

9.11 SAI - Sailfish

The most recent stock assessments for East and West sailfish were conducted in the 2023 Atlantic Sailfish Data Preparatory and Stock Assessment Meeting (Anon., 2023b) held in June 2023 using catch data available to 2021, through a process that included a single meeting for the data preparatory and stock assessment. The previous stock assessment was conducted in the 2016 Sailfish Stock Assessment Meeting (Anon., 2017a) held in June 2016.

SAI-1. Biology

Sailfish have a mainly pan-tropical distribution in the Atlantic Ocean, with occasional catches reported from temperate waters. Based on life history information, migration rates, and geographic distribution of catch, ICCAT has established two management units for sailfish, eastern and western Atlantic stocks (SAI-Figure 1). However, two recent studies using mitogenome and genome-wide genetics for sailfish showed measured genetic differences between the Atlantic and the Indo-Pacific areas but not within the Atlantic, suggesting there is a single panmictic sailfish genetic stock in the Atlantic. The lack of evidence of a single stock in the current conventional tagging data warrants the need for deployment of electronic tags throughout the potential mixing range of Atlantic sailfish.

Sailfish is more coastally oriented than other billfish species. Conventional tagging data suggests they move shorter distances than the other billfish (SAI-Figure 2). Temperature preferences for adult sailfish appear to be in the range of 25-28°C. Sailfish generally seek out the warmest water available, and electronic tagging studies indicate that about 96% of darkness, 86% of twilight, and 82% of daylight hours are spent near the surface (Hoolihan *et al.*, 2011). Vertical habitat use is more complex however, with frequent short duration excursions to deeper depths in excess of 100 m, with some dives as deep as 350 m.

Sailfish grow rapidly and reach a maximum size of around 160 cm for males and 220 cm for females, with a mean maximum age of at least 12 years. Estimates of length at 50% maturity (L50) are currently available for western Atlantic sailfish (146 cm LJFL for females and 135 cm LJFL for males); no values are available for eastern Atlantic sailfish.

Sailfish spawn over a wide area and year around. For the western stock, evidence of spawning has been detected in the Straits of Florida, and off the Venezuelan, Guyanese, and Surinamese coasts. In the southwestern Atlantic, spawning has been confirmed off the southern coast of Brazil between 20° and 27°S. Additional spawning areas occur in the eastern Atlantic off Senegal and Côte d'Ivoire. Timing of spawning can differ between regions, from the Florida Straits to the areas off Guyana. In the western Atlantic, sailfish spawn in the second and third quarter of the year, while in the southwestern Atlantic, they spawn during the austral summer.

SAI-2. Fisheries indicators

Sailfish are targeted by coastal artisanal and recreational fleets and are captured to a lesser extent as bycatch in longline and purse seine fisheries (SAI-Figure 3). Historically, catches of sailfish were reported together with spearfish by many longline fleets. In 2009 these catches were separated by the Committee (SAI-Table 1).

Several standardized CPUE data series were available in 2023 for the Atlantic sailfish stock assessment. For the eastern Atlantic stock, the indices of abundance used were: Senegal artisanal, Chinese Taipei longline, Japan longline (early and late), EU-Portugal longline, and EU-Spain longline. For the western Atlantic stock, the indices used were: Brazilian longline, Chinese Taipei longline, Japanese longline (early and late), EU-Spain longline, US longline observer, Venezuelan longline, and Venezuelan rod & reel (SAI-Figure 4). For both stocks, some of the available CPUE time series showed a decreasing trend while others showed an increasing trend. Therefore, there were clear conflicting trends among the indicators of stock abundance (SAI-Figure 4).

East Atlantic

The eastern stock is exploited by surface fisheries, mainly artisanal gillnet and troll, and to a lesser degree by purse seine, as well as longline and recreational fisheries. The main surface fisheries are carried out by the artisanal fleets of Côte d'Ivoire, Ghana and Senegal, followed by the industrial scale EU fleets (France and Spain) in the Gulf of Guinea and the waters of the tropical eastern Atlantic. The main longline fleets are EU-Spain, Japan, and Chinese Taipei fleets which operate in the central, eastern and western Atlantic. Total reported landings, increased abruptly after 1973, to peak above 5,000 t in 1975-1976, remaining relatively high (>2000 t), largely due to the incorporation of artisanal fishing effort by the traditional surface (gillnet and troll) fisheries (**SAI-Table 1; SAI-Figure 3a**). A generally decreasing trend in catch is apparent since 2008, mainly due to a decreased catch by the surface fisheries (gillnet and purse seine) (**SAI-Figure 3a**). Preliminary Task 1 catches of sailfish East in 2022 were 1,110 t, compared to 1,706 t reported for 2021 (**SAI-Table 1**).

West Atlantic

The western stock is exploited by longline, recreational fisheries, and by artisanal surface fisheries, drift-gillnet and longline. The main longline fleets include Brazil, EU-Spain, Panama, Venezuela and Grenada, which operate in the western and central Atlantic. The main surface fisheries are carried out by the artisanal longline fleets of Grenada and Venezuela in the Caribbean Sea and waters of the tropical western Atlantic, and those artisanal fleets operating around anchored FADs like those of Martinique and Guadalupe and the Dominican Republic.

Total reported landings steadily increased since 1960 to peak at 2,060 t in 2002 (**SAI-Figure 3b**). A steep decreasing trend of catch is observed from 2005, mainly due to a variable decreased catch by the surface (artisanal drift-gillnet) fisheries. Preliminary Task 1 catches of sailfish West in 2022 were 1029 t, compared to 876 t reported for 2021 (**SAI-Table 1**).

Although there has been progress, historical catches of unclassified billfish continue to be reported to the Committee, confounding sailfish catch estimates. Catch reports from countries that have historically been known to land sailfish continue to suffer from gaps and there is increasing ad hoc evidence of unreported landings in some other countries. These considerations provide support to the idea that the historical catch of sailfish continues to be underreported. This also seems to be the case in recent times where more and more fleets encounter sailfish as bycatch or direct targeting.

SAI-3. State of the stocks

Compared to the 2016 stock assessment, during the 2023 assessment further progress was made on the integration of new data sources, in particular standardized catch rate data, size data, and modeling approaches. For both stocks (East and West), uncertainty in data inputs and model configuration continued to be explored through sensitivity analysis. Conflicting trends in the available CPUEs challenged a clear interpretation of trends in abundance; results were sensitive to CPUEs included in the model.

East Atlantic

For the SAI-E stock, a single assessment platform was used for the stock assessment; Just Another Bayesian Biomass Assessment (JABBA), a Bayesian Surplus Production based model. The trajectories of B/B_{MSY} and F/F_{MSY} are shown in **SAI-Figure 5**. The stock was determined to be not overfished with $B_{2021}/B_{MSY} = 1.83$ (1.14 - 2.88), and not undergoing overfishing, with $F_{2021}/F_{MSY} = 0.362$ (0.212-0.585). The Kobe phase plot shows a typical anti-clockwise trajectory, with the stock status moving from underexploited through a period of unsustainable fishing to the overexploited phase and then to the recovery phase after a decrease in fishing mortality. The resultant stock status for 2021 has a 99% probability of being in the green quadrant of the Kobe phase plot, indicating that the stock is not overfished nor undergoing overfishing (**SAI-Figure 6**).

The Committee recognizes that there has been a substantial change in the stock status compared to the last stock assessment. This change can mainly be attributed to improved estimates of the life history parameters for the East sailfish stock. However, other factors may also contribute to this change including, the lack of some of the indices of abundance from small-scale fisheries (i.e., Côte d'Ivoire and Ghana).

West Atlantic

During the data preparatory and stock assessment meeting, the Committee agreed to combine the results from both JABBA and Stock Synthesis models to determine stock status and to conduct projections to estimate the K2SM. However, post-meeting examination of the Stock Synthesis results identified issues with the model solution that could not be addressed in time for the results to be presented here and included in the management advice. Therefore, the state of the stock for West Atlantic sailfish is based on the JABBA model runs.

The Bayesian surplus production model JABBA was applied. The trajectories of B/B_{MSY} and F/F_{MSY} are shown in **SAI-Figure 7**. The stock was determined to be overfished with $B_{2021}/B_{MSY} = 0.96$ (0.59-1.49), but not undergoing overfishing with $F_{2021}/F_{MSY} = 0.585$ (0.364-0.952). The Kobe phase plot shows a typical anti-clockwise trajectory, with the stock status moving from underexploited through a period of unsustainable fishing to the overexploited phase and then to the recovery phase after a decrease in fishing mortality (**SAI-Figure 8**). The resultant stock status in 2021 for the final model has a 57% probability of being overfished but not subject to overfishing (i.e., yellow quadrant of the Kobe phase plot). There is a 98% probability that the stock is not undergoing overfishing.

SAI-4. Outlook*East Atlantic*

The Committee conducted JABBA stochastic stock projections for the SAI-E stock with eleven constant catch scenarios (0; 1,000 – 3,000 t with 250 t interval; 2,336 t MSY level). The annual medians of relative B/B_{MSY} and F/F_{MSY} are provided in **SAI-Figure 9**. The Kobe II Strategic Matrices (**SAI-Table 2**) were estimated and show the probability that overfishing is not occurring ($F \leq F_{MSY}$), the stock is not overfished ($B \geq B_{MSY}$), and the joint probability of being in the green quadrant of the Kobe plot (i.e., $F \leq F_{MSY}$ and $B \geq B_{MSY}$).

West Atlantic

The Committee conducted JABBA stochastic stock projections for the western stock also with ten constant catch scenarios (0; 1,000 – 2,000 t). The annual medians of relative B/B_{MSY} and F/F_{MSY} are provided in **SAI-Figure 10**. The Kobe II Strategic Matrices (**SAI-Table 3**) were estimated and show the probability that overfishing is not occurring ($F \leq F_{MSY}$), the stock is not overfished ($B \geq B_{MSY}$), and the joint probability of being in the green quadrant of the Kobe plot (i.e., $F \leq F_{MSY}$ and $B \geq B_{MSY}$).

Given the uncertainty projection probabilities should be interpreted with caution for both stocks. The probabilities of the stock biomass to fall below 20% B_{MSY} under different scenarios of constant catch are presented in **SAI-Table 4** and **SAI-Table 5** for the East and West sailfish stocks respectively.

SAI-5. Effect of current regulations

In 2016, the Commission established catch limits for both sailfish stocks (**Rec. 16-11**) and included several provisions that would allow the Committee to enhance data collection initiatives to reduce fishing mortality estimates and overcome data gap issues in all fisheries.

East Atlantic

It was established in **Rec. 16-11** that if the total catch harvested in any year exceeds 1,271 t, the Commission shall review the Recommendation and effectiveness of this. Catches in 2019 (2,244 t) and 2021 (1,706 t) did exceed this amount.

West Atlantic

It was established in **Rec. 16-11** that if the total catch harvested in any year exceeds 1,030 t, the Commission shall review the Recommendation and effectiveness of this, the reported catch levels in 2018, 2019, and 2020 exceeded this level.

In line with other ICCAT conservation measures, some countries have established domestic regulations to limit the catch of sailfish. Among these regulations are: the requirement of releasing all billfish from longline vessels, minimum size restrictions, use of circle hooks and catch and release strategies in sport fisheries.

Currently, [Rec. 22-12](#) and four ICCAT Contracting Parties (Brazil, Canada, Mexico, and the United States) mandate or encourage the use of circle hooks on their pelagic longline fleets. Recent research has demonstrated that in some longline fisheries, the use of non-offset circle hooks resulted in a reduction of billfish mortality, while the catch rates of several of the target species remained the same or were greater than the catch rates observed with the use of conventional J hooks or offset circle hooks.

SAI-6. Management recommendations

As in the 2016 stock assessment, important sources of uncertainty still remain in the assessments of both the eastern and western stocks. Available abundance indices demonstrate conflicting trends for both stocks, and the Committee believes that reported catches, including dead discards, are significantly incomplete and unreported. These important sources of uncertainty should be taken into consideration by the Commission when adopting management measures. Nevertheless, it should be noted that there have been some improvements since the last assessment.

East Atlantic

The stock status of SAI-E indicates that the stock is not overfished and not undergoing overfishing. Given the number of unquantified uncertainties described above, the Commission should consider managing catch levels that will keep the stock in the green quadrant of the Kobe phase plot with a high probability.

West Atlantic

The Committee noted that while the reported catches in the past few years have been below the estimated MSY (1,612 t), the stock remains overfished. The Committee believes that the reported catches are significantly underreported. Given the important uncertainties described above, the Committee recommends that the results provided in the Kobe II Strategy Matrix be interpreted with extreme caution. Should the Commission choose to continue setting the catch level at 67% of the current MSY, that value will be 1,080 t.

ATLANTIC SAILFISH SUMMARY		
	West Atlantic	East Atlantic
Maximum Sustainable Yield (MSY)	1,612 (1,357-1,968) t ¹	2,337 (2,003-2,833) t ¹
Current Yield (2022)	1,029 t ²	1,110 t ²
B ₂₀₂₁ /B _{MSY}	0.96 (0.59-1.45) ¹	1.83 (1.14-2.88) ¹
F ₂₀₂₁ /F _{MSY}	0.59 (0.36 - 0.95) ¹	0.36 (0.21 - 0.59) ¹
Overfished	Yes (59% prob.) ³	No (99% prob.) ³
Overfishing	No (98% prob.) ³	No (100% prob.) ³
Management Measures in Effect:	Rec. 16-11 : Limit Atlantic sailfish Catches of either stock to the level of 67% of MSY	

¹ 95% credibility interval.

² 2022 yield should be considered provisional.

³ As estimated from the Kobe plot probability in each quadrant.

SAI-Table 1. Estimated catches (t) of Atlantic sailfish (*Istiophorus albicans*) by area, gear and flag.

			1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022				
TOTAL			3228	2292	2445	3023	2604	2978	2922	3976	4603	4411	4137	4339	4059	3855	4138	3963	3755	3083	2890	2869	2325	2047	2251	2840	3067	2625	3721	2497	2582	2110				
	ATE		1814	1171	1231	1880	1347	1363	1342	1980	2805	2351	2639	2612	2220	1916	2577	2229	2129	1853	1553	1591	1339	1163	1246	1422	1631	936	2244	1176	1706	1110				
	ATW		1414	1121	1214	1143	1257	1615	1580	1996	1798	2060	1498	1727	1839	1939	1562	1734	1626	1230	1337	1278	986	884	1005	1419	1436	1688	1476	1321	876	1029				
Landings	ATE	Longline	332	234	261	729	216	275	273	198	568	756	497	335	319	580	590	628	622	514	546	543	457	423	436	338	356	497	962	329	194	311				
		Other surf.	1034	871	836	970	644	859	883	1231	1470	1496	1860	2057	1758	1289	1798	1493	932	900	870	985	754	730	749	1082	1175	435	1273	792	973	644				
		Sport (HL+RR)	448	67	135	182	488	228	186	551	767	98	282	219	143	46	189	108	575	439	136	58	128	10	56	0	94	1	2	50	537	71				
	ATW	Longline	958	651	581	453	641	1033	1102	1711	1661	1636	1161	1271	1704	1738	1300	1407	1154	1132	1215	1084	882	735	917	1330	1248	1513	1351	1273	746	921				
		Other surf.	160	225	256	390	209	287	244	163	66	311	331	449	131	194	248	310	457	92	102	154	86	126	75	67	168	163	115	42	119	91				
		Sport (HL+RR)	233	217	348	230	350	267	163	76	60	106	0	0	0	2	6	7	4	2	10	19	7	12	5	15	13	6	5	2	8	15				
	Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79				
Discards	ATE	Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	6	1	4	2	6	5	2	4		
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	1	0	1			
	ATW	Longline	63	28	29	69	57	27	72	45	11	7	5	7	3	5	8	9	10	4	10	20	12	11	7	7	7	7	5	3	2	3				
		Other surf.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Landings	ATE	CP	Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0			
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0		
			China PR	0	3	3	3	3	5	9	4	5	11	4	4	8	16	8	1	4	5	2	4	1	1	2	2	4	2	11	25	1	4			
			Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		
			Côte d'Ivoire	40	54	66	91	65	35	80	45	47	65	121	73	93	78	52	448	74	24	108	192	80	99	55	38	405	35	959	404	336	60			
			EU-España	42	8	13	42	48	15	20	8	195	245	197	169	202	214	227	239	318	206	197	257	229	302	333	225	236	277	324	86	84	234			
			EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	11	8	31	8	2	11		
			EU-Portugal	2	1	2	1	2	27	53	13	4	10	13	19	31	137	43	49	131	170	121	72	109	33	41	30	27	123	65	51	13	30			
			El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	
			Gabon	3	3	110	218	2	0	0	0	0	0	0	4	4	1	0	0	0	0	0	0	0	0	0	4	0	0	5	0	0	2	1	0	
			Ghana	693	450	353	303	196	351	305	275	568	592	566	521	542	282	420	342	358	417	299	201	220	191	99	238	267	82	78	68	0	0	0		
			Great Britain	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Guinea Ecuatorial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	1	3	0	0	0	2	3	5	3		
			Honduras	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Japan	27	45	52	47	19	58	16	26	6	20	22	70	50	62	144	199	94	115	143	157	71	59	36	52	45	47	62	48	30	14			
			Korea Rep	2	5	5	11	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	10	1	6	10	2	6	15	9	8	10	5	1		
			Liberia	0	0	33	85	43	136	122	154	56	133	127	106	122	118	115	0	0	0	0	0	0	0	0	0	0	0	59	11	50	47	3	25	
			Maroc	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Namibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	22	0	
			Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	12	0	0	
			Russian Federation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			S Tomé e Príncipe	81	88	92	96	139	141	141	136	136	515	346	292	384	114	119	121	124	127	131	134	312	212	219	2	234	28	223	224					
			Senegal	462	162	167	240	560	260	238	786	953	240	673	567	463	256	737	446	630	484	174	247	165	37	60	586	301	313	397	350	972	417			
			Sierra Leone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	
			South Africa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			St Vincent and Grenadines	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	5	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	
			USSR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NCC	Chinese Taipei	157	38	58	24	56	44	66	45	50	62	49	15	25	36	109	121	80	21	52	54	42	17	21	23	26	21	16	17	6	2		
			NCO	Benin	20	20	20	19	6	4	5	5	12	2	2	5	3	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Cuba	77	83	72	533	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Mixed flags (FR+ES)	182	160	128	97	110	138	131	353	400	365	413	336	264	274	205	251	308	265	275	275	275	275	275	275	0	0	0	0	0	0	0	
				NEI (BIL)	0	0	0	0	0	0	0	28	269	408	213	55	1	105	43	20	11	0	44	0	0	0	0	0	0	0	0	0	0	0	0	0
				NEI (ETRO)	27	51	57	69	86	127	120	77	43	3	2	16	7	8	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
				Togo	0	0	0	0	9	22	36	23	62	55	95	135	47	31	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			ATW	CP	Barbados	50	46	74	25	71	58	44	44	42	26	27	26	42	58	42	0	0	18	36	36	39	44	54	56	42	20	15	15	20	18	
Belize	0	0			0	0	0	0	0	0	0	0	0	0	5	0	12	0	0	52	8	7	4	3	0	11	19	62	104	42	0	1				
Brazil	243	129			245	310	137	184	356	598	412	547	585	534	416	139	123	268	433	71	138	108	76	57	72	59	39	43	17	28	24	11				
China PR	0	3			3	3	3	3	9	4	3	1	0	1	0	0	0	1	2	1	1	1	1	1	1	1	3	6	2	9	160	8				

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		1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
	Curaçao	15	15	15	15	15	15	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	EU-España	13	19	36	5	20	42	7	14	309	414	183	160	89	134	214	361	412	275	190	184	203	244	311	207	454	256	228	57	67	240	
	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	4	10	
	EU-Portugal	0	0	0	0	0	0	0	4	0	0	12	12	110	18	53	101	20	19	9	2	0	0	0	0	1	37	9	3	0	1	
	El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Grenada	246	151	119	56	83	151	148	164	187	151	171	112	147	159	174	216	183	191	191	191	191	191	210	137	165	150	111	97	61	89	
	Japan	1	8	2	4	17	3	10	12	3	3	10	5	22	4	1	33	43	36	12	16	7	11	12	13	7	3	18	3	7	8	
	Korea Rep	3	4	4	12	4	0	0	0	0	0	0	0	0	0	0	0	0	1	0	40	3	1	1	0	0	0	0	0	0	0	
	Mexico	2	19	19	10	9	65	40	118	36	34	45	51	55	41	46	45	48	34	32	51	63	42	35	47	51	24	27	20	24	17	
	Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	415	0	461	378	417	198	122	
	St Vincent and Grenadines	4	4	2	1	3	2	1	0	2	164	3	86	73	59	18	13	8	7	4	4	3	4	1	85	8	10	5	19	0	0	
	Trinidad and Tobago	1	2	1	4	10	25	37	3	7	6	8	10	9	17	13	32	16	16	38	72	34	29	51	53	63	51	56	47	43	37	
	UK-British Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	USA	203	180	348	232	349	267	163	76	58	103	0	0	0	0	0	3	3	0	0	7	3	2	2	3	3	3	3	1	1	2	
	Venezuela	341	223	180	255	279	515	367	261	249	277	327	509	607	1042	549	382	416	498	590	543	341	230	225	305	543	534	481	396	408	461	
NCC	Chinese Taipei	112	117	19	19	2	65	17	11	33	31	13	8	21	5	14	10	11	6	8	26	6	3	6	5	5	5	4	7	2	1	
	Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	3	1	5	14	9	13	14	6	2	4	1	
NCO	Aruba	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Cuba	42	46	37	37	40	28	196	208	68	32	18	50	72	47	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Dominica	0	0	0	0	0	0	0	0	5	3	0	1	0	3	3	4	2	0	2	0	0	5	3	3	3	2	1	2	2	2	
	Dominican Republic	50	90	40	40	101	89	27	67	81	260	91	144	165	133	147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	NEI (BIL)	0	0	0	0	0	0	0	297	268	0	0	0	68	81	252	17	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0
	NEI (ETRO)	15	27	30	36	46	67	64	41	23	1	1	9	4	4	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Saint Kitts and Nevis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
	Seychelles	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Sta Lucia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	2	3	2	3	1	1	4	2	0	0	0	
Landings(FP ATE)	CP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	
	EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Discards	ATE	CP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Curaçao	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EU-España	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	1	0
	El Salvador	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Japan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	1
	Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Panama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	6	1	4	2	4	2	2	3
ATW	CP	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EU-France	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Korea Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	USA	63	28	29	69	57	27	72	45	11	7	5	7	4	5	7	10	10	4	10	19	11	11	6	7	6	6	5	3	2	2	
NCC	Chinese Taipei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0

SAI-Table 2. Kobe 2 Strategic Matrices for the East Atlantic sailfish stock. Top: the probability that overfishing is not occurring ($F \leq F_{MSY}$); middle: the probability that the stock is not overfished ($B \geq B_{MSY}$); and bottom: the joint probability of being in the green quadrant of the Kobe plot (i.e., $F \leq F_{MSY}$ and $B \geq B_{MSY}$).

Probability $F \leq F_{MSY}$										
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1000	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1250	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1500	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1750	100%	100%	100%	99%	99%	99%	99%	99%	99%	99%
2000	99%	99%	98%	98%	97%	97%	96%	95%	94%	94%
2250	98%	97%	95%	94%	92%	90%	88%	86%	84%	83%
2336	98%	96%	94%	91%	89%	87%	84%	82%	79%	77%
2500	97%	94%	90%	86%	83%	79%	75%	71%	68%	65%
2750	94%	88%	82%	75%	69%	64%	58%	52%	48%	44%
3000	90%	81%	72%	62%	54%	46%	40%	35%	30%	27%

Probability $B \geq B_{MSY}$										
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
1000	98%	99%	99%	99%	99%	99%	99%	100%	100%	100%
1250	98%	99%	99%	99%	99%	99%	99%	99%	99%	99%
1500	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
1750	98%	98%	97%	97%	97%	97%	96%	96%	95%	96%
2000	98%	97%	97%	96%	95%	94%	93%	92%	91%	91%
2250	98%	97%	95%	93%	92%	90%	88%	86%	84%	82%
2336	98%	97%	95%	92%	90%	88%	85%	83%	81%	78%
2500	98%	96%	94%	91%	87%	84%	80%	77%	73%	70%
2750	98%	96%	92%	87%	82%	76%	71%	65%	60%	55%
3000	98%	95%	89%	83%	75%	67%	60%	52%	46%	40%

Probability $F \leq F_{MSY}$ and $B \geq B_{MSY}$										
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
1000	98%	99%	99%	99%	99%	99%	99%	100%	100%	100%
1250	98%	99%	99%	99%	99%	99%	99%	99%	99%	99%
1500	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
1750	98%	98%	97%	97%	97%	97%	96%	96%	95%	96%
2000	98%	97%	96%	96%	95%	94%	93%	92%	91%	91%
2250	98%	96%	94%	93%	91%	89%	87%	85%	82%	81%
2336	98%	96%	93%	91%	88%	86%	83%	81%	78%	76%
2500	97%	93%	90%	86%	82%	78%	74%	71%	67%	64%
2750	94%	88%	82%	75%	69%	63%	58%	52%	48%	44%
3000	90%	81%	72%	62%	54%	46%	40%	35%	30%	27%

SAI-Table 3. Kobe II Strategic Matrices for the West Atlantic sailfish stock. Top: the probability that overfishing is not occurring ($F \leq F_{MSY}$); middle: the probability that the stock is not overfished ($B \geq B_{MSY}$); and bottom: the joint probability of being in the green quadrant of the Kobe plot (i.e., $F \leq F_{MSY}$ and $B \geq B_{MSY}$).

Probability $F \leq F_{MSY}$										
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
1000	95%	96%	97%	97%	98%	98%	98%	99%	99%	99%
1250	86%	87%	88%	89%	89%	90%	90%	90%	91%	91%
1500	74%	73%	72%	71%	70%	70%	69%	68%	68%	68%
1600	68%	66%	65%	63%	61%	60%	59%	57%	56%	55%
1700	63%	59%	56%	53%	51%	50%	47%	45%	44%	43%
1750	59%	55%	52%	49%	47%	45%	42%	40%	38%	37%
1800	56%	52%	48%	45%	42%	40%	37%	35%	33%	31%
1900	50%	45%	41%	37%	34%	30%	28%	26%	24%	22%
2000	45%	39%	34%	30%	26%	23%	21%	19%	16%	15%

Probability $B \geq B_{MSY}$										
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	68%	87%	95%	98%	99%	100%	100%	100%	100%	100%
1000	68%	75%	80%	84%	87%	89%	91%	92%	93%	94%
1250	68%	71%	74%	76%	78%	79%	81%	82%	83%	83%
1500	68%	67%	67%	66%	66%	66%	65%	65%	64%	64%
1600	68%	66%	64%	62%	61%	60%	58%	56%	55%	54%
1700	68%	64%	61%	58%	55%	53%	51%	48%	47%	45%
1750	68%	63%	60%	56%	53%	50%	47%	44%	43%	40%
1800	68%	62%	58%	53%	50%	47%	44%	40%	38%	36%
1900	68%	61%	55%	49%	45%	41%	36%	33%	30%	28%
2000	68%	59%	52%	45%	40%	35%	30%	27%	23%	21%

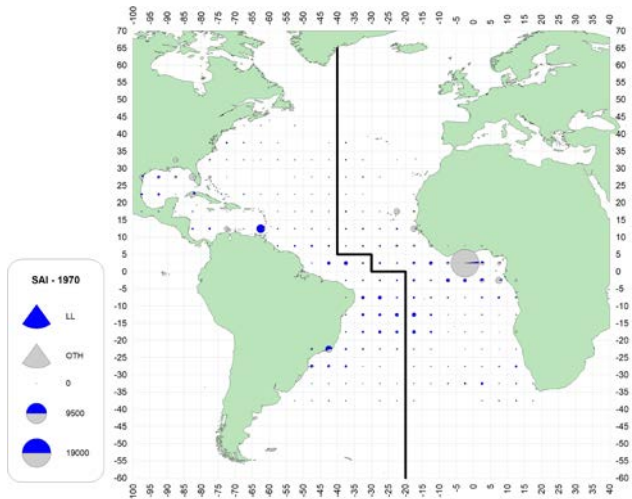
Probability $F \leq F_{MSY}$ and $B \geq B_{MSY}$										
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	68%	87%	95%	98%	99%	100%	100%	100%	100%	100%
1000	68%	75%	80%	84%	87%	89%	91%	92%	93%	94%
1250	68%	71%	74%	76%	78%	79%	81%	82%	83%	83%
1500	67%	66%	66%	66%	65%	65%	65%	64%	63%	63%
1600	65%	63%	61%	60%	58%	57%	56%	54%	54%	53%
1700	61%	58%	55%	52%	50%	48%	46%	44%	43%	42%
1750	59%	55%	52%	48%	46%	44%	41%	39%	38%	36%
1800	56%	52%	48%	45%	42%	39%	37%	34%	32%	31%
1900	50%	45%	41%	36%	34%	30%	28%	26%	24%	22%
2000	45%	39%	33%	30%	26%	23%	21%	19%	16%	15%

SAI-Table 4. Estimated probabilities of the East Atlantic biomass sailfish stock levels being below 20% of B_{MSY} during the projection period for a given catch level.

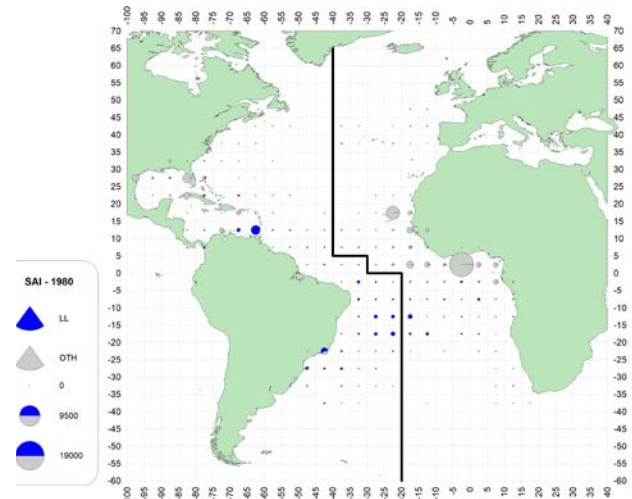
Probability of $B < 20\%$ of B_{MSY}										
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1250	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1750	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2250	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
2336	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%
2500	0%	0%	0%	0%	0%	0%	0%	1%	2%	3%
2750	0%	0%	0%	0%	0%	1%	1%	3%	5%	8%
3000	0%	0%	0%	0%	1%	2%	4%	7%	12%	17%

SAI-Table 5. Estimated probabilities of the West Atlantic biomass sailfish stock levels being below 20% of B_{MSY} during the projection period for a given catch level.

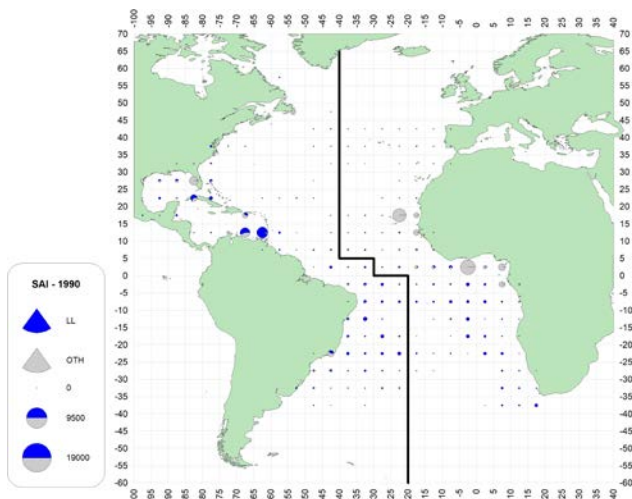
Probability of $B < 20\%$ of B_{MSY}										
Catch (t)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1000	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1250	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%
1500	0%	0%	0%	1%	2%	2%	3%	4%	6%	7%
1600	0%	0%	0%	1%	2%	4%	5%	8%	10%	12%
1700	0%	0%	1%	2%	4%	6%	9%	12%	15%	18%
1750	0%	0%	1%	2%	4%	7%	11%	14%	18%	22%
1800	0%	0%	1%	2%	5%	9%	13%	17%	21%	25%
1900	0%	0%	1%	3%	7%	12%	18%	23%	29%	35%
2000	0%	0%	1%	5%	10%	17%	24%	31%	38%	44%



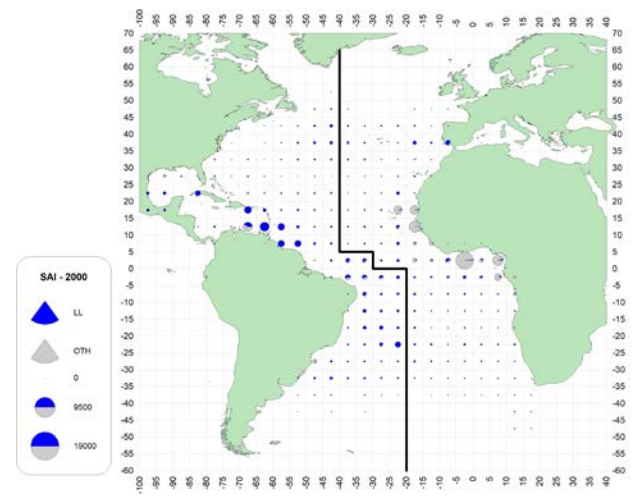
a. SAI (1970-79)



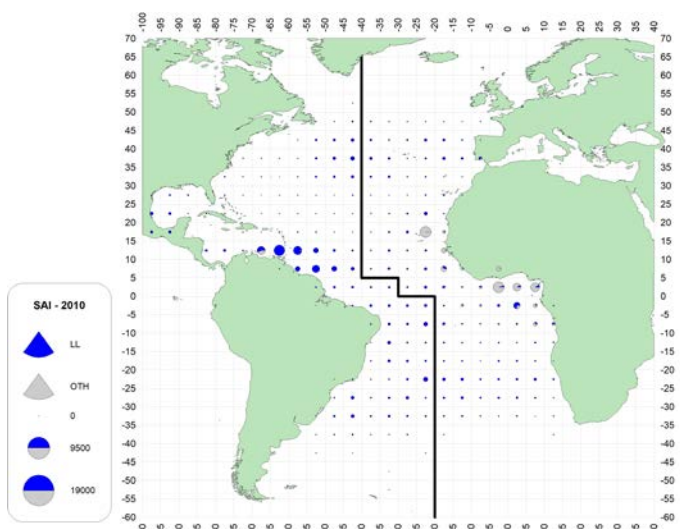
b. SAI (1980-89)



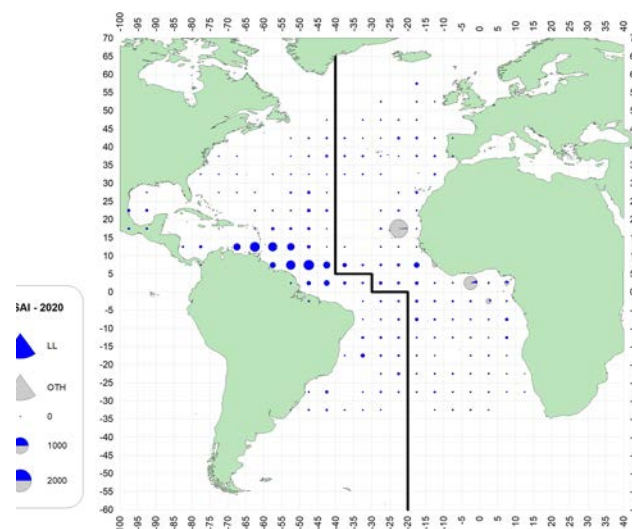
c. SAI (1990-99)



d. SAI (2000-09)

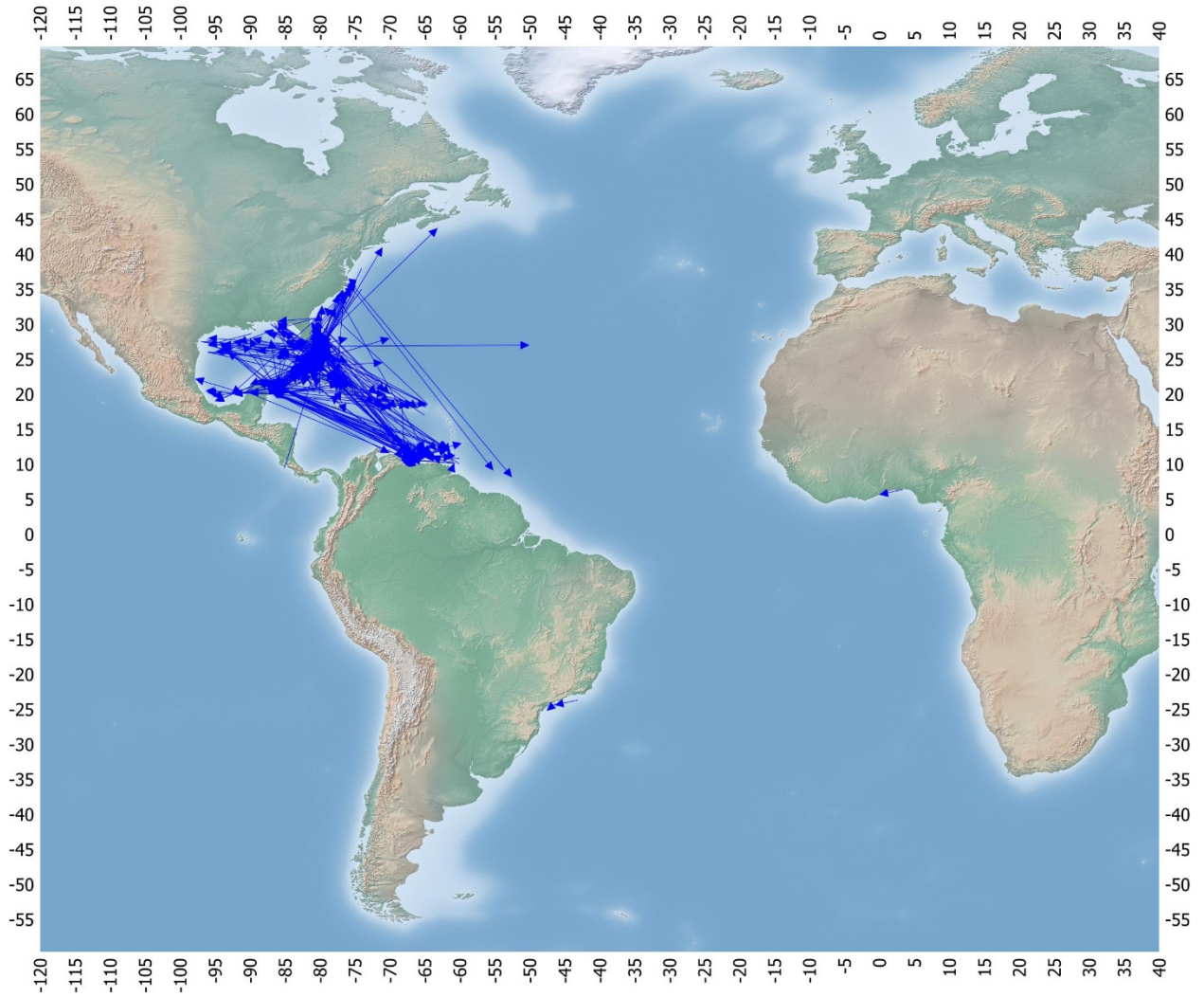


e. SAI (2010-19)

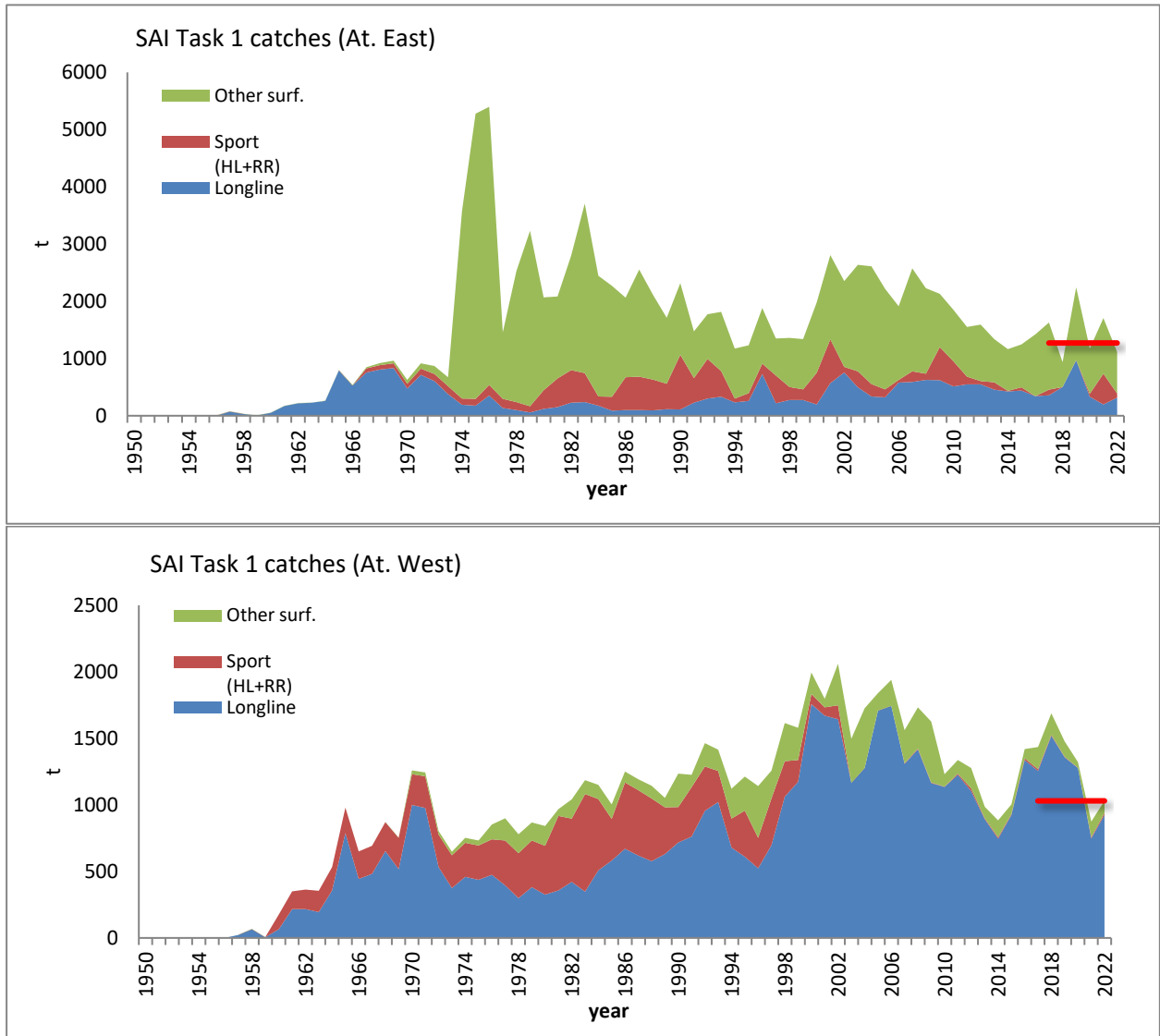


f. SAI (2020-21)

SAI-Figure 1. Geographic distribution of sailfish total catches by decade (last decade only covers 2 years). The dark line denotes the separation between stocks.

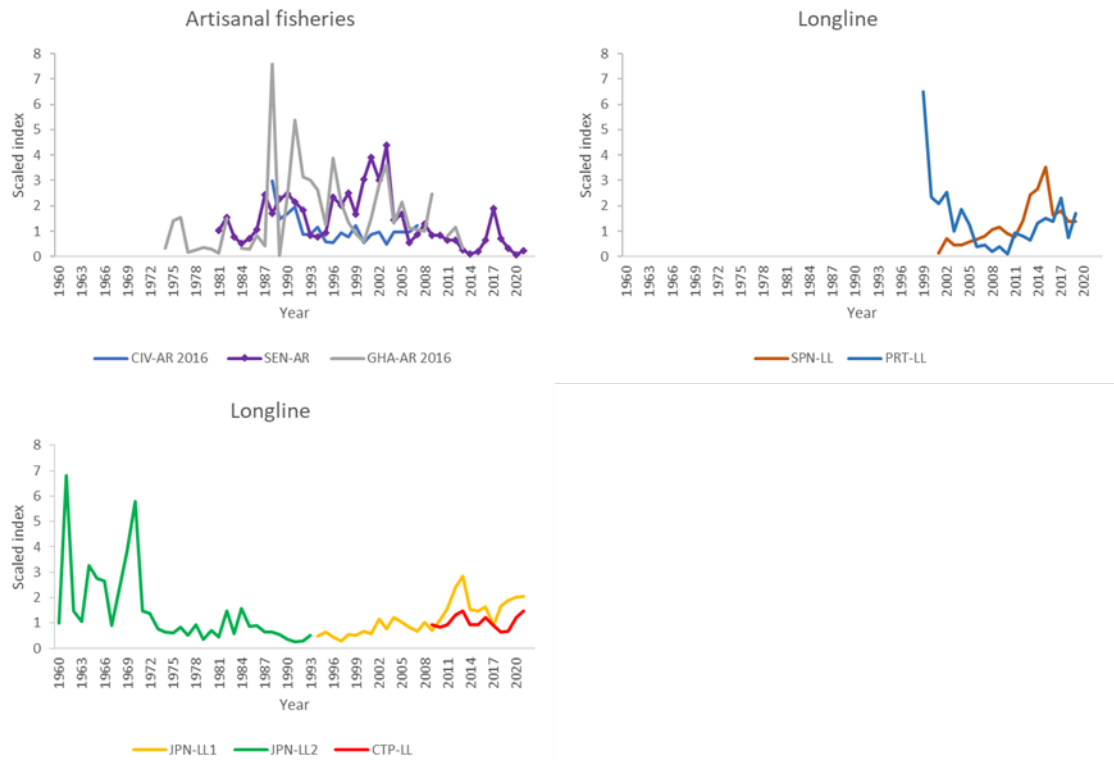


SAI-Figure 2. Conventional tag returns for Atlantic sailfish. Lines join the locations of release and recapture.

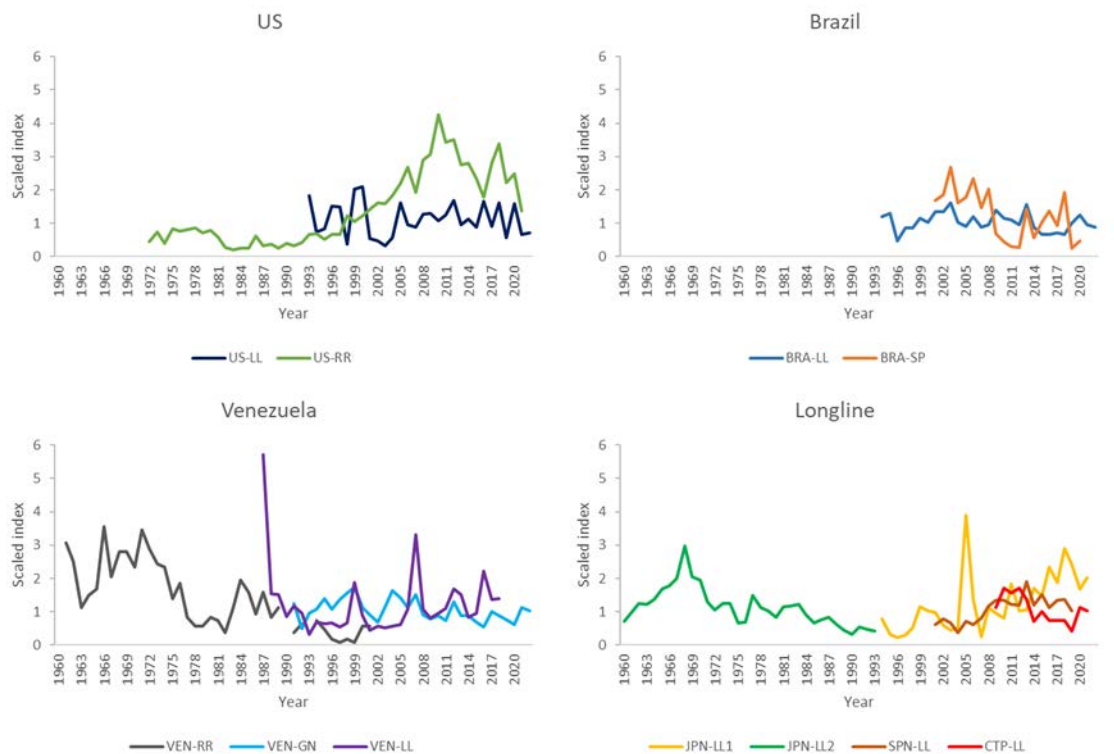


SAI-Figure 3. Task 1 catches of sailfish for each of the two Atlantic stocks, East and West. In 2017 catch levels of 1271 t and 1030 t that triggers the review of [Rec. 16-11](#) were implemented, for East and West stocks, respectively.

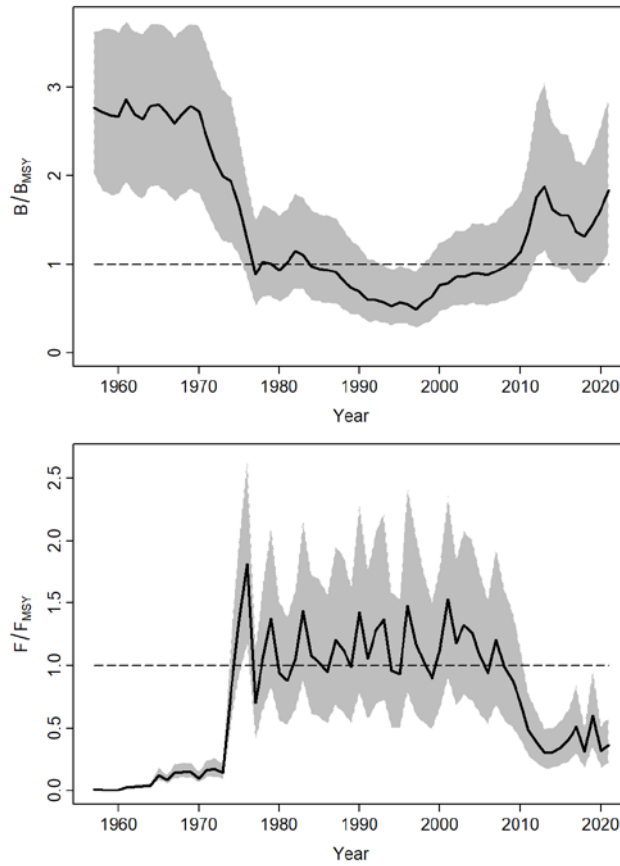
East Atlantic



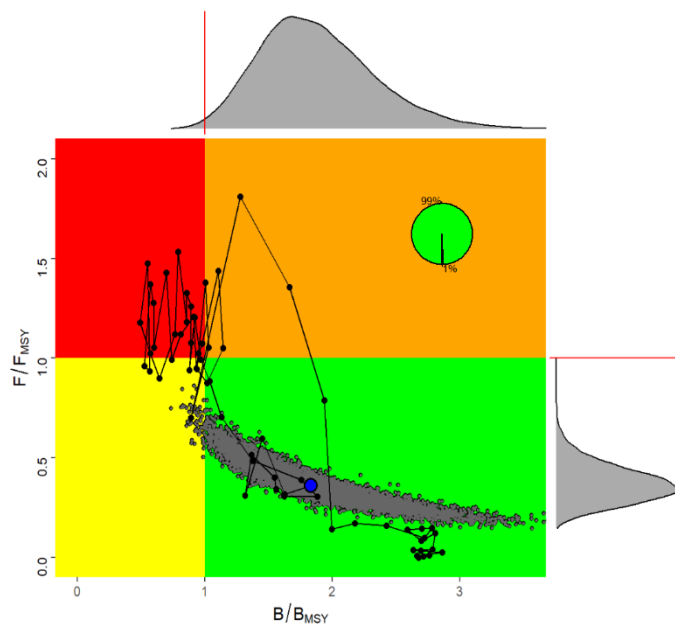
West Atlantic



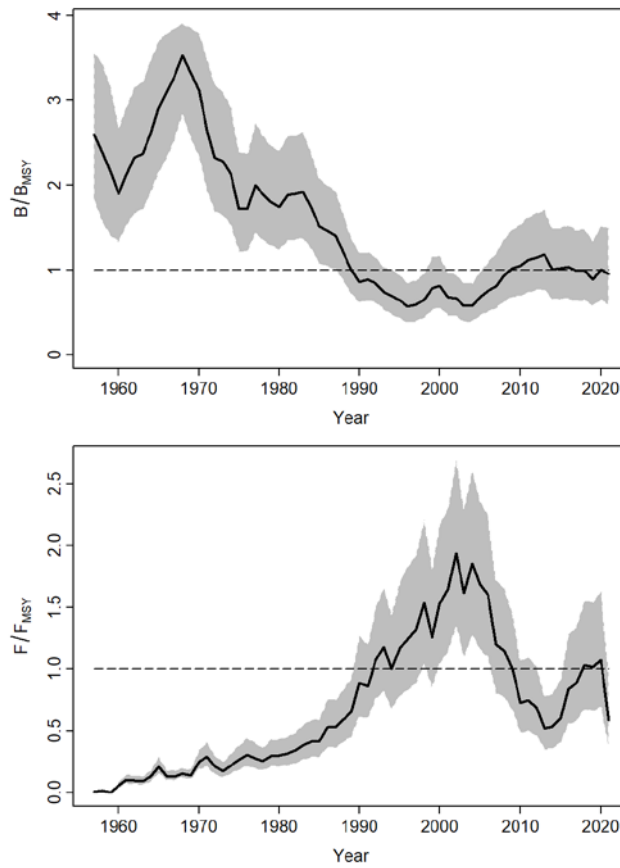
SAI-Figure 4. Relative abundance indices considered in the assessments of the East and West Atlantic sailfish stocks. All indices were scaled to the mean of each series prior to graphing.



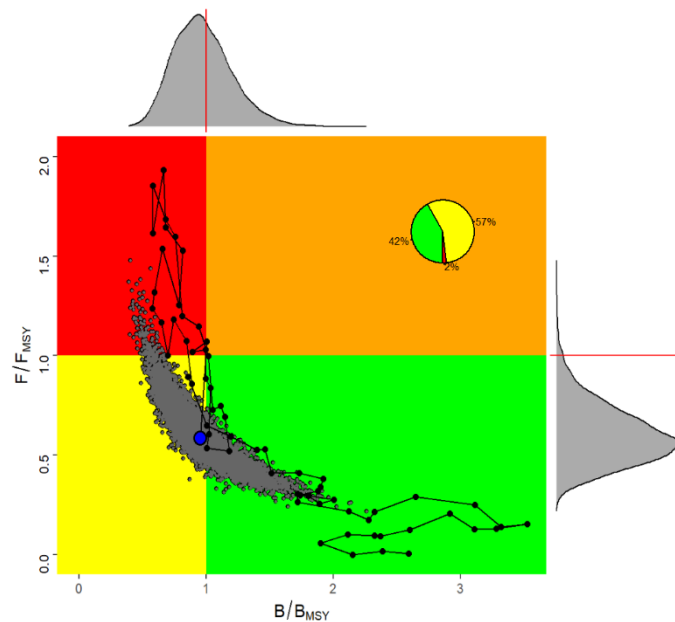
SAI-Figure 5. Estimated annual trend for the East Atlantic sailfish stock for B/B_{MSY} (upper panel), and F/F_{MSY} (lower panel) with 95% CI.



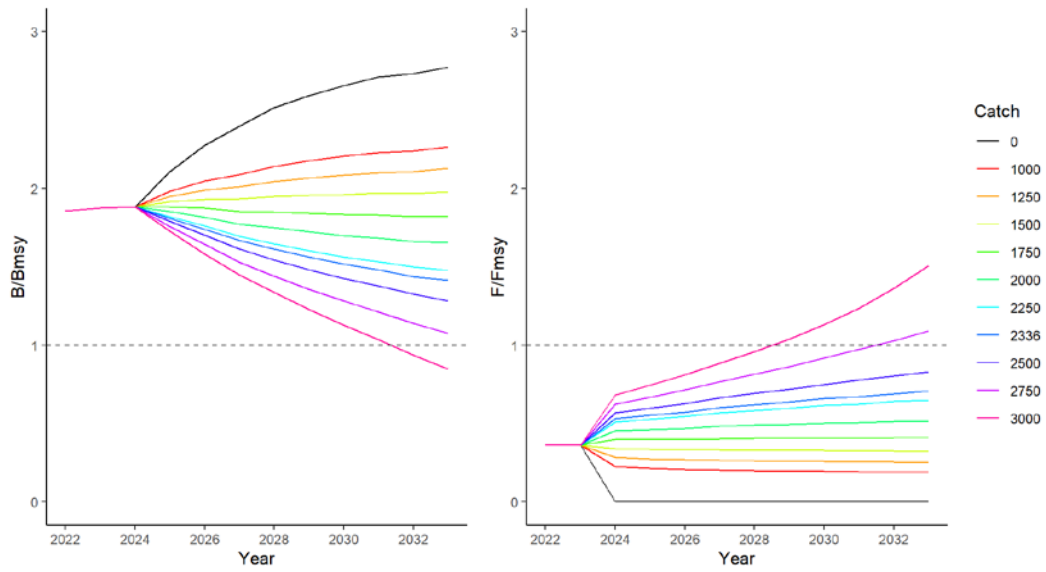
SAI-Figure 6. Kobe phase plot for the East Atlantic sailfish stock. Solid black dots and solid line indicate the stock status trajectory, with the blue dot indicating the terminal year (2021), and grey dots are the interactions for the terminal year with the marginal distributions plotted in the lateral axis.



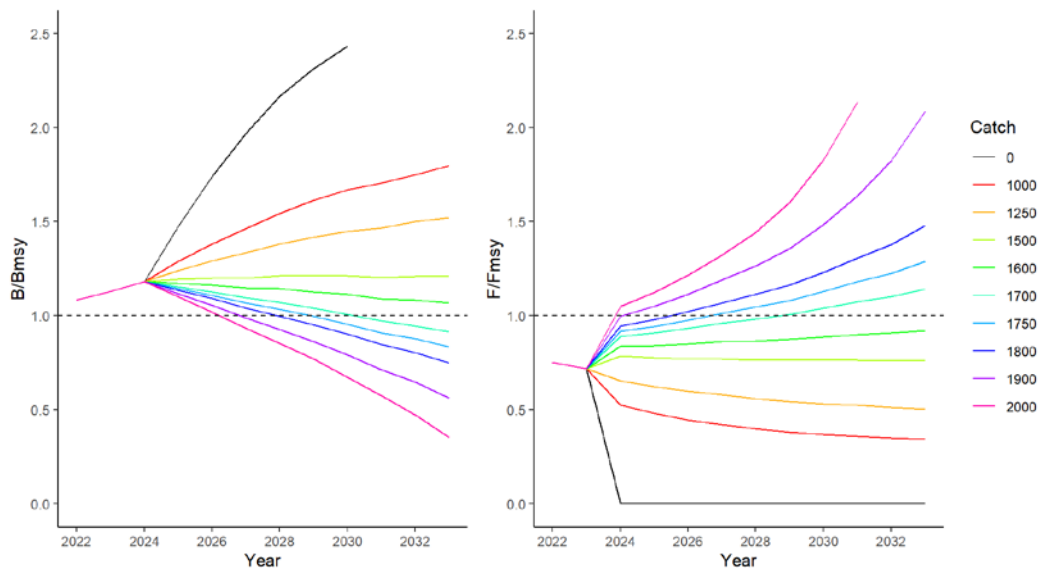
SAI-Figure 7. Estimated annual trend for the West Atlantic sailfish stock for B/B_{MSY} (upper panel), and F/F_{MSY} (lower panel) with 95% CI.



SAI-Figure 8. Kobe phase plot for the West Atlantic sailfish stock. Solid black dots and solid line indicate the stock status trajectory, with the blue dot indicating the terminal year (2021), and grey dots are the interactions for the terminal year with the marginal distributions plotted in the lateral axis.



SAI-Figure 9. Projections for B/B_{MSY} and F/F_{MSY} for the East Atlantic sailfish stock for various levels of future constant catch ranging from 1,000 – 3,000 t, including a zero-catch scenario starting in 2024. The initial catch for the years 2022-2023 was set to 1,586 t, which is the average catch of the recent three years (2019-2021). The projections were run until 2033 (10 years).



SAI-Figure 10. Projections for B/B_{MSY} and F/F_{MSY} for the West Atlantic sailfish stock for various levels of future constant catch ranging from 1,000-2,000 t, including a zero-catch scenario starting in 2024. The initial catch for the years 2022-2023 was set to 1,313 t, which is the geometric mean catch of the recent three years (2019-2021). The projections were run until 2033 (10 years).