

Preliminary/Initial Review of Crab Prohibited Species Catch Limits in the BSAI Groundfish Trawl Fisheries



Presentation to the AP
February 2021

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History of Council Action

Dec 2019

- Council received public testimony on this issue
- Initiated a Preliminary/ Initial review analysis

Feb 2021

- SSC/ AP/ Council consideration of Preliminary/ Initial review analysis

Also consulted with the Crab Plan Team several times during the development of this analysis: May 2020, Sept 2020, and Jan 2021



Purpose and Need

- ▶ *“At present, most Bering Sea crab stocks are experiencing low productivity and small population sizes, leading to large reductions in directed harvest levels....This action is intended to ensure there is consistency in management measures between directed fisheries and bycatch in groundfish fisheries, making more explicit the balance of impacts to all the fisheries and communities that are affected by the status of depressed stocks.”*



Section 1.1, page 17 for the full Purpose and Need



Alternatives

- ▶ Alternative 1: No Action
- ▶ Alternative 2: Reduced PSC limits for BSAI trawl CDQ and non-CDQ groundfish fishing when the corresponding directed crab fishery is closed.
 - ▶ When no Crab Rationalization Program individual fishing quota (IFQ) is issued in a season for BBRKC, bairdi, or opilio, set the crab PSC limit for that stock at the lowest abundance-based level. As described in regulation at 50 CFR 679.21(e)(1), the PSC limits for the groundfish fisheries would be as follows under this alternative when the directed crab fishery is closed:
 - ▶ Bairdi Zone 1 - 0.5% of total abundance minus 20,000 animals
 - ▶ Bairdi Zone 2 - 1.2% of the total abundance minus 30,000 animals
 - ▶ BBRKC Zone 1 - 32,000 red king crab
 - ▶ Opilio - 4.350 million animals



Triggered Area Closures

Zone 1 and 2 area closures
(BBRKC and EBS Tanner crab)

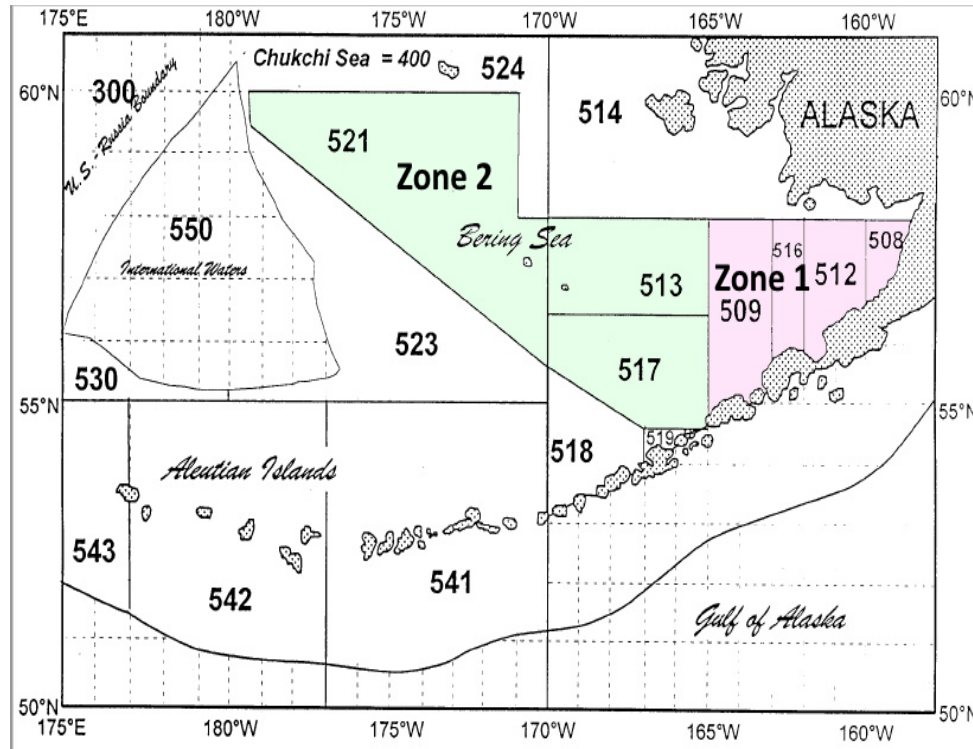


Figure 1 to Part 679. Bering Sea and Aleutian Islands statistical and reporting areas
a. Map

C. *Opilio* Bycatch Limitation Zone(COBLZ)

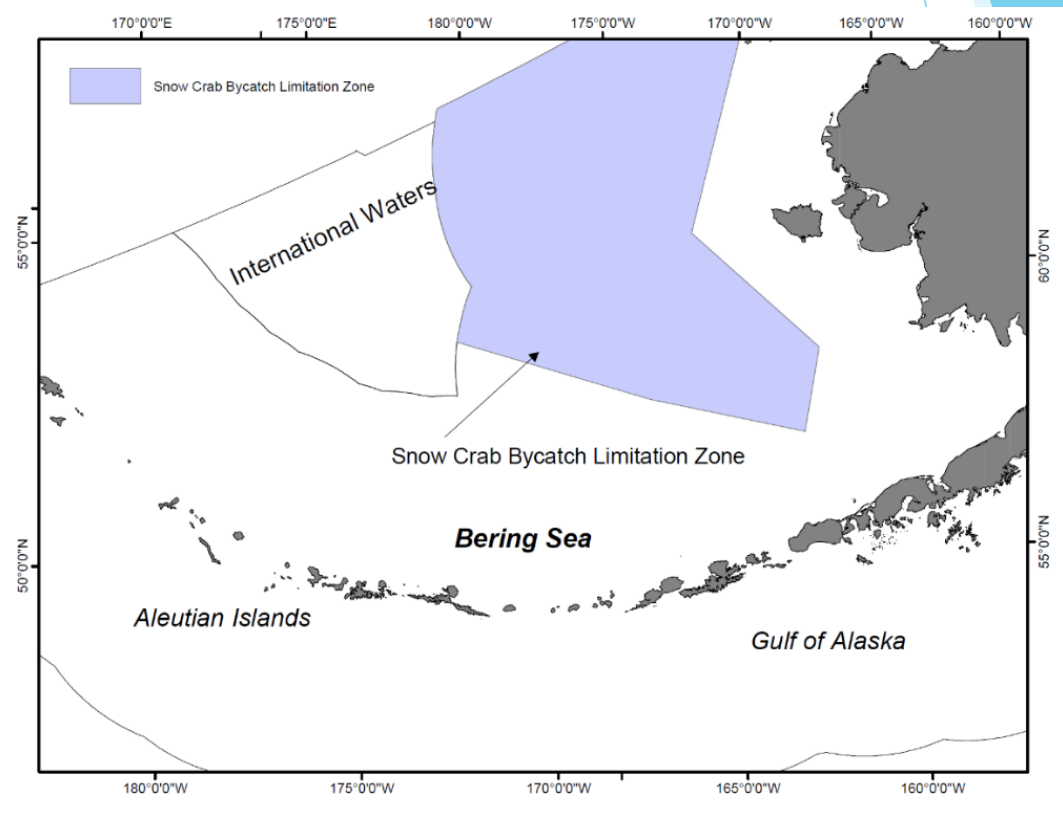


Figure 1 and 2, page 22



Zone 1 Red King Crab PSC Limits

| When the number of mature female red king crab is ... | The zone 1 PSC limit will be ... |
|--|----------------------------------|
| (A) At or below the threshold of 8.4 million mature crab or the effective spawning biomass is less than or equal to 14.5 million lb (6,577 mt) | 32,000 red king crab. |
| (B) Above the threshold of 8.4 million mature crab and the effective spawning biomass is greater than 14.5 but less than 55 million lb (24,948 mt) | 97,000 red king crab. |
| (C) Above the threshold of 8.4 million mature crab and the effective spawning biomass is equal to or greater than 55 million lb | 197,000 red king crab. |

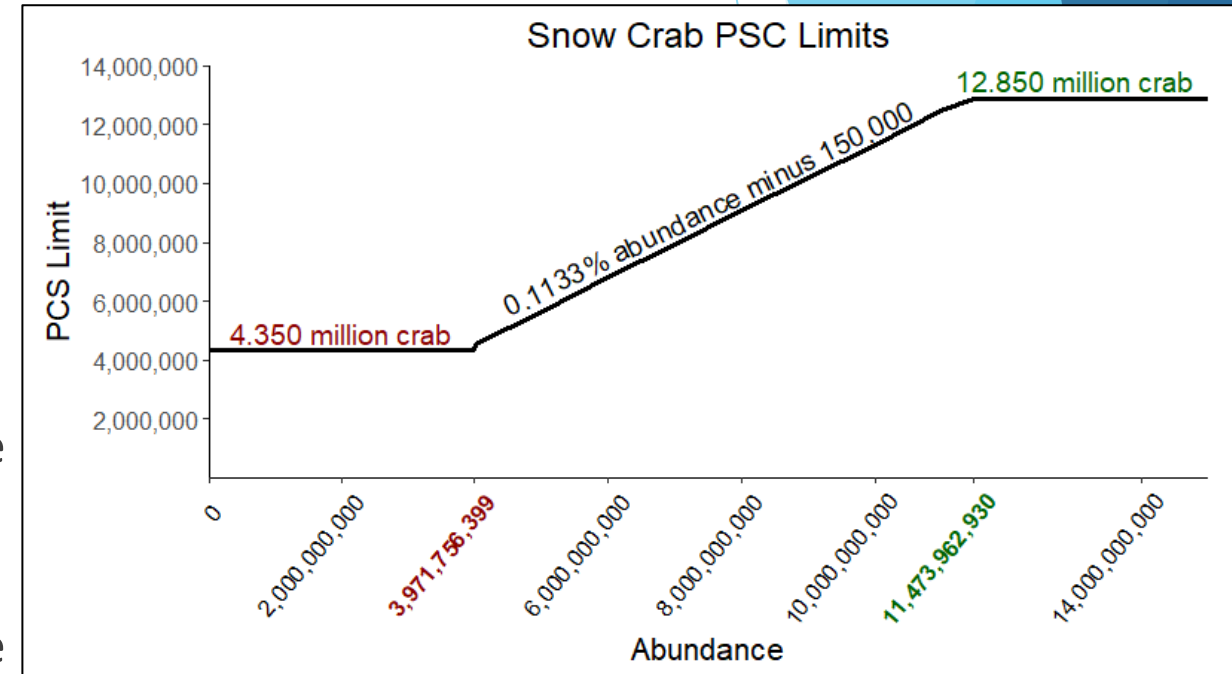


Table 4, page 24



COBLZ Snow Crab PSC Limits

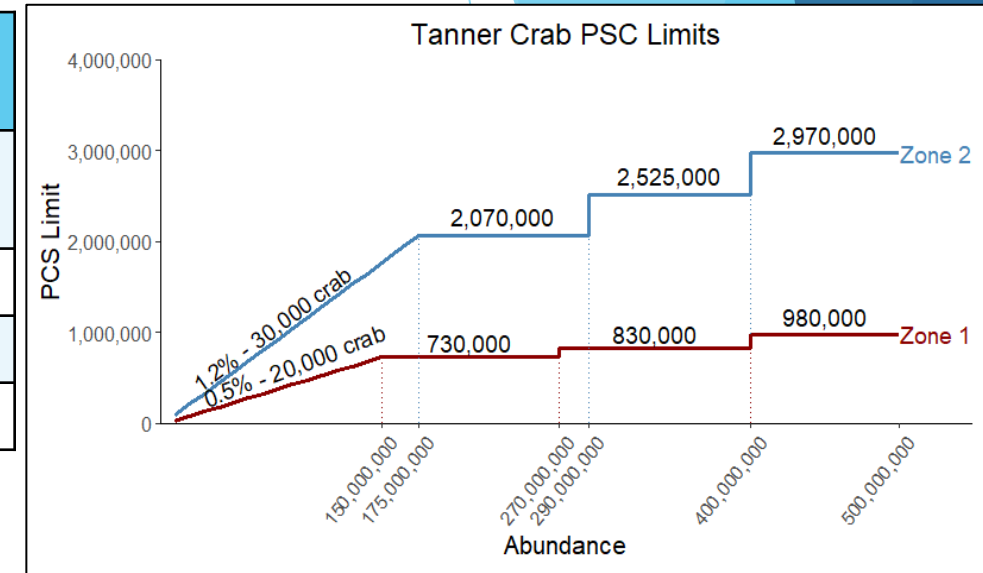
- ▶ Set annually at 0.1133% of the snow crab abundance estimates minus 150,000 crab unless minimum or maximum abundance threshold is reached.
 - ▶ If 0.1133% multiplied by the total abundance is less than 4.5 million, then the minimum PSC limit will be 4.350 million animals.
 - ▶ If 0.1133% multiplied by the total abundance is greater than 13 million, then the maximum PSC limit will be 12.850 million animals.



EBS Tanner Crab PSC Limits

Zone 1:

| When the total abundance of <i>C. bairdi</i> crab is ... | The PSC limit will be ... |
|--|---|
| (1) 150 million animals or less | 0.5 percent of the total abundance minus 20,000 animals |
| (2) Over 150 million to 270 million animals | 730,000 animals |
| (3) Over 270 million to 400 million animals | 830,000 animals |
| (4) Over 400 million animals | 980,000 animals |



Zone 2:

| When the total abundance of <i>C. bairdi</i> crab is ... | The PSC limit will be ... |
|--|---|
| (1) 175 million animals or less | 1.2 percent of the total abundance minus 30,000 animals |
| (2) Over 175 million to 290 million animals | 2,070,000 animals |
| (3) Over 290 million to 400 million animals | 2,520,000 animals |
| (4) Over 400 million animals | 2,970,000 animals |



Table 5 and 6, page 25



Sources of Abundance

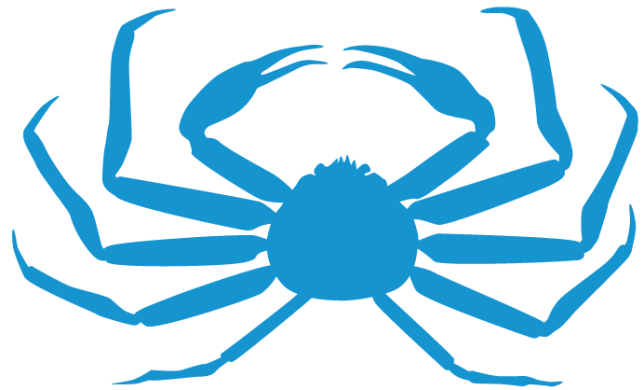
- ▶ The Council also requested that the analysis include source numbers for the crab abundance estimates used to calculate the PSC limits and clearly state whether they are from raw numbers from the NMFS bottom trawl survey or from stock assessment model estimates.

| | Abundance estimate | Effective spawning biomass |
|-------------------|---|--|
| BBRKC | Modeled survey estimates of mature female abundance using data from NMFS bottom trawl survey | From stock assessment (mature males and females) |
| EBS Snow | Modeled estimates of total abundance (accounting for survey selectivity) using data from NMFS bottom trawl survey | N/A |
| EBS Tanner | Modeled estimates of total abundance (accounting for survey selectivity) using data from NMFS bottom trawl survey | N/A |



Table 2, page 23





Background and Summary of Alt 1, No Action



Highlight several sections of the EA and RIR analysis



Description of the Fisheries

Groundfish Fisheries

- ▶ Amendment 80
 - ▶ 18-20 CP vessels
 - ▶ Average crew size: 37
 - ▶ Fleet ex-vessel value: \$133 million
- ▶ BSAI TLAS
 - ▶ 58-83 vessels
 - ▶ Average crew size (CV): 4
 - ▶ Fleet ex-vessel value: \$36.5 million
 - ▶ P. Cod deliveries to 8-11 shoreside processors
- ▶ BSAI CDQ
 - ▶ 21-29 vessels
 - ▶ Average crew size (CPS and CVs): 23
 - ▶ Fleet ex-vessel value: \$78 million

Crab Fisheries

- ▶ Average crew size: 6
- ▶ BBR and BSS
 - ▶ 60-70 CVs
 - ▶ 2 CPs
- ▶ EBST and WBST
 - ▶ 24-49 CVs
 - ▶ 1 CP
- ▶ Harvesting sector gross ex-vessel revenue
 - ▶ BBR: \$70 million
 - ▶ BSS: \$109.5 million
 - ▶ BST: \$22.2 million





Bristol Bay Red King Crab in Zone 1





Alternative 1: BBRKC Use Based on the Lowest Limits

- ▶ Have not been set to lowest threshold between 2008-2020
- ▶ Past years where – had BBRKC been set to lowest limit – sectors *may* have reached limit and been closed out of Zone 1 (represented in blue)

| Bristol Bay RKC Zone 1 | CDQ PSQ | | | A80 | | | BSAI TLAS | | |
|------------------------|---------|-------|------------|--------|--------|------------|-----------|-------|------------|
| | Limit | Use | % of limit | Limit | Use | % of limit | Limit | Use | % of limit |
| 2008 | 3,424 | 2,623 | 77% | 14,282 | 78,426 | 549% | 8,739 | 4,492 | 51% |
| 2009 | 3,424 | 2,187 | 64% | 14,282 | 59,428 | 416% | 8,739 | 4,664 | 53% |
| 2010 | 3,424 | 779 | 23% | 14,282 | 54,314 | 380% | 8,739 | 0 | 0% |
| 2011 | 3,424 | 3,630 | 106% | 14,282 | 31,003 | 217% | 8,739 | 3,336 | 38% |
| 2012 | 3,424 | 2,605 | 76% | 14,282 | 24,164 | 169% | 8,739 | 225 | 3% |
| 2013 | 3,424 | 2,425 | 71% | 14,282 | 22,524 | 158% | 8,739 | 224 | 3% |
| 2014 | 3,424 | 1,455 | 42% | 14,282 | 26,333 | 184% | 8,739 | 177 | 2% |
| 2015 | 3,424 | 62 | 2% | 14,282 | 12,615 | 88% | 8,739 | 77 | 1% |
| 2016 | 3,424 | 430 | 13% | 14,282 | 21,442 | 150% | 8,739 | 1,448 | 17% |
| 2017 | 3,424 | 3,722 | 109% | 14,282 | 27,143 | 190% | 8,739 | 4,167 | 48% |
| 2018 | 3,424 | 1,936 | 57% | 14,282 | 9,799 | 69% | 8,739 | 989 | 11% |
| 2019 | 3,424 | 2,044 | 60% | 14,282 | 20,775 | 145% | 8,739 | 2,141 | 25% |
| 2020 | 3,424 | 6,137 | 179% | 14,282 | 30,367 | 213% | 8,739 | 3,971 | 45% |



Table 9, page 29





Alternative 1: Impact of Lower BBRKC Limits to the Groundfish Sectors

- ▶ Thresholds for BBRKC PSC limits align with the State harvest strategy
- ▶ Groundfish sector impacts if directed fishery is not opened/ thresholds not met:
 - ▶ Closed out of Red King Crab Savings Subarea (RCKSS)
 - ▶ Reduce A80 sector limit from 43,293 crab to 14,282 crab
 - ▶ Lower PSC limits may come at a cost (even when catch is not approaching the limits)
 - ▶ A Zone 1 closure likely to result in additional forgone revenue and increased costs associated with fishing

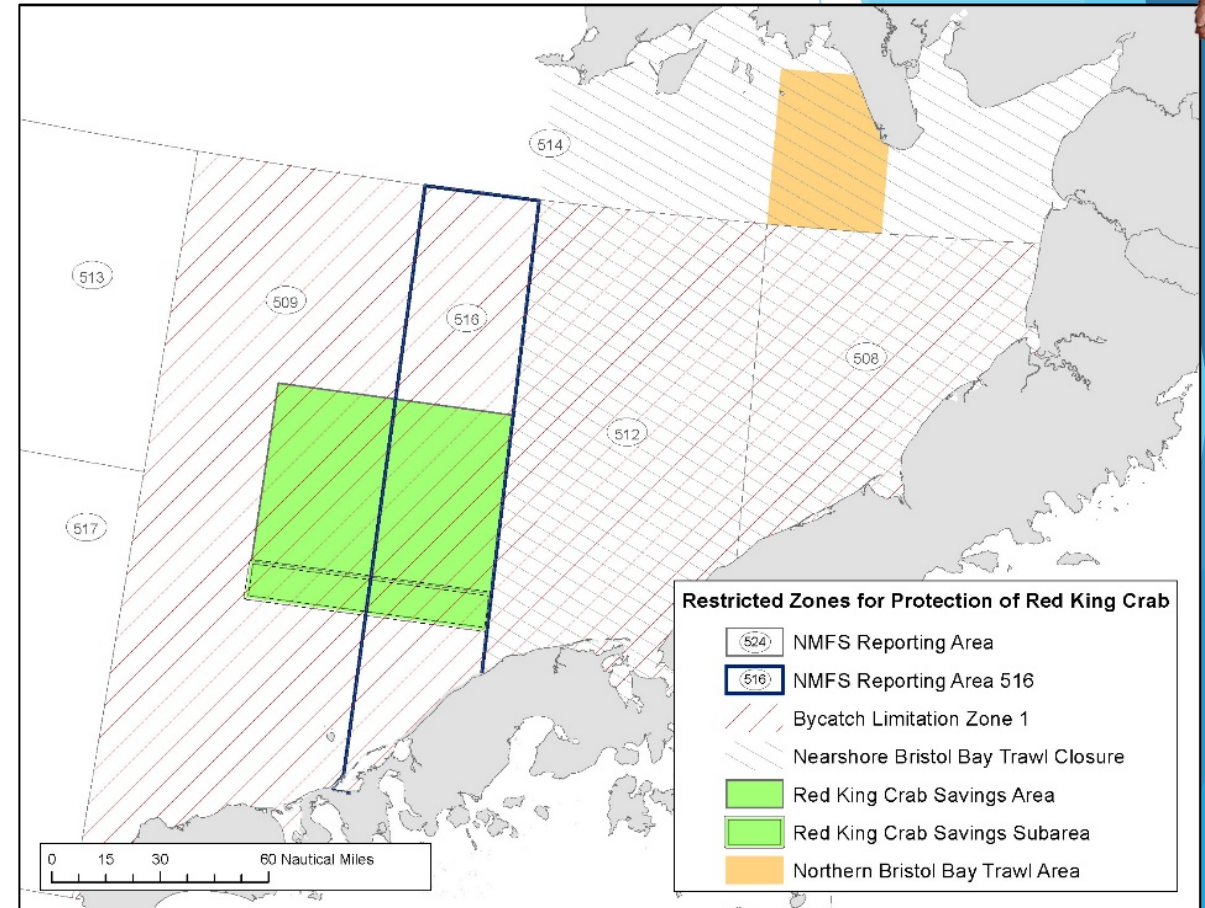


Figure 15, page 54



Alternative 1: Impact of Lower BBRKC Limits to Processors and Communities

- ▶ Shoreside processing connection to this action is through the trawl CV Pacific cod component of the TLA sector
 - ▶ Deliveries to five communities: Adak, Akutan, Dutch Harbor/Unalaska, King Cove, and Sand Point
 - ▶ A80, trawl CVs harvesting CDQ, trawl CPs harvesting CDQ, and trawl CV harvesting yellowfin sole in the TLA sector are all generally offshore
 - ▶ Based on past PSC use in this sector, unlikely to change the amount of P.cod landed or distribution of landings
- ▶ Also, community connections through spending (induced impacts) associated with crew, vessel owners, others employed, as well as spending from port calls, landings tax, and CDQ communities
 - ▶ If BBRKC limits drop, these communities could be impacted under Alt 1

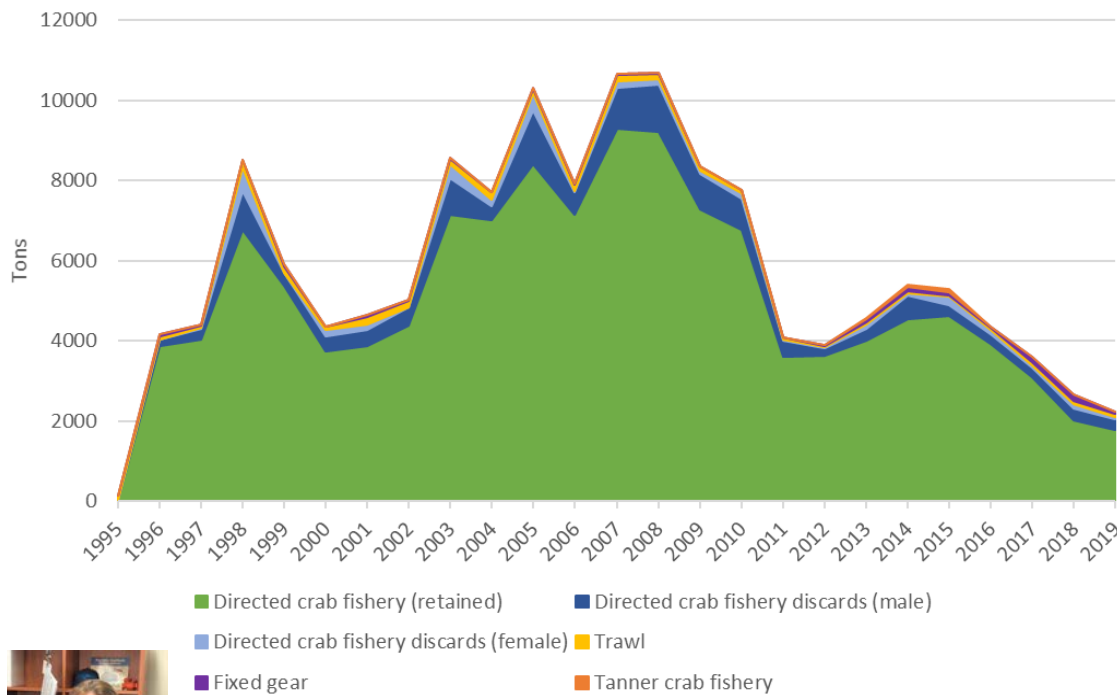




Alternative 1: Potential Effects on BBRKC

- ▶ trawl PSC still represents a small portion of fishing mortality
- ▶ other gear types are estimated to represent a greater portion of the crab PSC
- ▶ crab PSC limits at their lowest threshold may have a modest impact on stock's ability to rebuild

BBRKC Estimated Mortality by Gear



Bycatch Estimated Mortality by Gear



Figure 6 and 7, page 47
Also Section 3.5.2, page 86-90



Sensitivity Analyses

- ▶ Potential impacts of unobserved trawl mortality
- ▶ For BBRKC, when **bycatch biomass increases by 500% or more** in the models, estimated MMB values in the terminal years **could decrease about 14% or more**; the decreases might be much larger for some years.
- ▶ For Tanner crab, based on previous catch rates, **increasing the bycatch by 1000%** would have lowered the MMB in the 1970s by an estimated **~100,000 t**, while in recent years it **would have been estimated to be ~6,000 t less**.
- ▶ For snow crab, bycatch has been small enough that **increasing the bycatch input by 1000%** **resulted in only a ~2% change** in the terminal year of MMB (with largest changes in the mid-1990s through mid-2010).





Alternative 1: Impact of Lower BBRKC Limits on the Crab Directed Fishery

- ▶ Declines over the last 10 years
 - ▶ 87% TAC reduction
 - ▶ Season truncated by 1-2 months
 - ▶ 1.8 trips per vessel
 - ▶ Decline in vessel participation and available crew positions
 - ▶ Drastic reduction in overall value and crew earnings
- ▶ Given the expectation for modest stock impacts, BBRKC PSC limits set to lower thresholds expected to have limited indirect impacts to the directed fishery



Overfishing and Rebuilding Plans

- ▶ Council requested additional information on triggers for which a stock is redefined as *overfished* and the process of a rebuilding plan.
- ▶ Overfished if $MMB < MSST$, defined as $B/B_{MSY} \leq 50\%$
- ▶ Triggers MSA and NS1 guidelines to rebuild stock *within an appropriate timeframe*
 - ▶ Rebuilt when stock reaches B_{MSY} for two consecutive years
- ▶ Rebuilding plans must consider:
 - ▶ Harvest strategy
 - ▶ Bycatch control measures
 - ▶ Habitat protection measures
- ▶ Monitoring requirements



Overfishing and Rebuilding – Status of BBRKC

- ▶ BBRKC is listed as a Tier 3b stock
 - ▶ 3: Reliable estimates of the spawner/recruit relationship are not available, but proxies for FMSY and BMSY can be estimated
 - ▶ b: Current biomass is less than BMSY but greater than the level specified as *critical biomass threshold*
- ▶ Approaching *overfished* status

| Year | Tier | B/B _{MSY} |
|---------|------|--------------------|
| 2016/17 | 3b | 0.93 |
| 2017/18 | 3b | 0.85 |
| 2018/19 | 3b | 0.82 |
| 2019/20 | 3b | 0.75 |
| 2020/21 | 3b | 0.59 |

Section 3.3.5, page 678 and Appendix 2



Snow Crab in COBLZ and Tanner Crab in Zone 1 and 2





Trawl PSC limits by crab fishery, with years of closed crab fisheries circled, 2008-2020

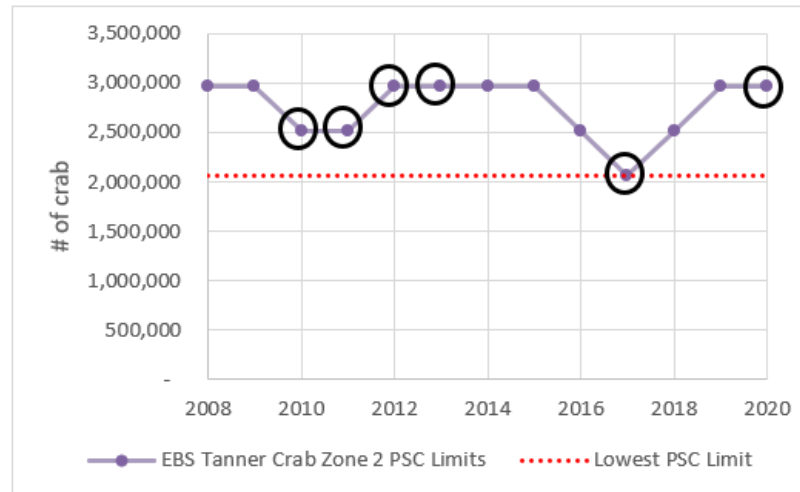
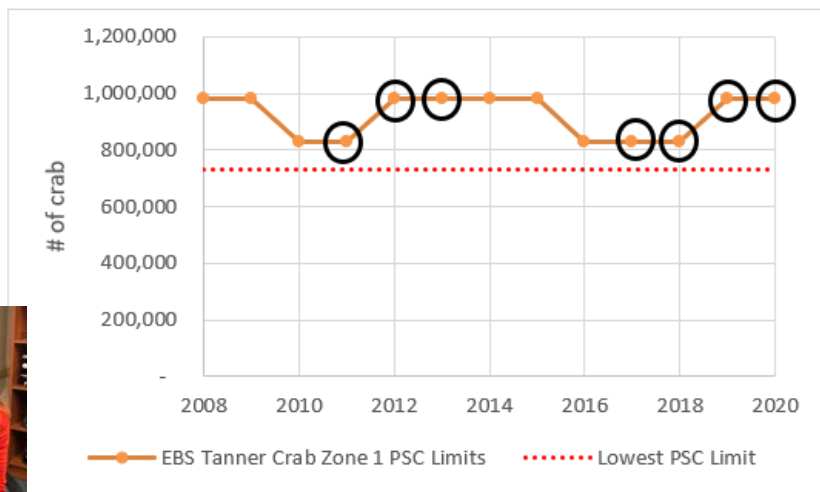
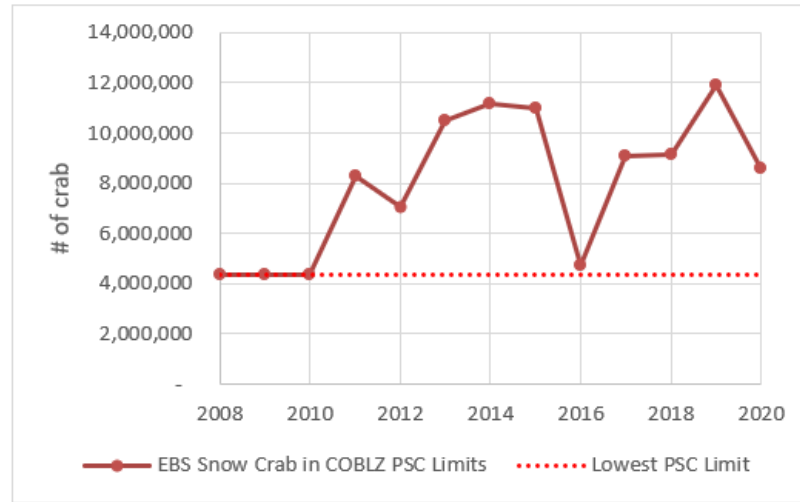
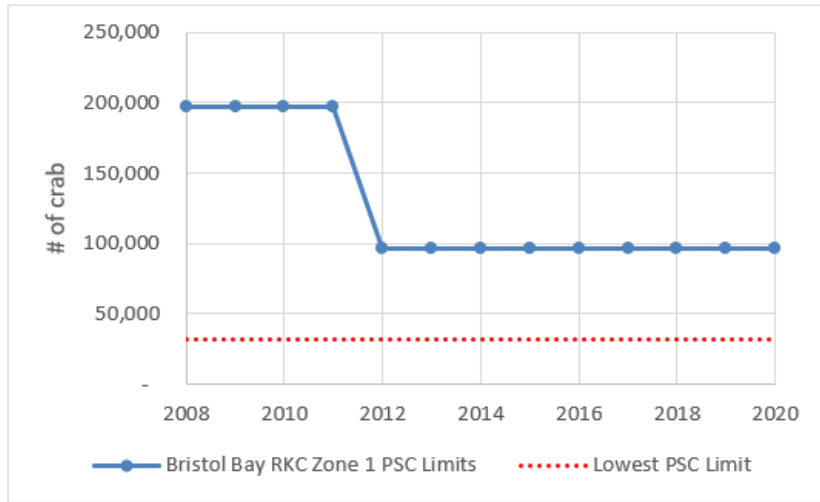


Figure 3, page 31





EBS Snow crab COBLZ PSC use relative to the lowest limits (# of crab), 2008-2020

| EBS Snow Crab in COBLZ | CDQ PSQ | | | A80 | | | BSAI TLAS | | |
|------------------------|---------|---------|------------|-----------|-----------|------------|-----------|-----------|------------|
| | Limit | Use | % of limit | Limit | Use | % of limit | Limit | Use | % of limit |
| 2008 | 481,500 | 10,998 | 2% | 1,975,093 | 601,773 | 30% | 1,291,546 | 64,590 | 5% |
| 2009 | 481,500 | 56,254 | 12% | 1,975,093 | 356,667 | 18% | 1,291,546 | 23,129 | 2% |
| 2010 | 481,500 | 11,530 | 2% | 1,975,093 | 266,102 | 13% | 1,291,546 | 1,379,131 | 107% |
| 2011 | 481,500 | 29,749 | 6% | 1,975,093 | 480,262 | 24% | 1,291,546 | 212,241 | 16% |
| 2012 | 481,500 | 26,600 | 6% | 1,975,093 | 326,335 | 17% | 1,291,546 | 239,451 | 19% |
| 2013 | 481,500 | 19,445 | 4% | 1,975,093 | 400,283 | 20% | 1,291,546 | 224,401 | 17% |
| 2014 | 481,500 | 34,958 | 7% | 1,975,093 | 329,062 | 17% | 1,291,546 | 81,796 | 6% |
| 2015 | 481,500 | 40,269 | 8% | 1,975,093 | 394,127 | 20% | 1,291,546 | 48,005 | 4% |
| 2016 | 481,500 | 12,189 | 3% | 1,975,093 | 145,705 | 7% | 1,291,546 | 2,711 | 0% |
| 2017 | 481,500 | 19,709 | 4% | 1,975,093 | 125,564 | 6% | 1,291,546 | 4,946 | 0% |
| 2018 | 481,500 | 291,314 | 61% | 1,975,093 | 1,216,259 | 62% | 1,291,546 | 68,722 | 5% |
| 2019 | 481,500 | 74,151 | 15% | 1,975,093 | 834,553 | 42% | 1,291,546 | 17,017 | 1% |
| 2020 | 481,500 | 19,953 | 4% | 1,975,093 | 655,590 | 33% | 1,291,546 | 57,192 | 4% |



Table 10, page 33





EBS Tanner Zone 1 PSC use relative to the lowest fixed limits (# of crab), 2008-2020

| EBS Tanner Crab Zone 1 | CDQ PSQ | | | A80 | | | BSAI TLAS | | |
|------------------------|---------|--------|------------|---------|---------|------------|-----------|--------|------------|
| | Limit | Use | % of limit | Limit | Use | % of limit | Limit | Use | % of limit |
| 2008 | 78,110 | 3,815 | 5% | 274,511 | 141,453 | 52% | 306,323 | 41,545 | 14% |
| 2009 | 78,110 | 7,203 | 9% | 274,511 | 167,340 | 61% | 306,323 | 17,518 | 6% |
| 2010 | 78,110 | 13,200 | 17% | 274,511 | 148,284 | 54% | 306,323 | 16,373 | 5% |
| 2011 | 78,110 | 9,635 | 12% | 274,511 | 221,988 | 81% | 306,323 | 21,358 | 7% |
| 2012 | 78,110 | 14,594 | 19% | 274,511 | 171,355 | 62% | 306,323 | 8,827 | 3% |
| 2013 | 78,110 | 20,603 | 26% | 274,511 | 239,861 | 87% | 306,323 | 16,929 | 6% |
| 2014 | 78,110 | 6,603 | 8% | 274,511 | 155,223 | 57% | 306,323 | 10,657 | 3% |
| 2015 | 78,110 | 3,088 | 4% | 274,511 | 71,616 | 26% | 306,323 | 17,657 | 6% |
| 2016 | 78,110 | 2,761 | 4% | 274,511 | 50,605 | 18% | 306,323 | 9,941 | 3% |
| 2017 | 78,110 | 4,812 | 6% | 274,511 | 95,674 | 35% | 306,323 | 53,859 | 18% |
| 2018 | 78,110 | 1,638 | 2% | 274,511 | 21,763 | 8% | 306,323 | 3,920 | 1% |
| 2019 | 78,110 | 1,719 | 2% | 274,511 | 23,181 | 8% | 306,323 | 4,041 | 1% |
| 2020 | 78,110 | 1,812 | 2% | 274,511 | 113,122 | 41% | 306,323 | 4,534 | 1% |



Table 11, page 34





EBS Tanner Zone 2 PSC use relative to the lowest fixed limits (# of crab), 2008-2020

| EBS Tanner Crab Zone 2 | CDQ PSQ | | | A80 | | | BSAI TLAS | | |
|------------------------|---------|--------|------------|---------|----------------------|------------|-----------|---------|------------|
| | Limit | Use | % of limit | Limit | Use | % of limit | Limit | Use | % of limit |
| 2008 | 221,490 | 9,508 | 4% | 437,542 | 386,049 | 88% | 865,288 | 69,749 | 8% |
| 2009 | 221,490 | 5,652 | 3% | 437,542 | 226,578 | 52% | 865,288 | 52,978 | 6% |
| 2010 | 221,490 | 15,975 | 7% | 437,542 | 225,088 | 51% | 865,288 | 70,663 | 8% |
| 2011 | 221,490 | 14,706 | 7% | 437,542 | 566,190 ¹ | 129% | 865,288 | 61,437 | 7% |
| 2012 | 221,490 | 16,964 | 8% | 437,542 | 166,732 | 38% | 865,288 | 43,728 | 5% |
| 2013 | 221,490 | 16,753 | 8% | 437,542 | 344,658 | 79% | 865,288 | 70,504 | 8% |
| 2014 | 221,490 | 38,298 | 17% | 437,542 | 303,607 | 69% | 865,288 | 103,381 | 12% |
| 2015 | 221,490 | 9,055 | 4% | 437,542 | 196,608 | 45% | 865,288 | 25,527 | 3% |
| 2016 | 221,490 | 4,885 | 2% | 437,542 | 102,466 | 23% | 865,288 | 5,609 | 1% |
| 2017 | 221,490 | 5,630 | 3% | 437,542 | 157,924 | 36% | 865,288 | 27,350 | 3% |
| 2018 | 221,490 | 17,988 | 8% | 437,542 | 108,259 | 25% | 865,288 | 10,166 | 1% |
| 2019 | 221,490 | 15,580 | 7% | 437,542 | 249,557 | 57% | 865,288 | 7,007 | 1% |
| 2020 | 221,490 | 3,301 | 1% | 437,542 | 177,700 | 41% | 865,288 | 25,272 | 3% |



Table 12, page 34





Tanner and Snow Crab Stock Status

Tanner Crab

- ▶ EBT and WBT directed fisheries have experienced variable closures over time
- ▶ MMB has been declining since 2014/15
- ▶ Harvest strategy amended in March 2020
 - ▶ New thresholds for opening
 - ▶ Reduces number of years the fishery is closed

Snow Crab

- ▶ MMB increase
- ▶ Large recruitment, positive trends
- ▶ Unlikely for directed fishery closure in the near term



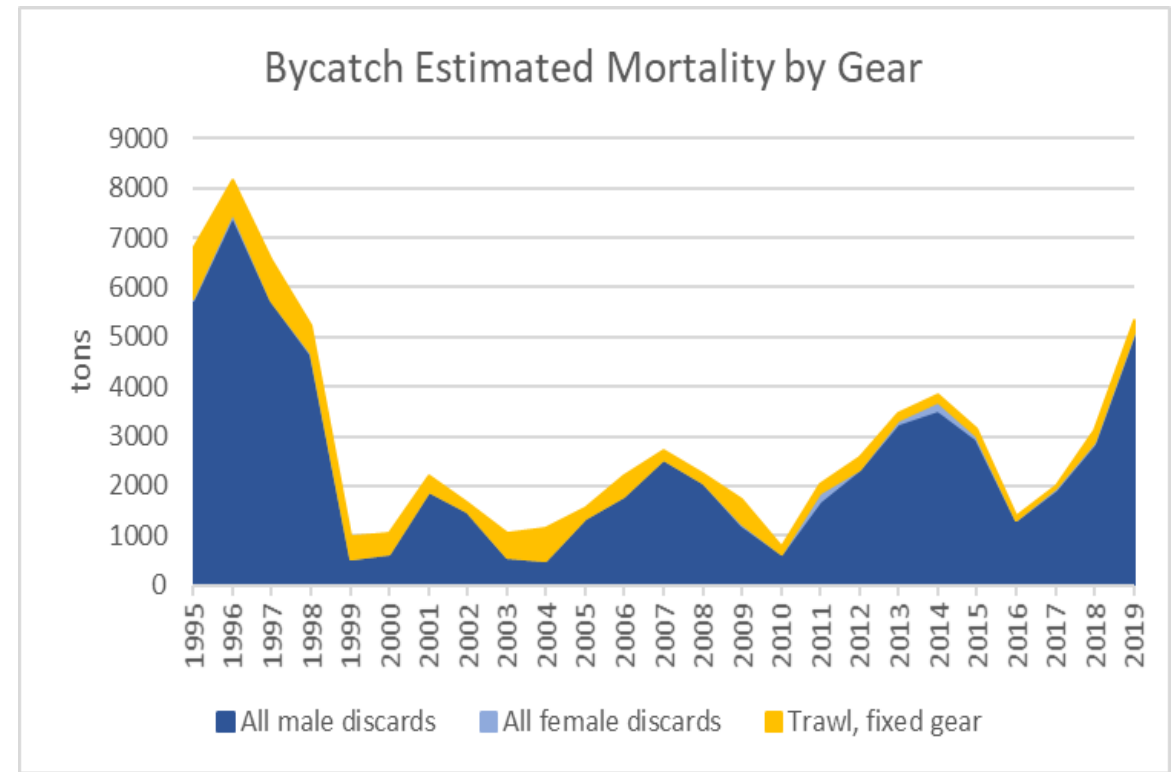
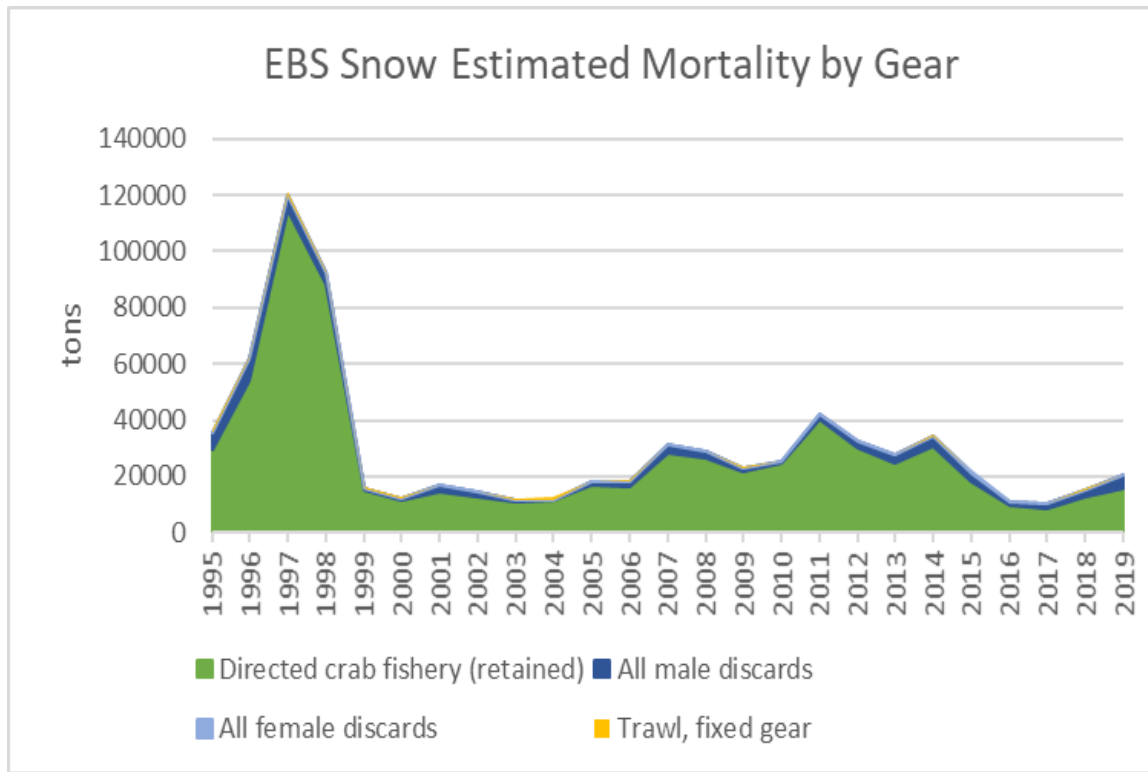
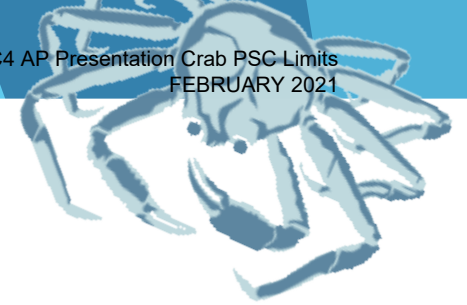
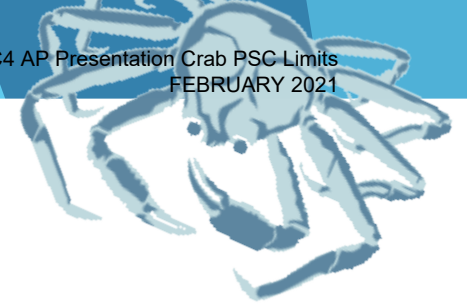
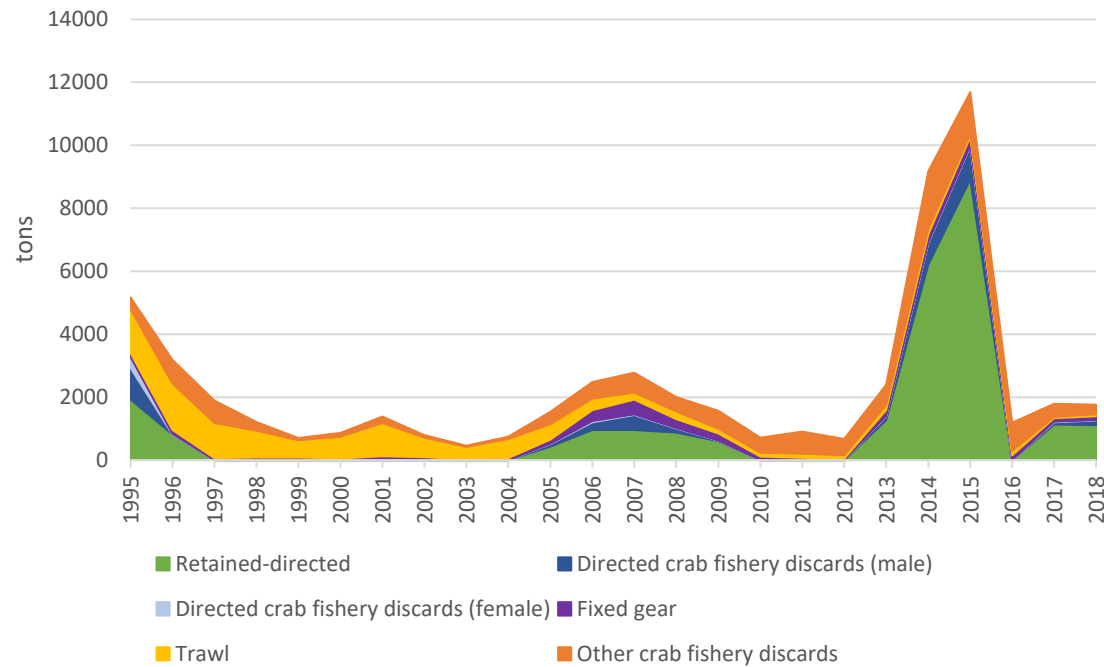


Figure 10 and 11, page 50-51



EBS Tanner Estimated Mortality by Gear



Bycatch Estimated Mortality by Gear

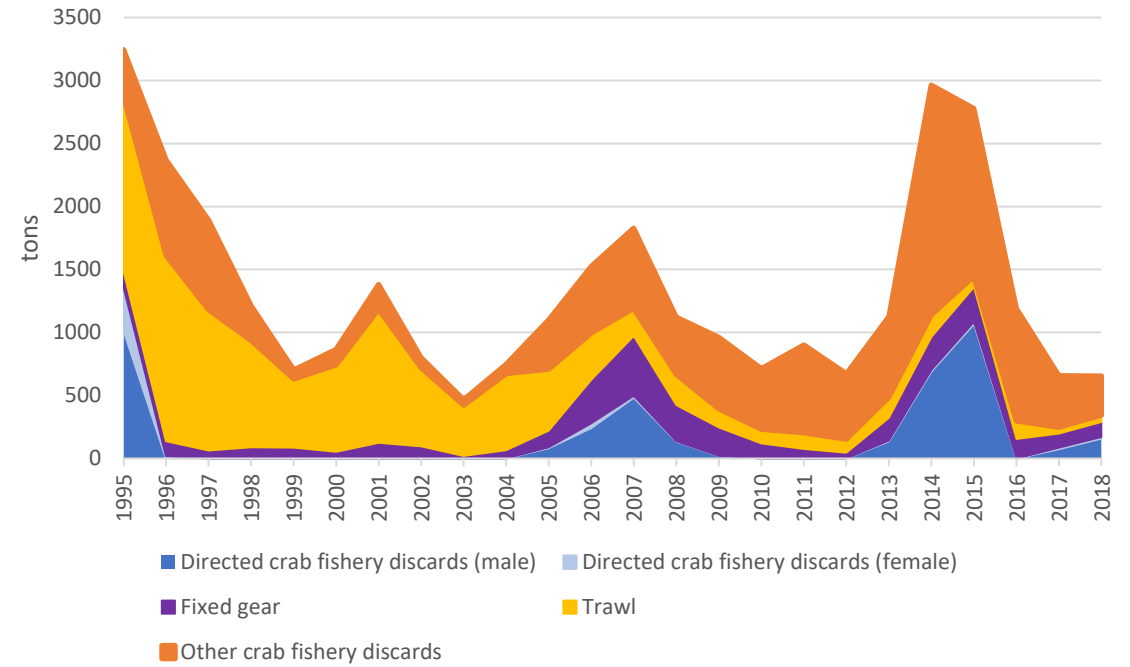
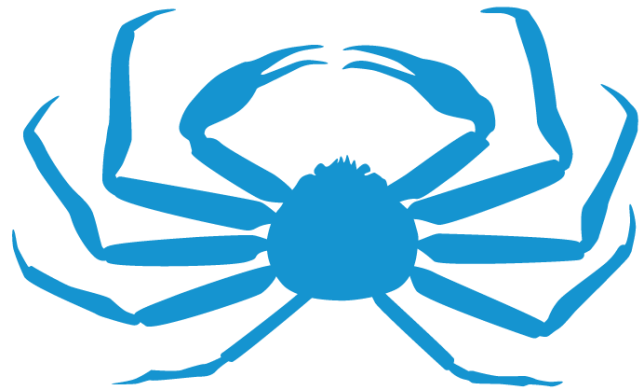


Figure 13 and 14, page 53



Summary of Anticipated Changes Under Alt 2



*Primarily highlights Section 2.3 and 3.5.2 of the EA
and Section 4.6.2 of the RIR analysis*



Alternative 2

| If directed _____ fishery is closed | PSC limit would be.... |
|-------------------------------------|------------------------------------|
| Bristol Bay red king crab | 32,000 animals in Zone 1 |
| Bering Sea snow crab | 4.350 million animals in the COBLZ |
| Eastern Bering Sea Tanner* | 730,000 animals in Zone 1 |
| Western Bering Sea Tanner* | 2.07 animals in Zone 2 |

*These limits are not the lowest tier currently specified in regulation, but the lowest fixed amount.

- ▶ Expected impacts under Alternative 2 are essentially the same *types* of impacts highlighted under Alternative 1
- ▶ Alternative 2 *may increase the likelihood* crab PSC would be applied at lowest abundance-based thresholds
 - ▶ Particularly Zone 1 and Zone 2 Tanner PSC limits
- ▶ Changes in groundfish trawl fishing behavior and thus changes in resource components are expected to be limited, relative to no action



Figure 7, page 28



Impacts of Alternative 2

- ▶ Limited scope of impacts is expected for BBRKC because thresholds are already aligned (not because lower PSC limits would have no effect)
- ▶ Limited scope of impacts expected for snow and Tanner based on past PSC relative to lowest PSC limits
 - ▶ Large snow or Tanner crab recruitment events could change “typical” PSC pattern in groundfish trawl fisheries
 - ▶ Snow and Tanner crab PSC based on abundance estimates that include juveniles
 - ▶ Directed fishery may close due to low mature crab biomass, but large recruitment means PSC encounter rates could be higher
 - ▶ Further investigation of size selectivity



Section 2.3, page 27-34
Section 3.5.2, page 90



Additional Implications of Alternative 2

- ▶ Trawl crab PSC is a small portion of observed fishing mortality
 - ▶ Reduced BBRKC limits in Zone 1 may adversely impact groundfish trawl sector, but is most likely to provide greatest PSC savings
 - ▶ Reduced Tanner and snow crab limits would have limited impacts to groundfish sector, associated processors, and communities, based on past PSC use
- ▶ **More explicit and definitive link between management of directed crab fisheries and PSC limits in groundfish trawl fisheries**



*Section 3.5.2, page 90-91;
Section 4.6.2; page 131-134*



Thank You

Especially to stock assessment authors:

- Jie Zheng
- William Stockhausen
- Cody Szuwalski

And all reviewers/ contributors

(Section 6, page 142)

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