9.4 ALB-AT - Atlantic albacore

The status of the North Atlantic albacore stock is based on the analyses conducted in June 2023 with available data up to 2021. Complete information on the assessment can be found in the Report of the 2023 Atlantic Albacore Stock Assessment Meeting (including MSE) (Anon., 2023a).

The status of the South Atlantic albacore stock is based on the analyses conducted in July 2020 with available data up to 2018. Complete information on the assessment can be found in the Report of the 2020 Atlantic Albacore Stock Assessment Meeting (Anon., 2020b).

ALB-AT-1. Biology

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. On the basis of the biological information available for assessment purposes, the existence of three stocks is assumed: northern and southern Atlantic stocks (separated at 5°N) and a Mediterranean stock (**ALB-AT-Figure 1**). However, some studies support the hypothesis that various sub populations of albacore exist in the North Atlantic and Mediterranean. Likewise, there is likely intermingling of Indian Ocean and South Atlantic immature albacore which needs further research.

Scientific studies on albacore stocks, in the North Atlantic, North Pacific and the Mediterranean, suggest that environmental variability may have a serious potential impact on albacore stocks, affecting fisheries by changing the fishing grounds, as well as productivity levels and potential MSY of the stocks. Those yet sufficiently unexplored aspects might explain recently observed changes in fisheries, such as the lack of availability of the resource in the Bay of Biscay in some years, which are demanding focussed research.

The expected life-span for albacore is around 15 years. While albacore is a temperate species, spawning in the Atlantic occurs in tropical waters. Present available knowledge on habitat, distribution, spawning areas and maturity of Atlantic albacore is based on limited studies, mostly from past decades. In 2023 a new age specific natural mortality vector was adopted by the Committee.

More information on albacore biology and ecology is published in the *ICCAT Manual.*

ALB-AT-2. Description of fisheries or fishery indicators

North Atlantic

The northern stock is exploited by surface fisheries targeting mainly immature and sub-adult fish (50 cm to 90 cm FL) and longline fisheries targeting immature and adult albacore (60 cm to 130 cm FL). The main surface fisheries are carried out by EU fleets (Ireland, France, Portugal and Spain) in the Bay of Biscay, in the adjacent waters of the Northeast Atlantic, including the Azores Islands in summer and autumn, and in the vicinity of the Canary Islands year around. The main longline fleet is the Chinese Taipei fleet which operates in the central and western North Atlantic year around. However, Chinese Taipei fishing effort decreased in the late 1980s due to a shift towards targeting tropical tunas, and then continued at this lower level to the present. Over time, the relative contribution of different fleets to the total catch of North Atlantic albacore has changed, which resulted in differential effects on the age structure of the stock. Since the 1980s, a reduction of the area fished for albacore was observed for both longline and surface fisheries.

Total reported landings, steadily increased since 1930 to peak above 60,000 t in the early 1960s, declining afterwards, largely due to a reduction of fishing effort by the traditional surface (troll and baitboat) and longline fisheries (**ALB-AT-Table 1**; **ALB-AT-Figure 2**). Some stabilization was observed in the 1990s and early 2000s, mainly due to increased effort and catch by new surface fisheries (driftnet and mid-water pair pelagic trawl). The lowest catch level of the whole time series was observed in 2009 with 15,391 t, but catches have substantially increased since then, and have fluctuated around the TAC in the last few years.

The preliminary total reported catch in 2022 was 31,654 t (below the TAC of 37,801 t), and the catch in the last five years has remained slightly above 30,000 t. During the last years, the surface fisheries (mainly by EU-Spain, EU-Ireland and EU-France) contributed to approximately 84% of the total catch (**ALB-AT-Table 1**). Longline catch contributed to approximately 16% of the total catch during the last five years. During the last decades, both Chinese Taipei and Japan have reduced their fishing effort directed to albacore. In the case of Japan, albacore was taken mainly as by-catch.

South Atlantic

During the last decades, the total annual South Atlantic albacore landings were largely attributed to five fisheries, namely the surface baitboat fleets of South Africa and Namibia, and the longline fleets of Chinese Taipei, Brazil and Japan (**ALB-AT-Table 1**; **ALB-AT-Figure 2**). The surface fleets are albacore directed and mainly catch sub-adult fish (70 cm to 90 cm FL). These surface fisheries operate seasonally, from October to May, when albacore is available in coastal waters. The longline Chinese Taipei fleet operates over a larger area and throughout the year, consisting of vessels that target albacore and vessels that take albacore as bycatch, in bigeye directed fishing operations. On average, the longline vessels catch larger albacore (60 cm to 120 cm FL) than the surface fleets.

Albacore landings increased sharply since the mid-1950s to reach values oscillating around 25,000 t between the mid-1960s and the 1980s, 35,000 t until the last decade when they oscillated around 20,000 t. However, total reported albacore landings for 2017 decreased to 13,825 t, which is among the lowest values in the time series. The preliminary total reported catch in 2022 was 23,544 t, mostly by longlines and baitboats. The Chinese Taipei catch in the last years has decreased compared to historical catches, mainly due to a decrease in fishing effort targeting albacore. During the last decades, Japan took albacore as bycatch using longline gear, but recently Japan is again targeting albacore and increased the fishing effort in waters off South Africa and Namibia (20˚-40˚S). Thus, catches during the last decade have substantially increased compared to those in the last few decades.

ALB-AT-3. State of stocks

North Atlantic

In 2023 a thorough revision of North Atlantic Task 1, size and age data was conducted, and catch rates were updated with new information for the northern albacore fisheries up to and including data to 2021. In the stock assessment two model formulations with different degrees of complexity were used. In addition to the surplus production model that is part of the adopted Management Procedure, a Stock Synthesis model was also used. The more complex stock synthesis model allowed to incorporate more detailed data and alternative hypotheses, compared to the surplus production model. Both models provided similar results and the Committee agreed to use the Stock synthesis model to characterize stock status, as well as to verify that catch projections are consistent with the catch advice provided by the Management Procedure (MP).

The five CPUE indices (four longline and one baitboat) specified in the MP were used in the production model (**ALB-AT-Figure 3**). These indices were further split into different areas for the Stock synthesis model. Despite their variable pattern, these indices showed an overall increasing trend during the last decades.

The Stock Synthesis model results suggest a biomass drop between 1930 and the 1990s and a recovery since then, while fishing mortality decreases. Relative to MSY benchmarks, the base case scenario estimates that the stock remained slightly overfished with B below B_{MSY} between the late 1970s and the 2000s, but has now recovered to levels well above B_{MSY} (**ALB-AT-Figure 4**). Peak relative fishing mortality levels in the order of 1.66 times F_{MSY} were observed in the early 1980s but overfishing stopped in the early 2000s, with the current F_{2021}/F_{MSY} ratio being 0.45. There is large uncertainty around the current stock status estimated by the model. The probability of the stock currently being in the green area of the Kobe plot (not overfished and not undergoing overfishing, $F<F_{MSY}$ and $B>B_{MSY}$) is 99.6% while the probability of being in the yellow area (overfished, $B<B_{MSY}$) is 0.4%. The probability of being in the red area (overfished and undergoing overfishing, $F>F_{MSY}$ and $B<B_{MSY}$) is 0% (**ALB-AT-Figure 4**).

South Atlantic

In 2020, a stock assessment of South Atlantic albacore was conducted including catch and effort data up until 2018, and considering similar methods as in the previous assessment.

For the South Atlantic stock, the standardized CPUE indices are mainly based on longline fisheries, which catch mostly adult albacore. The same three longline CPUEs that were used in 2016 were also selected to update the 2020 stock assessment results. The longest time series of Chinese Taipei showed a strong declining trend in the early part of the time series followed by a less steep decline over the next three decades (similar to the Japanese longline index), and an increasing trend since the early 2000s. The Uruguayan longline CPUE series showed a decrease since the 1980s (**ALB-AT-Figure 5**). The Chinese Taipei CPUE was the only index that informed stock trends in recent years. In addition, standardized CPUE series from the Brazilian longline (2002-2018) and the South African baitboat fishery were made available, which were used for sensitivity analyses.

In the 2020 assessment the Committee selected a base case to best represent the population dynamics of albacore and uncertainty around stock status as well as impact of alternative fishing scenarios. Base case model results suggest that biomass increased since fishing mortality started to decrease in the early 2000s, and currently there is a 99.4% probability that the South Atlantic albacore stock is neither overfished nor subject to overfishing, with only 0.6% probability for the stock to be overfished. The median MSY value was 27,264 t (ranging between 23,734 t and 31,567 t), the median estimate of current B_{2018}/B_{MSY} was 1.58 (ranging between 1.14 and 2.05) and the median estimate of current F_{2018}/F_{MSY} was 0.40 (ranging between 0.28 and 0.59). The wide confidence intervals reflect the large uncertainty around the estimates of stock status (**ALB-AT-Figure 6**).

ALB-AT-4. Outlook

North Atlantic

In 2021, the Commission adopted a MP that uses a production model and a Harvest Control Rule (HCR) to set TACs every three years (Rec. 21-04). MSE tests showed that this MP would meet the management objectives for this stock, i.e., to be in the green quadrant of the Kobe plot with a probability higher than 60%. Variants to this MP have also been tested (see item 19.6 of this report)

The current management procedure results in a TAC of 47,251 t for 2024-2026. This represents a 25% increase with respect to the previous one and is in line with the positive stock status estimated in the 2023 assessment. If the Commission would select any of the variants requested in Rec. 21-04 (F_{TAR} between 0.8 and 1 and B_{THRESH} between 0.8 and 1.2), the resulting TAC would be the same because the maximum TAC increase of 25% would apply in all cases. It is noted that this TAC for 2024-2026 is above the MSY estimate for this stock (41,995 t); this is because the current biomass is well above B_{MSY} (B_{2021}/B_{MSY} = 2.19), and therefore this level of catch can be sustained in the near term. Projections conducted by the stock Synthesis model also supported that level of catch in the short term.

South Atlantic

The Kobe matrix indicates that catches around the MSY level of 27,000 t will maintain biomass levels above B_{MSY} and fishing mortality below F_{MSY} with a high probability of 90% over the projection horizon through 2033 (**ALB-AT-Table 2**). In fact, due to the current high stock biomass, catches of up to 30,000 t are expected to maintain stock levels above B_{MSY} until 2033 with a probability higher than 60%. However, it is important to note that these catch levels would exceed MSY and it would require a reduction in TAC after 2033 to prevent overfishing (**ALB-AT-Table 2**).

ALB-AT-5. Effect of current regulations

North Atlantic

In 2021, the Commission adopted a model-based management procedure including the HCR described in **ALB-AT-Figure 7**, with a maximum TAC of 50,000 t and a maximum change of +25% -20% when $B_{CUR}>B_{THR}$. Its application established a TAC of 37,801 t for 2022-2023 (Rec. 21-04) and the possibility to carry over some unused portions of the quotas to be caught later in time remained. The Committee noted that, since the establishment of the TAC in the year 2001, catch remained substantially below the TAC in all but four years (**ALB-AT-Figure 2**), which might have accelerated rebuilding over the last decades. The bulk of the catch is caught by traditional surface fisheries operating in the Bay of Biscay and surrounding waters. Thus, it is likely that the fluctuations in catches reflect the fluctuations in the availability of the resource to those local regional fisheries, and the carry-over allows to compensate the fleets for the years when the stock was less available.

Furthermore, Rec. 98-08 that limits fishing capacity to the average of 1993-1995, remains in force. The effect of this Recommendation has not been evaluated but a general decrease of fishing mortality has been observed since its implementation.

South Atlantic

In 2022 the Commission established a new TAC of 28,000 t for 2023-2026 (Rec. 22-06). The Committee noted that reported catches remained below 28,000 t since 2004 (**ALB-AT-Table 1**). The Committee did not test for the effect of perfect implementation of the TAC since 2004.

ALB-AT-6. Management recommendations

North Atlantic

Recommendation 21-04 sets the management procedure to achieve the management objective of maintaining the stock in the green area of the Kobe plot with at least 60% probability while maximizing long-term yield.

In the 2023 assessment, the Committee noted that the relative abundance of North Atlantic albacore has continued to increase over the last two decades and the stock is estimated to be in the green area of the Kobe plot with > 99% probability. Considering that no exceptional circumstances have been detected that preclude the application of the MP, the Committee recommends applying the MP to the current biomass estimate (B_{2021} in the Summary Table below) to set the next TAC for the 2024-2026 period. The recommended TAC obtained by applying the MP is 47,251 t, which represents a 25% increase with respect to the previous one.

South Atlantic

Results indicate that, most probably, the South Atlantic albacore stock is not overfished and that overfishing is not occurring. Projections at a level consistent with the MSY (27,264 t) showed that probabilities of being in the green quadrant of the Kobe plot would remain very high (90%) by 2033. In fact, due to the current high stock biomass, catches of up to 30,000 t are expected to maintain stock levels above B_{MSY} until 2033 with a probability higher than 60%. However, it is important to note that these catch levels exceed MSY and it would require a reduction in TAC after 2033 to prevent overfishing (**ALB-AT-Table 2**).

ATLANTIC ALBACORE SUMMARY		
	North Atlantic[1]	**South Atlantic**
Maximum Sustainable Yield	41,995 t (38,860 - 45,130)[2]	27,264 t (23,734 - 31,567)[2]
Current (2022) Yield	31,654 t	23,544 t
$Yield_{current}$ in last year of assessment [3]	31,393 t	17,098 t
SSB_{MSY}	93,202 t (51,136 - 135,269) [2]	124,453 t (79,611 - 223,424) [2]
F_{MSY}	0.115 (0.092 - 0.141)[3]	0.219 (0.116 - 0.356) [2]
B_{2021}	519,799 t (462,465 - 608,819) [3]	
SSB_{2021}/SSB_{MSY}	2.19 (1.21 - 4.01) [2]	
B_{2018}/B_{MSY}		1.58 (1.14 - 2.05) [2]
$F_{current}/F_{MSY}$ [4]	0.45 (0.29 - 0.71)	0.40 (0.28 - 0.59)
Stock Status	Overfished: NO Overfishing: NO	Overfished: NO Overfishing: NO
Management measures in effect:	Rec. 98-08: Limit number of vessels to 1993-1995 average. Rec. 21-04: TAC of 37,801 t for 2022-2023, according to MP. Management objective is to keep the stock in (or rebuild it to) the green area of the Kobe plot with at least 60% probability, while maximizing catch and reducing variability of TAC.	Rec. 22-06: TAC of 28,000 t for 2023-2026
Recommended TAC for the period 2024-2026 as estimated following the MP adopted in Rec. 21-04[5]	47,251 t	

[1] All values from the Stock Synthesis model, except for B_{2021} and F_{MSY}, which are used for TAC calculation, where values from the production model are shown.
[2] Mean (North Atlantic) or median (South Atlantic) and 95% CI for the reference/base case.
[3] Median and 95% CI for the production model used for the MP iteration (Rec. 21-04).
[4] Current year (the last year in the assessment) is 2021 for North Atlantic and 2018 for South Atlantic.
[5] The recommended TAC is capped by the maximum allowed increase of 25%, since the TAC obtained when applying the MP equation resulted in a higher value ($F_{TAR}*B_{CUR}$ = 47,673.9 t).

ALB-AT-Table 1. Estimated catches (t) of albacore (*Thunnus alalunga*) 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				70949	70464	65931	57229	57045	56341	62206	64511	65048	54462	53571	48501	54199	61416	42274	39350	37640	38636	44115	50704	44095	40361	40835	44783	42299	46831	50400	49358	56452	55198
	ATN			38135	35163	38377	28803	29023	25746	34549	33123	26252	22716	25567	25957	35318	36963	21991	20483	15391	19411	19989	25432	24671	26638	25635	30400	28475	29786	34922	31274	31391	31654
	ATS			32814	35301	27554	28426	28022	30595	27656	31388	38795	31746	28005	22545	18882	24453	20283	18867	22248	19225	24126	25272	19424	13723	15201	14383	13825	17045	15478	18084	25061	23544
Landings	ATN		Bait boat	15646	11967	16411	11338	9821	7562	8780	11072	6123	6638	7840	8128	10458	14273	8496	7931	4994	6026	5530	8816	4975	7341	9265	14455	12196	11330	12662	11855	11696	11069
			Longline	7093	7309	4859	4641	4051	4035	6710	7320	7372	6235	7826	7037	6911	5223	3237	2647	2619	3913	3666	3510	6298	3076	4541	5448	5025	4567	4758	5714	4870	4422
			Other surf.	7279	7506	3555	3337	4378	6846	6817	5971	2808	365	470	577	624	625	525	274	427	231	359	344	816	163	136	95	139	62	179	116	115	288
			Purse seine	229	292	278	263	26	91	55	191	263	93	211	344	99	162	198	70	101	70	3	176	40	35	116	50	38	39	65	21	30	3
			Trawl	1779	2131	3049	2571	2877	1318	5343	3547	5374	5376	3846	2369	7001	6385	3429	4321	2811	2026	6852	6678	6558	9184	5771	6299	6611	8820	10816	7577	8309	9713
			Troll	6109	5959	10226	6652	7870	5894	6845	5023	4312	4009	5373	7501	10224	10296	6105	5239	4440	7146	3578	5909	5891	6660	5597	3753	4165	4807	6292	5938	6250	6134
	ATS		Bait boat	7341	9334	7009	6913	8092	10352	6708	6815	10343	9710	6973	7475	5084	5876	3375	4350	7926	3748	5938	6931	5211	4765	4965	2949	1846	3228	2852	4297	4434	7014
			Longline	23950	24806	20040	21000	19547	19799	20640	24399	28039	21671	20626	14735	12977	17740	15087	13218	12113	13471	16445	17846	13888	8907	10104	11243	11674	13715	12473	13747	20601	16289
			Other surf.	74	96	92	256	145	1	74	116	389	325	85	300	323	395	1762	1219	2066	1651	1538	66	266	7	0	108	114	84	113	17	0	196
			Purse seine	1450	1065	413	258	118	434	183	58	25	39	308	16	499	442	58	81	144	355	205	428	58	44	131	83	190	19	3	11	21	34
			Trawl	0	0	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Discards	ATN		Longline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	179	209	300	302	160	151	53	121	0
			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
			Trawl	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	25
			Troll	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
	ATS		Longline	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	0	37	11	5	10
			Purse seine	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	
Landings	ATN	CP	Barbados	0	0	0	0	1	1	1	0	2	5	8	10	13	9	7	7	4	6	4	20	22	13	16	38	32	15	7	10	12	12
			Belize	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	26	39	416	351	155	230	79	1	399	448	385	216	326	201	214
			Brazil	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	148	83	14	**0**
			Canada	9	32	12	24	31	23	38	122	51	113	56	27	52	27	25	33	11	14	28	34	32	47	32	20	17	26	31	12	40	27
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	**0**
			China PR	0	14	8	20	0	0	21	16	57	196	155	32	112	202	59	24	27	142	101	21	81	35	21	103	124	124	129	208	291	240
			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	12	0	0	0	**0**
			Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	53	39	146	0	0	0	151	549	0	76	14	30	1
			EU-España	18380	16998	20197	16324	17295	13285	15363	16000	9177	8952	12530	15379	20447	24538	14582	12725	9617	12961	8357	13719	10502	11607	14126	17077	13964	15691	16536	16205	17408	16870
			EU-France	6293	5934	5304	4694	4618	3711	6887	5718	6005	4320	3456	2444	7266	6559	3179	3009	1139	1293	3352	3370	4625	6716	3441	4229	4191	5824	7881	4753	5397	6362
			EU-Ireland	1946	2534	918	874	1913	3750	4858	3464	2093	1100	755	175	306	521	596	1517	1997	788	3597	3575	2231	2485	2390	2337	2492	3102	3213	2938	2879	3374
			EU-Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	**0**
			EU-Portugal	3385	974	6470	1634	395	91	324	278	1175	1953	553	513	556	119	184	614	108	202	1046	1231	567	2609	929	1111	2527	498	2493	1596	501	281
			FR-St Pierre et Miquelon	0	0	0	0	0	0	0	0	4	0	7	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Great Britain	499	613	196	49	33	117	343	15	0	0	0	0	6	19	30	50	67	118	57	50	133	136	31	0	0	0	0	77	165	121
			Grenada	0	0	2	1	6	7	6	12	21	23	46	25	29	19	20	15	18	18	18	0	0	0	79	50	62	37	23	22	6	
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	**0**
			Iceland	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	485	505	386	466	414	446	425	688	1126	711	680	893	1336	781	288	402	288	525	336	400	1745	267	276	297	366	196	334	260	261	301
			Korea Rep	8	0	2	2	1	0	0	0	0	0	0	0	59	45	12	59	82	110	60	200	184	64	5	13	8	27	48	116	115	124
			Liberia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	90	3	0	0	0	0
			Maroc	0	0	0	0	0	0	0	0	0	55	81	120	178	98	96	99	130	0	0	0	0	0	0	20	20	20	25	29	40	60
			Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	2	0	7	0	1	1	0
			Panama	60	117	73	11	5	0	0	0	0	0	0	0	0	96	298	113	45	154	103	0	246	108	103	200	0	196	185	176	183	181
			Philippines	0	0	0	0	0	151	4	0	0	0	0	0	9	0	8	19	54	0	0	83	0	0	0	0	0	0	0	0	0	**0**
			Senegal	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	4	0	0	**0**
			Sierra Leone	0	0	0	0	0	0	0	0	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			St Vincent and Grenadines	2	0	0	0	0	0	1	704	1370	300	1555	89	802	76	263	130	135	177	329	305	286	328	305	291	297	173	180	252	202	**0**
			Trinidad and Tobago	0	0	0	0	2	1	1	2	11	9	12	12	9	12	18	32	17	17	23	47	67	71	95	71	48	33	22	16	27	22
			UK-Bermuda	0	0	0	0	1	0	2	2	2	0	0	1	1	0	0	0	0	0	1	0	0	1	0	1	0	0	1	2	4	5
			UK-Turks and Caicos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	**0**
			USA	509	741	545	472	577	829	315	406	322	480	444	646	488	400	532	257	189	221	369	409	819	458	354	250	238	103	221	328	296	311
			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**
			Venezuela	246	282	279	315	75	107	91	299	348	162	346	457	175	321	375	222	398	288	247	312	181	285	351	287	301	165	221	246	299	317
		NCC	Chinese Taipei	6300	6409	3977	3905	3330	3098	5785	5299	4399	4330	4557	4278	2540	2357	1297	1107	863	1587	1367	1180	2394	947	2857	3134	2385	2926	2770	3549	2896	2806
			Costa Rica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	5	11	5	1	1	2	1
			Guyana	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	0	0	**0**
		NCO	Cuba	0	0	0	0	0	0	0	0	0	1	322	435	424	527	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Dominica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	1	0	2	0	0	
			Dominican Republic	0	0	0	0	323	121	73	95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			NEI (Flag related)	13	10	8	11	3	8	12	0	0	0	0	0	0	0	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	0	0	0	
			Sta Lucia	1	0	1	1	0	0	0	1	3	2	10	0	2	2	2	2	0	130	2	3	2	0	0	2	1	0	1	0	0	0
			Vanuatu	0	0	0	0	0	0	0	0	0	0	0	414	507	235	95	20	140	187	196	172	228	195	0	0	0	0	0	0	0	
	ATS	CP	Angola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	168	0	5	0	0	0	0	0	0	0	**0**
			Belize	0	0	2	0	0	0	8	2	0	0	0	0	0	54	32	31	213	303	365	171	87	98	0	123	219	311	158	162	31	13

				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
			Brazil	3613	1227	923	819	652	3418	1872	4412	6862	3228	2647	522	556	361	535	487	202	271	1269	2077	2016	462	490	658	497	343	854	534	502	543
			Cape Verde	0	0	0	0	0	0	0	0	0	0	0	0	8	46	24	0	5	0	5	0	0	0	0	0	0	0	0	0	0	**0**
			China PR	0	0	0	0	0	0	39	89	26	30	26	112	95	100	35	25	89	97	80	61	65	34	120	94	185	116	132	184	10	31
			Curaçao	0	0	0	0	9	192	0	2	0	0	0	0	0	0	0	0	21	4	4	24	0	0	1	14	10	0	0	0	0	18
			Côte d'Ivoire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	43	45	50	0	0	0	0	0	6	19	45	47	19
			EU-España	783	831	457	184	256	193	1027	288	573	836	376	81	285	367	758	933	1061	294	314	351	369	259	418	195	347	303	186	30	37	32
			EU-France	565	130	83	191	39	40	13	23	11	18	63	16	443	347	12	50	43	109	50	151	40	41	54	64	78	16	3	10	21	16
			EU-Portugal	483	1185	655	494	256	124	232	486	41	433	415	9	43	8	13	49	254	84	44	11	1	3	1	9	9	11	3	2	3	3
			Ghana	0	0	0	0	0	0	0	0	0	0	53	0	0	0	5	10	14	25	0	0	0	0	0	0	0	0	0	0	0	**0**
			Great Britain	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**
			Guatemala	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	56	0	0	15	0	1	3	1	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	6	0	0	0	0	1	0	0	0	**0**
			Guinée Rep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	74	0	0	0	0	0	0	0	0	0	**0**
			Honduras	0	0	2	0	7	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Japan	467	651	389	435	424	418	601	554	341	231	322	509	312	316	238	1370	921	973	1194	2903	3106	1131	1752	1096	1189	2985	1506	900	1737	1871
			Korea Rep	20	3	3	18	4	7	14	18	1	0	5	37	42	66	56	88	374	130	70	89	33	2	4	48	86	167	170	131	131	153
			Maroc	68	24	24	0	5	4	0	0	0	14	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
			Namibia	0	1111	950	982	1199	1429	1162	2418	3419	2962	3152	3328	2344	5100	1196	1958	4936	1320	3791	2420	848	1057	1062	994	214	888	260	2166	8165	6319
			Panama	318	458	228	380	53	60	14	0	0	0	0	0	17	0	87	5	6	1	0	12	3	18	6	5	13	1	13	31	17	12
			Philippines	0	0	0	0	0	5	4	0	0	0	0	0	52	0	13	79	45	95	96	203	415	18	0	0	0	0	0	0	0	**0**
			Senegal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	24	0	0	**0**
			South Africa	6881	6931	5214	5634	6708	8412	5101	3610	7236	6507	3469	4502	3198	3735	3797	3468	5043	4147	3380	3553	3510	3719	4030	2065	1785	2572	2455	4026	3823	5587
			St Vincent and Grenadines	0	29	30	41	0	23	0	2116	4303	44	0	0	0	65	160	71	51	31	94	92	97	110	100	107	101	98	31	0	14	23
			Trinidad and Tobago	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**
			UK-Sta Helena	38	5	82	47	18	1	1	58	12	2	3	1	35	62	46	94	81	3	120	2	2	0	0	0	0	0	0	0	0	**0**
			USA	0	0	0	1	5	1	1	1	2	8	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	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**
			Uruguay	28	16	49	75	56	110	90	90	135	111	108	120	32	93	34	53	97	24	37	12	209	0	0	0	0	0	0	0	0	**0**
		NCC	Chinese Taipei	19400	22573	18351	18956	18165	16106	17377	17221	15833	17321	17351	13288	10730	12293	13146	9966	8678	10975	13032	12812	8519	6675	7157	8907	9090	9227	9626	9851	10519	8894
		NCO	Argentina	0	2	0	0	120	9	52	0	0	0	12	18	0	0	0	0	0	130	43	0	0	0	0	0	0	0	0	0	0	
			Cambodia	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Cuba	3	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	
			NEI (ETRO)	0	1	10	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	
			NEI (Flag related)	146	123	102	169	47	42	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Seychelles	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	
			Vanuatu	0	0	0	0	0	0	0	0	0	0	0	0	684	1400	96	131	64	104	85	35	83	91	0	0	0	0	0	0	0	
Discards	ATN	CP	Canada	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	0	0	0	25
			EU-Portugal	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	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**
			UK-Bermuda	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
			Venezuela	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93	179	209	300	302	160	151	52	121	**0**
		NCC	Chinese Taipei	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**
	ATS	CP	Côte d'Ivoire	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	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	37	11	5	10
			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**
			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**
		NCC	Chinese Taipei	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	0	0	0	0	**0**

ALB-AT-Table 2. South Atlantic albacore estimated probabilities (in %) based on Bayesian surplus production model that the stock fishing mortality is below F_{MSY} (a), biomass is above B_{MSY} (b) and both (c). Projections for constant catch levels (16,000 t to 34,000 t) are shown.

(a) Probability $F<F_{MSY}$.

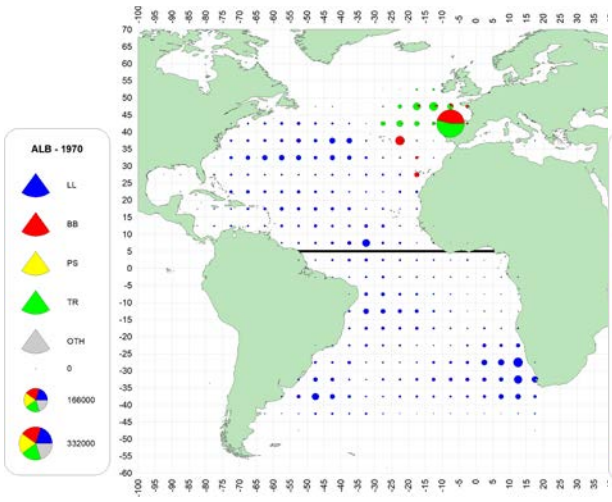
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
16000	100	100	100	100	100	100	100	100	100	100	100	100	100
18000	100	100	100	100	100	100	100	100	100	100	100	100	100
20000	100	100	100	100	100	100	100	100	100	100	100	100	100
21000	100	100	100	100	100	100	100	100	100	100	100	100	100
22000	100	100	100	100	100	100	100	100	100	100	99	99	99
23000	100	100	100	100	100	100	99	99	99	99	99	99	99
24000	100	100	100	99	99	99	99	99	99	99	99	98	98
25000	100	100	99	99	99	99	98	98	98	98	98	97	97
26000	99	99	99	99	98	98	98	97	97	96	95	95	94
27000	99	99	98	98	97	97	96	95	94	93	92	91	90
28000	99	98	98	97	96	95	93	92	91	89	87	86	84
29000	99	98	97	96	94	93	90	88	85	82	80	77	74
30000	98	97	96	94	91	89	85	81	78	73	70	65	62
32000	97	95	92	88	82	76	69	62	56	49	44	39	35
34000	95	91	85	77	67	57	48	40	32	27	22	19	16

(b) Probability $B>B_{MSY}$.

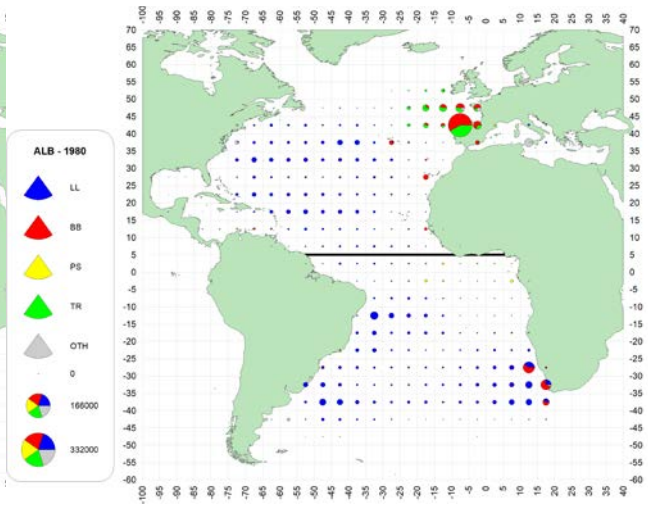
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
16000	100	100	100	100	100	100	100	100	100	100	100	100	100
18000	100	100	100	100	100	100	100	100	100	100	100	100	100
20000	100	100	100	100	100	100	100	100	100	100	100	100	100
21000	100	100	100	99	99	99	99	99	99	99	99	99	99
22000	100	100	100	99	99	99	99	99	99	99	99	99	99
23000	100	100	100	99	99	99	99	99	99	99	99	99	98
24000	100	99	99	99	99	99	99	99	98	98	98	98	98
25000	100	100	99	99	99	99	98	98	98	98	97	97	97
26000	100	99	99	99	99	99	98	98	97	97	96	95	95
27000	100	99	99	99	98	98	97	97	96	95	94	93	92
28000	100	99	99	99	98	97	96	95	94	93	91	90	88
29000	100	99	99	98	98	97	96	94	92	90	88	85	83
30000	100	99	99	98	97	96	94	92	89	86	83	79	76
32000	100	99	99	98	96	93	89	85	80	74	68	62	56
34000	100	99	98	96	93	89	82	75	66	58	49	42	36

(c) Probability of green status ($B>B_{MSY}$ and $F<F_{MSY}$).

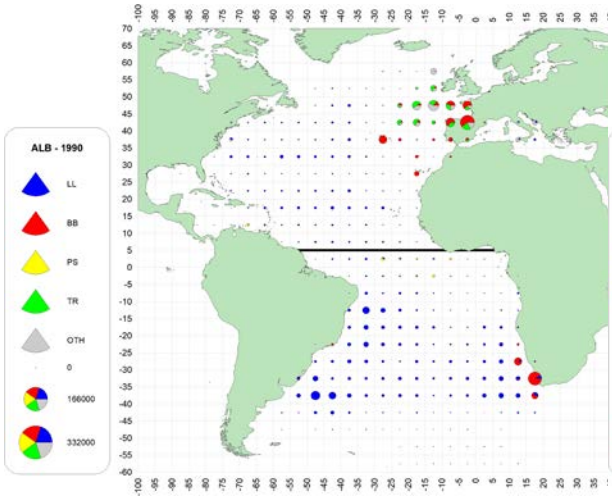
TAC | Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
16000	100	100	100	100	100	100	100	100	100	100	100	100	100
18000	100	100	100	100	100	100	100	100	100	100	100	100	100
20000	100	100	100	100	100	100	100	100	100	100	100	100	100
21000	100	100	100	99	99	99	99	99	99	99	99	99	99
22000	100	100	100	99	99	99	99	99	99	99	99	99	99
23000	100	100	99	99	99	99	99	99	99	99	99	98	98
24000	100	99	99	99	99	99	99	98	98	98	98	98	98
25000	100	99	99	99	99	98	98	98	98	97	97	97	96
26000	99	99	99	98	98	98	97	97	96	96	95	94	94
27000	99	99	98	98	97	97	96	95	94	93	92	91	90
28000	99	98	98	97	96	95	93	92	90	89	87	85	83
29000	99	98	97	96	94	93	90	88	85	82	79	77	74
30000	98	97	96	94	91	89	85	81	78	73	69	65	61
32000	97	95	92	88	82	76	69	62	56	49	44	39	35
34000	95	91	85	77	67	57	48	40	32	27	22	19	16



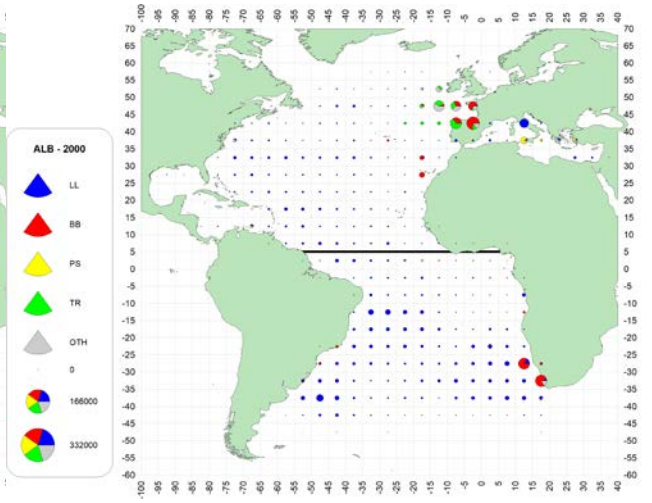
a. ALB (1970-79)



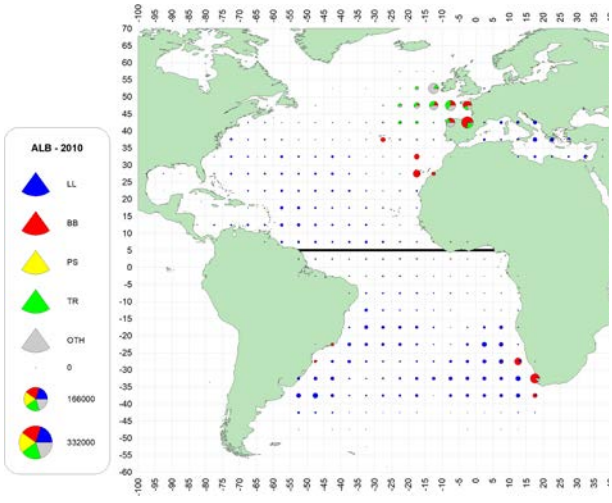
b. ALB (1980-89)



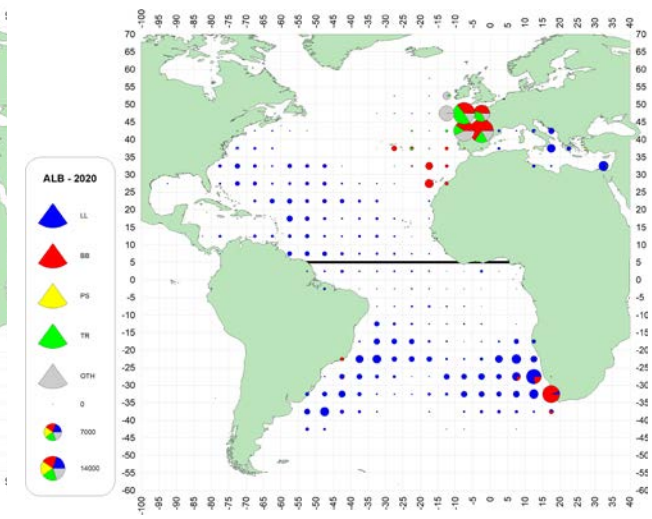
c. ALB (1990-99)



d. ALB (2000-09)

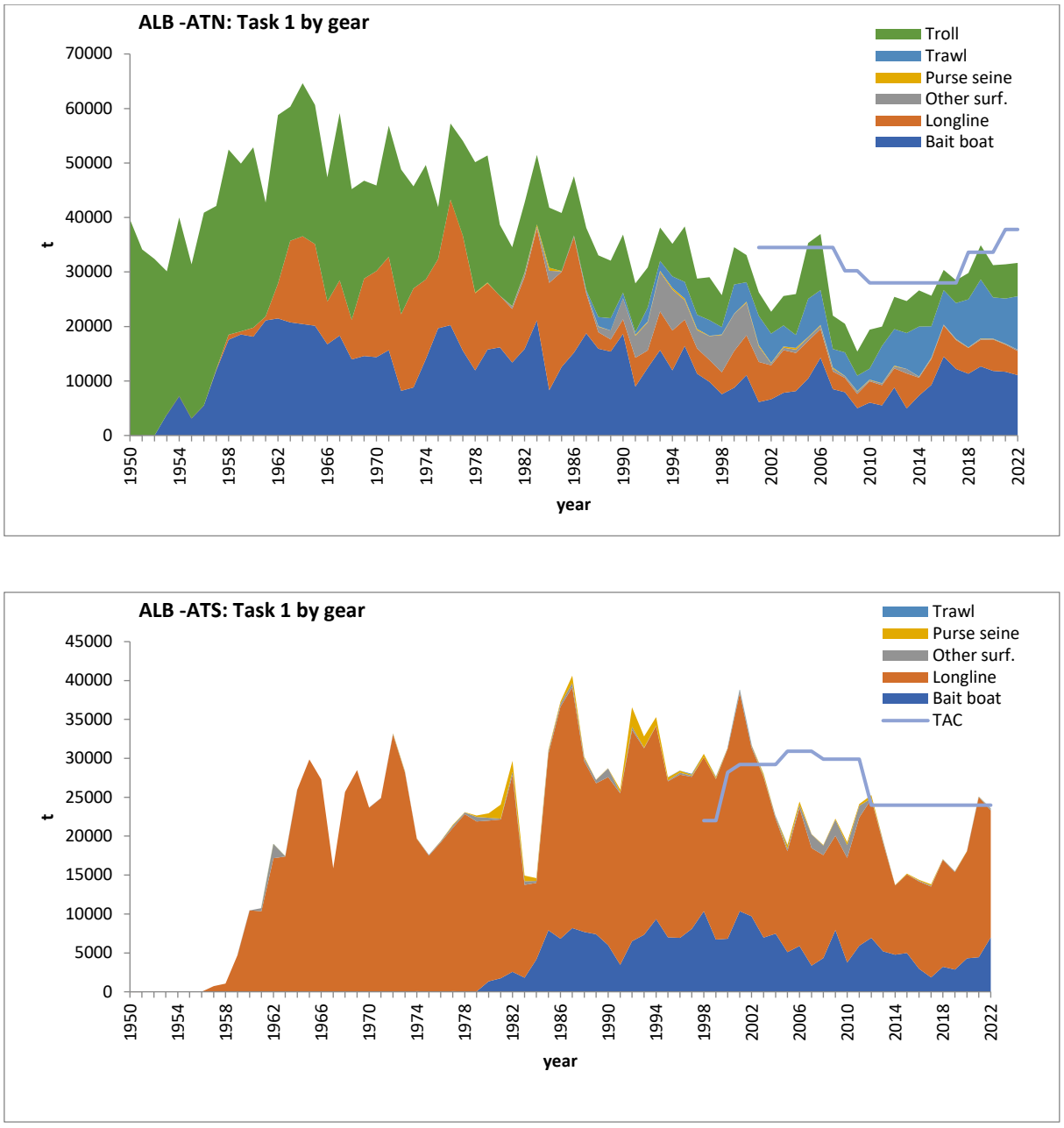


e. ALB (2010-19)

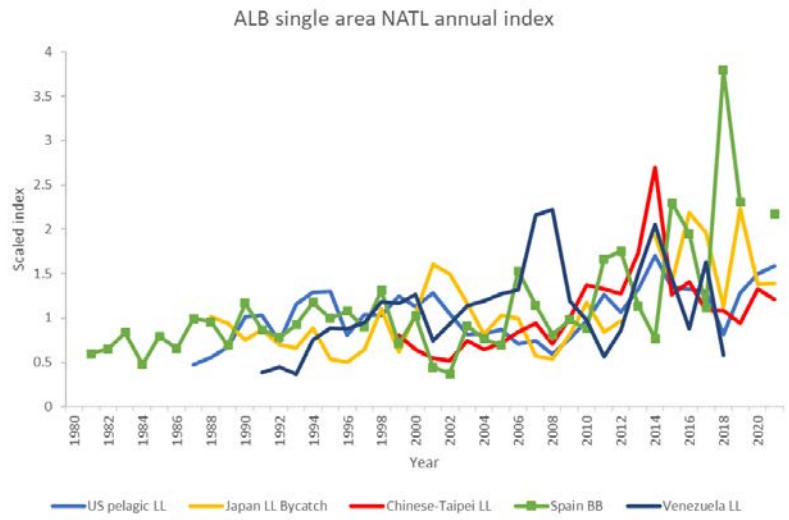


f. ALB (2020-21)

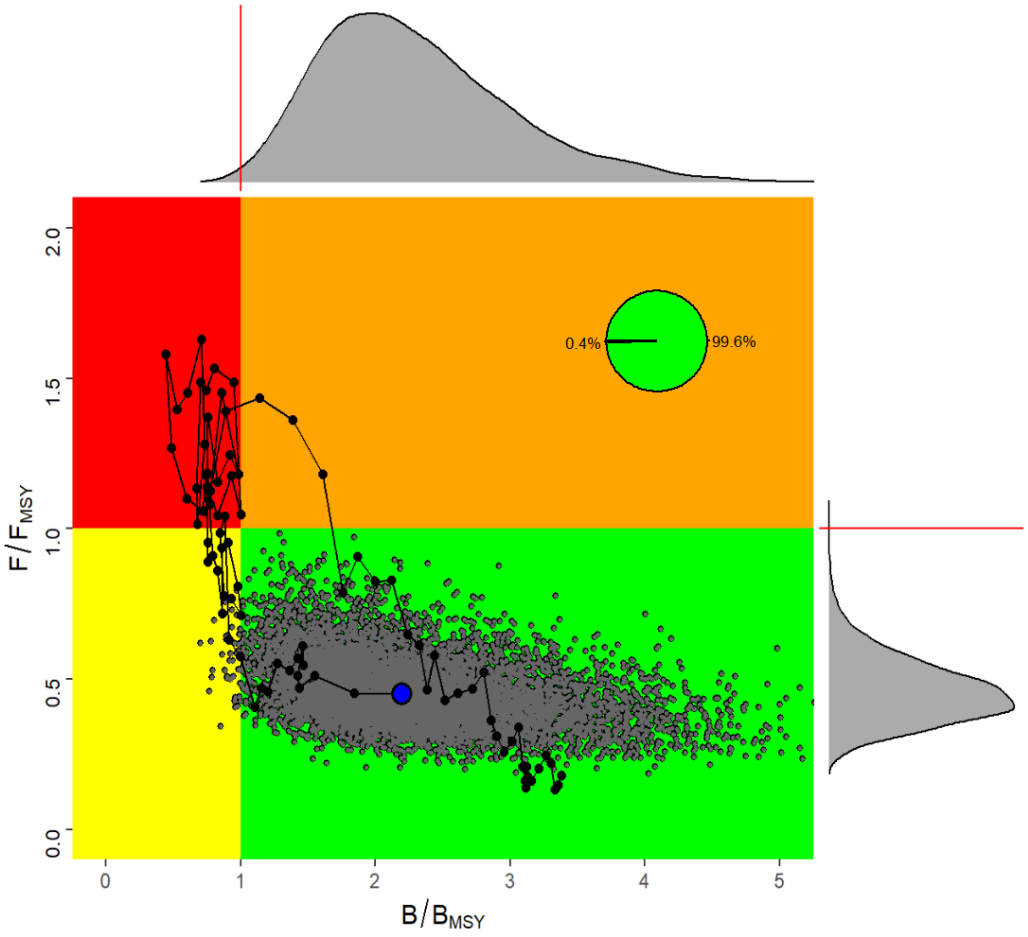
ALB-AT-Figure 1. Geographic distribution of albacore accumulated catch by major gears and decade (1970-2021). Baitboat and troll catches prior to the 1990s, these catches were assigned to only one 5ºx5º stratum in the Bay of Biscay. Plots are scaled to the maximum catch observed from 1970 to 2021 (last decade only covers 2 years).



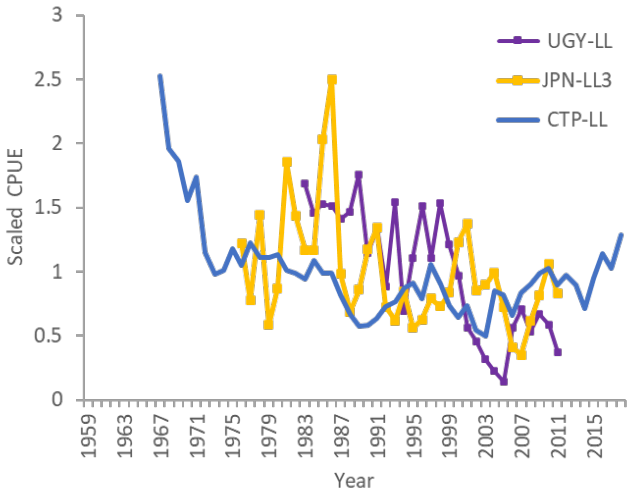
ALB-AT-Figure 2. Total albacore catches reported to ICCAT (Task 1) by gear for the northern (top) and southern (bottom) Atlantic stocks including TAC.



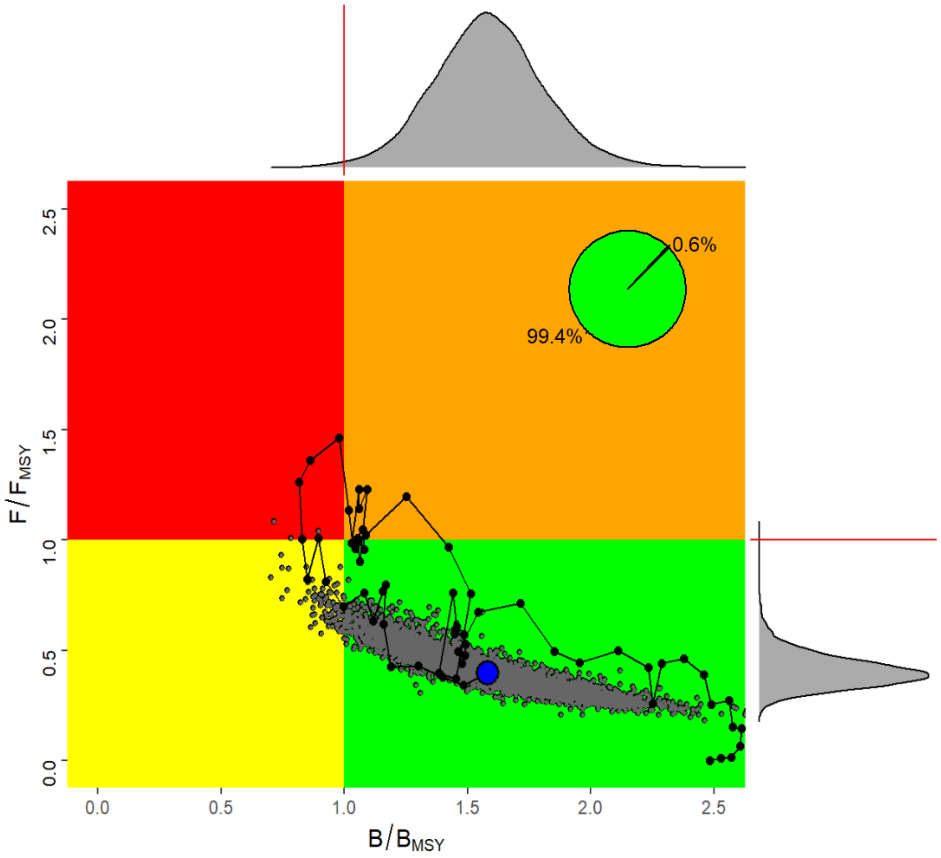
ALB-AT-Figure 3. North Atlantic albacore. Standardized catch rate indices used in the 2023 stock assessment from the surface fishery (baitboat) which take mostly juvenile fish, and from the longline fisheries which take mostly adult fish.



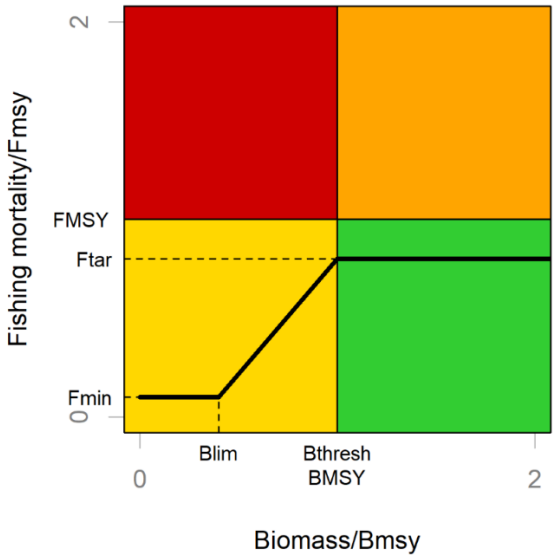
ALB-AT-Figure 4. North Atlantic albacore (Kobe plot). Stock status trajectories of B/B_{MSY} and F/F_{MSY} over time (1930-2021), as well as uncertainty (grey dots) around the current (F_{2021}/F_{MSY}, B_{2021}/B_{MSY}) estimate (blue point) based on Stock Synthesis model with probability of being overfished and overfishing (red, 0%), of being neither overfished nor overfishing (green, 99.6%), and of being overfished (yellow, 0.4%).



ALB-AT-Figure 5. South Atlantic albacore. Standardized catch rates used for the base case of the 2020 Stock Assessment (Anon., 2020b).



ALB-AT-Figure 6. South Atlantic albacore (Kobe plot). Stock status trajectories of B/B_{MSY} and F/F_{MSY} over time (1956-2018), as well as uncertainty (grey dots) around the current (2018) estimate (blue point) based on Bayesian surplus production model with probability of being overfished and overfishing (red, 0%), of being neither overfished nor overfishing (green, 99.4%), and of being overfished (yellow, 0.6%).



ALB-AT-Figure 7. Graphic form of the HCR adopted in Rec. 17-04. B_{LIM} (set at $0.4B_{MSY}$) is the limit biomass reference point, B_{THRESH} (set at B_{MSY}) is the point below which fishing mortality decreases linearly, F_{TAR} (set at $0.8F_{MSY}$) is the target fishing mortality rate to be applied to achieve the management objectives, and F_{MIN} (set at $0.1F_{MSY}$) is the fishing mortality to be applied when $B<B_{LIM}$.