EBS Pcod Fishery ISS Assesssment Results

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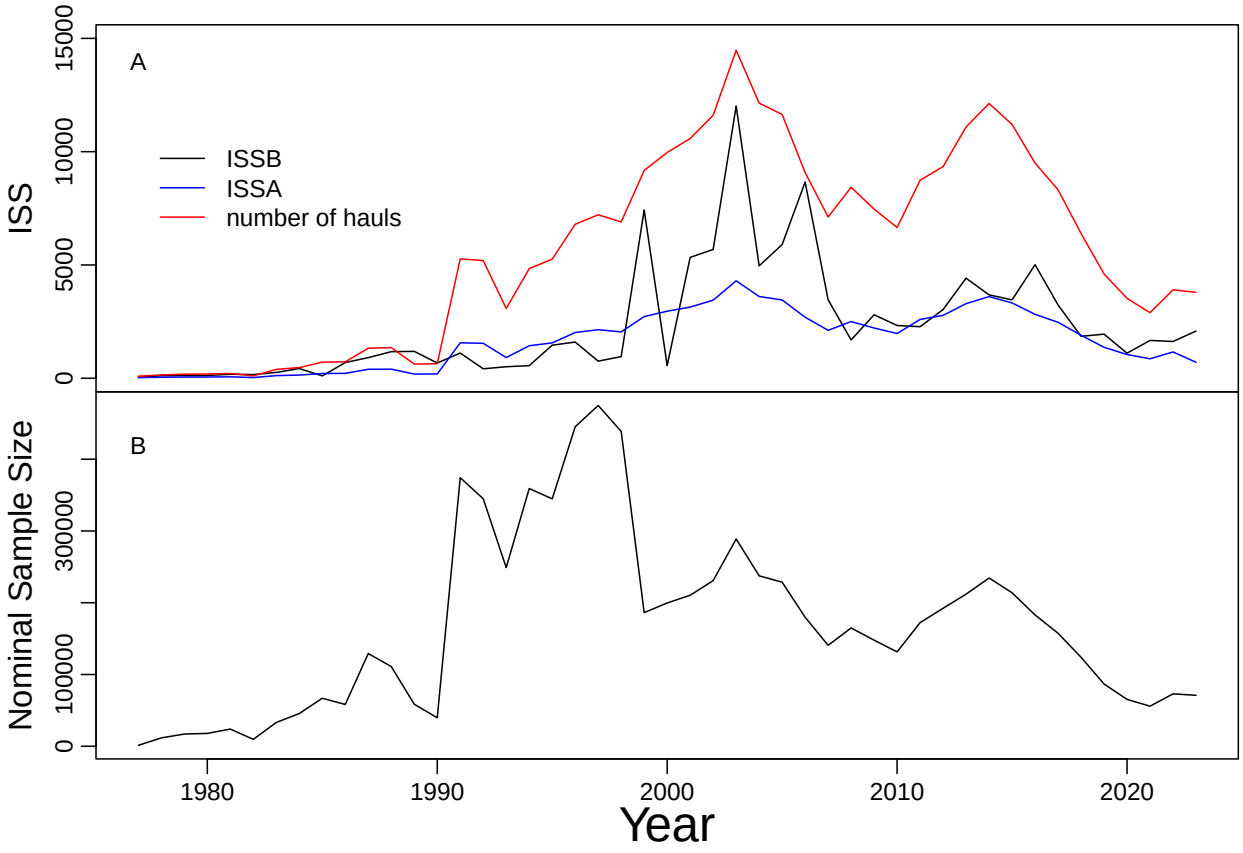
Introduction

This document summarizes the impact of our bootstrap fishery composition ISS results on the 2023 EBS Pacific cod stock assessment.

ISSB Results

ISSB stands for the fishery input sample size by bootstrapping. ISSB is the time series output from our bootstrap analysis. ISSA stands for the fishery input sample size traditionally used in the assessment.



EBS Pcod Assessment Impact

Steve B. ran the published 2023 stock assessment version with ISSB to see if it impacted the assessment outcomes. The below results are from stock assessment runs with Francis tuning, although Steve also produced runs without tuning.

Tables of parameters

These tables include the point estimates and standard deviations (SD) of selected parameters and quantities with the original 2023 assessment configuration using ISSA and the modified using ISSB. Both the untuned and tuned results are shown. The values highlighted in grey are the only values exceeding an absolute percent difference of 10%

	Point Estimate		SD	
	ISSA tuned	ISSB tuned	ISSA tuned	ISSB tuned
L_at_Amin_Fem_GP_1	14.87	14.84	0.3679	0.3717
L_at_Amax_Fem_GP_1	112.39	112.97	3.5082	3.7987
VonBert_K_Fem_GP_1	0.1155	0.1146	0.0132	0.0139
Richards_Fem_GP_1	1.4070	1.4122	0.0738	0.0772
SR_LN(R0)	13.41	13.40	0.0372	0.0380
LnQ_base_Survey(2)	-0.0763	-0.0664	0.0454	0.0471
Size_DblN_peak_Fishery(1)	74.82	74.68	0.9796	1.0681
Size_DblN_ascend_se_Fishery(1)	5.9624	5.9510	0.0439	0.0487
Size_DblN_peak_Survey(2)	22.00	21.87	0.5641	0.5863
Size_DblN_ascend_se_Survey(2)	3.8728	3.8440	0.1368	0.1427
SSB_2023	427,035	427,674	39,397	39,570
SSB_2038	470,184	468,587	20,879	15,571
SPRratio_2023	0.5533	0.5547	0.0257	0.0258
SPRratio_2038	0.5900	0.5939	0.0106	0.0041
Bratio_2023	0.3735	0.3724	0.0316	0.0313
Bratio_2038	0.4113	0.4080	0.0128	0.0079

Tuned

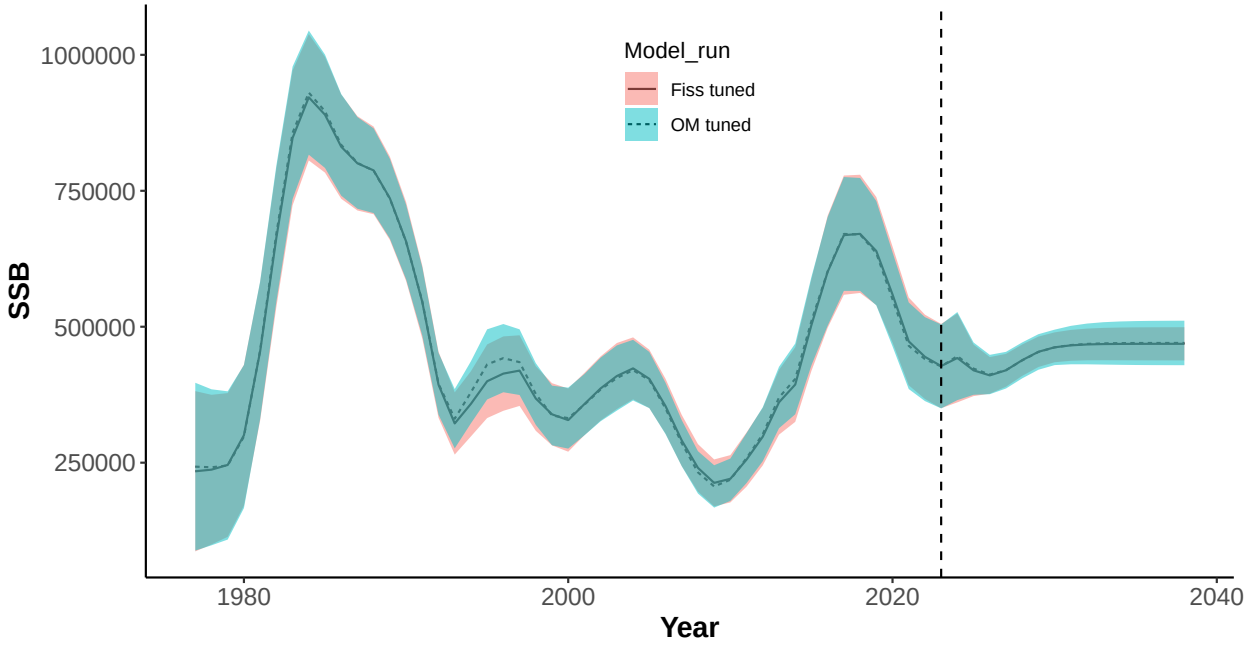
Tuned with added params

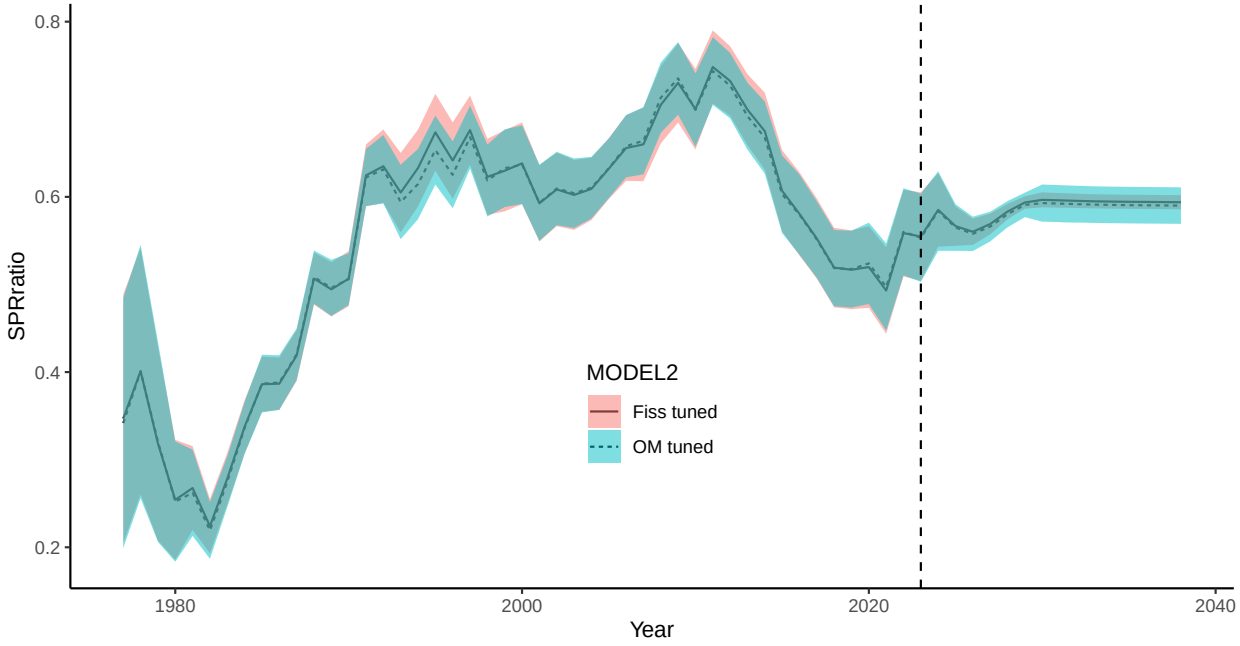
	Point Estimate		SD	
	ISSA tuned	ISSB tuned	ISSA tuned	ISSB tuned
L_at_Amin_Fem_GP_1	14.87	14.84	0.3679	0.3717
L_at_Amax_Fem_GP_1	112.39	112.97	3.5082	3.7987
VonBert_K_Fem_GP_1	0.1155	0.1146	0.0132	0.0139
Richards_Fem_GP_1	1.4070	1.4122	0.0738	0.0772
SR_LN(R0)	13.41	13.40	0.0372	0.0380
LnQ_base_Survey(2)	-0.0763	-0.0664	0.0454	0.0471
Size_DblN_peak_Fishery(1)	74.82	74.68	0.9796	1.0681
Size_DblN_ascend_se_Fishery(1)	5.9624	5.9510	0.0439	0.0487
Size_DblN_peak_Survey(2)	22.00	21.87	0.5641	0.5863
Size_DblN_ascend_se_Survey(2)	3.8728	3.8440	0.1368	0.1427
Size_DblN_peak_Fishery(1)_BLK4repl_1977	77.6051	79.9793	5.8828	0.6505
Size_DblN_ascend_se_Fishery(1)_BLK4repl_1977	6.5259	6.6270	0.2636	0.0774
SSB_2023	427,035	427,674	39,397	39,570
SSB_2038	470,184	468,587	20,879	15,571
SPRratio_2023	0.5533	0.5547	0.0257	0.0258
SPRratio_2038	0.5900	0.5939	0.0106	0.0041
Bratio_2023	0.3735	0.3724	0.0316	0.0313
Bratio_2038	0.4113	0.4080	0.0128	0.0079

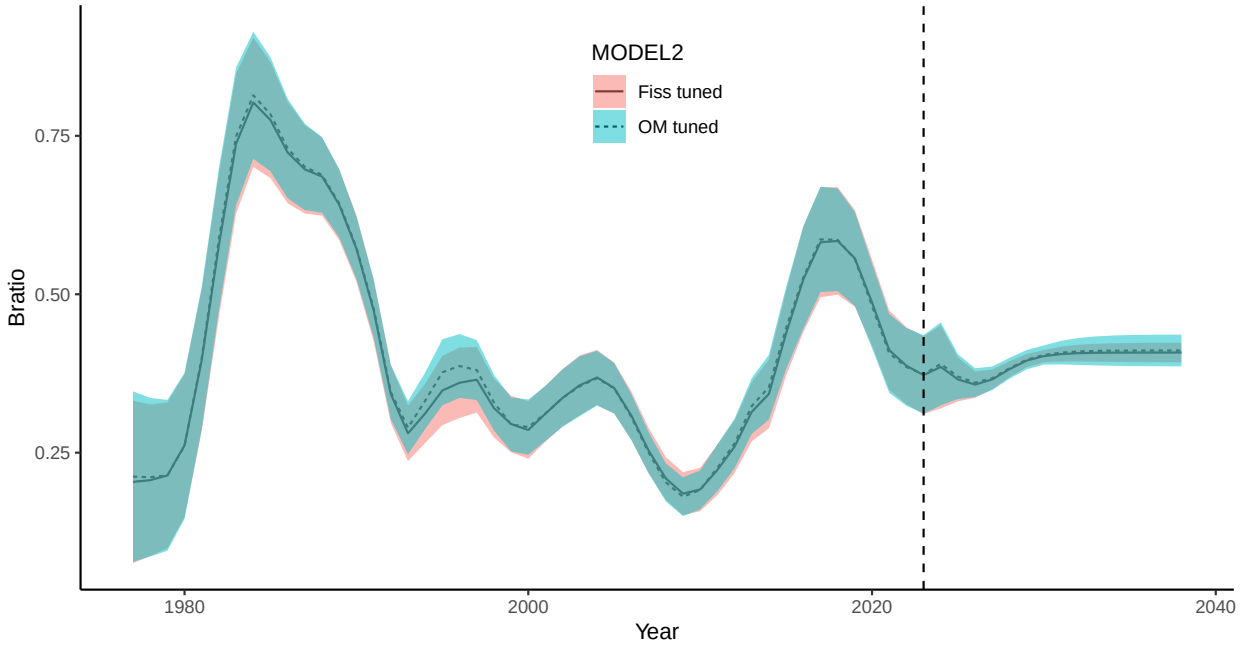
	Point Estimate		SD	
	ISSA untuned	ISSB untuned	ISSA untuned	ISSB untuned
L_at_Amin_Fem_GP_1	14.80	14.73	0.3271	0.3350
L_at_Amax_Fem_GP_1	111.40	112.55	1.2349	1.1889
VonBert_K_Fem_GP_1	0.1162	0.1164	0.0054	0.0051
Richards_Fem_GP_1	1.3879	1.3818	0.0338	0.0324
SR_LN(R0)	13.46	13.42	0.0240	0.0247
LnQ_base_Survey(2)	-0.1736	-0.1308	0.0262	0.0276
Size_DblN_peak_Fishery(1)	74.11	73.88	0.3014	0.2705
Size_DblN_ascend_se_Fishery(1)	5.9386	5.9223	0.0134	0.0123
Size_DblN_peak_Survey(2)	23.07	23.21	0.3255	0.3244
Size_DblN_ascend_se_Survey(2)	4.1712	4.1821	0.0814	0.0823
SSB_2023	513,607	511,125	26,076	24,708
SSB_2038	468,837	462,078	12,681	12,759
SPRratio_2023	0.5060	0.5115	0.0145	0.0138
SPRratio_2038	0.5901	0.5979	0.0033	0.0024
Bratio_2023	0.4485	0.4457	0.0209	0.0198
Bratio_2038	0.4094	0.4029	0.0065	0.0064

Untuned

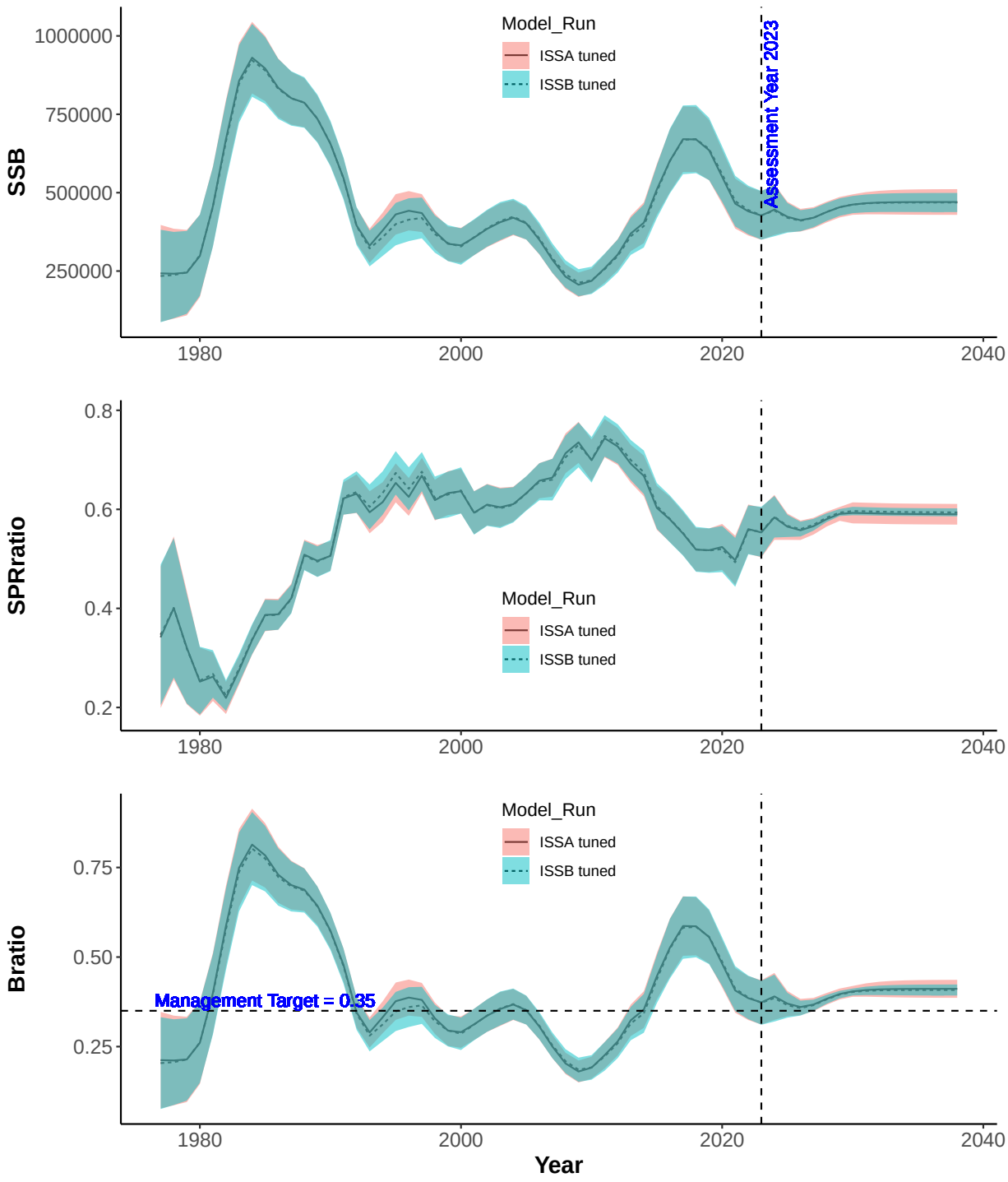
Plots old

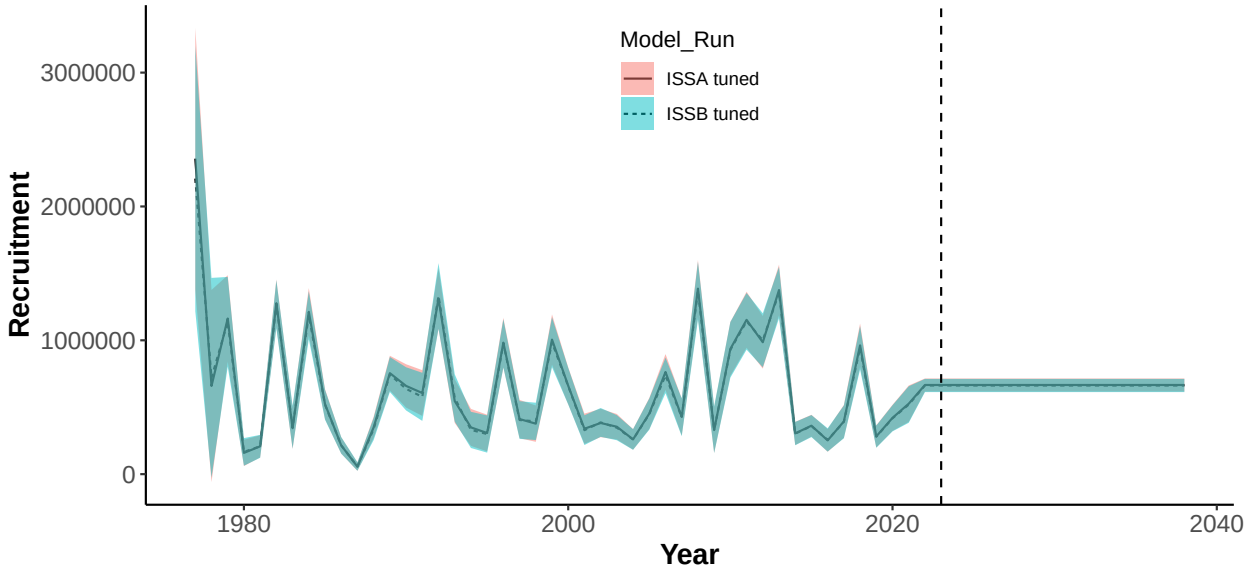

Model_run
Fiss tuned
OM tuned
SSB
1000000
750000
500000
250000
1980
2000
2020
2040
Year

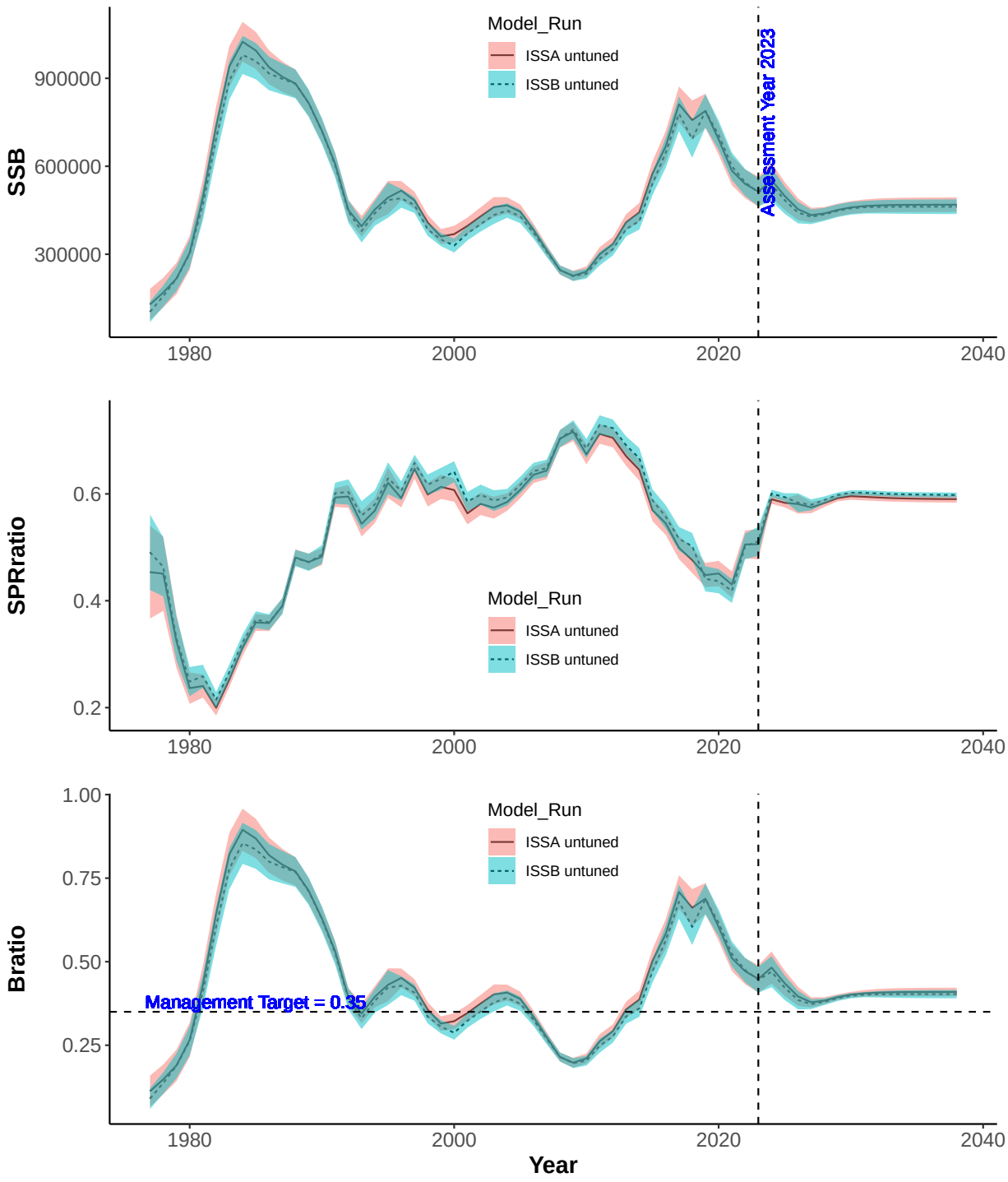

MODEL2
Fiss tuned
OM tuned
SPRratio
0.8
0.6
0.4
0.2
1980
2000
2020
2040
Year


MODEL2
Fiss tuned
OM tuned
Bratio
0.75
0.50
0.25
1980
2000
2020
2040
Year

Plots

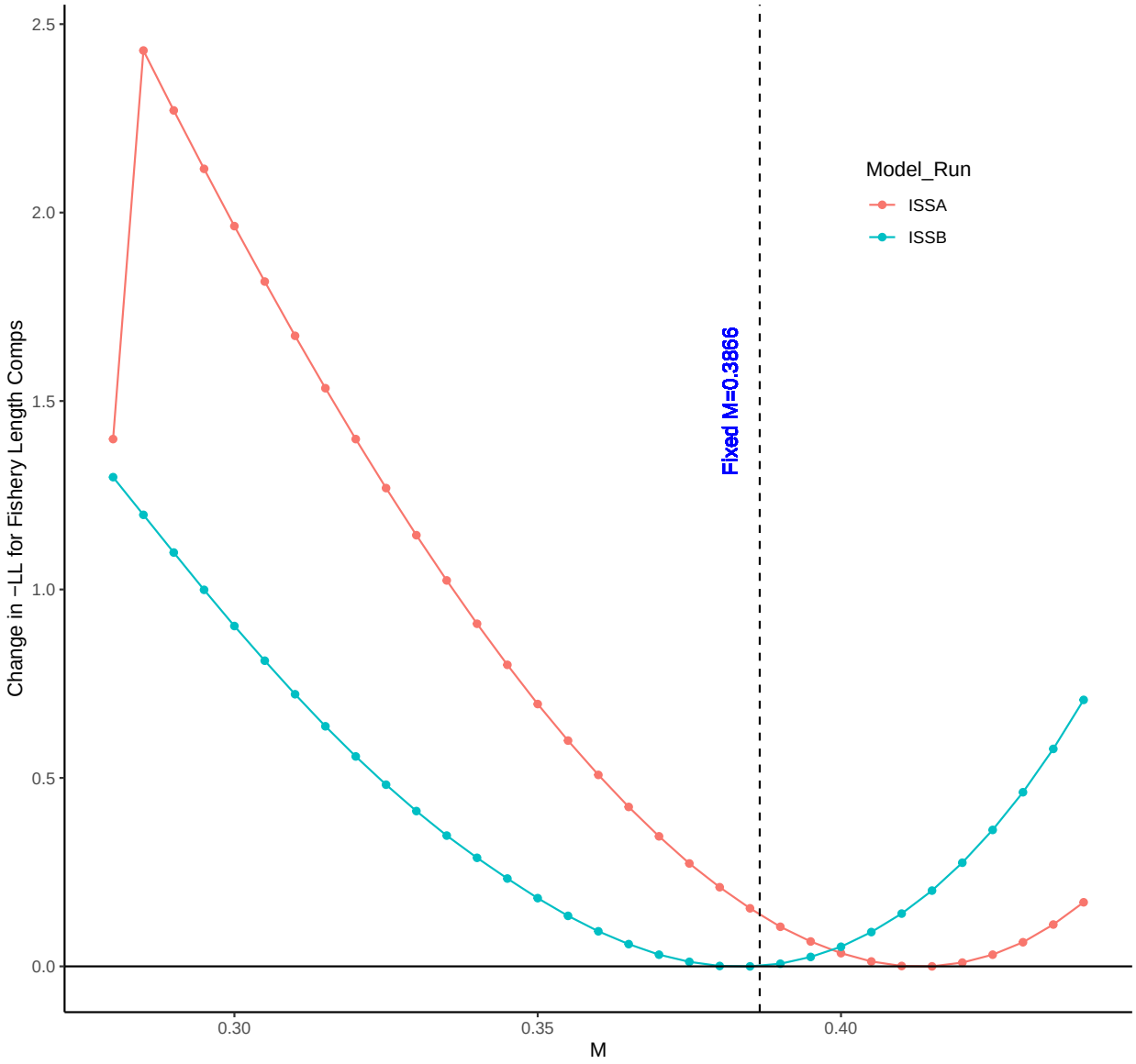

SSB
1000000
750000
500000
250000
Model_Run
ISSA tuned
ISSB tuned
Assessment Year 2023
1980
2000
2020
2040
SPRratio
0.8
0.6
0.4
0.2
Model_Run
ISSA tuned
ISSB tuned
1980
2000
2020
2040
Bratio
0.75
0.50
0.25
Management Target = 0.35
Model_Run
ISSA tuned
ISSB tuned
1980
2000
2020
2040
Year


Model_Run
ISSA tuned
ISSB tuned
Recruitment
3000000
2000000
1000000
0
1980
2000
2020
2040
Year

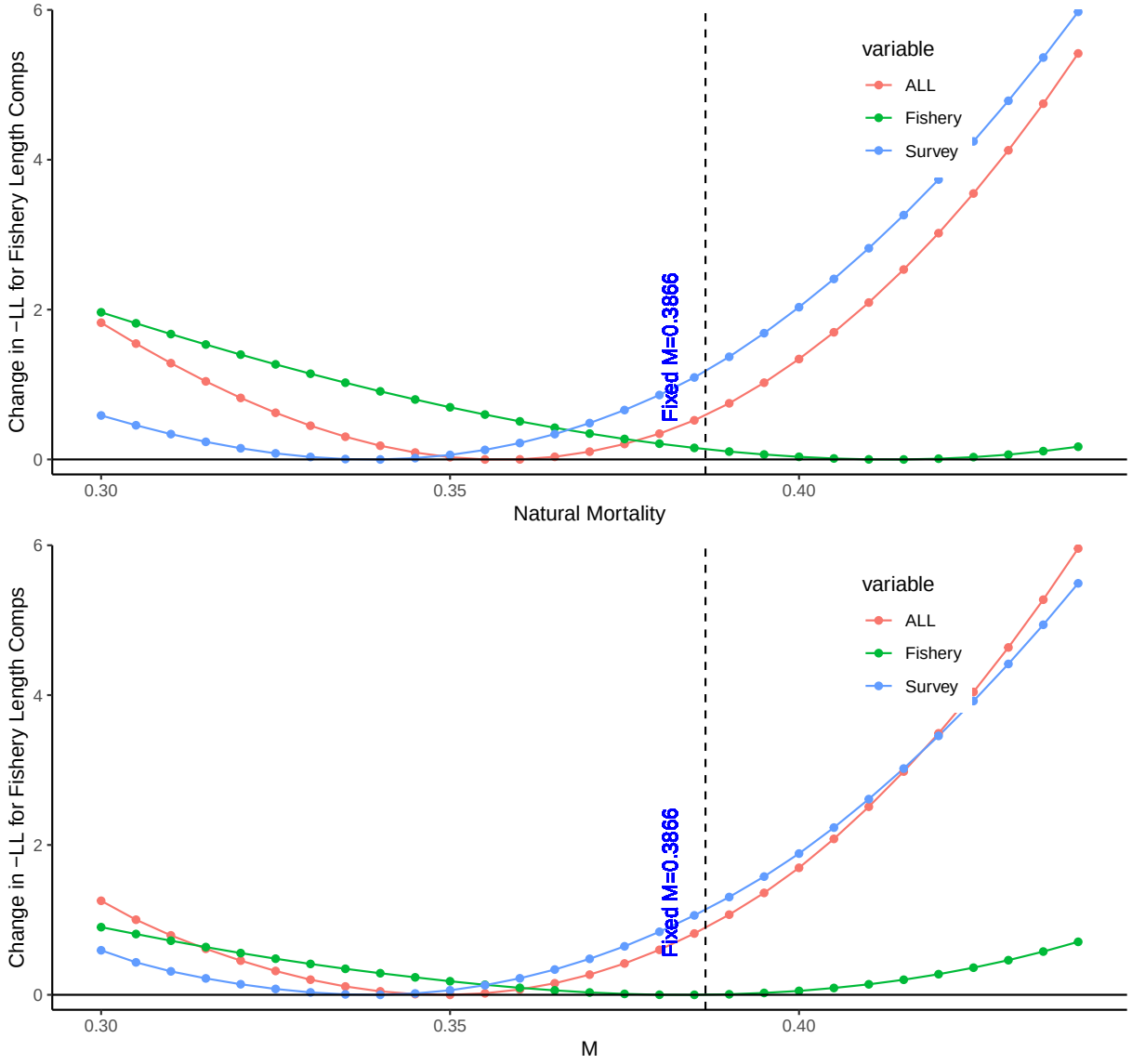

SSB
900000
600000
300000
Model_Run
ISSA untuned
ISSB untuned
Assessment Year 2023
1980
2000
2020
2040
SPRratio
0.6
0.4
0.2
Model_Run
ISSA untuned
ISSB untuned
1980
2000
2020
2040
Bratio
1.00
0.75
0.50
0.25
Management Target = 0.35
Model_Run
ISSA untuned
ISSB untuned
1980
2000
2020
2040
Year

M

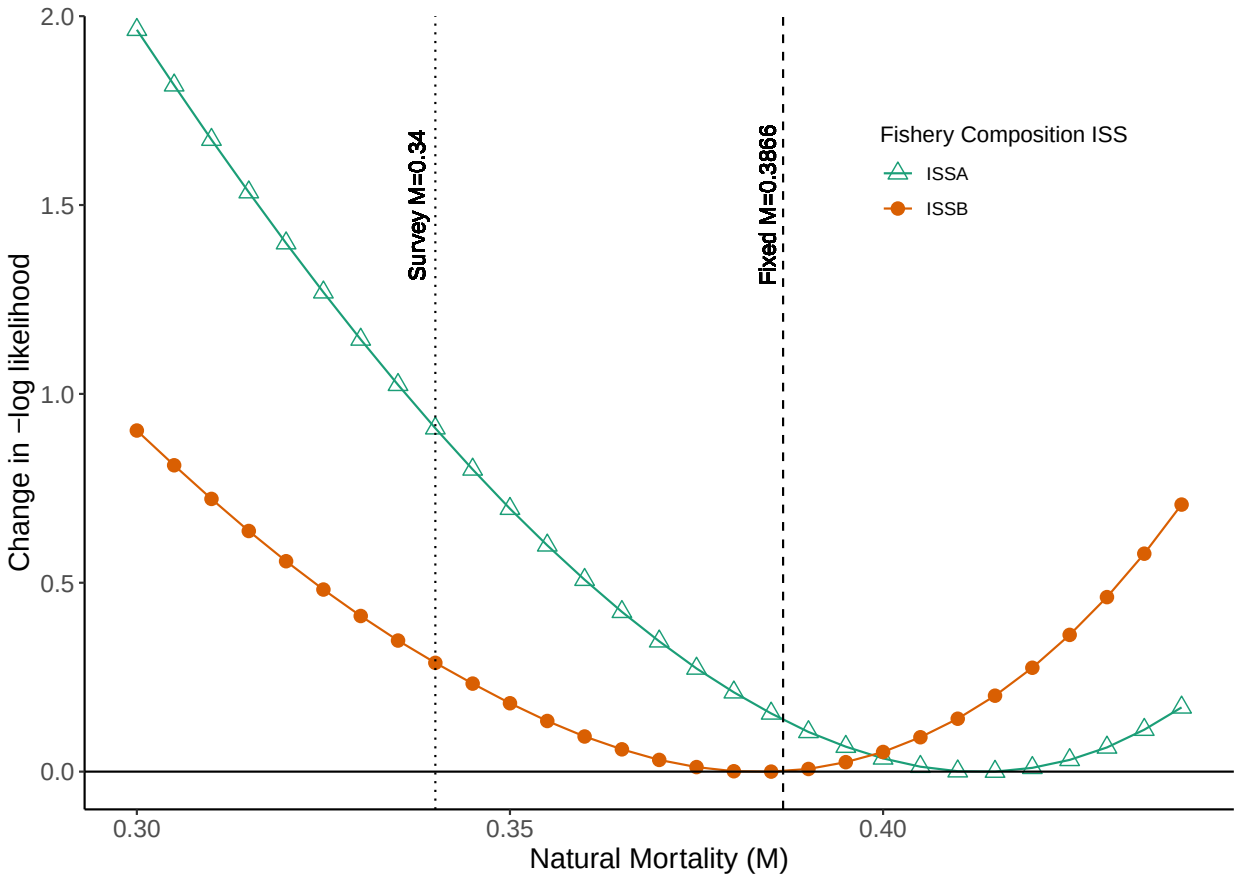
ISSA to ISSB single plot



ISSA to ISSB 2



#M ISSA to ISSB 3 for paper

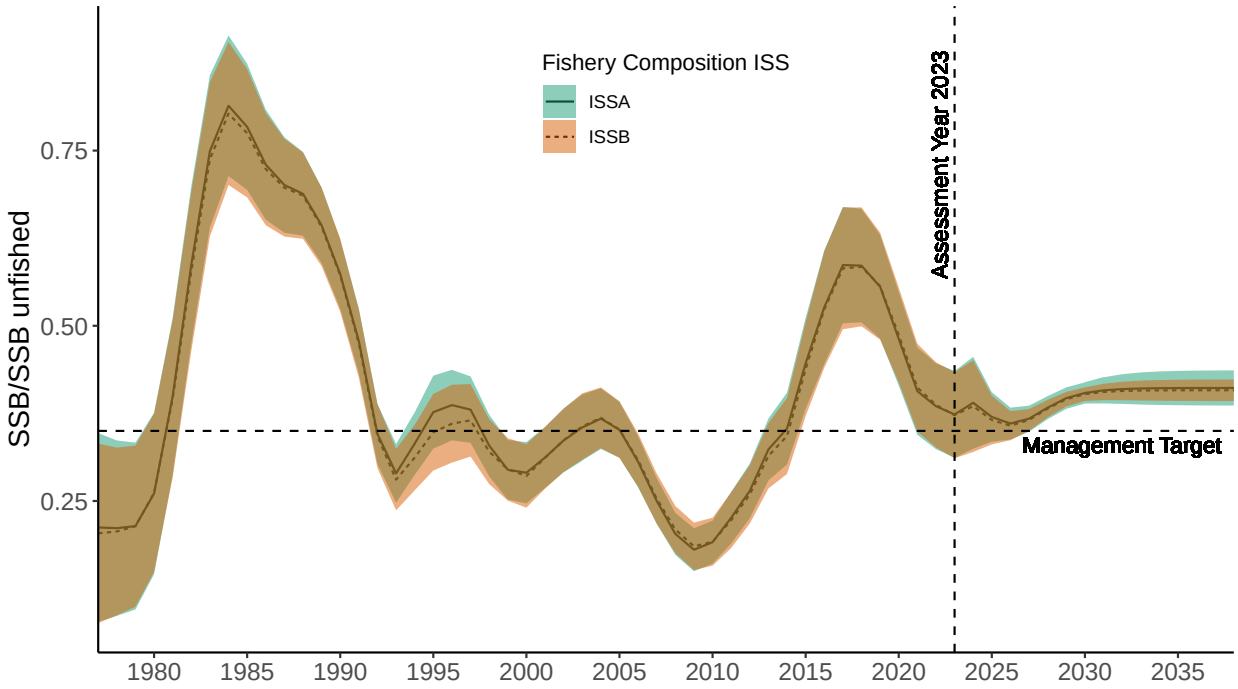


notes: survey ISS at 0.34 for BOTH ISSA and ISSB. Fixed M is the fixed value for natural mortality specified in the assessment model. This is after tuning. ISSA min at 0.415, ISSB min at 0.385

caption: "Likelihood profiles of the fishery composition data over natural mortality using ISSA or ISSB in the cod assessment. The cod assessment has a fixed value of 0.3866 for natural mortality, and the likelihood profiles of the survey composition data are minimized at 0.34."

say in paper: Using ISSB in the assessment suggests a lower value of natural mortality (M) compared to using ISSA. The value of M at the minimum negative log likelihood for the fishery composition data using ISSB was 0.385, whereas for ISSA it was 0.415. The value of M suggested by ISSB is very close to the fixed value of 0.3866 specified in the cod assessment, and closer to the value suggested by the survey length composition data (0.34 when either ISSA or ISSB is used in the assessment). Therefore, using ISSB in the assessment results in less of a data conflict between the fishery and survey length composition information used in the cod assessment.

Bratio for paper

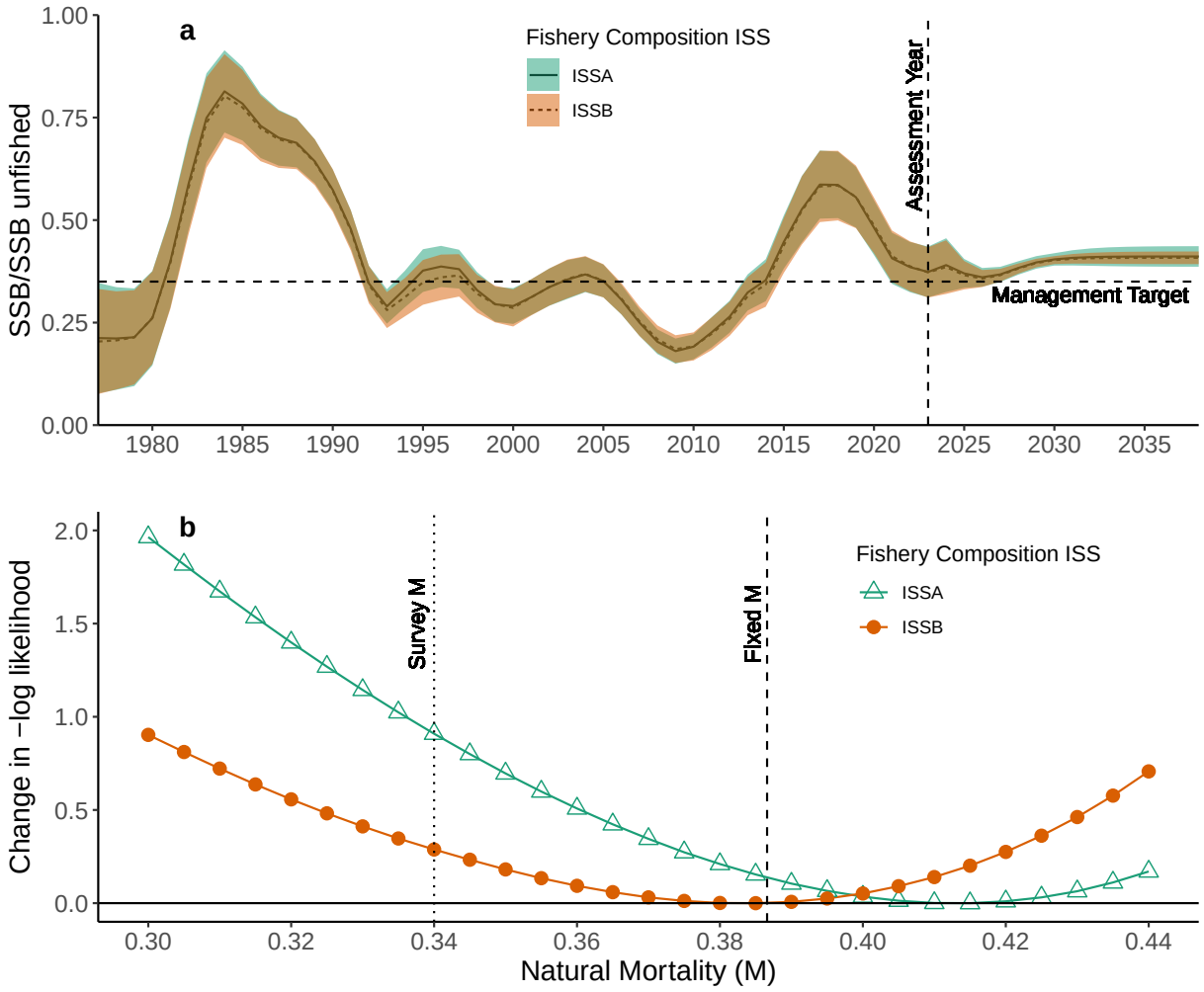


caption: "Point estimates and standard deviations of estimated spawning stock biomass (SSB) relative to unfished SSB using ISSA or ISSB in the cod assessment. Values past the assessment year of 2023 are projected estimates. Horizontal dashed line is the management target of 0.35.

notes: After tuning. the point estimates are similar. the uncertainty is comparable prior to the assessment year for most years but is lower for using ISSB compared to ISSA.

say in paper: The point estimates of the biomass ratio were similar for most years when using either ISSA or ISSB in the cod assessment. However, using ISSB resulted in lower uncertainty for projected estimates (sd = 0.0079 at year 2038) compared to ISSA (sd = 0.0128 at year 2038).

Plots Together a,b



CONISDER FULL PARAMETER TABLE IN SUPPLEMENTARY MATERIAL.