14 Sea bass in northern and central Bay of Biscay

bss.27.8ab – *Dicentrarchus labrax in divisions 8.a-b*

14.1 General

Type of assessment: age-at-length stock synthesis (SS, Methot and Wetzel, 2013) runs/update for a category 1 stock. Stock was last benchmarked during WKBASS 2018 (ICES, 2018a) and IBPBASS in 2018 (ICES, 2018b). There were no data revisions for this update assessment.

14.1.1 Stock definition and ecosystem aspects

A better understanding of the stock identity was reported during the first step of the benchmark (ICES, 2023), and this would be integrated, if possible, in the new assessment model during the next steps of the benchmark.

14.1.2 Fishery description

Sea bass in the Bay of Biscay is targeted mainly by France with more than 98.3% of international landings in 2022 (Table 14.1). Spain is responsible for about 1.7% of the catches in 2022. A more detailed description of the fishery can be found in the Stock Annex.

Table 14.1. Summary of official and ICES commercial landings data (in tonnes). The UK includes England, Wales, Northern Ireland, and Scotland.

Year	Belgium	France	NL	Spain	UK	Total Official	Total ICES
1985	0	2477	0	0	0	2477	3420
1986	0	2606	0	0	0	2606	3549
1987	0	2474	0	0	5	2479	3417
1988	0	2274	0	0	15	2289	3217
1989	0	2201	0	0	0	2201	3144
1990	0	1678	0	0	0	1678	2621
1991	0	1774	0	17	0	1791	2734
1992	0	1752	0	14	0	1766	2709
1993	0	1595	0	14	0	1609	2552
1994	0	1708	0	17	0	1725	2668
1995	0	1549	0	0	0	1549	2492
1996	0	1459	0	0	0	1459	2402
1997	0	1415	0	0	0	1415	2358

Year	Belgium	France	NL	Spain	UK	Total Official	Total ICES
1998	0	1261	0	27	0	1288	2231
1999	0	NA	0	11	0	11	2091
2000	0	2080	0	67	0	2147	2362
2001	0	2020	3	68	0	2091	2306
2002	0	1937	0	176	0	2113	2392
2003	0	2812	0	119	0	2931	2616
2004	0	2561	0	96	0	2657	2380
2005	0	3184	0	74	0	3258	2796
2006	0	3318	0	167	2	3487	2875
2007	1	2984	0	74	1	3060	2751
2008	0	1508	0	145	0	1653	2745
2009	1	2339	0	194	0	2534	2278
2010	0	2322	0	165	2	2489	2229
2011	1	2536	0	311	0	2848	2575
2012	1	2325	0	204	5	2535	2549
2013	0	2504	0	156	0	2660	2685
2014	0	2926	0	89	0	3015	2991
2015	0	2216	0	71	0	2287	2264
2016	0	2121	0	85	0	2206	2252
2017	0	2146	0	65	0	2211	2295
2018	0	2204	0	84	0	2288	2316
2019	0	2116	0	97	0	2213	2227
2020	0	2032	0	24	0	2056	2090
2021	0	1956	0	41	0	1997	2032
2022	0	1861	0	33	0	1894	1906

For France, line fisheries (handlines and longlines) take place all year-round (especially during quarters 3 and 4), while nets, pelagic and bottom-trawl fisheries take place from November to April, the period when prespawning and spawning sea bass aggregate to reproduce. In 2022, nets represent 35.5% of the landings of the area, lines 38.9%, bottom trawl 18.4%, pelagic trawl 2.9%, and other gears 4.3%.

In 2022, total landings decreased slightly compared to 2021. Landings were observed stable for liners and other gears while a decrease for both pelagic, bottom trawlers and netters (Figure 14.1). Note that netters are very dependent on weather conditions (2014 was an exceptional year).

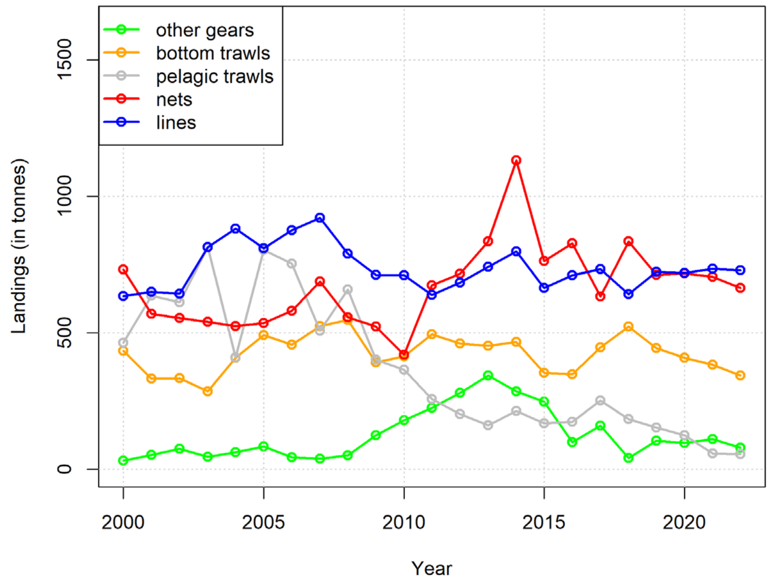


Figure 14.1. French landings per gear.

14.2 ICES advice for 2023

ICES advises that when the EU multiannual plan for Western waters and adjacent waters is applied (MAP; EU, 2019), total removals in 2023 that correspond to the F ranges in the plan are between 2897 tonnes and 3398 tonnes.

14.3 Management

14.3.1 Commercial fishery

Sea bass in the Bay of Biscay is not subject to EU TACs and quotas. However, sea bass is ruled by an EU multiannual plan since 2019 (EU, 2019). It aims to ensure that particular sea bass stocks are exploited sustainably and that the decisions on fishing opportunities are based on the most up-to-date scientific information. It allows certain flexibility in setting fishing opportunities by defining the target F as a range of values, which would result in a long-term F_{MSY} and would be based on the best available scientific advice. The plan does not include quantified reference points for F or biomass levels, which are instead provided by the latest scientific advice available, and used by the Council when fixing fishing opportunities. In addition to the F_{MSY} ranges, the plan introduces safeguard measures based on biomass levels, in order to restore the stocks when they fall below the safe biological limits. Where recreational F has a significant impact on a stock managed on the basis of MSY (which is the case of sea bass stocks), the Council should be able to set non-discriminatory limits for recreational fishers. The Council should use transparent and objective criteria when setting such limits. Where appropriate, Member States should make the necessary and proportionate arrangements for monitoring the stocks and data collection in order to make a reliable estimate of effective levels of recreational catches.

14.3.2 Commercial fishery at national level

Since 2012, a national professional quota system for sea bass fishing licences, defined and implemented by the Committees for Maritime Fisheries and Fish Farming (CNPMEM, 2020), has regulated French professional catches of the species both for the Bay of Biscay (divisions 8.a, 8.b, and 8.d) and the Northern stocks (divisions 4.b, 4.c, 7.a, 7.d–7.h).

Since 2017, a Minimum Landing Size (MLS) of 38 cm has been implemented in the Bay of Biscay (ICES divisions 8.a, 8.b, and 8.d). This MLS was revised to 40 cm in 2019 and applied in 2020. Moreover, all French professional fishing activities in the area have been subjected to an annual overall catch limit. It has been implemented since 2017. To manage the overall catch limit, annual and periodic individual limitations of fishing opportunities were implemented.

14.3.3 Recreational fishery

A series of management measures have been implemented for the French recreational fishery:

- A minimum conservation size of 42 cm was implemented in 2013.
- A 5-fish bag limit was implemented in 2017.
- A 3-fish bag limit was implemented in 2018-2019.
- A 2-fish bag limit was implemented in 2020-onwards.

14.4 Data

14.4.1 Commercial landings and discards

A detailed description of the commercial landings can be found in the Stock Annex. Landings time-series were reconstructed using the three main sources available (Figure 14.2):

1. Official statistics recorded in the FishStat database (FAO, 2020) since around the mid-1980s (total landings).
2. French landings for 2000-2022 from a separate analysis of logbook and auction data by Ifremer (SACROIS methodology; Demaneche *et al.*, 2010), which is used to answer the ICES annual InterCatch data call. Landings are available by *métier*.
3. Spanish landings for 2007–2011 from sale notes and for 2012–2018 from InterCatch statistics.

The 2022 French data have been used for the assessment. There was no data revision for this stock (Figure 14.2).

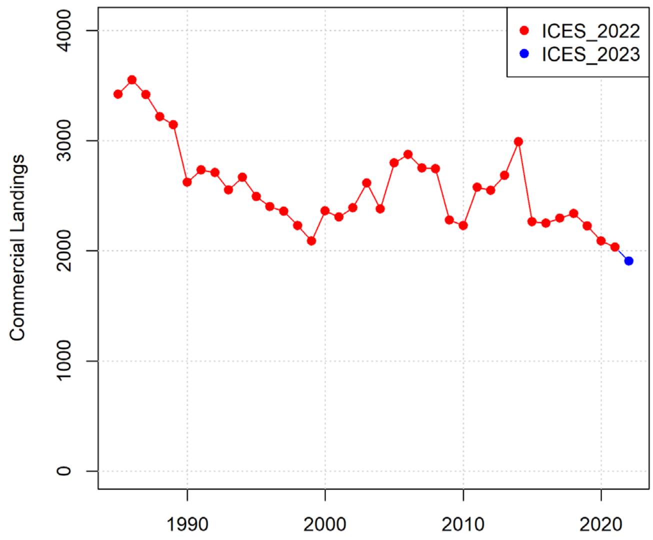


Figure 14.2. Commercial landings used in the 2021 and 2022 assessments. Weights are in tonnes.

Discarding of sea bass by commercial fisheries can occur when fishing takes place in areas where caught individuals are smaller than the MLS. For France, discards rates are low (Table 14.2). In 2022, the total discards percentage was estimated at 7.74% of the total French commercial catches, corresponding to an amount of 160 t. For Spain, observer data from Spanish vessels fishing in Area 8, have shown that no sea bass was discarded since 2003. No information in 2022 was available on discards for this year's WG.

In agreement with the Stock Annex that considered discards as negligible, they were not included in the stock assessment, despite the availability of this information and their increasing trend. However, when providing catch options, discards prediction was computed for 2024, and added to both the projected commercial landings and recreational removals as follows:

- r = average discards rate (2015-2022)
- r = mean(commercial discards/commercial landings)
- r = 5.73 %
- Commercial discards (2024) = commercial landings (2024) x (r/(1-r))
- Total catches (2024) = commercial landings (2024) + commercial discards (2024) + recreational removals (2024)

Table 14.2: Estimated sea bass discards of French vessels in the Bay of Biscay. Weights are in tonnes.

Year	Commercial discards	Commercial landings	Total commercial catches	% commercial discards
2015	68	2264	2332	2.92
2016	65	2252	2317	2.81
2017	196	2295	2491	7.87
2018	155	2338	2493	6.22
2019	183	2227	2410	7.59
2020	41	2090	2131	1.92
2021	196	2032	2228	8.80
2022	160	1906	2066	7.74

14.4.2 Length and age sampling

The full description of the biological sampling is available in the Stock Annex.

14.4.2.1 French commercial fishery

The French sampling programme for sea bass landings length compositions covers at-sea and onshore samplings. Data are available from 2000 onwards. French length compositions for 8.a–b across time and all gears combined are presented in Figure 14.3. It is worth noting that the sampling effort has increased since 2021 for commercial length composition.

The French sampling programme for sea bass age compositions is based on age-length keys (ALKs) with fixed allocation. For the 8.a–b area, the information is available only from 2008. This year, as for the years 2018–2021, it was observed that the 2022 ALK showed a pattern inconsistent with the historical data. The observed bias was related to a change in age readers over the years (Table 14.3). WGBIE decided again this year not to include these age-at-length data.

Table 14.2. Proportion of scales read by each age reader over years 2008–2022.

Year	Age readers				
	JH	KS	RE	SM	AD
2008			100		
2009			100		
2010		71	29		
2011		100			
2012		100			
2013		100			
2014	13	78	9		
2015		31	69		
2016		89	5	6	
2017		88	12		
2018			100		
2019			100		
2020			100		
2021			73		27
2022					100

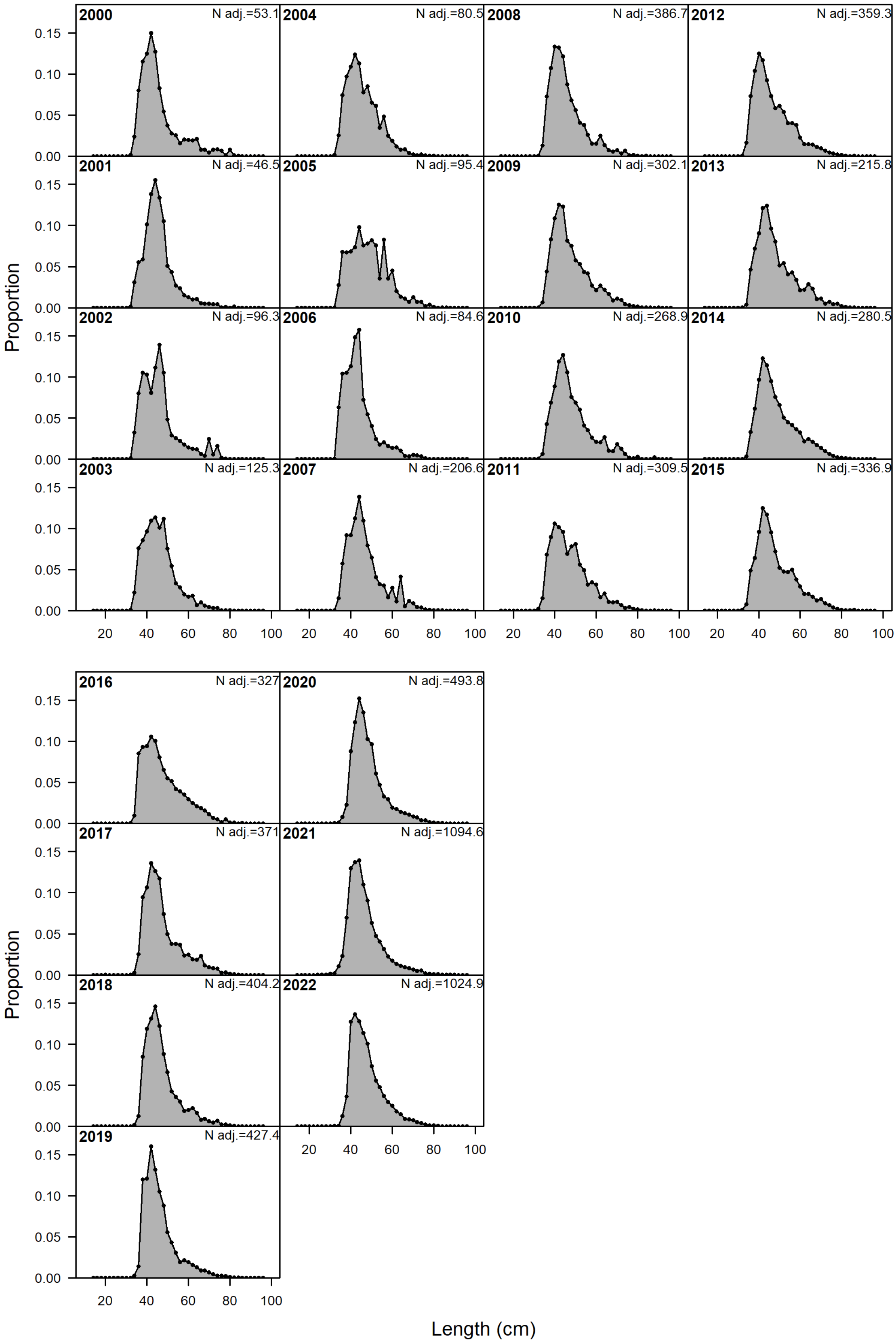


Figure 14.3. Length compositions of all French fleets combined from 2000 onwards.

14.4.2.2 Recreational fishery

The full description of the recreational catches is presented in the Stock Annex.

Recreational fishery catches reconstructed for the whole time-series

In a previous report (ICES, 2016b), partitioning French recreational data between the Biscay and Northern stock was only possible for the 2009–2011 study (Rocklin *et al*., 2014). There are no historical estimates of the recreational catch over the entire time-series. IBPBASS (ICES, 2014) considered it more plausible to treat recreational fishing as having more stable participation and effort over time than commercial fishery. A decision was made during WKBASS 2018 benchmark meeting (ICES, 2018a) to apply a constant recreational F over time considering the same approach used for the Northern stock. Total retained recreational catches were iteratively adjusted to obtain a constant recreational F over all years in the time-series, which was derived using the catch value of 1430 t estimated in 2010. The implementation of new management measures should have led to a reduction in F as more and larger fish are released (Hyder *et al*., 2018). This means that it is not appropriate to assume constant recreational F in the last years and, thus, it is necessary to re-estimate the recreational removals. This has been done using the estimated reductions generated from the assessment of the effect of different bag limit levels and Minimum Conservation Reference Size (MCRS) (Armstrong *et al*., 2014) in order to derive changes in recreational F. Also, the application of different management measures gave a recreational F multiplier for 2010–2012 of 1 and 0.684 for 2013–2016 (related to an increase in MCRS to 42 cm). In 2017, with a 5-fish bag limit implementation, the multiplier was estimated to be unchanged. However, for 2018 with a 3-fish bag limit implementation, it was estimated to be 0.647. In 2020–2022, a 2-fish bag limit was decided and the new multiplier used was estimated to be 0.584. Table 14.4 and Figure 14.4 compiled figures used in the assessment for the recreational fishery.

Table 14.3. Time-series used in the SS model as commercial landings and recreational removals (in tonnes).

Year	Estimated recreational removals	Observed recreational removals
1985	1593	
1986	1541	
1987	1501	
1988	1482	
1989	1474	
1990	1485	
1991	1501	
1992	1499	
1993	1481	
1994	1435	
1995	1367	
1996	1287	
1997	1215	
1998	1179	

Year	Estimated recreational removals	Observed recreational removals
1999	1219	
2000	1298	
2001	1371	
2002	1422	
2003	1448	
2004	1455	
2005	1451	
2006	1444	
2007	1452	
2008	1460	
2009	1453	
2010		1430
2011	1391	
2012	1335	
2013	868	
2014	804	
2015	754	
2016	754	
2017	772	
2018	748	
2019	748	
2020	659	
2021	681	
2022	691	

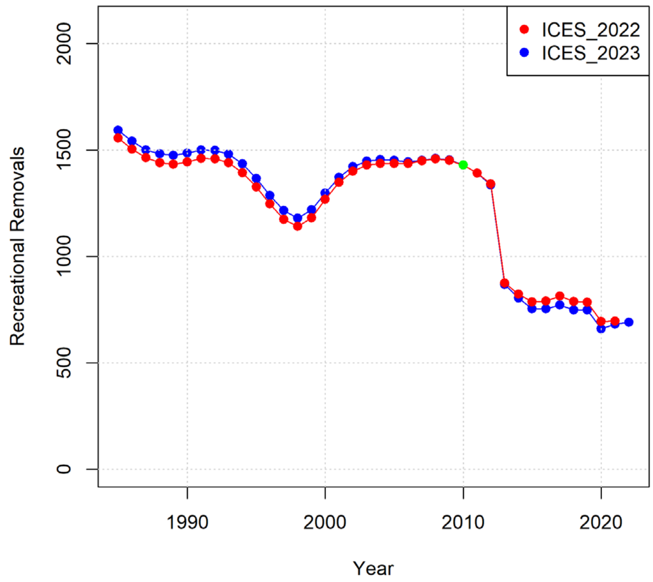


Figure 14.4. Recreational removals used in the 2021 and 2022 assessments. Weights are in tonnes.

After the benchmark in 2018 (ICES, 2018a), an additional survey has been conducted in France by FranceAgriMer that provided estimates of the sea bass recreational removals in the Bay of Biscay. However, this survey has different associated uncertainty and bias than the ones encountered in 2010. It is not straightforward how well these data can be combined for use in the assessment and also ensure no significant departure or changes from the current approach. Hence, this should be done as part of the next benchmark and then peer-reviewed to ensure the robustness of the process. As a result, the current approach will be used until the next benchmark and the review of recreational removals and their inclusion in the assessment will be included on the issue list.

Recreational post-released mortality (PRM)

Based on the information provided by Hyder *et al.* (2018), WKBASS 2018 agreed on a figure of 5% for PRM in recreational fisheries for the Northern and the Bay of Biscay sea bass stocks (ICES, 2018a). This estimate was based on a published study (Lewin *et al.*, 2018).

Recreational length compositions

The estimate of removals was recalculated for the 2010 reference year as the sum of the retained and released fish with a PRM of 5%. A length composition for recreational removals for the 2010 reference year was estimated as described in a WD from Hyder *et al.* (2018) and illustrated in Figure 14.5.

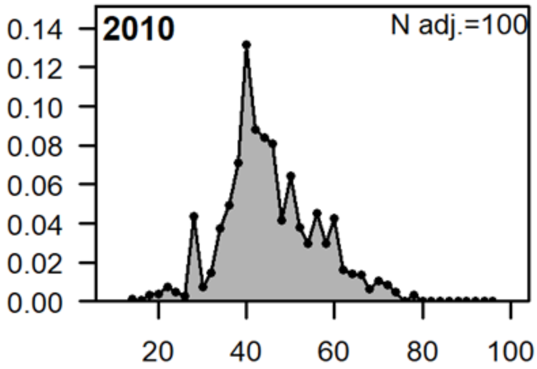


Figure 14.5. Length composition for the recreational fishery. Data available only for 2010.

14.4.3 Abundance indices from surveys

Currently, there is no survey providing relative indices of adult or juvenile sea bass abundance over time. A French study has been undertaken since 2013 to explore the possibility of creating recruitment indices in estuarine waters. Good results were obtained from this study but financial support is needed to be routinely carried out (Le Goff *et al.*, 2017). Abundance indices have been calculated for years 2016–2022 in the Loire estuary and for years 2019–2022 for the Gironde estuary. These series of indices collection are planned to be continued. The ultimate objective would be to fund them in a sustainable manner through the Data Collection Framework (DCF).

14.4.4 Commercial landing-effort data

A full description of the LPUE and its estimation methods are presented in the Stock Annex and in a WD by Laurec and Drogou (2017). The absence of a relative index of abundance covering adult sea bass has been identified as a major issue for the assessment of the Bay of Biscay stock. There are no scientific surveys providing sufficient data on adult sea bass to develop an abundance index for the area. Hence, Ifremer investigated the potential of deriving an index from commercial fishery landings and effort data available since 2000. This allowed the possibility to derive from French logbooks data (vessels with length > or < 10 m) an LPUE index at the resolution of ICES rectangle and gear strata. A new LPUE index was presented at WKBASS 2018 (ICES, 2018a). This index was obtained by modelling the zero and non-zero values using a delta-GLM approach (Stefánsson, 1996). A review of the study has been done by an external expert (M.C. Christman, MCC Statistical Consulting, Gainesville, Florida, USA) before WKBASS 2018 (ICES, 2018a). The reviewer recommended the use of the new LPUE index in the assessment of the Bay of Biscay sea bass stock. The new LPUE index has been incorporated in the Northern and the Bay of Biscay stocks assessment models. Results updated with 2022 data are presented in Figure 14.6.

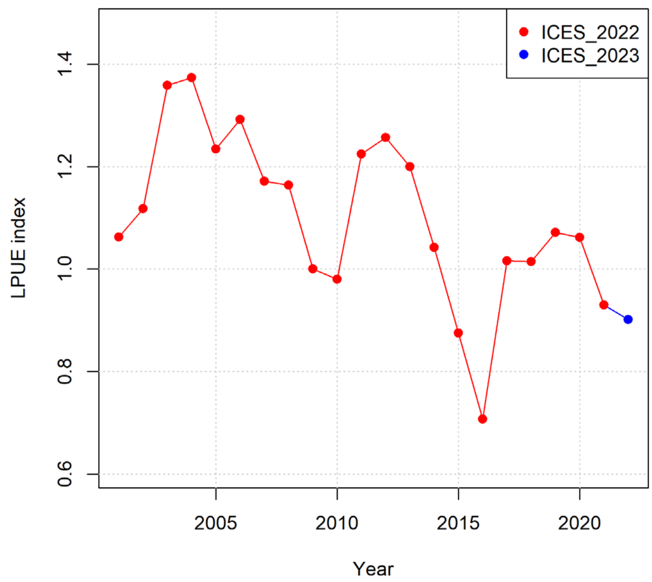


Figure 14.6. Comparison of the LPUE index used in the 2022 and 2023 assessments.

14.4.5 Biological parameters

The full description of the biological parameters is presented in the Stock Annex.

14.4.5.1 Growth

In the Bay of Biscay, studies on sea bass growth exist and have been published by Dorel (1986) and Bertignac (1987). To update these studies, sea bass was sampled by Ifremer during the years 2014–2015 along the coasts of France in areas 8.a and 8.b (Drogou *et al.*, 2018). The von Bertalanffy model parameters were estimated using an absolute error model minimizing $\sum(obs - exp)^2$ the lengths-at-age data used. L_{inf} was fixed to 80.4 cm (Bertignac, 1987). The standard deviation could be described by a linear model: SD = 0.1861 * age + 2.6955 (samples used from age 0 to age 15). The standard deviation of length-at-age increased with length as expected. K was estimated (see Stock Annex), but this value is not used as K is re-estimated by the assessment model.

14.4.5.2 Maturity

Sea bass maturity has been studied with samples collected by Ifremer in the Bay of Biscay. Samples were derived from French fisheries around the Bay of Biscay coast. The size at which 50% of the females are mature is 42.14 cm (with a lower limit of 41.31 cm and an upper limit of 43.08 cm). The Pearson test (p-value = 0.597) identifies a good fit of the model to the data (Figure 14.7).

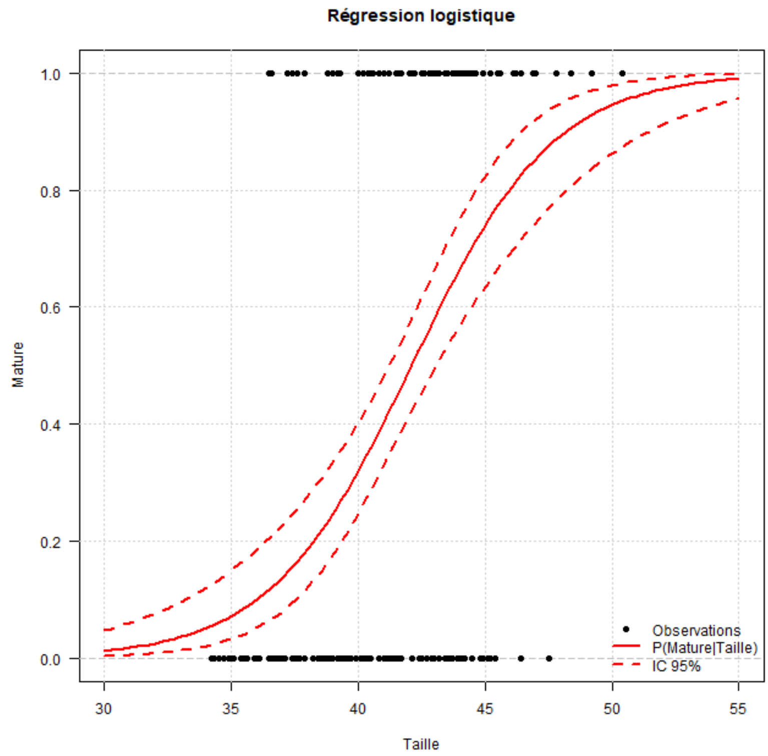


Figure 14.7. Maturity ogive for the Bay of Biscay sea bass stock.

14.4.5.3 Natural mortality

WKBASS 2017/2018 (ICES, 2018a) proposed to use the same value for both the northern and the Bay of Biscay sea bass stocks and set the natural mortality (M) to 0.24, the value predicted by Then *et al*. (2015) based on a t_{max} method which is considered more robust than inferences from any single study.

14.5 Assessment

This is an update assessment including the new data available for the year 2022 from the WKBASS assessment.

14.5.1 Input data

Input data are described in the Stock Annex (see under section "Input data for Stock Synthesis").

14.5.2 Data revisions

There were no data revisions for this update assessment.

14.5.3 Model

The SS assessment model (Methot and Wetzel, 2013) was selected for use in this assessment. Model description and settings are presented in the Stock Annex (under "Current assessment" for model description and "SS settings (input data and control files)" for model settings).

14.5.4 Assessment results

The assessment model includes estimation of size-based selectivity functions (selection pattern-at-length) for commercial and recreational fleets and LPUE abundance index. Figure 14.8 presents selectivity functions by fleet estimated by the model. The inclusion of 2022 data did not change the general shape of the selectivity pattern.

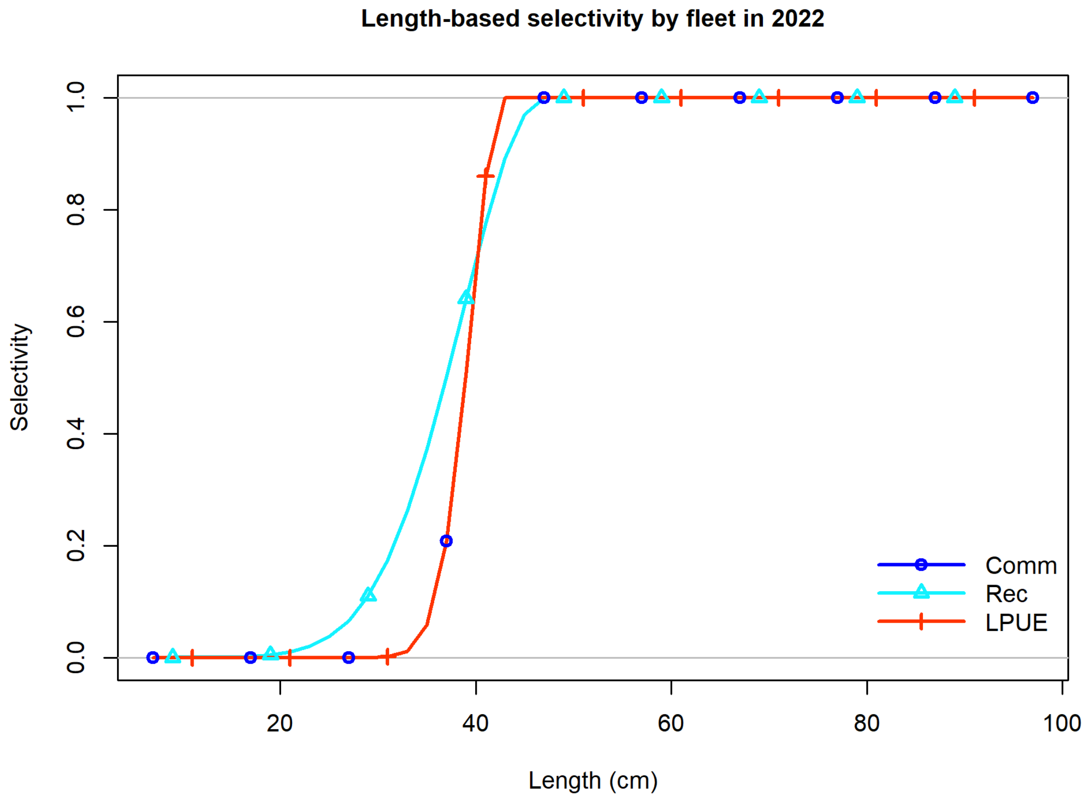


Figure 14.8. Selection patterns at length by commercial and recreational fleets estimated by the SS model. Selection pattern for the LPUE abundance index was assumed to follow the one from the commercial fleets.

The selection curve is assumed constant over the whole period for all the fleets. The selection curve for the LPUE abundance index was assumed identical to that of the commercial fleets. The assessment currently assumes that commercial fleets do not discard fish (at the time of the last benchmark, discards were negligible, i.e. less than 5% of the total landings).

Model fit for the LPUE abundance index was good (Figure 14.9). The index was useful for the model to get the correct trend over time.

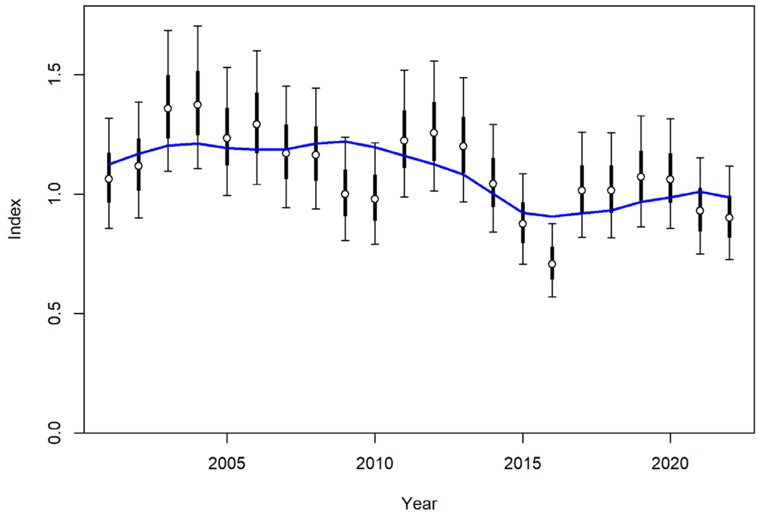
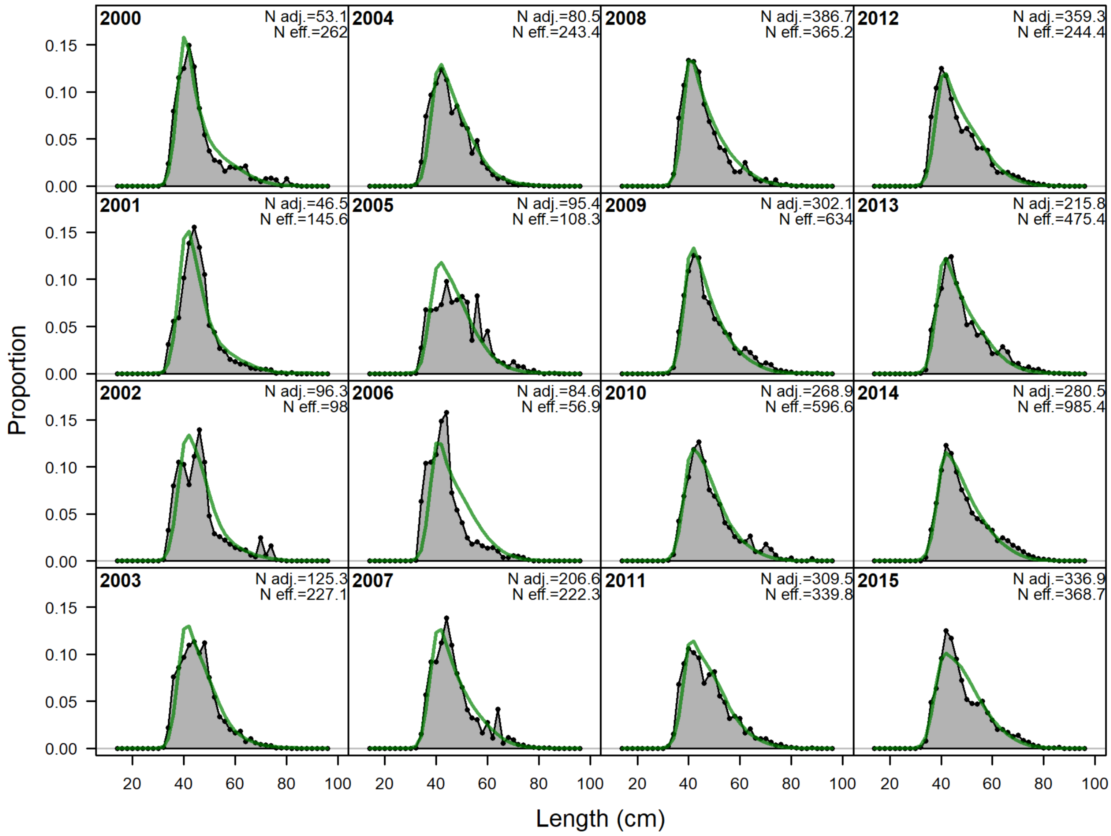


Figure 14.9. Fit to the LPUE abundance index.

Model fit for the commercial and recreational length composition data was good (Figures 14.10 and 14.11).



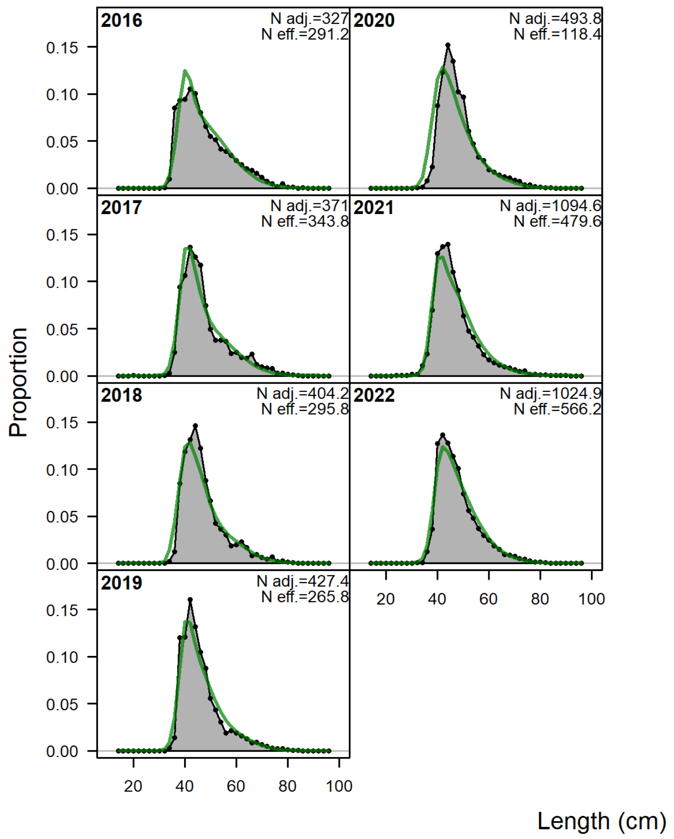


Figure 14.10. Fit to the commercial fishery length composition data.

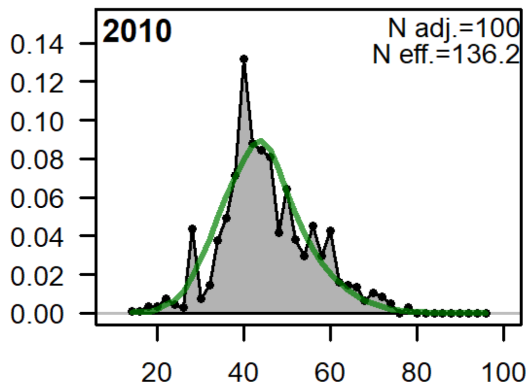
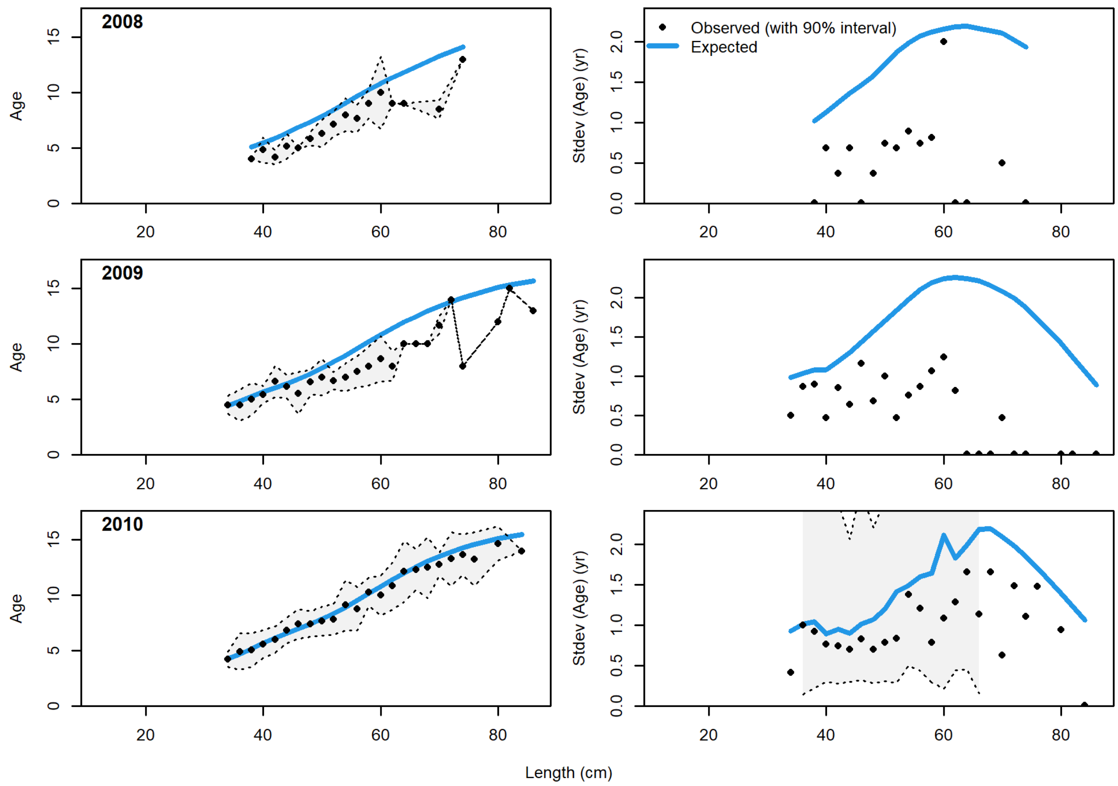
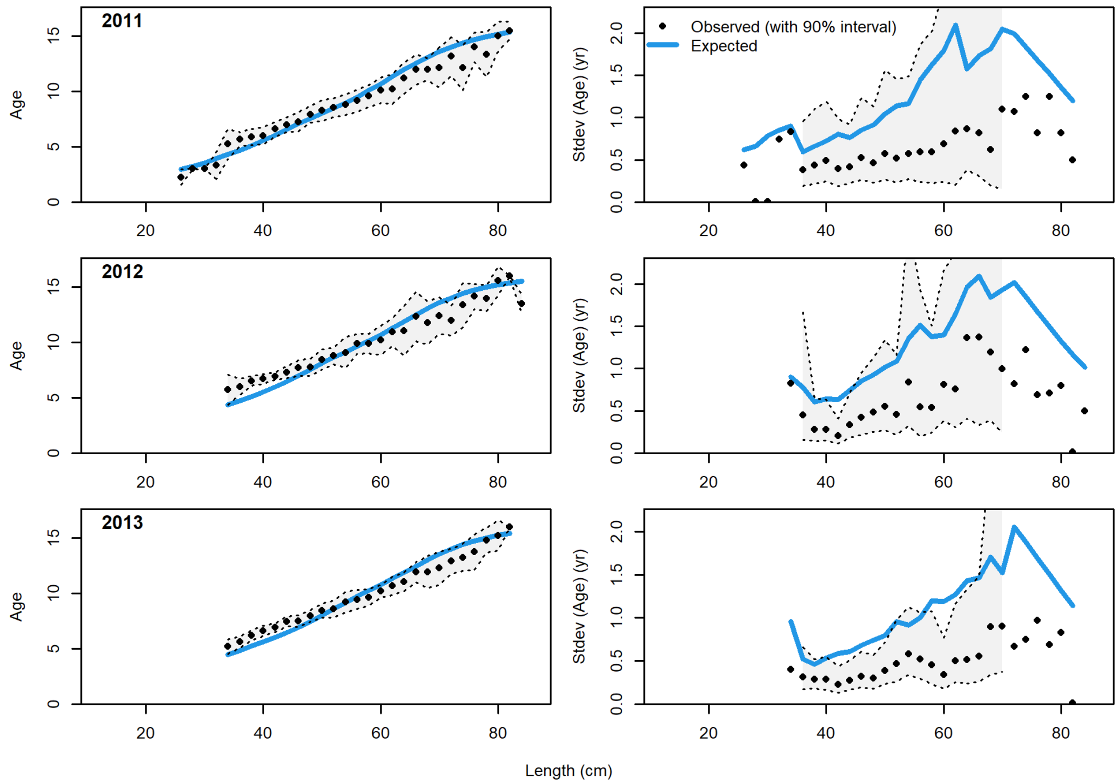


Figure 14.11. Fit to the recreational fishery length composition data.

Model fit for the aggregated fishery age-at-length composition data was good on average, but poor in standard deviation (Figure 14.12). 2018, 2019, 2020, 2021 and 2022 age-at-length data were not included in the assessment as they showed a pattern incoherent with the historical data.

The fit was poor for the first 2 ALKs for years 2008 and 2009 as the sampling size during these two years was considered low.


2008
2009
2010
Age
Stdev (Age) (yr)
Observed (with 90% interval)
Expected
Length (cm)


2011
2012
2013
Age
Stdev (Age) (yr)
Observed (with 90% interval)
Expected
Length (cm)

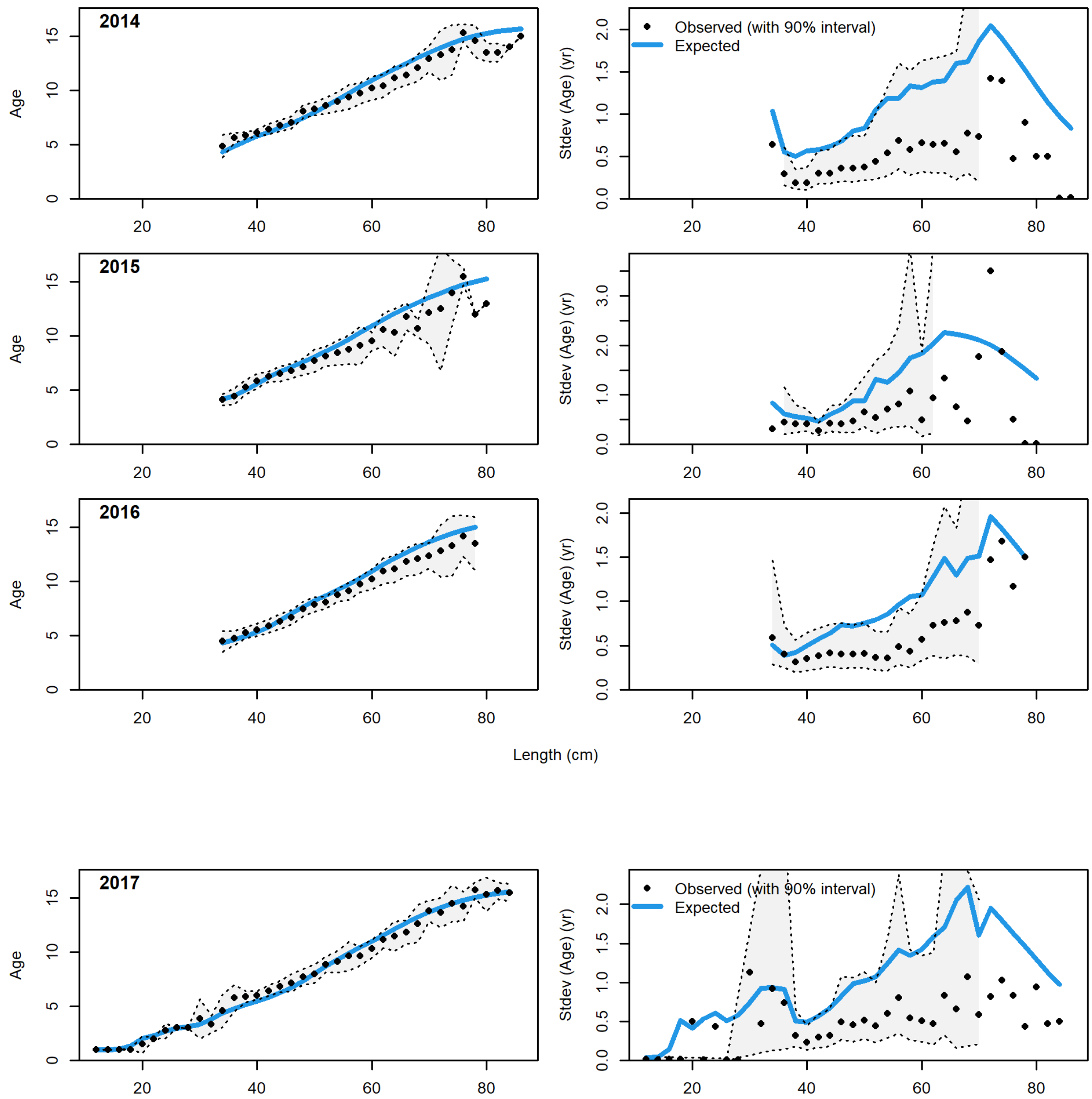


Figure 14.12. Fit to conditional age-at-length for commercial fishery.

Age composition data were included in the base model as “ghost,” meaning that they were not used for estimating the model likelihood. The purpose was to illustrate what the model estimated in terms of age composition data (Figure 14.13). Model and observations compared well despite the evident discrepancies for some years. For instance, in the years 2011–2014, the model overestimated the proportion of age ≤ 5 individuals compared to observations, or *vice versa*. Uncertainty in age reading or sampling bias may be considered as a potential explanation. Model underestimate age 4 and 5 in 2022.

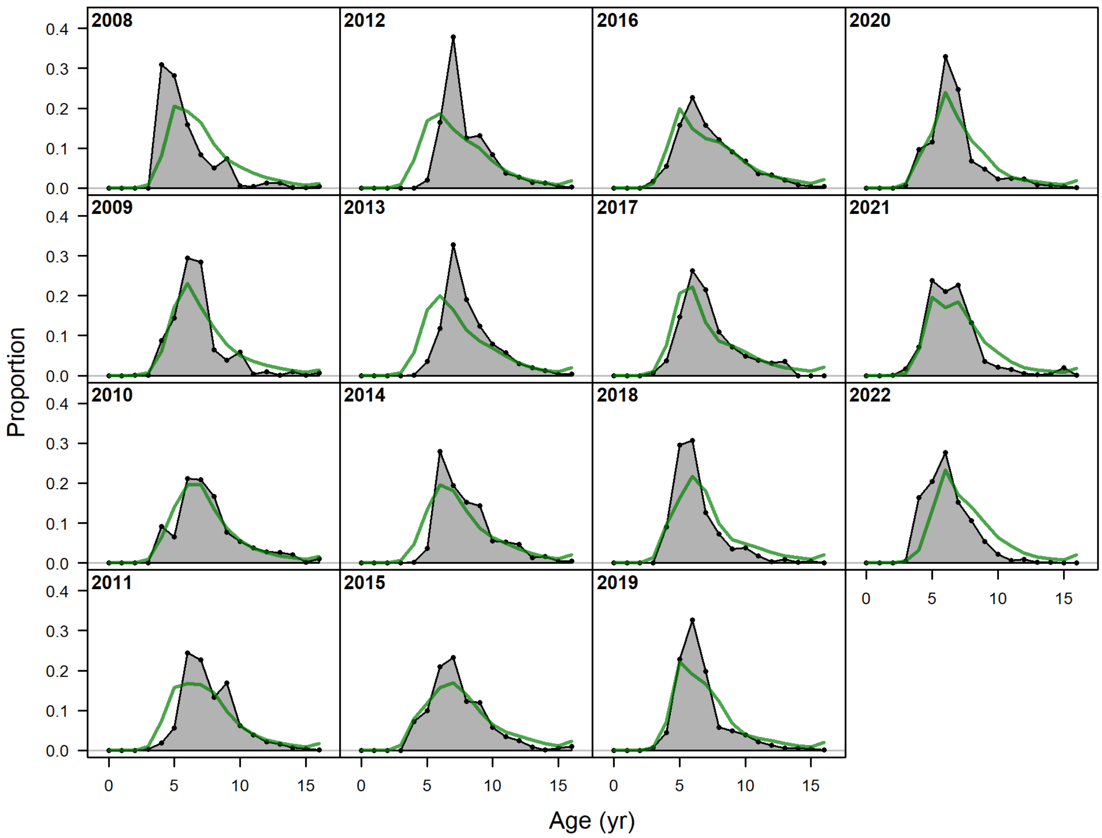


Figure 14.13. Observations and model predictions for age composition.

Figure 14.14 shows a comparison between the 2022 and 2023 assessments for the sea bass in the Bay of Biscay area. The recruitment series show great changes, with three low values estimated for 2015, 2017-2018, the latter value being revised to lower value compare to 2022 assessment. The SSB increases slightly during the recent years. The F continues to decrease.

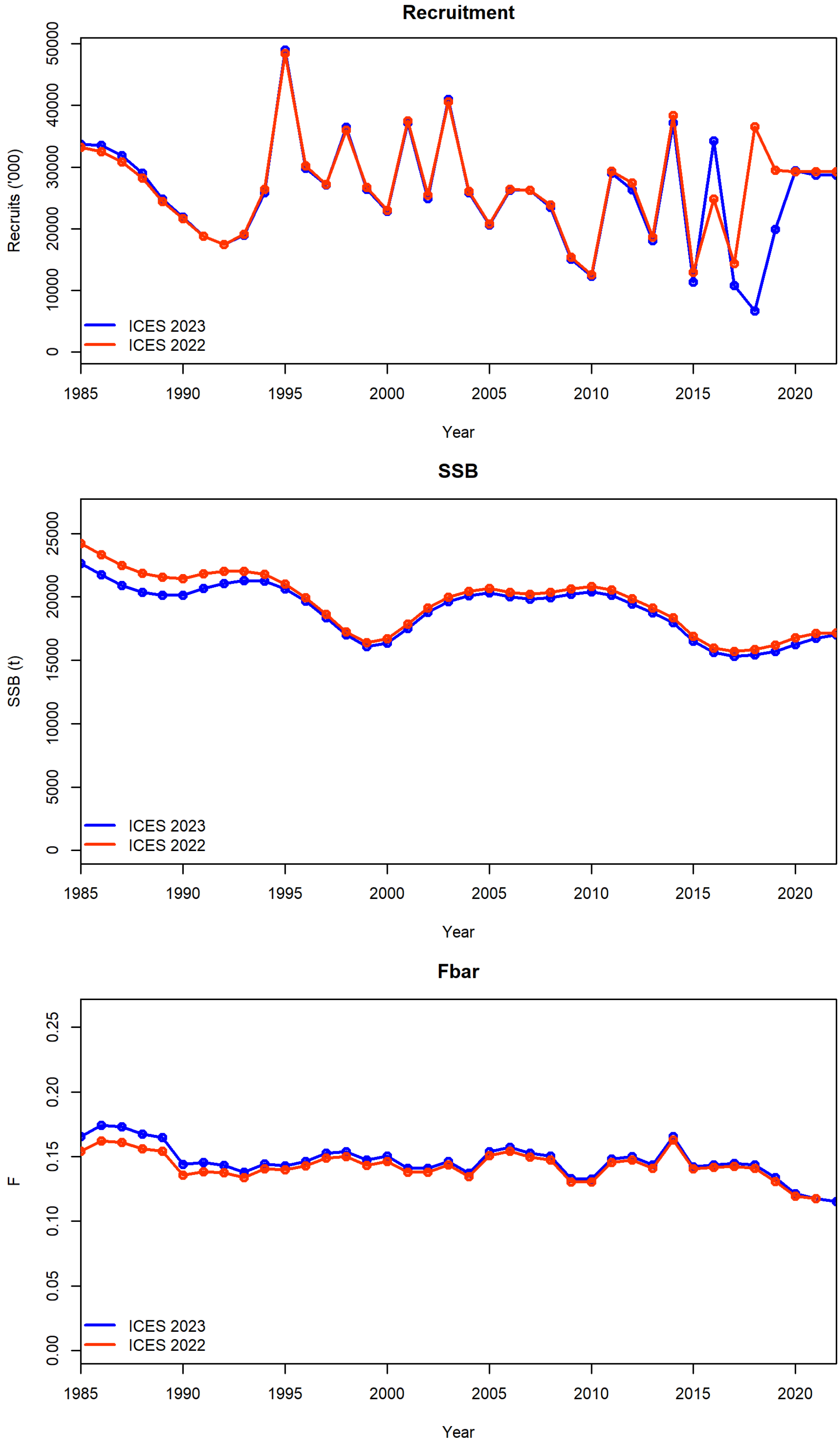


Figure 14.14. Comparison of the 2021 and 2022 assessment outputs (Recruitment, SSB, Fbar).

A retrospective analysis was performed (Figure 14.15). Recruitment, SSB and F series showed a pattern. The assessment tends to overestimate stock size and underestimate fishing pressure. This change was particularly large last year. The pattern is lower this year. The SSB is stable at around 20 000 t, while the F is below 0.15 with a decreasing trend. Recruitment was poorly estimated in recent years and showed high variability during the last decade.

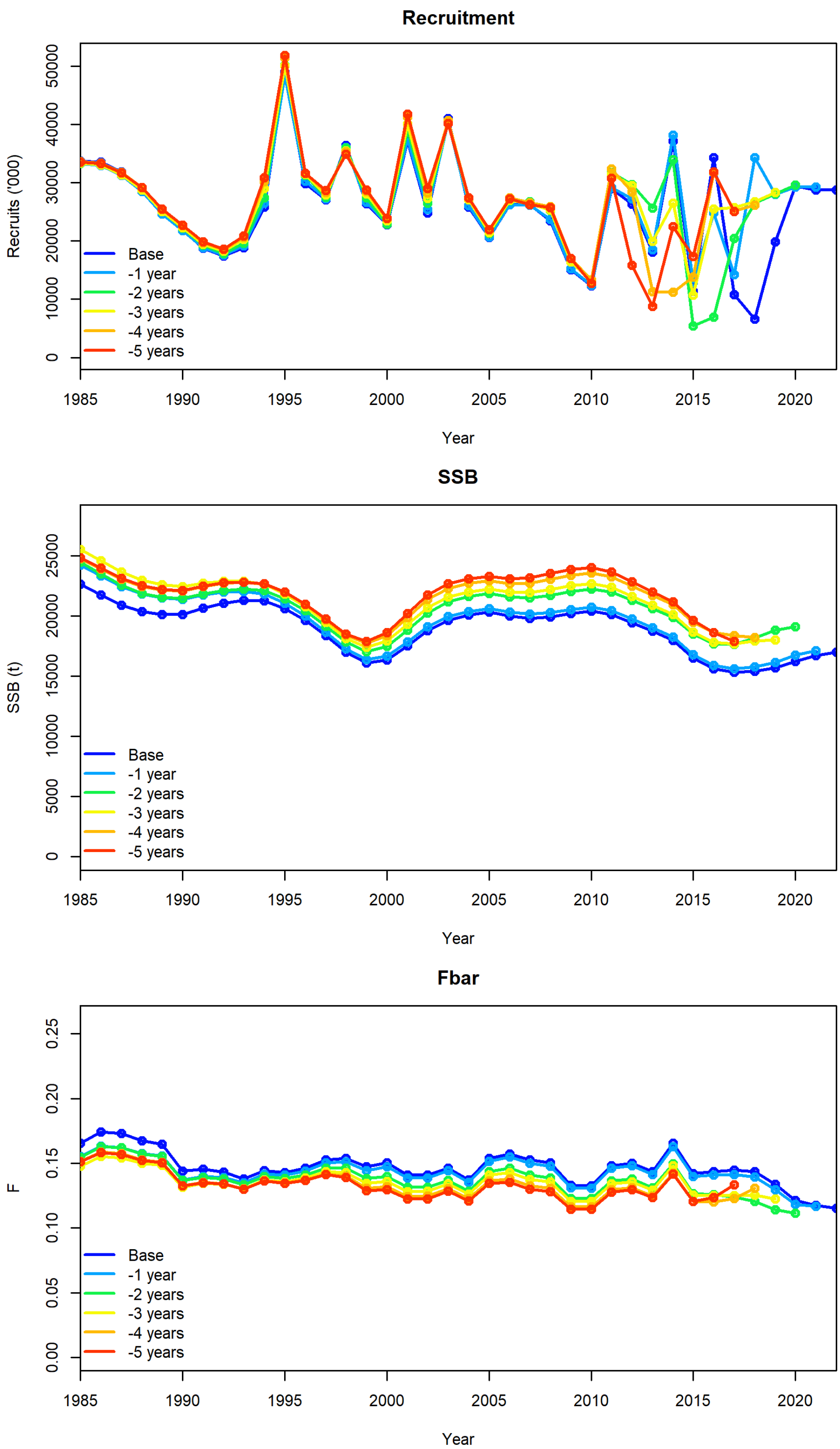


Figure 14.15. Retrospective analysis of SSB, F, and recruitment

Inconsistencies between the time-series of the retrospective analysis were quantified by Mohn's rho values (see Table 14.5; Mohn, 1999). The 2023 assessment shows a high Mohn's rho value for the recruitment series, which is highly variable and uncertain. Data that help quantifying recruitment only comes from length distributions of the commercial fisheries at age 5, revising every year recruitment series estimated by SS, the latter recruitment values only depending of recruitment parameters (R0, steepness, etc) before age 5.

Table 14.4. Mohn's rho values for the retrospective analysis.

2023 assessment		
SSB	Rec	Fbar
0.139	0.948	-0.068

An in-depth analysis of the assessment model parameters shows that the selectivity pattern is slightly increasing over time (see Figure 14.16), thus affecting SSB and F level estimates of the 2022 assessment. This trend in the selectivity pattern is in agreement with the management measures implemented on the MLS. This change should be accounted for in the next benchmark.

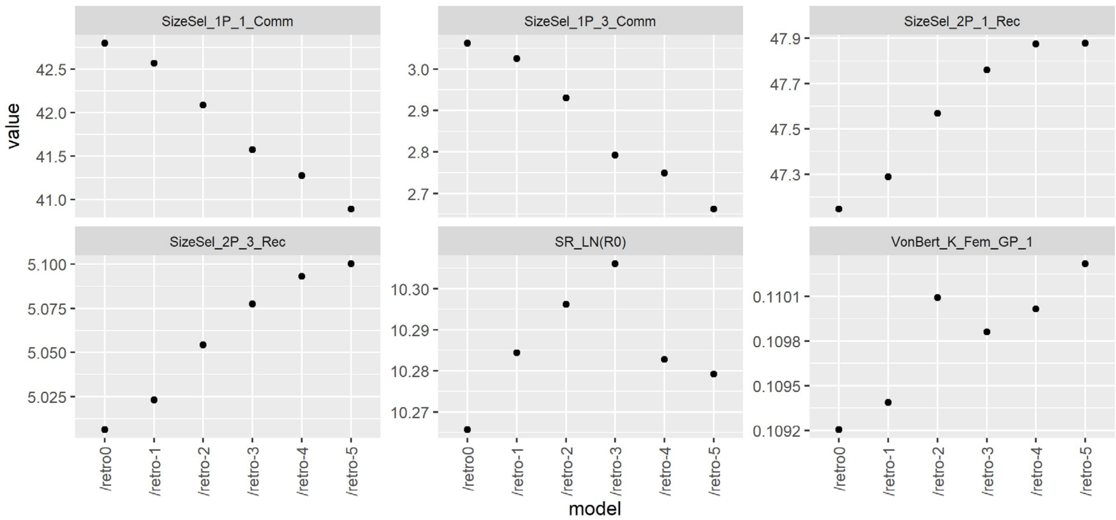


Figure 14.16. Retrospective plot for assessment model parameters that are not annual and that vary more than 1%.

14.6 Historic trends in biomass, fishing mortality, and recruitment

In 2022, fishing pressure on the stock is below F_{MSY} and spawning-stock size is above MSY $B_{trigger}$, B_{pa}, and B_{lim} (Figure 14.17).

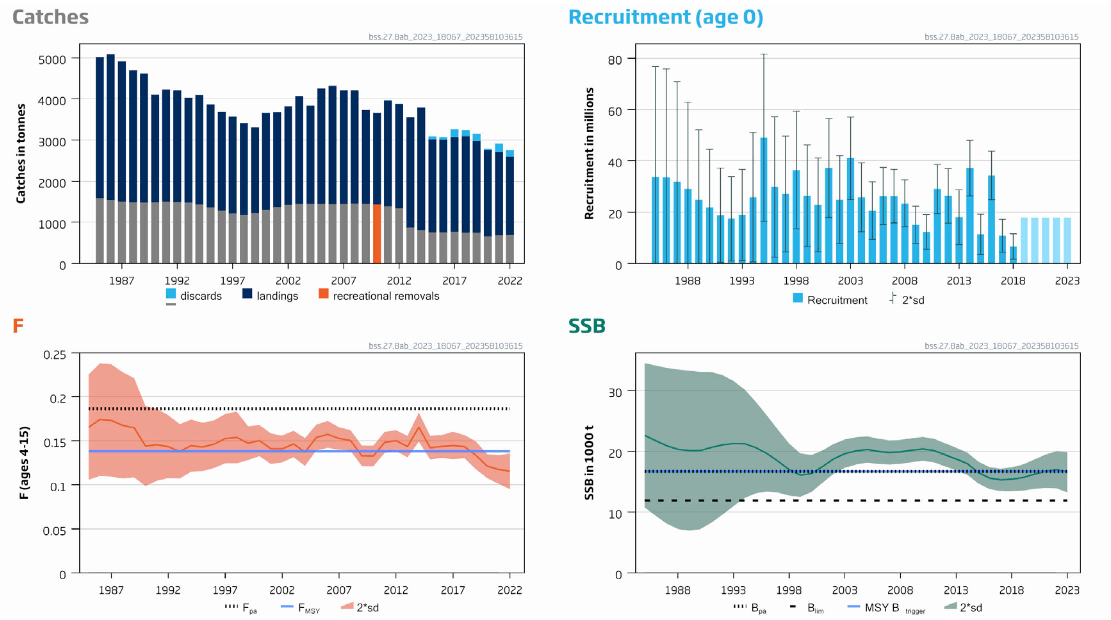


Figure 14.17. Summary of the stock assessment (weights in thousand tonnes). Commercial landings (with discards only included in 2015-2022), and recreational removals (only presented for 2010, where the data are available), including 5% mortality of released fish. Fishing mortality is shown for the combined commercial and recreational fisheries. The assumed recruitment value for 2019–2023 is shaded in a lighter colour. Recruitment, F and SSB are shown with 95% confidence intervals.

The stock is at full reproductive capacity, but incoming low recruitment causes the intermediate year's SSB to fall below MSY Btrigger (Table 14.6).

Table 14.5. State of the stock and fishery relative to reference points.

	Fishing pressure				Stock size			
		2020	2021	2022		2021	2022	2023
Maximum sustainable yield	F_{MSY}	✓	✓	✓ Appropriate	MSY $B_{trigger}$	✓	✓	✗ Below trigger
Precautionary approach	F_{pa},F_{lim}	✓	✓	✓ Undefined	B_{pa},B_{lim}	✓	✓	○ Increased risk
Management plan	F_{MGT}	–	–	– Not applicable	B_{MGT}	–	–	– Not applicable

Uncertainties around recruitment remain high throughout the time-series (Figure 14.18). Uncertainties around other ages reduced with age (Figure 14.19). The selectivity pattern is slightly increasing over time, thus affecting SSB and F level estimates (Figure 14.18).

The quality of the assessment is expected to improve when recruitment information from scientific surveys will be included in the next benchmark (Figure 14–18). Annual surveys have been conducted by France in the Bay of Biscay (Baie de Douarnenez, Loire and Gironde estuaries) since 2016.

Note that, this year, to smooth out the recruitment variability in the forecast, the last 5 years of numbers at age 0 are now replaced by its long term geometric mean.

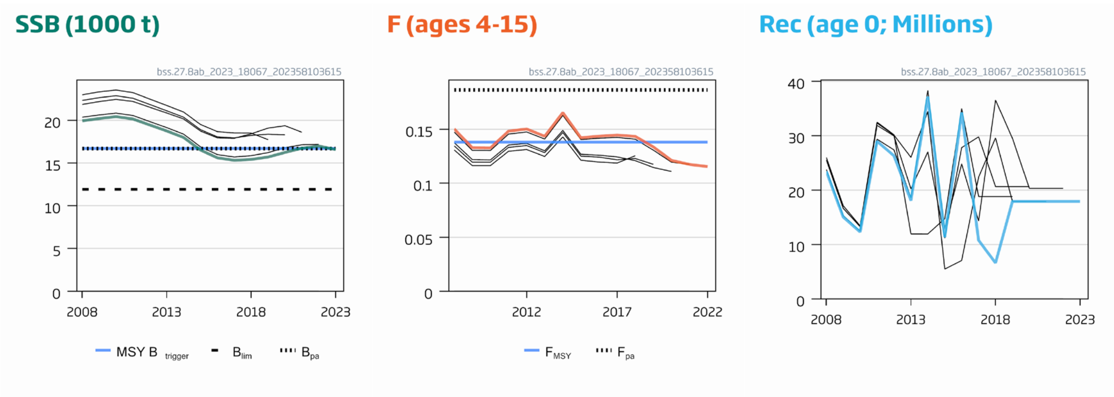


Figure 14.18. Historical assessment results (3 final-year recruitment assumption included for each line, except for 2022 for which 5 final-year recruitment assumption was made).

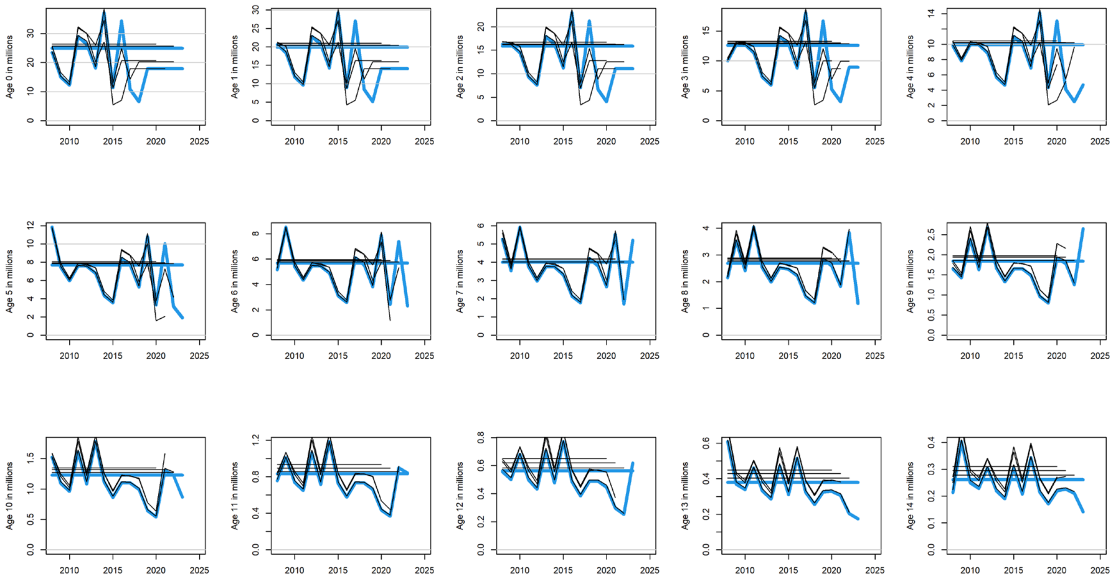


Figure 14.19. Historical assessment results for numbers-at-age (from age 0 to 14). 3 final-year recruitment assumptions are included for each line when appropriate. Horizontal lines represent averages over the series.

Table 14.6. Compilation of the assessment summary provided by the SS model. These assessment outputs were used to produce the standard graph of the advice (Figure 14.17).

Year	Recruitment			SSB			F			simulated recreational removals	recreational removals	comm. landings	comm. discards
	Low	Mid-point	High	Low	Mid-point	High	Low	Mid-point	High				
	thousands			tonnes						t	t	t	t
1985	0	33684	76721	10773	22651	34528	0.106	0.166	0.23	1593		3420	

Year	Recruitment			SSB			F			simulated recreational removals	recreational removals	comm. landings	comm. discards
	Low	Mid-point	High	Low	Mid-point	High	Low	Mid-point	High				
	thousands			tonnes						t	t	t	t
1986	0	33554	75845	9395	21770	34145	0.110	0.174	0.24	1541		3549	
1987	0	31874	70833	8084	20921	33758	0.109	0.173	0.24	1501		3417	
1988	0	28986	62799	7224	20353	33482	0.107	0.168	0.23	1482		3217	
1989	0	24829	52016	6952	20133	33314	0.108	0.165	0.22	1474		3144	
1990	0	21842	44469	7201	20145	33088	0.099	0.144	0.189	1485		2621	
1991	398	18794	37189	8261	20663	33065	0.105	0.146	0.187	1501		2734	
1992	974	17398	33823	9579	21075	32570	0.108	0.143	0.179	1499		2709	
1993	1129	18895	36660	11008	21300	31592	0.107	0.138	0.169	1481		2552	
1994	598	25807	51015	12337	21260	30183	0.115	0.145	0.174	1435		2668	
1995	16470	49020	81569	13102	20630	28157	0.116	0.143	0.170	1367		2492	
1996	2497	29839	57180	13404	19651	25897	0.119	0.146	0.173	1287		2402	
1997	4534	27079	49625	13210	18371	23532	0.124	0.153	0.181	1215		2358	
1998	13512	36429	59346	12717	17000	21282	0.124	0.154	0.183	1179		2231	
1999	6579	26370	46161	12520	16101	19682	0.128	0.147	0.167	1219		2091	
2000	4554	22805	41056	13318	16362	19407	0.133	0.150	0.168	1298		2362	
2001	17916	37189	56462	14849	17519	20189	0.124	0.141	0.158	1371		2306	
2002	7733	24854	41974	16322	18783	21244	0.126	0.141	0.156	1422		2392	
2003	24861	40974	57087	17295	19638	21982	0.131	0.146	0.161	1448		2616	
2004	12364	25797	39231	17836	20089	22343	0.121	0.137	0.153	1455		2380	
2005	9359	20596	31833	18151	20323	22496	0.139	0.154	0.168	1451		2796	
2006	15125	26260	37394	17928	20009	22090	0.142	0.157	0.173	1444		2875	

Year	Recruitment			SSB			F			simulated recreational removals	recreational removals	comm. landings	comm. discards
	Low	Mid-point	High	Low	Mid-point	High	Low	Mid-point	High				
	thousands			tonnes						t	t	t	t
2007	15788	26216	36644	17822	19823	21824	0.140	0.153	0.165	1452		2751	
2008	14347	23448	32549	17958	19934	21910	0.139	0.150	0.162	1460		2745	
2009	7750	15041	22332	18221	20197	22173	0.121	0.133	0.145	1453		2278	
2010	5536	12299	19062	18454	20420	22387	0.121	0.133	0.145		1430	2229	
2011	19351	28982	38613	18205	20149	22092	0.136	0.148	0.160	1391		2575	
2012	15670	26313	36957	17536	19446	21355	0.138	0.150	0.162	1335		2549	
2013	7392	18081	28771	16883	18749	20615	0.131	0.144	0.156	868		2685	
2014	26334	37176	48017	16158	17989	19819	0.149	0.165	0.182	804		2991	
2015	3502	11346	19191	14705	16513	18321	0.129	0.142	0.156	754		2264	68
2016	24795	34280	43766	13803	15608	17413	0.131	0.144	0.157	754		2252	65
2017	4321	10775	17229	13460	15314	17168	0.129	0.145	0.160	772		2295	196
2018	1653	6601	11549	13450	15418	17386	0.130	0.143	0.157	748		2338	155
2019		17928**		13552	15701	17851	0.118	0.134	0.149	748		2227	183
2020		17928**		13819	16233	18647	0.108	0.121	0.135	659		2090	41
2021		17928**		13998	16727	19456	0.101	0.117	0.134	681		2032	196
2022		17928**		13932	16993	20053	0.095	0.115	0.136	691		1906	160
2023		17928**		13257	16571	19885							

*** Recreational removals are estimates derived from the 2010 observed data.**

**** Geometric mean 2008–2018.**

14.7 Biological reference points

IBPBASS (ICES, 2018b) set the biological reference points to be used for this stock. Table 14.8 compiles the biological reference points computed under type 6 stock–recruitment relationship as also agreed during the IBPBASS. In 2021, ICES ACOM asked WGBIE to revise the computation basis for F_{pa}, to ensure that the F leads to SSB ≥ B_{lim} with 95% probability (i.e. $F_{p0.5}$). F_{pa} was higher than the current F_{lim}. Consequently, F_{lim} was revised as "undefined". Consistent with the decision regarding $F_{pa} = F_{p05}$, F_{MSY} and MAP F_{MSY} were changed to the uncapped value from the IBPBASS 2018 (ICES, 2018b). F_{MSY} value is now set to 0.138.

Table 14.7. Biological reference points accepted during the IBPBASS (ICES, 2018b) for use in the ICES advice. All weights are in tonnes.

Framework	Reference point	Value	Technical basis
MSY approach	MSY $B_{trigger}$	16 688	B_{pa}
	F_{MSY}	0.138	The F that maximizes median long-term yield in stochastic simulations under constant F exploitation; constrained by the requirement that $F_{MSY} \leq F_{pa}$
Precautionary approach	B_{lim}	11 920	B_{pa} / exp (CV × 1.645)
	B_{pa}	16 688	Lowest observed SSB
	F_{lim}	Undefined	F_{lim} (0.172) is no longer considered appropriate given the estimate of F_{pa}
	F_{pa}	0.186	$F_{p.05}$ with AR: The F that provides a 95% probability for SSB to be above B_{lim}
Management plan	MAP MSY $B_{trigger}$	16 688	MSY $B_{trigger}$
	MAP B_{lim}	11 920	B_{lim}
	MAP F_{MSY}	0.138	F_{MSY}
	MAP range F_{lower}	0.117	Consistent with ranges provided by ICES (2018b), resulting in no more than 5% reduction in long-term yield compared with MSY.
	MAP range F_{upper}	0.151	Consistent with ranges provided by ICES (2018b), resulting in no more than 5% reduction in long-term yield compared with MSY.

14.8 Short-term forecast and catch options

Forecast inputs used for the projections are compiled in Table 14.9. The recruitment used for the projection is the geometric mean (GM) calculated from 2008 to 2018. For the short-term projection, F-at-age averaged over the last three years (2020-2022) and scaled to 2022 value was used for both the commercial and recreational fleets (Table 14.9).

Table 14.8. Forecast inputs table.

Ages	N@age	Weight@age	Prop.mature@age	Commerical F	Commerical mean weight	Recreational F	Recreational mean weight	Natural mortality
0	17928	0.004	0.000	0.000	0.009	0.000	0.009	0.24
1	14103	0.020	0.000	0.000	0.044	0.000	0.051	0.24

2	11093	0.077	0.000	0.000	0.262	0.001	0.150	0.24
3	8720	0.179	0.000	0.000	0.440	0.004	0.297	0.24
4	6831	0.325	0.039	0.011	0.597	0.011	0.478	0.24
5	1935	0.508	0.200	0.047	0.741	0.021	0.678	0.24
6	2321	0.721	0.489	0.079	0.907	0.028	0.887	0.24
7	5205	0.957	0.738	0.093	1.112	0.032	1.111	0.24
8	1188	1.207	0.880	0.097	1.348	0.034	1.351	0.24
9	2647	1.465	0.946	0.098	1.600	0.034	1.602	0.24
10	866	1.725	0.975	0.098	1.856	0.035	1.858	0.24
11	842	1.982	0.988	0.098	2.110	0.035	2.111	0.24
12	619	2.234	0.994	0.099	2.357	0.035	2.357	0.24
13	175	2.476	0.997	0.099	2.594	0.035	2.594	0.24
14	141	2.708	0.998	0.099	2.820	0.035	2.820	0.24
15	144	2.928	0.999	0.099	3.033	0.035	3.033	0.24
16	325	3.510	0.999	0.099	3.593	0.035	3.593	0.24

Age 0,1,2,3,4 over-written as follows: 2023 yc -> 2023 age 0 replaced by 2008–2018 LTGM (17 928 thousand); 2022 yc -> 2023 age 1 from SS survivor estimate at-age 1, 2023 * LTGM / SS estimate of age 0 in 2021; 2021 yc -> 2023 age 2 from SS survivor estimate at age 2, 2023 * LTGM / SS estimate of age 0 in 2020; 2020 yc -> 2023 age 3 from SS survivor estimate at age 2, 2023 * LTGM / SS estimate of age 0 in 2019; 2019 yc -> 2023 age 4 from SS survivor estimate at age 4, 2023 * LTGM / SS estimate of age 0 in 2018.

Total landings forecasted for 2023 are 2414 t, with 1765 t for the commercial landings and 649 t for recreational fishery. SSB for 2024 is forecasted to be at 15569 thousands, i.e. just below MSY $B_{trigger}$ (Table 14.10).

Table 14.9. The basis for the catch scenarios.

Variable	Value	Notes
$F_{ages\ 4–15}$ (2023)	0.115	Total F: average $F_{2020–2022}$ scaled to F_{2022} (0.085) for the commercial fishery plus F_{rec} = 0.031 for the recreational fishery (bag limit of 2 fish/day).
SSB (2024)	15569	Short-term forecast (STF); in tonnes.
$R_{age\ 0}$ (2019–2023)	17928	Geometric mean of recruitment (GM, 2008–2018); in thousands.
Total catch (2023)	2414	STF; in tonnes.
Projected commercial landings (2023)	1765	STF; in tonnes.
Commercial discard rate (2023)	5.73	Average discard rate, 5.73% (2015–2022) relative to commercial landings; in tonnes.

Projected recreational removals (2023)	649	STF; in tonnes.

Following the ICES advice rules, in the case where SSB < MSY $B_{trigger}$ and a reduced F value is used for the forecast instead of F_{MSY}, total catch (commercial landings, commercial discards and recreational removals) in 2024 should be no more than 2642 tonnes (Table 14.11).

Table 14.10. Catch options table.

Basis	Total removals (2024) #	$F_{ages\ 4–15}$ Total (2024)	SSB (2025)	% SSB change ##	% advice change ^^
ICES advice basis					
EU MAP^ : F_{MSY} × SSB_{2024}/MSY $B_{trigger}$	2642	0.129	14509	-6.8%	-22%
F = MAP^ : $F_{MSY\ lower}$ × SSB_{2024}/MSY $B_{trigger}$	2249	0.109	14816	-4.8%	-22%
Other scenarios					
MSY approach : F_{MSY}	2820	0.138	14370	-7.7%	-17%
F = 0	0	0	16593	6.6%	-100%
F = F_{pa}	3722	0.186	13669	-12.2%	9.5%
SSB_{2025} = B_{lim}	5994	0.32	11920	-23%	76%
SSB_{2025} = B_{pa}	-136	-0.005	16688	7.2%	-104%
SSB_{2025} = MSY $B_{trigger}$	-136	-0.005	16688	7.2%	-104%
SSB_{2025} = SSB_{2024}	1287	0.061	15569	0%	-62%
F = F_{2022} = F_{sq}	2379	0.115	14714	-5.5%	-25%

Includes commercial landings, recreational removals, and commercial discards computed assuming an average ratio of 5.73%.

SSB 2025 relative to SSB 2024 (15569 tonnes).

^ EU multiannual plan (MAP) (EU, 2019).

^^ Advice values for 2024 are relative to the corresponding 2023 values (MAP advice of F_{MSY} × SSB_{2023}/MSY $B_{trigger}$ = 3398 and $F_{MSY\ lower}$ × SSB_{2023}/MSY $B_{trigger}$ = 2897, respectively; all other values are relative to F_{MSY}).

14.8.1 Advice change

The advice has been reduced by 22% due to the downward revision of the recruitment in years 2017-2021 (Figure 14.20). Consequently, the intermediate year's SSB falls below MSY Btrigger, and a reduced FMSY is applied for the 2024 catch advice.

Figure 14.20: Advice change for commercial landings, SSB, recruitment and total F.

Advice change is mostly affected by numbers and biomass at ages 5 and 6 (Figure 14.21).

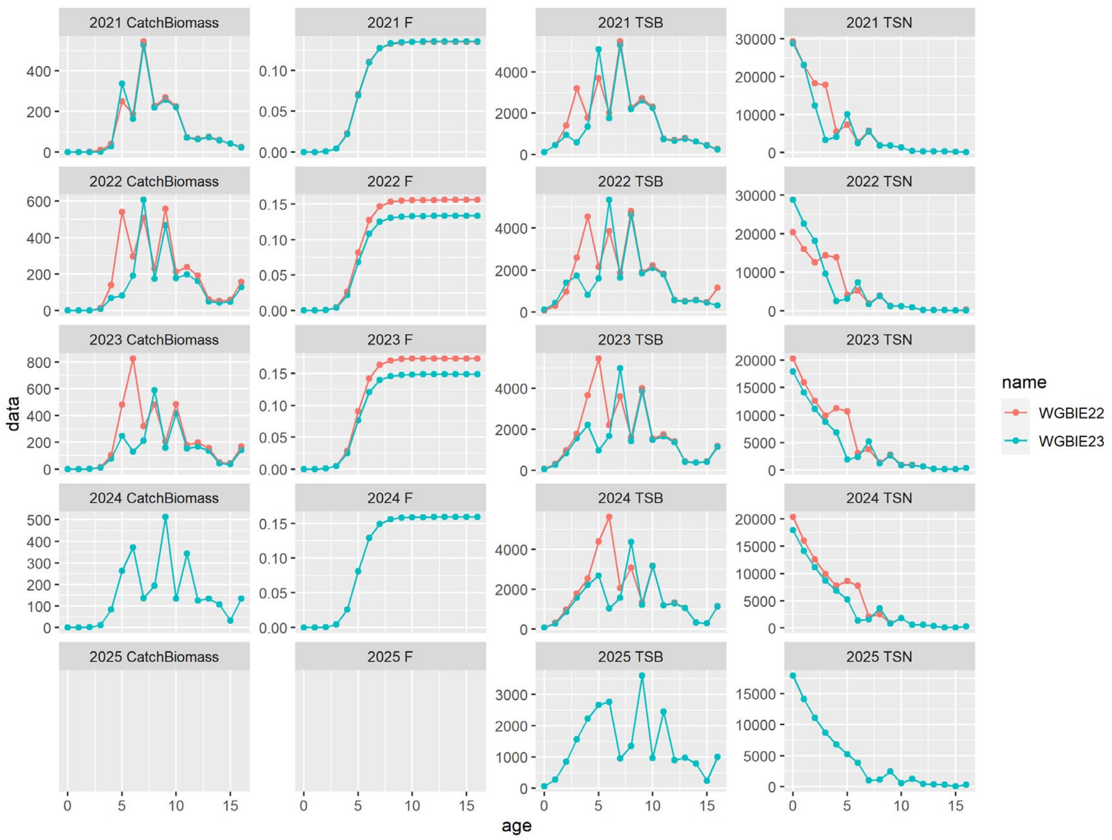


Figure 14.21: Advice change in catches-at-age, F-at-age, total stock biomass-at-age, total stock numbers-at-age.

14.9 Comments on the assessment

The assessment for the Bay of Biscay sea bass stock shows that since 2000, the spawning-stock biomass (SSB) fluctuated around 20 000 t. A low SSB was observed just before the 2000s, and a high SSB was observed around the year 2010. SSB is currently above MSY $B_{trigger}$ in the assessment. F showed a decreasing trend over the recent years and is currently below F_{MSY}. Recruitment is variable over time, and it was below average for the years 2009-2010 and 2015, 2017-2018. Total catches are slightly decreasing over time.

14.10 Considerations for a benchmark

This assessment relies on short time-series data: length composition time-series started only in 2000; age-at-length time-series started only in 2008 (with a proper sampling after 2010); recreational data were surveyed for only one year, in 2010. In addition, there is no scientific survey for adult sea bass to scale the model to an appropriate level of abundance. There is also no survey for recruits. All these elements make this assessment uncertain. In order to improve future assessments and advice for this stock, several important data limitations and deficiencies for the Bay of Biscay sea bass stock should be considered and addressed.

1. Recruitment indices are needed for the Bay of Biscay area. Estimation of recruitment is only based on commercial landings which may be smoothed by ageing errors (Laurec and Drogou, 2012). A French study has been undertaken in 2013–2018 to explore the possibility of creating recruitment indices in estuarine waters. The survey delivered good results but it needs stable economic support to be carried out routinely (Le Goff *et al.*, 2017). Abundance indices have been calculated for years 2016-2022 in the Loire estuary, and for years 2019-2022 in the Gironde estuary and additional surveys are planned for both estuaries for the year 2023. The final objective is to make these surveys sustainable through DCF funding from 2024, implement and test these estimated abundance indices in future assessments then discuss the results and their pertinence during a benchmark.
2. Robust relative fishery-independent abundance indices are needed for adult sea bass in the Bay of Biscay. The establishment of dedicated surveys on the spawning grounds could provide valuable information on abundance trends and the adult sea bass population structure. These can also provide information on the stock structure and linkages between spawning and recruitment grounds can be identified using a drift model.
3. Further research is needed to better understand the stock spatial dynamics (mixing between stock areas; effects of site fidelity on fishery catch rates; spawning site–recruitment ground linkages; environmental influences on recruitment).
4. The present assessment model should be revised through the integration of the undergoing tagging and genetic program results.
5. Studies are needed to investigate the accuracy and bias in ageing as well as identify errors due to historically aged sampling schemes.
6. Continued estimations of recreational removals and size compositions are needed across the stock range. Information to evaluate historical trends in recreational effort and removals would be beneficial for interpreting changes in age–length compositions over time.

7. Historical catches data (1985–2000) need to be revised following the methodology used for the recent years (2000 onwards) and disaggregated into several fishing fleets (e.g. midwater trawls, bottom trawls, nets, lines) to obtain longer time-series data.
8. Discard rates are considered negligible in the current assessment. Nonetheless, a time-series of discards-at-length and/or -age may be needed for all fleets if the impact of technical measures to improve selectivity is to be evaluated as part of any future sea bass management.
9. The absence of length composition data for French fisheries prior to 2000 is a serious deficiency in the assessment modelling as this prevents any evaluation of selectivity changes that may have occurred due to changes in the proportion of different gear types and especially with the significant decrease in pairtrawlers after 1995.

14.11 Management considerations

Sea bass is characterized by slow growth, late maturity, and low M in adults, which imply the need for comparatively low rates of F to avoid depletion of the spawning potential in each year class. The northern stock (4.b–c, 7.a,d–h) whose productivity is well-known, is affected by extended periods of enhanced or reduced recruitment which appear to be related to changes in sea temperature (ICES, 2016a). Warm conditions facilitate northward penetration of sea bass in the Northeast Atlantic and enhance the growth and survival of young fish in estuaries and other coastal nursery habitats. In the Bay of Biscay, there is no reason to observe a difference in dynamics. In terms of the numbers of recruits, the Bay of Biscay area looks more productive than in the North. If no efficient management plan is put in place, and if a combination of increasing F and environmental conditions cause relative successive poor recruitments, it could lead to a long-term and significant decline of biomass which is occurring in the Northern part.

The life-history behaviour of sea bass forming predictable aggregations for spawning in winter and moving inshore to feed at other times of the year increases their vulnerability to exploitation by offshore and inshore fisheries. The effects of targeting offshore spawning aggregations of sea bass are poorly understood considering the strong site fidelity of sea bass, particularly on how the fishing effort is distributed in relation to the mixing of fish from different nursery grounds or summer feeding grounds. Fisheries targeting offshore aggregation are mainly netters and, to a lesser extent, pelagic trawlers operating from December to March. Note that a high increase in the French landings of the nets fishery is observed since 2011. Indeed, as sea bass is currently a non-TAC species, there is a potential for a fishing effort displacement from other species with limiting quotas to this stock as observed with the netters in the Bay of Biscay that shifted their catches from sole to sea bass. The risk of a shift towards sea bass targeted fisheries occurring is high with no effective control on the fishery to limit the increase of the landings as observed in 2014. Many small-scale artisanal fisheries, especially line fishing, have developed a high seasonal catch dependence on sea bass. There is also a significant recreational F in inshore waters. The importance of sea bass to recreational, artisanal and other inshore commercial and large-scale offshore fisheries in different regions means that resource sharing is an important management consideration.

14.12 Information from stakeholders

Since 2017, the French commercial fishing activities in the Bay of Biscay (ICES divisions 8.a, 8.b, and 8.d) have been subjected to national management measures. These are aimed at limiting both sea bass fishing effort and fishing capacity, at levels compatible with the ICES recommendations.

These especially concern annual and periodic limitations of sea bass fishing opportunities, at the levels of both the whole fishery and individual vessels (CNPMEM, 2020).

Section contents