Northwest Atlantic Mackerel Supplementary Material

Table S1: Supplemental northwest Atlantic mackerel short-term projections following the methodology established by the Atlantic Mackerel Rebuilding 2.0 Amendment (MAFMC 2023) but assuming that the terminal year (2022) recruitment (thousands of fish) is equal to the median from 2009 onward (87,637) instead of the estimated value from the final ASAP model (252,424). When recent median recruitment was assumed for 2022, the fishing mortality that would result in a 61% probability of rebuilding the stock within ten years (by 2032) was reduced from 0.11 to 0.07.

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
SSB (mt)	Median	26,387	42,756	61,060	75,584	88,050	101,857	117,098	135,003	153,837	172,040
	5th Percentile	10,821	22,431	37,090	47,373	55,744	63,318	68,892	74,678	81,646	89,088
	40th Percentile	22,996	38,411	56,223	70,131	81,479	93,597	106,768	122,550	139,117	154,936
	75th Percentile	37,261	56,558	75,494	92,383	108,882	128,641	152,880	181,638	212,674	242,811
	95th Percentile	59,757	84,617	104,209	125,499	158,019	211,962	276,748	328,115	371,119	404,848
F	Median	0.23	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	5th Percentile	0.11	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	40th Percentile	0.21	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	75th Percentile	0.32	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	95th Percentile	0.51	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Catch (mt)	Median	5,953	2,726	3,900	4,866	5,741	6,760	7,806	8,976	10,200	11,386
	5th Percentile	5,953	1,449	2,393	3,085	3,644	4,214	4,593	4,994	5,482	5,990
	40th Percentile	5,953	2,451	3,604	4,524	5,305	6,197	7,121	8,172	9,256	10,288
	75th Percentile	5,953	3,584	4,813	5,957	7,177	8,533	10,090	11,897	13,834	15,771
	95th Percentile	5,953	5,339	6,727	8,307	10,357	13,355	17,401	20,753	23,681	26,006
Recruitme	Median	87,960	89,950	96,010	110,530	131,550	132,944	142,996	152,344	157,962	160,919
	5th Percentile	28,315	28,487	28,817	29,604	30,440	31,084	31,886	32,267	32,272	32,715
	40th Percentile	71,476	74,408	82,900	90,947	104,674	110,428	113,155	117,554	122,267	125,409
	75th Percentile	133,014	137,705	172,716	192,699	198,608	201,978	213,598	221,457	226,275	226,842
	95th Percentile	276,867	285,609	310,324	455,175	680,126	822,694	890,368	912,362	934,869	940,450

Figure S1: Likelihood profile of natural mortality for the final ASAP model. A constant natural mortality of 0.2 (blue circle) was used in the final ASAP model and the minimum value from the profile corresponded to a natural mortality of 0.19 (orange circle).
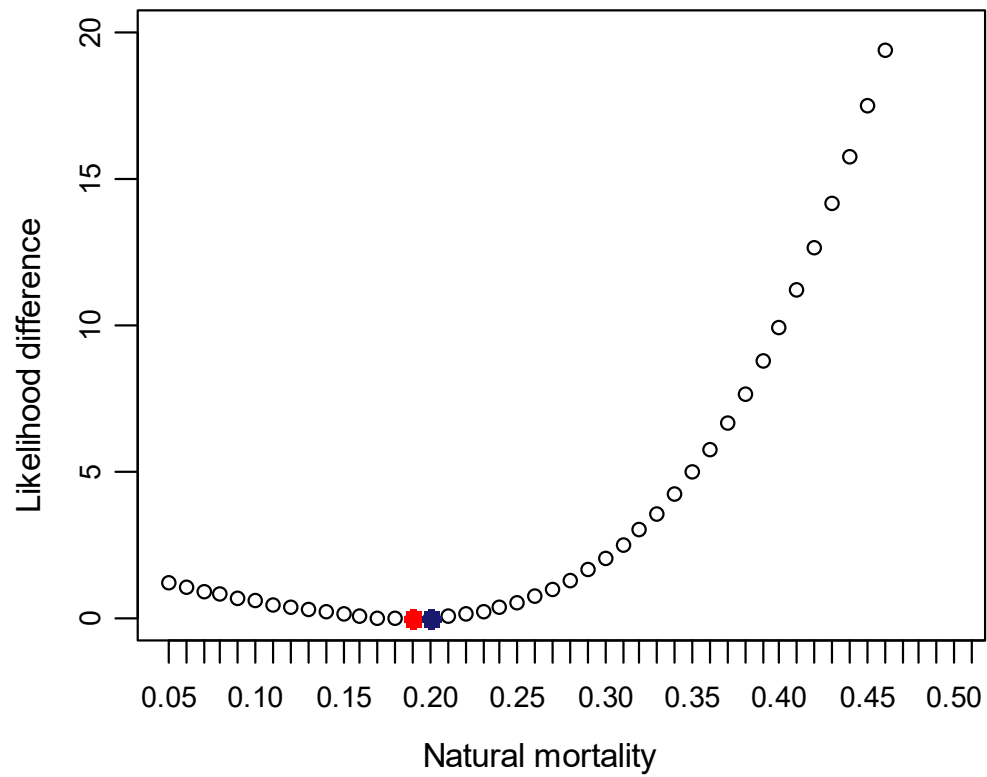
Figure S2: Retrospective analysis for estimated fishing mortality, spawning stock biomass and recruitment from the final ASAP model. Following the methodology of the 2017 benchmark assessment, Mohn's rho (ρ) values were based on five-year retrospective peels.
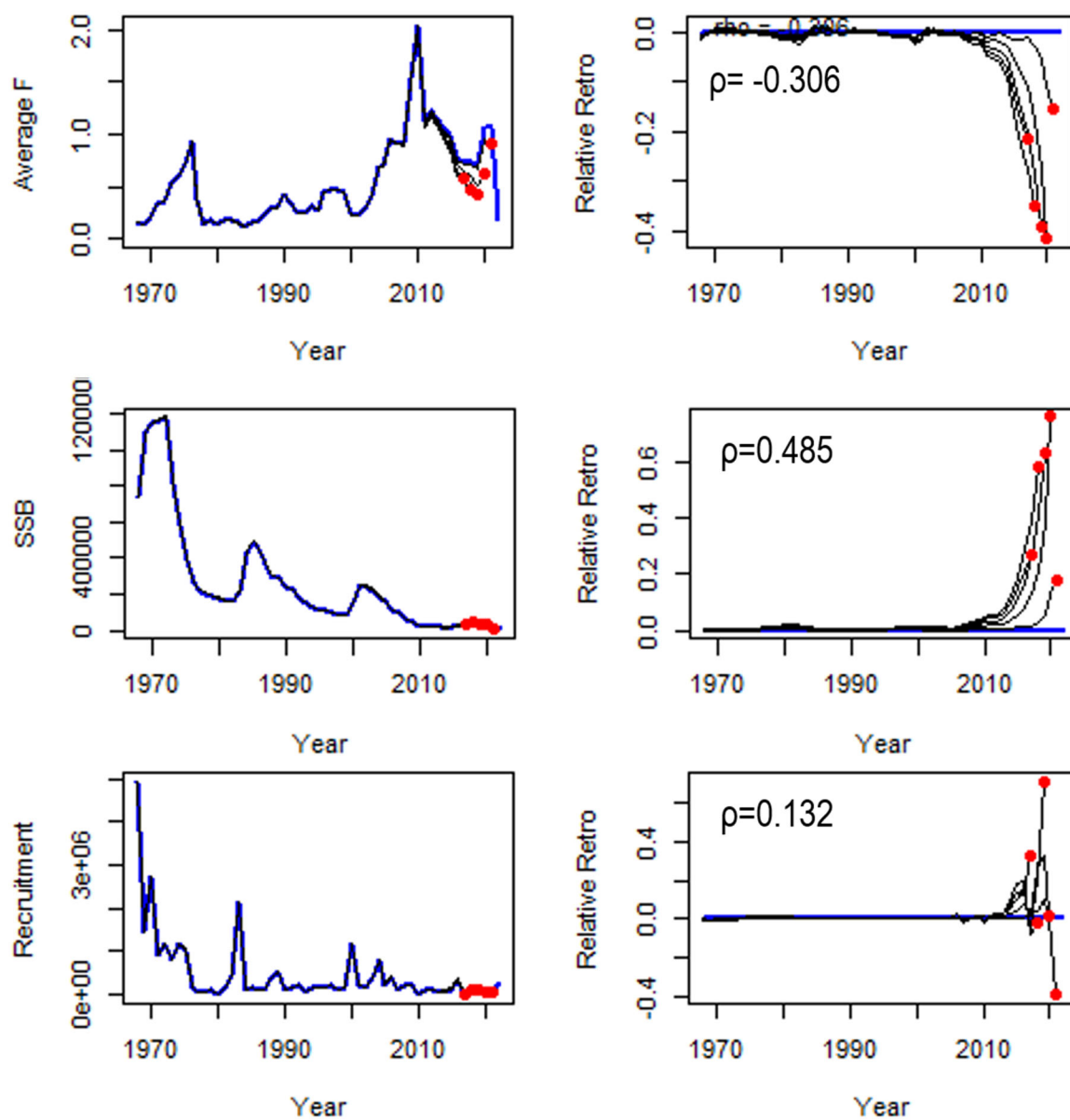
Figure S3: Comparison of the original terminal year fishing mortality and spawning stock biomass estimates with associated 90% confidence intervals (solid lines) and the rho-adjust estimates (dashed lines) from the final ASAP model.
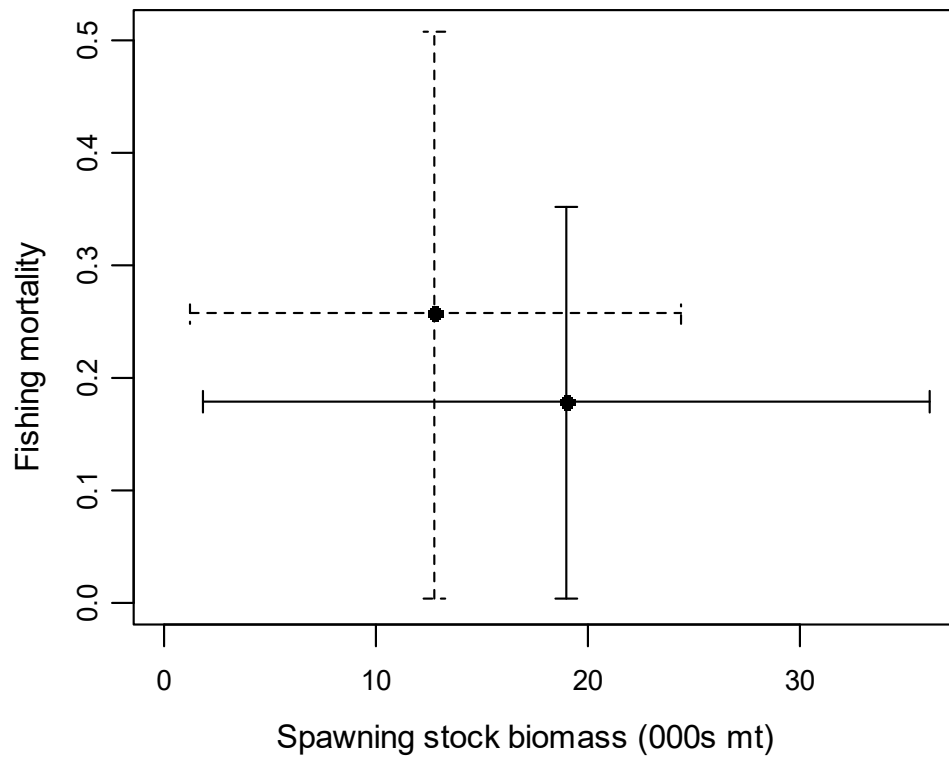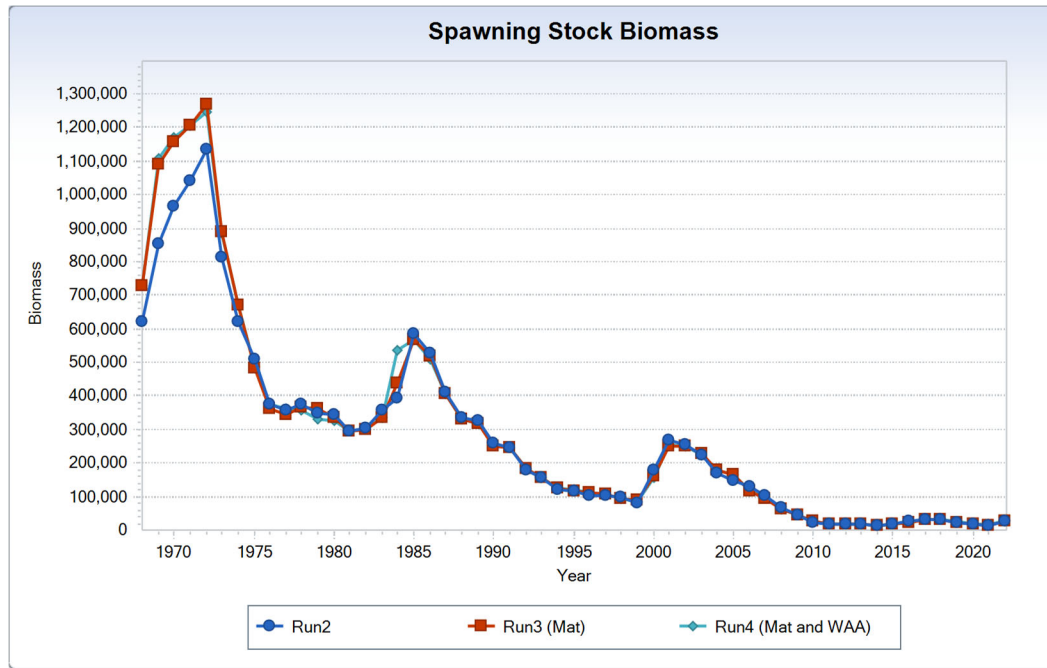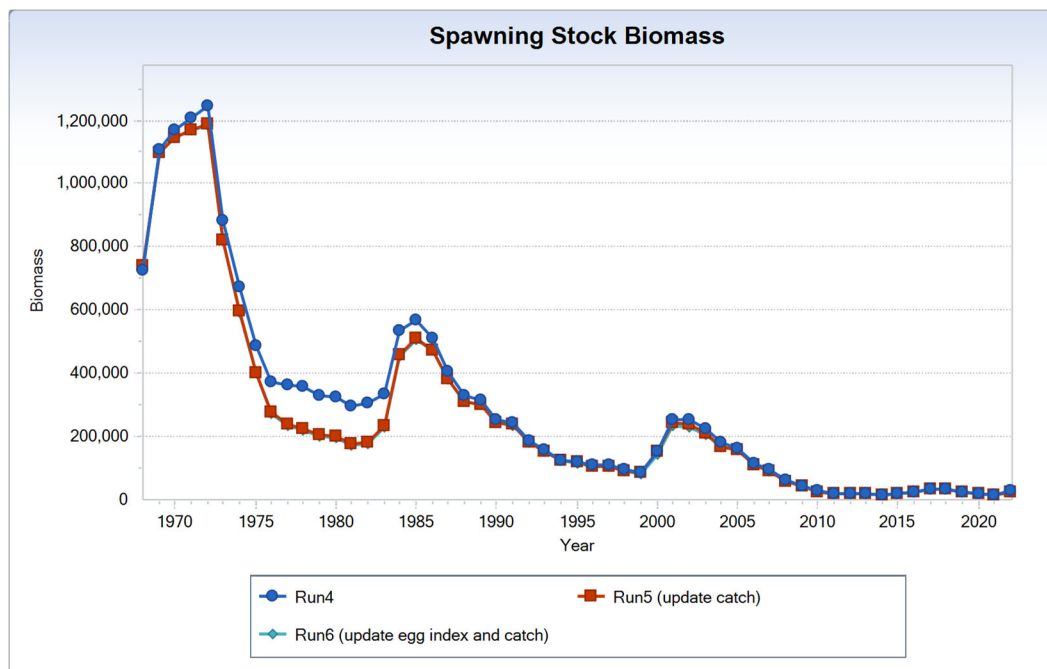
Figure S4: Comparison of spawning stock biomass estimates from bridge runs updating the Canadian maturity (Mat) and weight-at-age (WAA) time series (Figure A), the Canadian fishery catch and egg index time series (Figure B), the U.S. spring bottom trawl survey time series from the Bigelow years, and increasing the annual CVs corresponding to the egg index by 0.3 (Figure C).
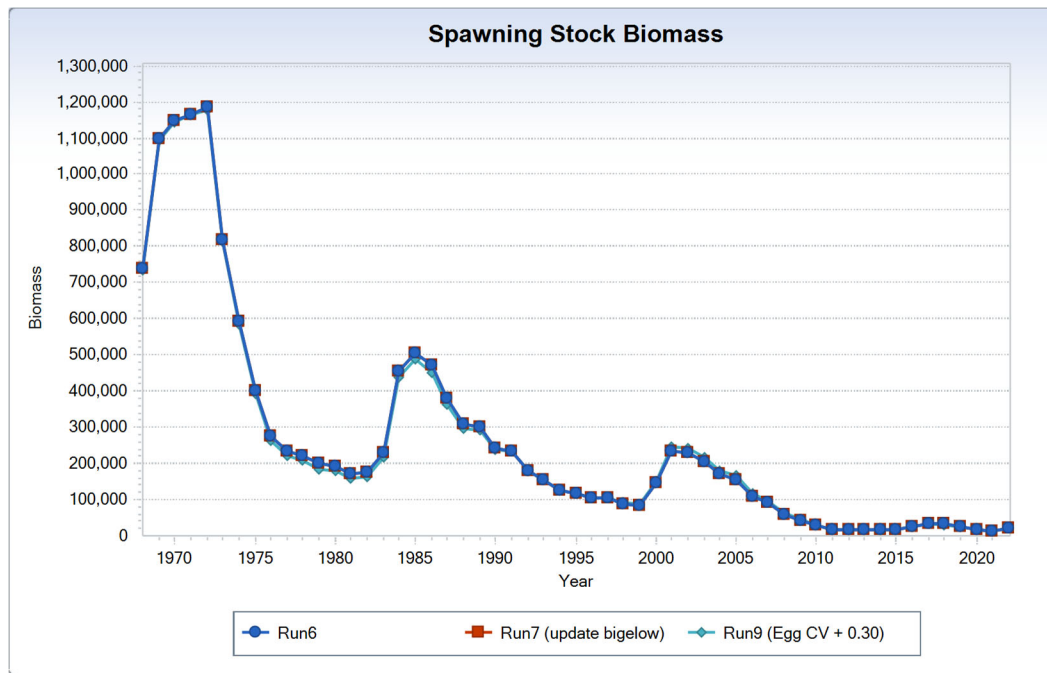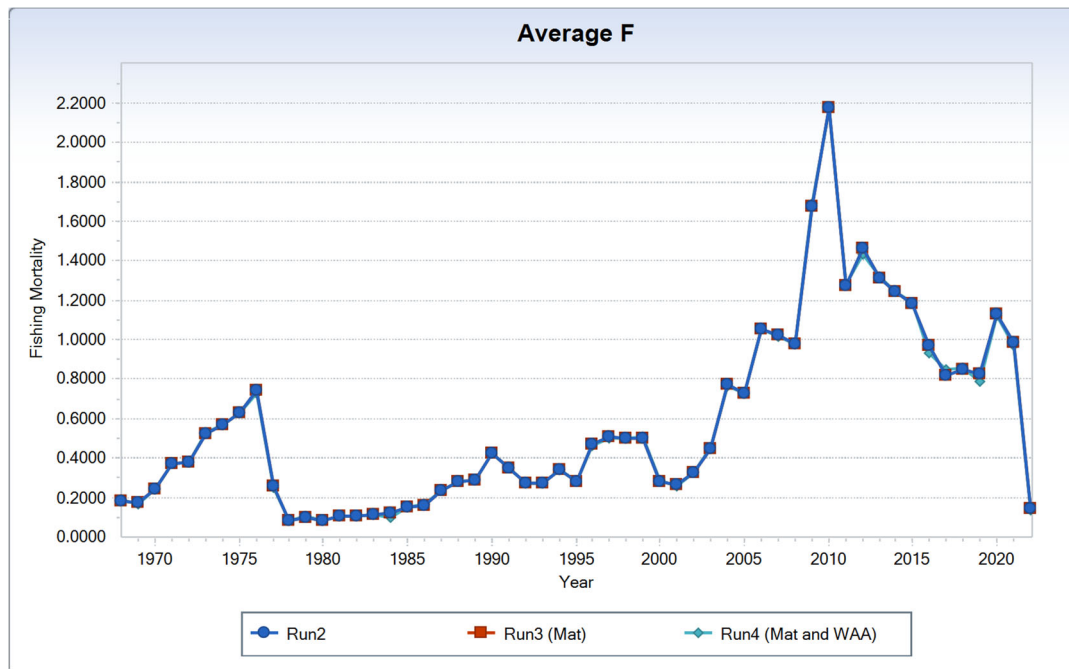
A)

B)

Figure S4, contd.: Comparison of spawning stock biomass estimates from bridge runs updating the Canadian maturity (Mat) and weight-at-age (WAA) time series (Figure A), the Canadian fishery catch and egg index time series (Figure B), the U.S. spring bottom trawl survey time series from the Bigelow years, and increasing the annual CVs corresponding to the egg index by 0.3 (Figure C).
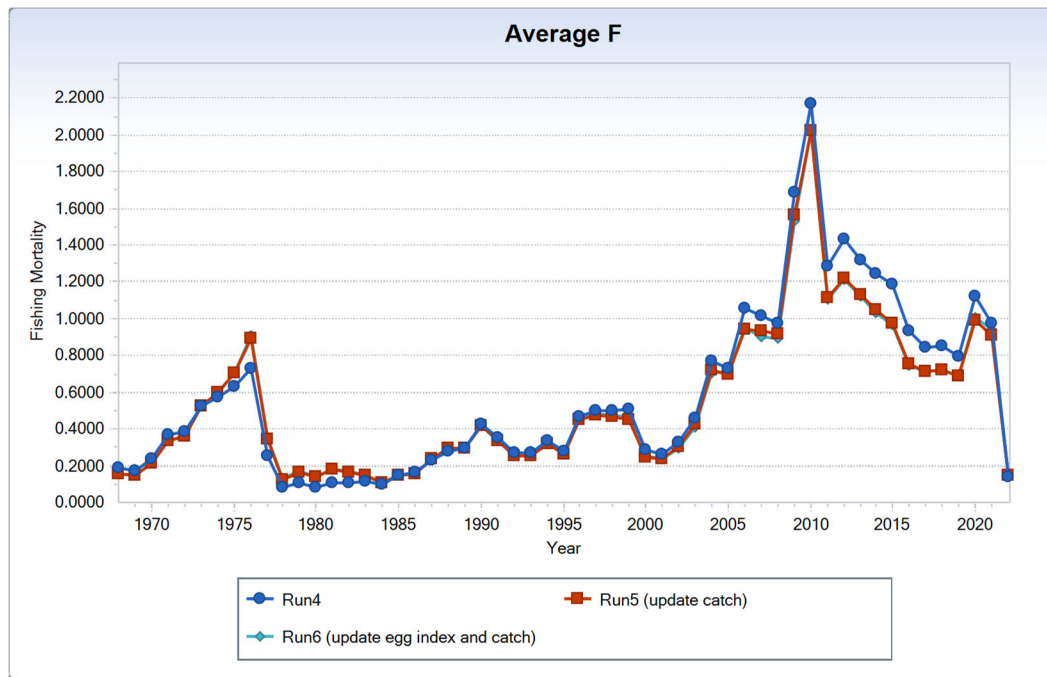
C)

Spawning Stock Biomass

Figure S5: Comparison of fishing mortality estimates from bridge runs updating the Canadian maturity (Mat) and weight-at-age (WAA) time series (Figure A), the Canadian fishery catch and egg index time series (Figure B), the U.S. spring bottom trawl survey time series from the Bigelow years, and increasing the annual CVs corresponding to the egg index by 0.3 (Figure C).

A)

B)

Figure S5, contd.: Comparison of fishing mortality estimates from bridge runs updating the Canadian maturity (Mat) and weight-at-age (WAA) time series (Figure A), the Canadian fishery catch and egg index time series (Figure B), the U.S. spring bottom trawl survey time series from the Bigelow years, and increasing the annual CVs corresponding to the egg index by 0.3 (Figure C).
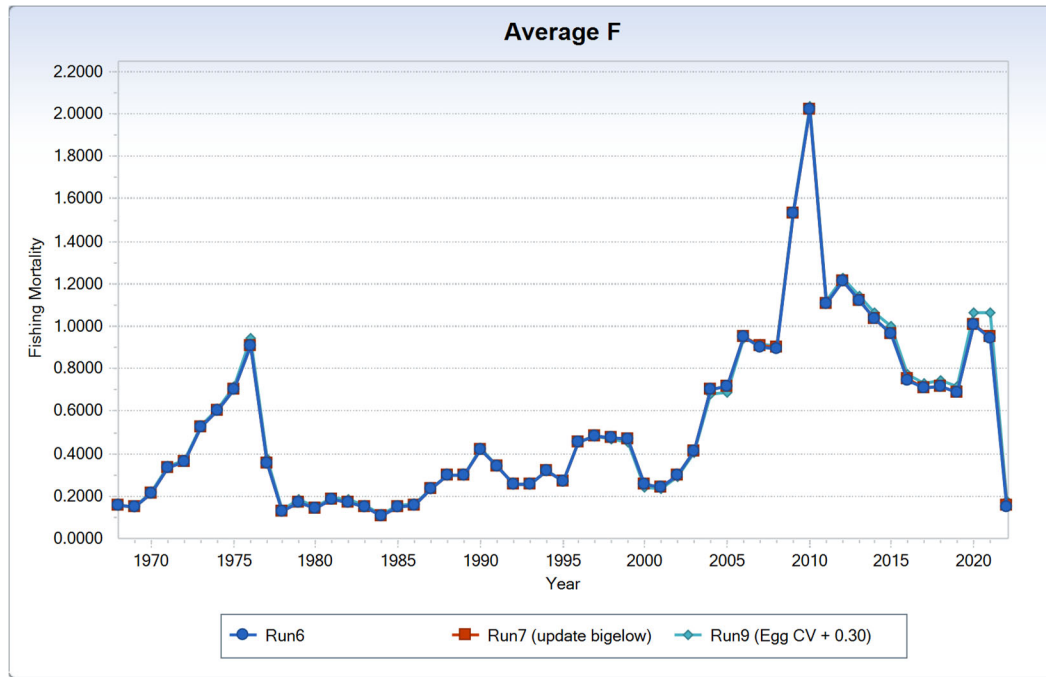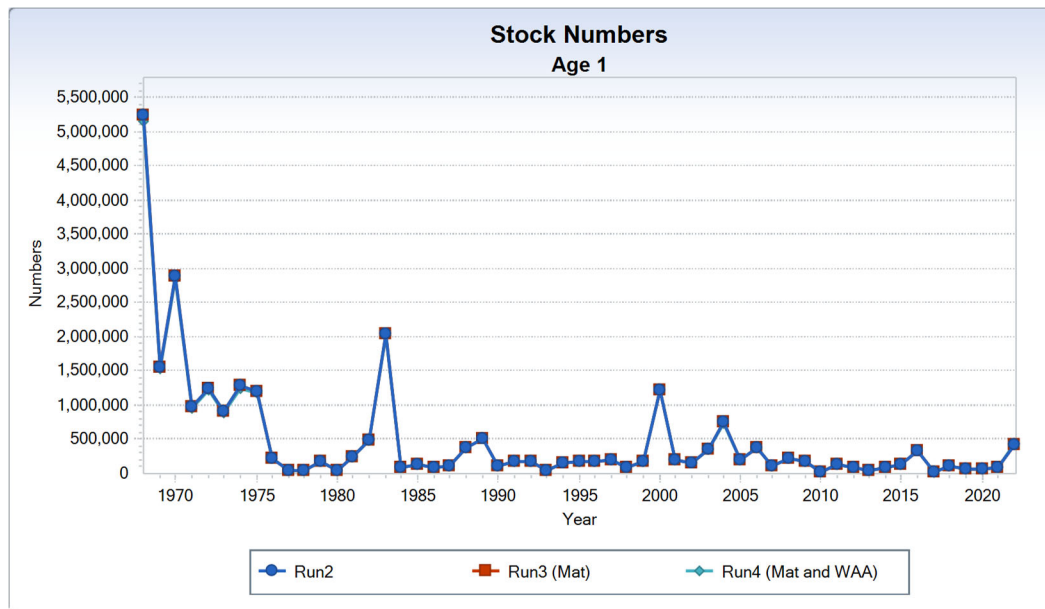
C)

Figure S6: Comparison of recruitment estimates from bridge runs updating the Canadian maturity (Mat) and weight-at-age (WAA) time series (Figure A), the Canadian fishery catch and egg index time series (Figure B), the U.S. spring bottom trawl survey time series from the Bigelow years, and increasing the annual CVs corresponding to the egg index by 0.3 (Figure C).
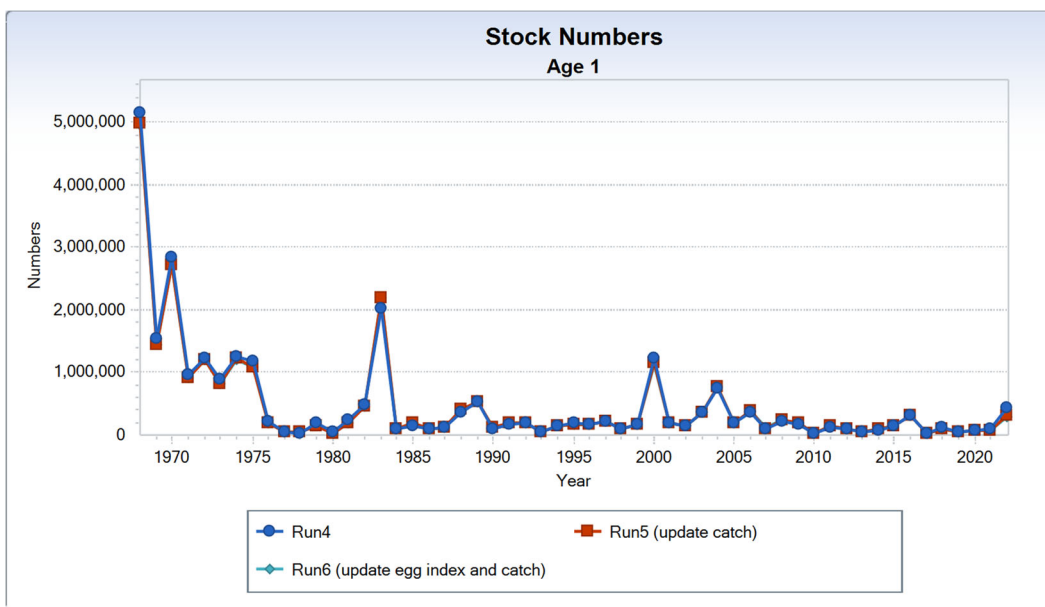
A)

B)

Figure S6, contd.: Comparison of recruitment estimates from bridge runs updating the Canadian maturity (Mat) and weight-at-age (WAA) time series (Figure A), the Canadian fishery catch and egg index time series (Figure B), the U.S. spring bottom trawl survey time series from the Bigelow years, and increasing the annual CVs corresponding to the egg index by 0.3 (Figure C).
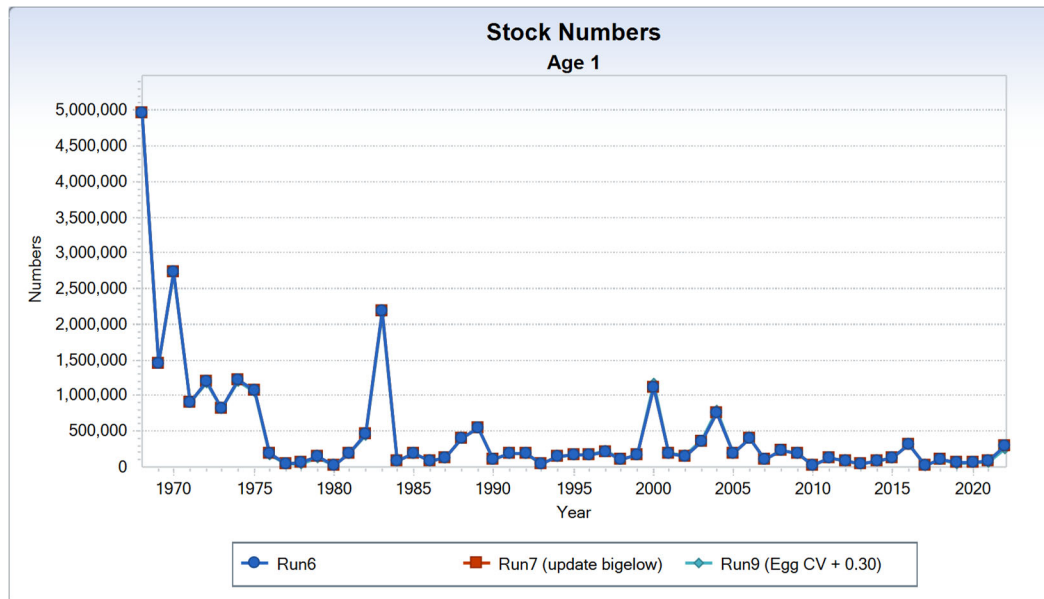
C)

Figure S7: Comparison of spawning stock biomass estimates (solid lines) and corresponding 90% confidence intervals (dashed lines) from the current ASAP model updated through 2022 (black), the final ASAP model from the 2021 MT assessment (orange) and the corresponding short-term projections from the 2021 assessment (green). The $SSB_{MSY\ proxy}$ represents the updated reference point from the current 2023 MT assessment.
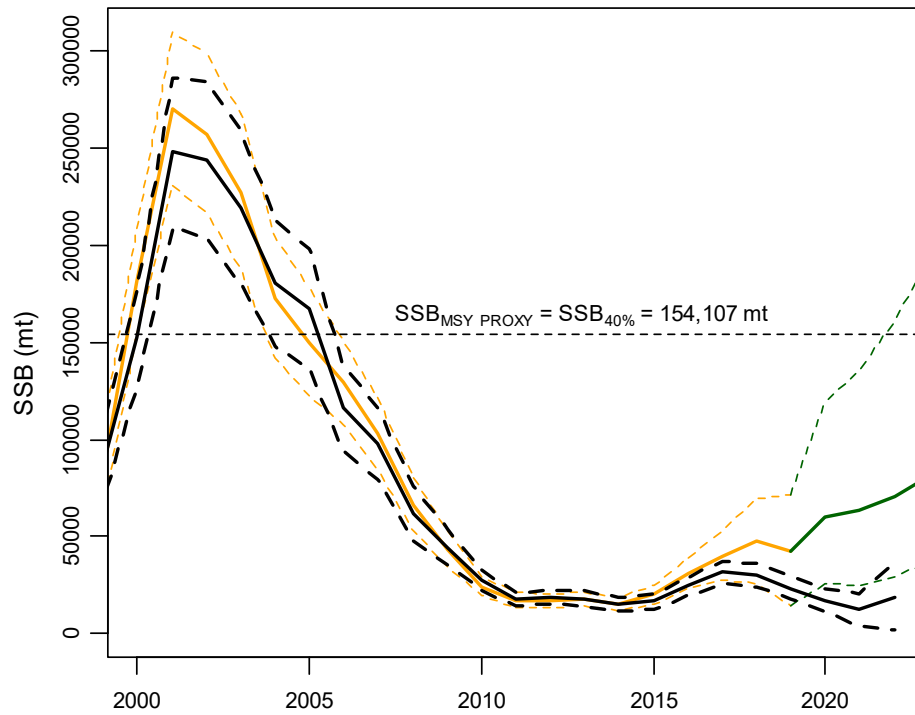
Figure S8: Comparison of spawning stock biomass estimates (solid lines) and corresponding 90% confidence intervals (dashed lines) from the 2021 Management Track assessment ASAP model (black) and corresponding short-term projections (purple), the final ASAP model from the 2017 benchmark assessment (orange), and the short-term projections from the 2017 assessment (green). The SSB$_{MSY\ proxy}$ represents the reference point from the 2021 MT assessment.