C-6 BSAI HALIBUT ABM DEIS

Presenters: Diana Stram, Sam Cunningham, Anna Henry, Carey McGilliard, Jim Ianelli, Mike Downs

Council, October 12, 2020

ABM Workgroup:
Council staff: Diana Stram, Sam Cunningham, Anna Henry, Mike Downs (Wislow Research)
AFSC: Carey McGilliard, Jim Ianelli, Dana Hanselman
NMFS RO: Anne Marie Eich, Joseph Krieger, Bridget Mansfield
IPHC: Allan Hicks

OUTLINE OF PRESENTATION

1. Purpose and Need
2. Current suite of alternatives for Amendment 80
3. Operating model changes to address SSC and Council requests
4. Results of modeling
5. Groundfish and halibut fishery background and revenue analysis
6. Social Impact Assessment –changes from previous review
7. Performance metrics
8. Review of Discussion paper
9. Wrap up

PURPOSE AND NEED SECTION 1.1 P42

The current fixed yield-based halibut PSC caps are inconsistent with management of the directed halibut fisheries and Council management of groundfish fisheries, which are managed based on abundance. When halibut abundance declines, PSC becomes a larger proportion of total halibut removals and thereby further reduces the proportion and amount of halibut available for harvest in directed halibut fisheries. Conversely, if halibut abundance increases, halibut PSC limits could be unnecessarily constraining. The Council is considering linking PSC limits to halibut abundance to provide a responsive management approach at varying levels of halibut abundance. The Council is considering abundance-based PSC limits to control total halibut mortality, particularly at low levels of abundance. Abundance based PSC limits also could provide an opportunity for the directed halibut fishery and protect the halibut spawning stock biomass. The Council recognizes that abundance-based halibut PSC limits may increase and decrease with changes in halibut abundance.

- Halibut PSC limits should be indexed to halibut abundance
- Halibut spawning stock biomass should be protected especially at lower levels of abundance
- There should be flexibility provided to avoid unnecessarily constraining the groundfish fishery particularly when halibut abundance is high
- Provide for directed halibut fishing operations in the Bering Sea
- Provide for some stability in PSC limits on an inter-annual basis

Consider modifying Purpose and Need to address change to Alternative set to A80 only

ALTERNATIVES OVERARCHING ELEMENTS AND OPTIONS

SOME CONSIDERATIONS BY ANALYSTS IN RED: PROPORTIONAL REDUCTION OF FLOOR TO A80 IN E3 AND UNDERSTANDING OF E8 IN CONJUNCTION WITH E3 [SEE FOOTNOTES P61 AND P64]

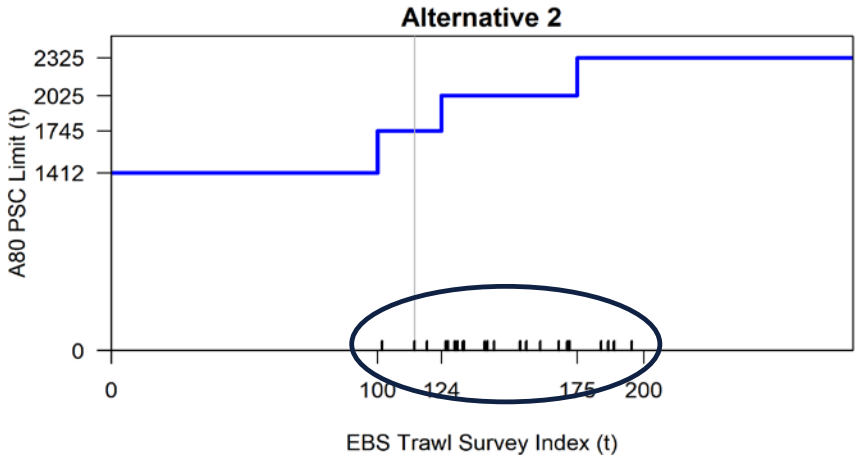
Element	Description	Range	Optional?
1	Starting Point	1,167-1,745 mt	N
2	Ceiling	1,745-2,325 mt	N
3	Floor	664-1,412 mt	N
4	Breakpoint	< or > -25% average -average	Y
5	Response	1:1 >1:1 <1:1	N (unless Element 7 selected)
6	Constraint	5-25%	Y
7	Look up Table	Up to 12 breakpoints; standard to mean or 2019	Y
8	SSB at low levels of abundance	PSC limit declines proportional to biomass when SSB < $B_{30\%}$	Y

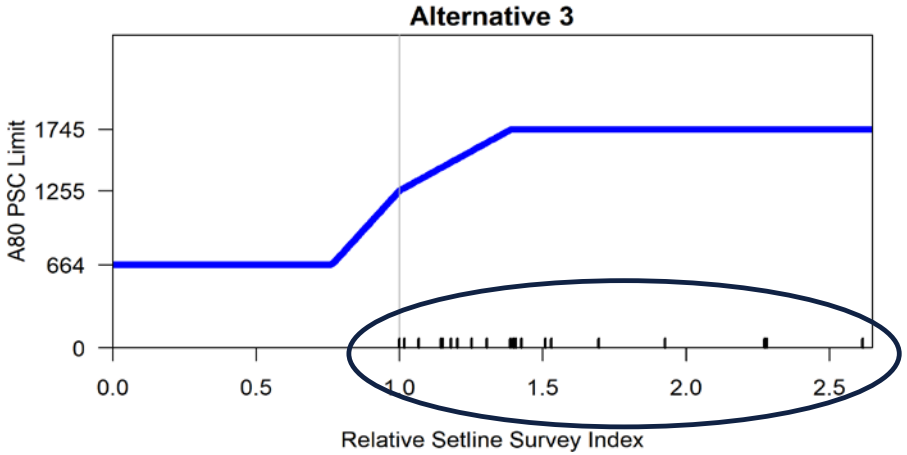
Red font are analyst assumptions absent direction otherwise by Council

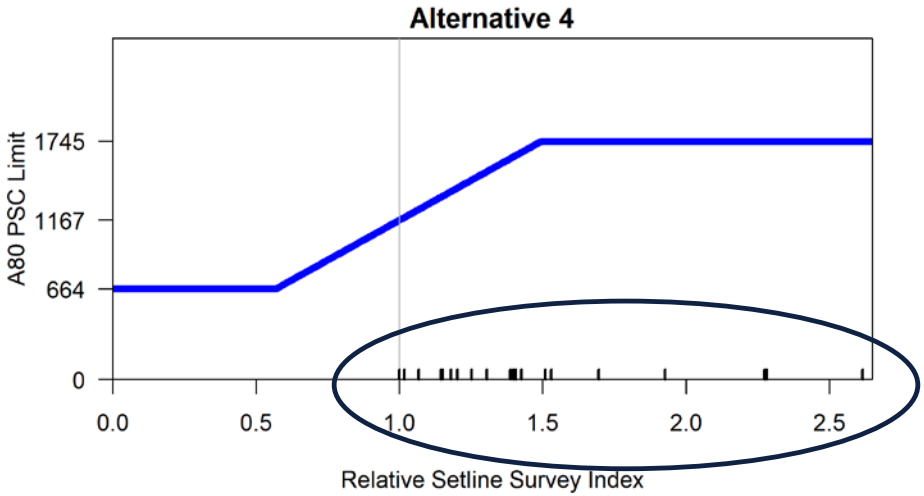
ALTERNATIVES 2-4 PROPOSED BY STAKEHOLDER AND MODIFIED BY COUNCIL

Alternative	Previously numbered (Oct 2019)	Source	Survey Index	E 1 Starting point	E 2 Ceiling	E 3 Floor	E 4 Breakpoint	E 5 Magnitude	E 6 Constraint	E 7 Look-up Table	E 8 SSB low levels of abundance
1	1	Status Quo	NA	1,745 fixed PSC limit							
2	2-2	A80	Trawl	1,745	2,325	1,412	3 specified	Stairsteps	2 yr avg	NA	NA
3	2-4	FVOA	Setline	1,255	1,745	664	1,255	1:1 above 2:1 below	15% max	NA	NA
4	3-3a_update	Directed halibut users	Setline	1,167	1,745	664	NA	1:1	20% max	NA	Yes

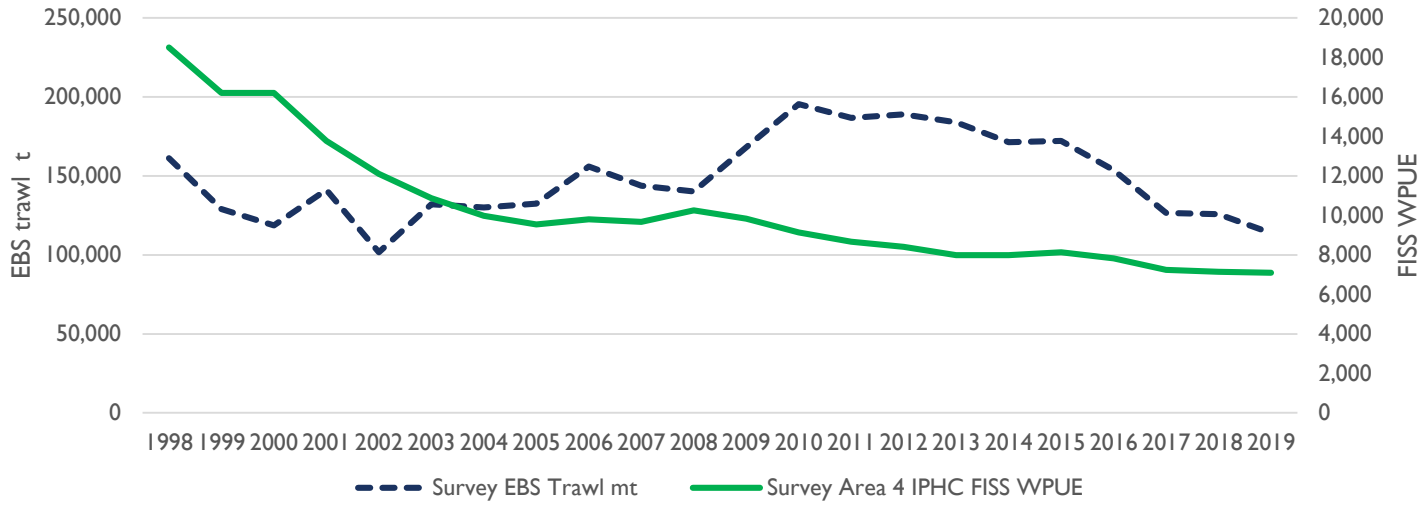
ACTION ALTERNATIVES

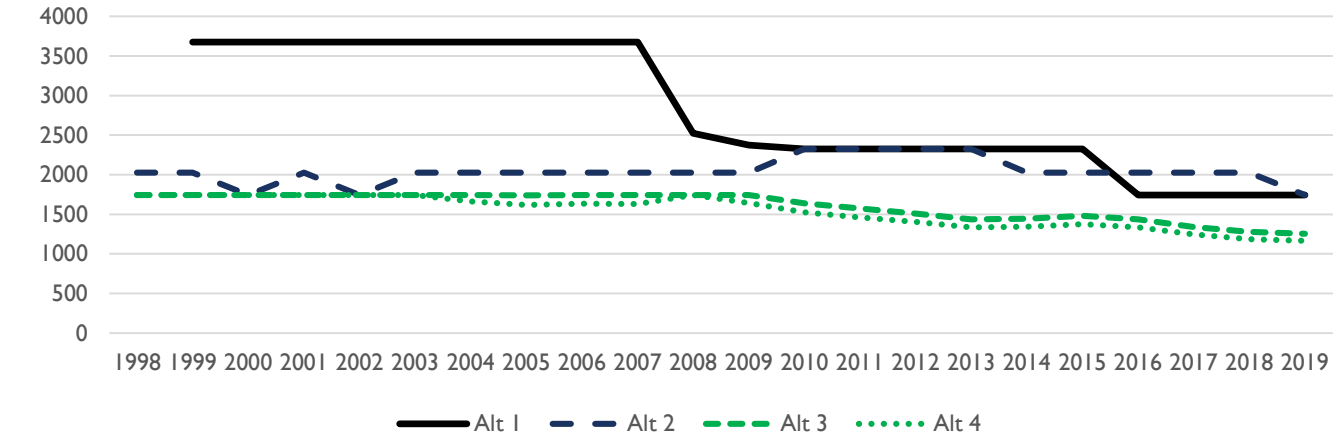






COMPARISON OF ALTERNATIVES (EXECUTIVE SUMMARY P21)



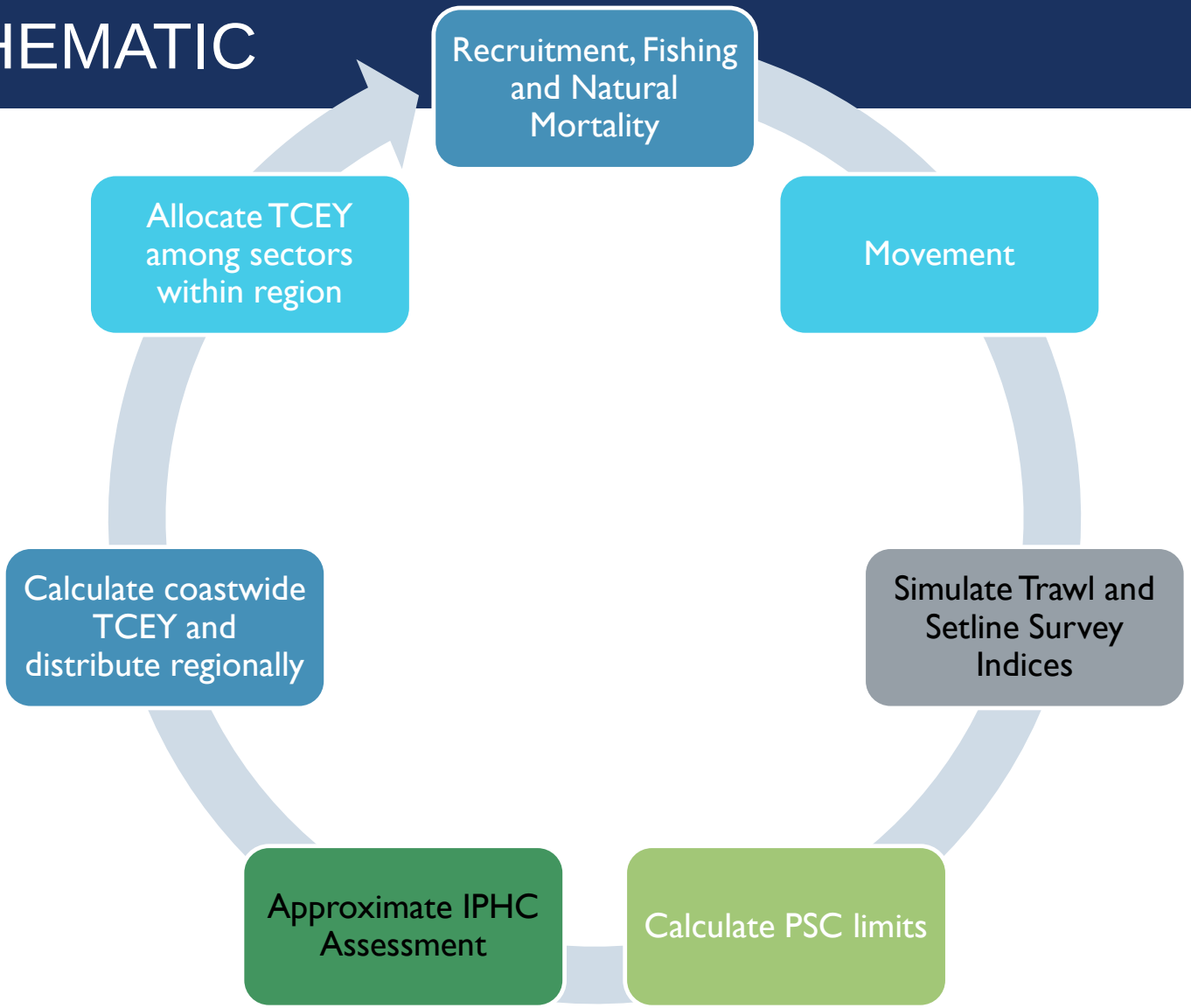


CLARIFYING ISSUES FOR COUNCIL ON ALTERNATIVES

How to implement Element 8 on an annual basis in conjunction with the IPHC process

What data to use in a year (as with 2020) in which there was no survey

CLOSED-LOOP SIMULATION MODEL SCHEMATIC

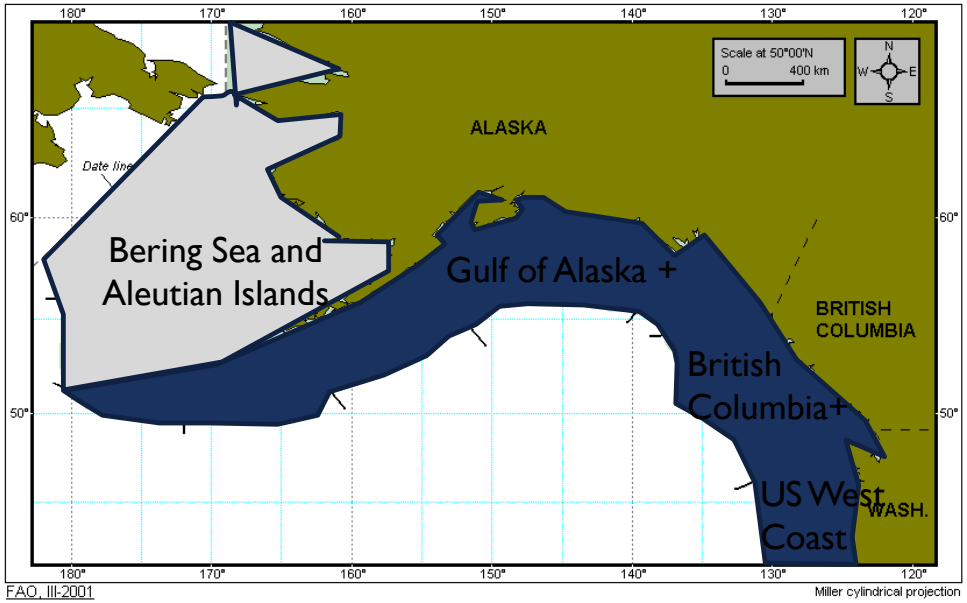


- 2 Area Model
  1. Bering Sea-Aleutian Islands
  2. Gulf of Alaska, British Columbia, US West Coast

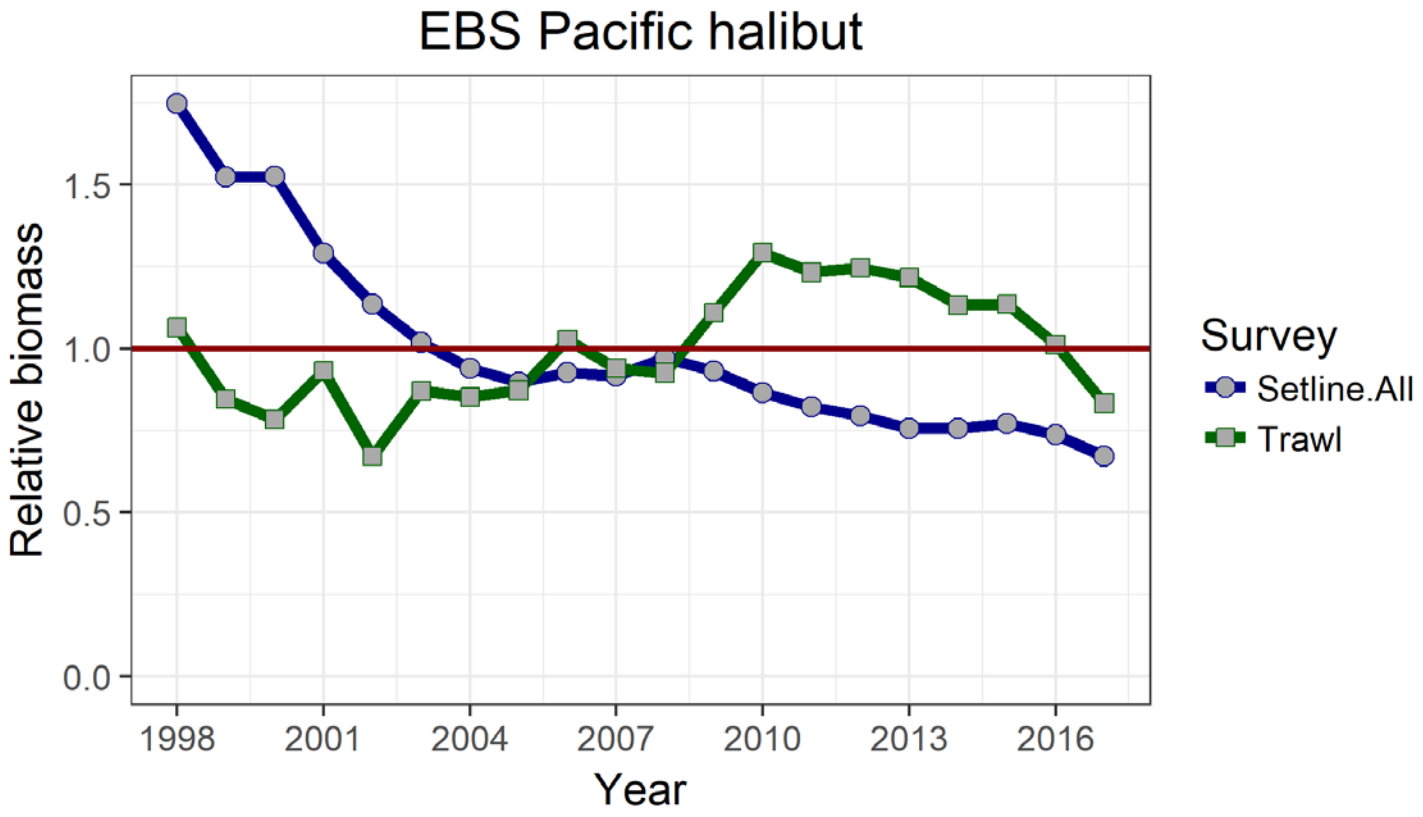
- Recruitment of halibut
  - Allocated among areas, time-varying
  - Function of example Pacific Decadal Oscillation index

- Adult movement unchanged

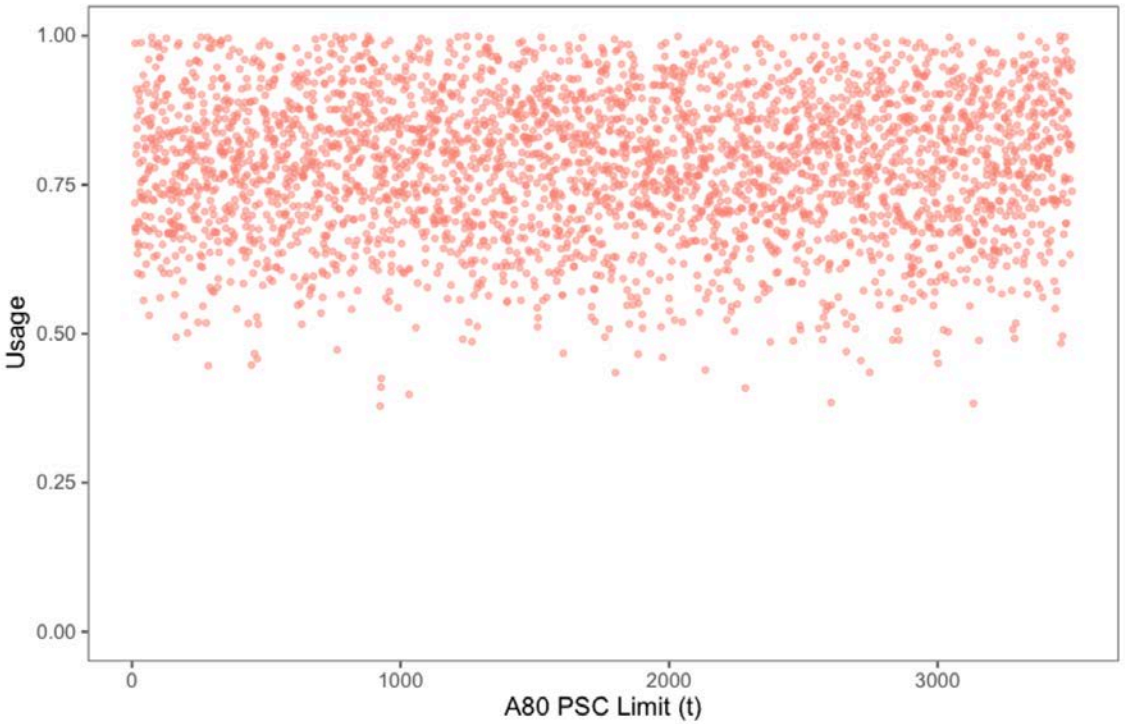
- Fleet structure unchanged, but selectivity updated according to new IPHC assessment results (trawl PSC fleet is still in aggregate)



Surveys in the Eastern Bering Sea



PSC use: limit relationship generated randomly based on historical distributions



SUMMARY OF CONVERSION ERROR

- Total historical catches were always correct.
- Total historical directed halibut catches were always correct
- The error incorrectly assigned a higher proportion of the historical directed halibut fishery catches to the BSAI than to the other area.
- Model doesn't use historical catches for any calculation after initiating the simulations.

- This means:
  - Modeling results didn't change except for minor changes in the first couple years of simulation
  - Scale of calculations using directed halibut fishery catch RELATIVE to 2019 changed
  - Directed halibut fishery catches in absolute biomass didn't change (except minorly in first couple years of simulation)
  - Comparison across alternatives didn't change

ERRATA TO ADDRESS CONVERSION ERROR

- The original DEIS posted to the Council website for this meeting presented results that contained conversion error 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

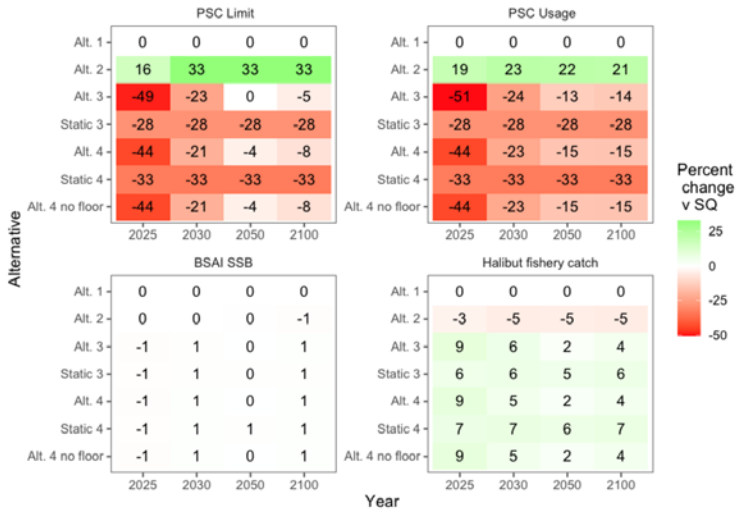
No changes greater than two percent in PSC limits, usage, BSAI SSB, and halibut fishery catch relative to the status quo

(Shown here for runs without a 30:20 rule for TCEY determination; CR = 0)

DEIS version (p.194)

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



Updated version

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)

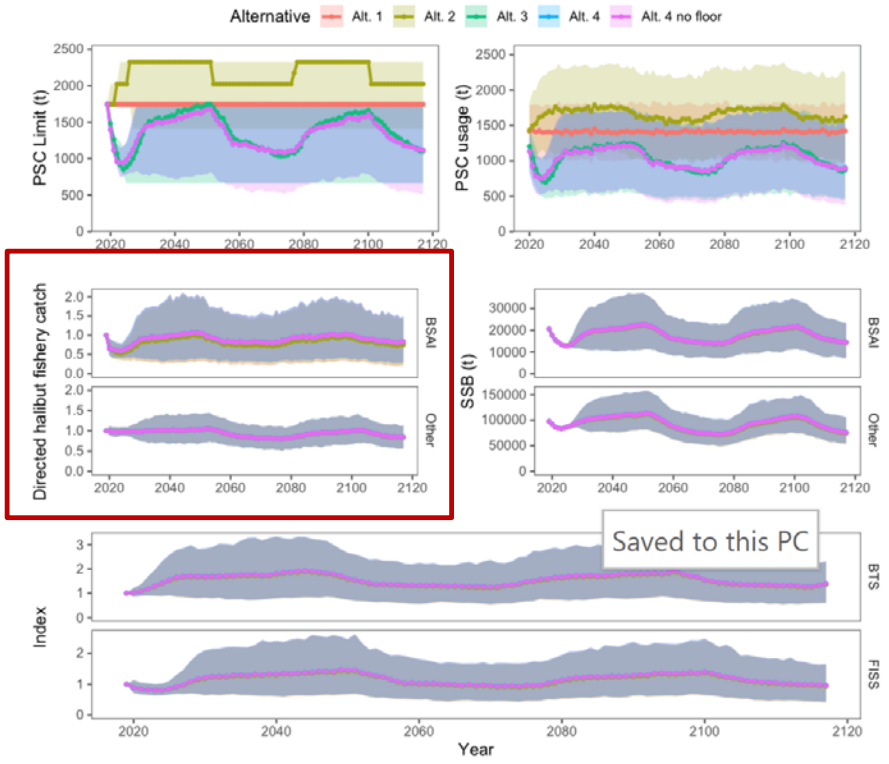
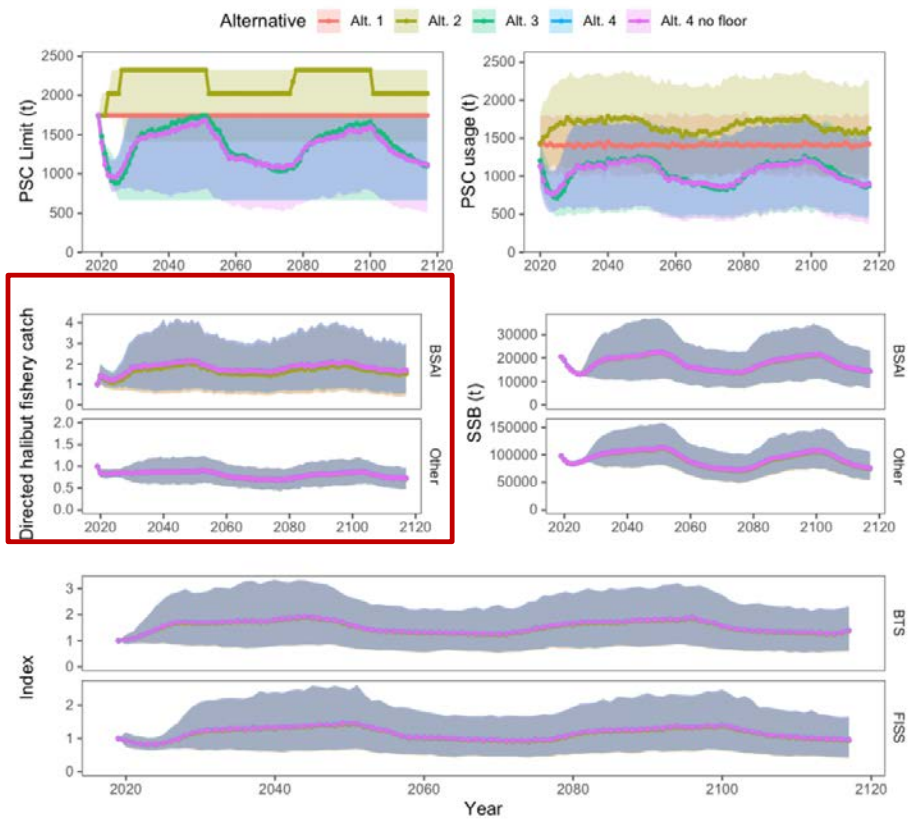


Figure 6-5 A comparison of projected PSC limits, usage, spawning biomass (SSB), and halibut fishery catch for the status quo (Alternative 1), and the 3 other alternatives, with uncertainty bounds. Solid lines are median values and 90 out of 100 model realizations fall within the shaded areas. In nearly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

Updated version



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	7.06	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**

REVISED STATUS QUO PROJECTION

- Status quo BSAI directed halibut fishery catch limit projections compared as actual values not as percentage change from status quo

Table 6-14 Median pr relative to their start "Alt. 4 wit point for /

Year	previous BSAI Status quo	
2021	5.03	5.30
2022	4.68	4.85
2023	4.52	4.65
2024	4.46	4.54
2025	4.77	4.84
2026	5.03	5.08
2027	5.25	5.29
2028	5.96	5.98
2029	6.25	6.27
2030	6.99	7.00

Revised SQ values in 6-14

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 2015-201 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

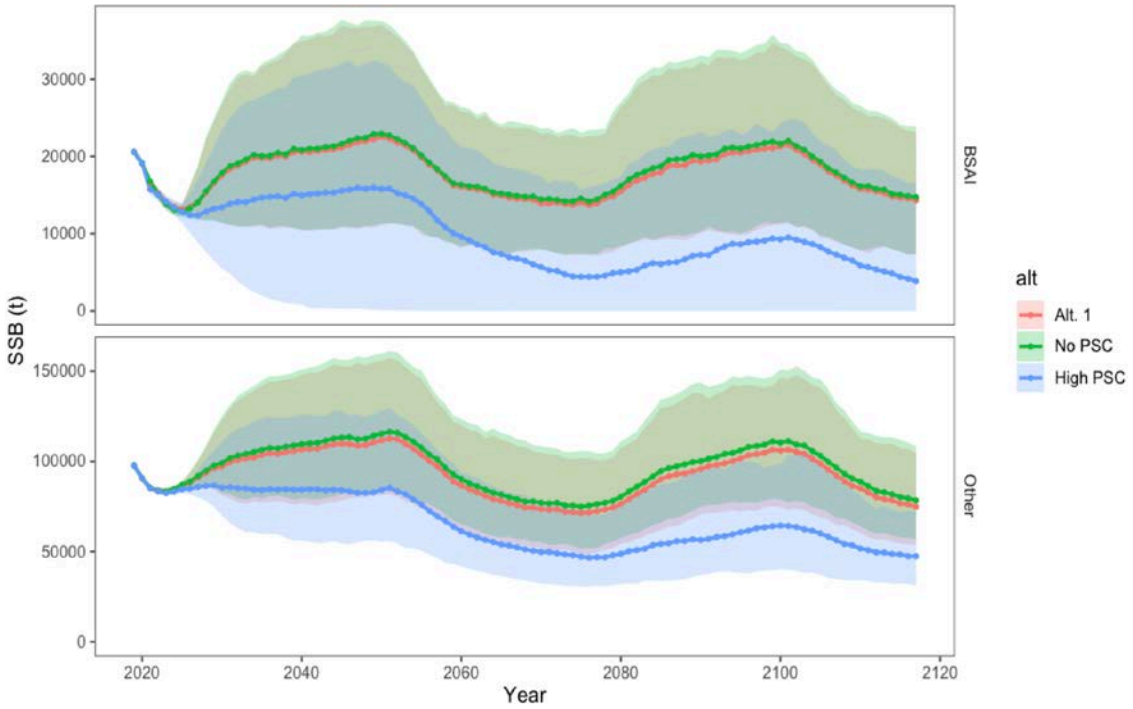
Updated version:

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

MODEL RESULTS

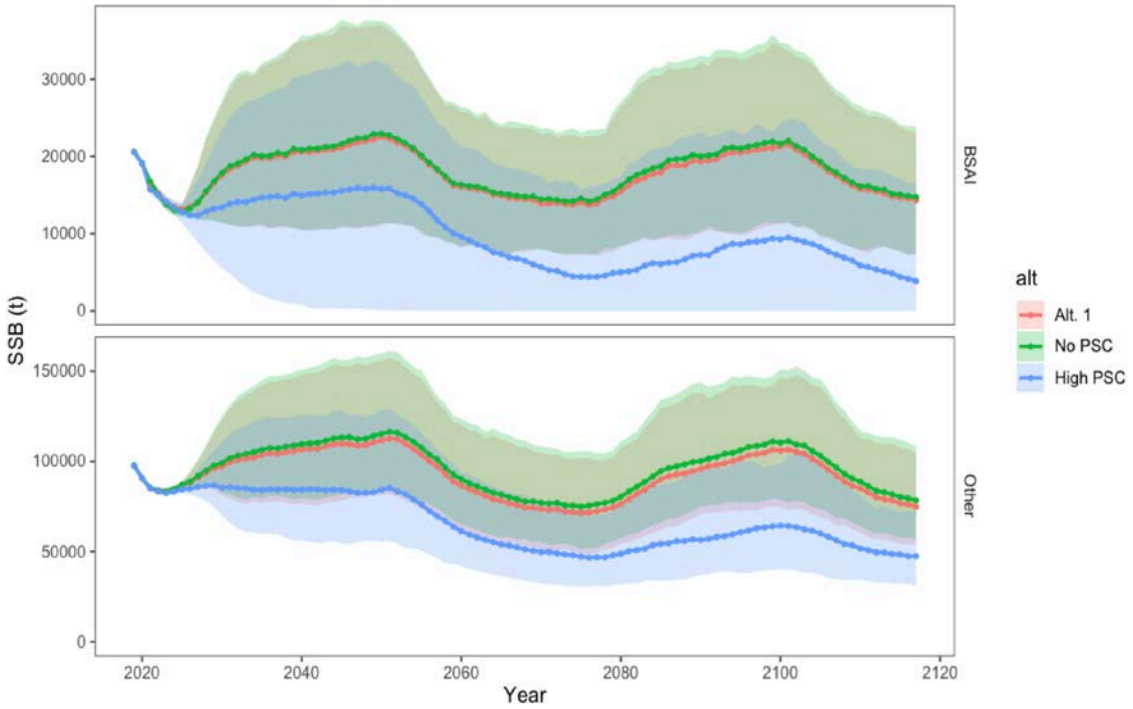
DEMONSTRATIONS

- SSB similar with or without PSC
- SSB declines in both areas with extreme high PSC (outside of range of alternatives)



WHY ISN'T SSB IMPROVED MORE IF NO PSC?

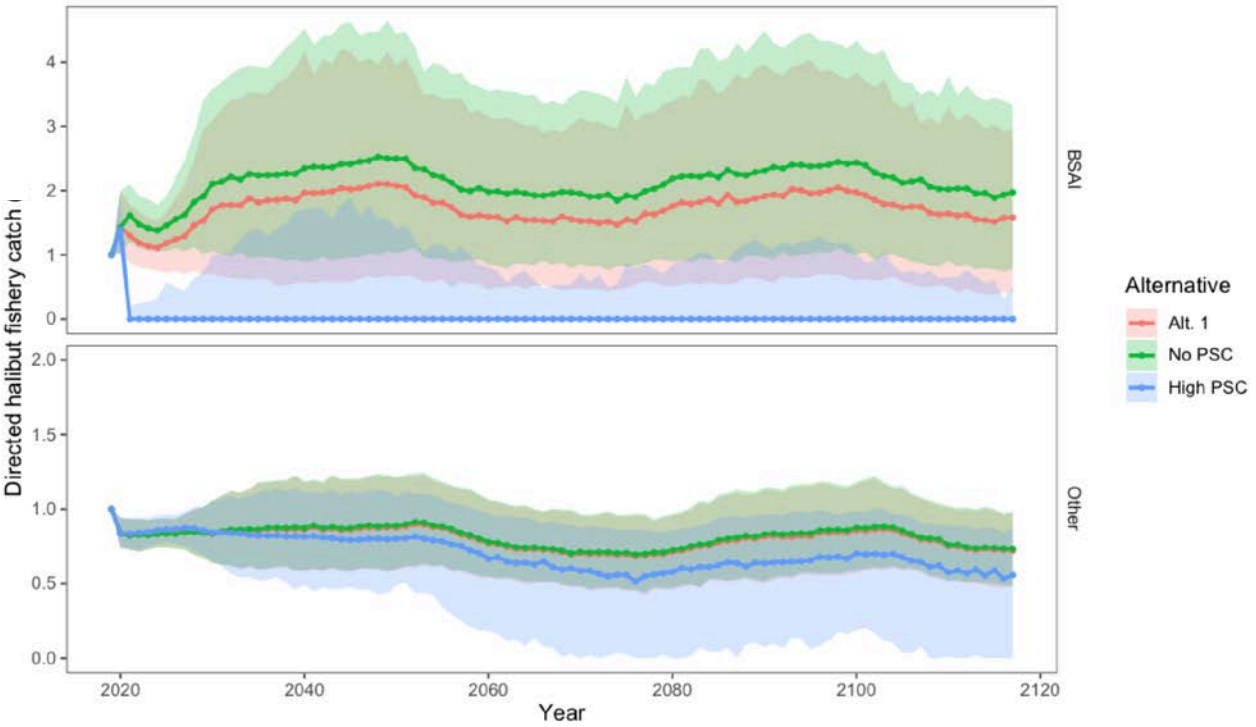
- O26 PSC reallocated to directed fishery
- Some U26 not caught die before reaching maturity
- Some U26 are male
- Net migration to other area (many more fish there)



DEMONSTRATIONS

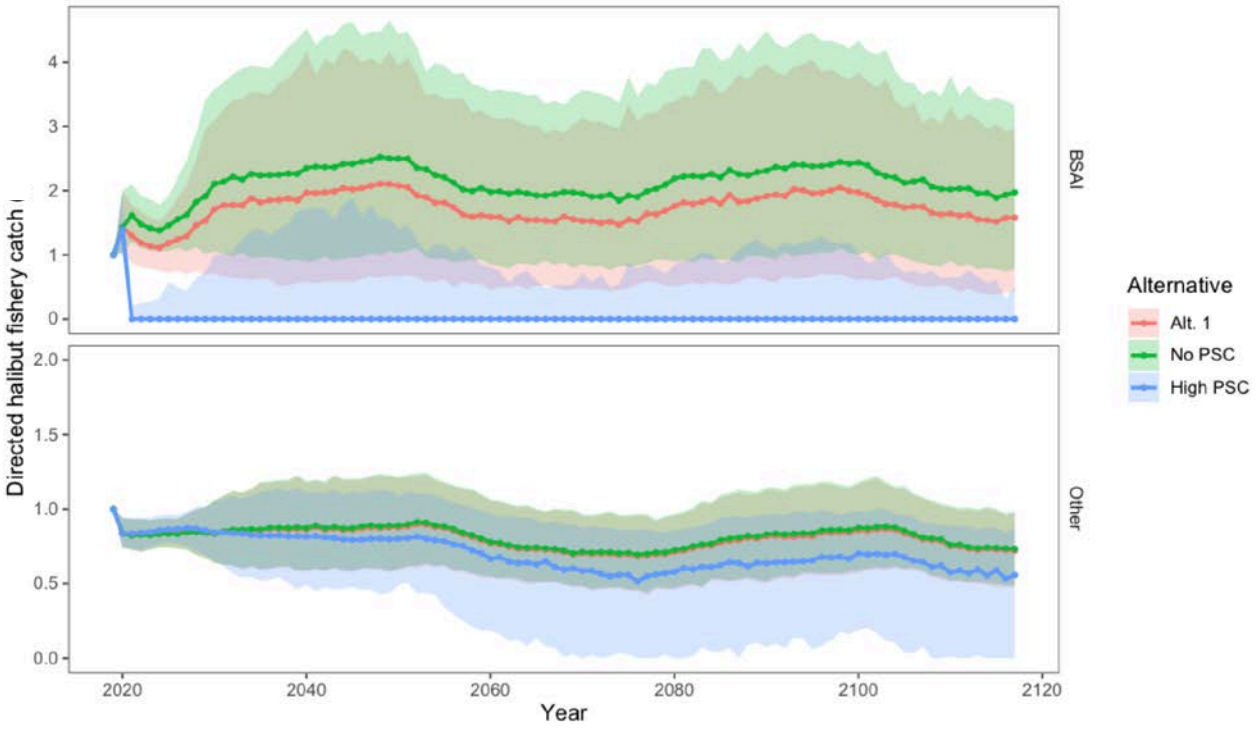
- Halibut fishery catches a little larger with no PSC
- Halibut catches in the BSAI are 0 if PSC limits are very high

(Relative to 2019)



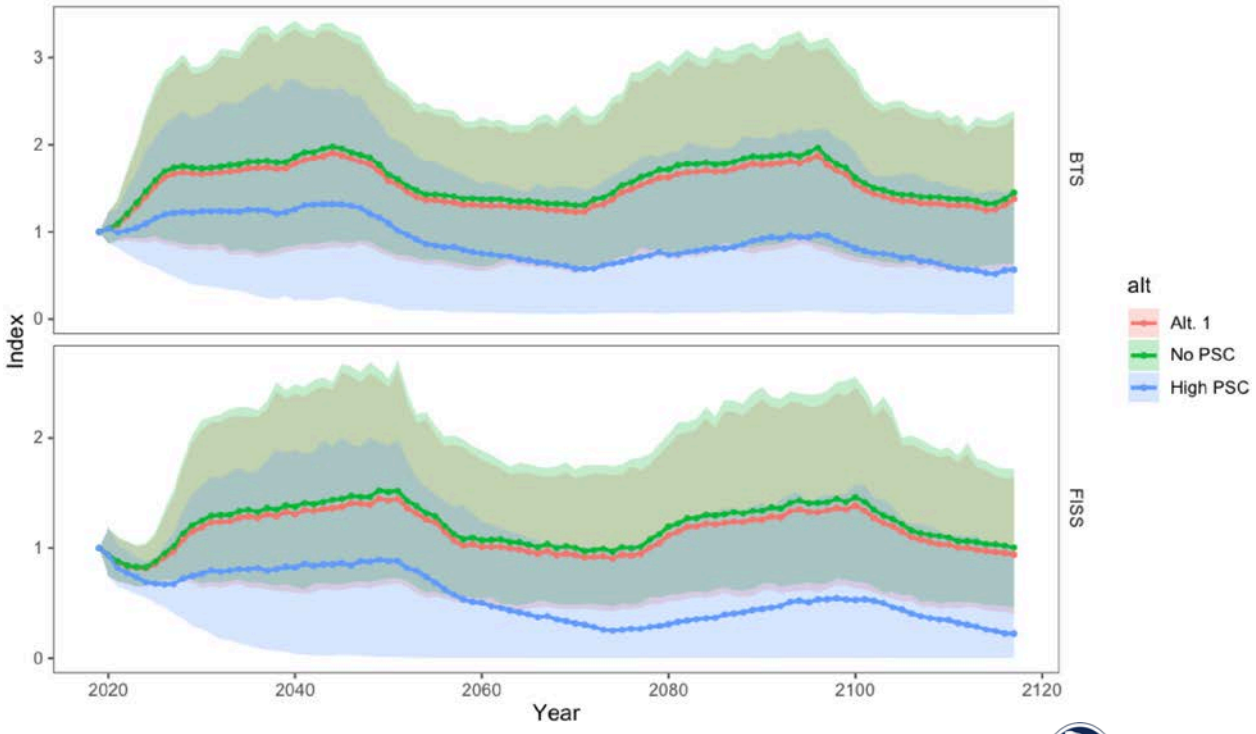
SCALE OF DIRECTED HALIBUT FISHERY CATCHES

- Status quo in projections are centered above 2019 directed catches
- The most uncertainty in model is in scale of directed catches
- This an area for refinement and better accounting for uncertainty and variability in some inputs.



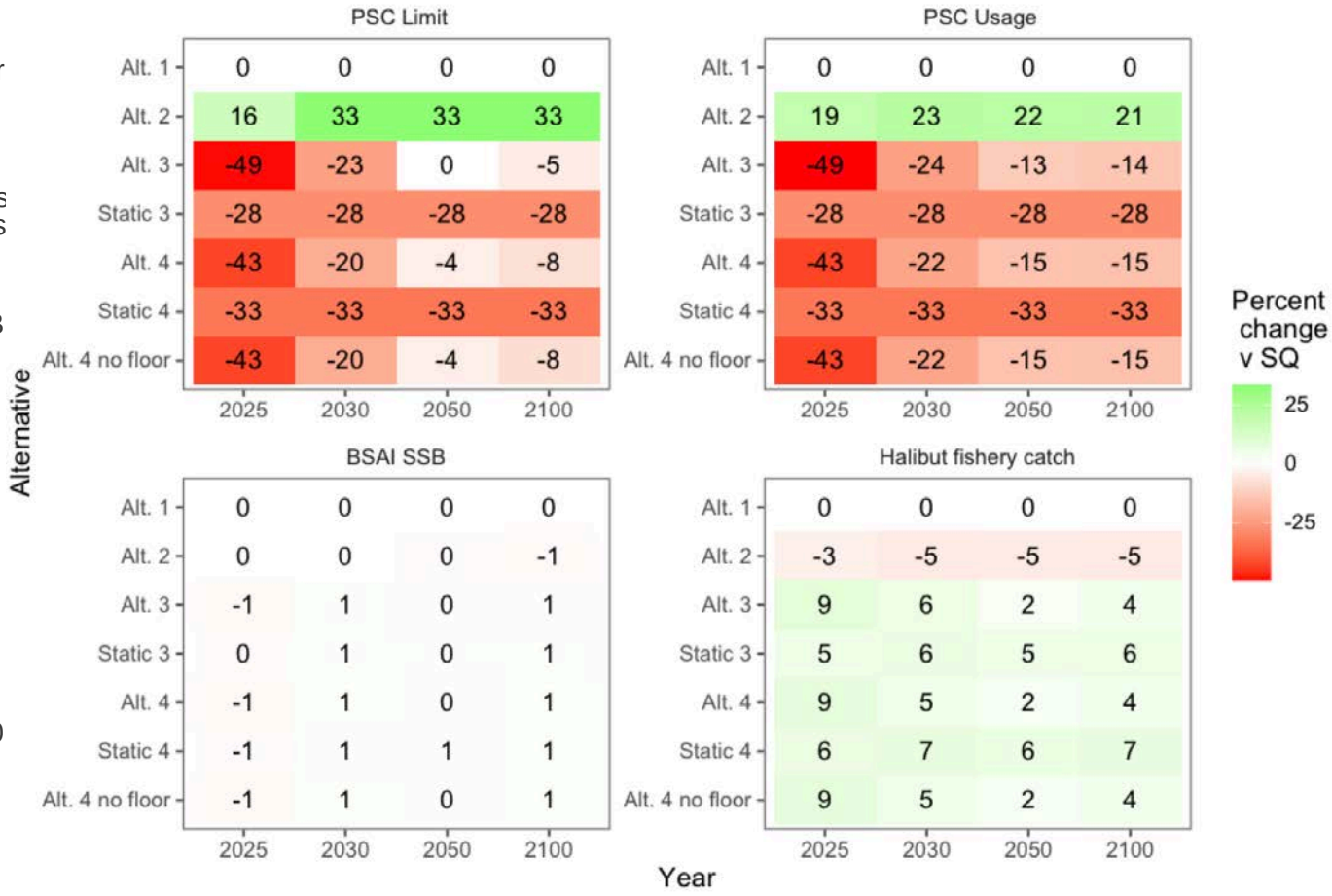
DEMONSTRATIONS

- Indices for no PSC and Alt 1 are similar
- Indices for high PSC are lower



COMPARING ALTERNATIVES

- Alt 2 leads to higher PSC limits and lower halibut catches than for the status quo and other Alts
- Alts 3 & 4 lead to lower PSC limits and slightly higher halibut catches
- No meaningful differences in SSB among alternatives
- PSC limits and use inversely correlated to halibut fishery catches
- Changes in PSC limits are larger than changes in halibut catches
- No effect of implementing a 30:20 control rule for halibut catch limit determination for current alternatives (not shown here)



COMPARING ALTERNATIVES

Without a 30:20 control rule for TCEY

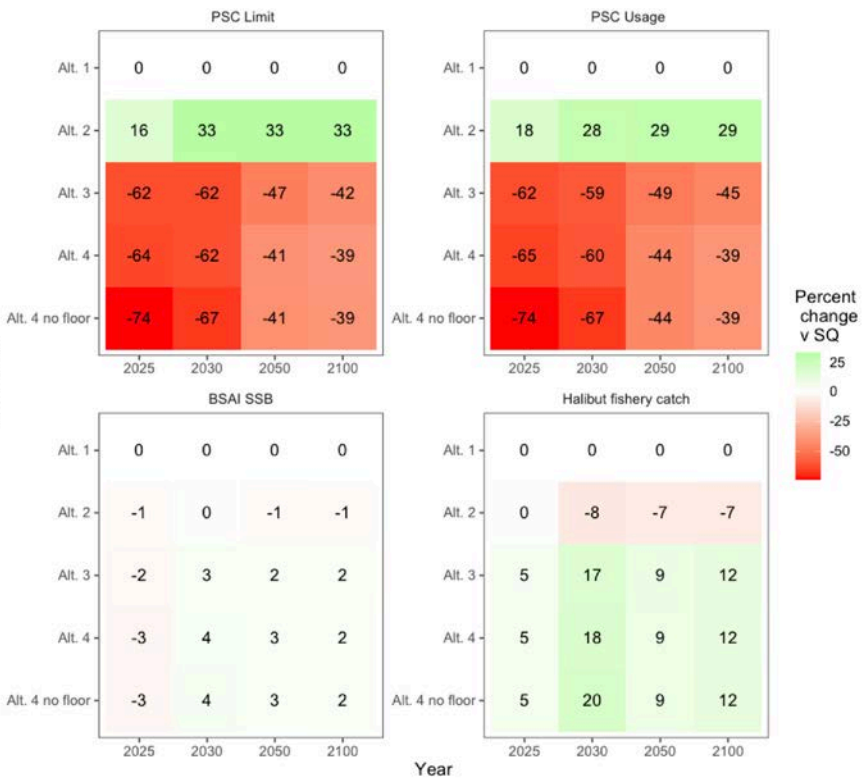
With a 30:20 control rule for TCEY

SENSITIVITY ANALYSES APPX 2

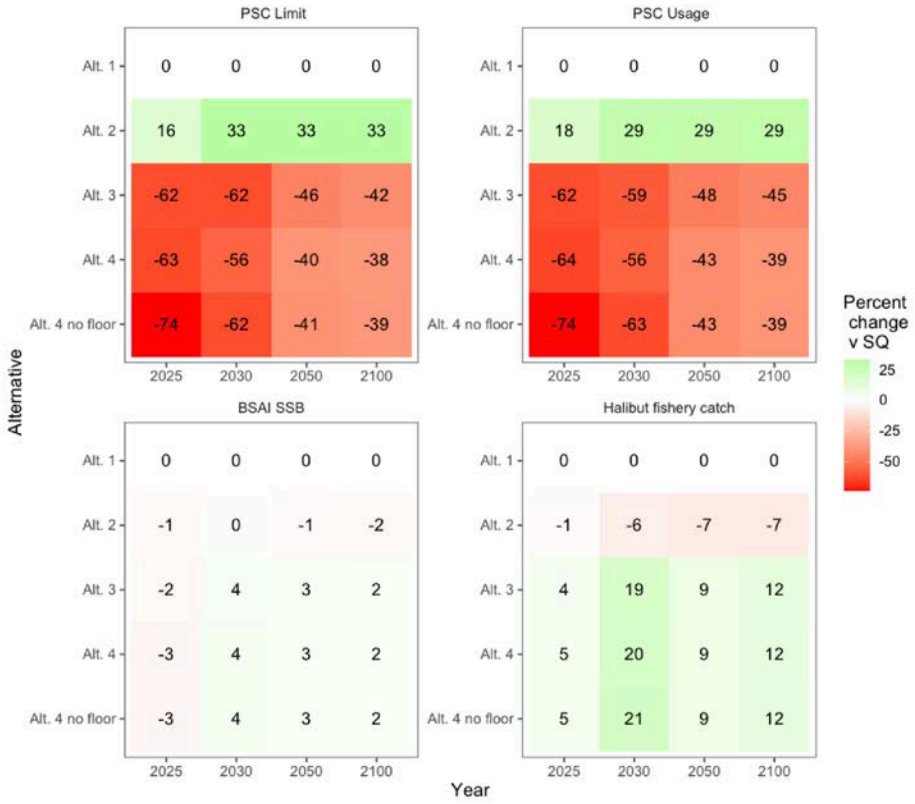
- Low recruitment scenario:
- Extreme low recruitment scenario (recruitment 50% of expected every year)
- PSC use:limit increases at low PSC limits
- Trawl selectivity shifted towards younger or older fish
- Temporal autocorrelation in estimated SSB

LOW RECRUITMENT
NO RECRUITMENT FOR 6 YEARS, FOLLOWED BY ALWAYS LOW PDO

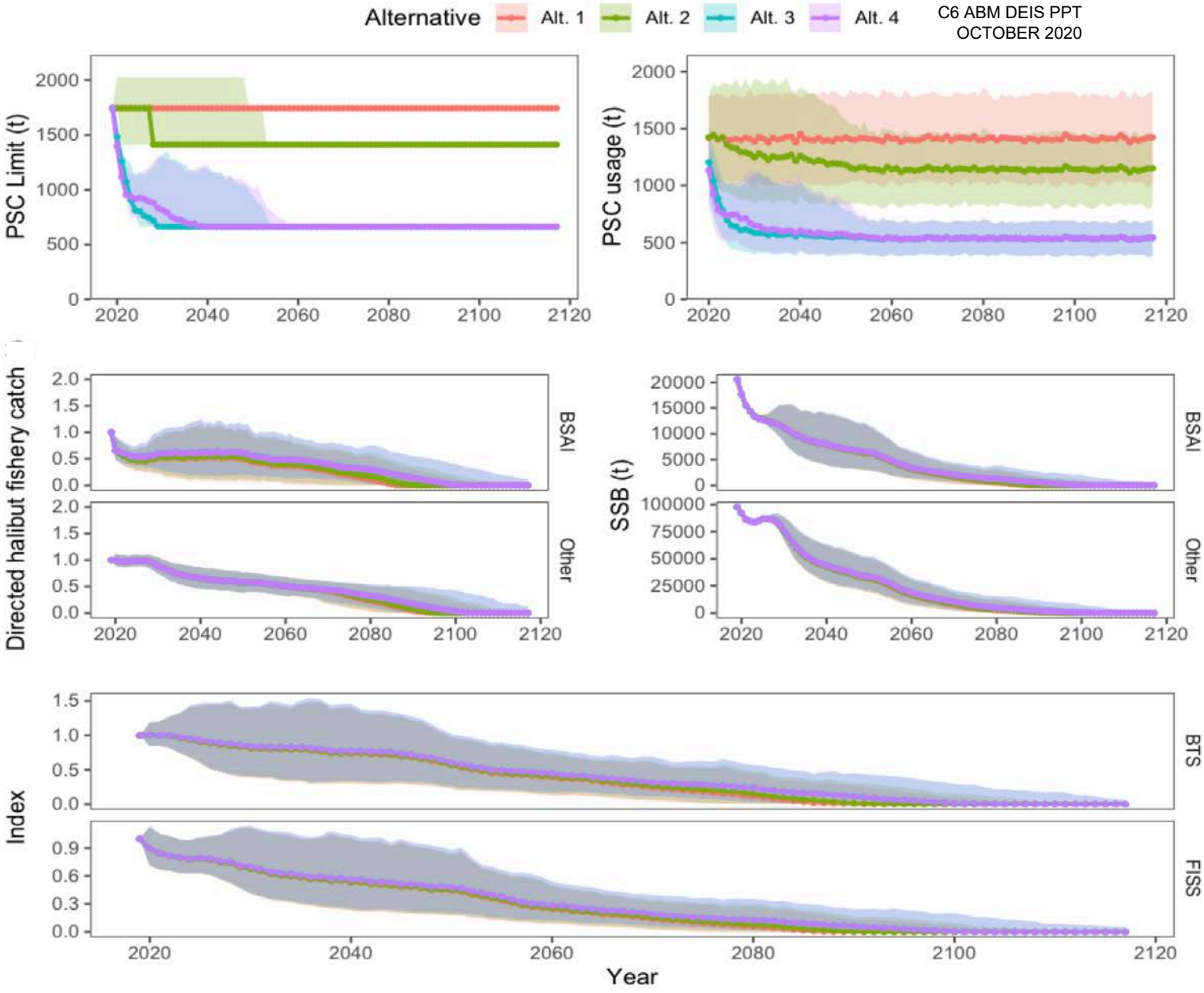
Without a 30:20 control rule for TCEY



With a 30:20 control rule for TCEY

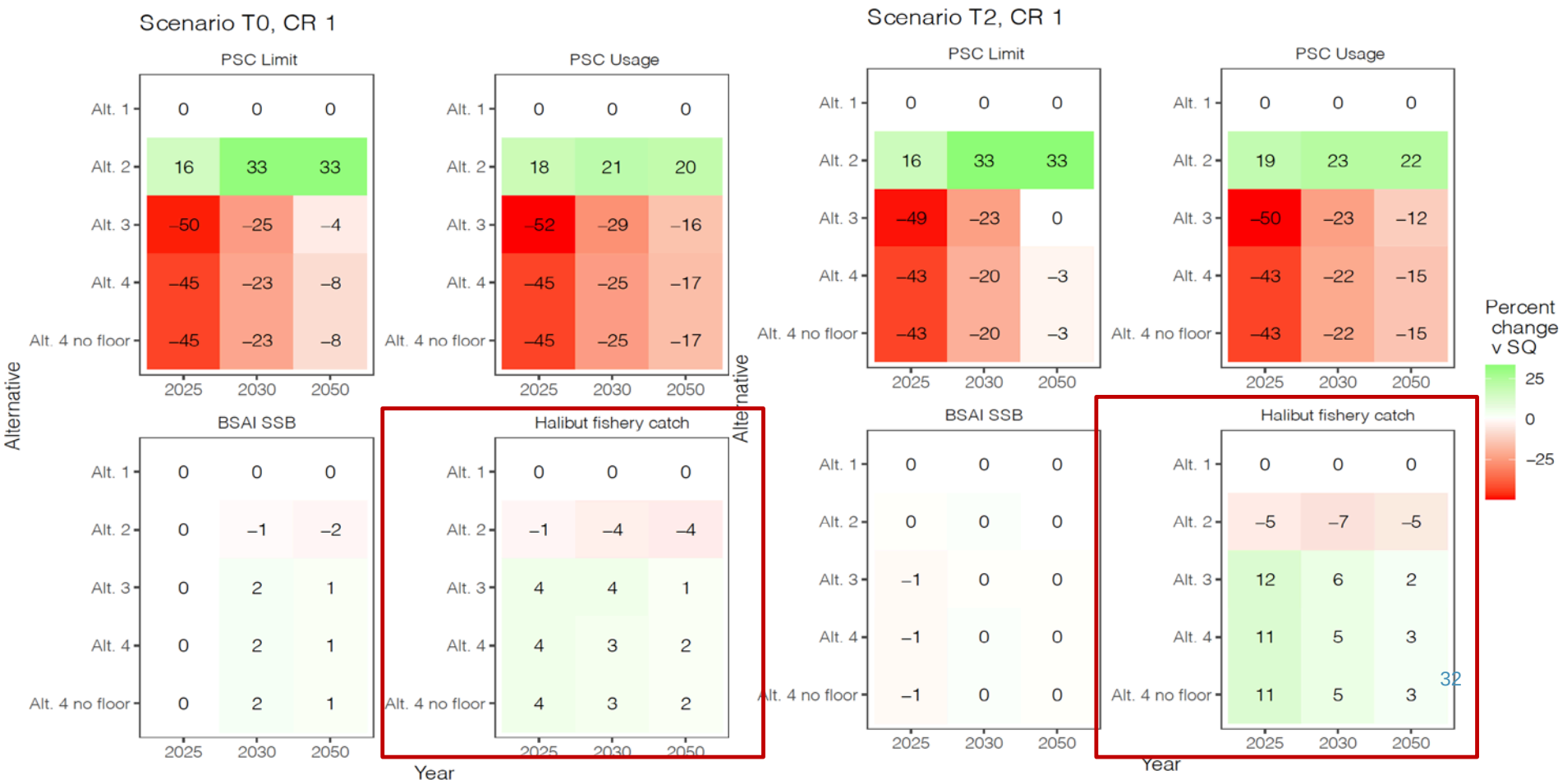


Extreme Low Recruitment 50% of expected recruitment in each year



ALTERNATIVE TRAWL PSC SELECTIVITY

TWO SCENARIOS: TRAWL CATCHES YOUNGER OR OLDER FISH THAN FOR BASE CASE



MAIN POINTS FROM MODELING ANALYSIS

- PSC limits are lowest and directed halibut fishery catches are highest for Alternatives 3 and 4.
- No meaningful differences in SSB trajectories between alternatives for the range of alternatives and expected population dynamics
- Changes from status quo are larger for PSC limits than for directed halibut fishery limits
- Trawl PSC selectivity impacts how much larger changes in PSC limits are in relation to changes in directed halibut fishery limits
- Effects of 30:20 harvest control rules cannot be seen unless the population dynamics are pushed outside of expectations
- Use of dynamic unfished spawning biomass lowers the probability of falling below 30% of unfished due to low recruitment

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FUTURE WORK TO REFINE SCALE OF FUTURE DIRECTED HALIBUT FISHERY CATCHES

- Refine proportion of directed halibut catches in the BSAI with respect to spatial mismatch between definition of IPHC and NPFMC management areas
- Refine and better account for variability in length-age relationship that specifies what bycatch are O26 vs U26
- Further work to represent uncertainty in BSAI trawl PSC selectivity (make sex specific?)

BSAI GROUNDFISH MGMT (3.1 & 3.2)

- Minor changes to groundfish mgmt. background
  - Relationship between A80 species TACs and pollock (Figs 3-2 & 3-6)
  - Trends in key A80 flatfish species (YFS; NRS; FHS); Flatfish Flexibility Exchange
  - PCod as a constraining species apportioned across sectors (Figure 3-9, p.85)
- Updated DMR information; focus on A80 (i.e. Deck Sorting) – Section 3.2.2

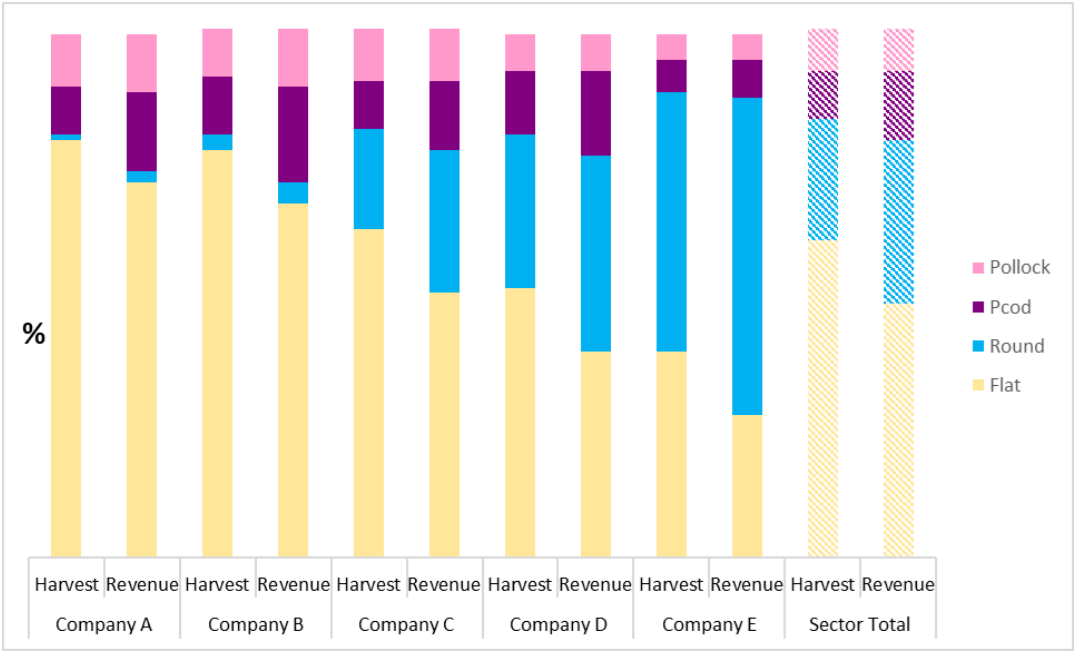
Table 3-7, p.91

Gear	Fishery/Sector	2010-13	2013-16	2016-17	2017-18	2018-19	2019-20	2020-21
Non-CDQ trawl	Alaska plaice		71	66				
	Arrowtooth flounder [1]	76	76	84				
	Atka mackerel	76	77	82				
	Flathead sole	74	73	72				
	Greenland turbot	67	64	82				
	Kamchatka flounder			84				
	Non-pelagic pollock	73	77	81				
	Pelagic pollock	89	88	88				
	Other flatfish [2]	72	71	63				
	Other species [3]	71	71	66				
	Pacific cod	71	71	66				
	Rockfish	81	79	83				
	Rock sole	82	85	86				
	Sablefish	75	75	66				
	Yellowfin sole	81	83	84				
Non-pelagic trawl	Mothership and catcher/processor				85	84	78	75

AMENDMENT 80 FISHERY (3.3)

- Five companies (2020); ownership transition in 2017 (Fig 3-16, p.103)
- Sector varies in reliance on flatfish → different exposure to PSC limit (Fig 3-15, p.102)
- Sector varies in reliance on mothershipping and CDQ revenues, by company (Table 3-14 & Fig 3-19, p.107)
- CDQ Groups are stakeholders in A80, though A80 is a relatively small portion of total CDQ revenues (Fig 3-21, p.122)

Figure 3-15, p.102



AMENDMENT 80 HALIBUT PSC (3.4)

- Absolute and Effective PSC mortality declines post-2015
  - Table 3-19 (p.125) & Fig 3-25 (p.126)
  - Effective mortality = PSC mortality / Halibut Catch
- Deck sorting has become pervasive since 2018 (Table 3-22 & Fig 3-39, p.140-141)
- More hauls made to catch same or fewer groundfish (Table 3-21, p.139; Table 3-13, p.104)
- Groundfish catch/halibut and revenue/halibut diverge by flatfish v. roundfish

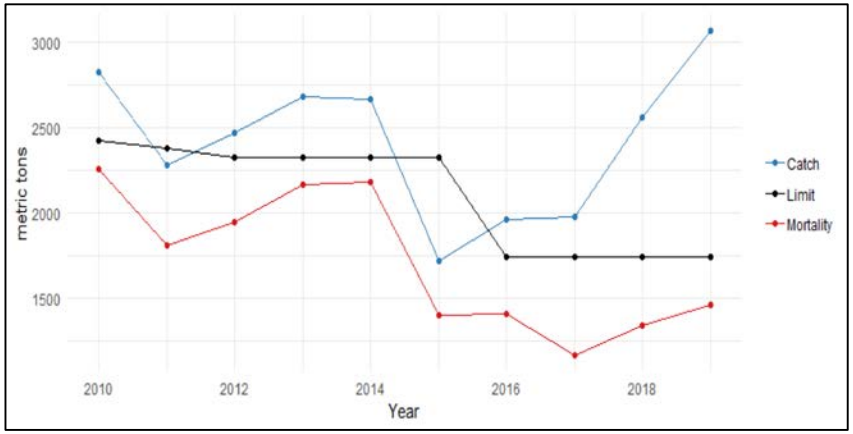


Fig. 3-24, p.125

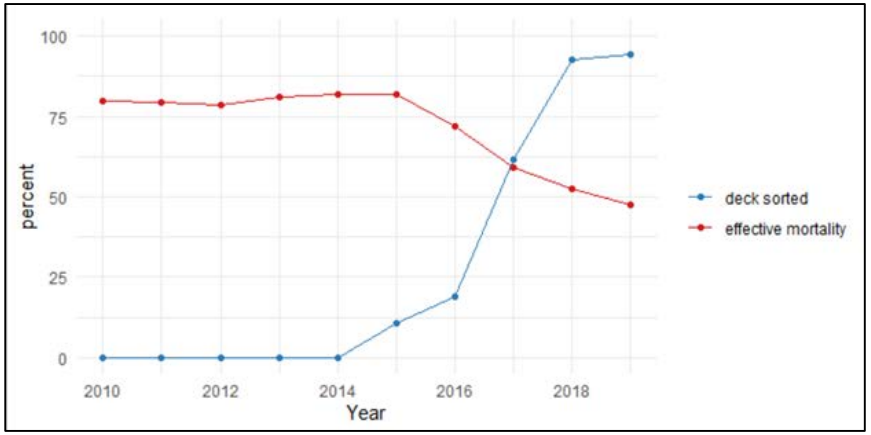
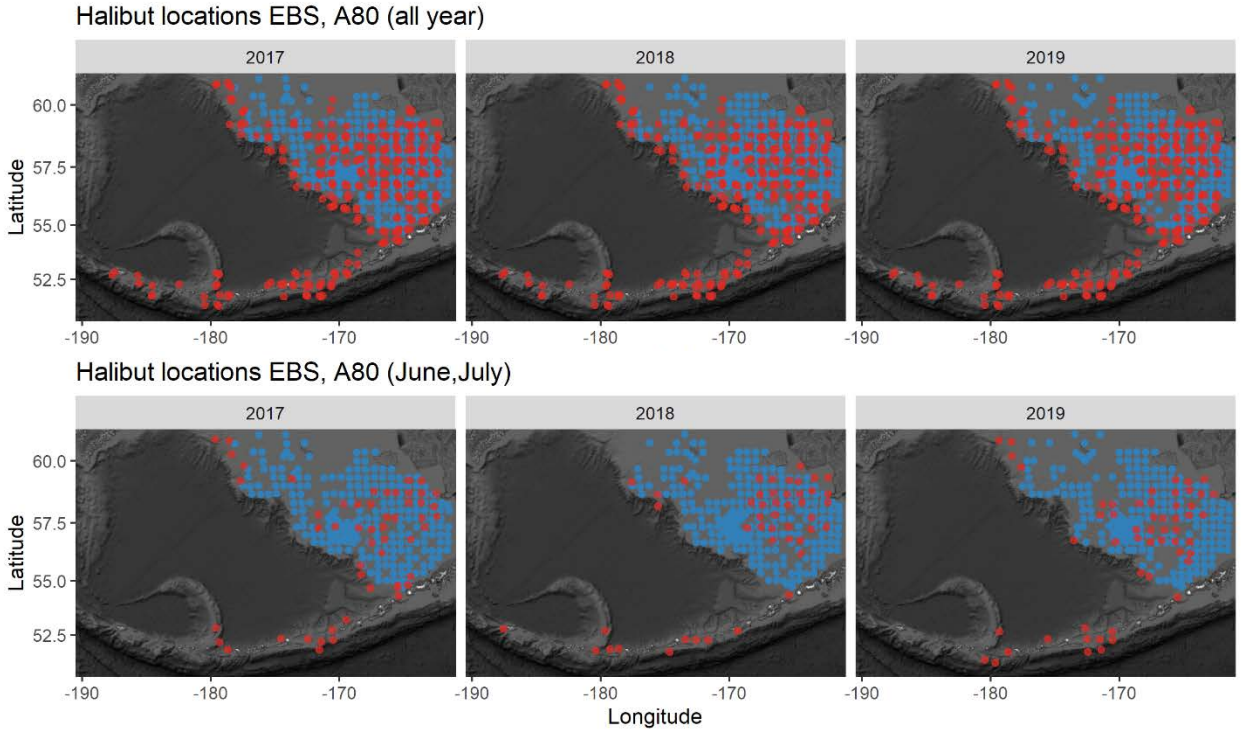


Fig. 3-26, p.126

AMENDMENT 80 HALIBUT PSC (3.4)

- Generally, the EBS Trawl Survey covers the areas where A80 encounters halibut throughout the year (Fig 3-37, p.137), excepting roundfish species (Fig 3-34, p.134)

Figure 3-37, p.137



EBS = BLUE
A80 = RED

MODEL ESTIMATION OF HALIBUT CATCH SHOWN AS GROSS REVENUE

Table 6-14,
Section 6.4.4 errata

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

Table 6*,
Section 6.4.4 errata

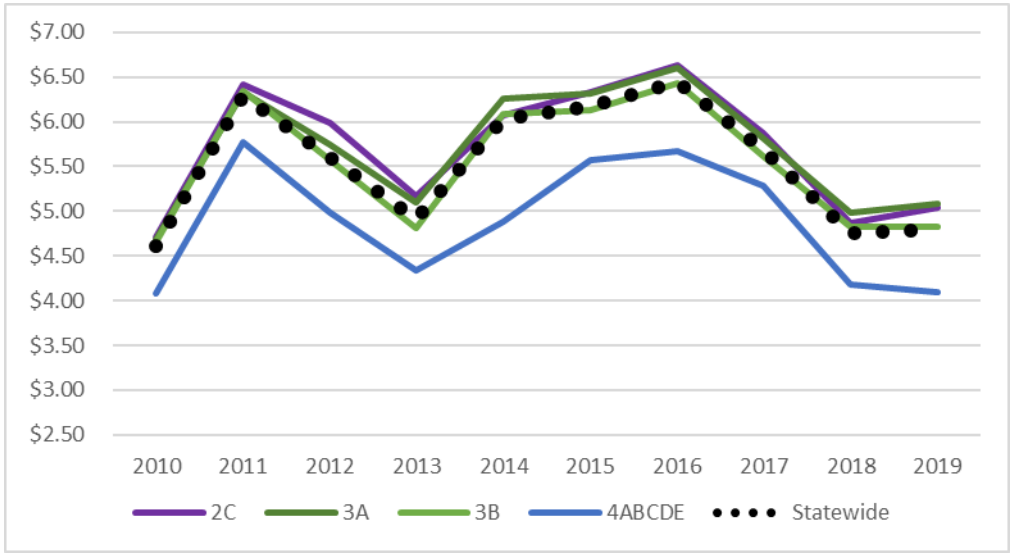
Projected gross ex-vessel value ($million) of BSAI directed halibut based on 2019 average IPHC Area 4 unit values adjusted to 2018 dollars, assuming 100% utilization.

Year	Status quo	Alt. 2	Alt. 3	Static 3	Alt. 4	Static 4	Alt. 4 w/o floor
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

AREA 4 HALIBUT FISHERY (4.4)

- High utilization of catch limit – 2012-2019 Avg. = IFQ: 91%, CDQ 90%
- Annual ex-vessel value (IFQ+CDQ; 2018$) between $16.9M and $24.9M since 2013… 2018 & 2019 lowest (Table 4-3, p.157)
- Ex-vessel unit value has declined since 2016 and is lowest in Area 4 (Figure 4-8)
- High likelihood of continued low or decreasing $/lb. in the near term

Figure 4-8, p.158

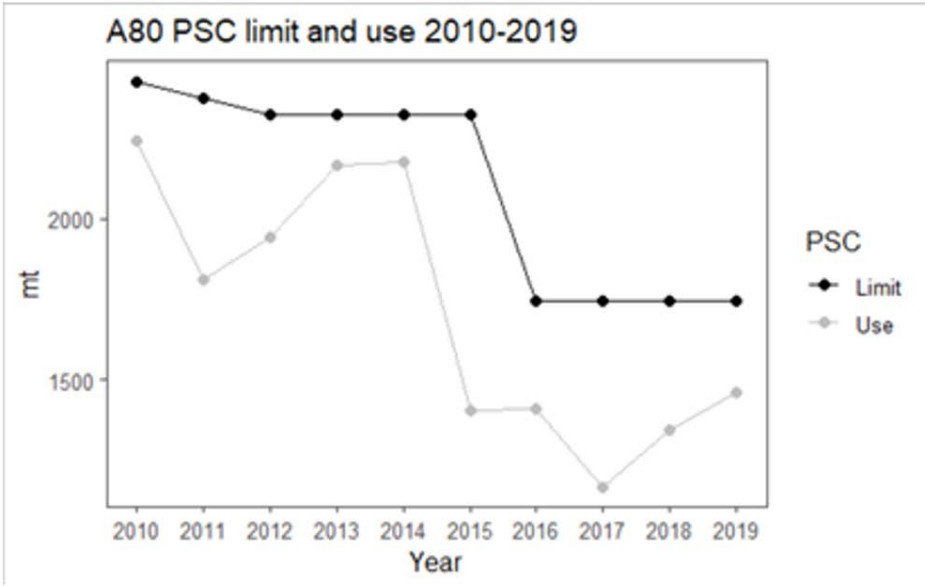


GROUNDFISH REVENUE IMPACT ESTIMATION (P. 216-231 DEIS)

General approach

- A80 haul level data (PSC, groundfish catch, wholesale value)
- Randomly resample hauls without replacement until reaching PSC limit or groundfish catch limit
- Sum wholesale values to estimate annual revenue
- 500 runs of 6 separate “scenarios” for each PSC limit specified in alternatives

GROUNDFISH REVENUE IMPACT ESTIMATION

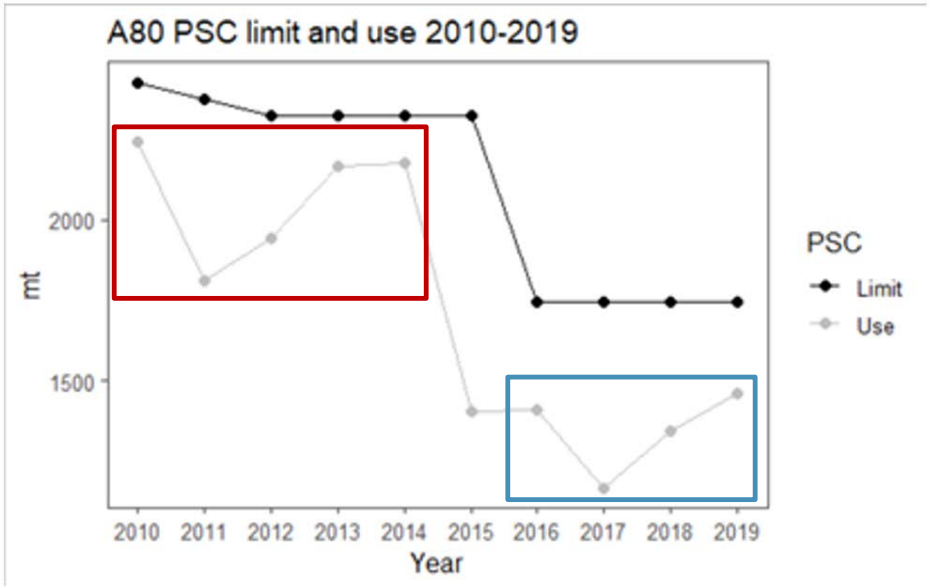


PSC limits and PSC use (in metric tons) for the A80 sector 2010-2019.

Figure 6-17, p. 219

PSC limits and use varied over the last 10 years

GROUNDFISH REVENUE IMPACT ESTIMATION



PSC limits and PSC use (in metric tons) for the A80 sector 2010-2019.
Figure 6-17, p. 219

PSC limits and use varied over the last 10 years

Subset into three datasets

- high PSC use years (2010-2014)
- all years (2010-2019, excluding 2015)
- low PSC use years (2016-2019)

GROUNDFISH REVENUE IMPACT ESTIMATION

- Separate runs with 2 groundfish catch limits
  - 310,000 mt (maximum all years)
  - 290,000 mt (maximum in most recent years)

Table 6-9 **Annual totals of the underlying haul-by-haul data used in the revenue estimates.**

Year	Groundfish catch (mt)	Wholesale value ($ 2018)	PSC (mt)	Hauls
2010	305,241	323,870,339	2,254	12,507
2011	302,157	385,153,549	1,810	11,163
2012	307,406	397,530,330	1,944	10,892
2013	306,775	307,582,132	2,166	11,338
2014	308,022	316,928,372	2,178	11,702
2015	Not used due to reporting structure			
2016	298,449	306,505,259	1,412	14,167
2017	278,771	359,357,539	1,167	13,821
2018	290,173	379,443,654	1,343	15,908
2019	288,302	335,260,125	1,458	16,574

p. 217

GROUNDFISH REVENUE IMPACT ESTIMATION

- 6 “scenarios”

  3 time periods or datasets x 2 catch limits

  high PSC use years (2010-2014)
  all years (2010-2019, excluding 2015)
  low PSC use years (2016-2019)

  310,000 mt (max catch all years)
  290,000 mt (max in most recent years)

- 7 PSC limits defined in Alternatives

Table 6-10 PSC limits used in revenue estimates and the associated Alternatives and Elements.

Alternative	Element	PSC limit
1	Status Quo	
2	Starting Point	1,745
3, 4	Ceiling	
2	Floor	1,412
2	Step	2,025
2	Ceiling	2,325
3	Starting Point	1,255
4	Starting Point	1,167
3, 4	Floor	664

p. 218

GROUNDFISH REVENUE IMPACT ESTIMATION

Estimates from these 7 PSC limits can be cross referenced with the PSC limits estimated by the operating model to compare across alternatives

Table 6-10 PSC limits used in revenue estimates

Alternative	Element	PSC limit
1	Status Quo	
2	Starting Point	1,745
3, 4	Ceiling	
2	Floor	1,412
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3, 4	Floor	664

p. 218

Table 6-8 Comparison of Pacific halibut A80 PSC limits (t) by alternative for median values of the projection simulations from 2021-2030. Grey shaded values represent the ceiling for that alternative. None of the Alternatives as projected out in median values for these years have reached their floor. Bolded values are greater than the status quo PSC limit; red indicates a PSC limit less than status quo.

Year	Status quo (Alt. 1)	Alt. 2	Alt. 3	Alt. 4	Alt. 4 w/o floor
2021	*1,745*	1,745	1,261	1,117	1,117
2022	*1,745*	**2,025**	1,072	956	956
2023	*1,745*	**2,025**	911	945	945
2024	*1,745*	**2,025**	849	939	939
2025	*1,745*	**2,025**	890	982	982
2026	*1,745*	**2,325**	930	1,047	1,047
2027	*1,745*	**2,325**	1,000	1,126	1,126
2028	*1,745*	**2,325**	1,097	1,234	1,234
2029	*1,745*	**2,325**	1,214	1,329	1,329
2030	*1,745*	**2,325**	1,336	1,386	1,386

p. 217

CONTEXT FOR RESULTS

- Revenue estimates should be read for comparison across alternatives
  - Results are not stand-alone predictions of future A80 revenue under each PSC limit. Harvesters are expected to make strategic choices that are different from the randomized selection of hauls used in this analysis.
- Results are aggregated at the A80 sector level
  - The distribution of impacts across companies and vessels will differ based on many factors, most notably fishing portfolio
- Estimates are based on actual fishery data
  - Only reflects the environmental conditions and fishing behavior that occurred during the past 10 years
  - Does not estimate outcomes under a changed environment or management regime, future TACs or market conditions, or incorporate potential future fishing adaptations or operational changes
- No predetermined relationship between PSC use and PSC limit
  - Implicit assumption that 100% of PSC use is possible (and is reached unless groundfish limit is reached first)
- Random selection of hauls
  - Hauls are selected based on their prevalence in the underlying distribution
  - Less likely to include the most extreme examples such as a year in which the fleet has difficulty avoiding halibut and accumulates PSC at a more rapid rate
  - Results center around the mean
  - Does not assume specific fishing strategy or operational response

RESULTS

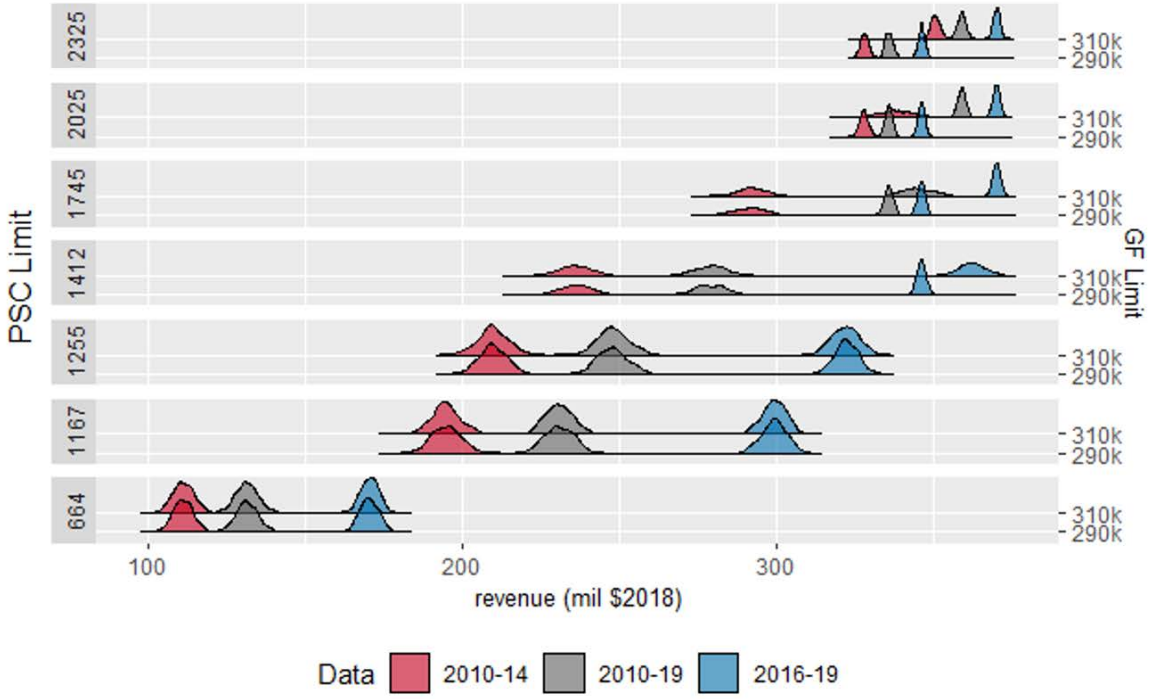

Figure 6-22 **Distribution of Amendment 80 sector gross wholesale revenue estimates under various PSC Limits (2018$)**

- Generally, lower PSC limits tend to result in reduced groundfish revenue

p. 226

RESULTS

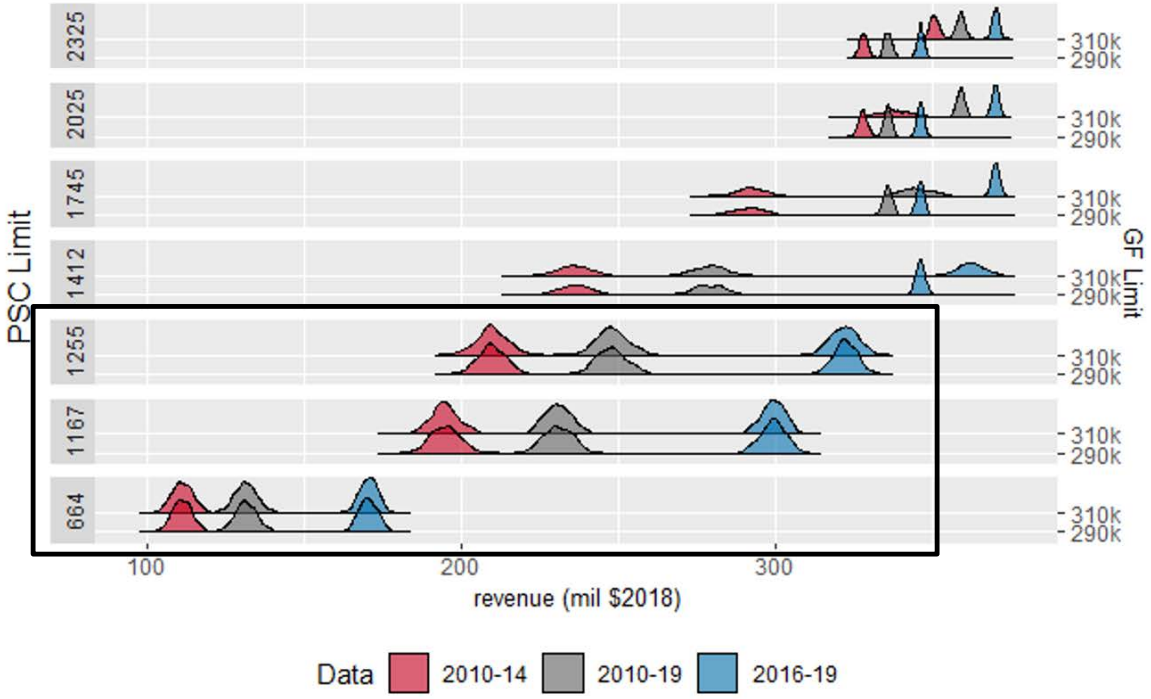

Figure 6-22 **Distribution of Amendment 80 sector gross wholesale revenue estimates under various PSC Limits (2018$)**

- Revenue constrained by PSC at low PSC limits
  - Similar revenue estimates under both groundfish limits

p. 226

RESULTS

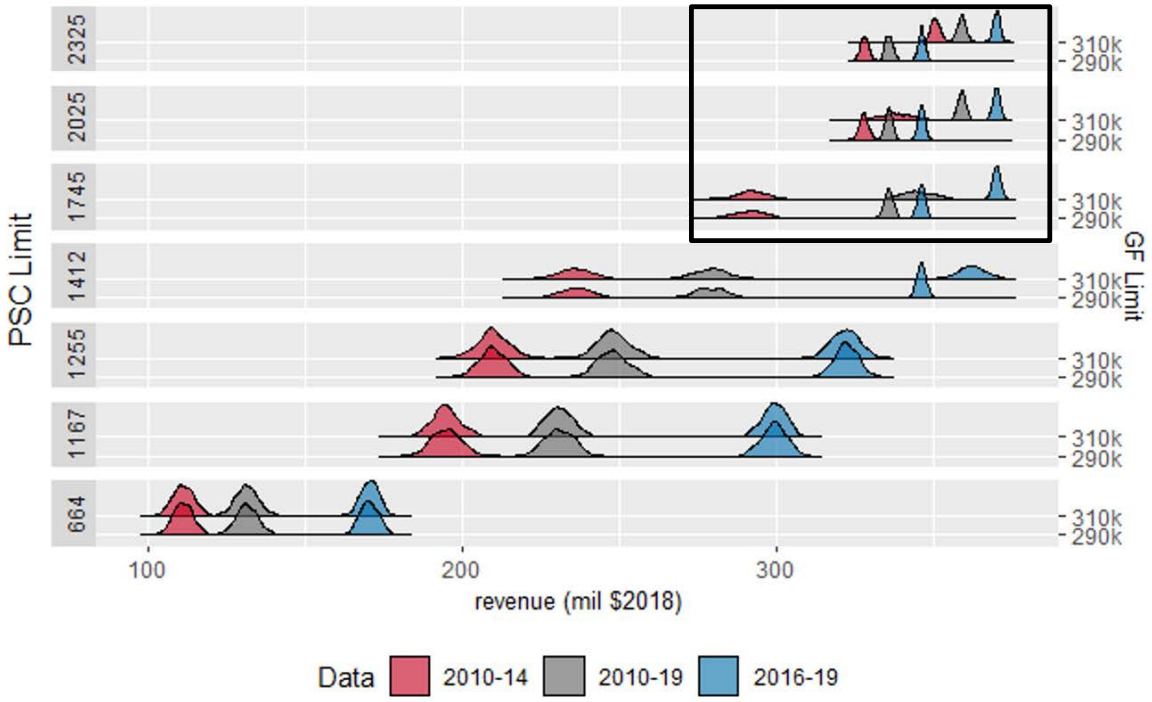

Figure 6-22 **Distribution of Amendment 80 sector gross wholesale revenue estimates under various PSC Limits (2018$)**

- Revenue constrained by groundfish limits at higher PSC limits
  - Revenue estimates vary with groundfish limit

p. 226

RESULTS

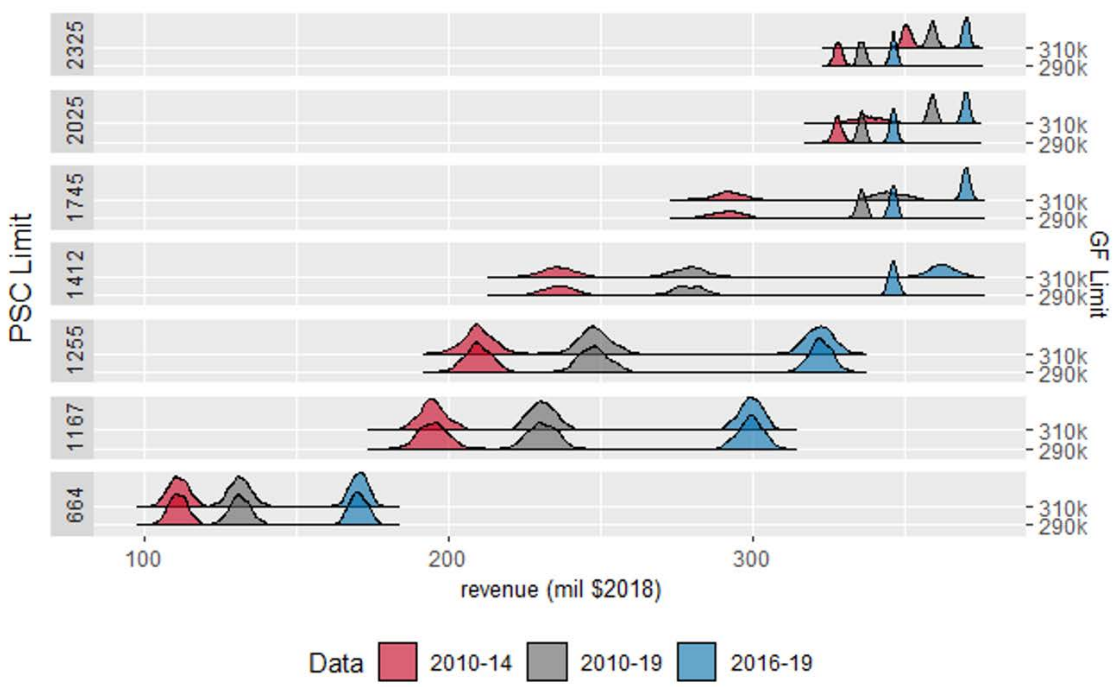

Figure 6-22 **Distribution of Amendment 80 sector gross wholesale revenue estimates under various PSC Limits (2018$)**

p. 226

- Revenue estimates are lower under the high PSC use and higher under low PSC use dataset
- Large range of potential revenue for each PSC limit based on high or low PSC use
- Particularly in mid range PSC limits with more variability across runs as to which constraint will bind revenue and thus a wider spread in revenue outcomes
- The range of estimates under each dataset (years sampled) should be considered when comparing alternatives

RESULTS

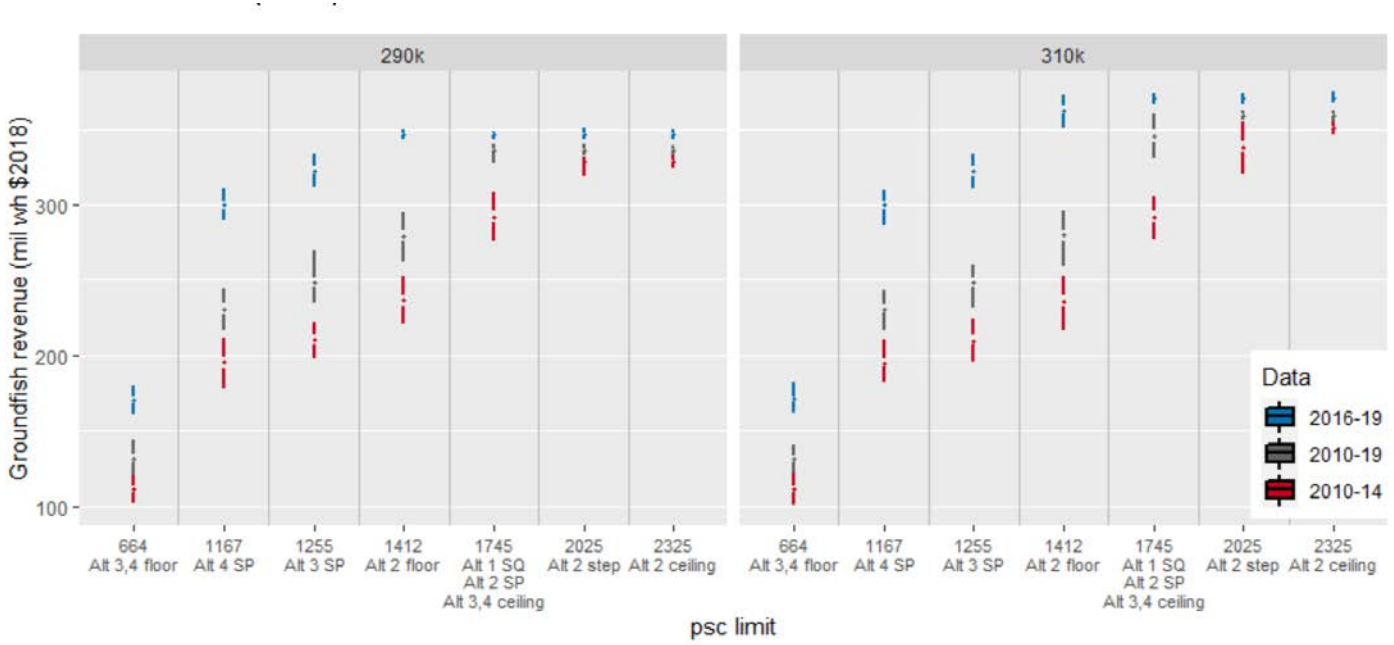

Figure 6-23 **Estimated Amendment 80 sector gross wholesale revenue (2018$) associated with PSC limits specified in Alternatives**

p. 226

SOCIAL IMPACT ASSESSMENT (APPENDIX 1)

- Overview
  - General changes/updates to the analysis since last Council review.
  - Portions of the analysis that are largely unchanged (halibut communities).
  - Changes to the analysis with shift in groundfish focus to Amendment 80.
  - Findings largely unchanged since last review (halibut communities)
  - Findings revised since last review (Amendment 80 communities)

- Findings summary in DEIS Section 6.5, Social and Environmental Justice

SIA: GENERAL CHANGES/UPDATES TO ANALYSIS SINCE LAST COUNCIL REVIEW

- Additional sources added to discussion of available LK and TK (Section 4.5.6).
- Quantitative measures of fishing engagement and dependency updated with 2019 data (Section 5 and throughout the document).
  - Amendment 80 fishery (Section 5.1)
  - Commercial halibut CV fishery (Section 5.2)
  - Halibut SBPRs accepting BSAI/Area halibut deliveries (Section 5.3)
  - Subsistence halibut fishery (Section 5.4 and multiple Sections 6.x.6).
  - Sport halibut fishery (Section 5.5).
- School enrollment data added and income data updated in regional demographic discussions (CDQ regional discussions, Sections 6.x.3).
- Fisheries tax revenue and total general fund revenue data 2010-2019 added for Unalaska (Section 7.1.1.1) as well as Atka and Adak (Section 7.1.1.2).

SIA: PORTIONS OF THE ANALYSIS THAT ARE LARGELY UNCHANGED (HALIBUT COMMUNITIES)

- Section 6 Regional and Community Context of the Fisheries
  - Discussion organized by CDQ region, with common elements
    - Historical overview
      - Time depth of halibut fishery engagement (e.g., APICDA region archaeological evidence)
      - Community institutional summary, including federally recognized tribes
      - Community historical summaries
    - Demographics, including Alaska Native, minority, and low-income population data
    - Local Economy
      - Engagement in the commercial halibut fishery by community
      - Engagement in the subsistence halibut fishery by community
      - Engagement in the Amendment 80 fishery by community
      - CDQ group direct BSAI/Area 4 halibut and/or Amendment 80 sector fisheries

SIA: CHANGES TO ANALYSIS WITH SHIFT IN GROUNDFISH FOCUS TO AMENDMENT 80

- Changes in screening criteria for inclusion of BSAI groundfish communities (Section 4.3.1).
  - FBT/FRLT data used in initial screening to define potential universe of communities
  - Eliminated 8 Alaska groundfish communities that were in previous analysis.
  - Added Togiak to the analysis (and Adak, Atka, Sand Point, and Unalaska/Dutch Harbor remained).
- Changes to section on data that would be useful but unavailable (Section 4.5)
  - Product transfer report data added as new subsection (Section 4.5.1)
  - Amendment 80 port call data added to discussion of support service sector data (Section 4.5.4)
- Discussion of CP product transfer locations across the BSAI region and specific to the APICDA region added to Section 6.1.7, along with FBT and FRLT revenue data for identified groundfish communities.
  - Region-specific discussions also added for CBSFA (Section 6.2.7) and BBEDC (Section 6.5.4) regions.

SIA: CHANGES TO ANALYSIS RELATED TO AMENDMENT 80 FOCUS (CONT.)

- CDQ ownership interest in Amendment 80 vessels updated (Section 6.4.8).
- Amendment 80 vessel homeport and LLP license data (Section 6.8) and EDR-derived crew information (Sections 6.8 and 10.2) updated with 2019 data.
- New section added containing detailed information on State of Alaska shared fishery tax revenues by tax type and fiscal year 2010-2019 (Section 10.4), broken out by program administrative entity:
  - Department of Revenue administered program (Section 10.4.1)
  - Department of Commerce, Community, and Economic Development administered program (Section 10.4.2)

SIA: FINDINGS LARGELY UNCHANGED SINCE LAST REVIEW (HALIBUT COMMUNITIES)

- Potential differential distribution of impacts to communities engaged in the commercial halibut fishery (Section 7.2.3)
  - Alaska communities, including potential Environmental Justice concerns for substantially engaged predominantly Alaska Native communities, including, but not limited to those with high proportions of their populations considered low-income (Section 7.2.3.1)
  - PNW communities (Section 7.2.3.2)
- Potential impacts to BSAI communities engaged in the subsistence halibut fishery (Section 7.2.4)
- Potential Impacts to BSAI communities engaged in the sport halibut fishery (Section 7.2.5)
- Potential cumulative small/rural community and cultural context issues (Section 7.2.6)

SIA: FINDINGS REVISED SINCE LAST REVIEW (AMENDMENT 80 COMMUNITIES)

- Potential adverse impacts of proposed alternatives to the Amendment 80 sector itself would largely accrue to the Seattle MSA and the PNW in general.
  - Magnitude of impacts would vary by company, based on fishing portfolios, business practices/decisions, and adaptive behaviors.
- Crew aboard Amendment 80 vessels are recruited from multiple states; demographics suggest Environmental Justice potentially of concern if CP crew experience high and adverse impacts.

SIA: FINDINGS REVISED SINCE LAST REVIEW (AMENDMENT 80 COMMUNITIES), CONT.

- Among Alaska communities:
  - Unalaska/Dutch Harbor, Atka, and Adak are the most vulnerable to adverse impacts from potential reductions in Amendment 80 product transfers/port calls under the proposed action alternatives. Potential for Environmental Justice concerns identified for Atka.
  - Impacts to Togiak or Sand Point (the other two AK communities selected by screening criteria) would likely be minor/negligible.
    - St. Paul averaged the 4th highest number of Amendment 80 port calls but adverse impacts via this pathway would likely be negligible under any of the proposed action alternatives.

SIA: FINDINGS REVISED SINCE LAST REVIEW (AMENDMENT 80 COMMUNITIES), CONT.

- Among Alaska CDQ groups:
  - 4 of the 6 CDQ groups typically lease multi-species groundfish quota in whole or in part to Amendment 80 industry partners.
  - Another CDQ group holds partial ownership interest in multiple Amendment 80 vessels.
  - Potential risks to returns from these activities under any of the proposed alternatives would depend on fishing portfolios, business practices, and adaptive behaviors of the individual Amendment 80 partners.

SIA: NEXT STEPS

- More alternative-specific detail will be provided following the selection of a preliminary preferred alternative.
- Include National Standard 4 in the Regulatory Context section.
  - Foundational data for NS-4 analysis already included in the SIA.

PERFORMANCE METRICS

- Developed through public Council/stakeholder process to evaluate how well each alternative addresses individual objectives (which were derived for performance metric evaluation)
  - Halibut PSC limits should be indexed to halibut abundance
  - There should be flexibility provided to avoid unnecessarily constraining the groundfish fishery particularly when halibut abundance is high
  - Provide for some stability in PSC limits on an inter-annual basis
  - Provide for directed halibut fishing operations in the Bering Sea
  - Halibut spawning stock biomass should be protected especially at lower levels of abundance

PERFORMANCE METRICS SECTION 6.3.2 P201

- Tables 6-3 through 6-7 (p202-204) and in the Executive Summary
- Supplemental errata contains revised tables
- Only revisions due to catch correction were to metrics associated with directed fishery objective
- Previous revision to Table 6-6 modified the relative ranking; correcting for catch error did not affect new ranking

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 >=15%) changed (year 2019 is included in the calculation)

DEIS version (p.202)

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
	Lower is better	*Lower is better*	*Lower is better*	*Lower is better*
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

Updated version

	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
	Lower is better	*Lower is better*	*Lower is better*	*Lower is better*
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
	Lower is better	*Lower is better*	*Lower is better*	*Lower is better*
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
	Lower is better	*Lower is better*	*Lower is better*	*Lower is better*
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*
BSAI Directed fishery / BSAI TCEY	Alt_1	0.771	0.785	0.801
	Alt_2	0.751	0.761	0.78
	Alt_3	**0.842**	**0.832**	0.835
	Alt_4	0.838	0.825	0.835
	Alt_4 (no floor)	0.838	0.825	**0.836**

Updated version

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

TABLE ES-9 CHANGE IN RELATIVE SHADING TO INDICATE REVISED RANKING

DEIS version

	Probability catch limit lower 2021-2040	Probability catch limit lower 2041-2050	AAV 2021-2040	AAV next 2041-2050	Time >15% first 2021-2040	Time >15% next 2041-2050	% TCEY to directed fishery 2040
Alt_1							
Alt. 2							
Alt. 3							
Alt. 4							
Alt. 4 no floor							

Corrected for revised Table 6-6 in errata

	Probability catch limit lower 2021-2040	Probability catch limit lower 2041-2050	AAV 2021-2040	AAV next 2041-2050	Time >15% first 2021-2040	Time >15% next 2041-2050	% TCEY to directed fishery 2040
Alt_1							
Alt. 2							
Alt. 3							
Alt. 4							
Alt. 4 no floor							

GENERAL COMMENTS ON PERFORMANCE METRIC CONCLUSIONS

- Metrics show limited contrast across alternatives but are useful for ranking alternatives
- Alternatives 1 and 2 perform better for flexibility and stability; Alternatives 3 and 4 best for directed fishery
- All are indexed to abundance to some extent (but for Alternative 1)
- Table 6-7 too difficult to interpret to be useful

MOVE TO ABM DISCUSSION PAPER

- Slide on action at this meeting are at the end of the Discussion paper presentation