
C6 SUPPLEMENTAL ERRATA FOR HALIBUT ABM DEIS

HALIBUT ABM WORKING GROUP, 9/30/2020



ERRATA TO ADDRESS CONVERSION ERROR

- The original DEIS posted to the Council website for this meeting presented results that contained an error in converting mass units that affected historical catches, including 2019 catch
- We corrected the error and re-ran the model, including all sensitivity analyses.
- The tables and figures from the original DEIS are presented in a side-by-side comparison with corrected tables and figures in the following slides for reference and discussion purposes.
- The conversion error impacted any calculation that was done to show results relative to 2019 halibut catches, in particular calculations involving directed halibut fishery catches relative to 2019.



IMPACT ANALYSES UNCHANGED BY CONVERSION ERROR

- Impact analysis on groundfish
- Comparison across alternatives in figures and tables
- Ranking of alternatives according to performance metrics
- Modeled values and trends over time
 - Simulated halibut fishery catches in absolute terms
 - Spawning and total biomass
 - Indices
 - PSC limits and usage
- Social Impact Analysis



Differences in SSB in model demonstrations are undetectable

DEIS version (p.189)

Updated version

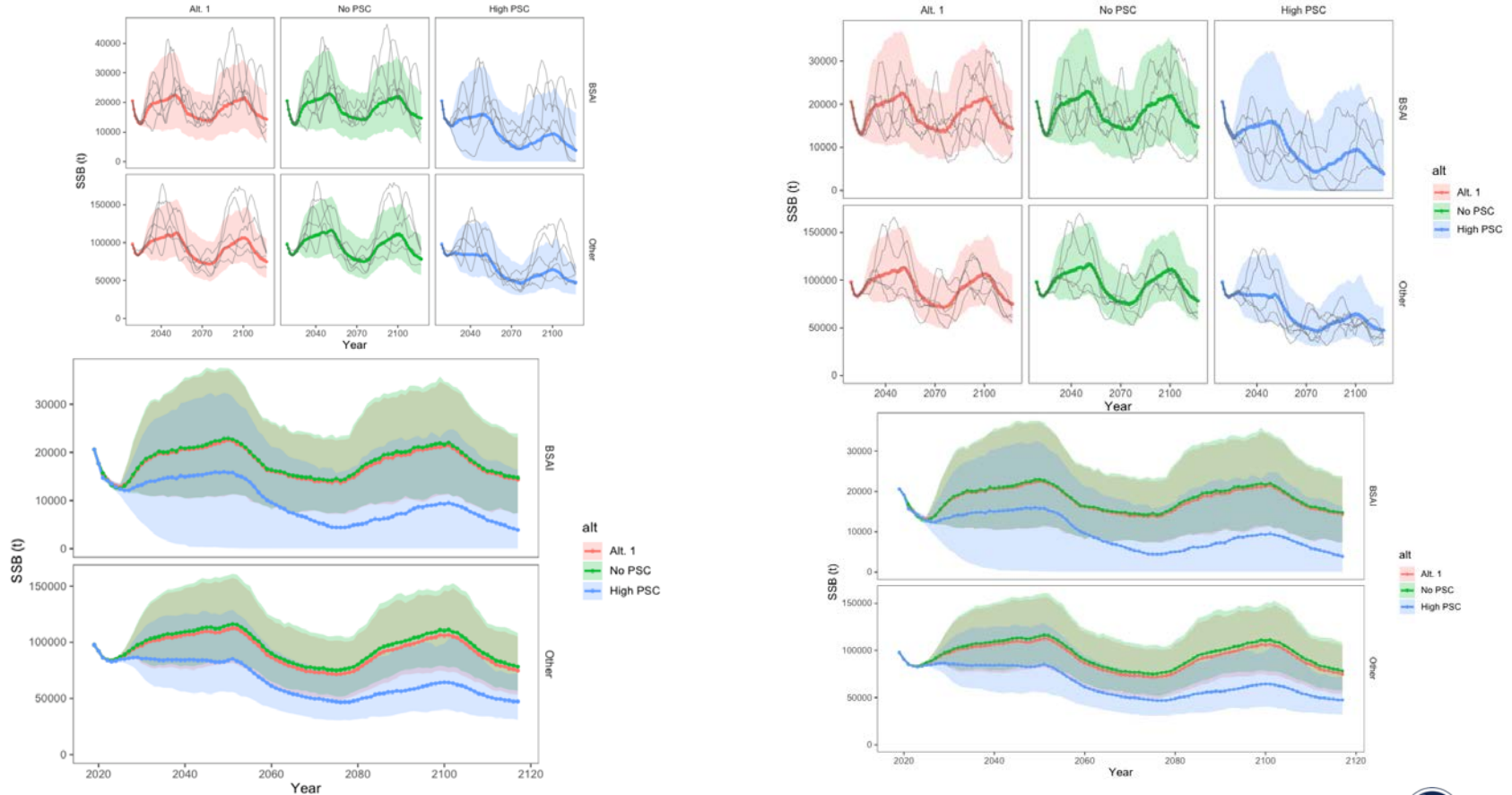


Figure 6-1 Demonstration of patterns in Pacific halibut SSB by region (note different vertical scales) over time for status quo, zero PSC Pacific halibut mortality, and 10,000 t of mortality. Solid lines are median values and 90 out of 100 model realizations fall within the shaded areas. The top and bottom panels show the same results, but the bottom panel shows the three demonstrations on the same scale. All results for the three demonstrations are identical when conducted with and without a 30:20 harvest control rule implemented for coastwide TCEY determination.



Directed halibut fishery catches relative to 2019 are higher in demonstrations (because 2019 catch is lower); trends and behavior across alternatives are unchanged

DEIS version (p.190)

Updated version

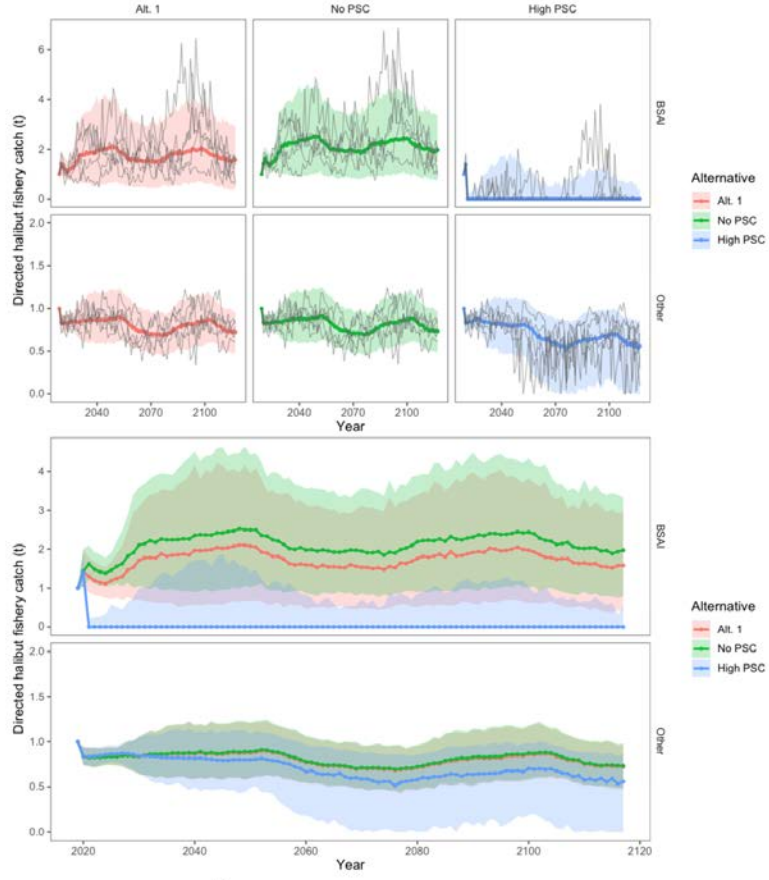
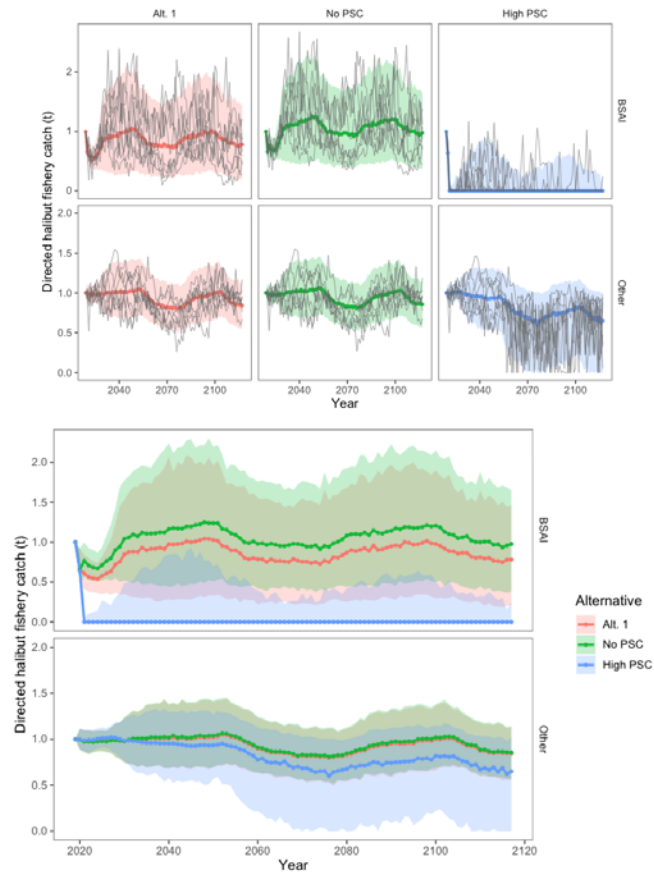


Figure 6-2 Demonstration of patterns in Pacific halibut directed fishery catch (by region and relative to 2019 values) over time for status quo, zero PSC Pacific halibut mortality, and 10,000 t of mortality. Solid lines are median values and 90 out of 100 model realizations fall within the shaded areas. The top and bottom panels show the same results, but the bottom panel shows the three demonstrations on the same scale. All results for the three demonstrations are identical when conducted with and without a 30:20 harvest control rule implemented for coastwide TCEY determination.



Indices for demonstrations are unchanged

DEIS version (p.191)

Updated version

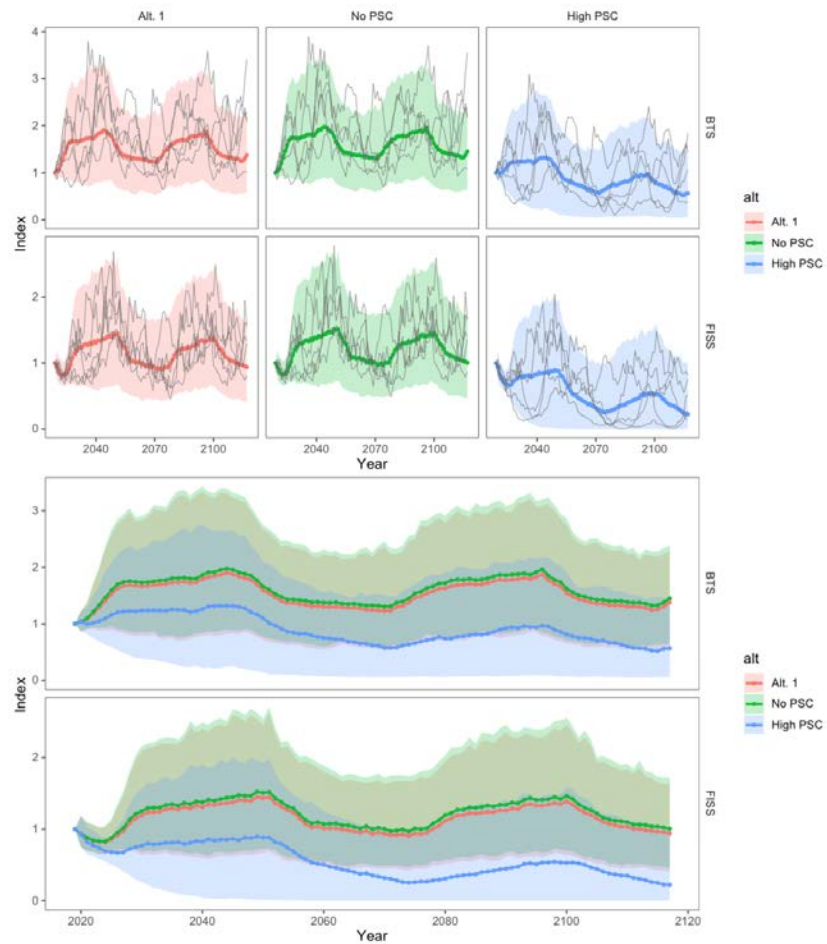
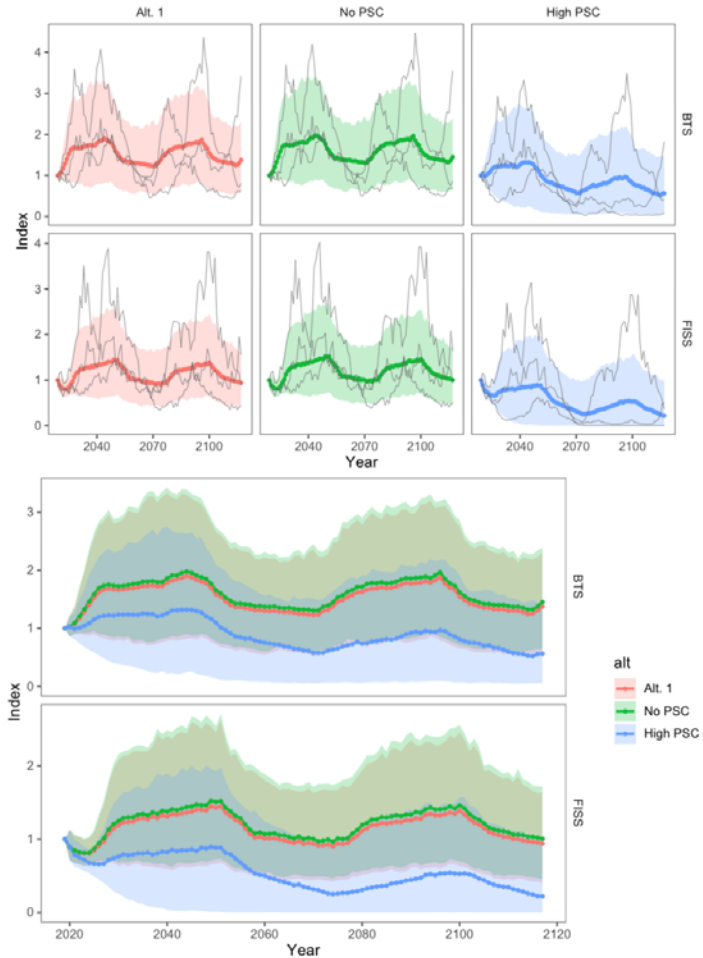
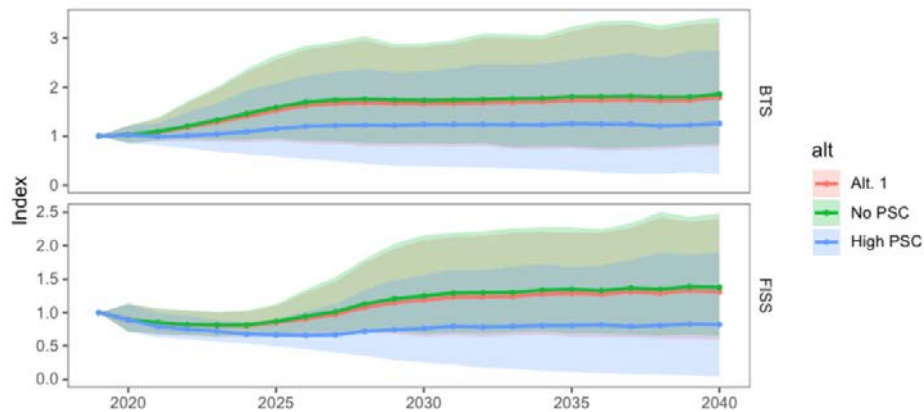


Figure 6-3 Demonstration of patterns in Pacific halibut indices (BTS and FISS and relative to 2019 values) over time for status quo, zero PSC Pacific halibut mortality, and 10,000 t of mortality. Solid lines are median values and 90 out of 100 model realizations fall within the shaded areas. The top and bottom panels show the same results, but the bottom panel shows the three demonstrations on the same scale. All results for the three demonstrations are identical when conducted with and without a 30:20 harvest control rule implemented for coastwide TCEY determination.



Indices for demonstrations are unchanged

DEIS version (p.192)



Updated version

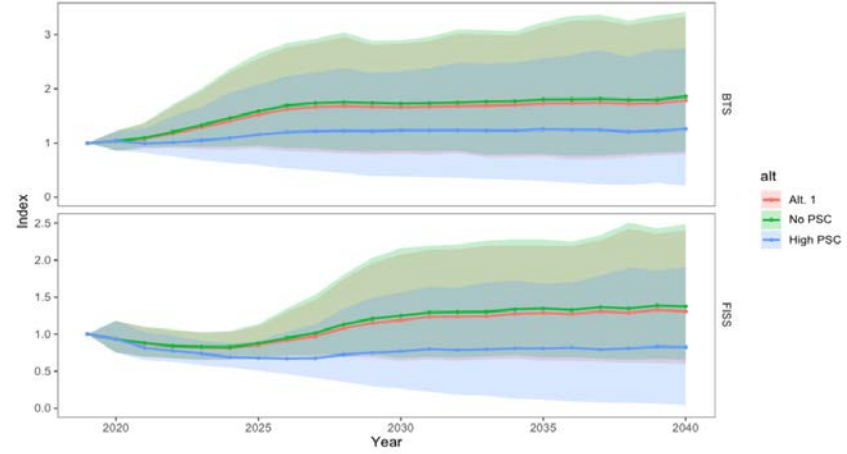


Figure 6-4 As for Figure 6-3, but showing results in more detail for initial years of simulation (2020-2040)



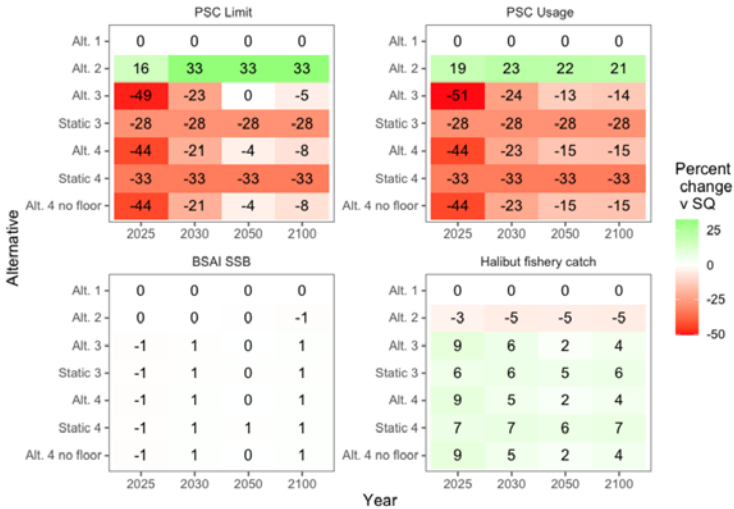
No changes greater than two percent in PSC limits, usage, BSAI SSB, and halibut fishery catch relative to the status quo (Shown here for runs without a 30:20 rule for TCEY determination; CR = 0)

DEIS version (p.194)

Updated version

Table 6-1 Projected relative median values of PSC usage, Pacific halibut spawning biomass, and Pacific halibut directed fishery catch, and PSC limit as estimated from the simulation model. Values are expressed relative to status quo (Alternative 1 in row 1). Red shading indicates a lower relative value within each measure. Rows labeled "Static 3" and "Static 4" are runs with PSC Limits fixed at their starting point values for alternatives 3 and 4, respectively (as requested by the SSC). "Alt. 4 no floor" is the same as Alt. 4 but with the floor removed. This first set of tables shows results for base case (B1) model runs without a 30:20 harvest control rule for TCEY determination (CR 0).

Scenario B1, CR 0



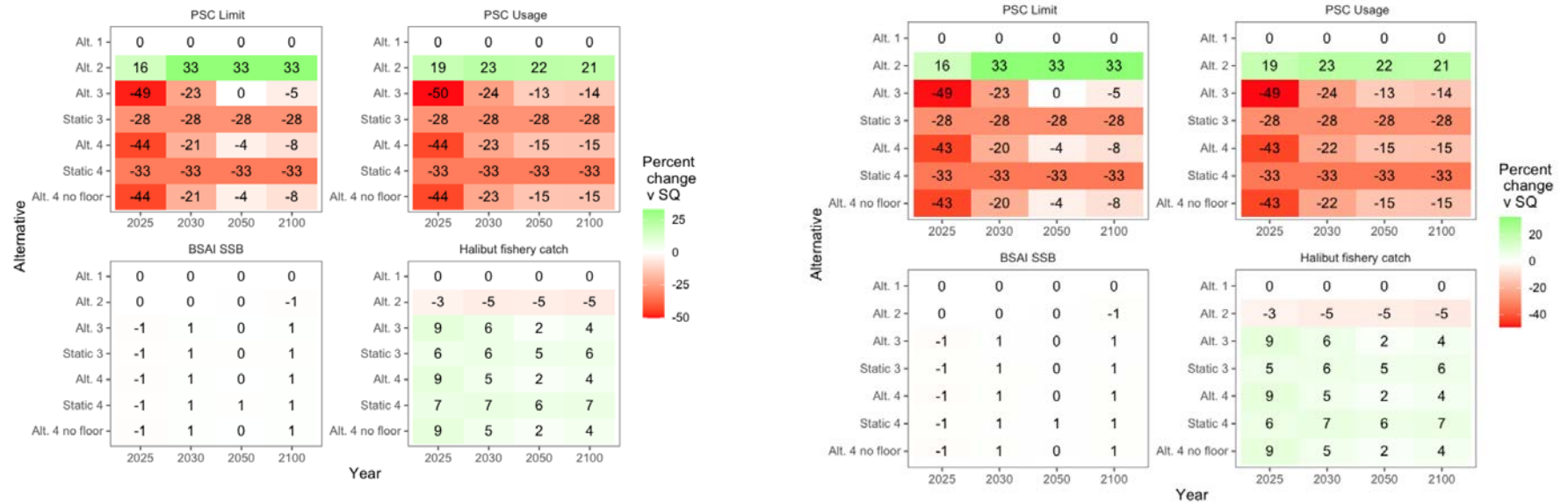
No changes greater than one percent in PSC limits, usage, BSAI SSB, and halibut fishery catch relative to the status quo (Shown here for runs with a 30:20 rule for TCEY determination; CR = 1)

DEIS version (p.195)

Updated version

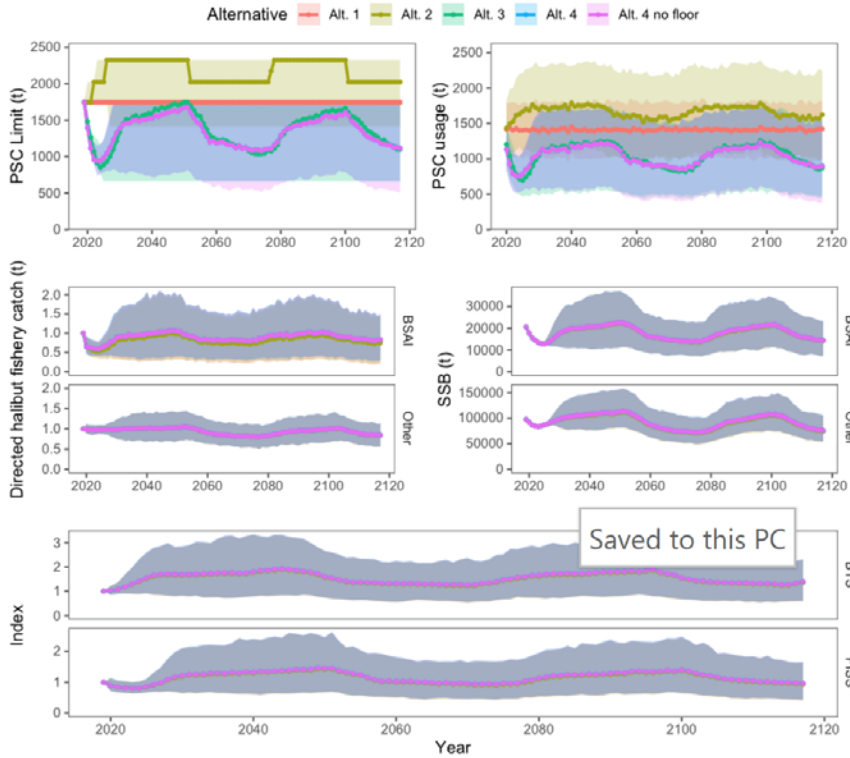
Table 6-1 (continued) Projected relative median values of PSC usage, Pacific halibut spawning biomass, and Pacific halibut directed fishery catch, and PSC limit as estimated from the simulation model (base case B1) with the 30:20 control included (CR 1). Values are expressed relative to status quo (Alternative 1 in row 1). Red shading indicates a lower relative value within each measure. Rows labeled "Static 3" and "Static 4" are runs with PSC Limits fixed at their starting point values for alternatives 3 and 4, respectively (as requested by the SSC). "Alt. 4 no floor" is the same as Alt. 4 but with the floor removed.

Scenario B1, CR 1



Changes from the conversion correction in model simulation results over time are undetectable, except that directed halibut fishery catch relative to 2019 is larger because 2019 catch is lower.

DEIS version (p.196)



Updated version

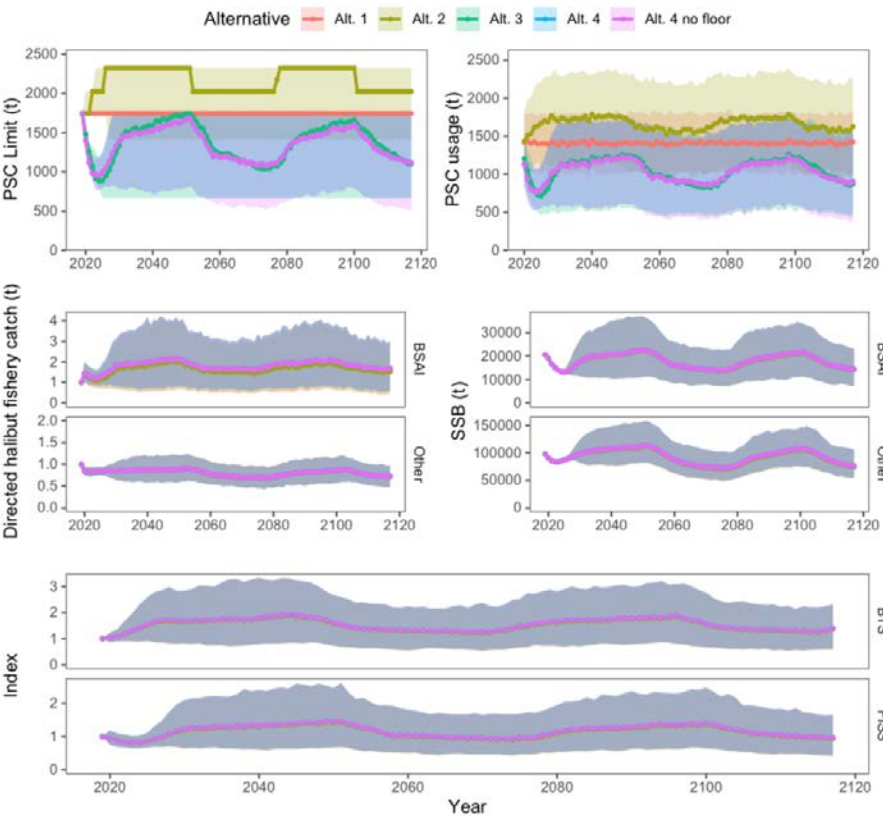
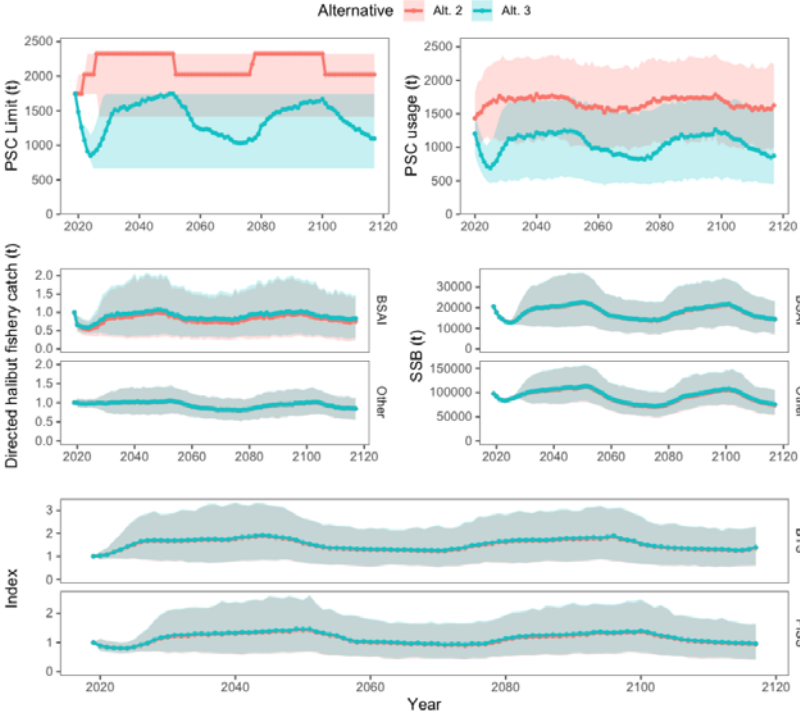


Figure 6-5 A comparison of projected PSC limits, usage, spawning biomass (SSB), and halibut fishery catch for the status quo (Alternative 1), and the 3 other alternatives, with uncertainty bounds. Solid lines are median values and 90 out of 100 model realizations fall within the shaded areas. In nearly all presentations the shades and lines are overlapped.



Changes from the conversion correction in model simulation results over time are undetectable, except that directed halibut fishery catch relative to 2019 is larger because 2019 catch is lower.

DEIS version (p.197)



Updated version

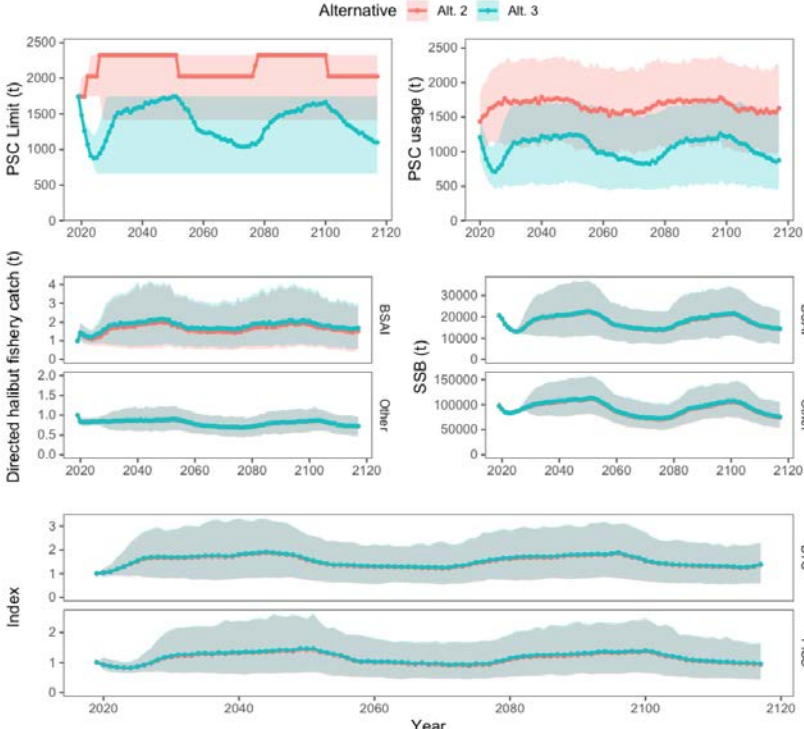
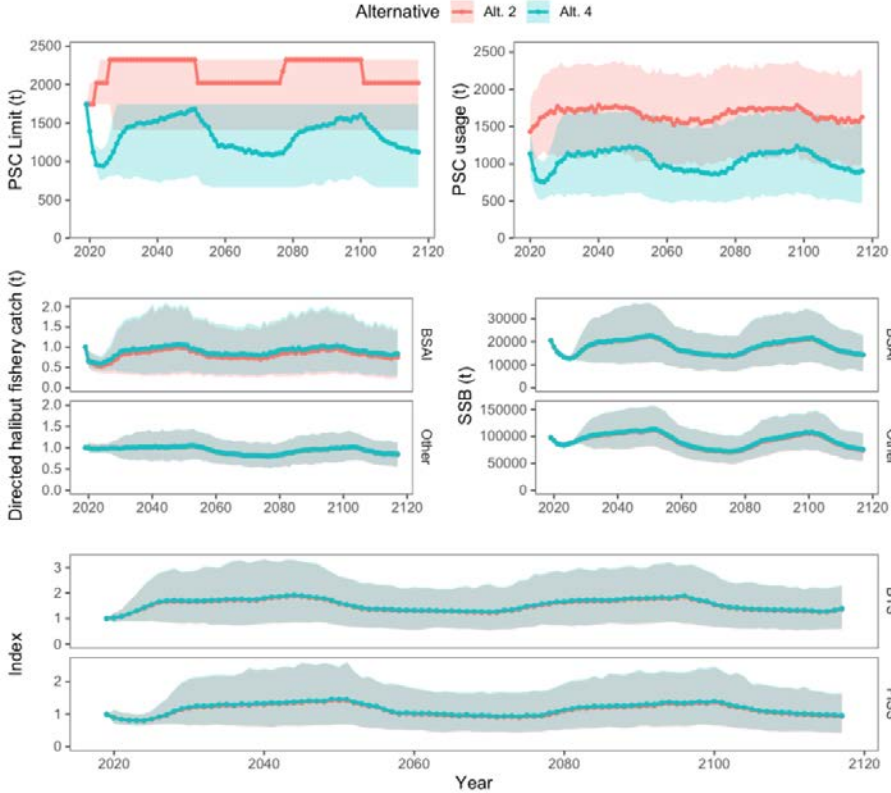


Figure 6-6 A comparison of projected PSC limits, usage, spawning biomass (SSB), and directed halibut fishery catch over time for Alternatives 2 and 3, with uncertainty bounds. Solid lines are median values and 90 out of 100 model realizations fall within the shaded areas. In nearly all presentations the shades and lines are overplotted.



Changes from the conversion correction in model simulation results over time are undetectable, except that directed halibut fishery catch relative to 2019 is larger because 2019 catch is lower.

DEIS version (p.198)



Updated version

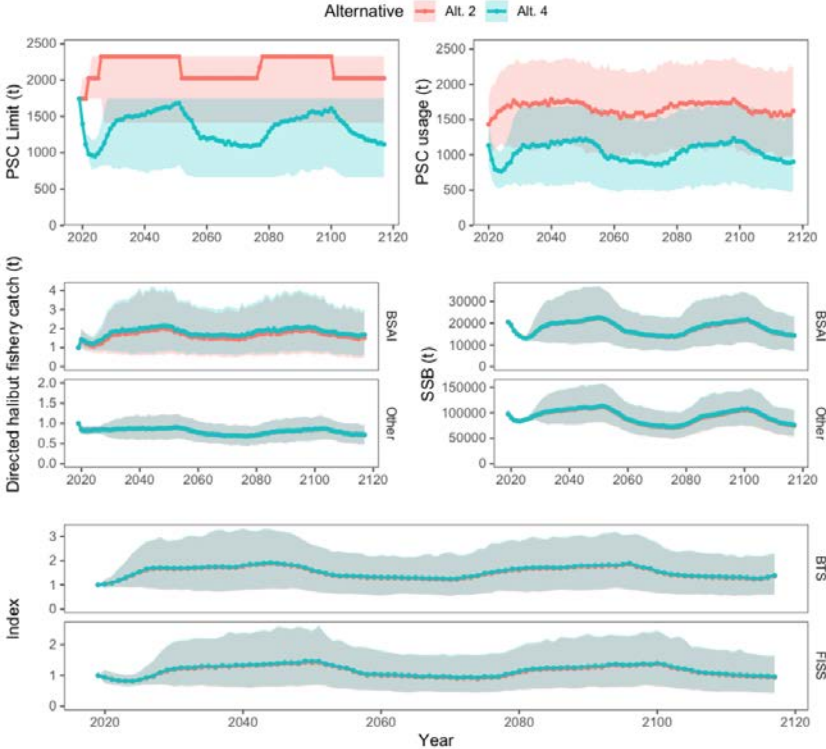


Figure 6-7 A comparison of projected PSC limits, usage, spawning biomass (SSB), and directed halibut fishery catch over time for Alternatives 2 and 4, with uncertainty bounds. Solid lines are median values and 90 out of 100 model realizations fall within the shaded areas. In nearly all presentations the shades and lines are overplotted.



Changes from the conversion correction in model simulation results over time are undetectable, except that directed halibut fishery catch relative to 2019 is larger because 2019 catch is lower.

DEIS version (p.199)

Updated version

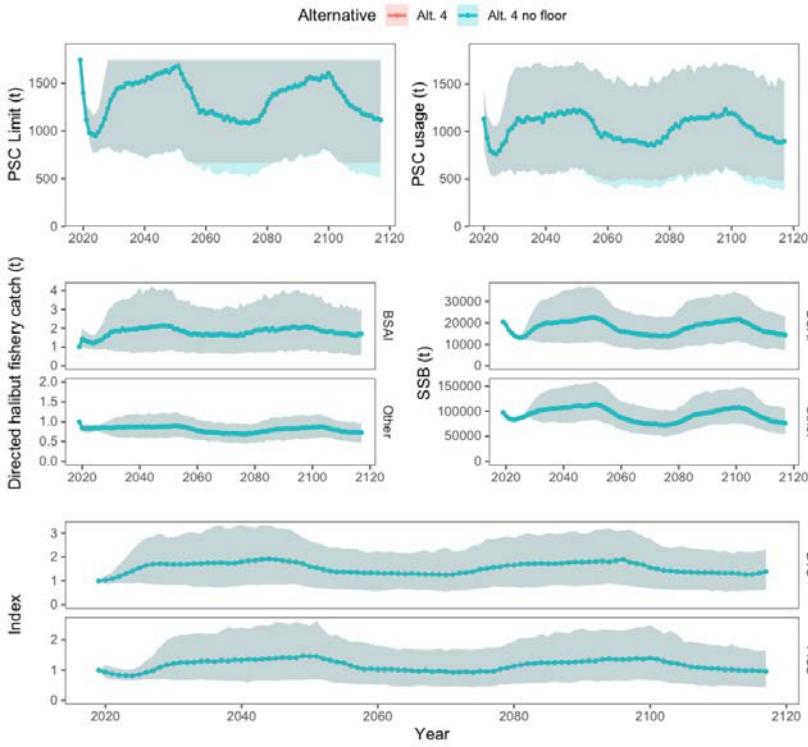
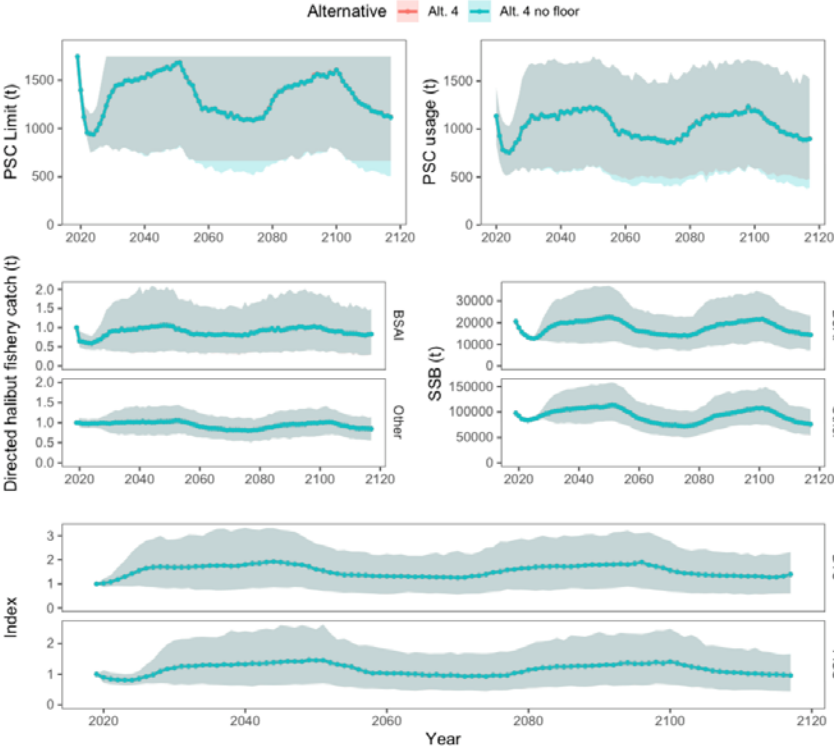


Figure 6-8 A comparison of projected PSC limits, usage, spawning biomass (SSB), and directed halibut fishery catch over time for Alternative 4 with Alternative 4 without a floor, with uncertainty bounds. Solid lines are median values and 90 out of 100 model realizations fall within the shaded areas. In nearly all presentations the shades and lines are overplotted.



2019 halibut catch changed to be lower, therefore halibut fishery change in catch relative to 2019 increased, but uncertainty and relative change across alternatives remained the same.

DEIS version (p.215)

Updated version

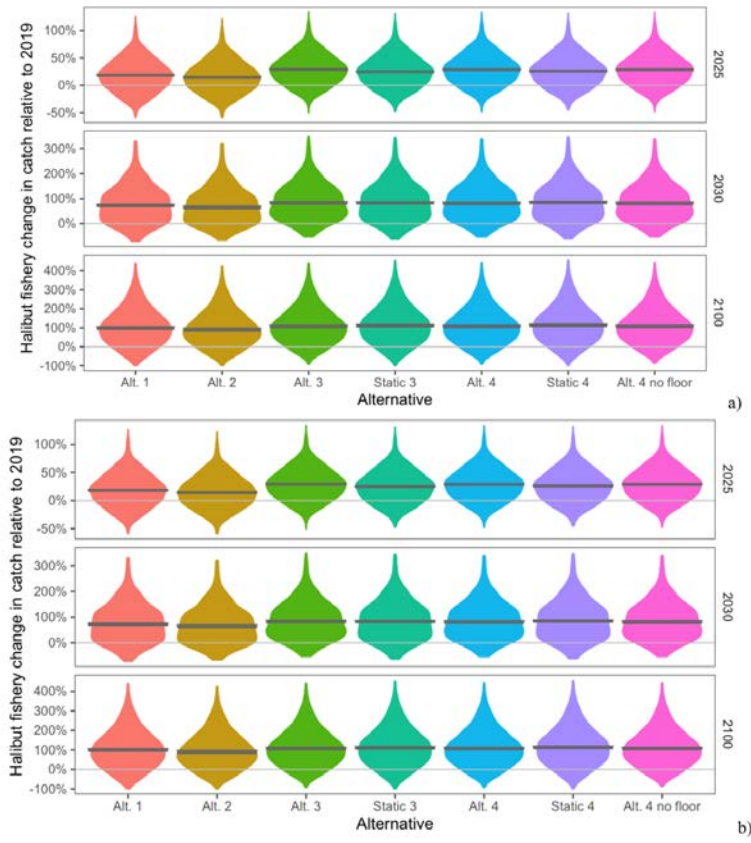
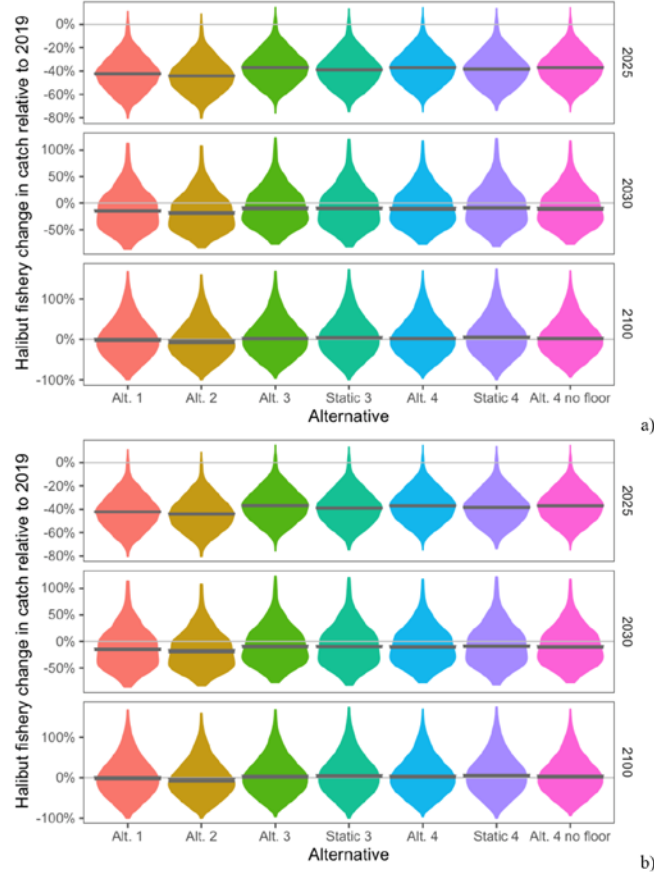


Figure 6-16 Comparison of changes in BSAI Pacific halibut fishery catch relative to the 2019 value by alternative (colors and x-axis within panels) and years (rows). The top set are for runs without the 30:20 harvest control rule and the lower set included the 30:20 rule in TCEY determination. Columns labeled "Static 3" and "Static 4" are runs with PSC limits fixed at their starting point values for Alternatives 3 and 4, respectively (as requested by the SSC). "Ait. 4 no floor" is the same as Ait. 4 but with the floor removed. Horizontal bars are median and mean values from the simulations.



DEIS version (p.232)

Table 6-14 Median projected **BSAI halibut TCEY** (millions of pounds, net weight) and percent change relative to 2019. Columns labeled "Static 3" and "Static 4" are runs with PSC Limits fixed at their starting point values for Alternatives 3 and 4, respectively (as requested by the SSC). "Alt. 4 without floor" is the same as Alternative 4 but with the floor removed. The starting point for Alternative 2 is the same as status quo.

BSAI Pacific halibut fishery TCEY (net wt. million pounds)							
Year	Status quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
2021	5.03	5.01	5.20	5.35	5.26	5.41	5.26
2022	4.68	4.64	4.96	4.97	5.04	5.01	5.04
2023	4.52	4.45	4.87	4.78	4.93	4.83	4.93
2024	4.46	4.35	4.84	4.71	4.86	4.76	4.86
2025	4.77	4.61	5.21	5.04	5.20	5.09	5.20
2026	5.03	4.82	5.53	5.34	5.48	5.38	5.48
2027	5.25	5.01	5.76	5.59	5.73	5.65	5.73
2028	5.96	5.66	6.42	6.30	6.39	6.36	6.39
2029	6.25	5.93	6.67	6.58	6.64	6.65	6.64
2030	6.99	6.64	7.40	7.42	7.32	7.50	7.32

Percent change relative to Status Quo (Alt. 1)							
Year	Status quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
2019	100%	0%	0%	0%	0%	0%	0%
2020	68%	0%	0%	0%	0%	0%	0%
2021	62%	0%	2%	4%	3%	4%	3%
2022	58%	-1%	3%	3%	4%	4%	4%
2023	56%	-1%	4%	3%	5%	3%	5%
2024	55%	-2%	5%	3%	5%	4%	5%
2025	58%	-2%	5%	3%	5%	4%	5%
2026	62%	-2%	6%	4%	6%	5%	6%
2027	65%	-2%	7%	5%	6%	5%	6%
2028	75%	-3%	7%	5%	6%	6%	6%
2029	82%	-4%	5%	4%	5%	5%	5%
2030	88%	-4%	5%	4%	4%	5%	4%

Updated version

Table 6-14 Median projected **BSAI directed halibut catch limits** (millions of pounds, net weight; top panel) and percent change relative to the status quo (Alternative 1) projection; bottom panel. Columns labeled "Static 3" and "Static 4" are runs with PSC limits fixed at their starting point values for Alternatives 3 and 4, respectively. "Alt. 4 without floor" is the same as Alternative 4 but with the floor removed. The starting point for Alternative 2 is the same as status quo.

BSAI Pacific halibut fishery catch limit (net wt. million pounds)							
Year	Status Quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
2019	4.09	4.09	4.09	4.09	4.09	4.09	4.09
2020	5.83	5.83	5.83	5.83	5.83	5.83	5.83
2021	5.30	5.28	5.47	5.62	5.53	5.68	5.53
2022	4.85	4.81	5.12	5.13	5.21	5.19	5.21
2023	4.65	4.58	5.00	4.90	5.05	4.96	5.05
2024	4.54	4.44	4.91	4.79	4.93	4.84	4.93
2025	4.84	4.68	5.27	5.10	5.25	5.15	5.25
2026	5.08	4.85	5.57	5.38	5.52	5.43	5.52
2027	5.29	5.05	5.79	5.62	5.76	5.68	5.76
2028	5.98	5.69	6.45	6.33	6.42	6.39	6.42
2029	6.27	5.95	6.68	6.60	6.65	6.66	6.65
2030	7.00	6.65	7.41	7.44	7.33	7.52	7.33

Projected directed fishery catch limit change relative to status quo (Alt. 1)							
Year	Status Quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
2019	0%	0%	0%	0%	0%	0%	0%
2020	0%	0%	0%	0%	0%	0%	0%
2021	0%	0%	3%	6%	4%	7%	4%
2022	0%	-1%	6%	6%	7%	7%	7%
2023	0%	-1%	7%	5%	9%	7%	9%
2024	0%	-2%	8%	6%	8%	7%	8%
2025	0%	-3%	9%	5%	9%	6%	9%
2026	0%	-5%	10%	6%	9%	7%	9%
2027	0%	-5%	9%	6%	9%	7%	9%
2028	0%	-5%	8%	6%	7%	7%	7%
2029	0%	-5%	7%	5%	6%	6%	6%
2030	0%	-5%	6%	6%	5%	7%	5%

Updated version:

- Corrects the mislabeling of directed catch limits as TCEY (yellow highlight)
- Revises the table based on correct 2019 catch limits and model projections from that point



Errata version (posted 9/25/20)

Table 6* Projected gross ex-vessel value (\$million) of BSAI directed halibut based on 2019 average IPHC Area 4 unit values adjusted to 2018 dollars, assuming 100% utilization.

Year	Status quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
2021	22.3	22.2	23.0	23.7	23.3	24.0	23.3
2022	20.7	20.6	22.0	22.0	22.3	22.2	22.3
2023	20.0	19.7	21.6	21.2	21.8	21.4	21.8
2024	19.8	19.3	21.4	20.9	21.5	21.1	21.5
2025	21.1	20.4	23.1	22.3	23.0	22.5	23.0
2026	22.3	21.4	24.5	23.7	24.3	23.8	24.3
2027	23.3	22.2	25.5	24.8	25.4	25.0	25.4
2028	26.4	25.1	28.4	27.9	28.3	28.2	28.3
2029	27.7	26.3	29.5	29.1	29.4	29.5	29.4
2030	31.0	29.4	32.8	32.9	32.4	33.2	32.4

Table 6** Projected gross ex-vessel value (\$million) of BSAI directed halibut based on 2015-2019 average IPHC Area 4 unit values adjusted to 2018 dollars, assuming 100% utilization.

Year	Status quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
2021	28.0	27.9	29.0	29.8	29.3	30.1	29.3
2022	26.1	25.8	27.6	27.7	28.1	27.9	28.1
2023	25.2	24.8	27.1	26.6	27.5	26.9	27.5
2024	24.8	24.2	27.0	26.2	27.1	26.5	27.1
2025	26.6	25.7	29.0	28.1	29.0	28.4	29.0
2026	28.0	26.8	30.8	29.7	30.5	30.0	30.5
2027	29.2	27.9	32.1	31.1	31.9	31.5	31.9
2028	33.2	31.5	35.8	35.1	35.6	35.4	35.6
2029	34.8	33.0	37.2	36.7	37.0	37.0	37.0
2030	38.9	37.0	41.2	41.3	40.8	41.8	40.8

Updated version (posted 9/30/20)

Year	Status quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
2019	18.12	18.12	18.12	18.12	18.12	18.12	18.12
2020	25.83	25.83	25.84	25.85	25.84	25.85	25.84
2021	23.49	23.41	24.22	24.90	24.49	25.16	24.49
2022	21.49	21.30	22.70	22.73	23.07	22.97	23.07
2023	20.59	20.29	22.13	21.71	22.37	21.95	22.37
2024	20.12	19.65	21.77	21.23	21.82	21.44	21.82
2025	21.44	20.72	23.34	22.61	23.26	22.82	23.26
2026	22.49	21.47	24.66	23.84	24.46	24.06	24.46
2027	23.42	22.35	25.63	24.88	25.52	25.15	25.52
2028	26.50	25.20	28.56	28.05	28.42	28.30	28.42
2029	27.77	26.35	29.59	29.24	29.47	29.52	29.47
2030	31.01	29.47	32.84	32.94	32.46	33.30	32.46

Year	Status quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
2019	22.78	22.78	22.78	22.78	22.78	22.78	22.78
2020	32.48	32.48	32.49	32.50	32.49	32.50	32.49
2021	29.53	29.43	30.45	31.31	30.79	31.63	30.79
2022	27.03	26.78	28.55	28.58	29.01	28.88	29.01
2023	25.88	25.52	27.82	27.30	28.13	27.60	28.13
2024	25.29	24.71	27.37	26.69	27.44	26.95	27.44
2025	26.95	26.05	29.35	28.43	29.25	28.69	29.25
2026	28.27	26.99	31.00	29.98	30.75	30.25	30.75
2027	29.45	28.11	32.23	31.29	32.09	31.63	32.09
2028	33.32	31.68	35.91	35.26	35.73	35.58	35.73
2029	34.91	33.13	37.21	36.76	37.06	37.12	37.06
2030	38.99	37.05	41.29	41.42	40.81	41.86	40.81

Updated version:

- Recalculates the table based on correct 2019 catch limits and model projections from that point



2019 halibut catch was corrected to be lower; therefore the following columns changed, but ranking across alternatives remained the same:

- Column 1 (probability that the directed halibut catch limit in the BSAI is less than 75% of the 2019 limit over 20 years)
- Column 3 (proportion of the time that % change in directed halibut catch limit in the BSAI from the previous year is $\geq 15\%$) changed (year 2019 is included in the calculation)

DEIS version (p.202)

Updated version

Table 6-4 Directed halibut fishery PSC performance metrics and spawning stock biomass, calculated over the first 20 years of simulation for each alternative. The best value across alternatives for each performance metric is highlighted in bold (defined as the value that is closest to the optimal value). The first three performance metrics were developed to address the Council Objective "Provide for directed halibut fishing operations in the Bering Sea" while the fourth column is intended to reflect the objective "to protect the halibut spawning stock biomass at low levels of abundance."

	Probability that the directed halibut catch limit in the BSAI is less than 75% of the 2019 limit over 20 years	Average Annual Variability (AAV) over 20 years	Proportion of time that the percent change in directed halibut catch limit in the BSAI from the previous year is greater than or equal to 15% over 20 years	Proportion of time that the BSAI PSC limit is greater than the BSAI TCEY
	<i>Lower is better</i>	<i>Lower is better</i>	<i>Lower is better</i>	<i>Lower is better</i>
Alt_1	0.583	0.241	0.634	0.0051
Alt_2	0.609	0.248	0.644	0.0040
Alt_3	0.534	0.226	0.613	0.0001
Alt_4	0.534	0.227	0.614	0.0000
Alt_4 (no floor)	0.534	0.228	0.616	0.0000

	Probability that the directed halibut catch limit in the BSAI is less than 75% of the 2019 limit over 20 years	Average Annual Variability (AAV) over 20 years	Proportion of time that the percent change in directed halibut catch limit in the BSAI from the previous year is greater than or equal to 15% over 20 years	Proportion of time that the BSAI PSC limit is greater than the BSAI TCEY
	<i>Lower is better</i>	<i>Lower is better</i>	<i>Lower is better</i>	<i>Lower is better</i>
Alt_1	0.012	0.241	0.601	0.0051
Alt_2	0.013	0.248	0.612	0.0039
Alt_3	0.006	0.226	0.582	0.0001
Alt_4	0.007	0.227	0.584	0
Alt_4 (no floor)	0.007	0.228	0.583	0



Changes to Table 6-5 are in the magnitude of columns 1 and 3, but ranking across alternatives is unchanged. Differences in Table 6-6 across alternatives are small and the ranking remains the same.

DEIS version (p.203)

Table 6-5 Directed halibut fishery and spawning stock biomass PSC performance metrics, calculated over simulation period 2041-2050 for each alternative. The best value across alternatives/sub-alternatives for each performance metric is highlighted in bold (defined as the value that is closest to the optimal value). The first three performance metrics were developed to address the Council Objective "Provide for directed halibut fishing operations in the Bering Sea" while the fourth column is intended to reflect the objective "to protect the halibut spawning stock biomass at low levels of abundance."

	Probability that the directed halibut catch limit in the BSAI is less than 75% of the 2019 limit over 10 years	Average Annual Variability (AAV) over 10 years	Proportion of time that the percent change in directed halibut catch limit in the BSAI from the previous year is greater than or equal to 15% over 10 years	Proportion of time that the BSAI PSC limit is greater than the BSAI TCEY
	<i>Lower is better</i>	<i>Lower is better</i>	<i>Lower is better</i>	<i>Lower is better</i>
Alt_1	0.306	0.243	0.607	0.0182
Alt_2	0.333	0.249	0.618	0.0164
Alt_3	0.278	0.228	0.593	0.0000
Alt_4	0.277	0.229	0.597	0.0000
Alt_4 (no floor)	0.277	0.229	0.596	0.0000

Updated version

	Probability that the directed halibut catch limit in the BSAI is less than 75% of the 2019 limit over 10 years	Average Annual Variability (AAV) over 10 years	Proportion of time that the percent change in directed halibut catch limit in the BSAI from the previous year is greater than or equal to 15% over 10 years	Proportion of time that the BSAI PSC limit is greater than the BSAI TCEY
	<i>Lower is better</i>	<i>Lower is better</i>	<i>Lower is better</i>	<i>Lower is better</i>
Alt_1	0.009	0.243	0.648	0.0182
Alt_2	0.010	0.249	0.655	0.0164
Alt_3	0.003	0.228	0.623	0
Alt_4	0.003	0.229	0.624	0
Alt_4 (no floor)	0.003	0.229	0.624	0

Errata version (posted 9/25/20)

Table 6-6 Average percent of TCEY available to the directed fishery for the BSAI (for 2025, 2030 and 2040). Values represent the means over 500 simulations, noting that the deduction for expected PSC used to calculate directed fishery catch limits in the BSAI for these years is based on 2024, 2029, and 2039 PSC catch levels. This is a directed halibut fishery performance metric related to the Council objective to provide for a directed fishery in 4CDE.

	2025	2030	2040
Alt_1	0.771	0.785	0.801
BSAI Directed fishery / BSAI TCEY	0.751	0.761	0.78
Alt_2	0.842	0.832	0.835
Alt_3	0.838	0.825	0.835
Alt_4	0.838	0.825	0.836
Alt_4 (no floor)	0.838	0.825	0.836

Updated version

	2025	2030	2040
Alt_1	0.773	0.786	0.801
BSAI Directed fishery / BSAI TCEY	0.753	0.761	0.780
Alt_2	0.841	0.832	0.835
Alt_3	0.838	0.825	0.835
Alt_4	0.838	0.825	0.836
Alt_4 (no floor)	0.838	0.825	0.836

A note that is unrelated to the conversion error:
 Analysts note that DEIS Table 6-7 (p204) was difficult to interpret and thus recommend that it not be used for contrasting among alternatives.

Table 6-7 Performance metric to assess the Council objective to index PSC limits to halibut abundance. This was taken as the rate of change in PSC limit relative to rate of change of total biomass (top section) and spawning biomass (bottom section). For illustration, three future years were used (2025, 2050 and 2100) and values represent the means over 500 simulations, noting that the changes were relative to 2024, 2049, and 2099. If calculating this statistic for a single model realization, if the biomass dropped by 5%, and the PSC limit increased by 5% then the statistic below would show a value of -1.0, meaning they are perfectly inversely correlated. If a 5% increase in biomass and PSC limit occurred, the statistic would have a value of 1, meaning they are perfectly correlated. **Bold text indicates the Alternative that was “best” among simulated values for that year; the best value is the value closest to positive 1. Only columns with positive values have a “best value” that is in bold.**

		2025	2050	2100
Mean (relative change in PSC Limit over relative change in total biomass)	Alt_1	0.000	0.000	0.000
	Alt_2	-0.800	5.120	-0.271
	Alt_3	1.830	0.201	-0.106
	Alt_4	-3.050	1.770	-0.136
	Alt_4 (no floor)	-3.050	1.470	-0.124
Mean (relative change in PSC Limit over relative change in spawning biomass)	Alt_1	0.00	0.00	0.00
	Alt_2	-4.09	-0.15	0.12
	Alt_3	-18.50	-0.29	1.08
	Alt_4	-1.55	-0.40	1.26
	Alt_4 (no floor)	-1.55	-0.36	1.20

