

18 Whiting in Bay of Biscay and Atlantic Iberian waters

whg.27.89a – *Merlangius merlangus* in Subarea 8 and Division 9.a

18.1 General

of assessment in 2023:

Category 3 Length-based indicator method (LBI; ICES, 2017a) as fishing pressure indicator

Changes in the assessment: This stock was upgraded this year from a category 5 to 3 stock using the commercial LPUE and catch length structures.

Data revision in 2023: InterCatch data were compiled for 2022. French bottom trawl LPUE was updated for 2022.

18.1.1 Summary of ICES advice for 2022 and 2023

ICES advises that when the precautionary approach is applied, catches should be no more than 1 347 t in each of the years 2023 and 2024.

The rationale for the catch option was the following:

The ICES framework for category 5 stocks (ICES, 2012) was previously applied. For stocks with no information on abundance or exploitation, ICES considers that a precautionary reduction of catches should be implemented where there is no ancillary information clearly indicating that the current level of exploitation is appropriate for the stock. The precautionary buffer was last applied in 2019 and, thus, was again applied this year.

18.2 Data

18.2.1 Commercial catches and discards

Whiting (*Merlangius merlangus*) is caught in mixed demersal fisheries primarily by France and Spain (Table 18.1 and Figure 18.1). There are concerns about the reliability of the French data from 2008–2009 which appear to be incomplete. There is some whiting misidentification in the Portuguese markets with pollack due to the common names used for both stocks. This resulted in most pollack landings being recorded as whiting during the period 2004–2012. Based on this information, pollack landings were deducted from the whiting landings during this period and were then considered as unallocated (Table 18.1). Sampling data since 2012 indicate that Portuguese landings of whiting and pollack from division 9.a consisted of 2% whiting and 98% pollack (EC, 2015) as whiting landed by Portuguese vessels makes up an insignificant proportion of the total whiting landings in this area.

18.2.1.1 Commercial catches and discards

For 2023, the 2022 InterCatch data were processed to compute landings and discards estimates.

The standard procedure to estimate discards is to use the discard data provided for the different combinations of countries/gears/seasons/areas (“strata”), and to raise the available discard data to the total landings for the strata with limited available data.

In 2022, estimated discard rate is slightly below the average of the whole time-series (see Table 18.3) [$DR_{2022} = 0.230$, $average_{2016-2022} = 0.277$, $max_{2016-2021} = 0.331$].

18.2.1.2 Length structure of commercial catches

About 63, 44, 46, 41, 51, 78, 85% of the landings (in volume) had a length structure associated in 2016, 2017, 2018, 2019, 2020, 2021 and 2022, respectively.

For discards, the percentage of the total discards (after raising) with a length distribution provided are 60, 43, 44, 30, 17, 29 and 29% in 2016, 2017, 2018, 2019, 2020, 2021 and 2022, respectively. See Tables 18.4–10 for details.

Length distribution of landings and discards before and after raising are shown in Figures 18.2–8. Final distributions (pink dots) are similar to the sampled (provided) distribution, showing the limited effect of the raising procedures on length compositions.

The length distributions of the landings are truncated below 27 cm due to the minimum conservation reference size (MCRS) set at 27 cm in this area (EU, 2019b).

18.2.2 Survey data and commercial CPUEs

This species is at the southern extent of its range in the Bay of Biscay and Iberian Peninsula (Figure 18.8). It is not clear whether this is a separate stock from a biological point of view.

18.2.2.1 Survey data

Whiting is caught in the Bay of Biscay during the French EVHOE-WIBTS-Q4 (G9527) survey. In 2017, WGBIE investigated if this survey could provide an index of recruitment and/or biomass (ICES, 2017b). The survey regularly catches whiting on inshore stations but the catch rates are highly variable, resulting in very wide confidence limits. Thus, WGBIE does not propose to use these indices as a basis for the advice.

18.2.2.2 Commercial CPUEs

Commercial LPUEs were provided during the WKBMSYSPiCT2 (ICES, 2023b) workshop in order to explore the possibility of implementing the SPiCT (Pedersen and Berg, 2017) assessment approach for that stock. Even if the results were not conclusive in terms of assessment, estimated LPUEs could be used to provide a category 3 advice (ICES, 2023a) for the stock together with the life-history parameters and catch length structures.

LPUE standardisation was described in detail in the WKBMSYSPiCT2 report (ICES, 2023b) but the details of the main steps of the process are also provided below.

French logbooks were used to extract whiting landings from bottom trawls which represents around 1/3 of the total French landings. In order to reduce the number of vessels in the analysis, only vessels that have landed at least one tonne of whiting in 5 years over the period 2010–2022 where kept in the analysis.

All fishing operation using a bottom trawl of the selected vessel where used to compute the standardised LPUE. The standardisation was made by GAM using a Tweedie distribution (high frequencies of zeros in the data).

In order to take into account the targeting behaviour in the standardisation, only the 10 major species that are caught with whiting are selected. Catches were normalized into relative proportions by weight and the square root transformed (Winker et al., 2013). To construct data input for the GAM models, the direct principal component analysis (PCA) was conducted. It uses directly the PC's scores of the PCA as predictor variable in the model. We retained PCs that showed an eigenvalue superior to 1. Here, four PCs are considered. A cyclic cubic regression spline was

chosen to smooth the month predictor, while smoothing of other continuous variables was realized by thin plate regression spline functions. A random effect on vessels is applied. Characteristics of vessels (in term of size) is also included in the model. Efforts were estimated using the vessel fishing time and used as an offset in the model. The PC's scores of a PCA runs are represented by the covariates RS1, RS2, RS3 and RS4.

The final model is:

formula = "WHG_weight ~ offset(log(fishing_time)) + (YEAR) + s(MONTH, bs='cc', k=12) + s(carre.lon,carre.lat, k=20) + s(NAVS_COD, bs='re') + s(RS1) + s(RS2) + s(RS3) + s(RS4) + (size_NAVS)"

LPUEs from French bottom trawl were updated in 2022 and standardised values are presented in table 18.12 and figure 18.10. LPUEs show a decreasing trend between 2015 and 2018 followed by fluctuating levels since 2019. The lowest value was observed in 2020 while the 2022 value is lower than the MSY $B_{trigger}$ proxy set at 1.4*lowest observed value.

18.2.3 Indicators

18.2.3.1 Length-based indicators

Whiting length samples (sex-combined) from commercial catches were provided in InterCatch format for the years 2016–2022. Length structures of the catches were estimated from these samples and were used for the analyses of MSY proxies applying the length-based indicator (LBI) method as defined in WKLIFE VI (ICES, 2017a). The length distributions were binned to 40 mm length classes (Figure 19.11).

The method also requires growth and maturity parameters which were estimated from sampling data. Data from area 27.8 were limited and did not allow the adjusting of the von Bertalanffy curves. Data from area 27.7 were added to the analyses. Fits are shown in figure 18.12. Estimated L_{inf} is 488 mm and the $k = 0.3$. These values were compared with the FishBase (Fröese and Pauly, 2023) values for this species where L_{inf} is estimated at 413 mm while k is set at 0.2.

L_{mat} was also estimated based on the available sampling data and the estimated maturity ogive and is shown in figure 18.13. L_{50} for this stock was estimated at 203 mm. As a comparison, the estimated L_{50} in the North Sea is 202 mm (ICES, 1996) and 280 mm in the Celtic Sea (Hehir, 2003).

The results of the LBI method (ICES, 2017b) showed that all indicators are above the reference points (Figure 18.13).

However, given the uncertainty around the biological values, some sensitivity analyses were performed where the LBI on fishing pressure is computed using a range of L_{inf} (ref = 488 mm), varying from 440 to 540mm and a varying M/K ratio from 1 to 2 (ref = 1.5).

The results of the sensitivity analysis on the input parameter used for the computation of the $L_{mean}/L_{F=M}$ indicator is presented in figure 18.14. This analysis shows that the stock is considered exploited in 2022 above the F_{MSY} proxy due to the combination of a high L_{inf} (> 500 mm) and a low M/K (< 1.2) values.

From these results, it was concluded that even if the life-history parameters are not well estimated, whiting is currently exploited below F_{MSY} as $L_{mean}/L_{F=M}$ is above 1 from 2016 onwards.

18.2.3.2 LBSPR

Based on the life-history parameters and catch length structures, the LBSPR methods were also applied as indicator of stock development.

As for LBIs, given the uncertainty around life-history parameters, a sensitivity analysis was performed to assess the impact of the L_{50} and M/K ratio on the LBSPR results.

Two runs were made. The first run considered an L_{50} of 203 mm combined with an M/K ratio of 1.5 and was compared with a second run where L_{50} is set to 290 mm with an M/K ratio of 1.

Both results are presented in figure 18.14. Comparing the two runs, the second run ($L_{50} = 290$ mm and $M/K = 1$) more pessimistic in term of life history parameter, results in SPR values observed between 0.2 and 0.6, where 0.4 being considered as a population fished at MSY.

18.2.4 Assessment

The new ICES framework for category 3 stocks was applied (ICES, 2023a). Here, the new '*rfb*' rule (Method 2.1 in ICES, 2022) that replaced the previously applied 2-over-3 rule (ICES, 2012; 2018; 2019) for category 3 stocks was used to provide an MSY advice for the stock. A stock biomass index using the standardized commercial French bottom trawl LPUEs, estimated during the last WKBMSYSPiCT2 (ICES, 2023b) benchmark, was considered as the index of stock development.

This year, the advice is based on the ratio of the mean of the last two index values (index A) and the mean of the three preceding values (index B) multiplied by the recent catch advice, a ratio of observed mean length in the catch relative to the target mean length, a biomass safeguard and a precautionary multiplier.

Inputs used for the analyses are presented in table 18.13. The results of the advice are presented in table 18.14. The catch advice is 41% lower than the previous advice. The length structure and LPUE data were revised during the recent benchmark (ICES, 2023b) and the advice is now based on a category 3 stock assessment using the ICES framework for data-limited stocks (DLS). Due to the difference between recent catches and recent advice, and given that this is the first implementation of the '*rfb*' rule (Method 2.1; ICES, 2022), the most recent years (2020–2022) of catch were used in the calculation instead of recent advice. In addition, the biomass index has declined below the biomass safeguard.

Both the stock biomass trend and fishing pressure proxy are above 1. The precautionary multiplier used is 0.9 which corresponds to a stock with k values between 0.20 and 0.32.

The biomass safeguard (b) is below 1. Since the last value of the index is below I_{trigger} and the b is below 1, the stability clause should not be applied.

18.3 Biological reference points

The reference points proxies can be derived from the LBI analysis and the biomass index value (French bottom trawl LPUEs).

The proxies for the reference points are presented in table 18.15.

18.4 Management plans

The EU multiannual plan (MAP) for stocks in the Western Waters and adjacent waters applies to this stock (EU, 2019a). The MAP stipulates that when the F_{MSY} ranges are not available, fishing opportunities should be based on the best available scientific advice.

18.5 Issue list

Issues	Problems/Aims	Work needed / possible resolutions for consideration	Required data to resolve this. Are these available/ where should these come from?	Benchmark external expertise needed Type of expertise & proposed names
Data needed and/or to be quantified ¹	Time-series of catch data	7 years of data have been consolidated in InterCatch. A longer time-series needs to be consolidated.	France, Spain and Portugal need to consolidate their InterCatch data to get a longer time-series	
	Time-series of length structures. Samplings may not be sufficient in all areas	Assess the representativeness of the samplings in sub-area 8 and evaluate the possibilities for use to raise data in division 9 where very few samples are available.	Raw sampling data	
	Time-series of age structures. Samplings may not be sufficient in all areas	Assess the representativeness of the sampling in sub-area 8 and evaluate the possibilities for use to raise data in division 9 where very few samples are available.	Raw sampling data Estimate an age-length key (ALK)	
Discards	Time-series of discards has to be consolidated	7 years of data have been raised in InterCatch. A longer time-series needs to be consolidated	France, Spain and Portugal need to consolidate their InterCatch data to get a longer time-series	
Stock ID	This species is at the southern extent of its range in the Bay of Biscay and Iberian Peninsula. It is not clear whether this is a separate stock from a biological point of view	Review of literature		
Biological Parameters	Maturity	Little information about maturity is currently available for assessment but some information should have been collected during the scientific surveys and DCF collections in France, Spain and Portugal.	France, Spain and Portugal should provide all individual biological data to assess if some maturity ogive can be derived for this stock.	

Issues	Problems/Aims	Work needed / possible resolutions for consideration	Required data to resolve this. Are these available/ where should these come from?	Benchmark external expertise needed Type of expertise & proposed names
Assessment method	Some ongoing works exist which aim to provide length/age data. Once the data are consolidated, an a4a (Millar and Jardim, 1999) model can be envisaged and explored			a4a experts
Biological reference points	Fishing level values of catch, F and biomass	Little information is known about the SSB and recruitment while a significant uncertainty in F is known	Collect more information from literature	
<ul style="list-style-type: none"> • No discard information is provided for the Subarea 8.c and Division 9.a. • Very little information is available about the stock distribution. • Existing surveys should be further investigated to check for potential data availability. 				

18.6 Recommendations for a benchmark

This stock was benchmarked in 2023 during WKMSYSPiCT2 (ICES, 2023b) workshop. It was not possible to fit a SPiCT model for the stock due to the time constraints and the limited information provided by the catch time-series.

A significant amount of data needs to be collected and intersessional works should be done before this stock can proceed to another benchmark. Currently, only a short time-series of landings data is available with information on discards and limited data on abundance and/or biomass, stock distribution and biological parameters. This significant input data gap, identified in the issues list above, should be resolved prior to the next benchmark.

Once these data are collected, a simple linear model such as the Assessment for All (a4a; Millar and Jardim, 1999) or other integrated models can be explored and implemented.

18.7 References

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18.8 Tables and figures

Table 18.1. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Official landings (in tonnes). ICES estimates are based on a correction of mixed species (whiting and pollack) landings recorded in the Portuguese landings in Division 9a.

Year	Belgium	France	Portugal	Spain	Total	Unallocated *	ICES estimates
1994		3 496	15	136	3 647	0	3 647
1995		2 645	2	1	2 648	0	2 648
1996		1 544	4	13	1 561	0	1 561
1997		1 895	3	47	1 945	0	1 945
1998		1 750	3	105	1 858	0	1 858
1999			1	211	212	0	212
2000	2	1 106	2	338	1 448	0	1 448
2001	3	1 989	1	288	2 281	0	2 281
2002	3	1 970	1	230	2 204	0	2 204
2003	1	2 275	4	171	2 451	0	2 451
2004		1 965	77	249	2 291	-70	2 221
2005	3	1 662	2	416	2 083	-2	2 081
2006	2	1 420	7	433	1 862	-6	1 856
2007	4	1 617	107	296	2 024	-104	1 920
2008	1	772	98	187	1 058	-93	965
2009	2	1 303	114	54	1 473	-111	1 362
2010	3	2 234	114	101	2 452	-110	2 342
2011	1	2 029	105	108	2 243	-102	2 141
2012	3	1 791	90	110	1 994	-87	1 907
2013	1	1 943	95	55	2 094	-93	2 001
2014	1	1 579	65	55	1 700	-49	1 651
2015	2	2 138	38	56	2 234	-35	2 199
2016	1	2 441	20	40	2 502	23	2 525
2017	0	1 871	18	20	1 909	16	1 925
2018	2	1 524	15	26	1 565	0	1 565
2019	1	1 348		13	1 362	34	1 396
2020	1	1 094		1	1 096	25	1 121
2021	1	1 229		15	1 245	26	1 271
2022 [†]	1	1 167			1 168	29	1 197

*Unallocated are mostly coming from landings subtracted from pollock in subarea 8 and division 9a.

[†]Provisional

Table 18.2. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Landings with associated discards (in percent) in the same strata* that were submitted to InterCatch.

Year	Landings with associated discards*
2016	88%
2017	72%
2018	70%
2019	49%
2020	33%
2021	47 %
2022	53 %

*Similar combinations of countries/gears/seasons/areas.

Table 18.3. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Landings and discards (in tonnes) after raising procedures.

Year	Landings (Imported)	Discards (Imported)	Discards (raised)	Total discards	Overall discard rate
2016	2 525.00	828.40	98.38	926.78	0.268
2017	1 925.00	617.60	320.20	937.80	0.328
2018	1 565.00	376.00	279.50	655.50	0.295
2019	1 396.00	243.90	291.20	535.10	0.280
2020	1 122.00	92.50	206.20	298.70	0.210
2021	1 271.00	267.20	362.30	629.50	0.331
2022	1 198.00	262.20	108.20	370.40	0.230

Table 18.4. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Summary of the structures provided in 2020 (Imported_Data refers to data imported to InterCatch, Raised_Discards refers to discard raised based on observed data for other strata, Sampled_Distribution refers to landings or discards with length structures provided, Estimated_Distribution refers to length distribution estimated from the provided strata).

CatchCategory	RaisedOrImported	SampledOrEstimated	CATON	perc
Logbook Registered Discard	Imported_Data	Estimated_Distribution	0	NA
Landings	Imported_Data	Sampled_Distribution	1022	85
Landings	Imported_Data	Estimated_Distribution	175.6	15
Discards	Imported_Data	Sampled_Distribution	231.5	62
Discards	Raised_Discards	Estimated_Distribution	108.2	29
Discards	Imported_Data	Estimated_Distribution	30.71	8

Table 18.5. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Summary of the structures provided in 2021 (Imported_Data refers to data imported to InterCatch, Raised_Discards refers to discard raised based on observed data for other strata, Sampled_Distribution refers to landings or discards with length structures provided, Estimated_Distribution refers to length distribution estimated from the provided strata).

CatchCategory	RaisedOrImported	SampledOrEstimated	CATON	perc
Landings	Imported_Data	Sampled_Distribution	997.6	78
Landings	Imported_Data	Estimated_Distribution	273.7	22
Discards	Raised_Discards	Estimated_Distribution	362.3	58
Discards	Imported_Data	Sampled_Distribution	184.1	29
Discards	Imported_Data	Estimated_Distribution	83.08	13

Table 18.6. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Summary of the structures provided in 2020 (Imported_Data refers to data imported to InterCatch, Raised_Discards refers to discard raised based on observed data for other strata, Sampled_Distribution refers to landings or discards with length structures provided, Estimated_Distribution refers to length distribution estimated from the provided strata).

CatchCategory	RaisedOrImported	SampledOrEstimated	CATON	perc
Landings	Imported_Data	Estimated_Distribution	577.3	51
Landings	Imported_Data	Sampled_Distribution	544.2	49
Discards	Raised_Discards	Estimated_Distribution	206.2	69
Discards	Imported_Data	Sampled_Distribution	50.84	17
Discards	Imported_Data	Estimated_Distribution	41.66	14

Table 18.7. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Summary of the structures provided in 2019 (Imported_Data refers to data imported to InterCatch, Raised_Discards refers to discard raised based on observed data for other strata, Sampled_Distribution refers to landings or discards with length structures provided, Estimated_Distribution refers to length distribution estimated from the provided strata).

CatchCategory	RaisedOrImported	SampledOrEstimated	CATON	perc
Landings	Imported_Data	Estimated_Distribution	826	59
Landings	Imported_Data	Sampled_Distribution	570.1	41
Discards	Raised_Discards	Estimated_Distribution	291.2	54
Discards	Imported_Data	Sampled_Distribution	163.2	30
Discards	Imported_Data	Estimated_Distribution	80.77	15

Table 18.8. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Summary of the structures provided in 2018 (Imported_Data refers to data imported to InterCatch, Raised_Discards refers to discard raised based on observed data for other strata, Sampled_Distribution refers to landings or discards with length structures provided, Estimated_Distribution refers to length distribution estimated from the provided strata).

CatchCategory	RaisedOrImported	SampledOrEstimated	CATON	perc
Landings	Imported_Data	Estimated_Distribution	846.2	54
Landings	Imported_Data	Sampled_Distribution	718.6	46
Discards	Imported_Data	Sampled_Distribution	290.5	44
Discards	Raised_Discards	Estimated_Distribution	279.5	43
Discards	Imported_Data	Estimated_Distribution	85.51	13

Table 18.9. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Summary of the structures provided in 2017 (Imported_Data refers to data imported to InterCatch, Raised_Discards refers to discard raised based on observed data for other strata, Sampled_Distribution refers to landings or discards with length structures provided, Estimated_Distribution refers to length distribution estimated from the provided strata).

CatchCategory	RaisedOrImported	SampledOrEstimated	CATON	perc
Landings	Imported_Data	Estimated_Distribution	1080	56
Landings	Imported_Data	Sampled_Distribution	844.4	44
Discards	Imported_Data	Sampled_Distribution	404.7	43
Discards	Raised_Discards	Estimated_Distribution	320.2	34
Discards	Imported_Data	Estimated_Distribution	212.9	23

Table 18.10. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Summary of the structures provided in 2016 (Imported_Data refers to data imported to InterCatch, Raised_Discards refers to discard raised based on observed data for other strata, Sampled_Distribution refers to landings or discards with length structures provided, Estimated_Distribution refers to length distribution estimated from the provided strata).

CatchCategory	RaisedOrImported	SampledOrEstimated	CATON	perc
Landings	Imported_Data	Sampled_Distribution	1585	63
Landings	Imported_Data	Estimated_Distribution	939.9	37
Discards	Imported_Data	Sampled_Distribution	553.1	60
Discards	Imported_Data	Estimated_Distribution	275.2	30
Discards	Raised_Discards	Estimated_Distribution	98.38	11

Table 18.11. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Parameters used as input for the LBI method.

Data Type	Value/Year	Source
Length at maturity	261 261 261	https://www.fishbase.in/Reproduction/MaturityList.php?ID=29
von Bertalanffy growth parameter	443 443 443	https://www.fishbase.in/Reproduction/MaturityList.php?ID=29
Catch at length by year	2014 2020	Length data from IC
Length-weight relationship parameters for landings and discards	2014 2020	Mean weight at length from IC

Table 18.12. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Standardised LPUE from the French otter trawl.

Year	Standardised LPUE
2010	1.001
2011	1.346
2012	1.320
2013	1.269
2014	1.020
2015	1.288
2016	1.177
2017	0.895
2018	0.775
2019	0.767
2020	0.615
2021	0.830
2022	0.699

Table 18.13. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Assessment summary. All weights are in tonnes.

Year	Biomass index * (ratio)	Landings	Discards	Inverse f
2010	1.001	2 342		
2011	1.346	2 141		
2012	1.320	1 907		
2013	1.269	2 001		
2014	1.020	1 651		
2015	1.288	2 199		

Year	Biomass index * (ratio)	Landings	Discards	Inverse f
2016	1.177	2 525	927	0.929
2017	0.895	1 925	938	0.913
2018	0.775	1 565	656	0.96
2019	0.767	1 396	535	0.872
2020	0.615	1 121	299	0.908
2021	0.830	1 271	629	0.955
2022	0.699	1 197	370	0.941

* Standardized biomass index commercial French otter trawl LPUEs.

Table 18.14. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. The basis for the catch scenarios*

Previous catch advice A_y (2023)	1 630 tonnes	
Stock biomass trend		
Index A (2021, 2022)		0.76
Index B (2018, 2019, 2020)		0.72
r: Index ratio (A/B)		1.06
Fishing pressure proxy		
Mean catch length ($L_{\text{mean}} = L_{2022}$)		340 mm
MSY proxy length ($L_F = M$)		320 mm
f: multiplier for relative mean length in catches ($L_{\text{mean}}/L_F = M_{2022}$)		1.06
Biomass safeguard		
Last index value (I_{2022})		0.70
Index trigger value ($I_{\text{trigger}} = I_{\text{loss}} \times 1.4$)		0.86
b: multiplier for index relative to trigger $\min\{I_{2022}/I_{\text{trigger}}, 1\}$		0.81
Precautionary multiplier to maintain biomass above B_{lim} with 95% probability		
m: multiplier (generic multiplier based on life history)		0.90
rfb calculation $C_{y+1} = C_y \times r \times f \times b \times m$		1 3470 tonnes
Stability clause (+20%/-30% compared to A_y , only applied if $b \geq 1$)	Not applied	
Discard rate		0.28
Catch advice for 2024 and 2025 ($A_y \times \text{stability clause}$)		1 347 tonnes
Projected landings corresponding to advice**		970 tonnes
% advice change^		-41%

* The figures in the table are rounded. Calculations were done with unrounded inputs and computed values may not match exactly when calculated using the rounded figures in the table.

** [Advised catch for 2024 and 2025] \times [1 – discard rate].

^Advice value for each of the years 2024 and 2025 relative to the advice value for each of the years 2022 and 2023 (2 276 tonnes).

Table 18.15. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Reference points, values, and their technical basis.

Frame-work	Reference point	Value	Technical basis	Source
MSY approach	MSY B_{trigger} proxy	0.86	Biomass index trigger value (I_{trigger}), defined as $I_{\text{trigger}} = I_{\text{loss}} \times 1.4$, where I_{loss} is the lowest observed historical biomass index value.	(ICES, 2023b)
	F_{MSY} proxy	$\frac{L_{\text{mean}}}{L_{F=M}} = 1^*$	Relative value from LBI analysis, assuming the natural mortality rate (M) relative to somatic growth rate (M / K) = 1.5. $L_{F=M}$ is based on L_c (length at 50% of modal abundance) which varies each year.	(ICES, 2023b)

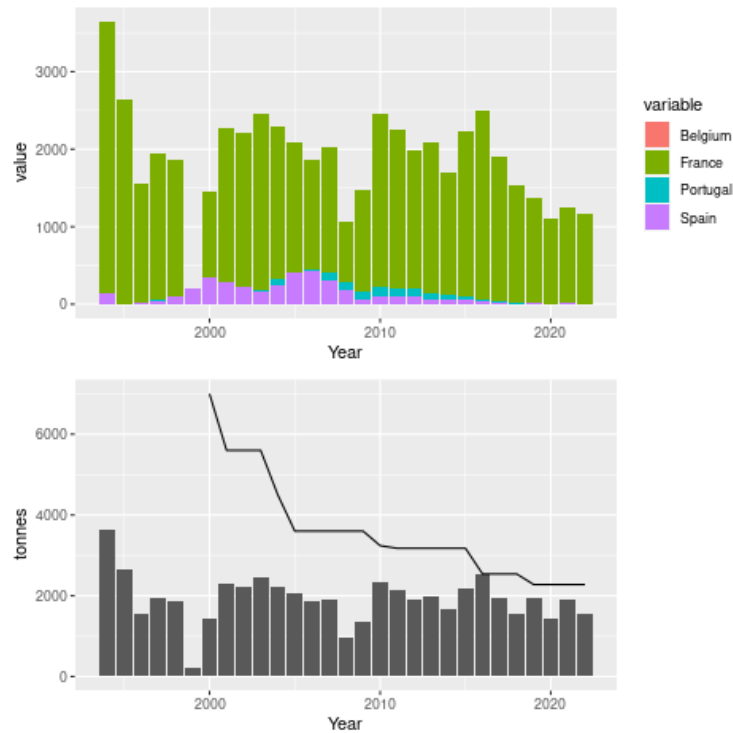


Figure 18.1. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Landings (in tonnes) per country (upper panel), landings (in tonnes) prior to 2019 (lower panel) and catches (in tonnes) after 2019 compared to TAC (solid line).

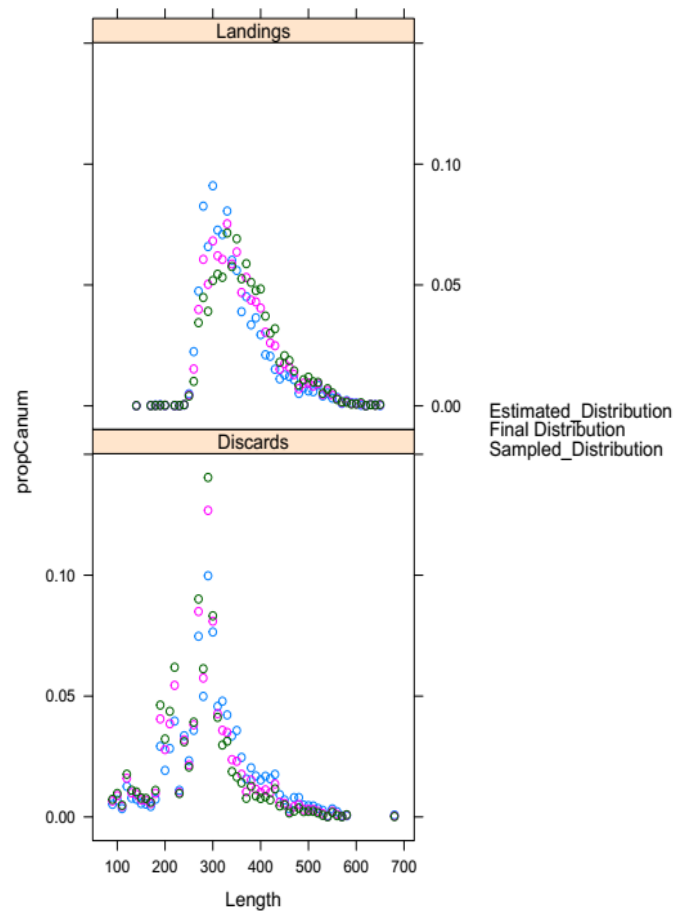


Figure 18.2. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Length distribution of landings (top) and discards (bottom) for 2016.

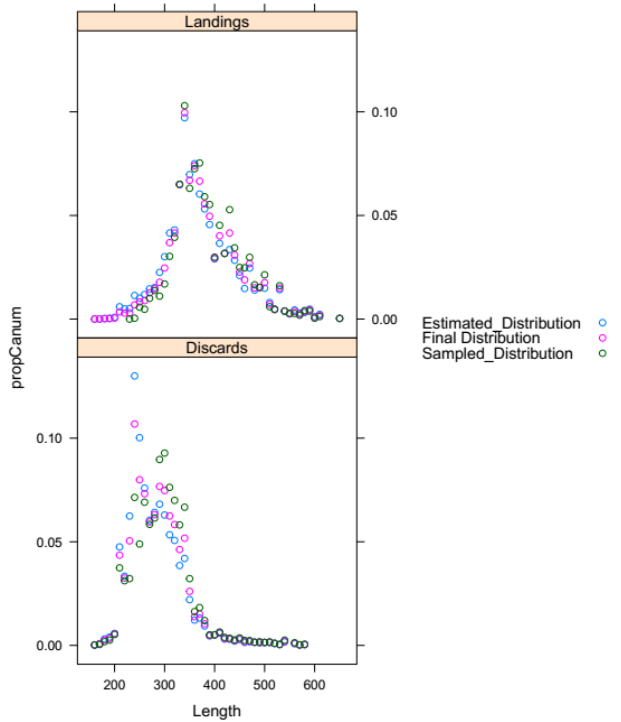


Figure 18.3. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Length distribution of landings (top) and discards (bottom) for 2017.

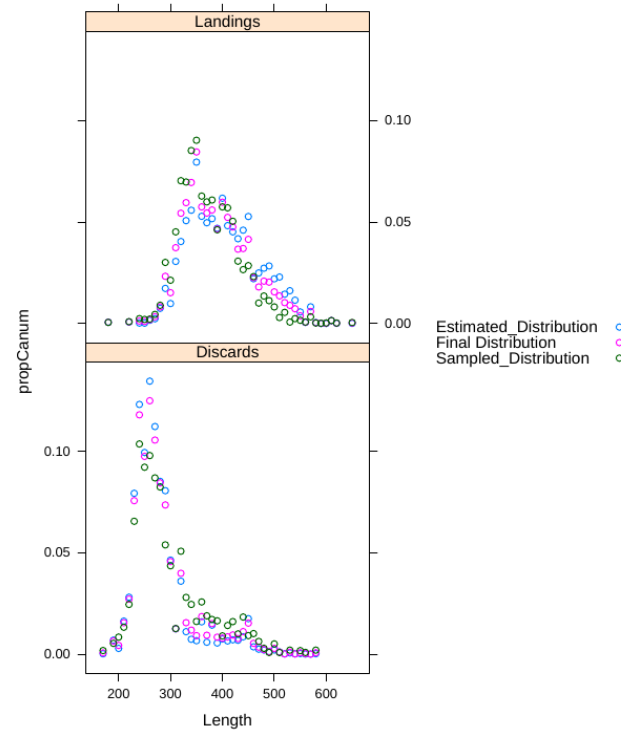


Figure 18.4. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Length distribution of landings (top) and discards (bottom) for 2018.

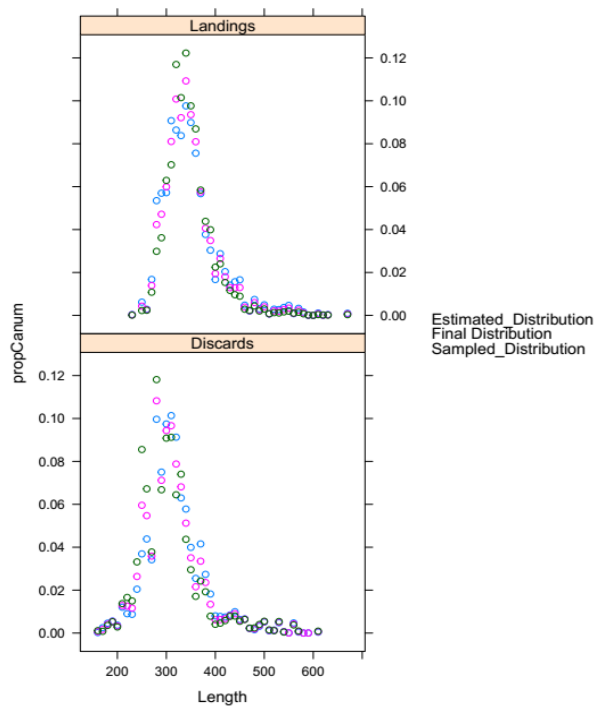


Figure 18.5. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Length distribution of landings (top) and discards (bottom) for 2019.

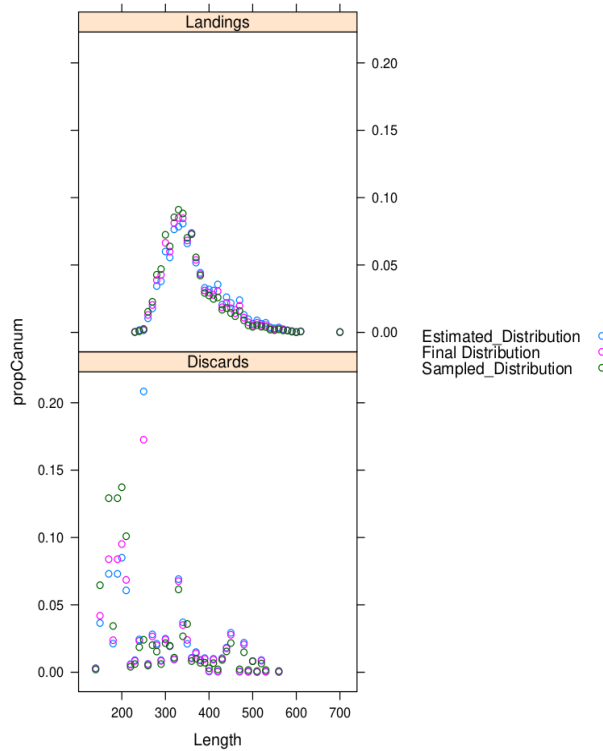


Figure 18.6. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Length distribution of landings (top) and discards (bottom) for 2020.

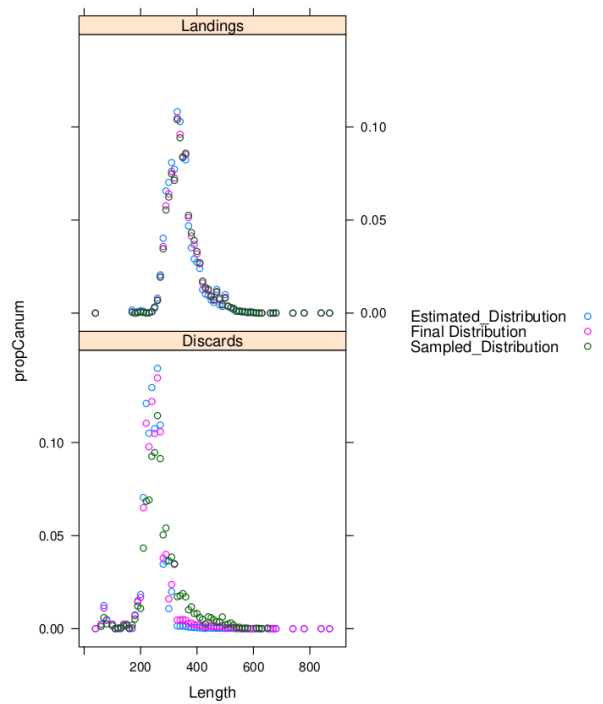


Figure 18.7. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Length distribution of landings (top) and discards (bottom) for 2021.

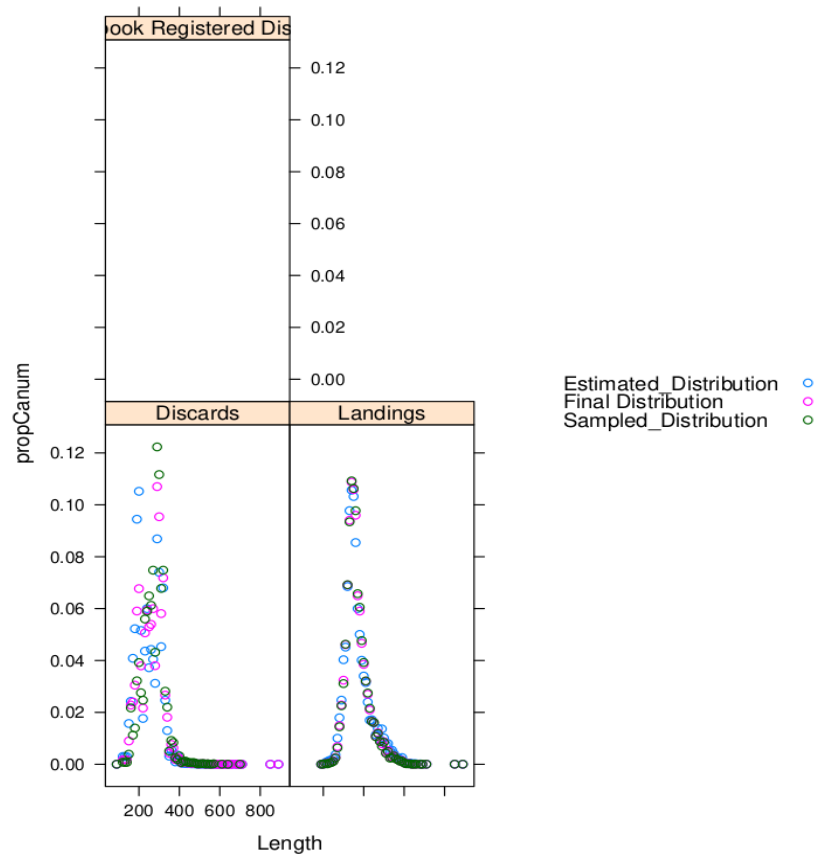


Figure 18.8. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Length distribution of Log book registered discards (no values on top) and landings and discards (bottom) for 2022.

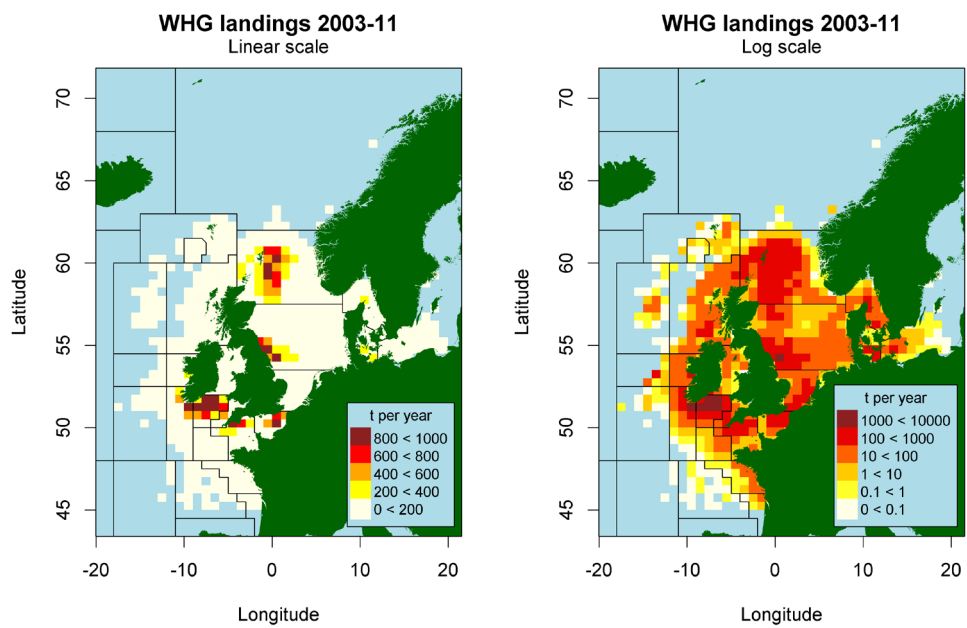


Figure 18.9. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Spatial distribution of whiting landings.

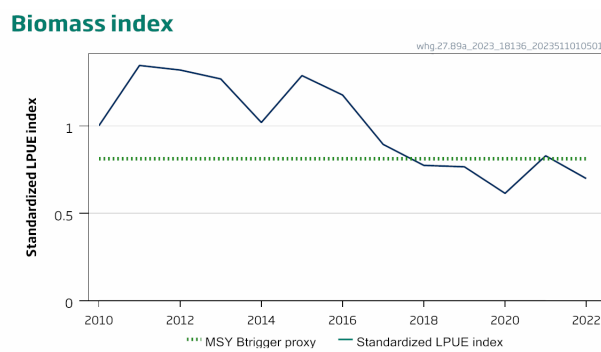


Figure 18.10. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Time series of standardised whiting LPUE for otter trawl fleets fishing in Divisions 8abd.

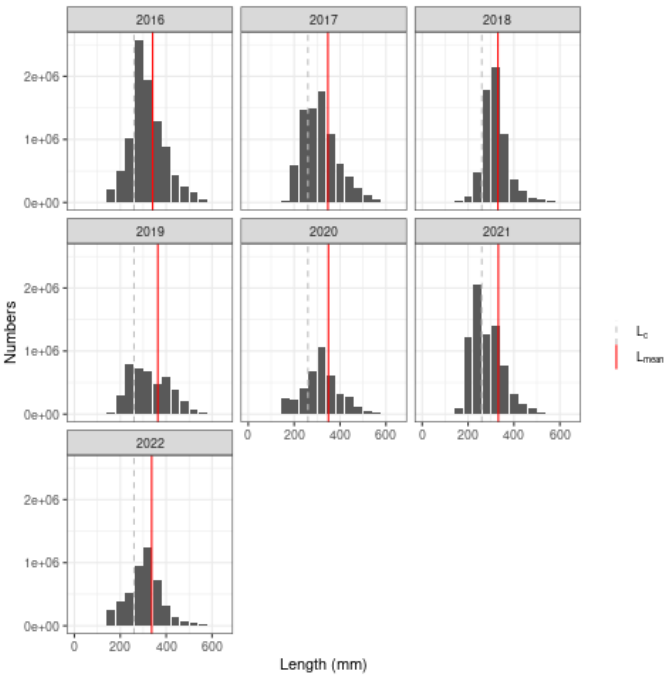


Figure 18.11. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Length composition of whiting catches binned at 40 mm.

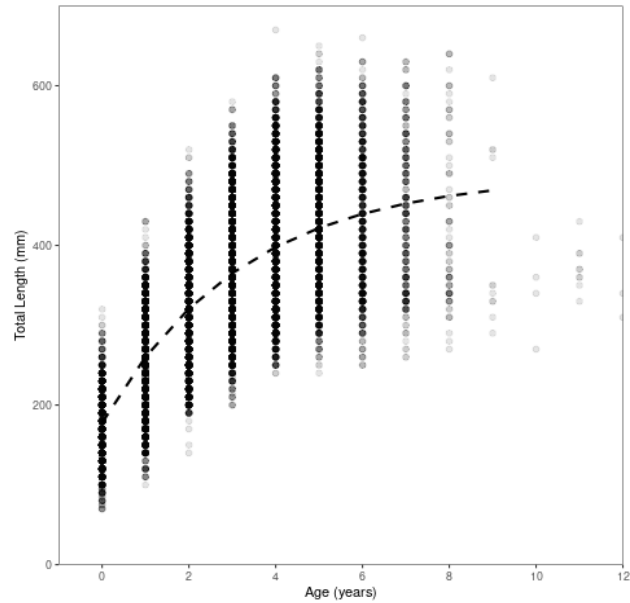


Figure 18.12. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. The von Bertalanffy curve adjusted on sampling data from areas 27.8 and 27.7.

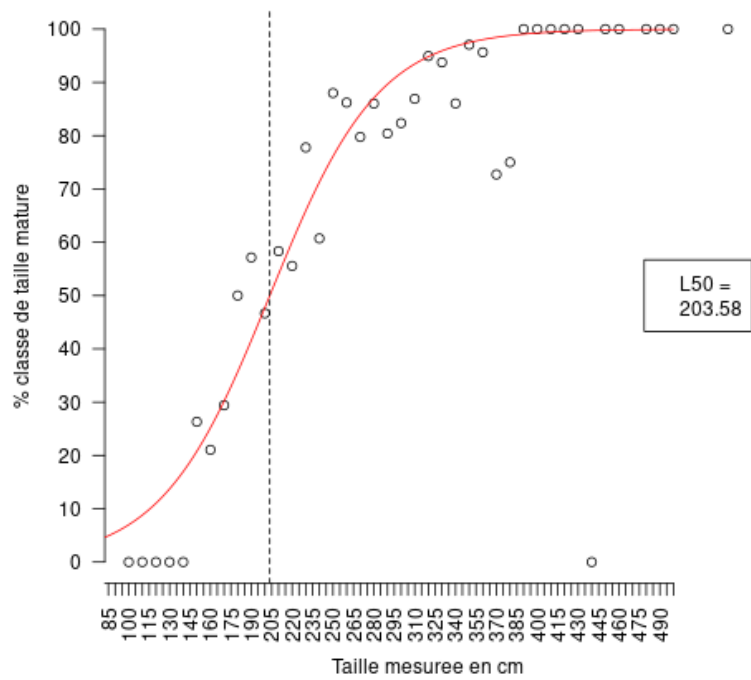


Figure 18.12. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Maturity ogive adjusted on sampling data from areas 27.8 and 27.7. The y-axis is the proportion of mature size class and x-axis is the measured length (in cm).

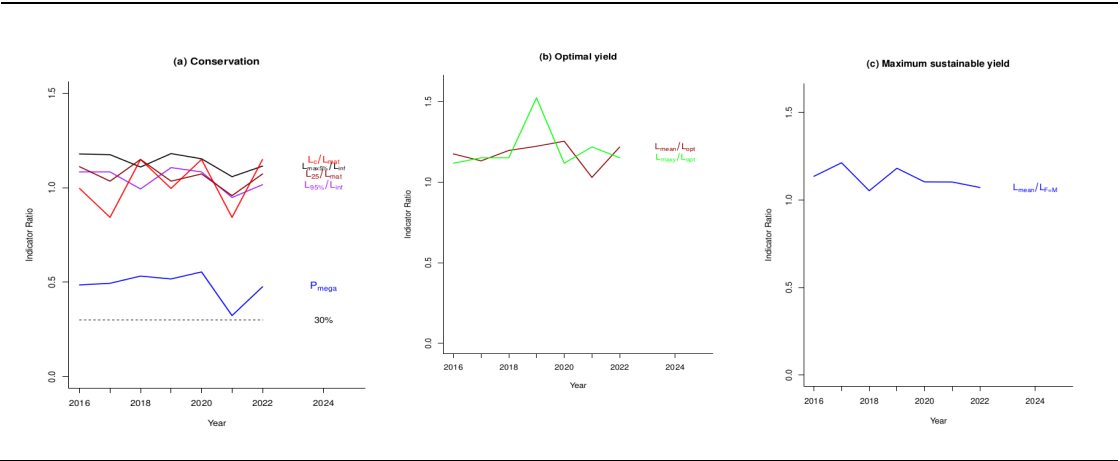


Figure 18.13. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. LBI analyses results.

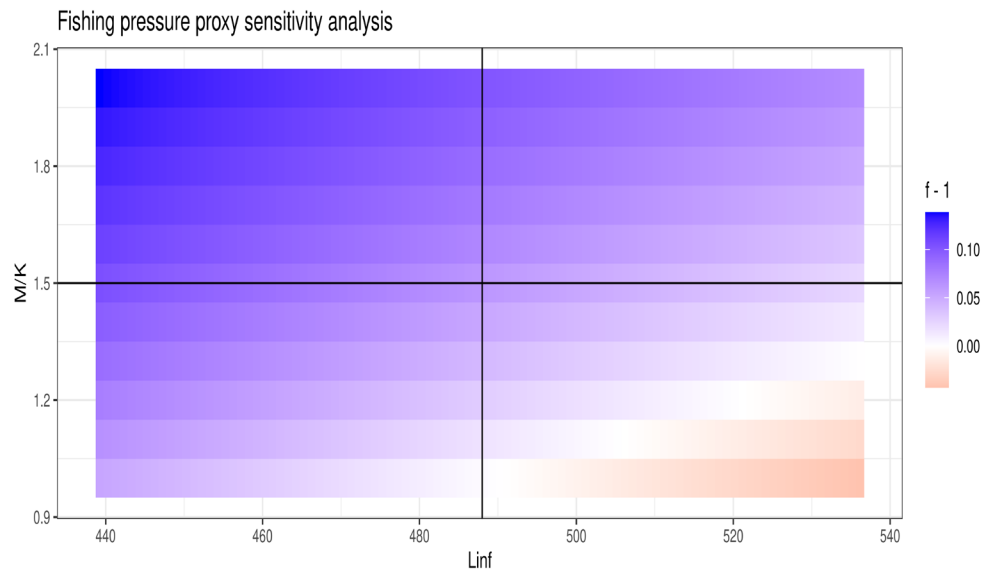


Figure 18.14. Whiting (*Merlangius merlangus*) in Subarea 8 and Division 9a. Fishing pressure proxy sensitivity analysis. Colours represent the difference between the indicator $L_{mean}/L_{F=M}$ Blue values mean that the indicator is above 1 and that the stock is fished under F_{MSY} proxy.

Contents

- 18 Whiting in Bay of Biscay and Atlantic Iberian waters 649
 - 18.1 General..... 649
 - 18.1.1 Summary of ICES advice for 2022 and 2023 649
 - 18.2 Data..... 649
 - 18.2.1 Commercial catches and discards..... 649
 - 18.2.2 Survey data and commercial CPUEs 650
 - 18.2.3 Indicators 651
 - 18.2.4 Assessment 652
 - 18.3 Biological reference points 652
 - 18.4 Management plans 652
 - 18.5 Issue list 653
 - 18.6 Recommendations for a benchmark..... 655
 - 18.7 References 655
 - 18.8 Tables and figures 656