

C2 Snow Crab Rebuilding Initial Review

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Outline

1. Introduction

- Description of the alternatives

2. Proposed Rebuilding Parameters

- Starting population conditions
- Restraints on Recruitment

3. Environmental Assessment

- Eastern Bering Sea Snow Crab
- Impacts of Snow crab Bycatch
- Marine Mammals
- Habitat
- Socioeconomic considerations
- Monitoring Rebuilding



Introduction

- Oct 19, 2021, NMFS notified Council that BS snow crab status has been changed to overfished therefore MSA section 304 requires a rebuilding plan be developed and implemented within two years of stock being declared overfished
- Council selected a purpose and need (section 1.1 on page 8) during their June 2022 meeting to facilitate compliance with MSA to rebuild the overfish stock
 - Develop a rebuilding plan to prevent overfishing and to rebuild the stock
 - Rebuilding time should be as short as possible taking into account status and biology of the stock, needs of the fishing communities, and the interaction of the stock within the marine ecosystem
- The shortest rebuilding time (T_{\min}) is calculated based on time frame to rebuild the stock to its MSY biomass (B_{MSY}) in the absence of no fishing mortality ($F=0$)
 - If T_{\min} is ≤ 10 years, then the maximum rebuilding time (T_{\max}) is 10 years for rebuilding a stock to its B_{MSY}
- Section 1.2 starting on page 8 provides MSA section 304 and the NS 1 guidelines for rebuilding overfished stocks



Description of Alternatives

- Alternative 1: No Action
- Alternative 2: Establish a rebuilding plan and specify a target rebuilding time to not exceed T_{\max} as recommended by the SSC. The stock will be considered rebuilt once it reaches B_{MSY}
 - Option 1: No directed fishing until that stock is rebuilt, allow bycatch removals only
 - Option 2: Allow bycatch removals and a directed snow crab fishery under the current State of Alaska harvest strategy



STARTING POPULATION CONDITIONS

SECTION 2.2.2

- Recruitment and natural mortality are the primary drivers of the rebuilding trajectory
 - 2 scenarios of recruitment and mortality were explored
 - 1982-2017 and 2005-2019
- Projections estimating rebuilding times are consistent regarding starting population conditions and B_{MSY} that defines a rebuilt stock
- SSC and CPT preferred the 1982-2017 recruitment and mortality scenarios
 - Rationale being that:
 1. Snow crab recruitment is projected to be lower in the future than it has been historically and the 1982-2017 has the lowest average recruitment of the scenarios considered
 2. Mortality event occurring in 2018/2019 related to the unprecedented number of snow crab in the EBS and high bottom temps. Bottom temps may be high, but it is likely that crab densities will not be



ALTERNATIVE 2 DETAILS

- Based on projections in section 2.2.1, the time with a greater than 50% probability of rebuilding to B_{msy} at $F=0$ is $T_{min} = 6$ years. Since $T_{min} = 6$ years, then $T_{max} = 10$ years
- Under Alt 2, a federal rebuilding plan for EBS snow crab will be incorporated into the BSAI King and Tanner Crab FMP.
 - Under Option 1, the FMP language would be amended to reflect a prohibition on directed harvest of EBS snow crab until stock is declared rebuilt and would prohibit the State of Alaska from setting a TAC under the State harvest strategy(SHS).
 - Option 2 would allow for a directed fishery as defined by the SHS

Projection specifications			T_{min}		
Fishing Scenario	Recruitment	Mortality	Median	5%	95%
No fishing	1982-2017	1982-2017	2029	2027	2034
bycatch	1982-2017	1982-2017	2029	2027	2034
State + bycatch	1982-2017	1982-2017	2029	2027	Inf
State - bycatch	1982-2017	1982-2017	2029	2027	Inf
ABC	1982-2017	1982-2017	2030	2027	Inf

Modified Table 4; Section 2.2.1



Environmental Assessment

SECTION 3

Potentially affected resource component					
Eastern Bering Sea Snow Crab	Non-Target Species	Marine Mammals	Seabirds	Habitat	Social and Economic
Y	Y	Y	N	Y	Y



EBS SNOW CRAB

SECTION 3.2

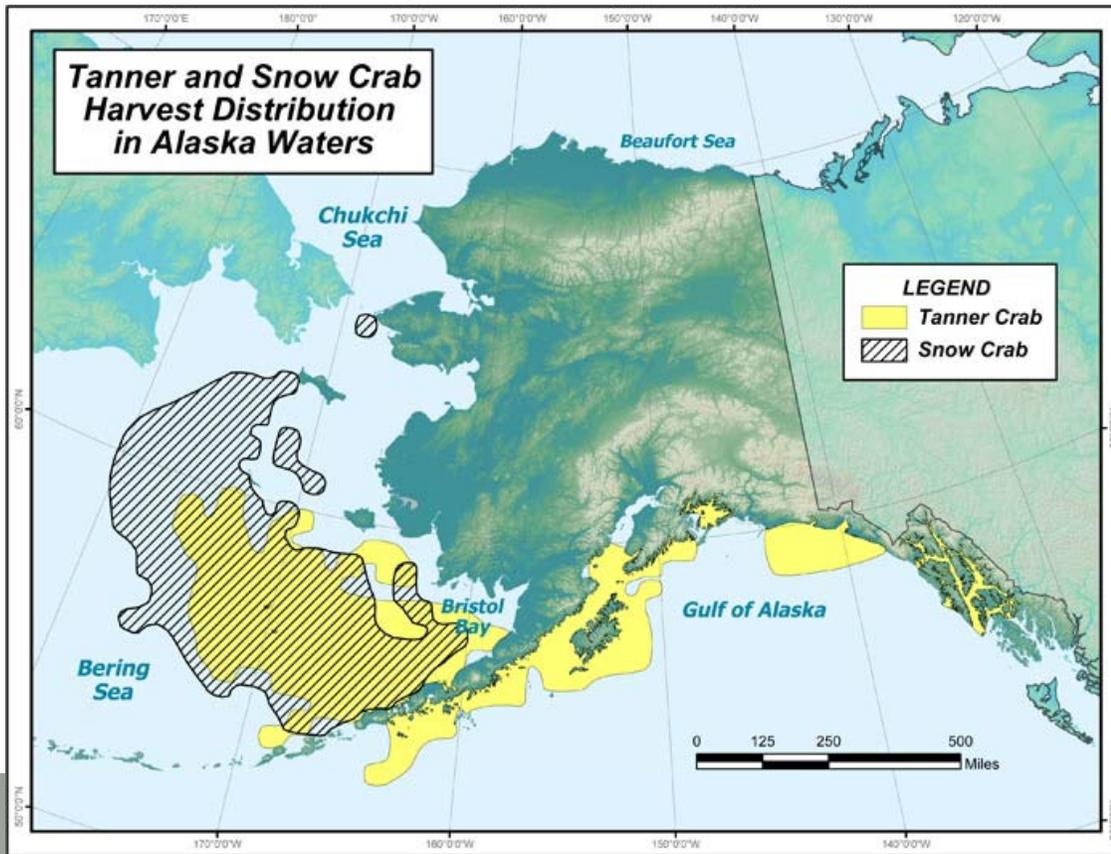


Figure 3-1

- Snow crab (*Chionoecetes opilio*) commercial catches in Alaska are concentrated in the Bering Sea.
- EBS Snow crab are managed as a single stock
- Distributed across the shelf
 - Common at depths <200m



EBS SNOW CRAB

- Molt/ Mate Cycle that correlates with spatial, environmental, and temporal preferences.
- Generation time=7 years

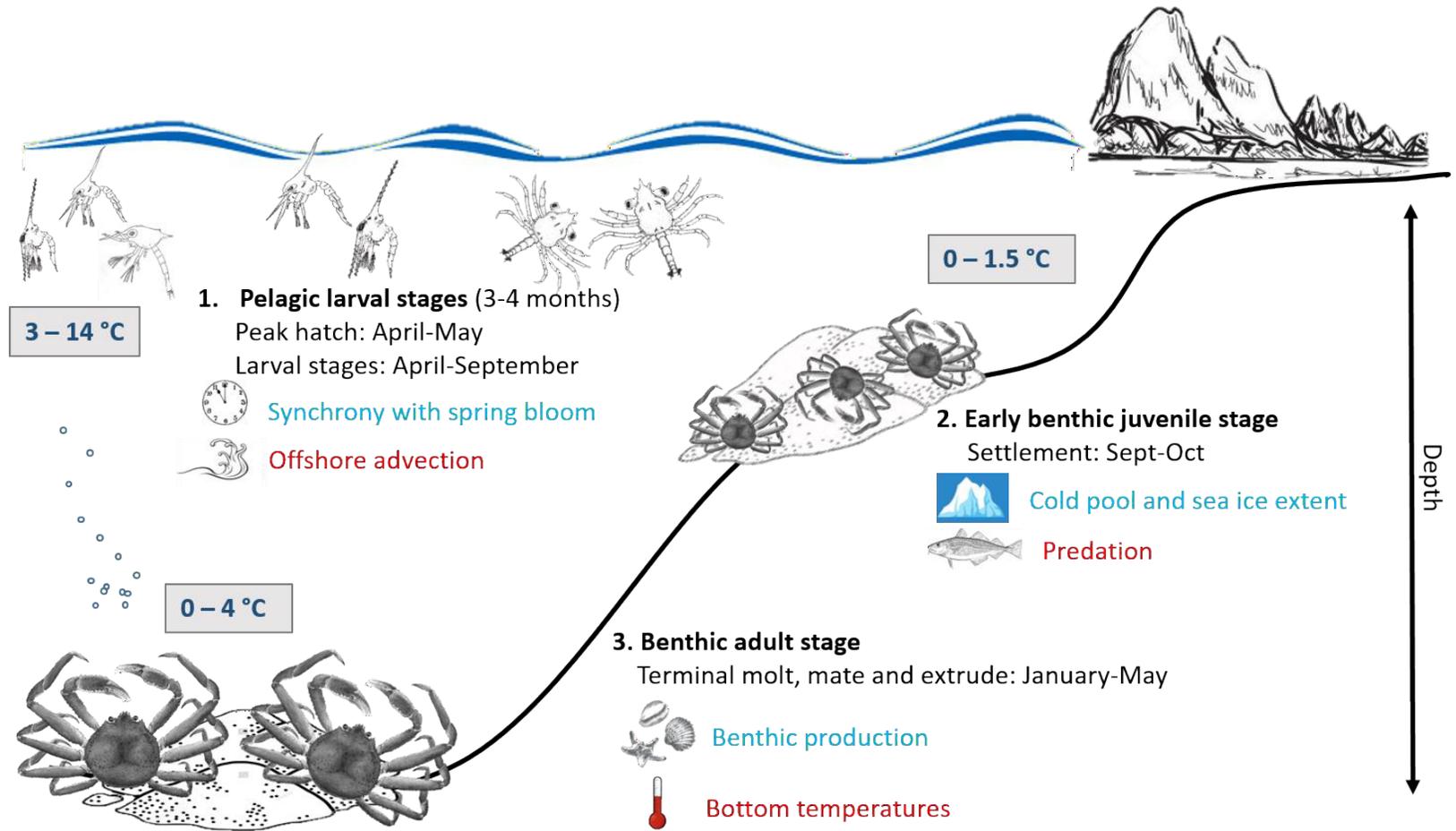


Figure 3-2

Source: 2022 EBS snow crab ESP

EBS SNOW CRAB

- 2022 BSAI Crab SAFE, the model estimate of mature male biomass for the 2021/22 fishing season (41.2 kt) was below the MSST; 91.6 kt, and so the stock remains in an overfished status.
- The 2019/2020 season was the first time a mass mortality event appears to have occurred for snow crab since the survey began and the biomass of important size categories of crab are at historic lows
- The observed biomass of males greater than 101mm carapace width was 13.36 kt in 2022.
 - When the stock was declared overfished in 1999, the observed biomass was 52.04 kt.
- Females are also currently at historic lows, observed at 22.44 kt in 2022.
- For the first time in history, the fishery will remain closed for the 2022/2023 fishing season.



EBS SNOW CRAB FISHERY

Retained Catch 21/22

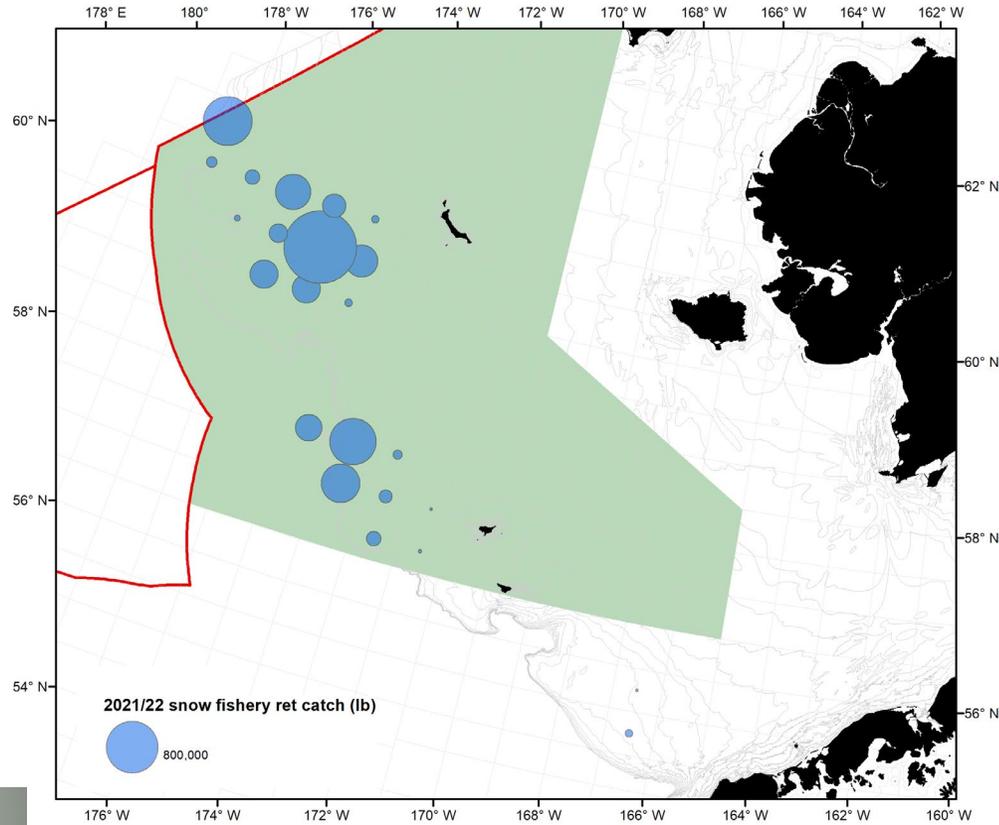


Figure 3-3

Historical Weighted Center EBS snow crab catch

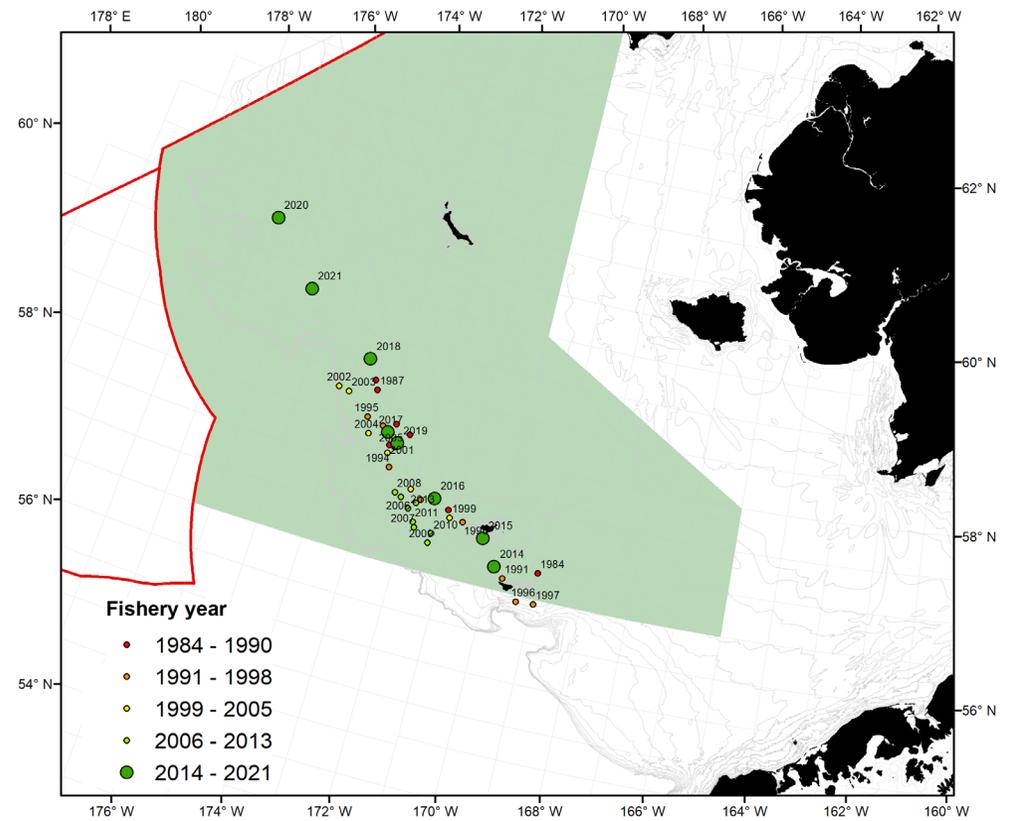


Figure 3-4



EBS SNOW CRAB AND CLIMATE CHANGE

- Snow crab are a cold-water, Arctic species that is primarily found in seasonally ice-covered areas of the Bering sea (BS) with summer bottom water temperatures $< 2^{\circ}\text{C}$.
- Snow crab have long been proposed as a species that is likely to be negatively impacted by climate warming and the loss of sea ice in the BS
- 2 unpublished studies identified warming as a major contributor in the snow crab collapse
 - Szuwalski et al. (in review)
 - Evidence for temperature and density dependence as the cause of the collapse
 - Litzow et al. (in prep) investigated the role of borealization in BS played in the snow crab collapse.
 - **Borealization:** the switch from an Arctic ecosystem state to a subarctic state - has long been proposed as the most important consequence of climate change for Arctic marine communities and fisheries



EBS SNOW CRAB AND CLIMATE CHANGE

SECTION 3.2.3

- The snow crab collapse coincided with rapid warming in the EBS during 2014-2020.
- The peak warming event: 2016, 2018, and 2019. Annual mean sea surface temperature (SST) was well outside the range of previous observations and 1.9 - 2.3°C above the pre-1950 mean

Annual mean sea surface temperature, 1854-2021

Source: NOAA Extended Reconstructed SST v5

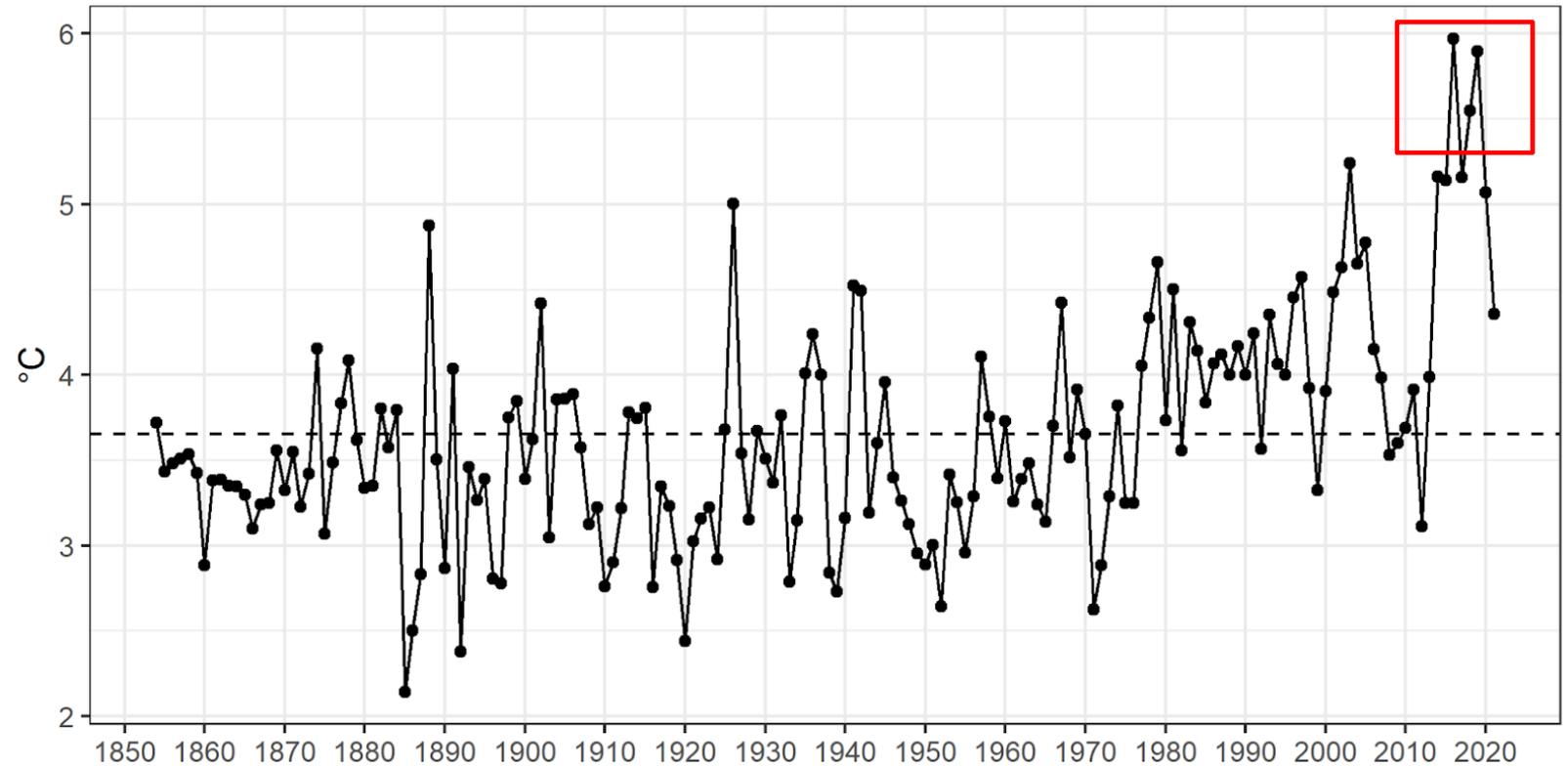


Figure 3-6

Source: NOAA reconstructed SST v5

EBS SNOW CRAB AND CLIMATE CHANGE

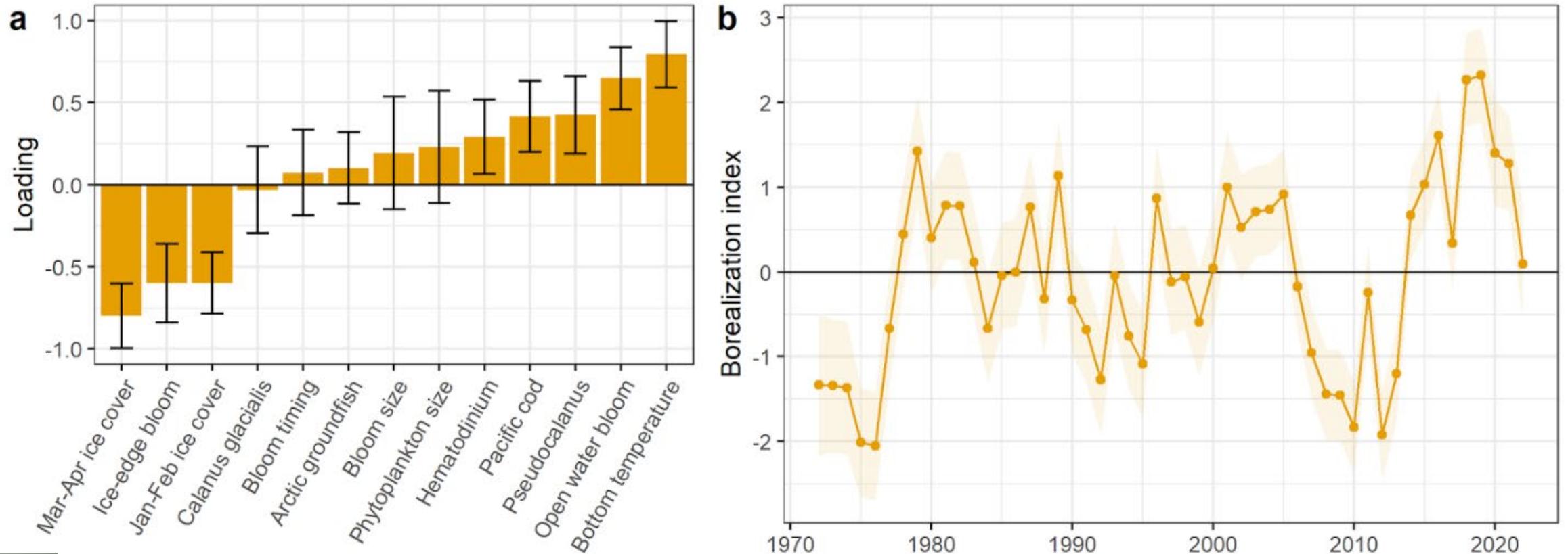


Figure 3-7



EBS SNOW CRAB AND CLIMATE CHANGE

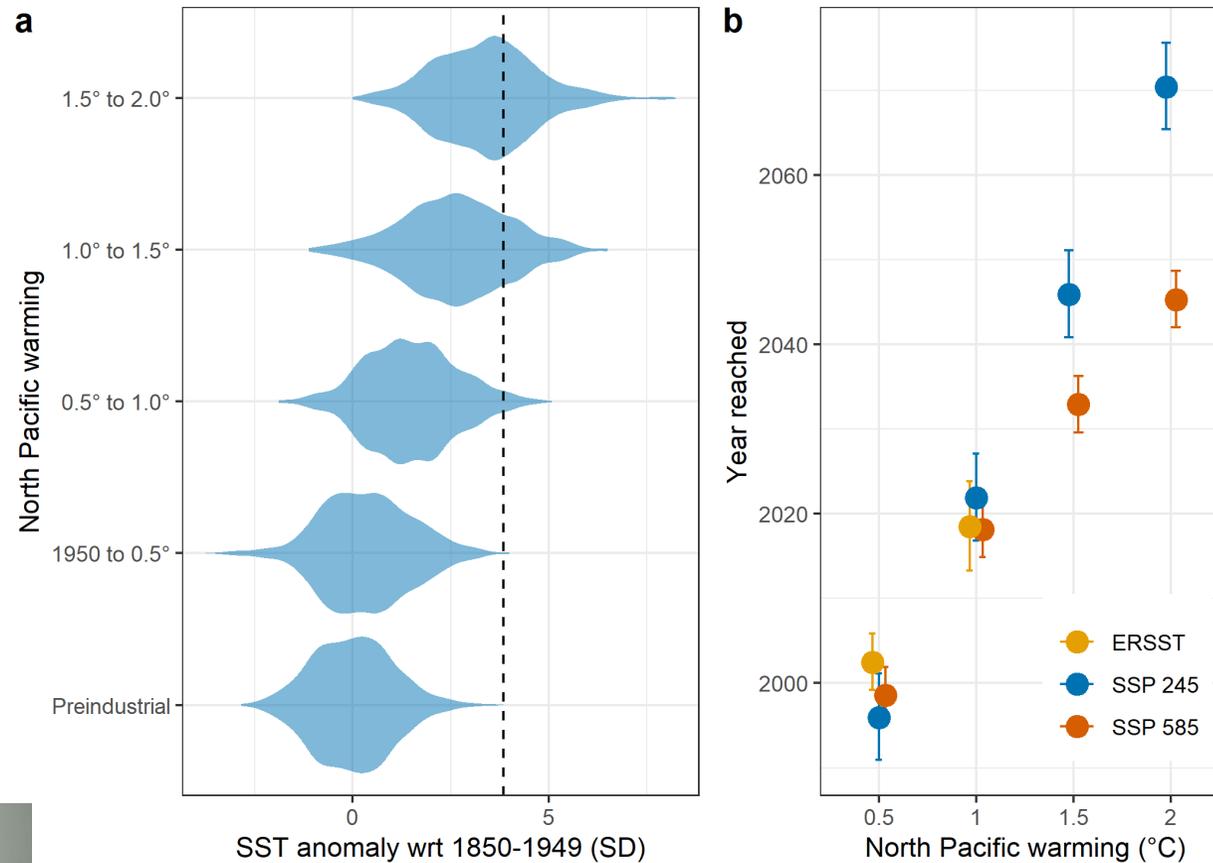


Figure 3-9

- Can expect to continue (17% of years) to temperatures as great or greater than the critical threshold throughout the proposed rebuilding timeline.
- Elevated Temperatures will become more common between 1.5° and 2.0° warming (32% of years)
- The North Pacific is expected to exceed 1.5° warming some time in the 2040s



Effects of the Alternatives on EBS snow crab

- Uncertain Nature of snow crab stock in recent years, and several possibilities may influence the effectiveness of rebuilding
 - Highly specific thermal optimums and habitat requirements of EBS snow crab may alter physiological demands as a response to warmer than average bottom temperatures.
 - Warmer temperatures may alter prey-predator relationships and predator distribution, resulting in a shift in predator-prey interactions, and food web dynamics.
 - Constraints on recruitment will likely persist for an extended period of time despite the implementation of a rebuilding plan.



Effects of the Alternatives on EBS snow crab

- Alternative 2/Option 1 would designate no directed EBS snow crab fishery, with bycatch removals only, and implications to the stock will be similar to those seen as a result of the 2022/2023 fishery closure.
- Given the current biomass and abundance estimates, it is likely that with no directed fishery and bycatch removals only, there would be an increased opportunity for the stock to continue an upward tick in recruitment.
- There existed no difference in median rebuilding time under the bycatch-only fishing mortality scenario when compared to the state harvest strategy scenario.



Effects of the Alternatives on EBS snow crab

- Alternative 2/Option 2: The EBS snow crab stock is likely to have similar rebuilding trajectories under Alternative 1 and Alternative 2/Option 2, due to the nature of the current FMP delegation of TAC setting to the state of Alaska.
 - Constraints on fishing mortality could be made more conservative by further restricting fishery operations if necessary to ensure adequate progress.
 - For the EBS snow crab fishery to open under option 2, the model estimate must indicate that ESB snow crab is at least 25% of the B_{MSY} .



Effects of the Alternatives on EBS snow crab

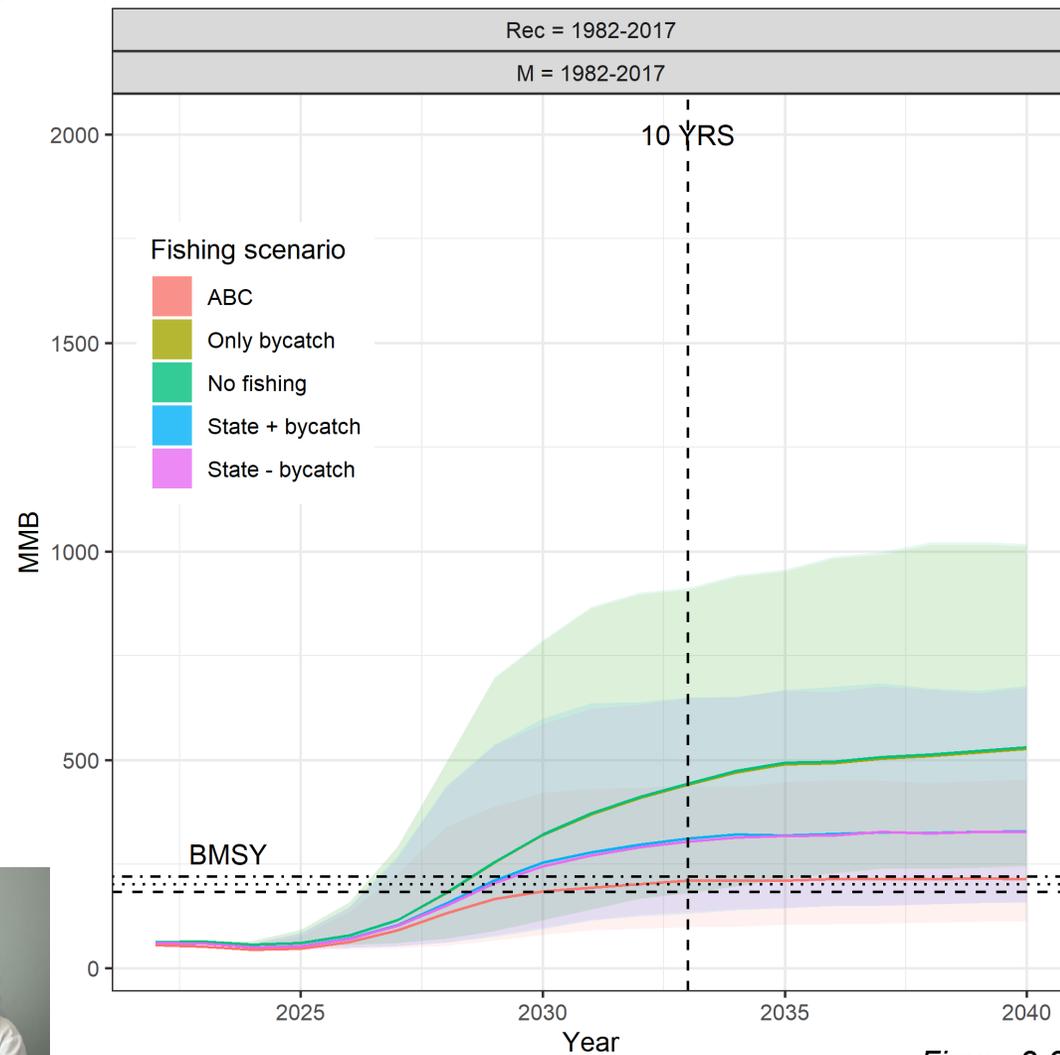


Figure 2-2

- Uncertainty in stock growth persists under all Fishing mortality scenarios
- High variability between biomass projections
- Median rebuilding times are the same between Alternative 2/Option 1 and Alternative 2/Option 2



Effects of the Alternatives on EBS snow crab

Summary

- Time: no difference in median rebuilding timeframe metrics.
- Recruitment and ecosystem conditions are likely the main drivers in time for rebuilding
- If current ecosystem conditions prevail, and recruitment remains at low levels, the population may take substantially longer to show rebuilding progress



Impacts of snow crab bycatch

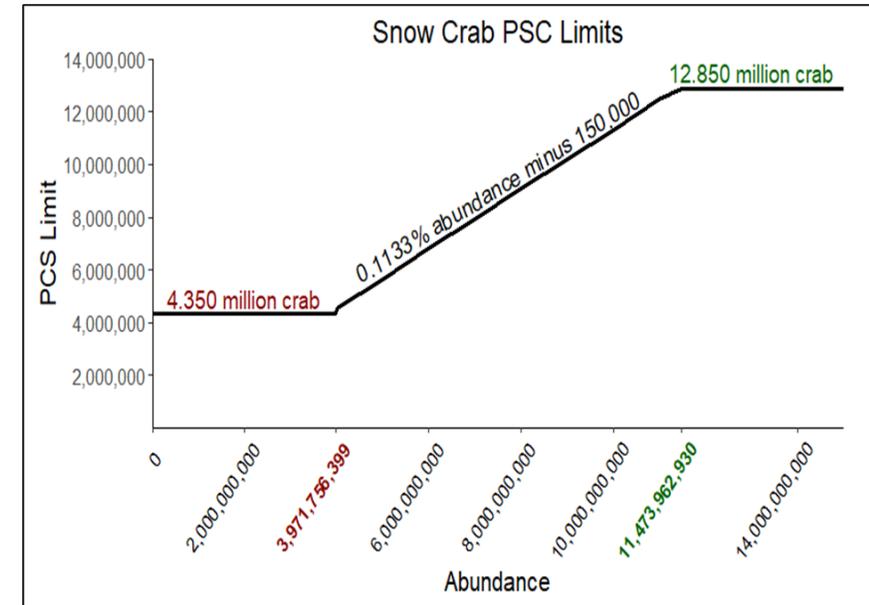
SECTION 3.3

- All existing management measures that minimize snow crab bycatch would be maintained under the current rebuilding alternatives
- Bycatch of snow crab occur in king and Tanner crab fisheries and in the groundfish fisheries
 - Bycatch of snow crab in king and Tanner crab fisheries in Table 10 (page 49)
 - Bycatch of snow crab in the groundfish fisheries by gear in Table 11 (page 53)
- Snow crab groundfish PSC management
 - Trawl PSC accrues within the COBLZ and this area is closed to trawl directed fishing in the fishery/sector that reaches the specified PSC limit
 - No bycatch measures are currently in place for any non-trawl gear fisheries inside or outside of the COBLZ



Impacts of snow crab bycatch

- PSC limits are set annually at 0.1133% of the snow crab abundance estimates with a minimum (4.5 million crab) and maximum (13 million crab) abundance threshold minus an additional 150,000 crab
 - Table 11 (page 53) provides annual snow crab abundance and the trawl PSC limit from 2006 through 2023



Impacts of snow crab bycatch

- Section 3.3.1.1 provides an overview of previous research on unobserved crab mortality
- Fishing activities results in crab mortality in ways not directly observed
 - This includes post-release mortality of discarded crab (estimated using discard mortality rate) and crab that are never captured by fishing gear but die due to gear interaction
 - Unobserved mortality associated with crab never captured by fishing gear is not accounted for in stock assessments and is not accrued towards trawl PSC limits
 - Overall, the studies focused on non-pelagic gear and showed that gear modification to include raised sweeps and footrope changes can mitigate some unobserved mortality



Impacts of snow crab bycatch

- Impacts of EBS snow crab bycatch were evaluated as potential factor in stock recovery using the average snow crab bycatch for the last 10 years
- The median rebuilding time of 6-years were the same with and without the 10-year average bycatch included in the projections
- Reasons for no difference in median rebuilding time:
 - Bycatch removals relative to total abundance are small
 - Stock productivity which is a function of ecosystem conditions overwhelms bycatch effect

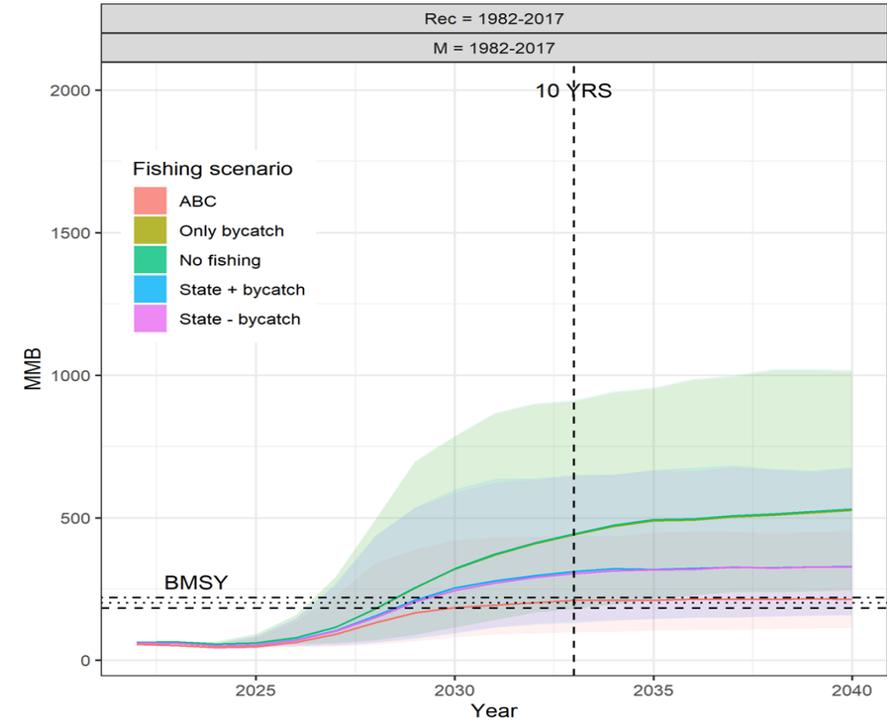


Figure 2-2

Projection specifications			T_{min}
Fishing Scenario	Recruitment	Mortality	Median
<i>No fishing</i>	1982-2017	1982-2017	2029
<i>bycatch</i>	1982-2017	1982-2017	2029
<i>State + bycatch</i>	1982-2017	1982-2017	2029
<i>State - bycatch</i>	1982-2017	1982-2017	2029
<i>ABC</i>	1982-2017	1982-2017	2030



Impacts of snow crab bycatch

- Model sensitivities concerning unobserved mortality were also explored in which the 10-year average bycatch was multiplied by 5 and 100
- Results from projections are provided in Figures 3-11 & 3-12 & Tables 14 & 15 on pages 61 and 62
- Projected rebuilding times were similar to projections without the additional mortality
 - The 100x did add one more year to the projected median rebuilding period
 - Once again, stock productivity likely overwhelming the effects of unobserved mortality

Projection specifications – 5x			T _{min}		
Fishing Scenario	Recruitment	Mortality	Median	5%	95%
<i>No fishing</i>	1982-2017	1982-2017	2029	2027	2035
<i>bycatch</i>	1982-2017	1982-2017	2029	2027	2036
<i>State + bycatch</i>	1982-2017	1982-2017	2030	2027	Inf
<i>State - bycatch</i>	1982-2017	1982-2017	2030	2027	Inf
<i>ABC</i>	1982-2017	1982-2017	2035	2027	Inf

Projection specifications – 100x			T _{min}		
Fishing Scenario	Recruitment	Mortality	Median	5%	95%
<i>No fishing</i>	1982-2017	1982-2017	2029	2027	2036
<i>bycatch</i>	1982-2017	1982-2017	2030	2027	Inf
<i>State + bycatch</i>	1982-2017	1982-2017	2030	2027	Inf
<i>State - bycatch</i>	1982-2017	1982-2017	2030	2027	Inf
<i>ABC</i>	1982-2017	1982-2017	2035	2027	Inf



Impacts of snow crab bycatch

- In June 2022, the Council requested additional information on groundfish PSC to help determine whether the following bycatch measures would affect rebuilding timeline:
 - Remove the snow crab PSC floor
 - Count all trawl PSC throughout the full range of the stock toward the PSC limit
 - Limit on fixed gear PSC
- To address this request, Table 11 on page 53 provides trawl PSC limits without a floor, information on PSC inside and outside COBLZ, and provides historical PSC for fixed gear sectors
- None of the changes in PSC management would have increased the rebuilding time since the additional bycatch is significantly less than 1% of the total abundance and bycatch is not primary component of rebuilding under the proposed projections



HABITAT

SECTION 3.4

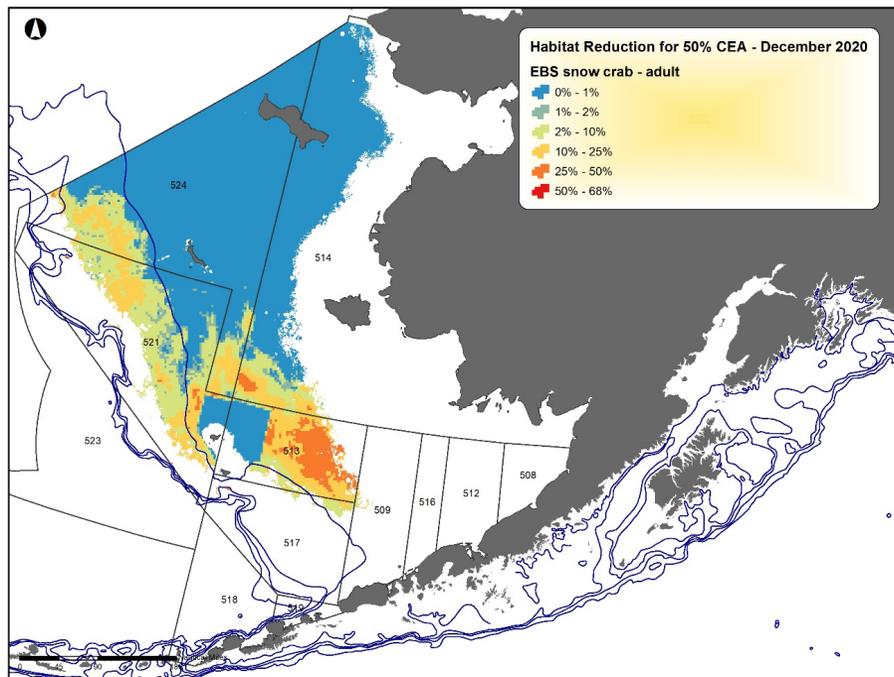


Figure 3-18

- Prevailing ecosystem conditions will exist under rebuilding
- 2022 EFH 5 year review deemed that snow crab habitat in the EBS experienced a cumulative 3.8% habitat disturbance as a result of fishing in 2020.



Fishing impacts to snow crab

- Bottom Contact Area Ratio (BCAR) analysis was performed to provide the historical fishing footprint and estimated bottom contact areas in areas with historically high snow crab abundance to estimate how fishing activity has historically influenced snow crab habitat
 - The BCARs presented in the analysis below are a straightforward estimate of when, where, and how much fishing gear may be contacting the seafloor relative to the overall area of the region.
- Analysts concluded that estimated bottom contact areas, and the historical fishing footprint has not drastically altered snow crab habitat in recent years.
- The presence of fishing, and the current estimates of bottom contact are an unlikely cause of the EBS snow crab decline, which further emphasizes the minimal impact to snow crab habitat as a result of implementing a rebuilding plan.
- Full results of the analysis are found in Appendix 1.



Effects of the Alternatives on Habitat

- **Summary: There are likely no effects on habitat as a direct result of implementing a rebuilding plan under the proposed alternatives**
- Continued monitoring of habitat should occur throughout the duration of the rebuilding plan
 - Next EFH 5 year review
 - Continued use of the ESP and ESR



Marine Mammals

SECTION 3.5

- Bearded Seal (*Erignathus barbatus*) known to forage on invertebrates, specifically snow crab. Snow crab has been present in 54%-91% frequency of occurrence in biosampled stomachs.
- Mainly smaller (mean carapace width=57mm)
- Bearded seals and benthic foragers and can likely switch prey types.
 - There is likely minimal effect on bearded seals due to the decline in snow crab abundance.
- **Summary: No effect on marine mammals under the proposed alternatives**

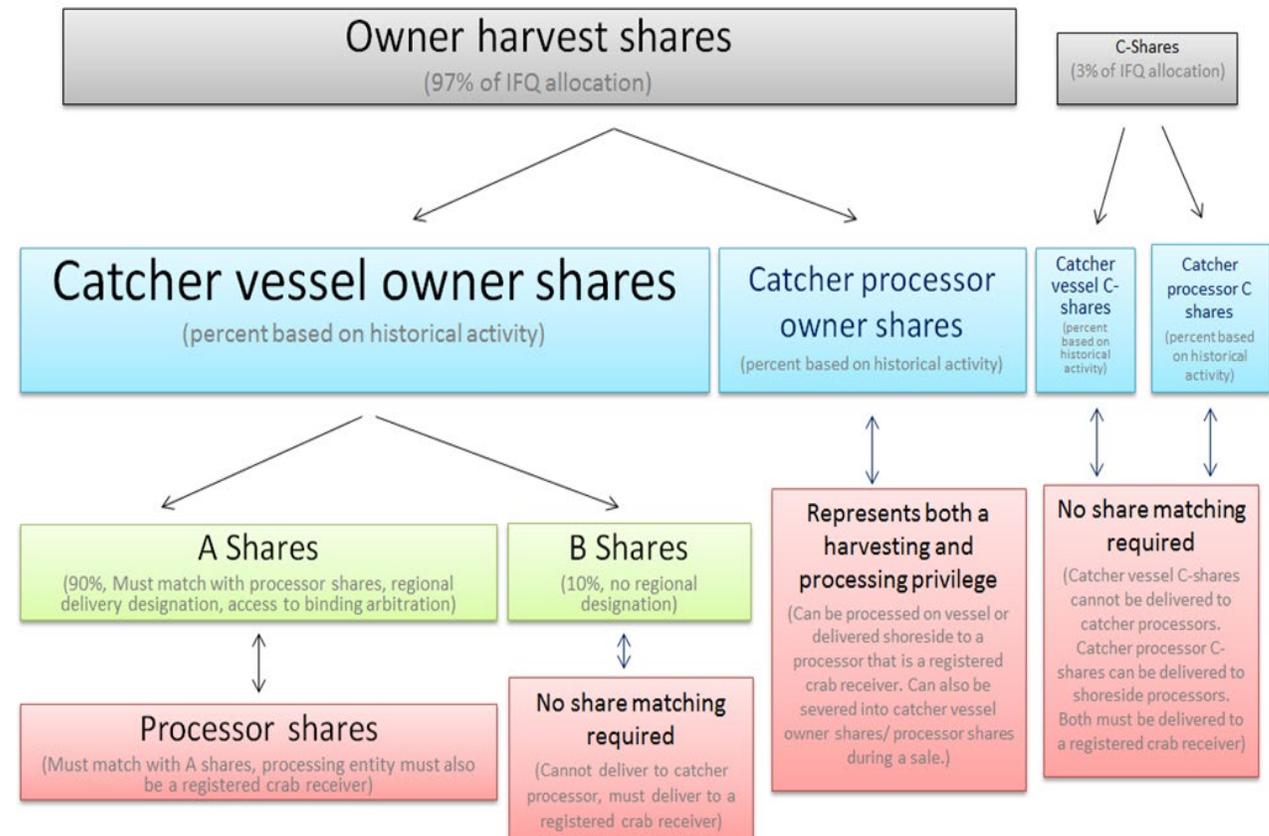


Economic and Social Impacts

SECTION 3.6

- This section provides background information on the fishery and the effects of the two rebuilding options under consideration
 - Section 3.6.1 (starting on page 68) provides a brief description of the BSAI Crab Rationalization Program to include harvester shares, processor shares, regional share designation, catch processor shares, and crew shares
- For further information on the Crab Rationalization Program, refer to the Jan 2017 Ten-Year Program Review

Crab Fishery TAC - 10% for CDQ & Adak = IFQ allocation



Economic and Social Impacts

- Section 3.6.2 (starting on page 73) provide a brief overview of the economic status and trends of the EBS snow crab fishery
- Table 16 provides general stats on harvesting and processing of snow crab through the 2021/2022 season
- Figures 3-20 – 3-22 provide annual vessel counts, catch data, and price data from 2005/2006 season through the 2021/2022 season
- Table 17 provides crew and processor employment data for the snow crab fishery. Source of data is the Crab Econ SAFE

Snow crab year	TAC/GHL 1000t	TAC/GHL million lbs	Vessels	Retained catch 1000t	Retained catch million lbs	Gross ex-vessel revenue \$ million	Ev-vessel price \$/lb	Plants	Gross first wholesale revenue \$ million	Gross first wholesale price \$/lb
2005-2006	16.86	37.18	78	16.77	36.97	\$55.79	\$1.51	13	\$96.27	\$2.60
2006-2007	16.59	36.57	69	16.47	36.31	\$72.67	\$2.00	18	\$118.89	\$3.27
2007-2008	28.59	63.03	78	28.59	63.02	\$133.69	\$2.12	17	\$209.31	\$3.32
2008-2009	26.56	58.55	77	26.55	58.54	\$101.24	\$1.73	16	\$163.64	\$2.80
2009-2010	21.78	48.02	69	21.69	47.82	\$76.48	\$1.60	11	\$125.92	\$2.63
2010-2011	24.62	54.28	68	24.61	54.26	\$164.80	\$3.04	14	\$231.51	\$4.27
2011-2012	40.32	88.89	72	39.99	88.16	\$224.00	\$2.54	13	\$323.57	\$3.67
2012-2013	30.1	66.35	70	29.71	65.49	\$173.96	\$2.66	12	\$259.17	\$3.96
2013-2014	24.48	53.98	70	24.49	53.98	\$144.25	\$2.67	10	\$222.86	\$4.13
2014-2015	30.82	67.95	70	30.79	67.88	\$157.49	\$2.32	11	\$227.73	\$3.36
2015-2016	18.42	40.61	69	18.41	40.60	\$119.89	\$2.95	9	\$174.12	\$4.29
2016-2017	9.78	21.57	63	9.76	21.53	\$75.82	\$3.52	10	\$127.00	\$5.90
2017-2018	8.6	18.96	63	8.60	18.95	\$76.25	\$4.02	9	\$86.39	\$4.56
2018-2019	12.51	27.58	61	12.47	27.50	\$109.49	\$3.98	9	\$154.02	\$5.60
2019-2020	15.4	33.95	59	15.43	34.02	\$133.53	\$3.92	9	\$177.81	\$5.23
2020-2021	20.4	44.97	62	20.41	45.00	\$219.16	\$4.87	9	\$286.37	\$6.36
2021-2022	2.5	5.51	42	2.5	5.51	Not available	Not available	Not available	Not available	Not available

Source: AKFIN (ADF&G fish ticket data and ADF&G COAR data). 2021/2022 retained catch from 2021/2022 Snow Crab SAFE. Source for 2021/2022 vessel count from September 2022 Ecosystem & Socioeconomic Profile for Eastern Bering Sea Snow Crab.

Data includes CDQ harvest

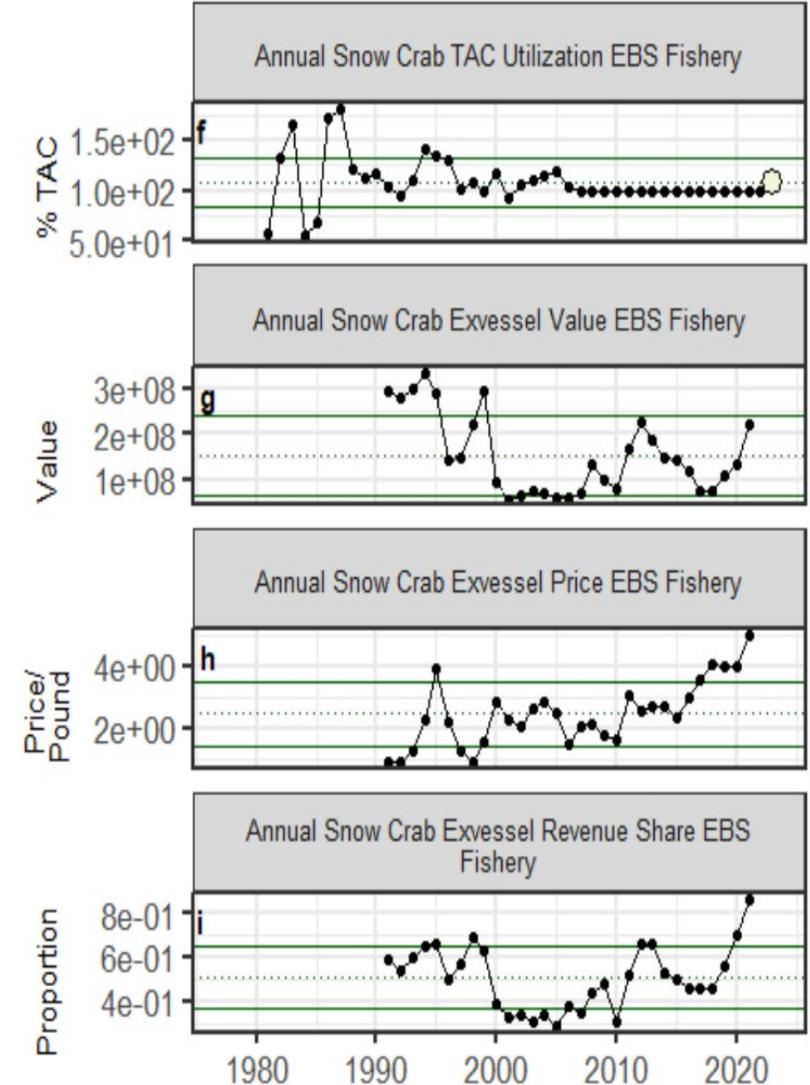
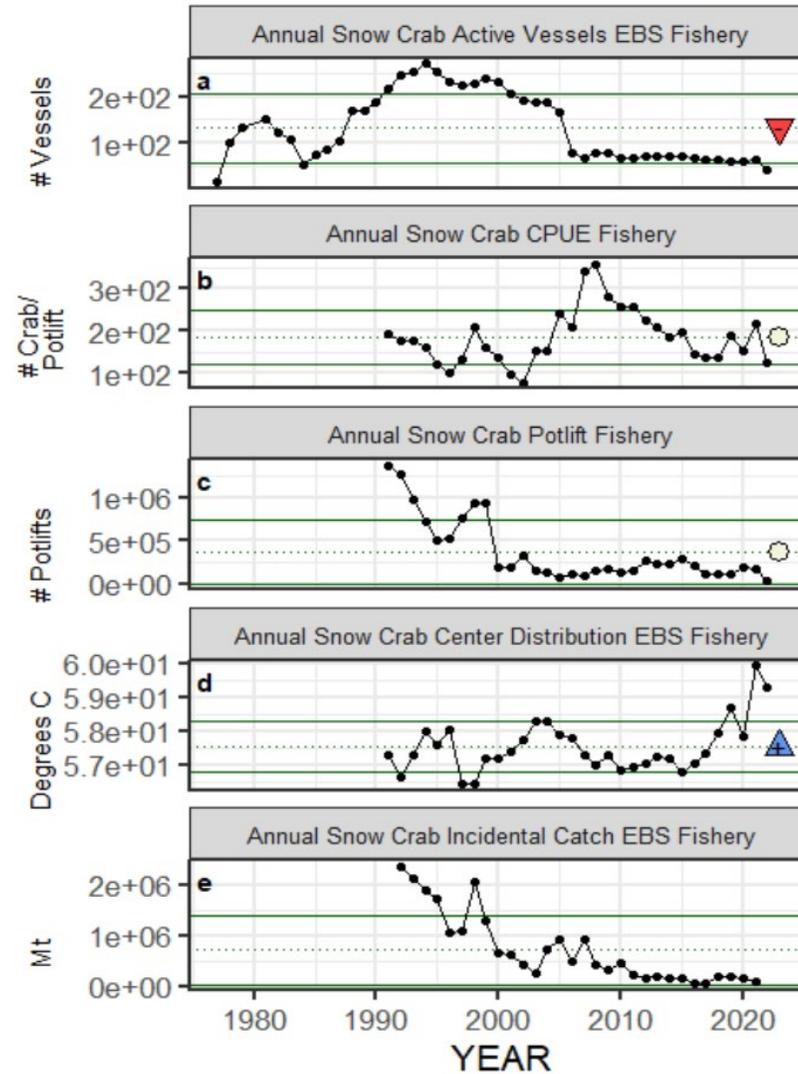
All price data is in real 2021 dollars

Note that value and price data is not yet available for the 2021/2022 snow crab season.



Economic and Social Impacts

- Section 3.6.2.1 provides the latest fishery performance and economic indicators from the 2022 Snow Crab Ecosystem and Socioeconomic Profile (ESP)
- All socioeconomic indicators for snow crab target fishery for the 2021/2022 season exhibited substantial deviation from historical patterns



Economic and Social Impacts

- Section 3.6.2.2 provides an overview of local knowledge (LK), traditional knowledge (TK), and subsistence specific to EBS snow crab fishery
- Search of LK, TK, and subsistence information specific to EBS snow crab for the crab fleet or communities substantially engage in, or dependent on, produced no results
- Analysts reached out to Alaska Bering Sea Crabber's Association regarding their new skipper survey
 - Administered online to all BS snow crab skippers that participated in the 2020/2021 and 2021/2022 fishery with a 31% response rate
 - Participating skippers reported:
 - a decrease in their encounters with commercial sized male crab and encounters with sub-commercial sized males
 - fished deeper due to smaller TACs in the 2021/2022 season and greater sea ice extent southward compared to prior years, while others reported no significant changes in fishing behavior
 - concerns about low abundance on the grounds
 - For the 2021/2022 season, continued limited availability of alternative fishing targets combined with higher operating costs suggest the fleet and communities are experiencing overall negative economic impacts despite the higher ex-vessel price for snow crab that season



Economic and Social Impacts

- Section 3.6.3 (starting on page 80) provides a social impact assessment of the snow crab fishery
- Utilizes a two-part approach:
 - First - tables based on existing quantitative fishery information to identify patterns of engagement in and dependency on the snow crab fishery based on the distribution across communities
 - Second – provide a more qualitative description for communities that appear to be substantially engage in or substantially dependent on the snow crab fishery based on the first approach
 - This approach provides a more wholistic context for the subsequent analysis of potential community impacts that may occur due to the rebuilding options



Economic and Social Impacts

- Section 3.6.3.1 (starting on page 81) provides a series of tables containing a range of quantitative information describing the distribution of sector-specific community engagement in and dependency on the snow crab fishery
 - First six tables provide information on snow crab vessel owners:
 - The number of vessels harvesting snow crab by community are concentrated in Seattle MSA, Kodiak, Anchorage, and Homer/Seldovia (Table 18 on page 83)
 - The distribution of snow crab ex-vessel gross revenue at the community level is Washington at 57%, Alaska 32%, and Oregon/other states at 11% (Table 19 on page 83)
 - In general, snow crab vessels on average receive 50% of their ex-vessel revenue from snow crab fishery (Table 20 on page 84)
 - Of the Alaska communities with vessel owner address, Kodiak at 9.9% of its annual average total ex-vessel gross revenue was from snow crab, while Homer/Seldovia was 4.3% (Table 21 on page 85). For Seattle MSA, 14.1% of its annual average total ex-vessel gross revenue was from snow crab
 - Largest share of annual average revenue was from snow crab, followed by BBRKC, with a very small percentage from groundfish (Table 22 on page 85)
 - Prior to 2021, dependency ranged from 10% to 70%, but in 2021, the majority of snow crab vessels were 90%-100% dependent on snow crab which was likely due to the closing of the BBRKC fishery (Table 23 on page 86)



Economic and Social Impacts

- The next few tables provide information on snow crab crew licenses by community and snow crab quota share holders by community
 - Table 24 (page 87) provides information on the number of crew licenses harvesting snow crab by community
 - The largest number of crew licenses were from Washington with an annual average of 242 licenses
 - For Alaska, Kodiak had the largest number of annual average crew licenses in the snow crab fishery at 61 licenses
 - Table 25 provides information on snow crab quota share holders by community
 - Washington had an annual average of 569 quota share holders
 - Alaska had an annual average of 321 quota share holders
 - Majority of snow crab quota is leased (between 2012 and 2021, 81%-89%)
 - Table 26 (page 88) provides IFQ lease prices and total value of those leases



Economic and Social Impacts

- The last series of tables in this section provide processor sector engagement in and dependency on the snow crab fishery by community
 - Five Alaska communities were the most relevant processors receiving snow crab deliveries to include Unalaska/Dutch Harbor, Akutan, King Cove, Kodiak, and Saint Paul (Table 27 on page 89)
 - Combined Akutan, King Cove, Kodiak, Saint Paul accounted for 46% of average annual first wholesale gross revenue, while Unalaska/Dutch Harbor accounted for 30% (Table 28 on page 89)
 - Relative to the total annual average first wholesale revenue, 12.6% was from snow crab for the combined shorebased processors in Akutan, King Cove, Kodiak, & St Paul while for Unalaska/Dutch Harbor 12.6% of its total was from snow crab (Table 29 & Table 31 on page 90 & 91)
 - Table 32 (page 91) provides annual processor dependency on the snow crab fishery
 - From the perspective on the communities of shorebased processors, first wholesale gross revenue from snow crab was 7.5% relative to the total annual average first wholesale gross revenue for the combined Akutan, King Cove, Kodiak, and St. Paul, while for Unalaska/Dutch Harbor snow crab contributed 8.5% of the annual average total (Table 30 on page 90)



Economic and Social Impacts

- Section 3.6.3.2 (starting on page 91) provides an overview of the communities that are engaged in or dependent on the snow crab fishery based on the previous SIA tables
- Section 3.6.3.3 (starting on page 101) provides an overview of the CDQ snow crab allocation and a description of the CDQ groups



Economic and Social Impacts

- Section 3.6.4 provides a qualitative overview of the likely impacts of the two rebuilding options associated with Alternative 2 on vessel owners, crew, quota shareholders and communities
- Effects section focuses solely on the impacts to the directed snow crab fishery participants and communities
- Since allocation of directed catch is determined by quota share holdings, all classes of quota shares (A, B, and C), processor shares, CDQ organizations, and those whose fish for CDQ allocations will be impacted by the proposed options
- There are also indirect and induced impacts on communities from the proposed rebuilding options



Economic and Social Impacts

- Section 3.6.4.1 (starts on page 105) provide an overview of the impacts to vessel owners, crew, quota shareholders, and associated communities
 - Under option 1, the loss of the snow crab fishery for 6-years for vessel owners, crew, and quota shareholders would likely range from substantial to severe
 - As noted in Table 23, in 2021, 32 of the 60 vessels that participated in the snow crab fishery received 90% to 100% of their ex-vessel revenue from the snow crab fishery therefore many vessel owners, crew, and quota share holders would receive no ex-vessel revenue
 - Those highly dependent on snow crab revenue could have difficulty maintaining their credit and debt instruments forcing some to refinance or business sale and/or bankruptcy
 - When combined with the closure of the BBRKC fishery, there would likely be substantial declines in payments on debt instruments which could lead to consolidation of the snow crab fleet and losses of crew positions
 - From the perspective of the communities of vessel owners, crew, and quota shareholders they would also likely be negatively impacted under option 1 due to the loss of direct expenditures by these participants in the community and the associated loss of indirect and induced expenditures
 - Communities most impacted include Seattle MSA, Kodiak, Homer/Seldovia, and Anchorage/Palmer/Wasilla
 - Impacts to these communities would depend on their economic diversification
 - Under Option 2, socioeconomic impacts could improve for vessel owners, crew, and quota shareholders since there is the potential for a directed fishery each year during the rebuilding period which would provide critical ex-vessel revenue from the fishery
 - However, if stock is insufficient to support a directed fishery based on the State's harvest strategy, the fishery will be closed



Economic and Social Impacts

- Section 3.6.4.2 (starts on page 107) provides an overview of impacts to processors and their associated communities
- Under option 1, loss of operating revenue could range from minor to severe impacts and depends on the how dependent the processor is on snow crab deliveries and its ability to adapt or diversify
 - For processors with little reliance on snow crab, it would be expected these processors would experience reduce operating revenue which could result in some reduced processor workers and/or reduced worker wages and the subsequent drop in expenditures by the processor and workers in the community
 - For processors that are highly reliant on snow crab, likely socioeconomic impacts would be severe for the processor and the plant workers due to no operational revenue from the fishery. Communities would also be severely impacted due to the loss of expenditures of goods and services in the community by the processor and its workers and the associated indirect and induced impacts



Economic and Social Impacts

- As noted in Table 32 (page 91), at least one shorebased processor is 90% to 100% dependent on the snow crab fishery
 - Of 11 processors shown in Table 32, the shorebased processor in Saint Paul is likely one of the processors most impacted under Option 1
 - The socioeconomic relationship between the Saint Paul processor and the community of Saint Paul result in severe consequences from option 1 since both are highly dependent on snow crab fishery:
 - Loss of processor purchases of goods and services in the community
 - Loss of purchases by local plant workers in the community
 - Potential loss of processor's ability to process local halibut IFQ landings
 - Loss of tax revenue from local sales tax on the sale of seafood
 - CBSFA's loss of operating revenue from its share of the CDQ snow crab allocation and its ownership in snow crab harvesting and processing quota which flows to the community of Saint Paul
 - When combined with the closure of the BBRKC fishery, the socioeconomic impacts to the Saint Paul shorebased processor and the community are even more severe
- Option 2 would provide opportunity for a directed fishery under State harvest strategy which would likely provide valuable operating revenue to pay processor worker wages, expenditures by processor and workers in the community, tax revenue to the communities, and operating revenue from CDQ allocations and ownership of snow crab quota



Economic and Social Impacts

- Section 3.6.4.3 (page 110) provides an overview of likely impacts to CDQ groups
 - Under option 1, the loss of revenue from the CDQ snow crab fishery would also impact vessel owners, crew, processors
 - Additionally, several communities would also be impacted due to the loss of expenditures by snow crab participants (vessel owners, crew, and quota share holders) in the local community as well as loss of operating revenue from the harvesting and processing of the CDQ allocations that flows to the CDQ communities
 - CDQ groups with ownership in harvesting vessels and harvesting and processing quota would also be negatively impacted under option 1 due to the loss of snow crab revenue which could impact communities that rely on revenue from the CDQ groups
 - Option 2 would provide opportunity for a directed fishery under State harvest strategy which would likely provide earnings from their CDQ allocation of snow crab and CDQ owned snow crab assets (vessels and quota shares) which would allow continued funding of CDQ programs



Monitoring Progress of the Rebuilding Plan

SECTION 3.7

- The Secretary must ensure that progress made under a rebuilding plan is adequate
 - Biennial assessment of the rebuilding plan
 - Continued annual stock assessments



Conclusion

Purpose and Need Statement

“The Eastern Bering Sea snow crab stock was determined to be overfished on October 19, 2021, because the estimated mature male biomass is below the minimum stock size threshold specified in the crab FMP. To comply with provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), a rebuilding plan must be implemented prior to the start of the 2023/2024 fishing season. This action is necessary to facilitate compliance with MSA requirements to rebuild overfished stocks and achieve optimum yield”

- Develop a rebuilding plan in as short a time as possible
 - Status and biology of any overfished stocks of fish
 - the needs of fishing communities
 - the interaction of the overfished stock of fish within the marine ecosystem.



Rebuilding Timeline

October 19, 2021: Snow Crab was declared overfished

- Rebuilding of overfished stocks is required by the MSA section 304 within 2 years (October 2023)
 - MSA section 304 and the NS 1 guidelines for rebuilding overfished stocks

June 2022: The Council selected snow crab rebuilding alternatives for analysis

October 2022 SSC meeting – establish rebuilding parameters

December 2022 Council Meeting: initial review of the snow crab rebuilding plan and the Council can potentially select a preliminary preferred alternative

February 2023 Council meeting – Council will take final action and select a preferred alternative to recommend to the Secretary of Commerce

- Following the selection of preferred alternative, NMFS prepares proposed FMP amendment text, draft notice of availability, draft Environmental Assessment, and, if required, a draft regulatory package

October 19, 2023: A rebuilding plan must be implemented to comply with MSA guidelines in rebuilding overfished stocks.



Questions

Special Thanks

Cody Szuwalski (NMFS)
Kate Haapala (NPFMC)
Mike Litzow (AFSC Kodiak)
Felipe Restrepo (APU Fast Lab)
Scott Smeltz (APU Fast Lab)



C2 Snow Crab Rebuilding CPT minutes summary

, Sarah Rheinsmith, December 5, 2022



Summary of Recommendations

- CPT noted that summaries of projected TACs may be useful for Council analysis under Option 2.
 - Cody Szuwalski indicated that these could be included in the next document iteration, but pointed out that TACs for the projections are calculated as 40% of the ABC; a simplification that does not incorporate the more nuanced elements of the State harvest strategy.
- Define BMSY as how the Federal assessment uses BMSY and how the state defines BMSY in the final iteration
- Suggested that projected TACs be shown in a figure similar to those for the rebuilding trajectories (Fig. 2-2) for the final review draft. These projections may be used to explore the socioeconomic effects of having a small directed fishery during the rebuilding timeframe.



Summary of Recommendations

- Discussion on assessment of the rebuilding plan
 - The CPT noted that a gauge of rebuilding progress is critically important, including potential spatial and temporal variability in recovery, as this stock has shown considerable resilience following historical periods of low abundance.
 - Biennial assessment
 - the NOAA Fisheries Regional Office is responsible for determining if inadequate progress is being made biennially once the rebuilding plan is in place, but would be interested in some input from the CPT regarding markers that could be examined.
 - Regional Office staff noted that criteria to strictly evaluate “progress” have not yet been developed and that substantial leeway exists on how to approach it.
- CPT supported the status quo approach of one year above BMSY as the criterion for establishing rebuilt status, but does acknowledge potential high variability in interannual sampling can occur at reduced stock levels, and notes the importance of the population model in smoothing these results.



Summary of Recommendations

- The CPT noted that there were negligible differences between the two options in the rebuilding trajectories and median rebuilding time based on the model projections, and no difference in the options with respect to the interactions within the marine ecosystem



Recommendations outside of Rebuilding

- The CPT expressed concern surrounding current bycatch levels and impacts on the snow crab population and supported future analysis into current PSC levels and impacts on snow.
- CPT suggested further consideration of structural elements of the Crab Rationalization Program that might be available to mitigate potential differential impacts in respect to the socioeconomic effects of a decrease in availability of snow crab



Questions?



EBS SNOW CRAB FISHERY

Discard Mortality

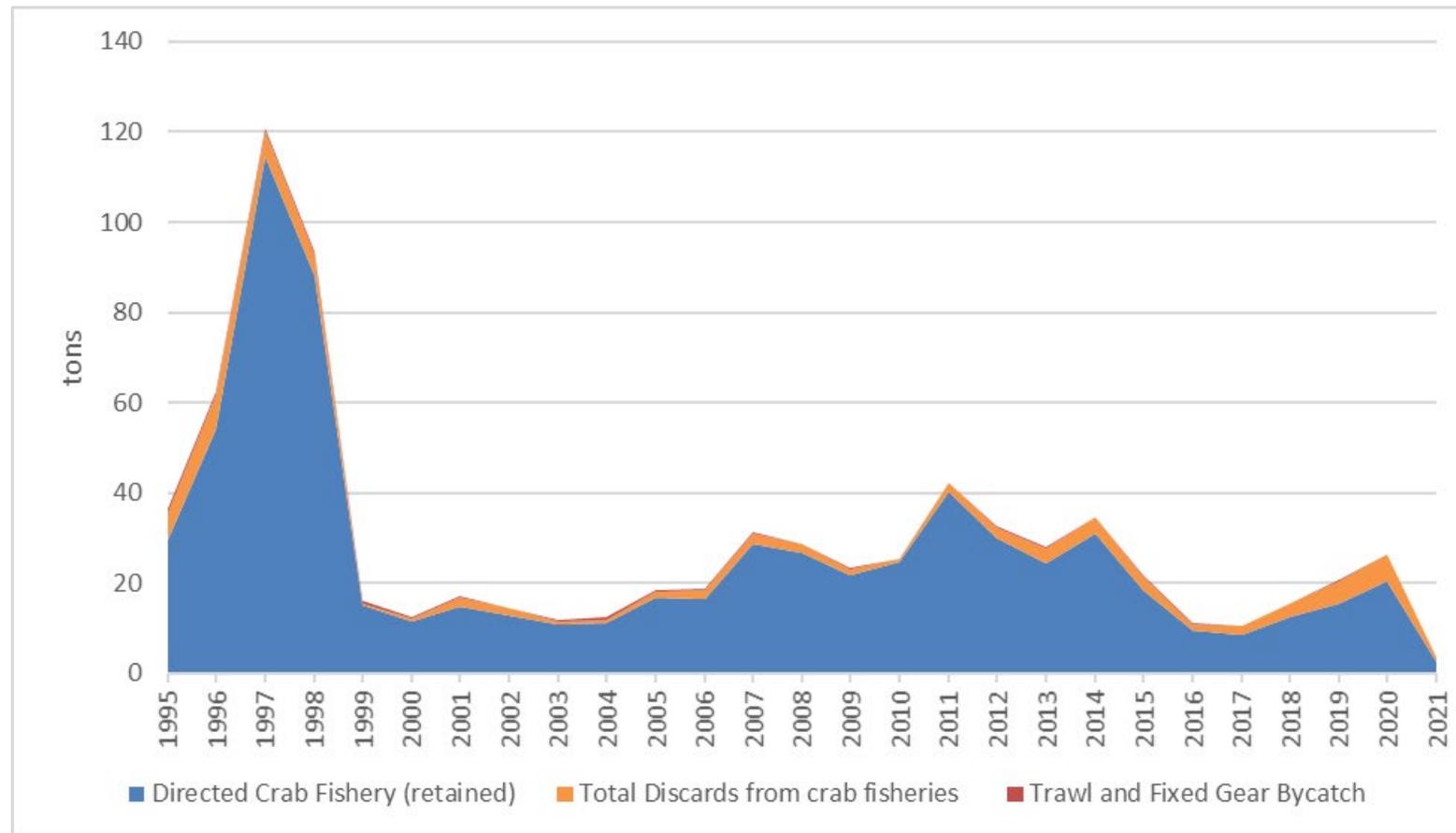


Figure 3-5

