharks, rays, turtles and cetaceans are handled following good practices and released alive when possible.

4. Conclusion

After a drop in activities, the year 2022 was characterized by a return of the fishing level to the years before 2020.

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Table 1. Annual number of purse seiners by size categories and total carrying capacity of European tropical tuna purse seine fishing fleet in the Atlantic Ocean during 1991-2 Total carrying capacity (CC) was weighted by the proportion of the year at sea months).

Year	*50-400*	*400-600*	*600-800*	*800-1200*	*1200-2000*	*> 2000*	*Nb_vessel*	*Nb_vessel_weighted*	*CC*
1991	2	9	6	6	0	0	23	17.42	11910
1992	1	8	2	6	0	0	17	16.08	11510
1993	1	8	3	6	0	0	18	16.33	11923
1994	1	8	3	6	0	0	18	16.83	12151
1995	0	10	2	5	0	0	17	14.92	10850
1996	0	9	2	5	0	0	16	15.75	11231
1997	0	10	2	5	2	0	19	14.67	11306
1998	0	7	2	6	0	0	15	14.58	10910
1999	0	8	2	5	0	0	15	14.00	10376
2000	0	7	2	5	0	0	14	13.50	10086
2001	0	7	2	7	1	0	17	14.00	11153
2002	0	8	3	5	1	0	17	12.25	9441
2003	0	8	1	5	0	0	14	12.42	9464
2004	0	6	1	5	0	0	12	10.08	8188
2005	0	4	0	5	0	0	9	8.25	6833
2006	0	4	0	3	0	0	7	5.42	3890
2007	1	3	0	2	0	0	6	4.92	3460
2008	0	3	2	2	0	0	7	4.67	3600
2009	0	1	2	4	3	0	10	7.33	6905
2010	0	1	2	4	3	0	10	9.08	8871
2011	0	1	2	4	2	0	9	8.17	7972
2012	0	0	2	5	2	0	9	8.67	9004
2013	0	0	2	5	2	0	9	8.42	8733
2014	0	0	2	5	2	0	9	8.92	9258
2015	0	0	2	5	2	0	9	8.75	9133
2016	0	0	2	7	2	0	11	9.50	9832
2017	0	0	2	6	2	0	10	9.58	9812
2018	0	0	2	6	2	0	10	9.58	9888
2019	0	0	2	6	2	0	10	9.58	9902
2020	0	0	1	6	2	0	9	8.83	9401
2021	0	0	1	7	2	0	10	9.33	9750
2022	0	0	1	7	2	0	10	9.67	10006

Table 2. Annual nominal fishing effort of the French purse seine fishing fleet expressed and searching days during 1991-2022. Searching days was derived from the t spent at sea corrected for periods of damage, route towards the port, and pu operation. The duration per day for fishing activities is 12 hours.

Year	*Number of trips*	*Mean duration in days*	*Days at sea*	*Fishing days*	*Set duration in days*	*Searching days*
1991	163	28	5088	4843	650	4193
1992	151	29	4627	4568	499	4069
1993	180	24	4621	4576	608	3969
1994	188	24	4847	4815	590	4225
1995	156	26	4335	4293	576	3717
1996	158	28	4618	4550	640	3910
1997	136	29	4327	4300	471	3829
1998	133	32	4396	4361	524	3837
1999	133	28	4049	3933	499	3434
2000	127	30	3968	3898	478	3419
2001	124	30	4086	4049	458	3590
2002	125	26	3468	3364	409	2955
2003	136	24	3463	3360	523	2837
2004	97	28	2942	2855	387	2469
2005	84	26	2309	2274	302	1973
2006	61	22	1453	1388	198	1189
2007	47	29	1396	1322	174	1148
2008	45	26	1303	1263	211	1052
2009	64	29	2075	2019	326	1693
2010	75	31	2625	2549	439	2110
2011	76	27	2290	2214	393	1821
2012	72	32	2530	2474	395	2079
2013	82	27	2402	2341	420	1921
2014	75	32	2597	2545	449	2096
2015	84	27	2453	2406	431	1975
2016	86	29	2801	2706	500	2207
2017	83	31	2853	2794	492	2302
2018	88	30	2850	2798	527	2271
2019	93	28	2829	2899	478	2421
2020	77	30	2212	2052	326	1726
2021	70	34	2320	2254	337	1917
2022	82	29	2390	2338	436	1902

Table 3. Number of positive and null sets by fishing mode made by the French purse s fishing fleet in the Atlantic Ocean during 1991-2022. A = All, L = FOB, floa object; F = FSC, free-swimming tuna school.

Year	*a_total*	*a_positive*	*a_null*	*l_total*	*l_positive*	*l_null*	*f_total*	*f_positive*	*f_null*	*% on FOB*
1991	3247	2521	726	853	772	81	2394	1749	645	26
1992	2685	2140	545	955	857	98	1730	1283	447	36
1993	3232	2650	582	1172	1116	56	2060	1534	526	36
1994	3135	2581	554	1377	1296	81	1758	1285	473	44
1995	3126	2508	618	1394	1294	100	1732	1214	518	45
1996	3519	2670	849	1347	1212	135	2172	1458	714	38
1997	2598	1908	690	816	725	91	1782	1183	599	31
1998	2889	2162	727	988	913	75	1901	1249	652	34
1999	2745	1995	750	720	653	67	2025	1342	683	26
2000	2616	1971	645	683	622	61	1933	1349	584	26
2001	2500	1904	596	630	560	70	1870	1344	526	25
2002	2209	1678	531	577	545	32	1632	1133	499	26
2003	2838	2263	575	701	662	39	2137	1601	536	25
2004	2075	1657	418	712	669	43	1363	988	375	34
2005	1613	1297	316	459	439	20	1154	858	296	28
2006	1059	828	231	221	214	7	838	614	224	21
2007	820	636	184	171	156	15	649	480	169	21
2008	1018	770	248	188	177	11	830	593	237	18
2009	1595	1253	342	451	400	51	1144	853	291	28
2010	2133	1725	408	872	826	46	1261	899	362	41
2011	1908	1503	405	645	586	59	1263	917	346	34
2012	1913	1556	357	900	813	87	1013	743	270	47
2013	2016	1631	385	824	748	76	1192	883	309	41
2014	2122	1810	312	932	884	48	1190	926	264	44
2015	2023	1736	287	960	907	53	1063	829	234	47
2016	2359	2008	351	949	905	44	1410	1103	307	40
2017	2335	1996	339	1044	1002	42	1291	994	297	45
2018	2480	2141	339	1204	1170	34	1276	971	305	49
2019	2278	1977	301	1148	1125	23	1130	852	278	50
2020	1547	1312	235	697	682	15	850	630	220	45
2021	1655	1484	171	1047	1017	30	608	467	141	63
2022	2042	1804	238	1123	1086	37	919	718	201	55

Table 4. Number of drifting Fish Aggregating Devices (dFADs) deployed by the French fleet from 2013 to 2022.

year	*objects*	*total buoys*	*new buoys*
2013	476	321	307
2014	485	1340	1146
2015	423	1398	1160
2016	709	1785	1522
2017	1197	2444	2053
2018	1054	2486	2106
2019	700	2123	1811
2020	725	1796	1567
2021	1100	2396	2170
2022	1551	2955	2555

Table 5. Number of drifting Fish Aggregating Devices (dFADs) deployed by the French fleet from 2013 to 2022.

year	*PS vessels*	*buoys (PS)*	*supply vessels*	*buoys (supply)*	*total buoys*
2013	5	82	1	239	321
2014	9	1001	1	339	1340
2015	9	1081	1	317	1398
2016	11	1428	1	357	1785
2017	10	1714	1	730	2444
2018	10	2486	0	0	2486
2019	10	2123	0	0	2123
2020	9	1796	0	0	1796
2021	10	2396	0	0	2396
2022	10	2955	0	0	2955

Table 6. Annual number of 1-degree squares explored by the French purse seine fishing fleet during 1991-2022. #sets indicate squares where a least 1 fishing set was made.

year	*total*	*#sets*	*Catch > 0*	*Effort > 1 d*	*Effort > 5 d*
1991	389	292	272	309	195
1992	423	293	287	324	188
1993	374	270	260	289	172
1994	420	337	334	348	217
1995	405	307	299	312	164
1996	391	302	291	313	185
1997	464	334	295	357	198
1998	466	355	332	352	182
1999	365	272	260	280	172
2000	368	289	274	288	162
2001	412	283	272	303	176
2002	360	262	249	275	153
2003	358	247	240	257	147
2004	343	254	240	250	129
2005	350	232	216	243	119
2006	264	167	161	176	72
2007	296	167	154	197	63
2008	258	156	146	154	67
2009	332	221	206	215	95
2010	325	256	241	243	120
2011	364	248	235	242	97
2012	345	245	232	213	103
2013	369	239	230	223	86
2014	344	238	229	222	104
2015	274	219	212	187	92
2016	388	243	238	241	105
2017	363	250	246	230	117
2018	417	287	278	242	108
2019	396	275	270	247	108
2020	388	225	218	216	98
2021	349	219	217	219	99
2022	342	211	207	198	96

Table 7. Catch (in t) by tuna species made on FOB-associated (FOB) and free-swimming tuna schools (FSC) for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	*YFT*	*SKJ*	*BET*	*ALB*	*OTH*	*TOTAL*
1991	30172	31814	3327	50	529	65893
1992	30778	20383	4985	451	236	56833
1993	33590	31537	10629	565	83	76404
1994	32381	30251	10075	130	140	72977
1995	27850	22542	6262	83	182	56919
1996	32179	21370	6778	191	184	60702
1997	29065	13335	4209	39	157	46805
1998	30468	14144	3641	40	146	48440
1999	28833	19457	3383	13	104	51791
2000	29506	16642	3936	23	94	50200
2001	31183	13774	3943	11	109	49020
2002	32982	13806	3597	18	113	50517
2003	32268	17318	3289	63	159	53096
2004	23413	19982	2417	19	168	45998
2005	22073	12606	1913	478	47	37117
2006	18353	5423	2402	347	10	26534
2007	13245	4427	781	12	248	18713
2008	15929	3661	989	50	0	20629
2009	18545	6602	2043	60	24	27274
2010	19974	13983	3199	109	99	37365
2011	21427	12088	3268	53	152	36990
2012	18243	11749	3574	161	273	33999
2013	20260	15559	3197	73	256	39345
2014	22192	16903	3763	49	151	43057
2015	20055	19893	2752	60	267	43027
2016	25684	18064	4387	65	481	48682
2017	25626	15295	3582	99	1128	45730
2018	24441	21926	3843	27	976	51214
2019	17554	19146	4859	18	899	42477
2020	15681	12161	1957	11	452	30261
2021	12513	16109	1737	21	810	31190
2022	16398	21129	3497	17	1688	42729

Table 8. Percentage of catches by tuna species made on FOB-associated (FOB) and free-swimming tuna schools (FSC) for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	YFT	SKJ	BET	ALB	OTH	TOTAL
1991	45.8	48.3	5.0	0.1	0.8	65893
1992	54.2	35.9	8.8	0.8	0.4	56833
1993	44.0	41.3	13.9	0.7	0.1	76404
1994	44.4	41.5	13.8	0.2	0.2	72977
1995	48.9	39.6	11.0	0.1	0.3	56919
1996	53.0	35.2	11.2	0.3	0.3	60702
1997	62.1	28.5	9.0	0.1	0.3	46805
1998	62.9	29.2	7.5	0.1	0.3	48440
1999	55.7	37.6	6.5	0.0	0.2	51791
2000	58.8	33.2	7.8	0.0	0.2	50200
2001	63.6	28.1	8.0	0.0	0.2	49020
2002	65.3	27.3	7.1	0.0	0.2	50517
2003	60.8	32.6	6.2	0.1	0.3	53096
2004	50.9	43.4	5.3	0.0	0.4	45998
2005	59.5	34.0	5.2	1.3	0.1	37117
2006	69.2	20.4	9.1	1.3	0.0	26534
2007	70.8	23.7	4.2	0.1	1.3	18713
2008	77.2	17.7	4.8	0.2	0.0	20629
2009	68.0	24.2	7.5	0.2	0.1	27274
2010	53.5	37.4	8.6	0.3	0.3	37365
2011	57.9	32.7	8.8	0.1	0.4	36990
2012	53.7	34.6	10.5	0.5	0.8	33999
2013	51.5	39.5	8.1	0.2	0.6	39345
2014	51.5	39.3	8.7	0.1	0.3	43057
2015	46.6	46.2	6.4	0.1	0.6	43027
2016	52.8	37.1	9.0	0.1	1.0	48682
2017	56.0	33.4	7.8	0.2	2.5	45730
2018	47.7	42.8	7.5	0.1	1.9	51214
2019	41.3	45.1	11.4	0.0	2.1	42477
2020	51.8	40.2	6.5	0.0	1.5	30261
2021	40.1	51.6	5.6	0.1	2.6	31190
2022	38.4	49.4	8.2	0.0	4.0	42729

Table 9. Catch (in t) by tuna species made on free-swimming schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	YFT	SKJ	BET	ALB	OTH	TOTAL
1991	25696	15349	826	50	417	42339
1992	24662	4013	1366	451	208	30700
1993	26867	7653	3776	565	11	38872
1994	23257	7979	1703	130	81	33150
1995	22301	4387	988	79	78	27834
1996	26430	4634	1837	191	11	33102
1997	24694	4259	1264	39	35	30290
1998	25799	5419	930	40	33	32221
1999	23038	7980	1067	13	30	32128
2000	25170	5435	1240	23	10	31878
2001	28094	4982	1608	11	33	34727
2002	28784	4498	1310	18	3	34614
2003	27936	6382	1456	63	4	35840
2004	19671	5380	516	19	73	25660
2005	19527	2801	749	472	0	23548
2006	17727	1498	1861	347	0	21433
2007	12733	970	455	12	0	14170
2008	15372	1558	598	50	0	17578
2009	17456	1071	1104	60	0	19691
2010	16973	2687	1668	97	8	21433
2011	19449	2646	1493	41	56	23685
2012	15486	414	1253	146	23	17323
2013	17784	3242	1224	58	47	22356
2014	17801	2303	1911	29	10	22055
2015	15849	2974	908	39	35	19805
2016	20942	3976	1748	42	68	26777
2017	21591	1226	1088	90	32	24028
2018	21729	3681	1453	26	19	26908
2019	15089	1109	2860	16	13	19086
2020	13404	670	909	7	19	15010
2021	8809	883	456	19	22	10189
2022	12815	1221	1692	12	32	15772

Table 10. Percentage of catch by tuna species made on free-swimming tuna schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	YFT	SKJ	BET	ALB	OTH	TOTAL
1991	60.7	36.3	2.0	0.1	1.0	42339
1992	80.3	13.1	4.4	1.5	0.7	30700
1993	69.1	19.7	9.7	1.5	0.0	38872
1994	70.2	24.1	5.1	0.4	0.2	33150
1995	80.1	15.8	3.5	0.3	0.3	27834
1996	79.8	14.0	5.6	0.6	0.0	33102
1997	81.5	14.1	4.2	0.1	0.1	30290
1998	80.1	16.8	2.9	0.1	0.1	32221
1999	71.7	24.8	3.3	0.0	0.1	32128
2000	79.0	17.0	3.9	0.1	0.0	31878
2001	80.9	14.3	4.6	0.0	0.1	34727
2002	83.2	13.0	3.8	0.1	0.0	34614
2003	77.9	17.8	4.1	0.2	0.0	35840
2004	76.7	21.0	2.0	0.1	0.3	25660
2005	82.9	11.9	3.2	2.0	0.0	23548
2006	82.7	7.0	8.7	1.6	0.0	21433
2007	89.9	6.8	3.2	0.1	0.0	14170
2008	87.4	8.9	3.4	0.3	0.0	17578
2009	88.6	5.4	5.6	0.3	0.0	19691
2010	79.2	12.5	7.8	0.5	0.0	21433
2011	82.1	11.2	6.3	0.2	0.2	23685
2012	89.4	2.4	7.2	0.8	0.1	17322
2013	79.6	14.5	5.5	0.3	0.2	22356
2014	80.7	10.4	8.7	0.1	0.0	22055
2015	80.0	15.0	4.6	0.2	0.2	19805
2016	78.2	14.9	6.5	0.2	0.3	26777
2017	89.9	5.1	4.5	0.4	0.1	24028
2018	80.8	13.7	5.4	0.1	0.1	26908
2019	79.1	5.8	15.0	0.1	0.1	19086
2020	89.3	4.5	6.1	0.0	0.1	15010
2021	86.5	8.7	4.5	0.2	0.2	10189
2022	81.3	7.7	10.7	0.1	0.2	15772

Table 11. Catch (in t) by tuna species made on FOB-associated schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	YFT	SKJ	BET	ALB	OTH	TOTAL
1991	4476	16465	2501	0	112	23554
1992	6116	16370	3619	0	28	26133
1993	6723	23884	6853	0	72	37532
1994	9124	22273	8372	0	59	39827
1995	5549	18155	5274	4	103	29084
1996	5750	16736	4941	0	173	27599
1997	4371	9076	2945	0	122	16515
1998	4669	8725	2712	0	113	16219
1999	5795	11478	2316	0	74	19663
2000	4335	11207	2696	0	84	18322
2001	3090	8792	2335	0	76	14292
2002	4198	9308	2287	0	110	15903
2003	4332	10937	1833	0	155	17256
2004	3742	14602	1901	0	94	20338
2005	2547	9805	1165	5	47	13569
2006	626	3925	541	0	10	5102
2007	512	3457	326	0	248	4543
2008	557	2103	391	0	0	3051
2009	1089	5531	939	0	24	7583
2010	3001	11297	1530	13	92	15932
2011	1978	9443	1776	12	96	13305
2012	2756	11335	2321	15	250	16677
2013	2476	12317	1972	15	208	16989
2014	4391	14599	1852	19	140	21002
2015	4206	16919	1844	22	232	23222
2016	4742	14088	2639	23	414	21905
2017	4035	14069	2494	9	1096	21702
2018	2712	18245	2390	1	957	24307
2019	2466	18037	1999	2	887	23391
2020	2277	11490	1048	4	432	15251
2021	3704	15226	1282	2	788	21002
2022	3583	19908	1805	5	1656	26958

Table 12. Percentage of catch by tuna species made on FOB-associated schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	YFT	SKJ	BET	ALB	OTH	TOTAL
1991	19.0	69.9	10.6	0.0	0.5	23554
1992	23.4	62.6	13.8	0.0	0.1	26133
1993	17.9	63.6	18.3	0.0	0.2	37532
1994	22.9	55.9	21.0	0.0	0.1	39827
1995	19.1	62.4	18.1	0.0	0.4	29084
1996	20.8	60.6	17.9	0.0	0.6	27599
1997	26.5	55.0	17.8	0.0	0.7	16515
1998	28.8	53.8	16.7	0.0	0.7	16219
1999	29.5	58.4	11.8	0.0	0.4	19663
2000	23.7	61.2	14.7	0.0	0.5	18322
2001	21.6	61.5	16.3	0.0	0.5	14292
2002	26.4	58.5	14.4	0.0	0.7	15903
2003	25.1	63.4	10.6	0.0	0.9	17256
2004	18.4	71.8	9.3	0.0	0.5	20338
2005	18.8	72.3	8.6	0.0	0.3	13569
2006	12.3	76.9	10.6	0.0	0.2	5102
2007	11.3	76.1	7.2	0.0	5.5	4543
2008	18.3	68.9	12.8	0.0	0.0	3051
2009	14.4	72.9	12.4	0.0	0.3	7583
2010	18.8	70.9	9.6	0.1	0.6	15932
2011	14.9	71.0	13.3	0.1	0.7	13305
2012	16.5	68.0	13.9	0.1	1.5	16677
2013	14.6	72.5	11.6	0.1	1.2	16989
2014	20.9	69.5	8.8	0.1	0.7	21002
2015	18.1	72.9	7.9	0.1	1.0	23222
2016	21.6	64.3	12.0	0.1	1.9	21905
2017	18.6	64.8	11.5	0.0	5.0	21702
2018	11.2	75.1	9.8	0.0	3.9	24306
2019	10.5	77.1	8.5	0.0	3.8	23391
2020	14.9	75.3	6.9	0.0	2.8	15252
2021	17.6	72.5	6.1	0.0	3.8	21002
2022	13.3	73.9	6.7	0.0	6.1	26958

Table 13. Discards (in t) of major and minor tuna species for the French purse seine fishing fleet in the Atlantic ocean in 2022.

Species group	FAO code	Scientific name	DD (t)
Tunas nei	ALB	*Thunnus alalunga*	0.000
Tunas nei	BET	*Thunnus obesus*	2.079
Tunas nei	BLT	*Auxis rochei*	0.000
Tunas nei	FRI	*Auxis thazard*	12.944
Tunas nei	LTA	*Euthynnus alletteratus*	8.082
Tunas nei	SKJ	*Katsuwonus pelamis*	106.350
Tunas nei	YFT	*Thunnus albacares*	25.322

Table 14. Bycatch (in t) of bycatch species caught by the French purse seine fishing the Atlantic Ocean in 2022. T: total catch (L+D), L: retained catch, DD: dis dead, DL: discarded alive, D: discarded (DD+DL).

Species group	*FAO code*	*Scientific name*	*Tl (t)*	*L (t)*	*DD (t)*	*DL (t)*	*D (t)*	*D (%)*
Billfishes	BUM	*Makaira nigricans*	45.301	36.475	8.400	0.426	8.826	19
Billfishes	SAI	*Istiophorus albicans*	11.710	10.704	0.982	0.024	1.006	9
Billfishes	WHM	*Kajikia albida*	0.091	0.091	0.000	0.000	0.000	0
Other bony fishes	ALM	*Aluterus monoceros*	0.158	0.105	0.030	0.023	0.053	34
Other bony fishes	CFW	*Coryphaena equiselis*	0.002	0.002	0.000	0.000	0.000	0
Other bony fishes	CNT	*Canthidermis maculata*	109.648	52.085	25.176	32.387	57.563	52
Other bony fishes	DOL	*Coryphaena hippurus*	25.682	21.785	3.772	0.125	3.897	15
Other bony fishes	GBA	*Sphyraena barracuda*	5.920	5.757	0.144	0.019	0.163	3
Other bony fishes	LGH	*Lagocephalus lagocephalus*	0.000	0.000	0.000	0.000	0.000	NaN
Other bony fishes	MOX	*Mola mola*	1.090	0.000	0.019	1.071	1.090	100
Other bony fishes	MRW	*Masturus lanceolatus*	0.386	0.000	0.030	0.356	0.386	100
Other bony fishes	NAU	*Naucrates ductor*	0.000	0.000	0.000	0.000	0.000	NaN
Other bony fishes	OIL	*Ruvettus pretiosus*	0.020	0.013	0.007	0.000	0.007	35
Other bony fishes	POA	*Brama brama*	0.000	0.000	0.000	0.000	0.000	NaN
Other bony fishes	RRU	*Elagatis bipinnulata*	138.154	104.949	15.456	17.749	33.205	24
Other bony fishes	RUB	*Caranx crysos*	57.357	35.678	6.014	15.665	21.679	38
Other bony fishes	TAL	*Taractichthys longipinnis*	0.000	0.000	0.000	0.000	0.000	NaN
Other bony fishes	TRG	*Balistes capriscus*	0.341	0.094	0.042	0.205	0.247	72
Other bony fishes	USE	*Uraspis secunda*	0.016	0.016	0.000	0.000	0.000	0
Other bony fishes	WAH	*Acanthocybium solandri*	42.622	40.082	2.442	0.098	2.540	6
Other bony fishes	YTL	*Seriola rivoliana*	5.695	4.561	0.353	0.781	1.134	20
Rays	PLS	*Pteroplatytrygon violacea*	0.172	0.006	0.017	0.149	0.166	97
Rays	RMM	*Mobula mobular*	2.537	0.000	0.000	2.537	2.537	100
Rays	RMO	*Mobula thurstoni*	0.120	0.000	0.000	0.120	0.120	100
Rays	RMT	*Mobula tarapacana*	5.562	0.000	0.000	5.562	5.562	100
Sharks	BSH	*Prionace glauca*	0.375	0.000	0.226	0.149	0.375	100
Sharks	FAL	*Carcharhinus falciformis*	65.443	0.141	12.320	52.982	65.302	100
Sharks	OCS	*Carcharhinus longimanus*	0.654	0.000	0.026	0.628	0.654	100
Sharks	SMA	*Isurus oxyrinchus*	0.611	0.000	0.250	0.361	0.611	100
Sharks	SPL	*Sphyrna lewini*	3.062	0.000	0.190	2.872	3.062	100
Sharks	SPN	*Sphyrna spp*	0.065	0.000	0.000	0.065	0.065	100
Sharks	SPZ	*Sphyrna zygaena*	6.329	0.000	0.997	5.332	6.329	100
Whale shark	RHN	*Rhincodon typus*	39.903	0.000	0.000	39.903	39.903	100

Table 15. Number of sets per searching days on FOBs and FSC for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	*ALL*	*FOB*	*FSC*
1991	0.77	0.20	0.57
1992	0.66	0.23	0.43
1993	0.81	0.30	0.52
1994	0.74	0.33	0.42
1995	0.84	0.38	0.47
1996	0.90	0.34	0.56
1997	0.68	0.21	0.47
1998	0.75	0.26	0.50
1999	0.80	0.21	0.59
2000	0.77	0.20	0.57
2001	0.70	0.17	0.52
2002	0.75	0.20	0.55
2003	1.00	0.25	0.75
2004	0.84	0.29	0.55
2005	0.82	0.23	0.59
2006	0.89	0.19	0.70
2007	0.71	0.15	0.57
2008	0.97	0.18	0.79
2009	0.94	0.27	0.68
2010	1.01	0.41	0.60
2011	1.05	0.35	0.69
2012	0.92	0.43	0.49
2013	1.05	0.43	0.62
2014	1.01	0.44	0.57
2015	0.99	0.47	0.52
2016	1.06	0.43	0.63
2017	1.01	0.45	0.56
2018	1.09	0.53	0.56
2019	0.94	0.47	0.47
2020	0.90	0.40	0.49
2021	0.86	0.55	0.32
2022	1.07	0.59	0.48

Table 16. Catch per unit of effort (in t per positive set) on FOB-associated schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	*YFT*	*SKJ*	*BET*	*TOTAL*
1991	1.07	3.93	0.60	5.62
1992	1.50	4.02	0.89	6.54
1993	1.69	6.02	1.73	9.55
1994	2.16	5.27	1.98	9.58
1995	1.49	4.88	1.42	8.05
1996	1.47	4.28	1.26	7.16
1997	1.14	2.37	0.77	4.40
1998	1.22	2.27	0.71	4.40
1999	1.69	3.34	0.67	5.79
2000	1.27	3.28	0.79	5.45
2001	0.86	2.45	0.65	4.03
2002	1.42	3.15	0.77	5.40
2003	1.53	3.86	0.65	6.16
2004	1.52	5.92	0.77	8.28
2005	1.29	4.97	0.59	6.88
2006	0.53	3.30	0.46	4.29
2007	0.45	3.01	0.28	3.98
2008	0.53	2.00	0.37	2.94
2009	0.64	3.27	0.55	4.48
2010	1.42	5.35	0.72	7.55
2011	1.09	5.18	0.98	7.31
2012	1.33	5.45	1.12	8.05
2013	1.29	6.41	1.03	8.94
2014	2.09	6.96	0.88	10.13
2015	2.05	8.24	0.90	11.57
2016	2.13	6.33	1.19	10.01
2017	1.75	6.11	1.08	9.54
2018	1.19	8.03	1.05	10.82
2019	1.02	7.45	0.83	9.70
2020	1.32	6.66	0.61	8.85
2021	1.93	7.94	0.67	10.98
2022	1.88	10.47	0.95	14.22

Table 17. Catch per unit of effort (in t per positive set) on free-swimming tuna schools (FSC) for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	YFT	SKJ	BET	TOTAL
1991	6.13	3.66	0.20	10.10
1992	6.06	0.99	0.34	7.60
1993	6.77	1.93	0.95	9.81
1994	5.50	1.89	0.40	7.92
1995	6.00	1.18	0.27	7.51
1996	6.76	1.19	0.47	8.51
1997	6.45	1.11	0.33	7.91
1998	6.72	1.41	0.24	8.43
1999	6.71	2.32	0.31	9.41
2000	7.36	1.59	0.36	9.33
2001	7.82	1.39	0.45	9.67
2002	9.74	1.52	0.44	11.73
2003	9.85	2.25	0.51	12.72
2004	7.97	2.18	0.21	10.39
2005	9.90	1.42	0.38	11.94
2006	14.91	1.26	1.56	18.02
2007	11.09	0.84	0.40	12.34
2008	14.62	1.48	0.57	16.72
2009	10.31	0.63	0.65	11.63
2010	8.04	1.27	0.79	10.16
2011	10.68	1.45	0.82	13.01
2012	7.45	0.20	0.60	8.34
2013	9.26	1.69	0.64	11.64
2014	8.48	1.10	0.91	10.51
2015	7.72	1.45	0.44	9.69
2016	9.41	1.79	0.78	12.07
2017	9.38	0.53	0.47	10.47
2018	9.57	1.62	0.64	11.86
2019	6.23	0.46	1.18	7.88
2020	7.76	0.39	0.53	8.70
2021	4.60	0.46	0.24	5.32
2022	6.74	0.64	0.89	8.31

Table 18. Catch per unit of effort (in t per searching day) on FOB-associated schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	*YFT*	*SKJ*	*BET*	*TOTAL*
1991	5.80	21.33	3.24	30.54
1992	7.14	19.10	4.22	31.05
1993	6.02	21.40	6.14	33.95
1994	7.04	17.19	6.46	31.24
1995	4.29	14.03	4.08	23.12
1996	4.74	13.81	4.08	23.09
1997	6.03	12.52	4.06	23.24
1998	5.11	9.56	2.97	18.50
1999	8.88	17.58	3.55	30.44
2000	6.97	18.02	4.34	29.97
2001	5.52	15.70	4.17	25.82
2002	7.70	17.08	4.20	29.28
2003	6.54	16.52	2.77	26.40
2004	5.59	21.83	2.84	30.55
2005	5.80	22.34	2.65	30.91
2006	2.92	18.34	2.53	23.85
2007	3.28	22.16	2.09	29.29
2008	3.15	11.88	2.21	17.45
2009	2.72	13.83	2.35	18.96
2010	3.63	13.68	1.85	19.29
2011	3.38	16.11	3.03	22.70
2012	3.39	13.94	2.85	20.59
2013	3.31	16.47	2.64	22.96
2014	4.97	16.52	2.10	24.05
2015	4.64	18.65	2.03	26.21
2016	5.24	15.57	2.92	24.63
2017	4.03	14.04	2.49	21.90
2018	2.32	15.59	2.04	21.01
2019	2.19	16.03	1.78	20.88
2020	3.34	16.85	1.54	22.41
2021	3.64	14.97	1.26	20.70
2022	3.30	18.33	1.66	24.91

Table 19. Catch per unit of effort (in t per searching day) on free-swimming tuna schools (FSC) for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

Year	*YFT*	*SKJ*	*BET*	*TOTAL*
1991	14.69	8.78	0.47	24.21
1992	19.22	3.13	1.06	24.09
1993	17.51	4.99	2.46	25.38
1994	18.10	6.21	1.32	26.04
1995	18.37	3.61	0.81	23.00
1996	18.13	3.18	1.26	22.81
1997	20.87	3.60	1.07	25.61
1998	20.66	4.34	0.74	25.88
1999	17.17	5.95	0.80	24.08
2000	18.66	4.03	0.92	23.64
2001	20.90	3.71	1.20	25.84
2002	25.41	3.97	1.16	30.59
2003	17.45	3.99	0.91	22.54
2004	19.91	5.44	0.52	25.97
2005	22.76	3.26	0.87	27.44
2006	28.87	2.44	3.03	34.91
2007	26.53	2.02	0.95	29.52
2008	25.92	2.63	1.01	29.64
2009	20.46	1.26	1.29	23.09
2010	18.88	2.99	1.86	23.84
2011	21.21	2.88	1.63	25.83
2012	20.84	0.56	1.69	23.34
2013	20.14	3.67	1.39	25.32
2014	19.22	2.49	2.06	23.83
2015	19.12	3.59	1.09	24.02
2016	18.99	3.60	1.58	24.36
2017	21.72	1.23	1.09	24.24
2018	22.38	3.79	1.50	27.74
2019	17.71	1.30	3.36	22.40
2020	21.28	1.06	1.44	23.85
2021	18.86	1.89	0.98	21.82
2022	17.85	1.70	2.36	22.00

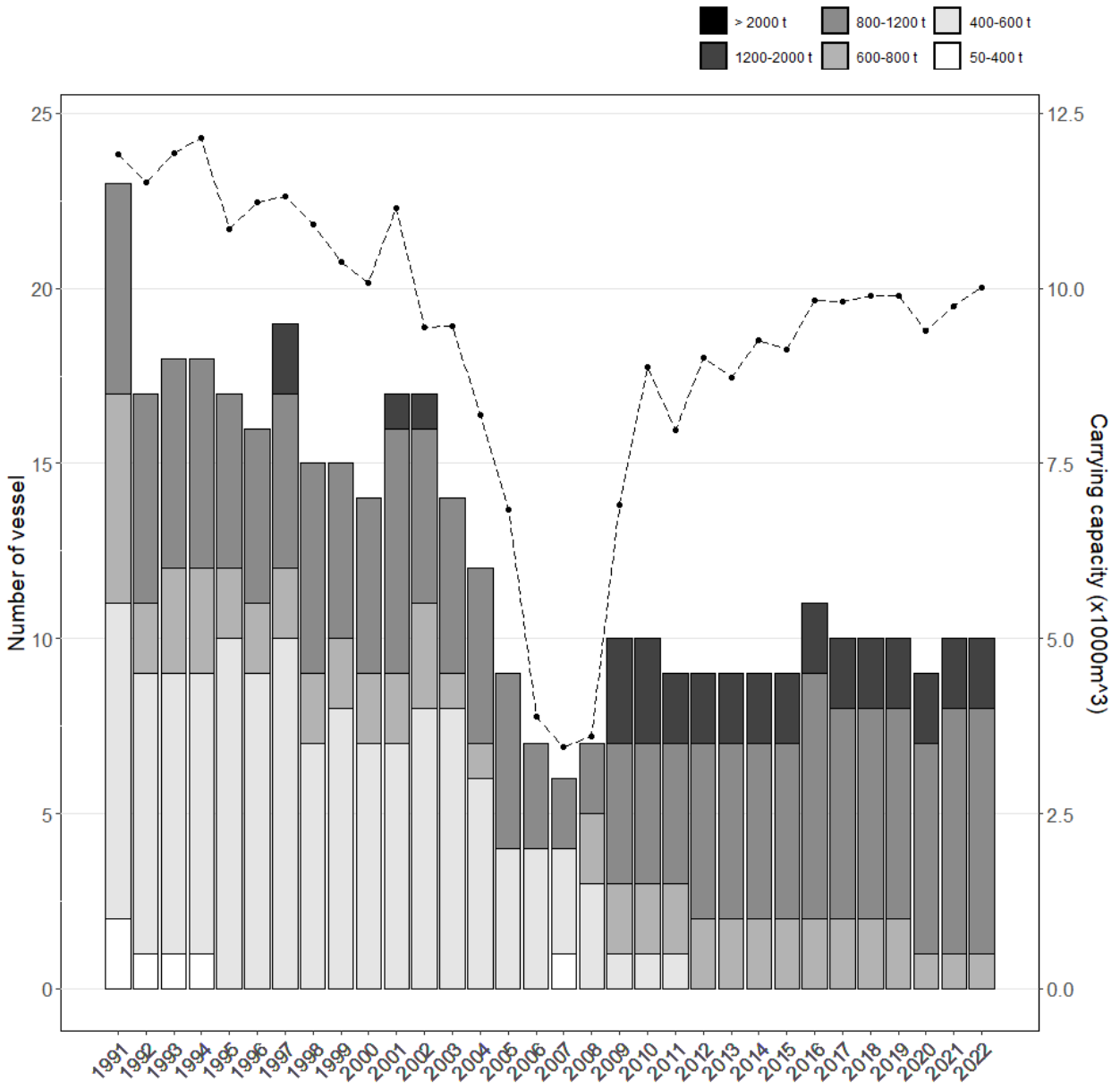

Figure 1. Fishing capacity of the French purse seine fishing fleet in the Atlantic Ocean. Annual changes in the number of purse seiners by tonnage categories (barplots) and total carrying capacity (dashed line with circles) during 1991-2022.

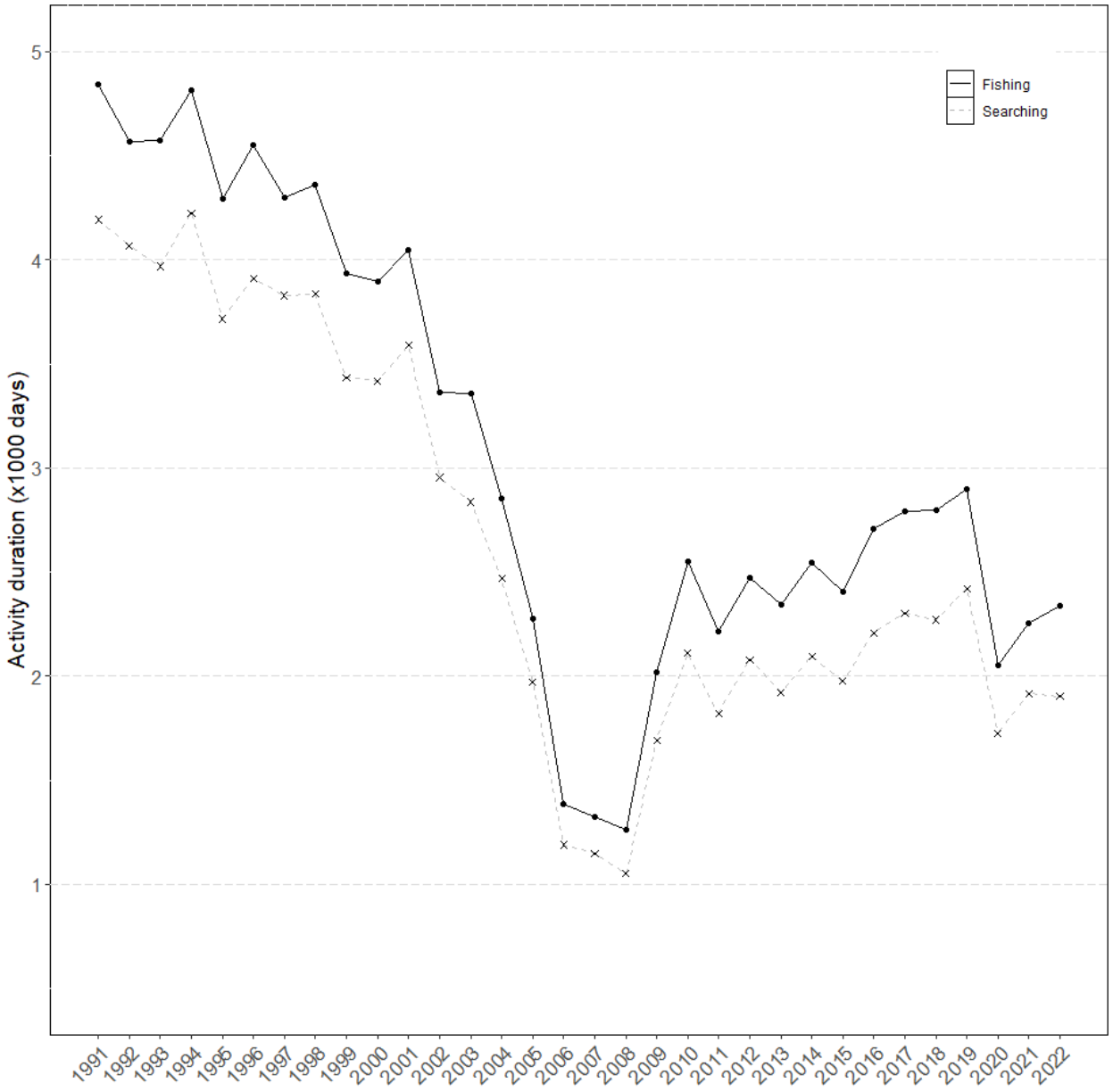

Figure 2. Changes in nominal effort over time. Annual total number of fishing and searching days for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

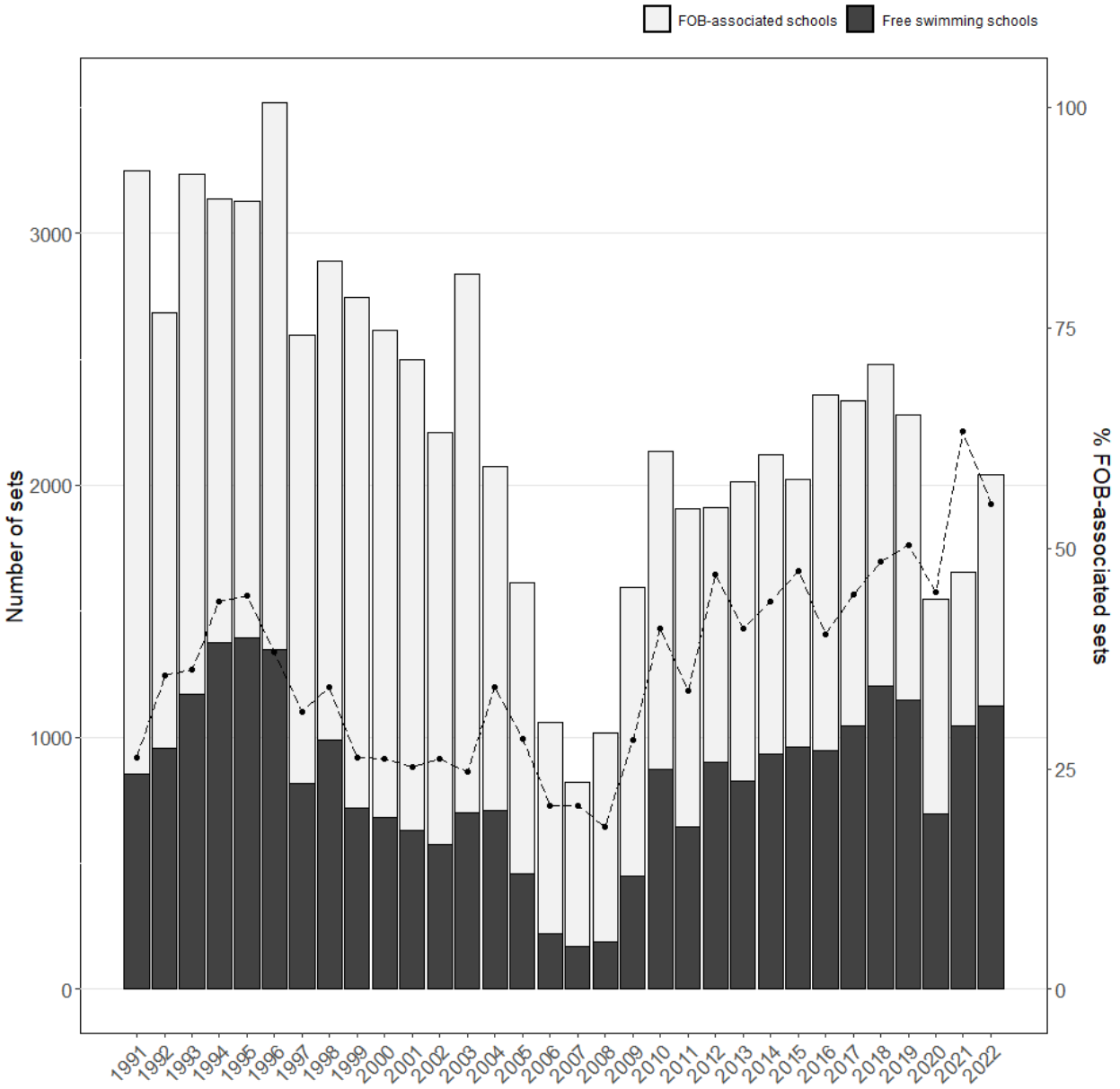

Figure 3. Fishing operations. Annual number of fishing sets in the French purse seine fishery on FOB-associated and free-swimming tuna schools during 1991-2022 (high panel). Line with solid circles indicates the percentage of sets on FOB-associated schools (low panel).

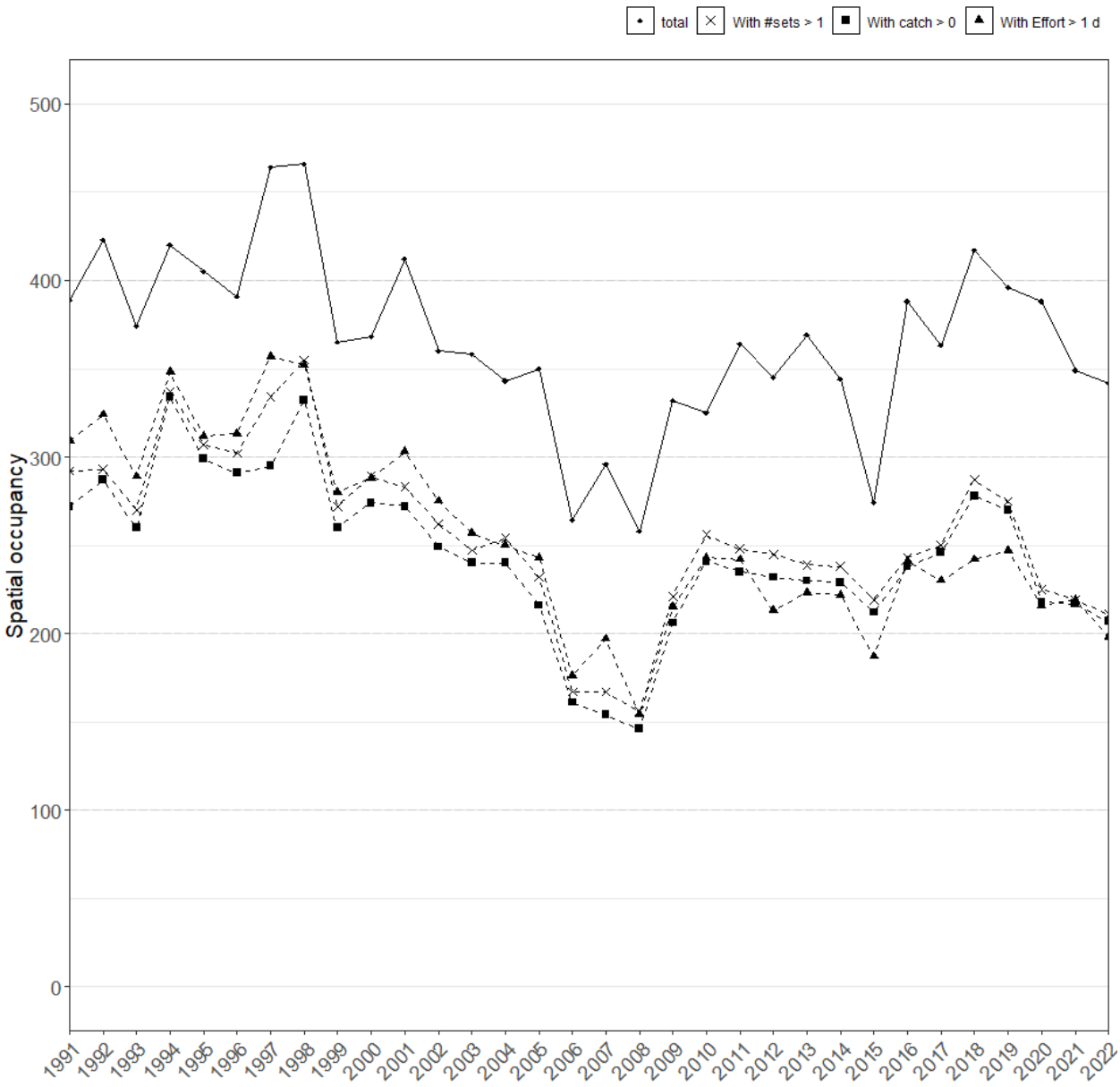

Figure 4. Changes in the spatial extent of the fishery over time. Annual number of 1-degree squares explored by each vessel of the French purse seine fishing fleet during 1991- 2022.

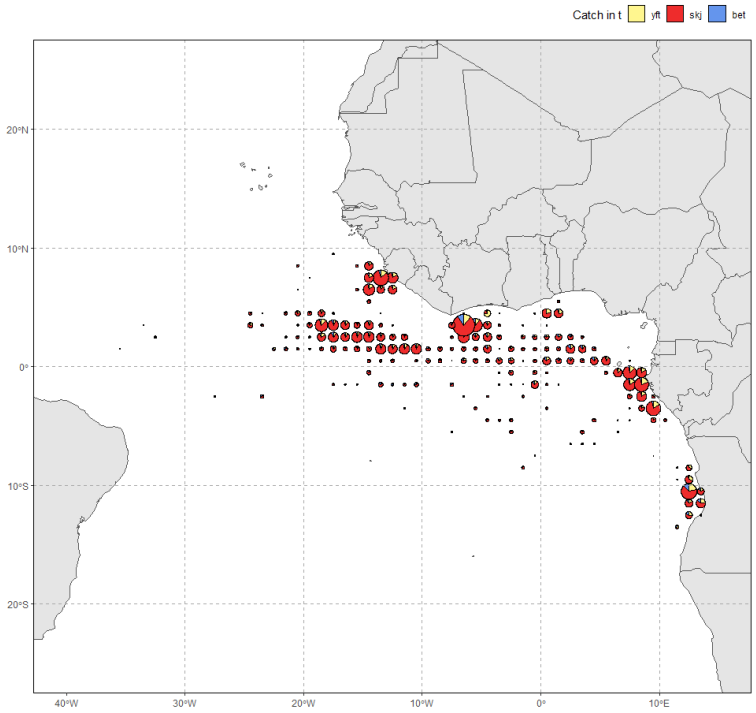

Figure 5. Spatial distribution of tuna catches of the French purse seine fishing fleet made on FOB-associated schools in 2022.

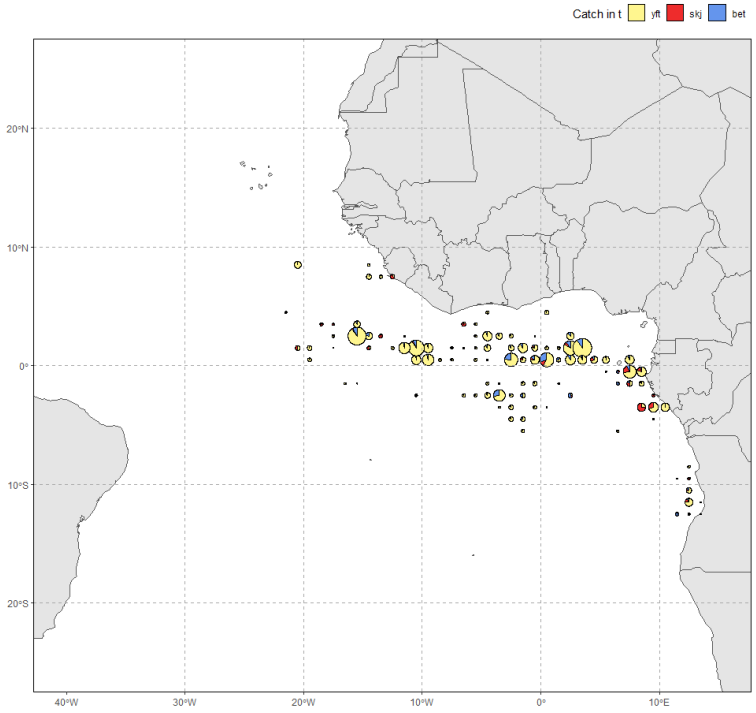

Figure 6. Spatial distribution of tuna catches of the French purse seine fishing fleet made on free-swimming tuna schools (FSC) in 2022.

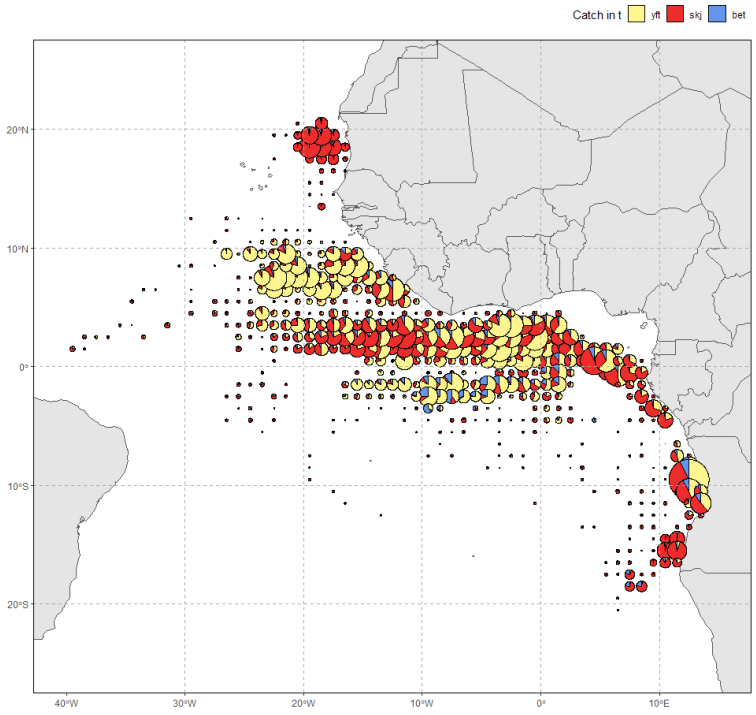

Figure 7. Maps of catches by species accounting all fishing mode, mean of the 2017-2021 period.

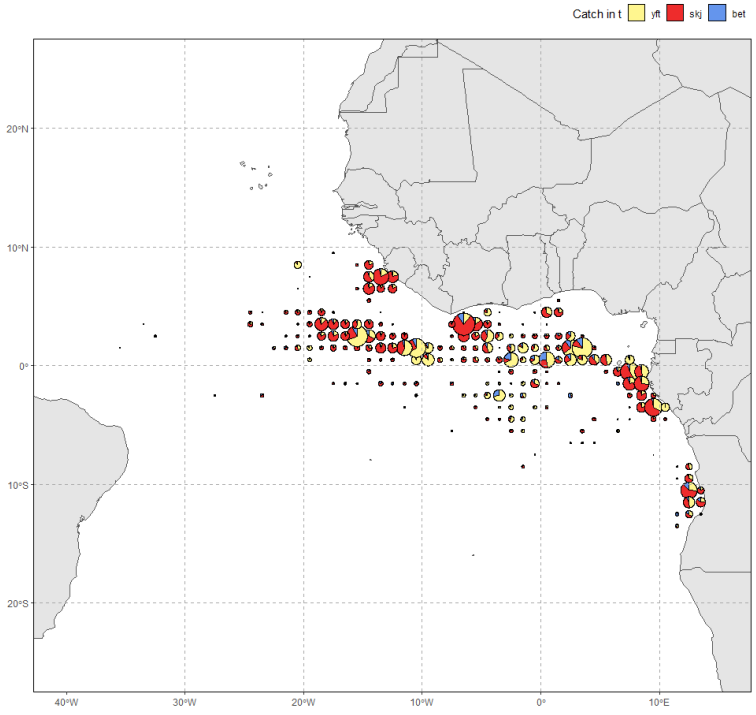

Figure 8. Maps of catches by species accounting all fishing mode in 2022.

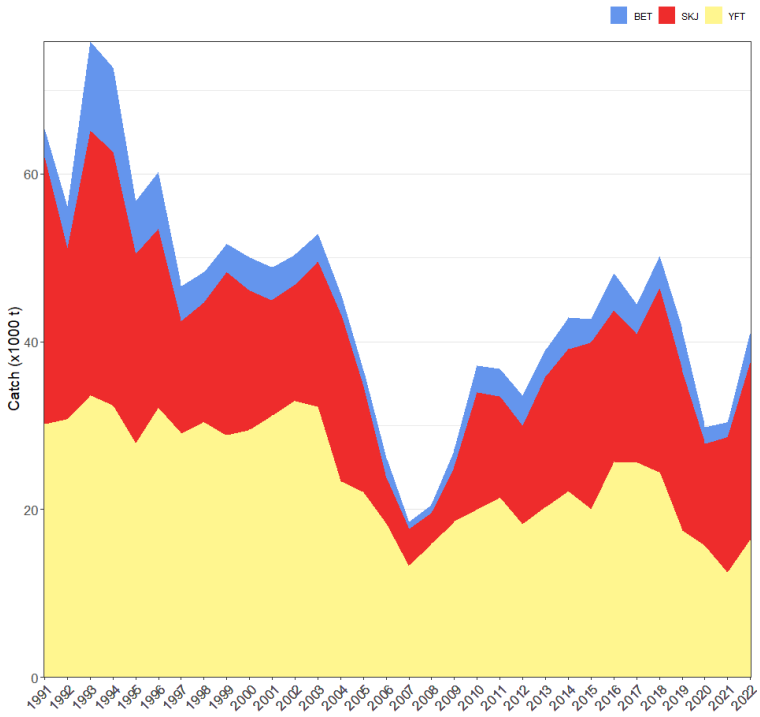

Figure 9. Total fishery production. Catch by species of the French purse seine fishing fleet during 1991-2022.

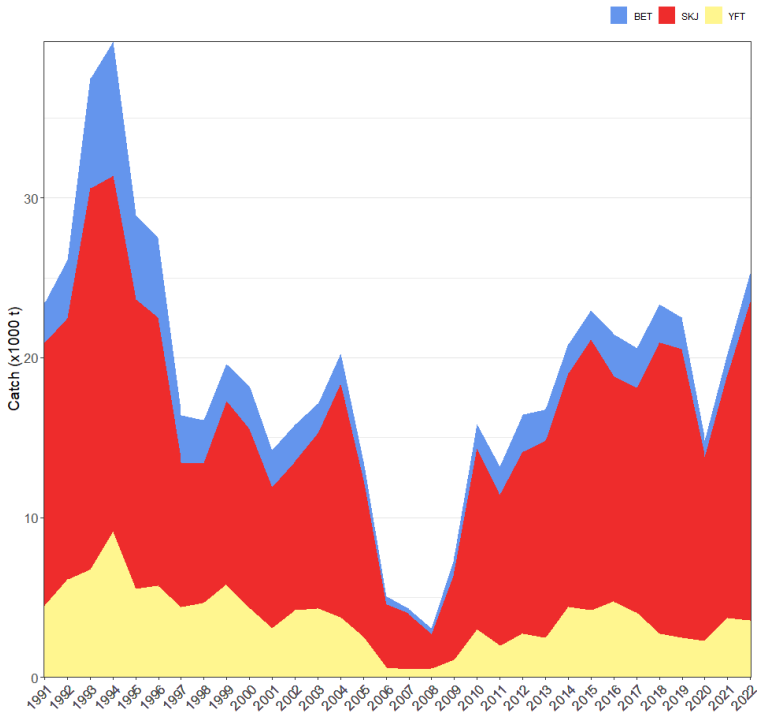

Figure 10. Fishery production by major fishing mode. Catch by species of the French purse seine fishing fleet on FOB-associated during 1991-2022.

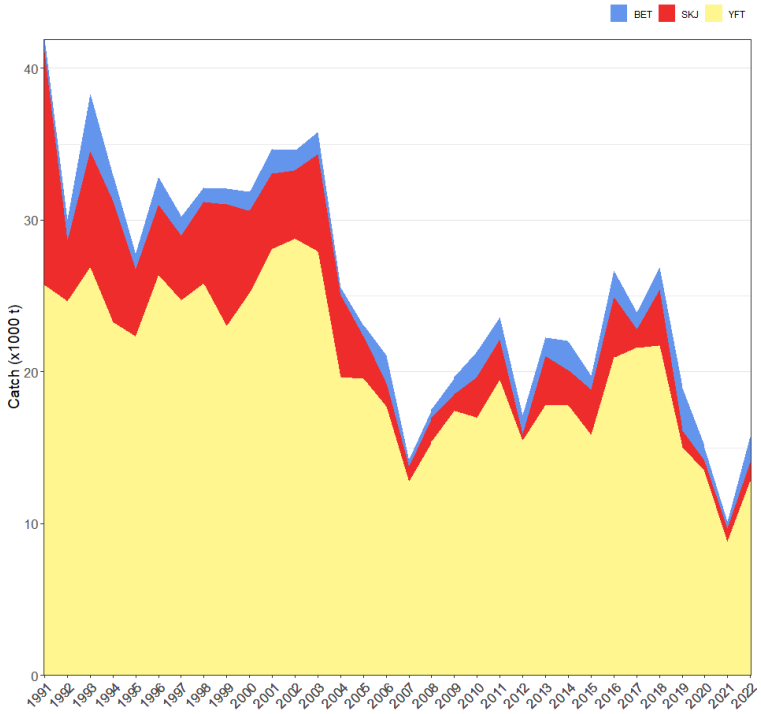

Figure 11. Fishery production by major fishing mode. Catch by species of the French purse seine fishing fleet on free-swimming tuna schools (FSC) during 1991-2022.

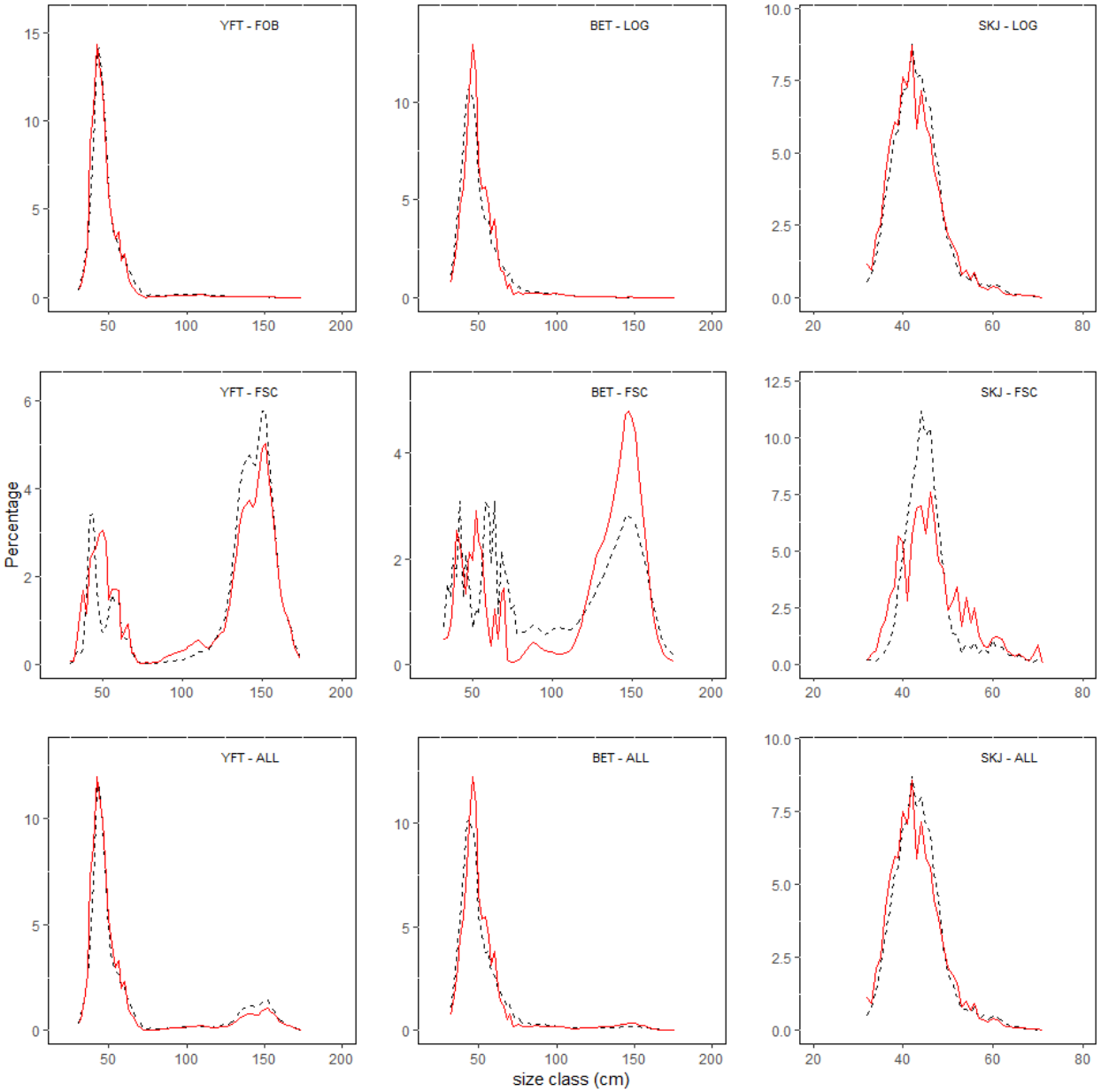

Figure 12. Size distribution of major tuna catches (in percentage of the total number of fishes) for the French purse seine fleet in 2022 (solid line) and for an average year representing the period 2017-2021 (dotted line).

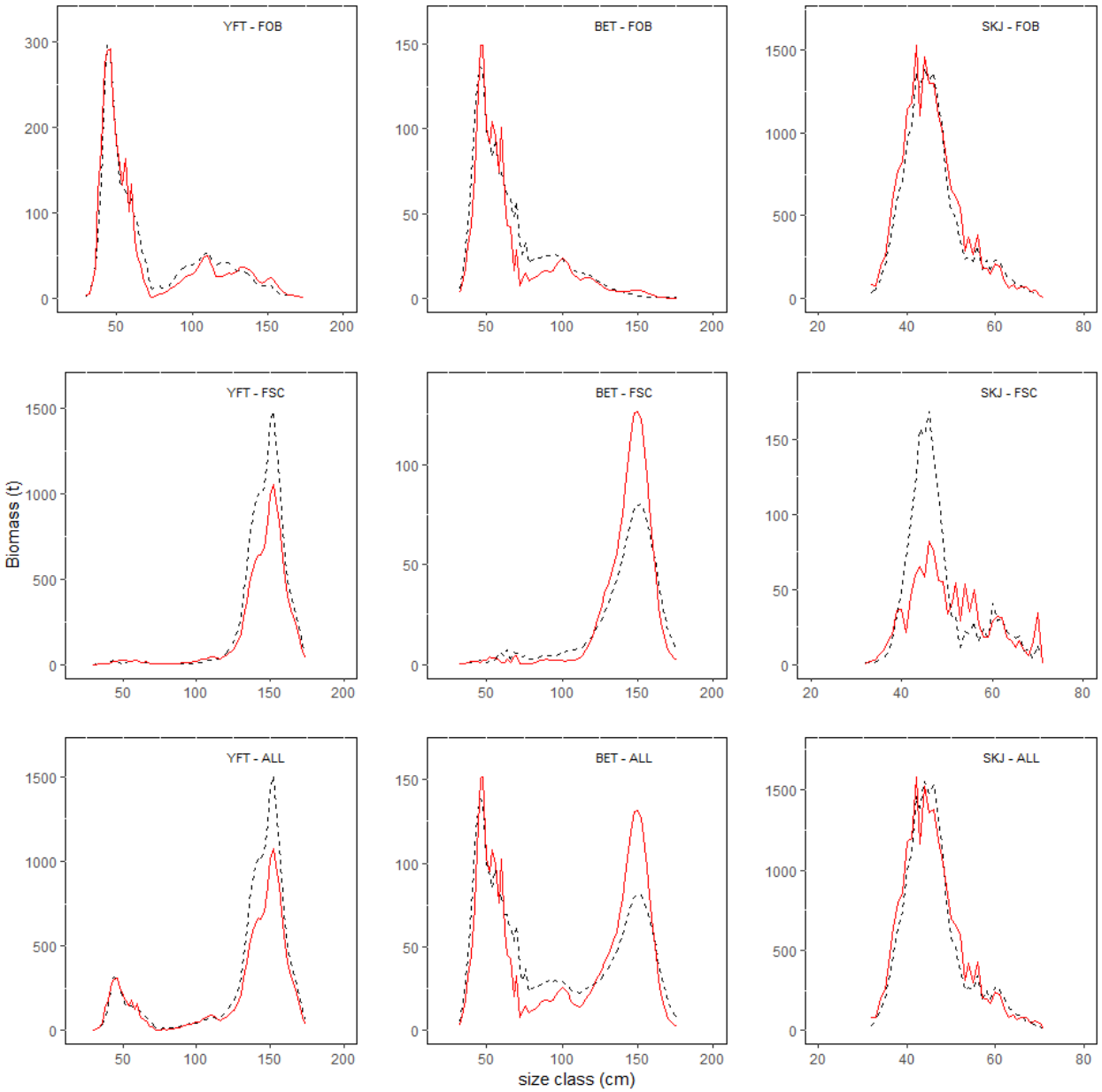

Figure 13. Weight distribution of the catch for the French purse seine fleet in 2022 (solid line) and for an average year representing the period 2017-2021 (dotted line).

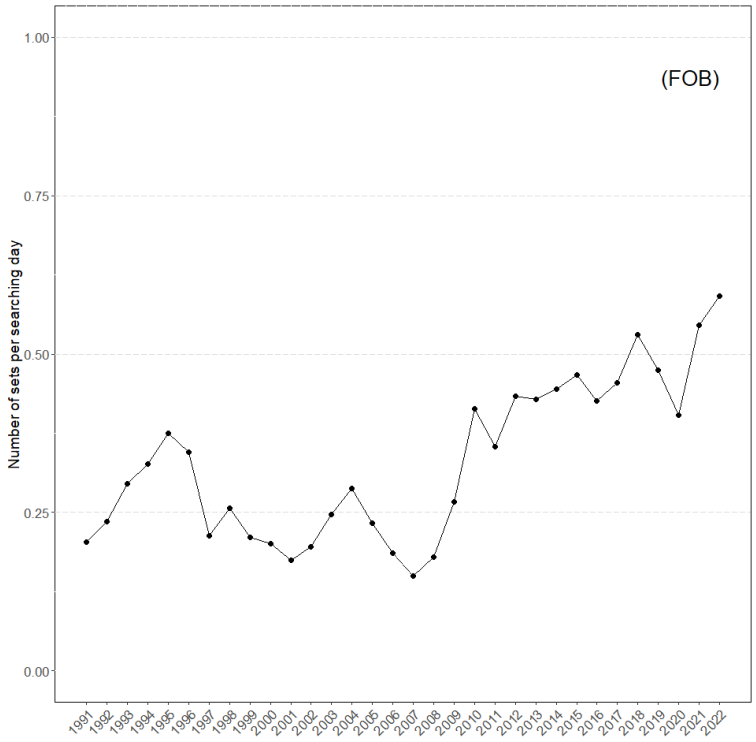

Figure 14. Annual number of sets per searching day on FOB-associated schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

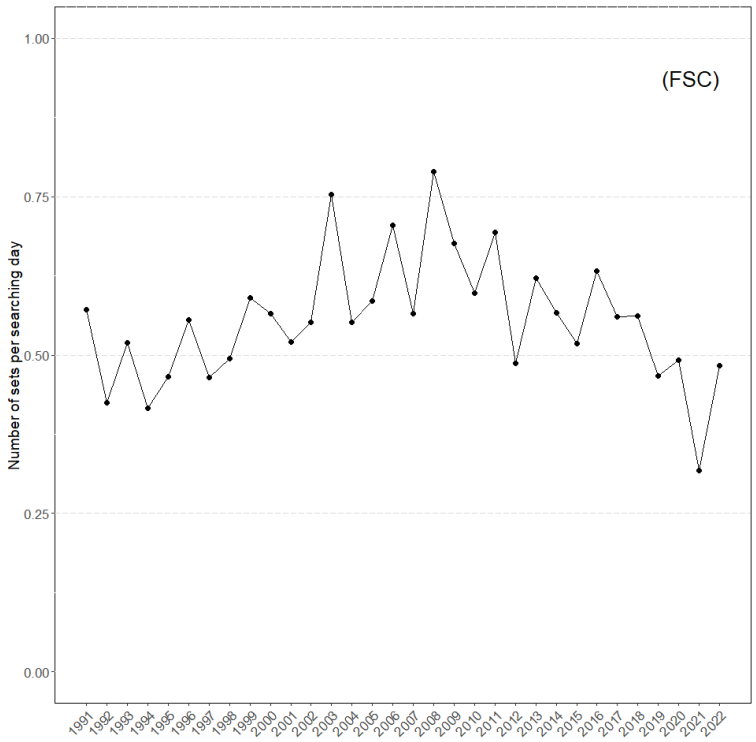

Figure 15. Annual number of sets per searching day on free-swimming schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

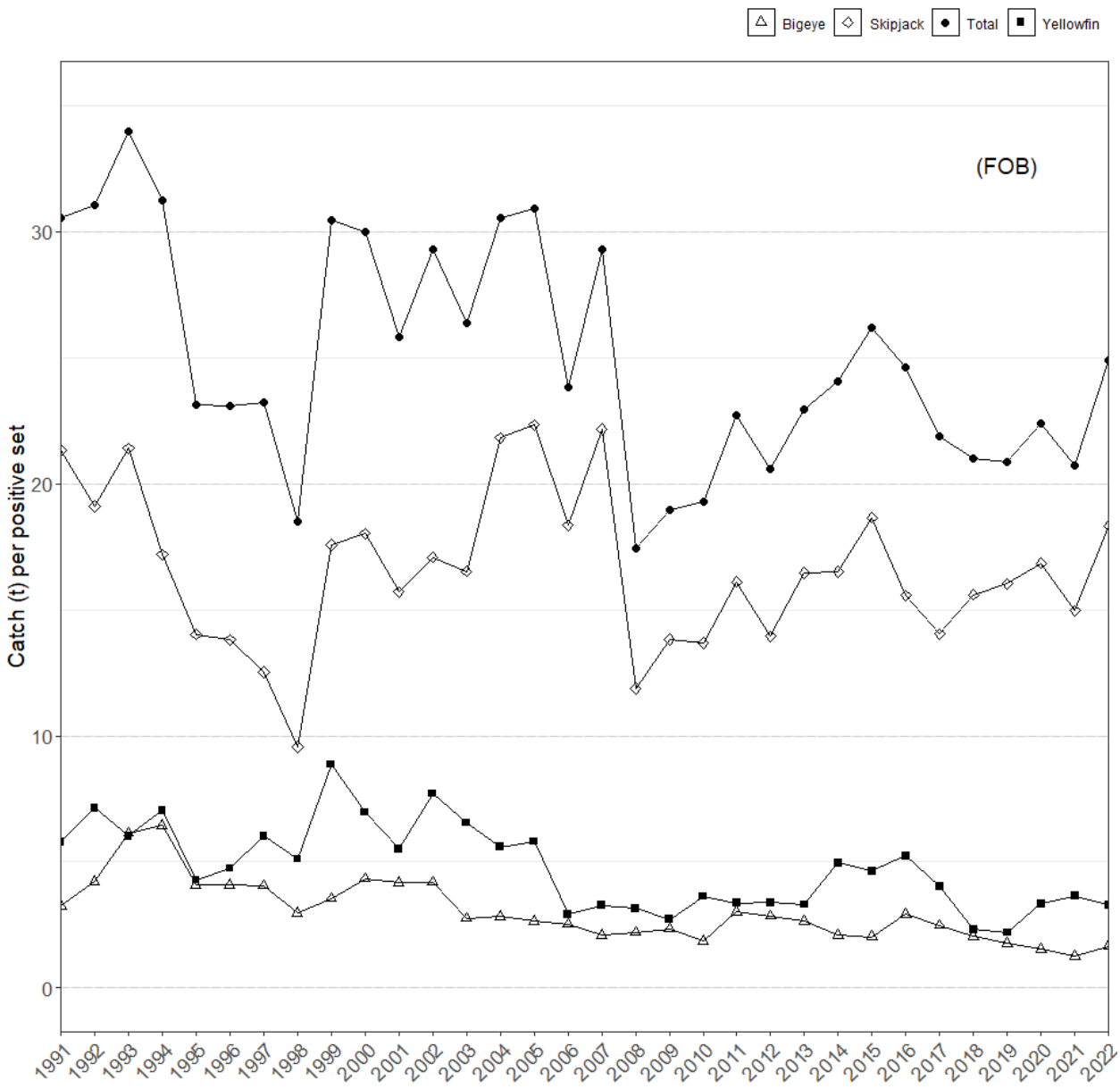

Figure 16. Annual number of catch per positive set on FOB-associated schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

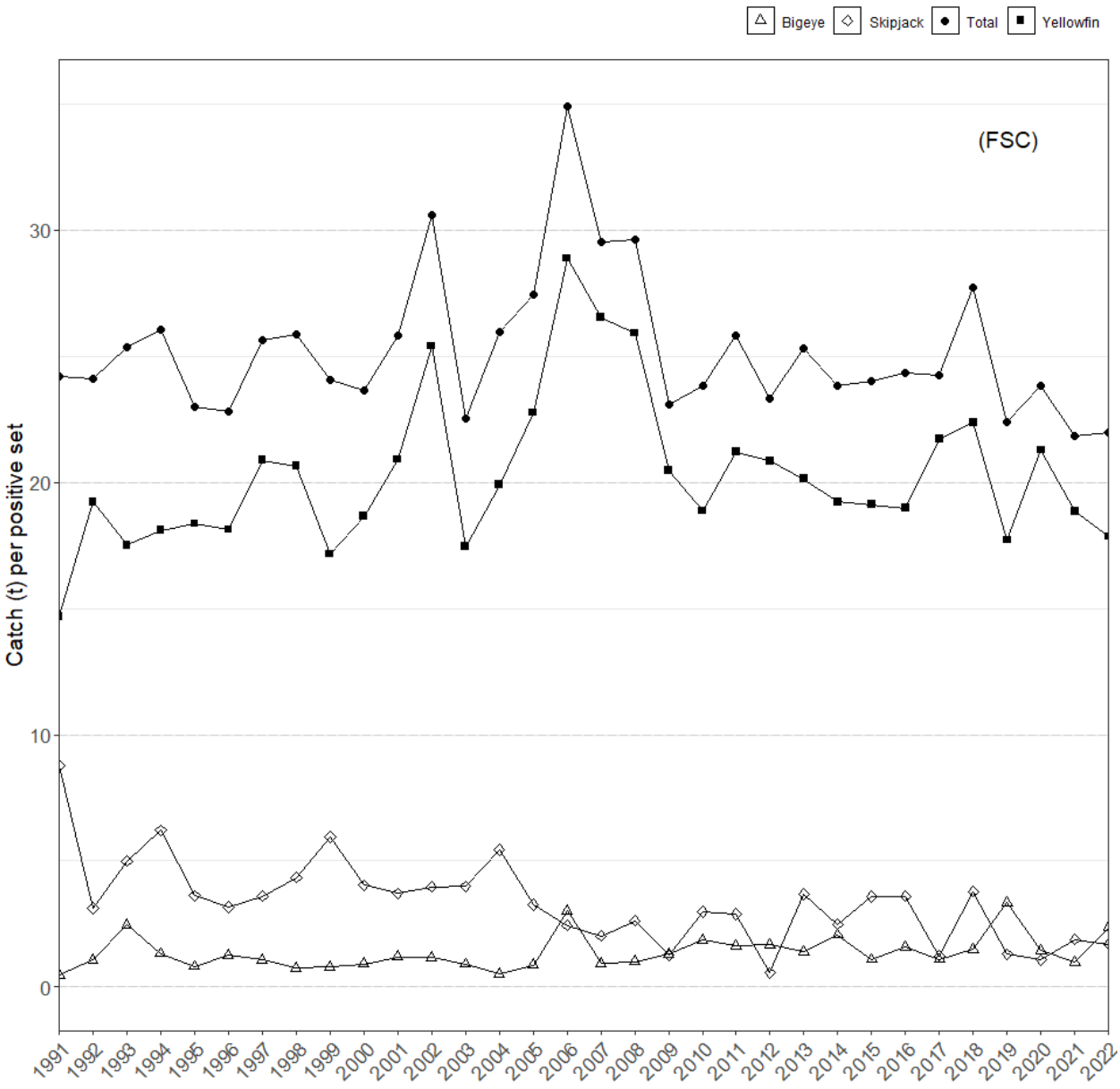

Figure 17. Annual number of catch per positive set on free-swimming schools for the French purse seine fishing fleet in the Atlantic Ocean during 1991-2022.

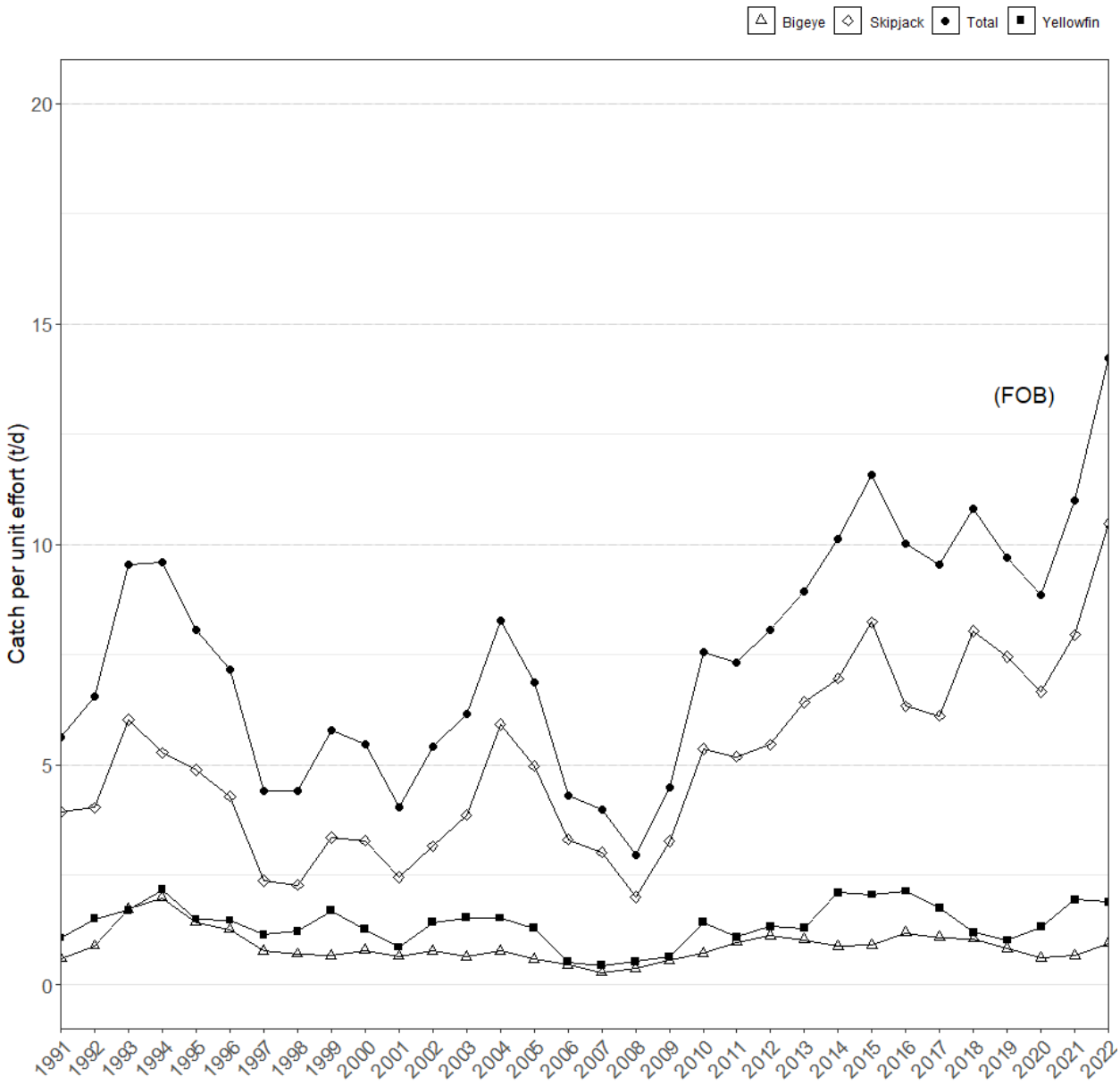

Figure 18. Annual catch rates (in t per searching day) of the French purse seine fishing fleet on FOB-associated schools in the Atlantic Ocean during 1991-2022.

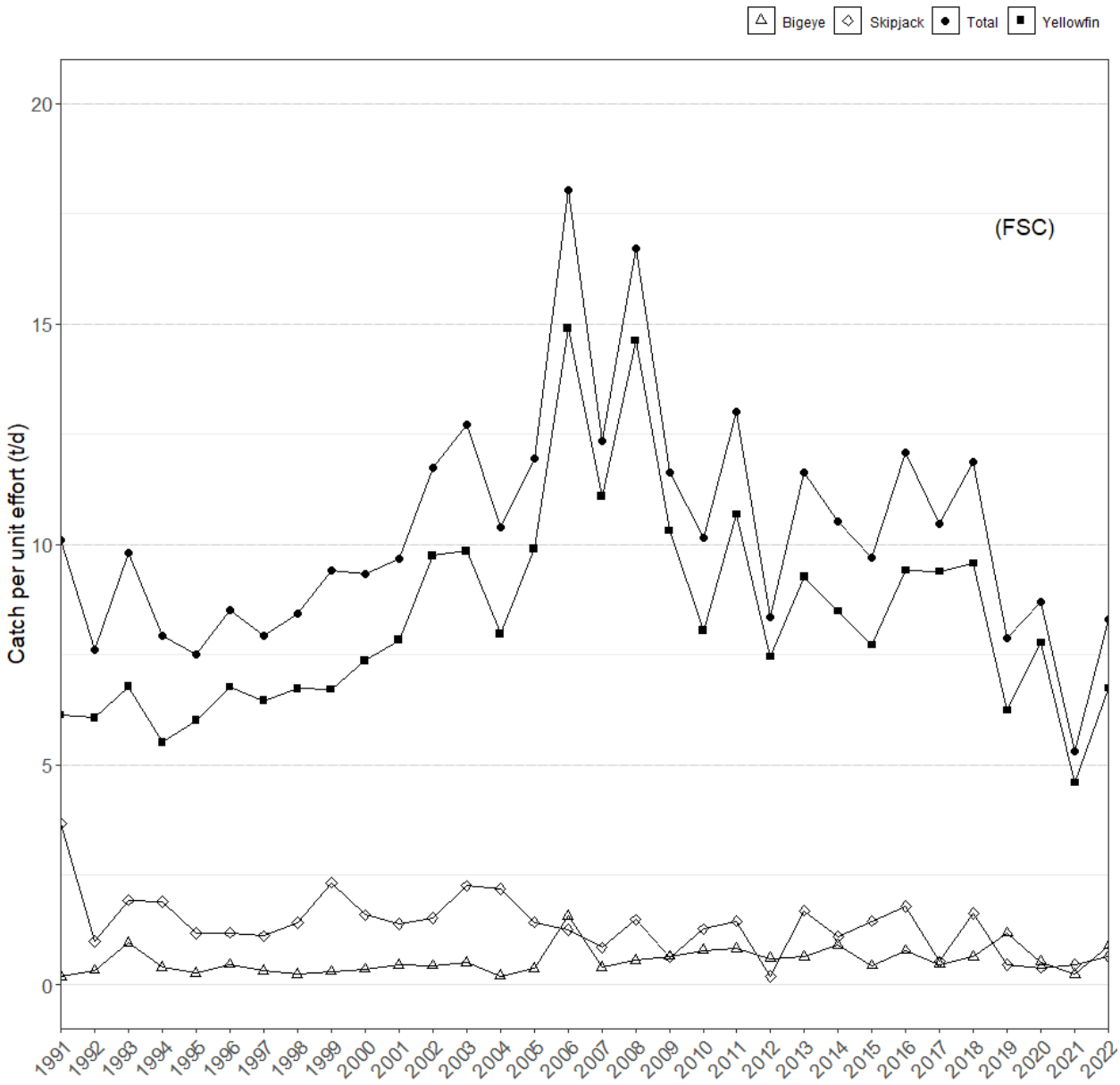

Figure 19. Annual catch rates (in t per searching day) of the French purse seine fishing fleet on free-swimming tuna schools (FSC) in the Atlantic Ocean during 1991-2022.

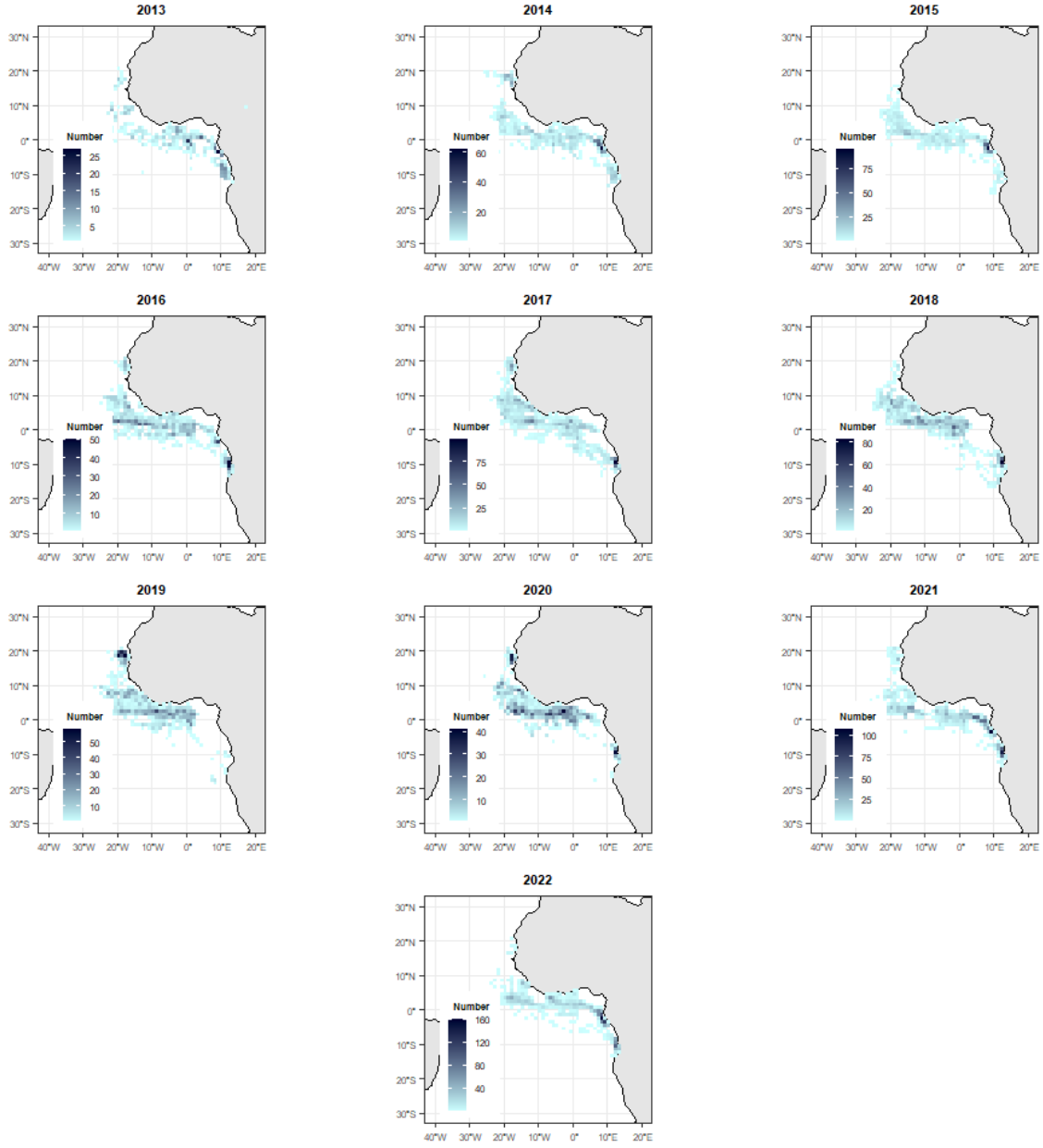

Figure 20. Annual density maps representing the number of dFAD deployments in each 1°x1° cell recorded in logbook data for the period 2013–2022.

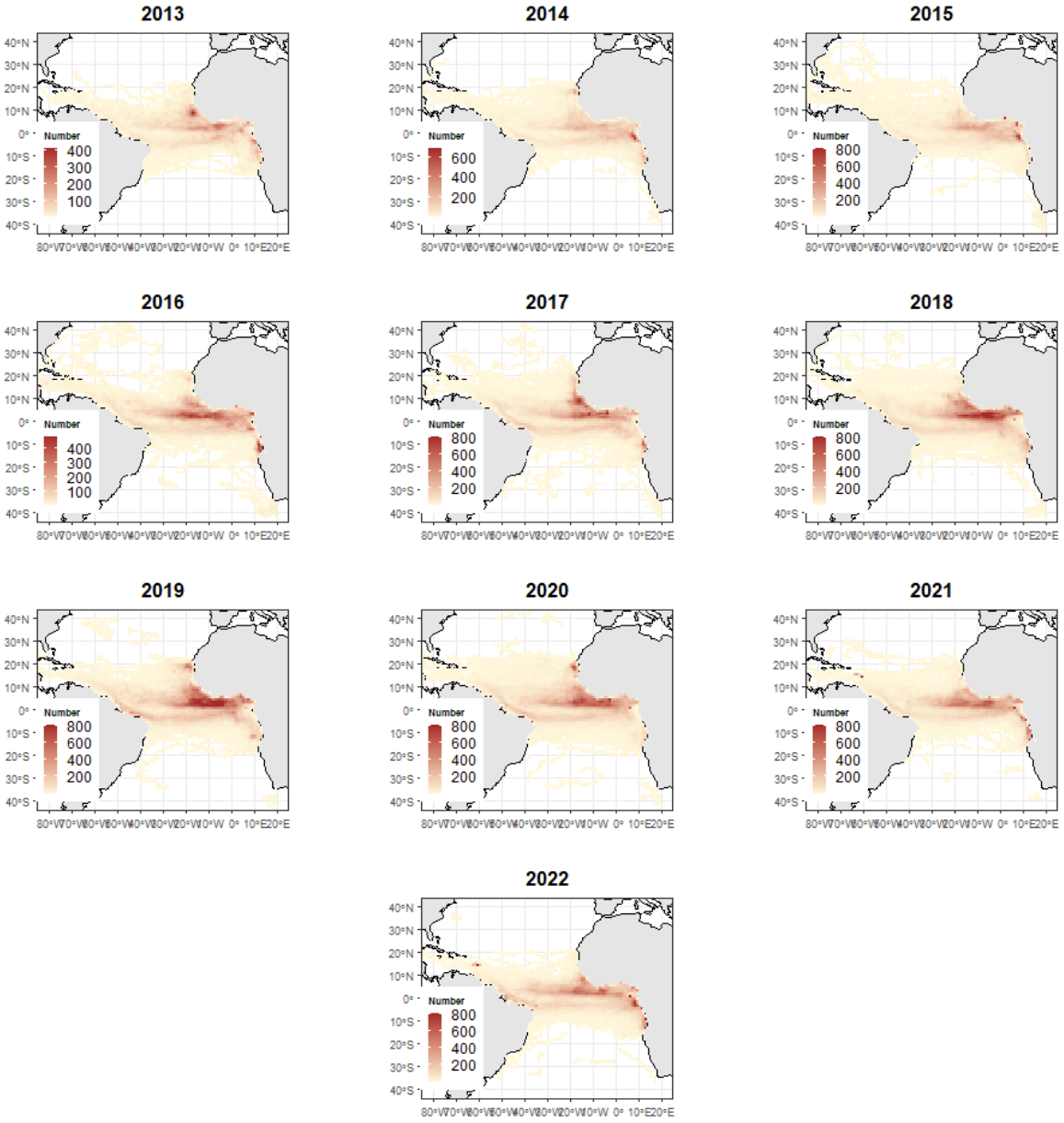

Figure 21. Annual density maps representing the total number of times dFADs passed through each 1°×1° grid cell for the period 2013–2022.