Operating Models Summary Report

North Atlantic Swordfish MSE

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Contents

Operating Model Scenarios

Base Case Model

Table 1. Key parameter values for the base case analysis. The column names are: Natural mortality (M) - fixed parameter; standard error of recruitment deviations (sigmaR) - fixed parameter; Steepness (h) - estimated in the base case model; Coefficient of variation for the indices (CPUE CV) - varied between indices and years (range of values shown here); Effective sample size of length composition (Len. Comp. Eff. Samp. Size) - fixed; Q Increase assumed for indices (Q increase); Environmental covariate included for some indices (Env. Covariate).

M	sigmaR	h	CPUE CV	Len. Comp. Eff. Samp. Size	Q increase	Env. Covariate
0.2	0.2	0.823509	0.16 - 0.38	20	FALSE	TRUE

Uncertainty Grid

Table 2. The uncertainty grid is a full factorial design with the following 7 factors, resulting in 288 OMs. M and h were fixed in the uncertainty grid. CPUE CV was fixed for all indices.

M	sigmaR	h	CPUE CV	Len. Comp. Eff. Samp. Size	Q increase	Env. Covariate
0.1	0.2	0.60	0.3	2	1	FALSE
0.2	0.6	0.75	0.6	20	1.01	TRUE
0.3		0.90				

Convergence

All 288 OMs in the uncertainty grid converged (invertible hessian).

Check for Parameters at Bounds

73 OMs had parameters that were close to the specified bounds (defined here as within 1% of the bounds). This only occurred for 3 parameters, all related to the size-selectivity parameters of the Japan Early and US fishing fleets.

Table 3. Table of parameters where the estimated values were within 1% of the specified minimum and maximum bounds. Filters at the top of each column can be used to subset the results. The table can be downloaded as a CSV file using the 'CSV' button.

NOTE: Dynamic tables are only available in HTML version of this report. Click here[1] to download the table in CSV format (After opening link, right-click and Save As .csv).

[1] https://github.com/ICCAT/nswo-mse/raw/master/docs/Reports/OM_Summary/Table3.csv

CSV Show 10 entries Search:

OM	Parameter	Value	Min	Max
All	All	All	All	All
3	SizeSel_5P_1_JPN_ERLY_5	316.811	70	317
6	SizeSel_5P_1_JPN_ERLY_5	316.793	70	317
9	SizeSel_5P_1_JPN_ERLY_5	316.894	70	317
12	SizeSel_5P_1_JPN_ERLY_5	316.867	70	317
14	SizeSel_5P_1_JPN_ERLY_5	316.536	70	317
15	SizeSel_5P_1_JPN_ERLY_5	316.914	70	317
17	SizeSel_5P_1_JPN_ERLY_5	316.178	70	317
18	SizeSel_5P_1_JPN_ERLY_5	316.887	70	317
27	SizeSel_5P_1_JPN_ERLY_5	315.158	70	317
33	SizeSel_5P_1_JPN_ERLY_5	316.441	70	317

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Parameter and Likelihood Table

Table 4. The parameters and the total and component likelihood values for the base case model and the 288 OMs from the uncertainty grid. Filters at the top of each column can be used to subset the results. The table can be downloaded as a CSV file using the 'CSV' button.

NOTE: Dynamic tables are only available in HTML version of this report. Click here[2] to download the table in CSV format (After opening link, right-click and Save As .csv).

[2]https://github.com/ICCAT/nswo-mse/raw/master/docs/Reports/OM_Summary/Table4.csv

CSV Show 10 entries Search:

Parameter Values								Likelihood Values				
OM	M	sigmaR	h	CPUE CV	Len. Comp. Eff. Samp. Size	Q increase	Env. Covariate	Total	Survey	Mean_body_wt	Length_comp	Recruitment
All	All	All	All	All	All	All	All	All	All	All	All	All
base_case	0.2	0.2	0.823509	0.2701595	20	1	TRUE	379.897	-188.35	122.919	480.688	-37.537
1	0.1	0.2	0.6	0.3	2	1	FALSE	-23.2488	-185.743	123.713	71.9124	-33.1381
2	0.2	0.2	0.6	0.3	2	1	FALSE	-46.1227	-183.918	121.006	52.8787	-36.093
3	0.3	0.2	0.6	0.3	2	1	FALSE	-45.965	-181.251	121.383	51.6647	-37.7726
4	0.1	0.6	0.6	0.3	2	1	FALSE	-3.80535	-190.121	123.429	73.5251	-10.6455
5	0.2	0.6	0.6	0.3	2	1	FALSE	-27.9356	-191.055	121.265	53.8414	-11.9904
6	0.3	0.6	0.6	0.3	2	1	FALSE	-26.6171	-187.491	121.684	51.7292	-12.5492
7	0.1	0.2	0.75	0.3	2	1	FALSE	-31.0565	-187.25	122.27	69.7248	-35.8075
8	0.2	0.2	0.75	0.3	2	1	FALSE	-49.9767	-186.628	121.273	53.1095	-37.7378
9	0.3	0.2	0.75	0.3	2	1	FALSE	-49.2952	-181.448	121.287	50.5191	-39.6651

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Reference Points Table

Table 5. Summary table of the biological reference points for the base case model and the 288 converged models from the uncertainty grid. Filters at the top of each column can be used to subset the results. The table can be downloaded as a CSV file using the 'CSV' button.

NOTE: Dynamic tables are only available in HTML version of this report. Click here[3] to download the table in CSV format (After opening link, right-click and Save As .csv).

[3]https://github.com/ICCAT/nswo-mse/raw/master/docs/Reports/OM_Summary/Table5.csv

CSV Show 10 entries Search:

Parameter Values								Reference Points						
OM	M	sigmaR	h	CPUE CV	Len. Comp. Eff. Samp. Size	Q increase	Env. Covariate	MSY	SB_{MSY}	F_{MSY}	F/F_{MSY}	SB/SB_{MSY}	SB_{MSY}/SB_0	Depletion
All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
base_case	0.2	0.2	0.823509	0.2701595	20	1	TRUE	12303.8	27046.7	0.14	0.85	1.12	0.22	0.24
1	0.1	0.2	0.6	0.3	2	1	FALSE	10546.2	148652	0.04	0.98	1.08	0.34	0.37
2	0.2	0.2	0.6	0.3	2	1	FALSE	12384.6	57655.4	0.08	0.71	1.32	0.31	0.41
3	0.3	0.2	0.6	0.3	2	1	FALSE	13174.6	28709.3	0.11	0.64	1.45	0.3	0.43
4	0.1	0.6	0.6	0.3	2	1	FALSE	11244.6	156292	0.04	1.03	0.98	0.34	0.33
5	0.2	0.6	0.6	0.3	2	1	FALSE	14180.6	65589.4	0.08	0.68	1.2	0.31	0.37
6	0.3	0.6	0.6	0.3	2	1	FALSE	15889.6	34630.6	0.11	0.56	1.37	0.3	0.4
7	0.1	0.2	0.75	0.3	2	1	FALSE	11323.4	105289	0.06	0.87	1.15	0.28	0.33
8	0.2	0.2	0.75	0.3	2	1	FALSE	12784.7	36699	0.12	0.66	1.42	0.25	0.36
9	0.3	0.2	0.75	0.3	2	1	FALSE	13716	17685.5	0.16	0.58	1.68	0.23	0.39

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SB/SB_{MSY} Timeseries Plots

Time-series plots of the spawning biomass (SB) relative to spawning biomass corresponding with maximum sustainable yield (SB_{MSY}) for the seven factors examined in the uncertainty grid.

Natural Mortality

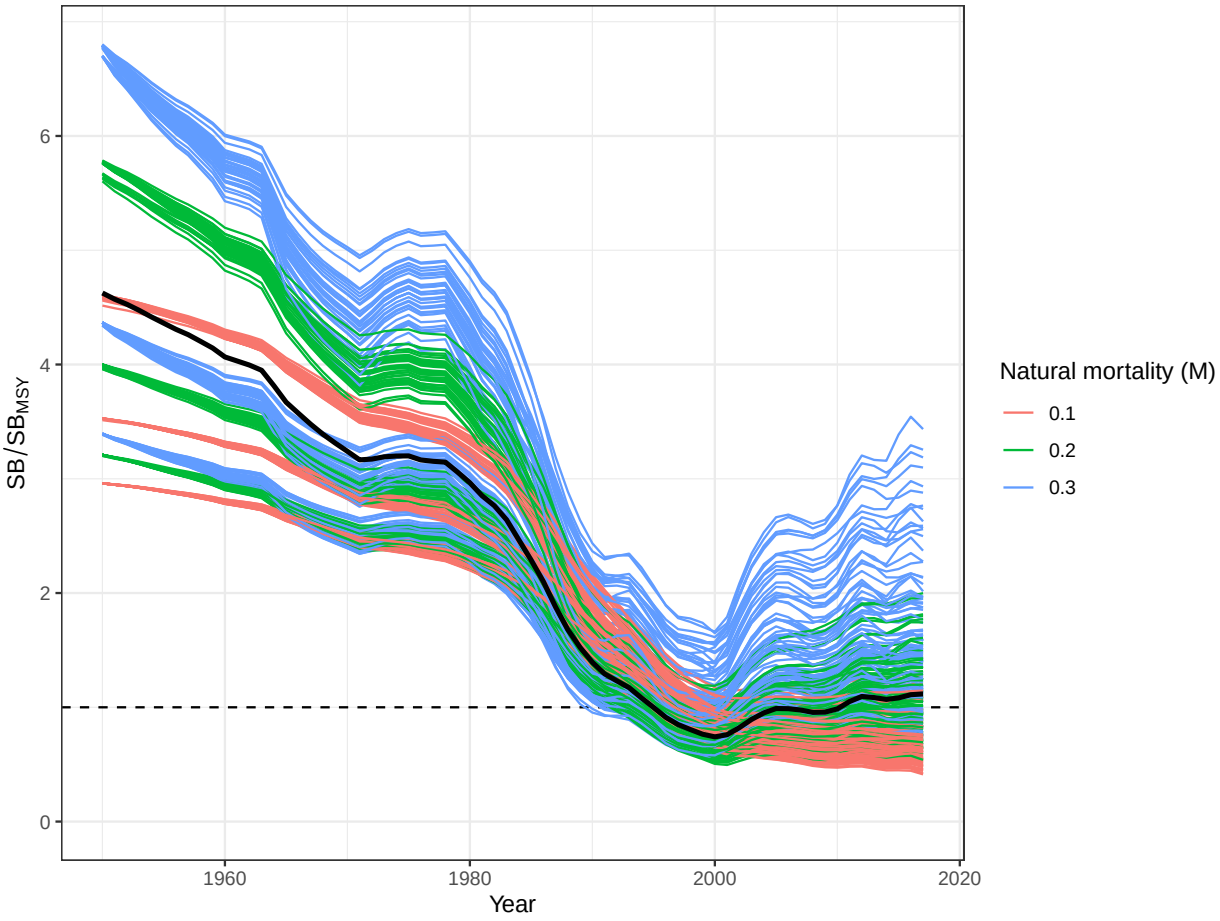

Figure 1. Predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 3 levels of Natural mortality (M) shown as coloured lines. The base case OM is shown as the thick black line.

Recruitment Variability

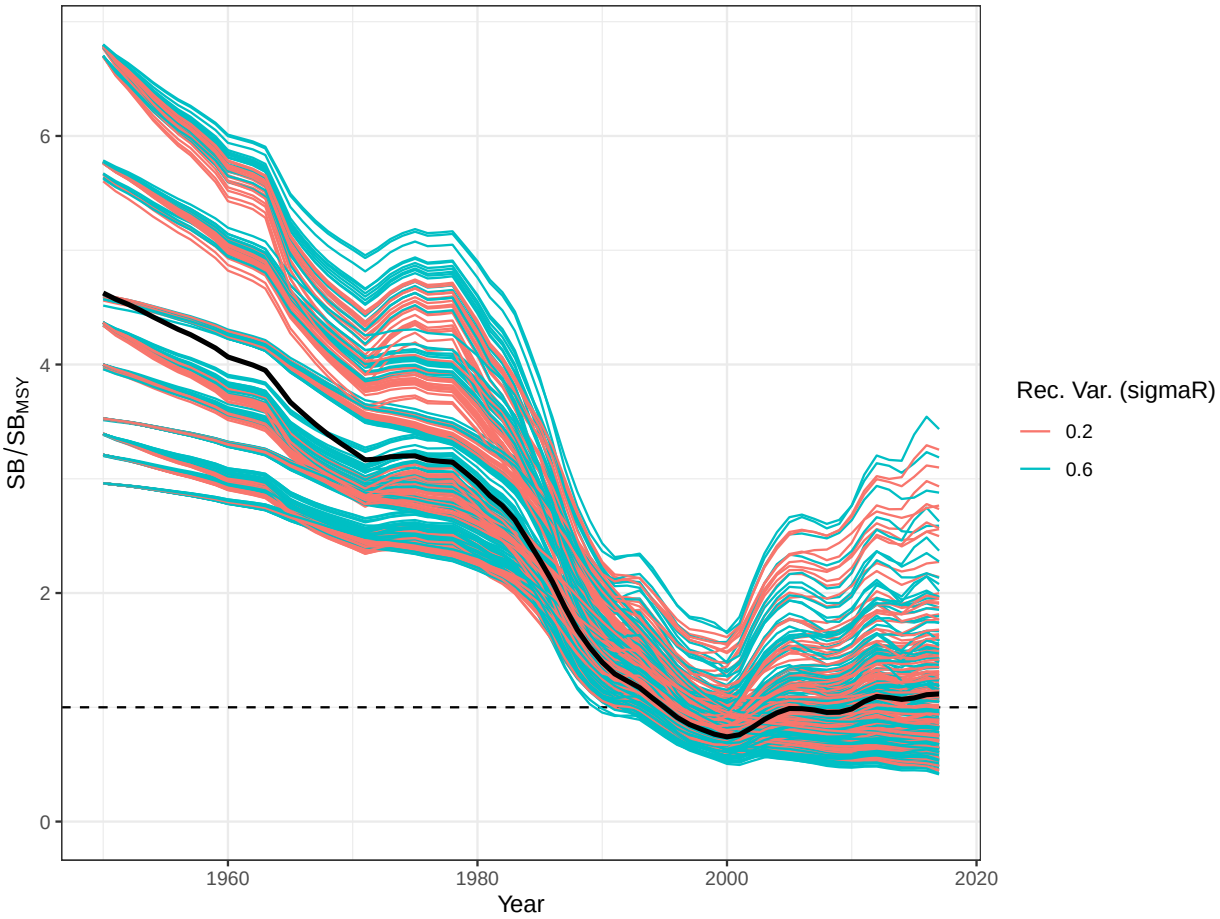

Figure 2. Predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of Rec. Var. (sigmaR) shown as coloured lines. The base case OM is shown as the thick black line.

Steepness

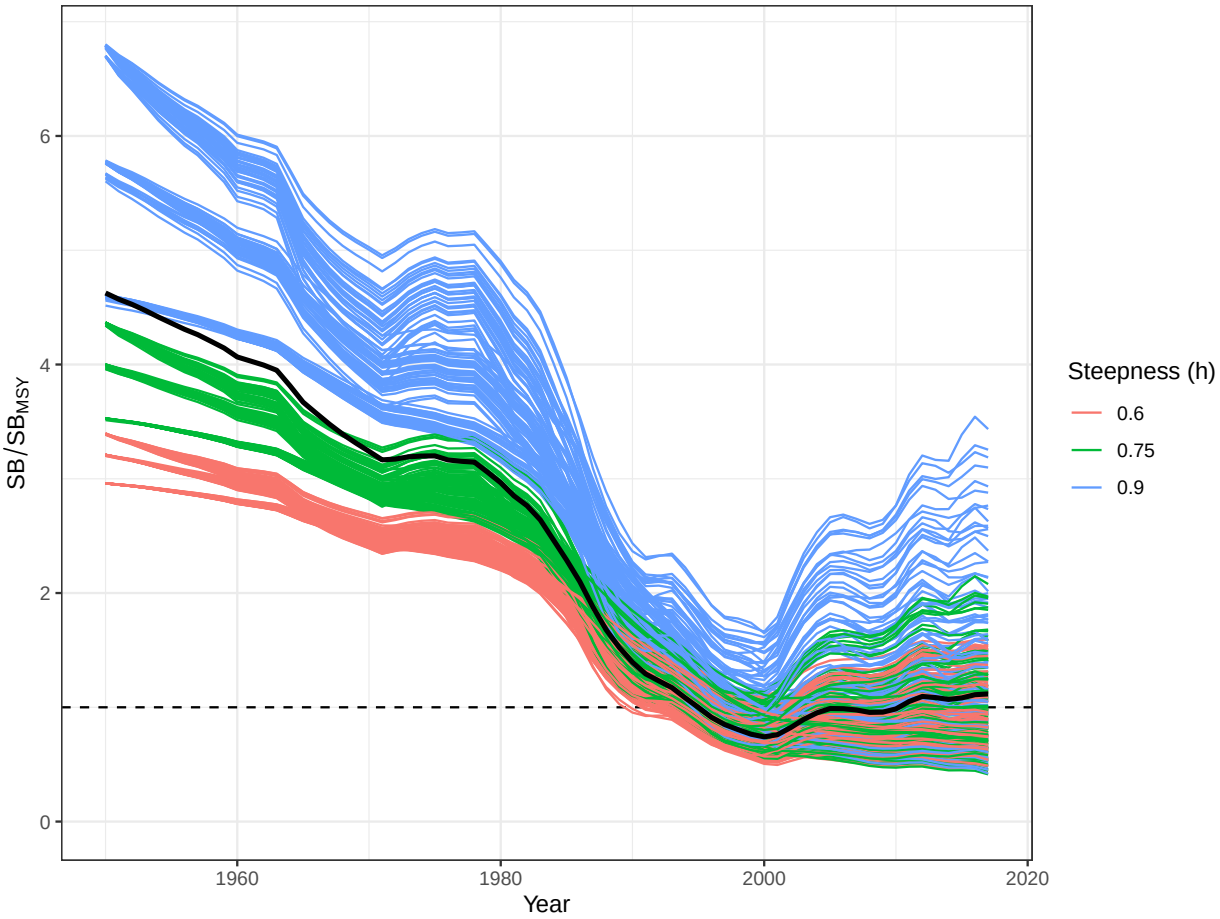

Figure 3. Predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 3 levels of Steepness (h) shown as coloured lines.

CPUE CV

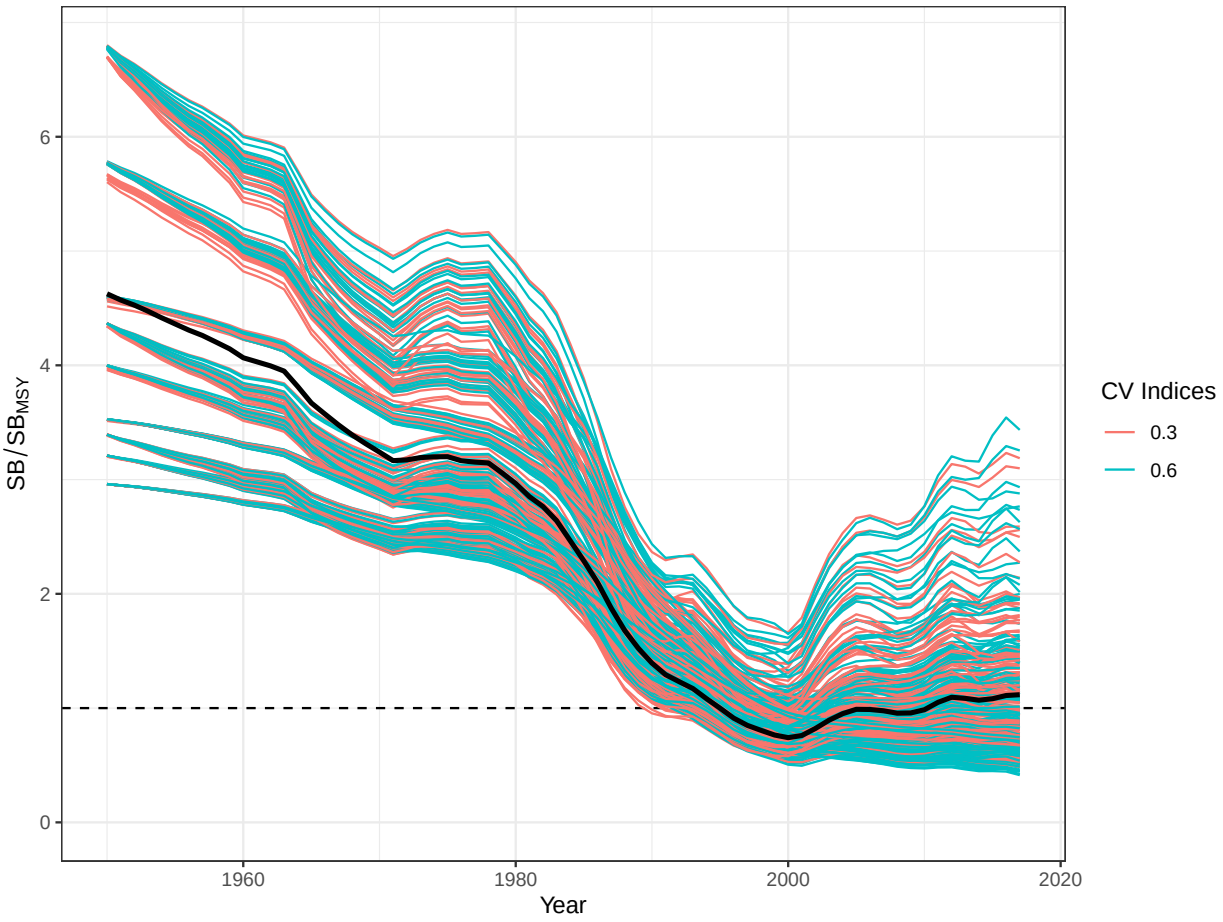

Figure 4. Predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of CV Indices shown as coloured lines. The base case OM is shown as the thick black line.

Length Comp. ESS

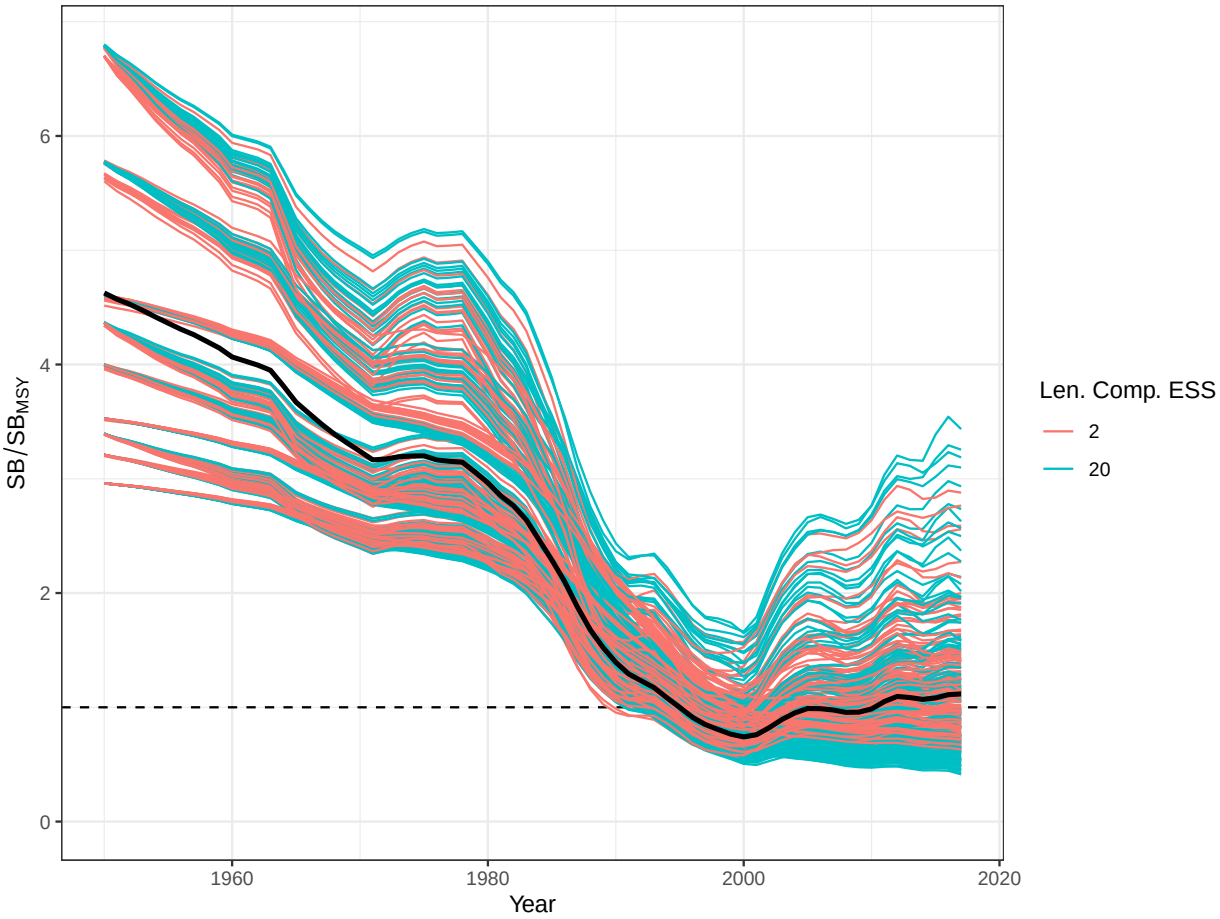

Figure 5. Predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of Len. Comp. ESS shown as coloured lines. The base case OM is shown as the thick black line.

Catchability Increase

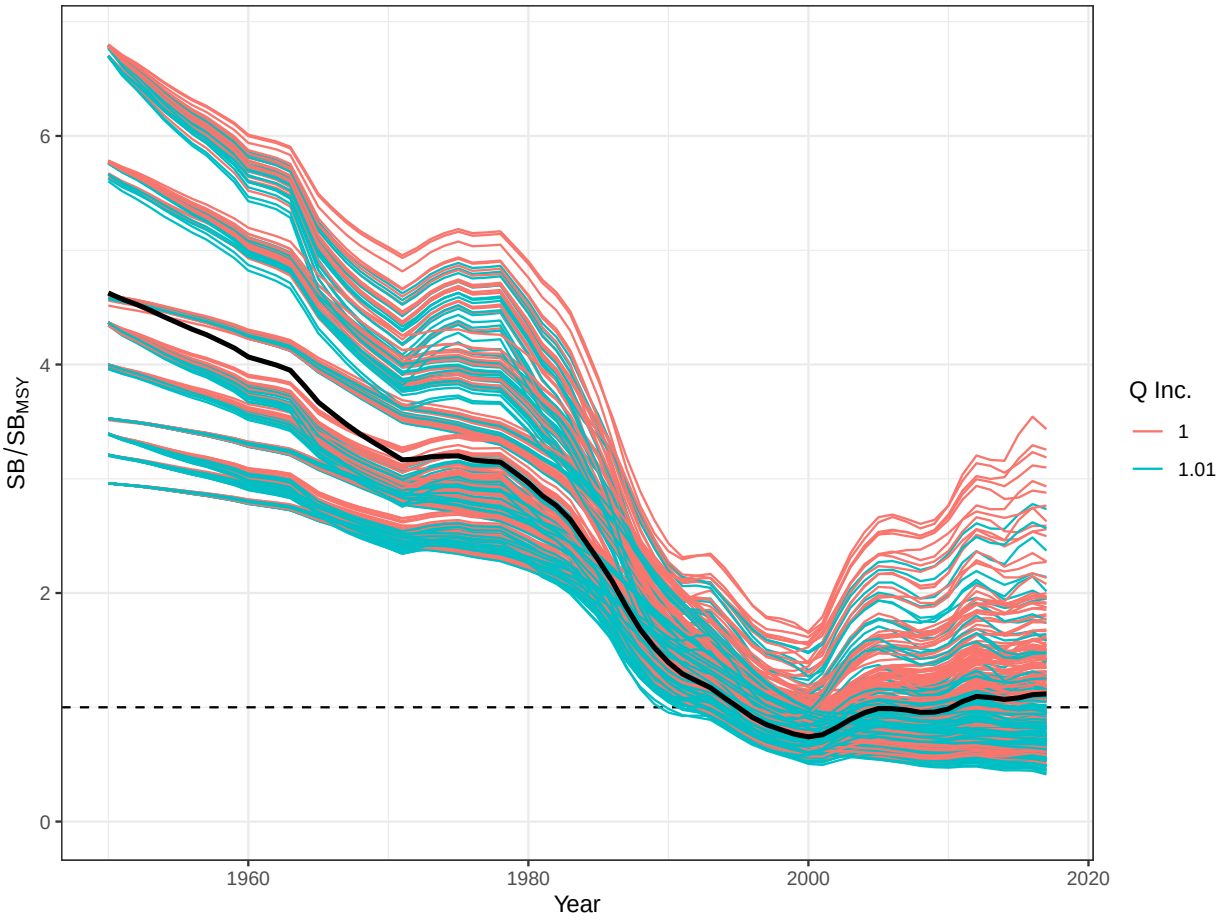

Figure 6. Predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of Q Inc. shown as coloured lines. The base case OM is shown as the thick black line.

Environmental Covariate

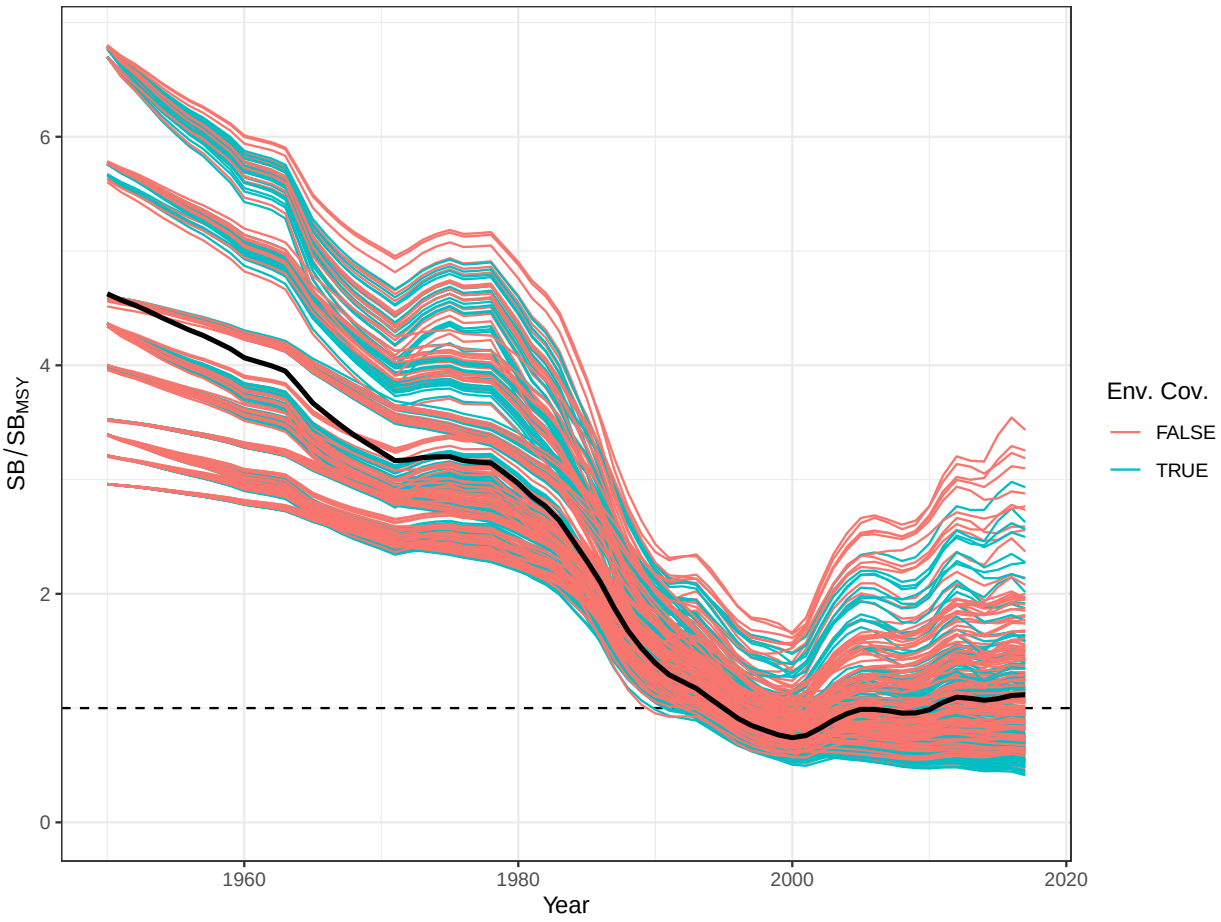

Figure 7. Predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of Env. Cov. shown as coloured lines.

Current SB/SB_{MSY} Boxplots

Bivariate boxplots of the spawning biomass (SB) relative to spawning biomass corresponding with maximum sustainable yield (SB_{MSY}) for the factors examined in the uncertainty grid.

Natural Mortality

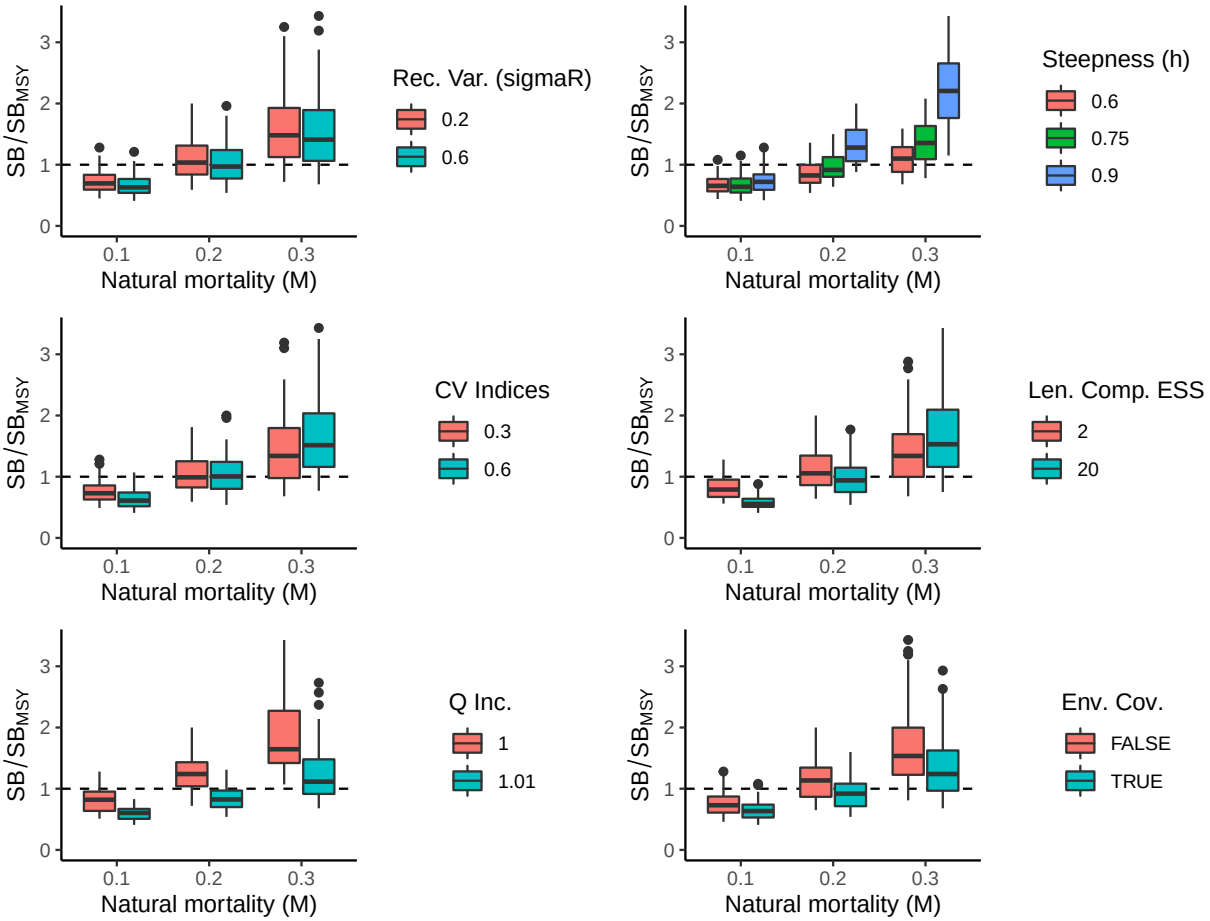

Figure 8. Boxplots of predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 3 levels of Natural Mortality shown as factors on the x-axis and colours indicating the other factors.

Recruitment Variability

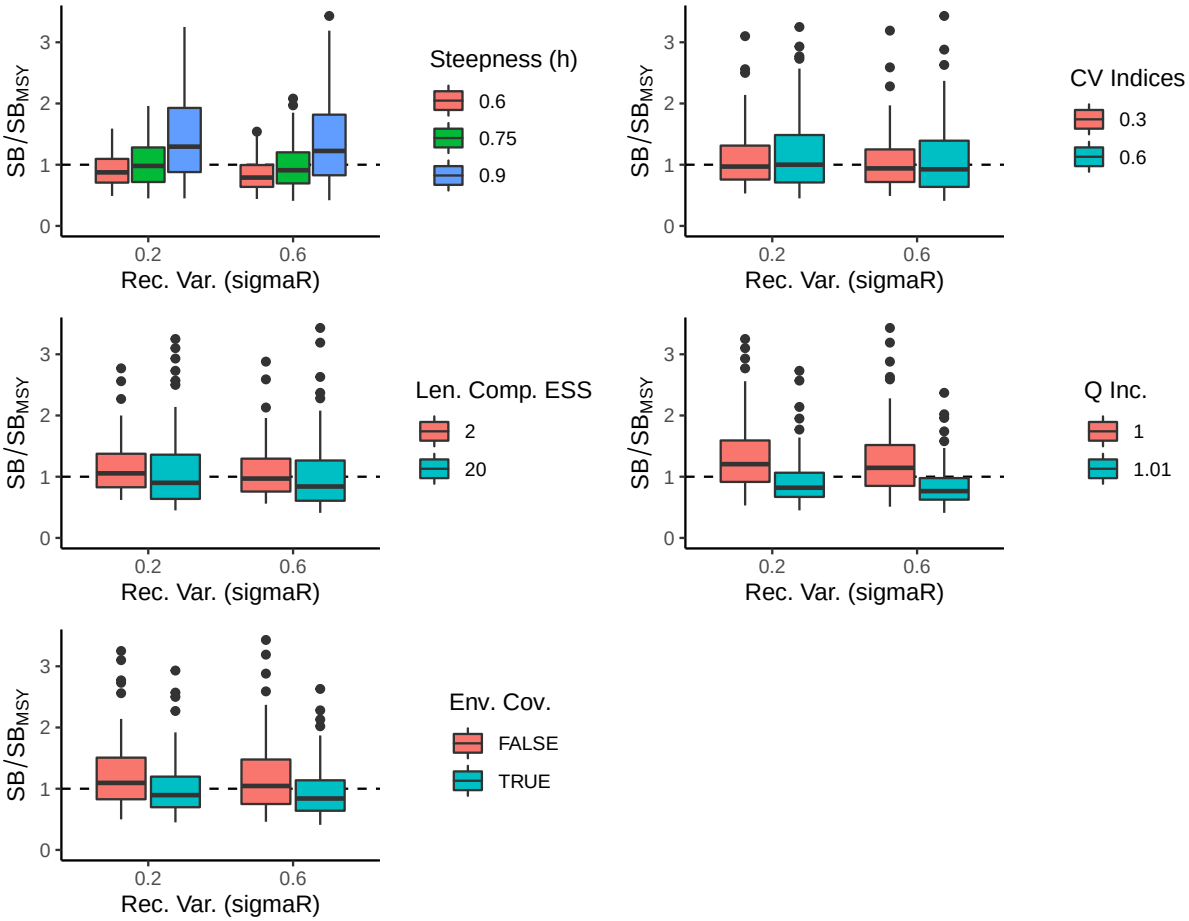

Figure 9. Boxplots of predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of Recruitment Variability shown as factors on the x-axis and colours indicating the other factors.

Steepness

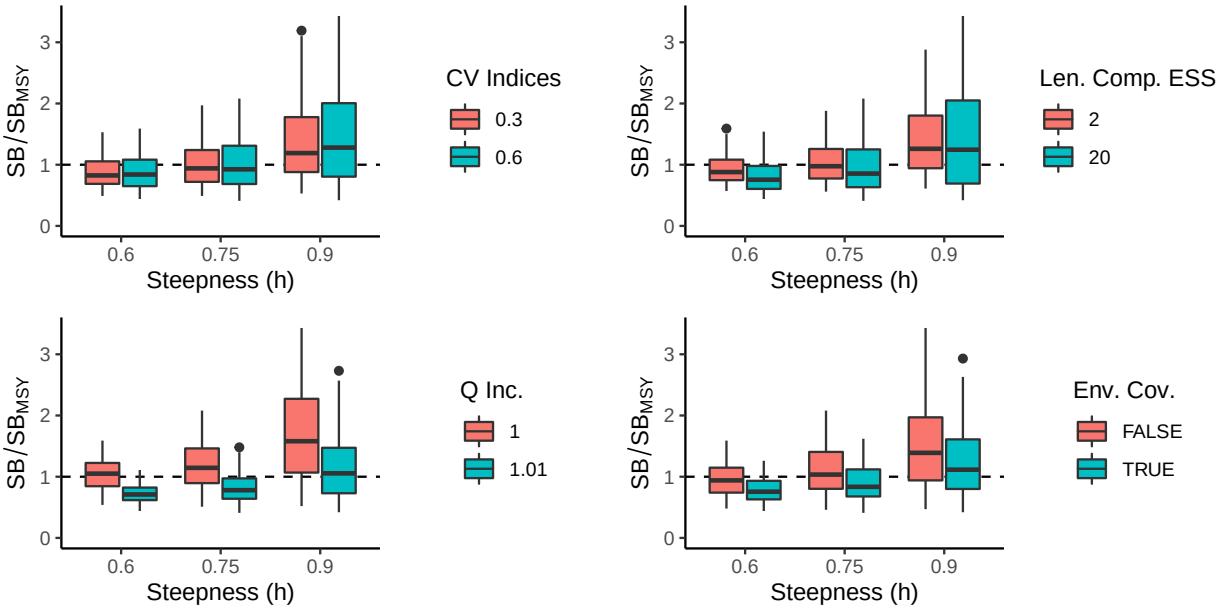

Figure 10. Boxplots of predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 3 levels of Steepness shown as factors on the x-axis and colours indicating the other factors.

CPUE CV

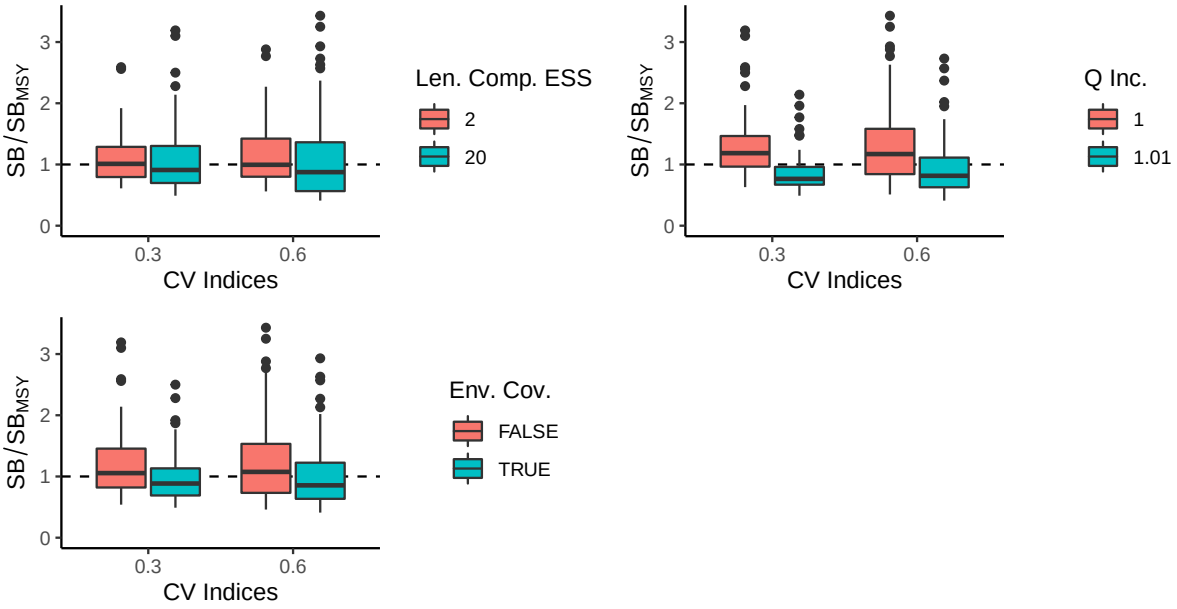

Figure 11. Boxplots of predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of CV Indices shown as factors on the x-axis and colours indicating the other factors.

Length Comp. ESS

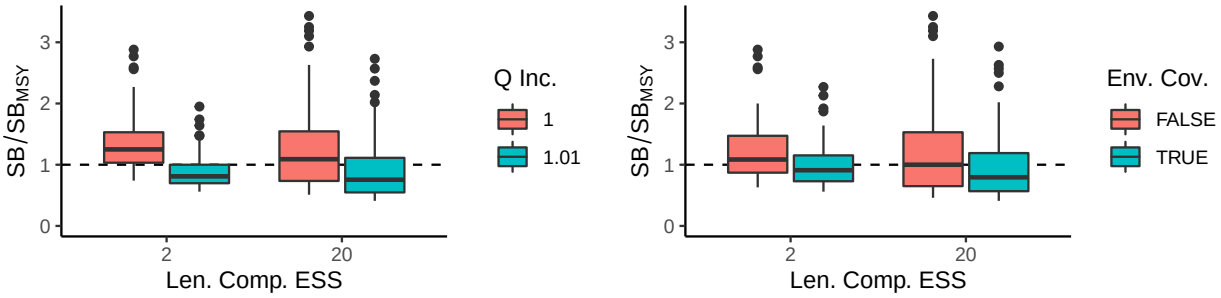

Figure 12. Boxplots of predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of Length Composition Effective Sample Size shown as factors on the x-axis and colours indicating the other factors.

Catchability Increase

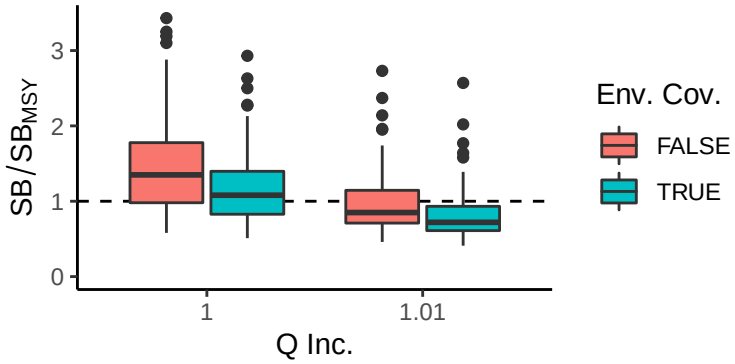

Figure 13. Boxplots of predicted spawning biomass (SB) relative to spawning biomass at maximum sustainable yield (SB_{MSY}) for the 288 converged OMs from the uncertainty grid with the 2 levels of Q Increase shown as factors on the x-axis and colours indicating the other factors.