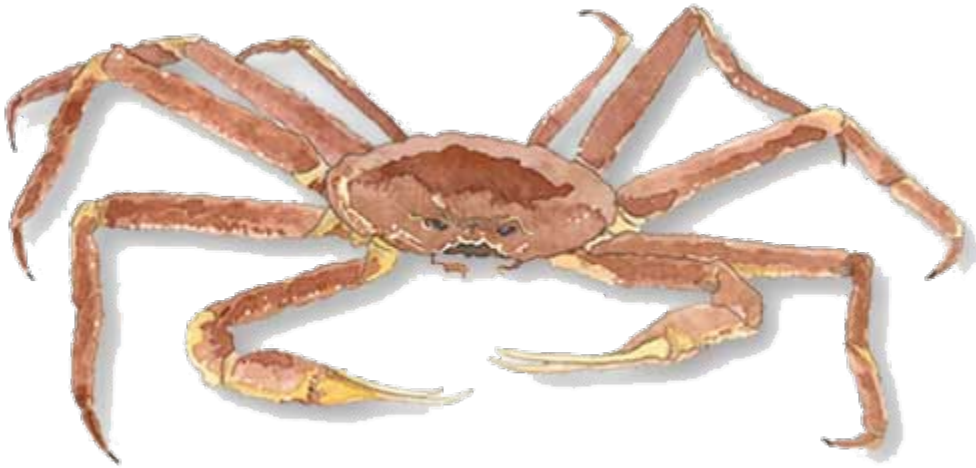


Bottom Trawl Survey Results

September 2021 Crab Plan Team meeting

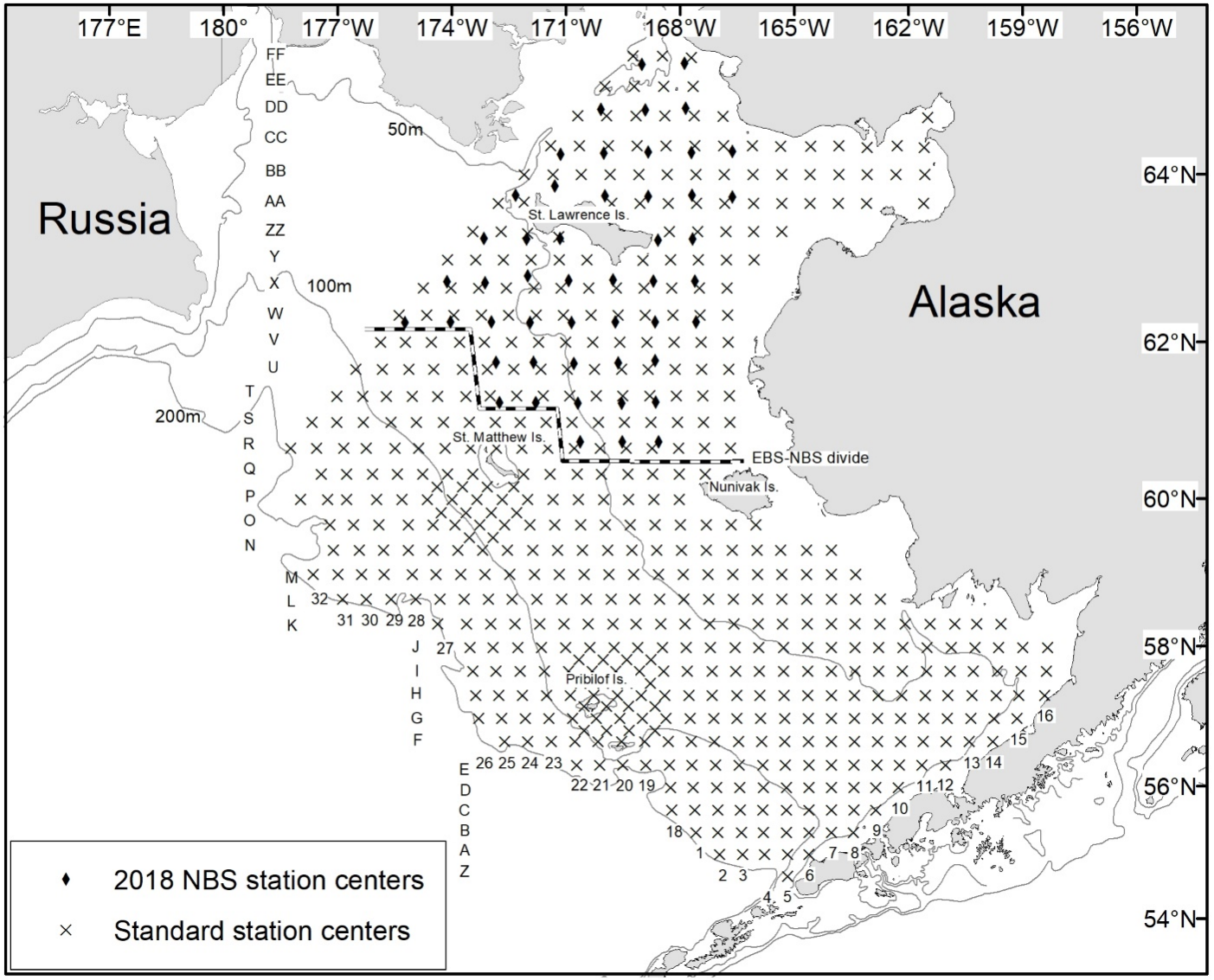
Mike Litzow, Jon Richar, Leah Zacher,
and everyone in the AFSC Shellfish Assessment Program

Acknowledgements

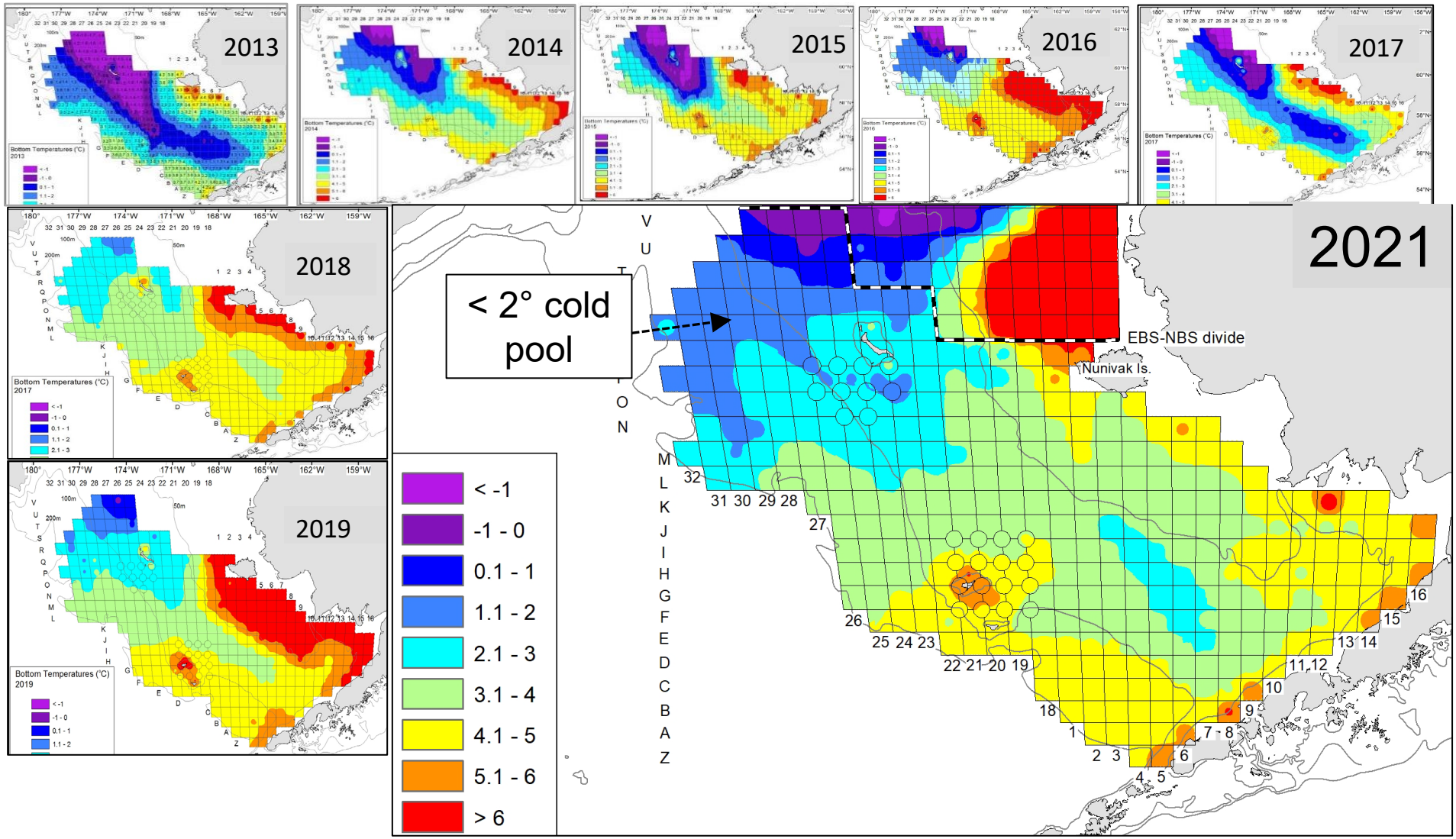
Crab biologists: Julie Ayers (ADF&G), Connor Cleary (NOAA), Erin Fedewa (NOAA), Charlie Heller (NRC), Heather Kenney (NOAA), Cory Lescher (ABSC), Mike Litzow (NOAA), Sara Ober (AIS), Adam Potter (NOAA), Jon Richar (NOAA), Joletta Silva (NOAA)

Survey coordination: Allie Conrad (NOAA)

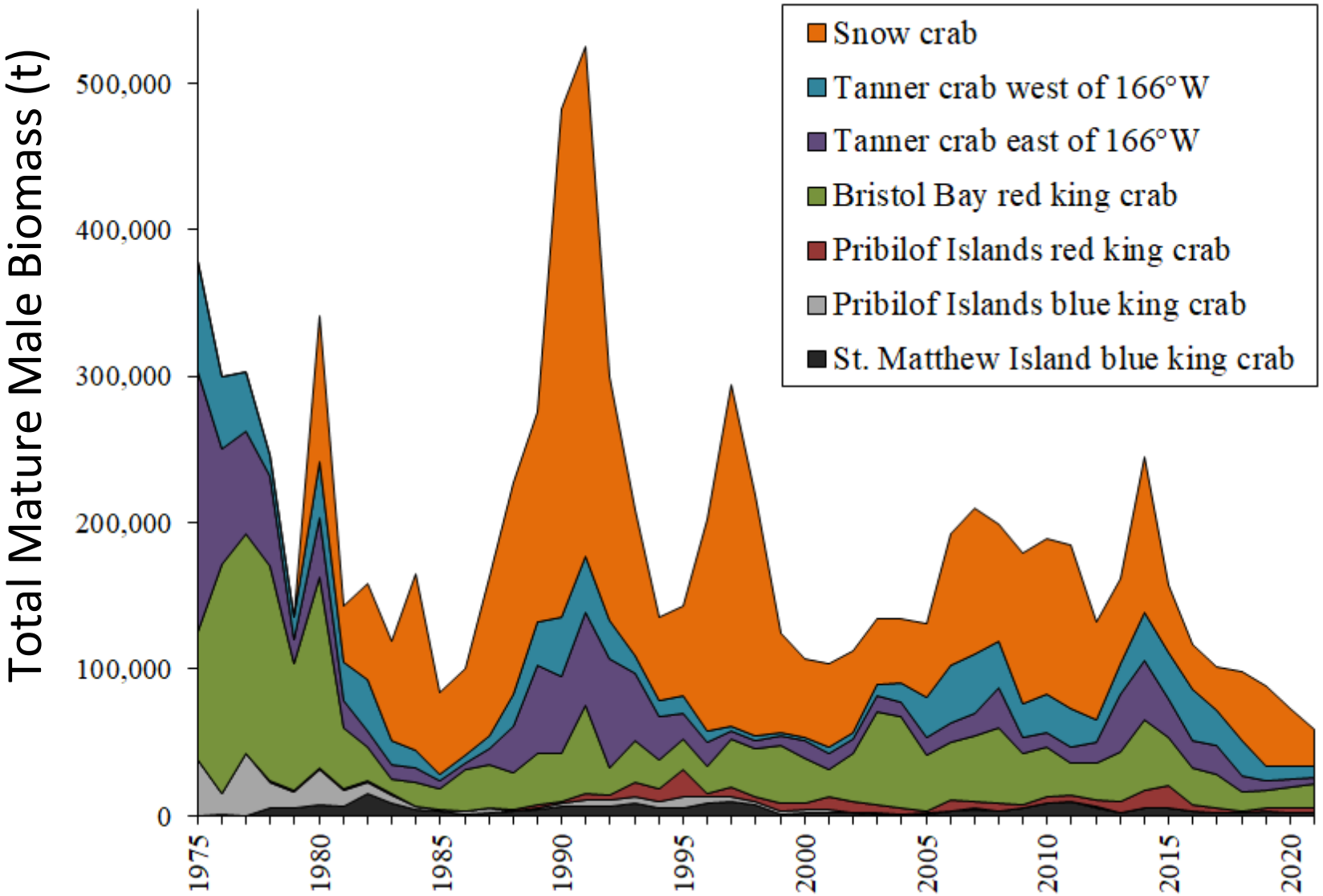
2021 – Full Eastern Bering / Northern Bering survey grids



Continuing trend: Cold pool reduced or absent from EBS shelf



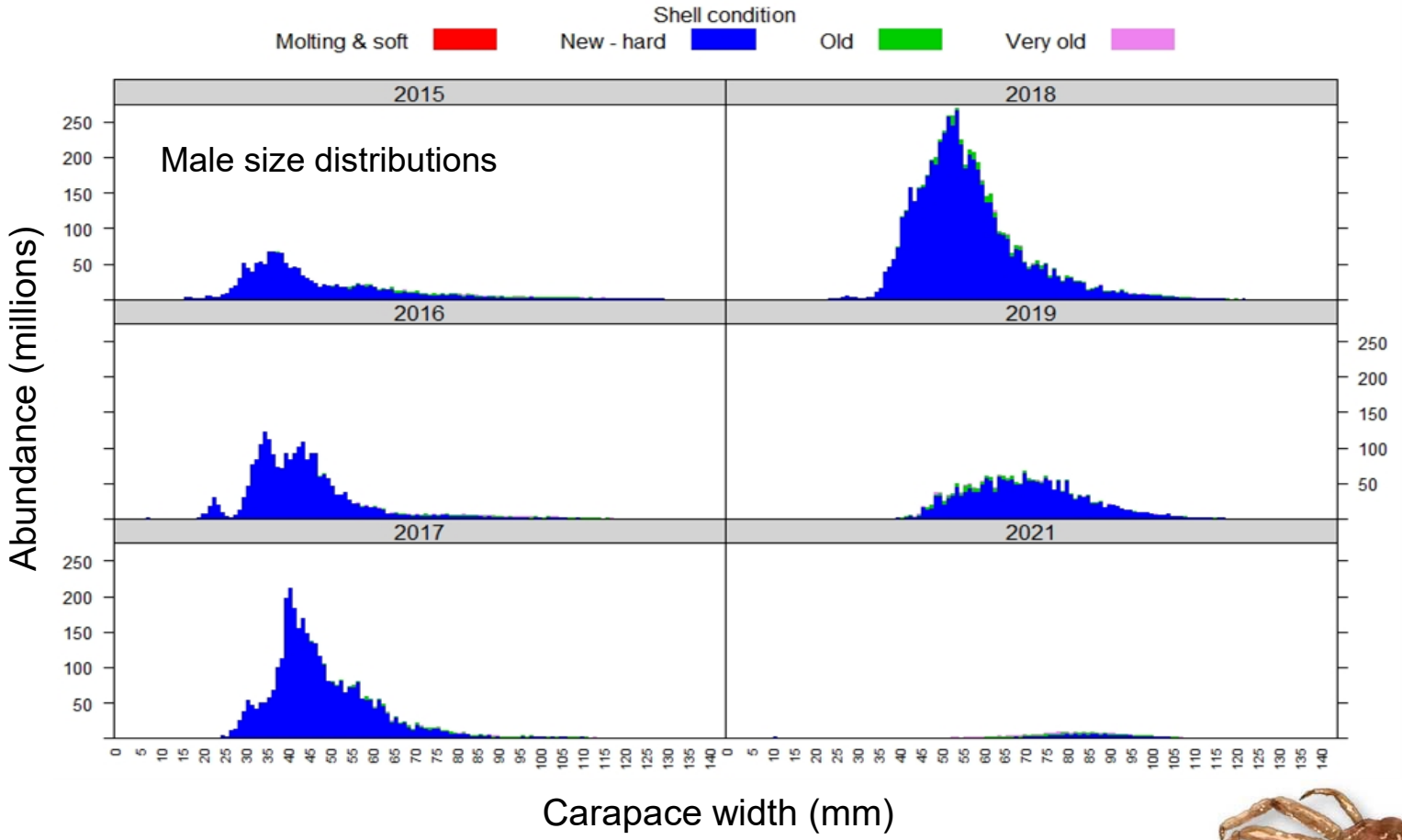
Lowest mature male biomass in 1975-2021 time series (all stocks combined)



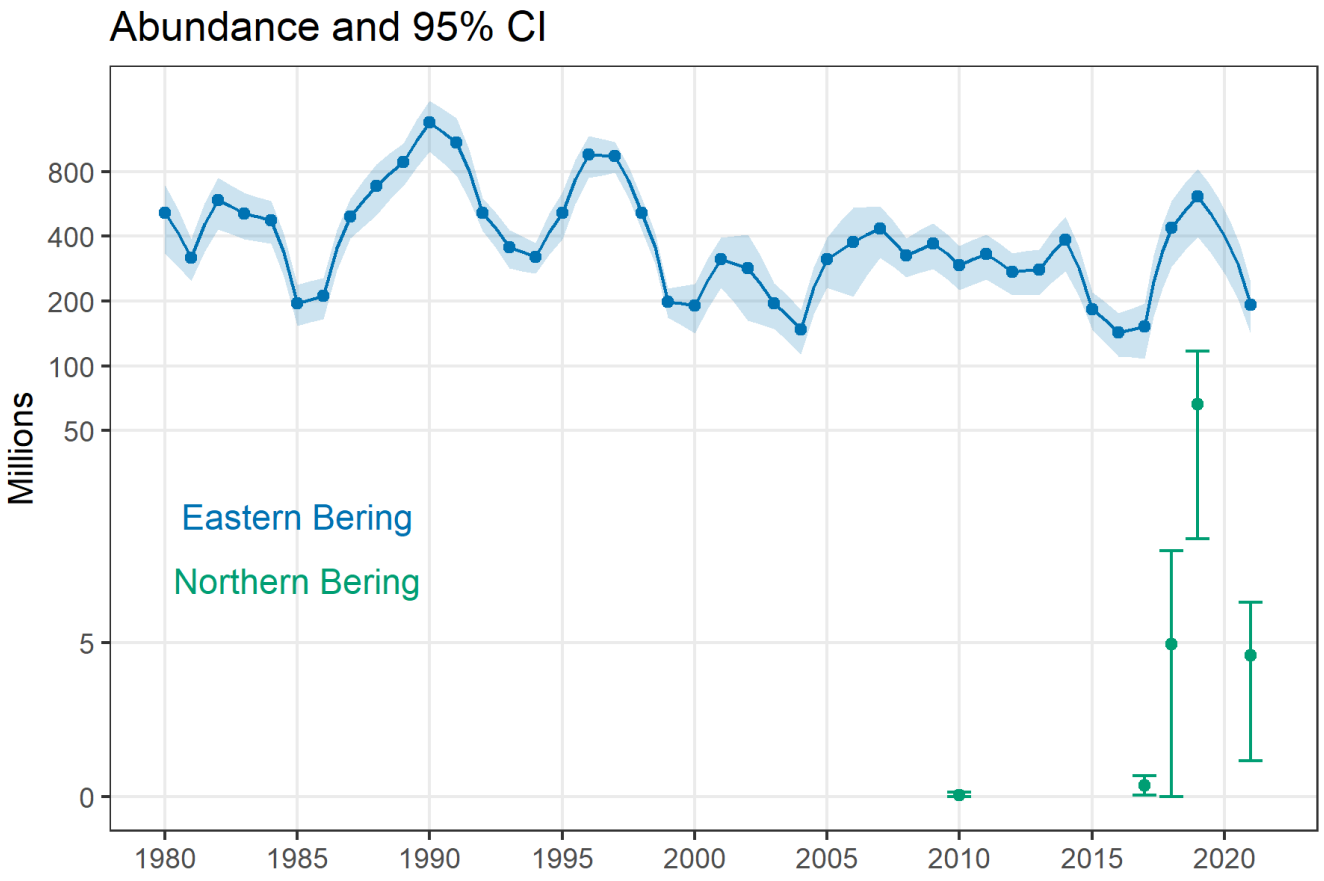
Snow Crab

Snow Crab

Survey catches 2015-2021



Legal male abundance



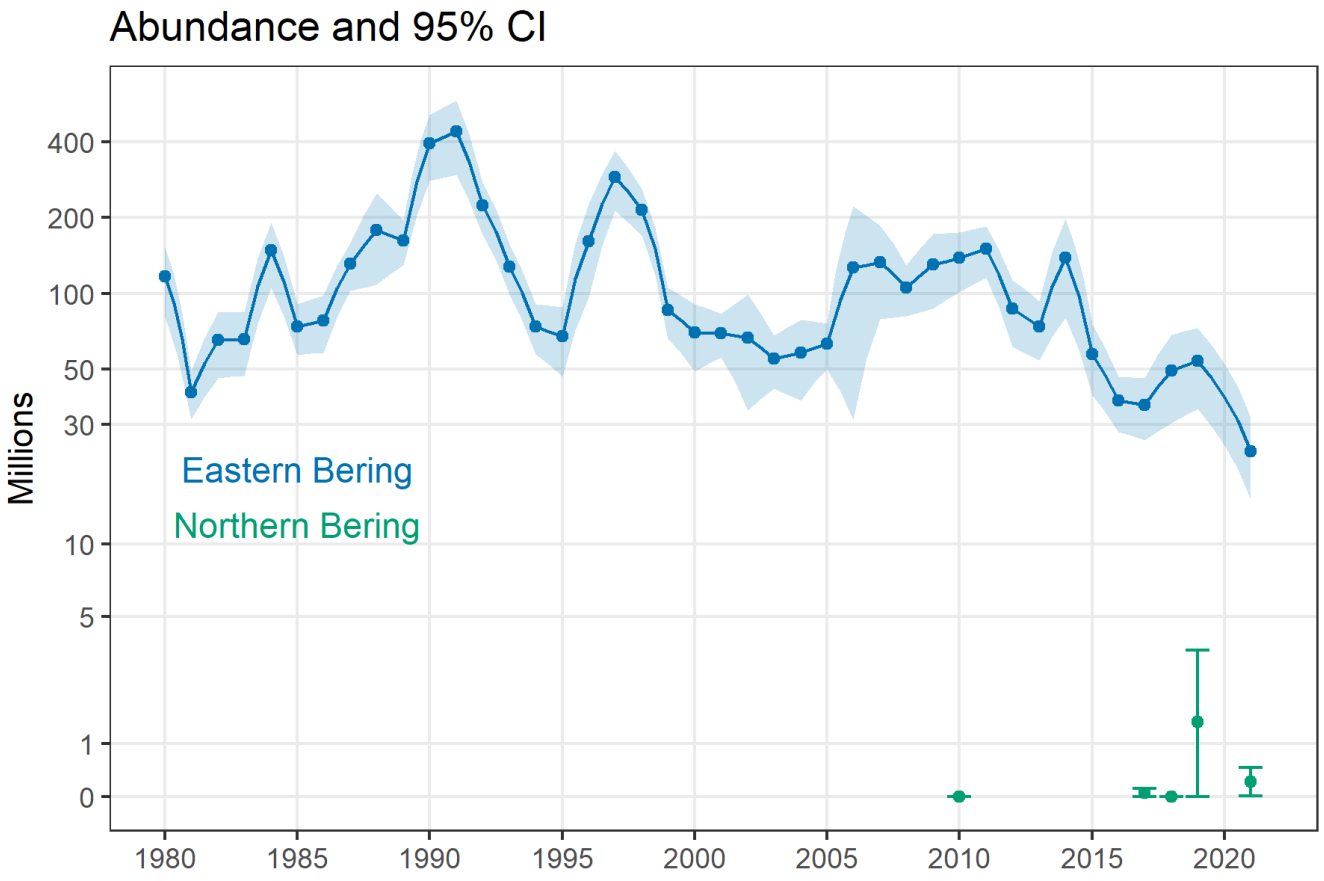
Eastern Bering results

- Abundance down 69% from 2019
- Decline of ≈ 419 million individuals
- Approximately half of the 20-year mean, not the lowest in time series

Snow Crab

Preferred-size male abundance

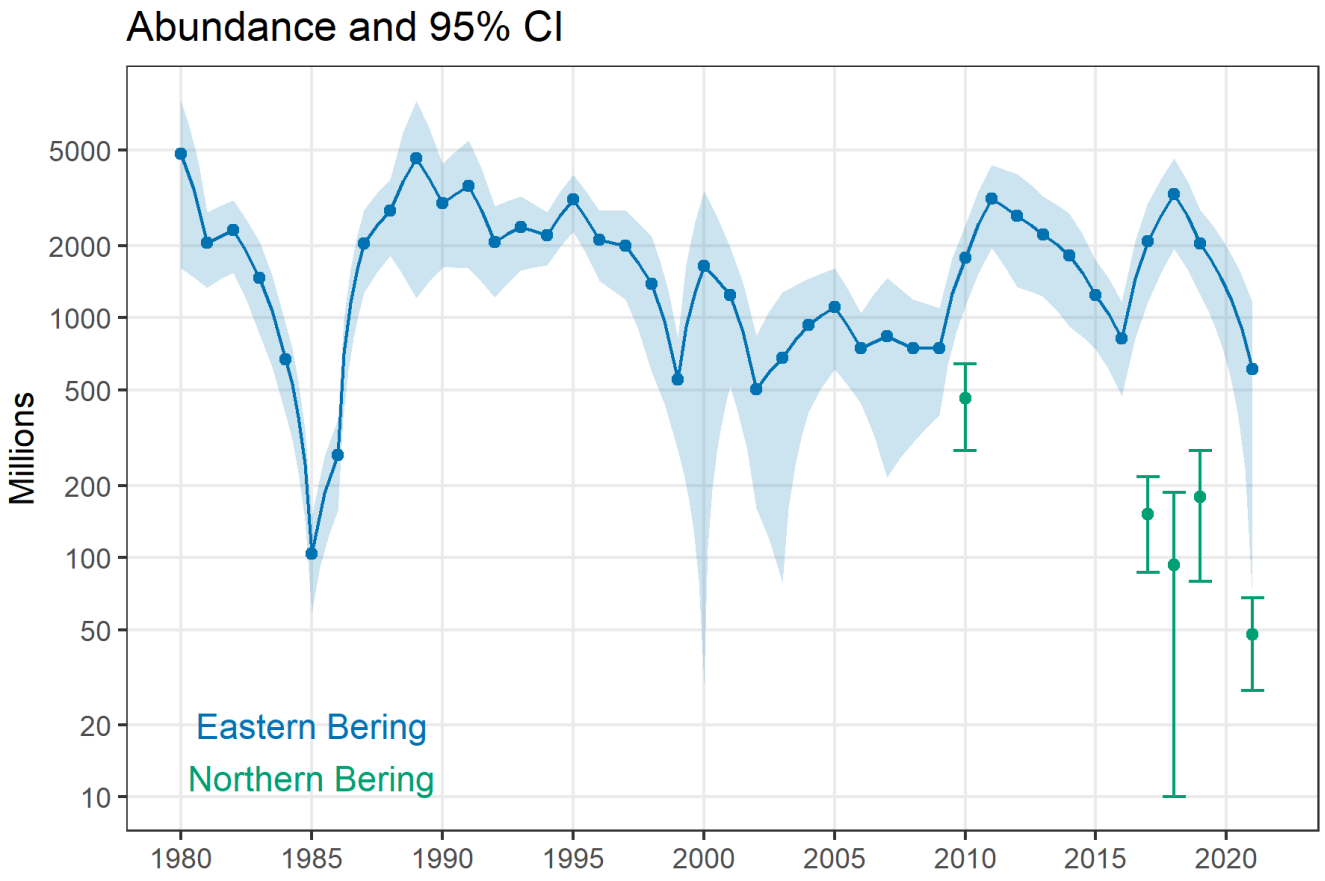
(≥ 102 carapace width)



Eastern Bering results

- Abundance down 56% from 2019
- Decline of ≈ 30 million individuals
- Lowest estimate in 1980-2021 time series

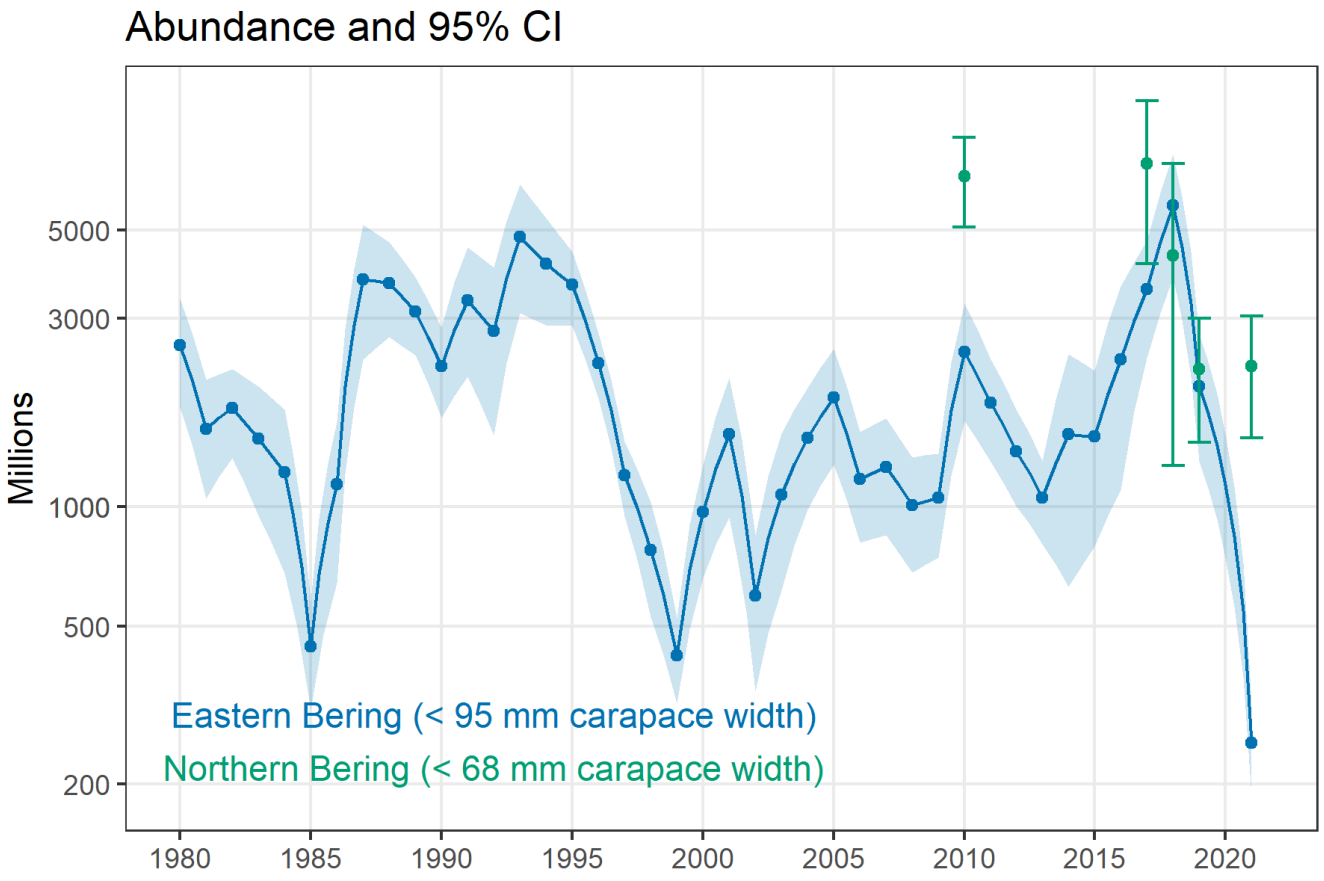
Mature female abundance



Eastern Bering results

- Abundance down 70% from 2018
- Decline of ≈ 2.7 billion individuals
- Not the lowest value in time series

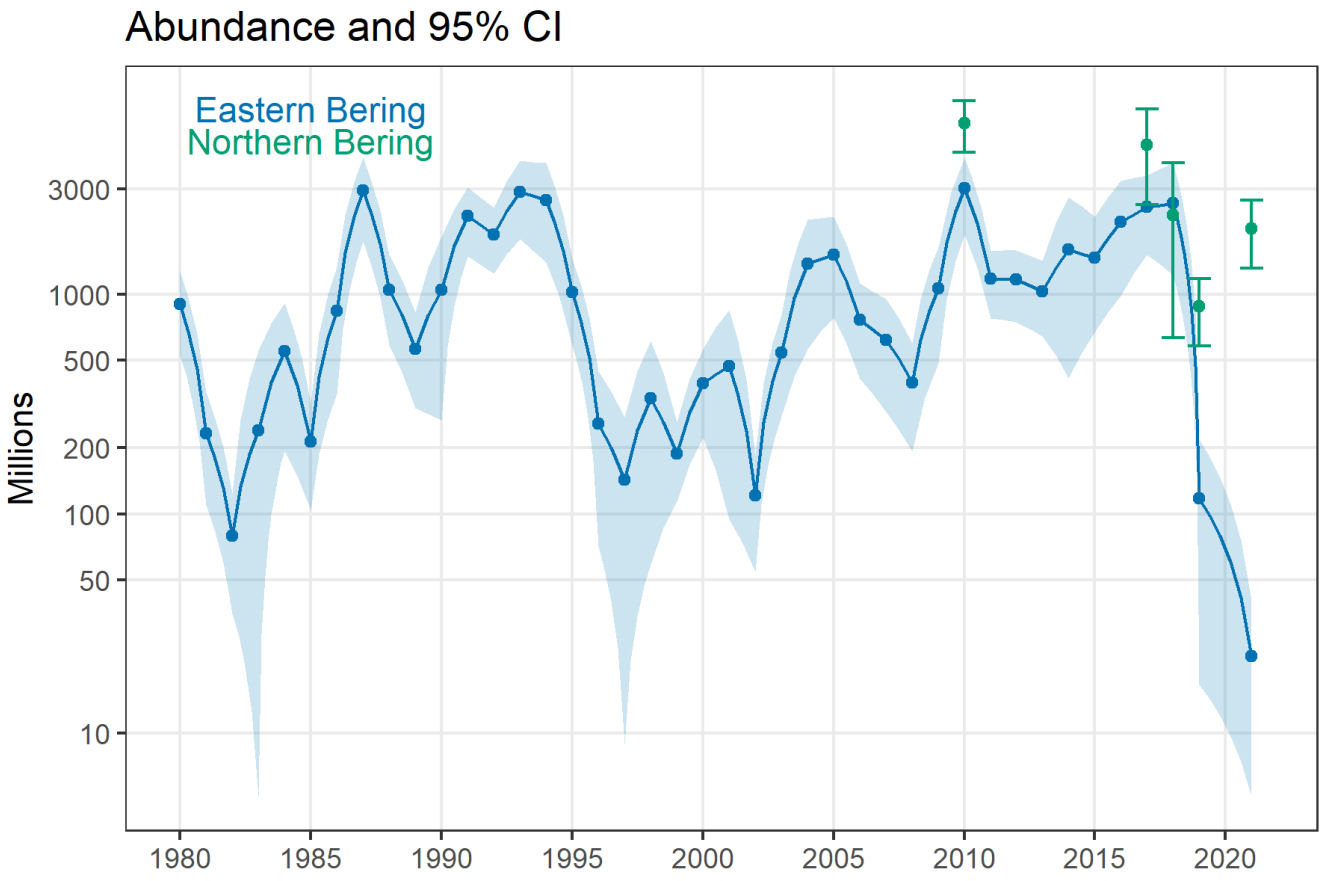
Immature male abundance



Eastern Bering results

- Abundance down 96% from 2018
- Decline of ≈ 5.5 billion individuals
- Lowest estimate in 1980-2021 time series

Immature female abundance



Eastern Bering results

- Abundance down >99% from 2018
- Decline of ≈ 2.6 billion individuals
- Lowest estimate in 1980-2021 time series

Snow Crab

Increased proportion oldshell

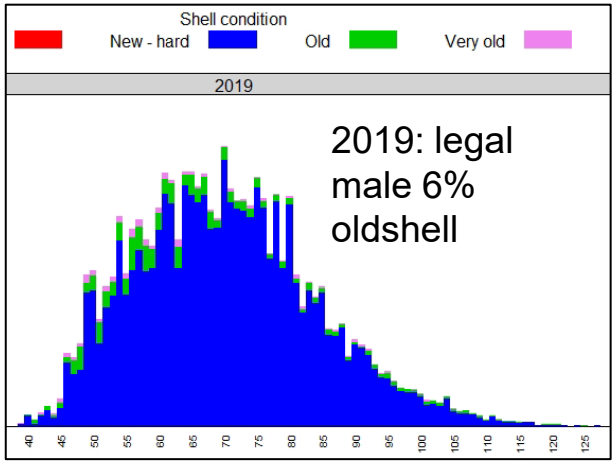
Male

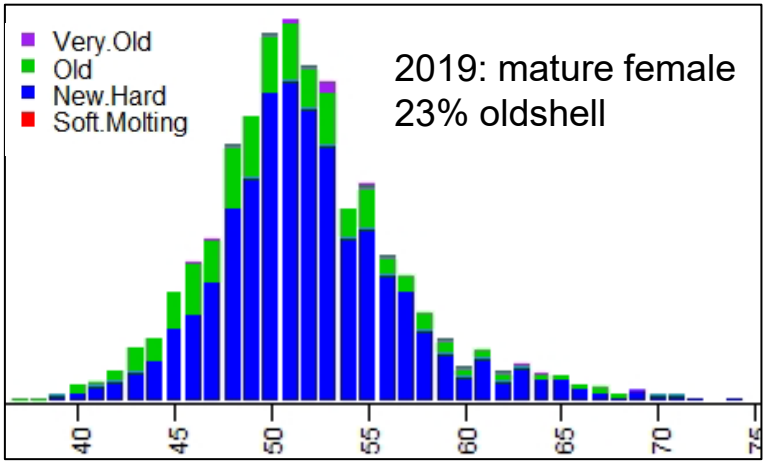
Female

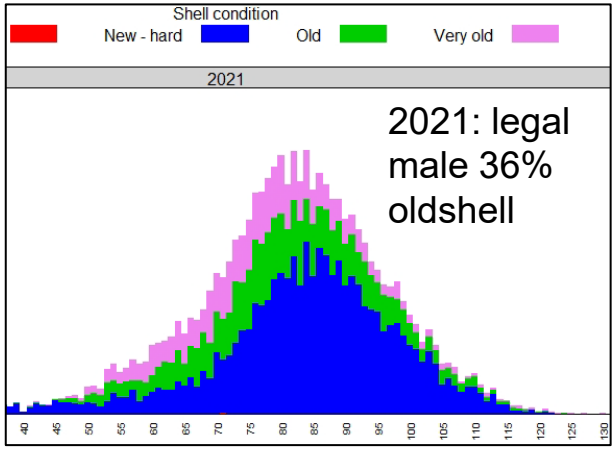
2019

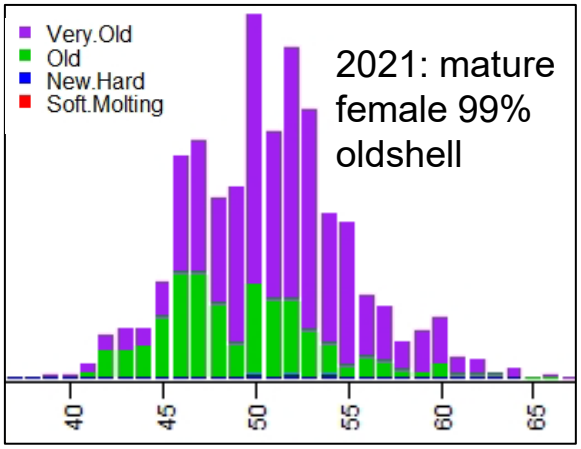
2021

Abundance





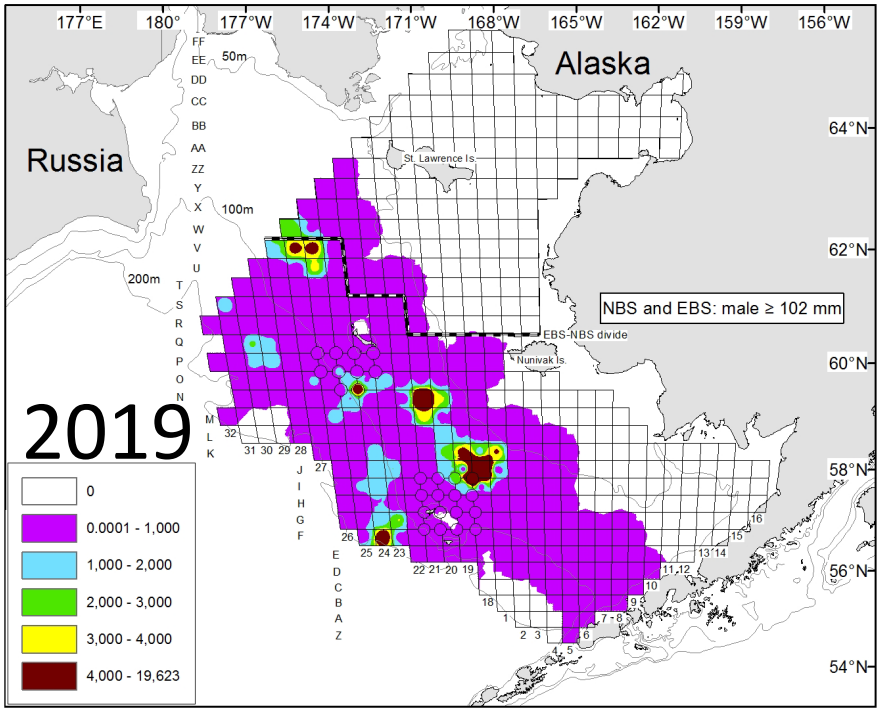


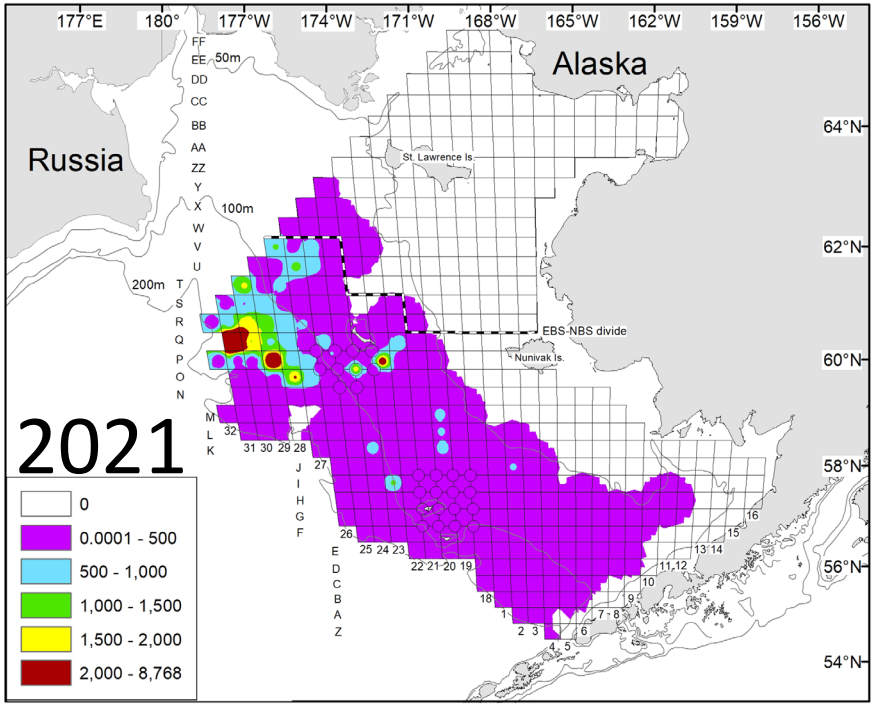


Carapace width (mm)

Snow Crab

Preferred-size male CPUE shifted NW
(carapace width ≥ 102 mm)

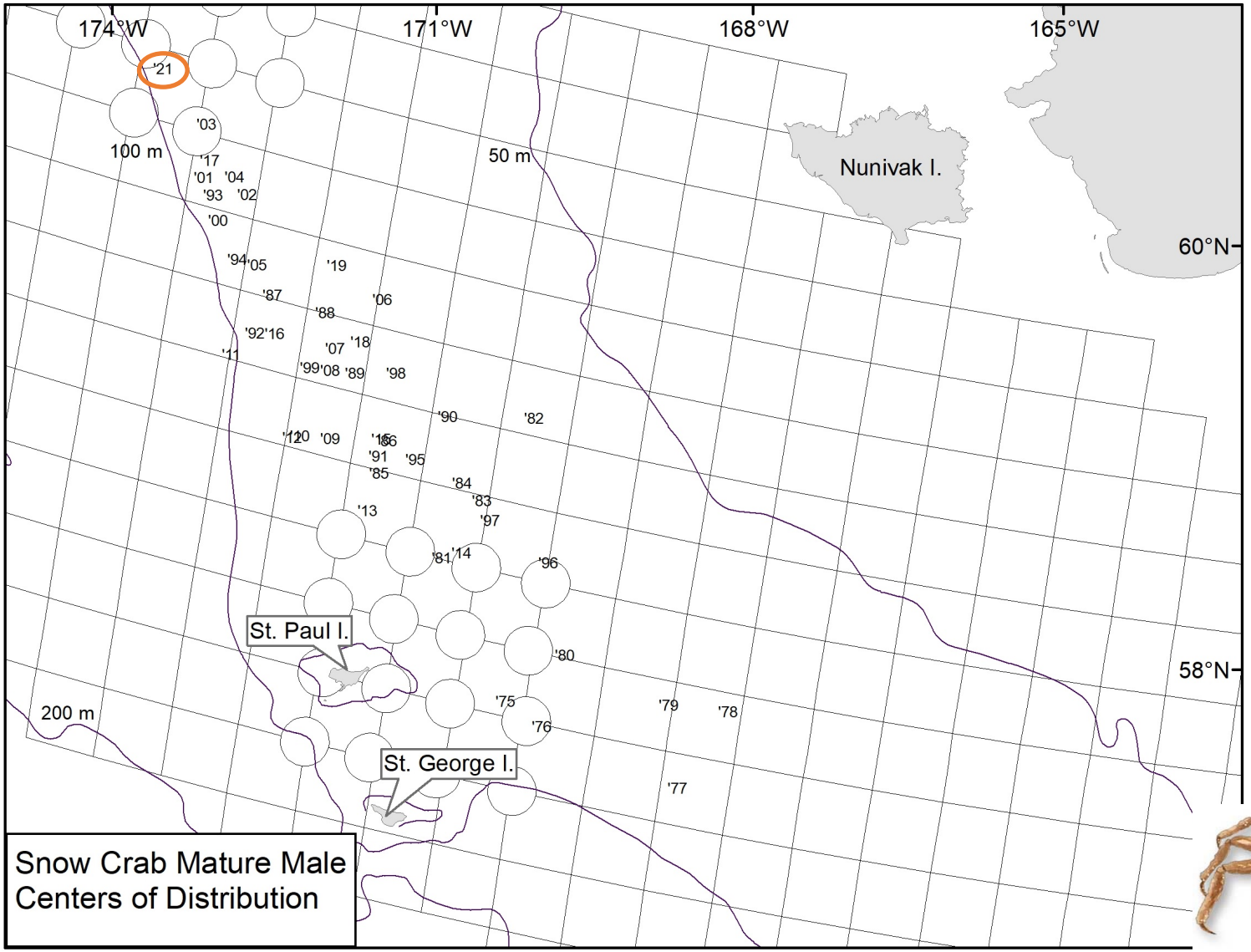




Note – Different scales each year

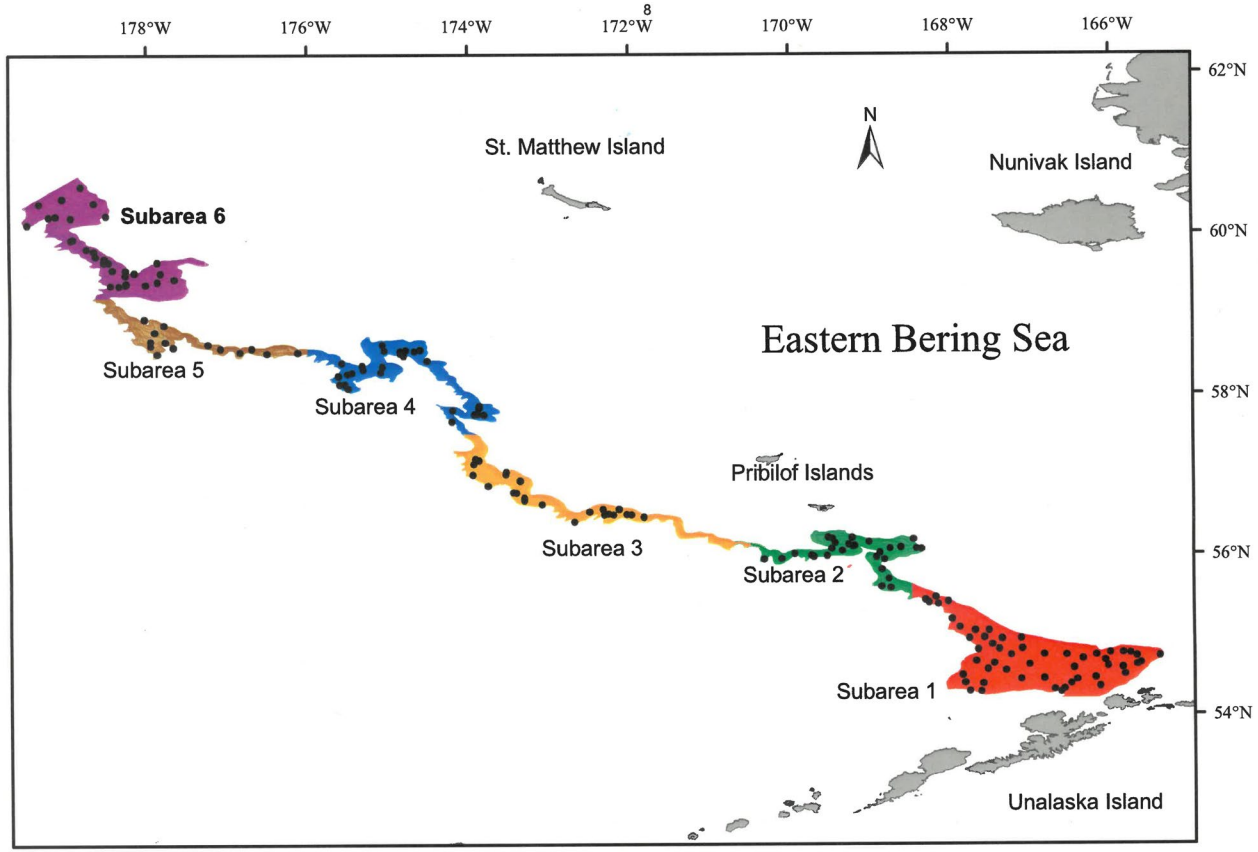
Snow Crab

Mature male center of distribution



Snow Crab

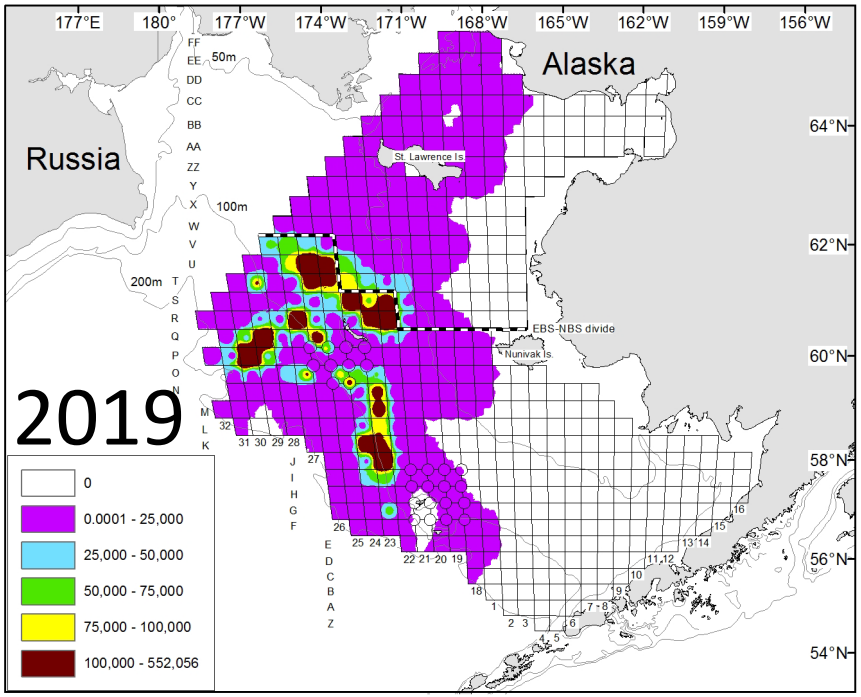
Bering Sea slope surveys

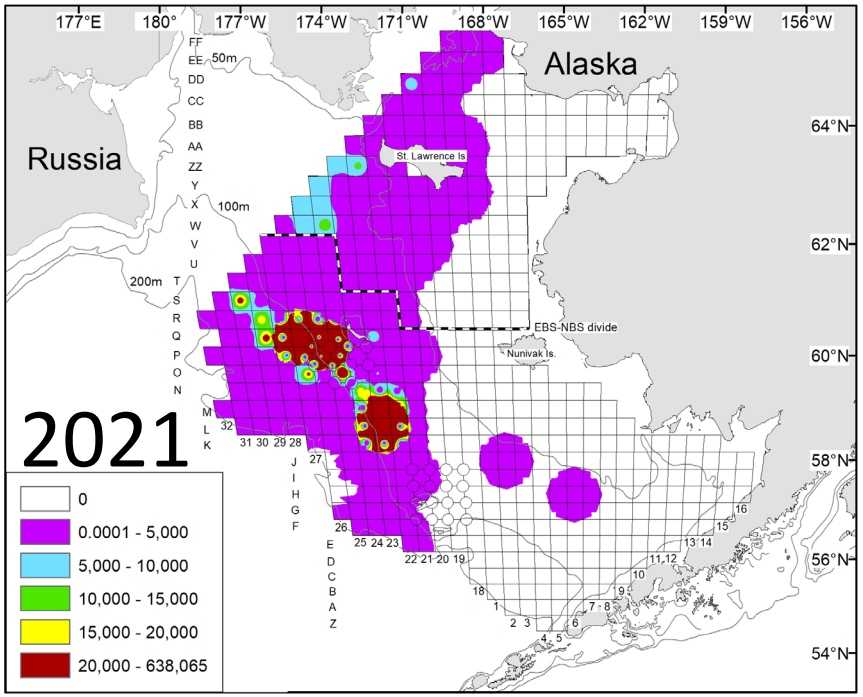


- Not sampled since 2016
- < 10% of EBS shelf area
- Maximum estimated biomass = 738 t (2012)
- < 0.1% of estimated EBS biomass in 2018

Snow Crab

Mature female CPUE not shifted

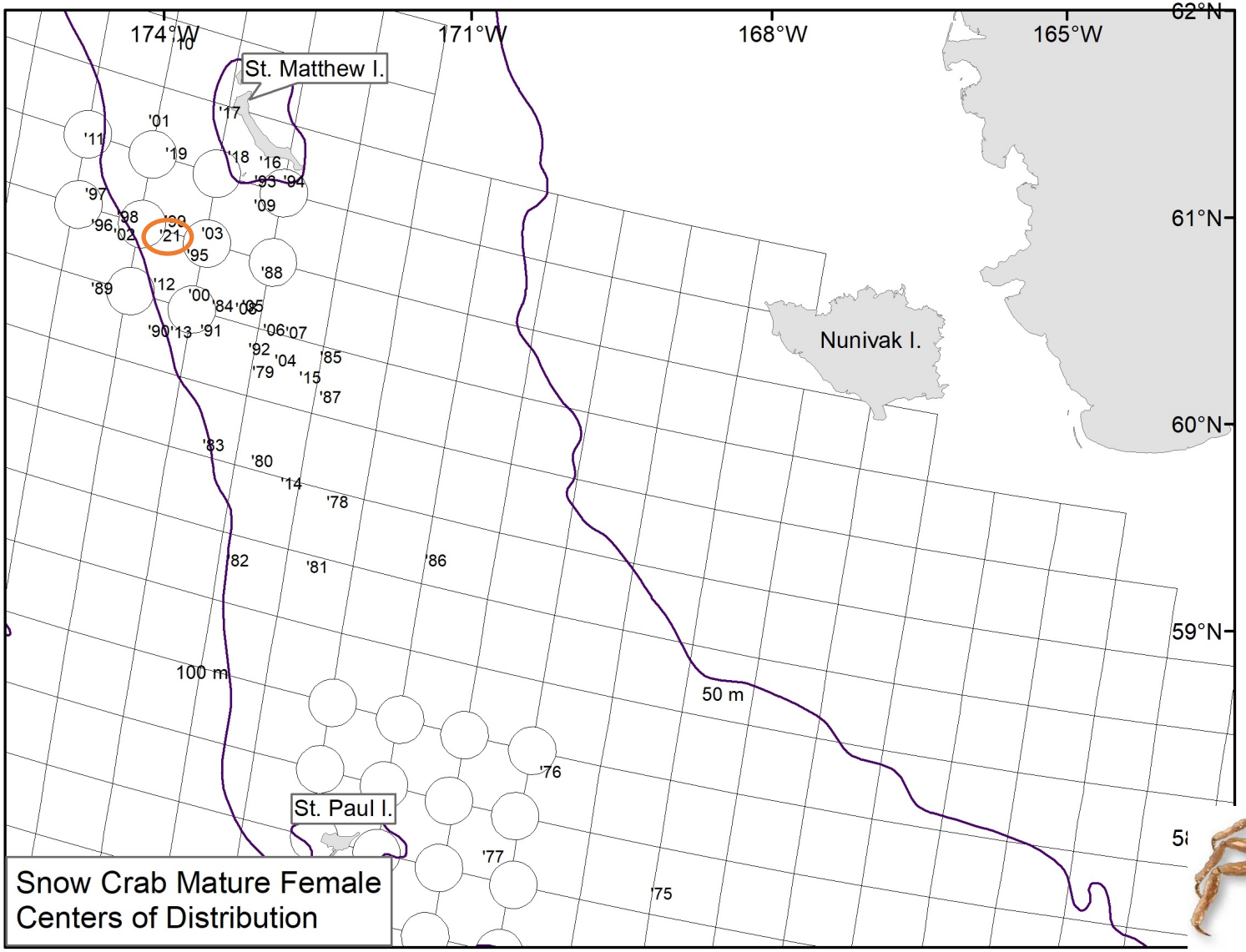




Note – Different scales each year

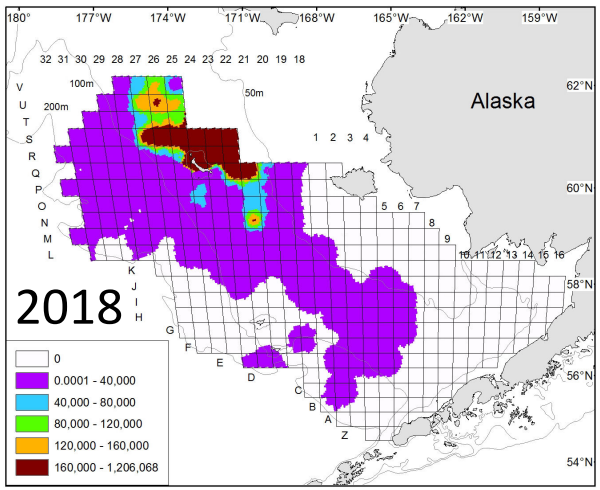
Snow Crab

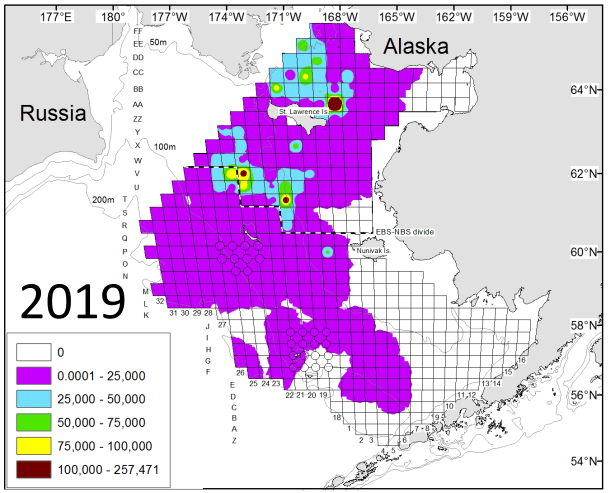
Mature female center of distribution

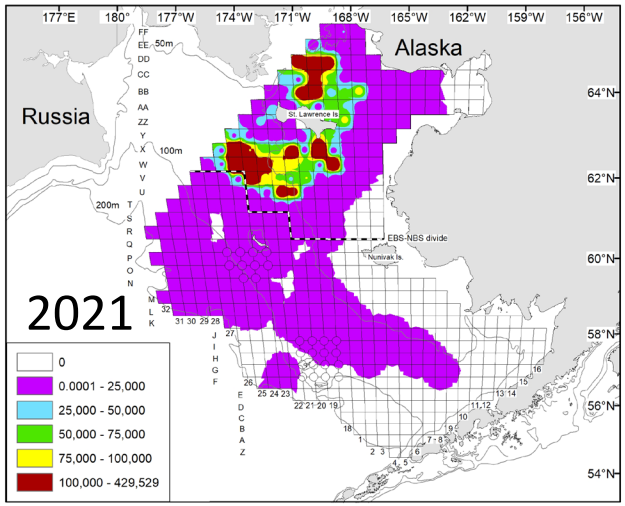


Snow Crab

Immature female CPUE shifted north



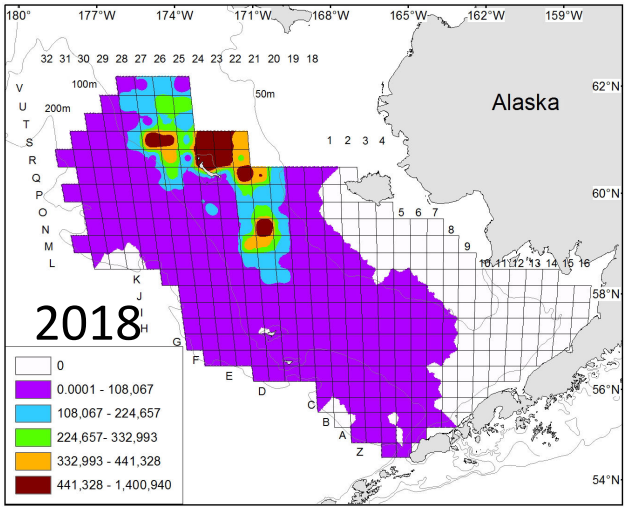


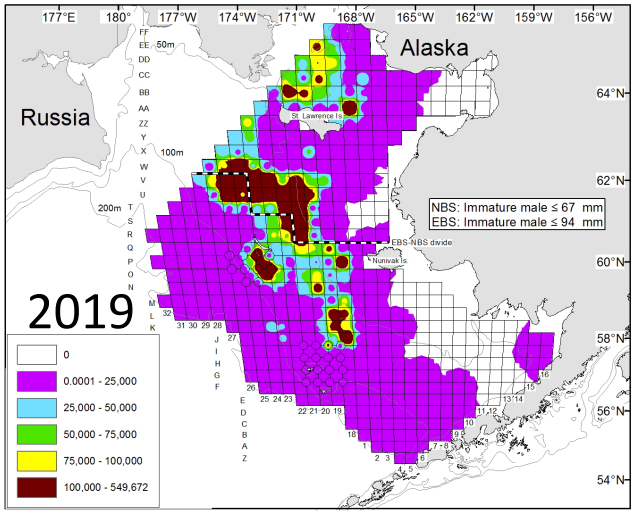


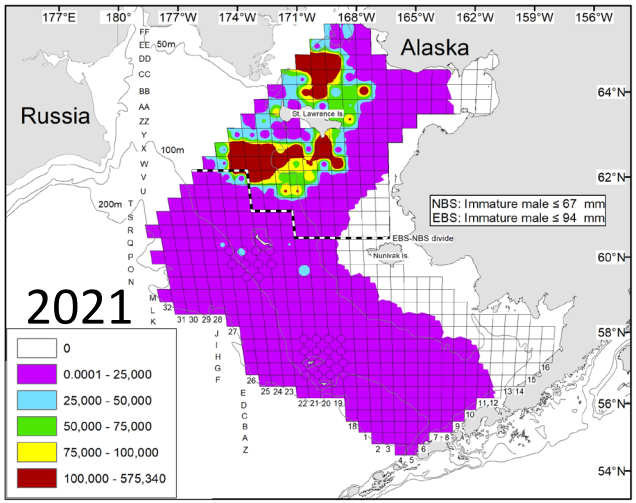
Note – Different scales each year

Snow Crab

Immature male CPUE shifted north







Note – Different scales each year

Possible explanations

Observation error / problems with survey – *not plausible*

- Other species caught at expected numbers
- No known problems with net performance, etc. that would explain low catches
- High oldshell incidence gives 2nd indication of population change

Changed distribution

- Northern Bering catches do not explain Eastern Bering declines
- Slope not surveyed since 2016…orders of magnitude smaller than EBS
- Increasing EBS temperatures likely making NBS and slope more important as habitat

Biological mechanisms

- Bitter crab syndrome – increasing visual ID on recent surveys
- Predation – increasing overlap with Pacific cod, other groundfish

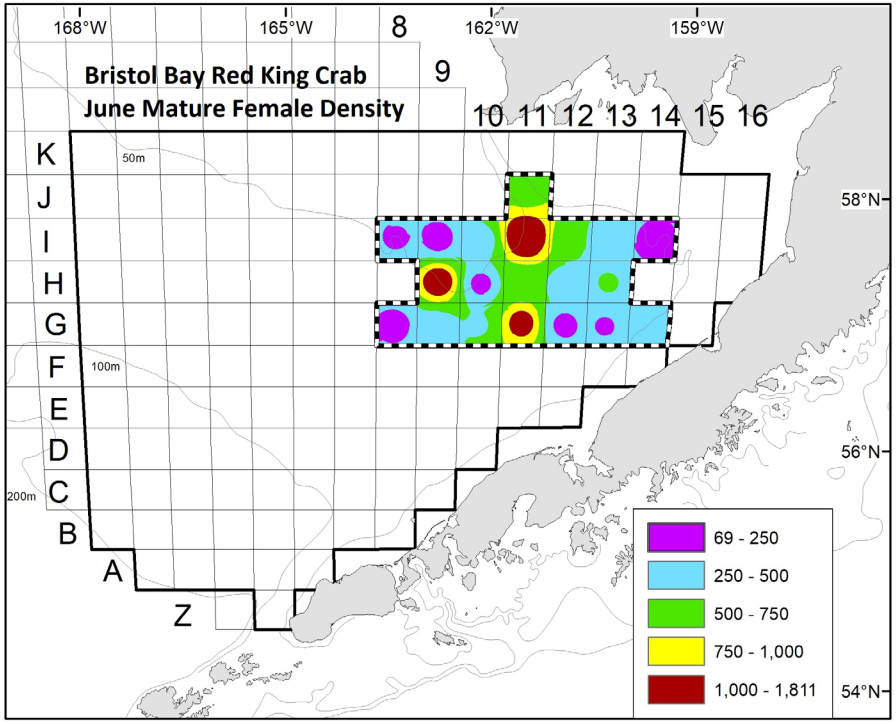
Climate change

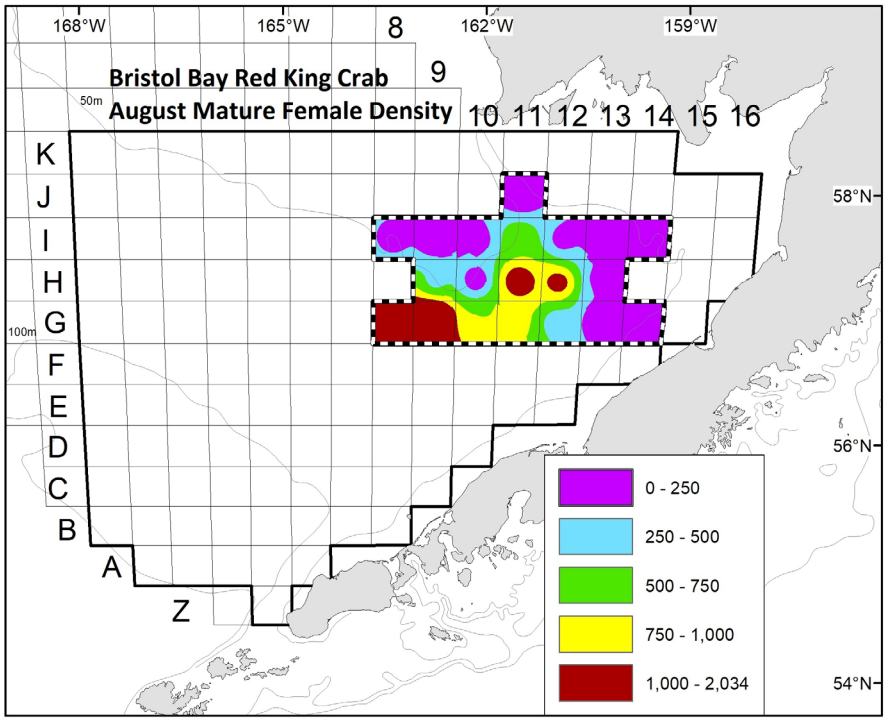
- Rapid transition away from Arctic conditions on EBS shelf

Red King Crab

Bristol Bay Red King Crab

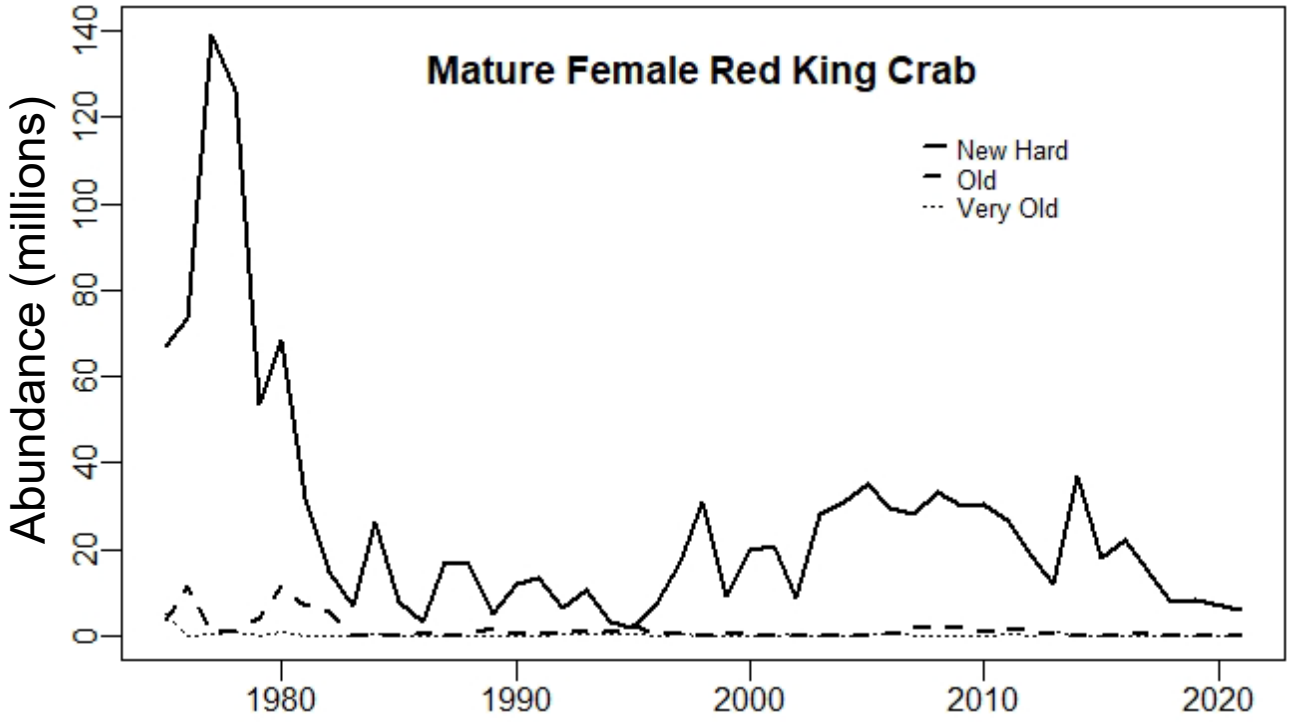
Retows to estimate female abundance / reproductive state





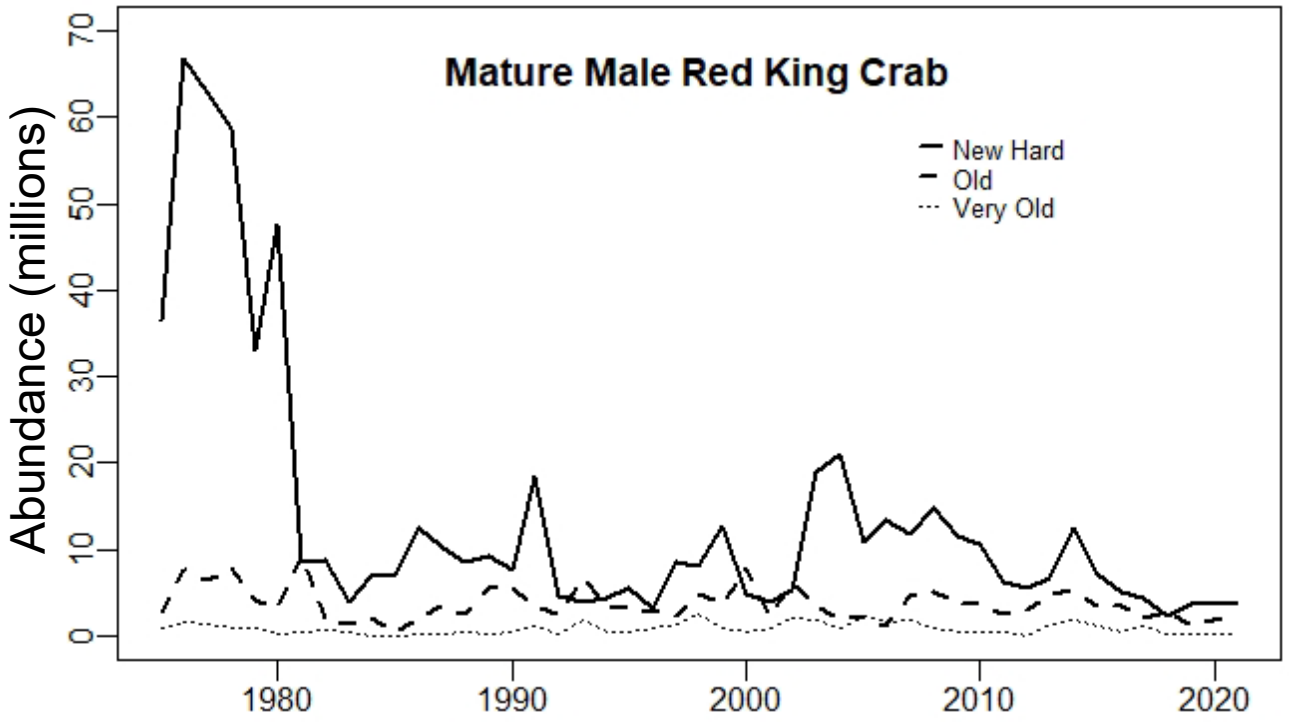
- June: 18% mature females with empty egg cases, hatching eggs, eyed embryos, or barren
- August: 100% mature females with uneyed embryos
- Density unchanged: 503 mature females / nm^2 in June, 508 / nm^2 in August
- All female area-swept estimates use retow data

Mature female abundance



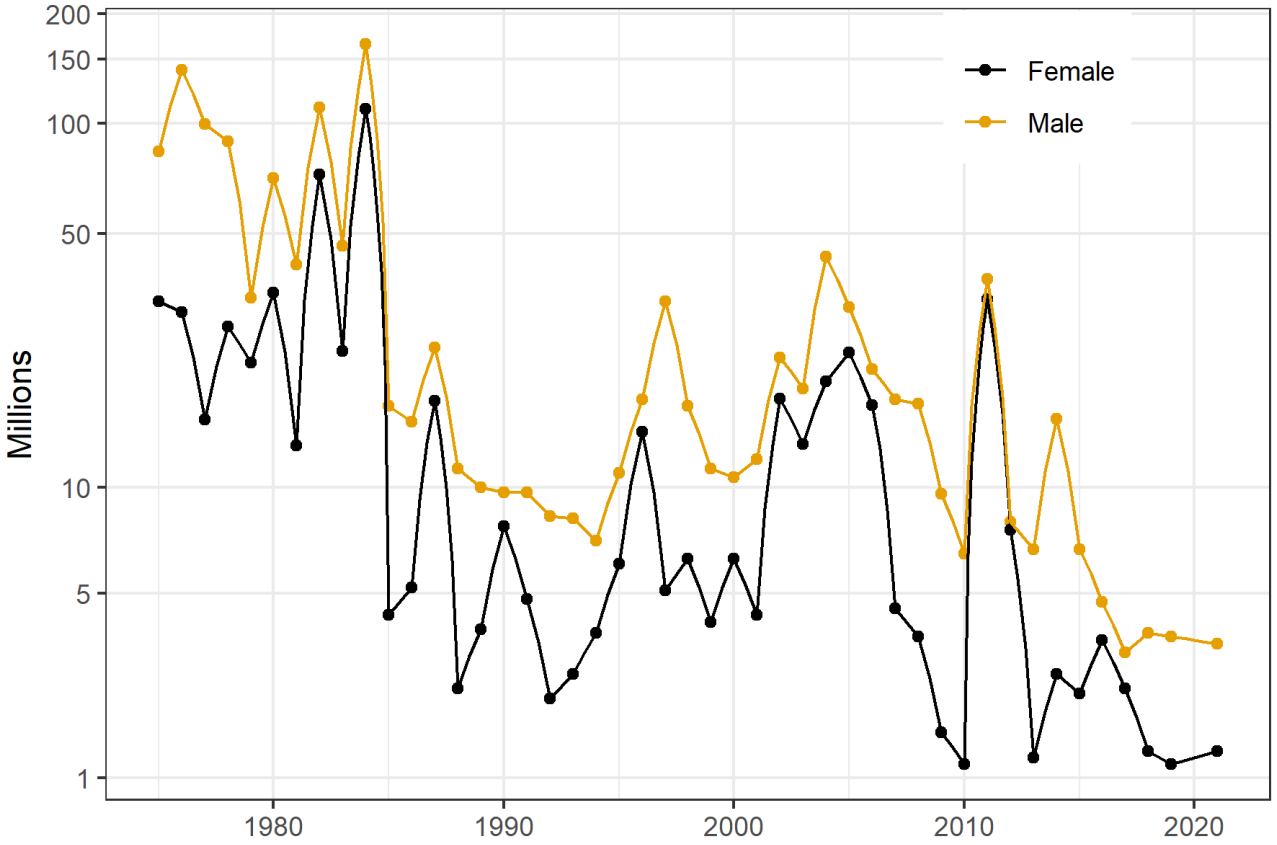
- Estimated abundance: 6.3 ± 2.9 million (95% CI)
- 25% decline from 2019

Mature male abundance



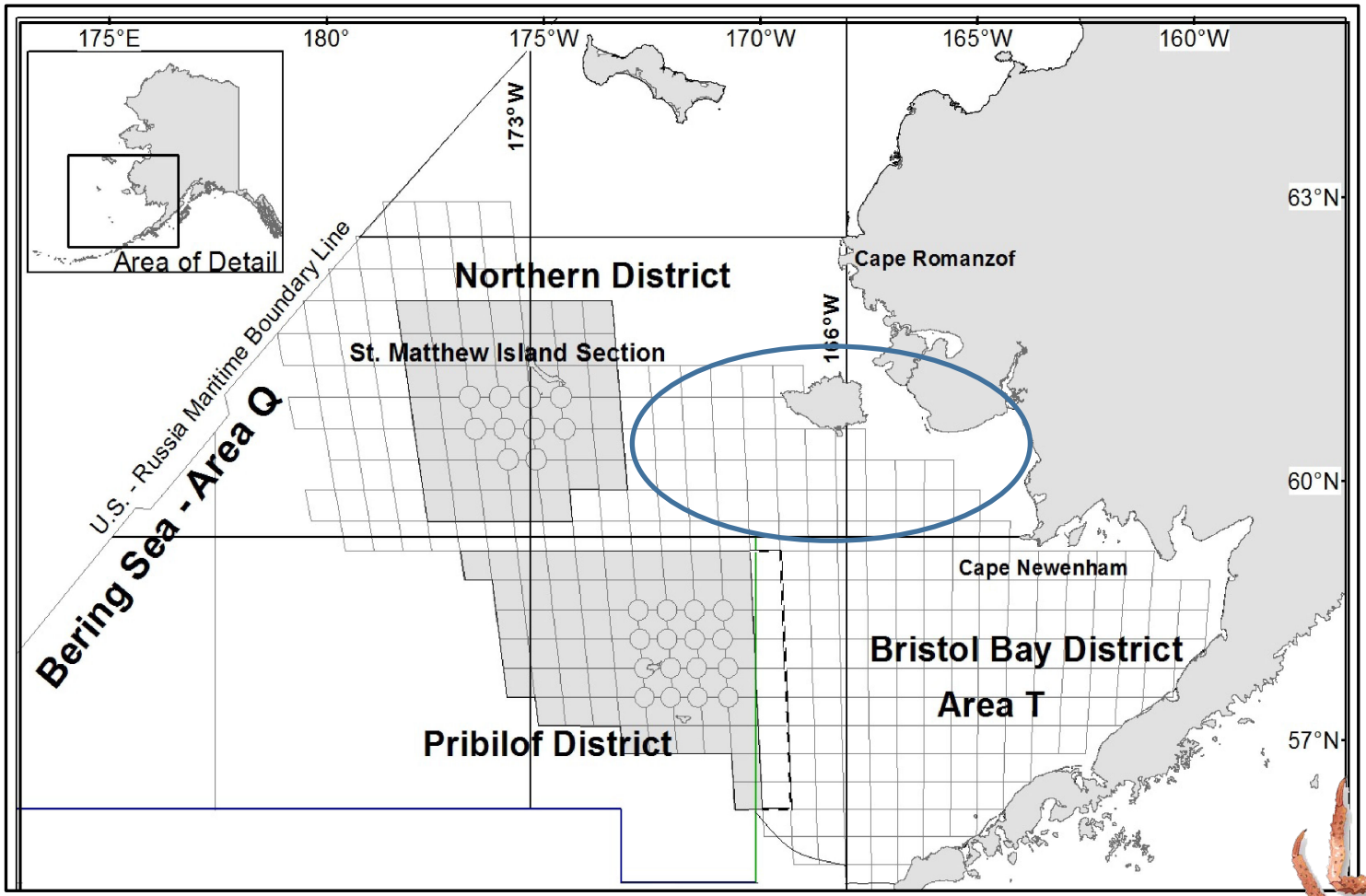
- Estimated abundance: 6.3 ± 2.3 million (95% CI)
- 26% increase from 2019

Immature abundance



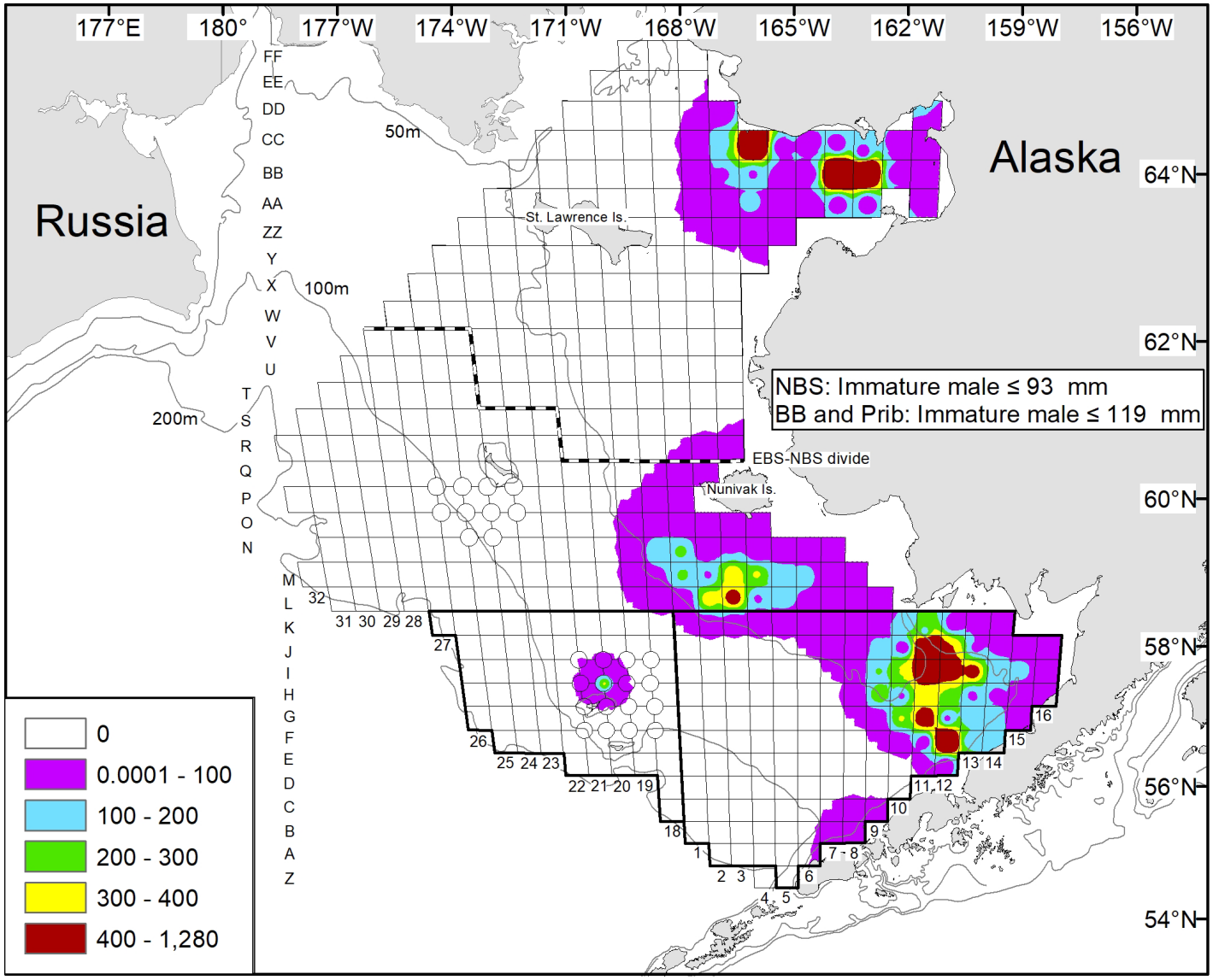
- Estimated immature female abundance: 1.4 million
- Estimated immature male abundance: 3.5 million

Northern District results



Red King Crab

Immature male abundance

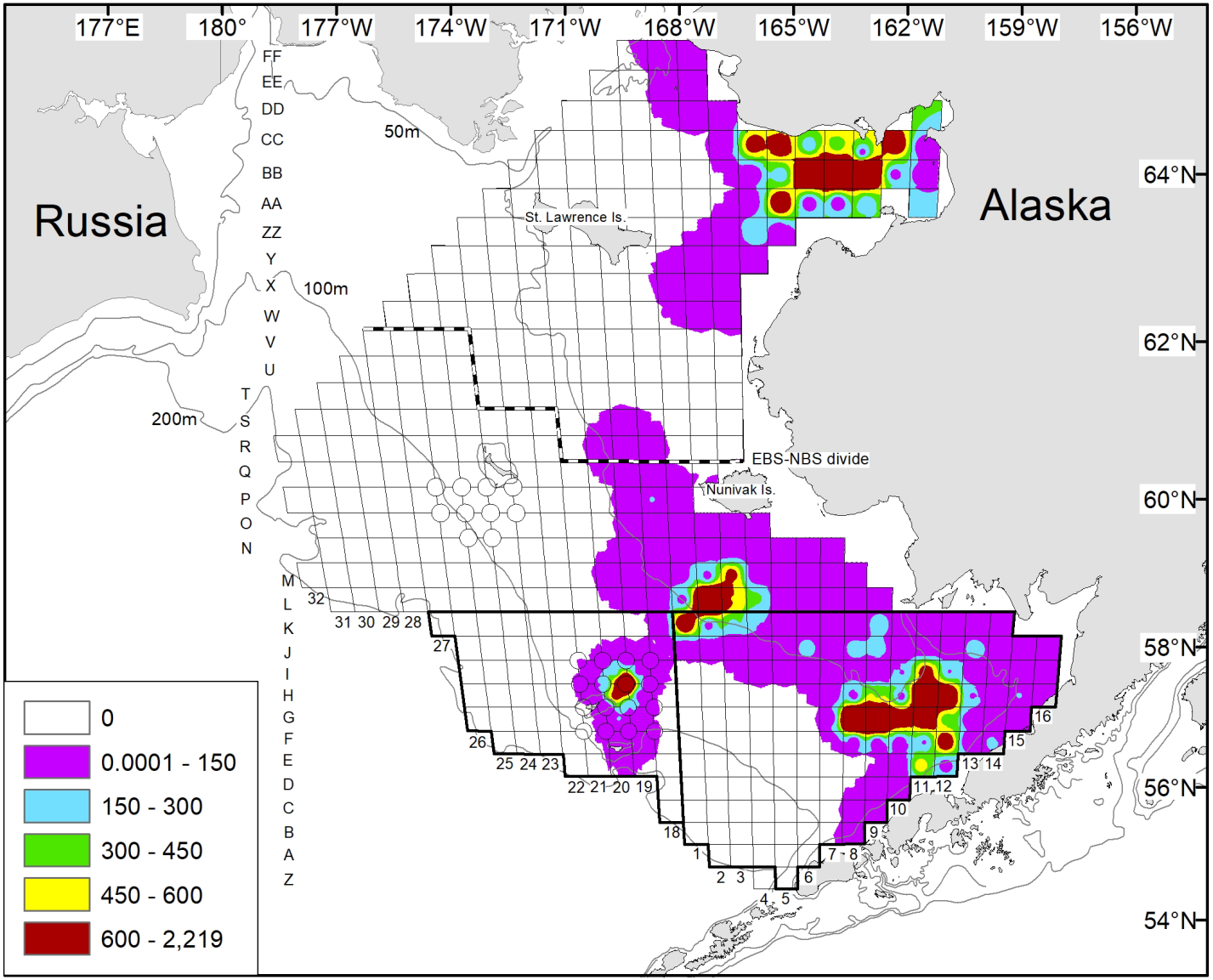


Northern District

- Estimated immature male abundance: 0.5 ± 0.2 million
- Second-highest biomass in 1975-2021 time series

Red King Crab

Mature female abundance

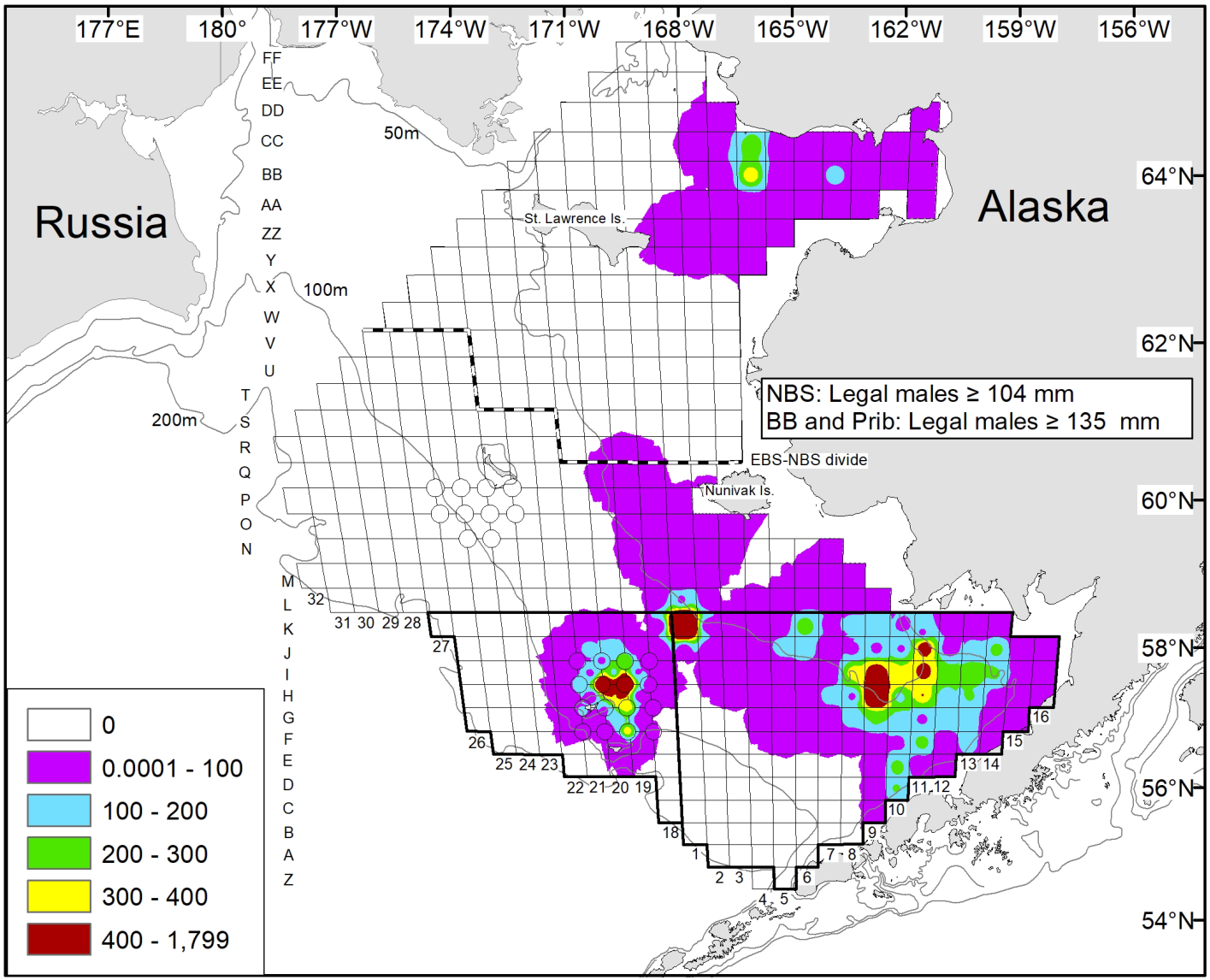


Northern District

- Estimated mature female abundance: 2.0 ± 1.8 million
- Roughly double the previous maximum

Red King Crab

Legal male abundance

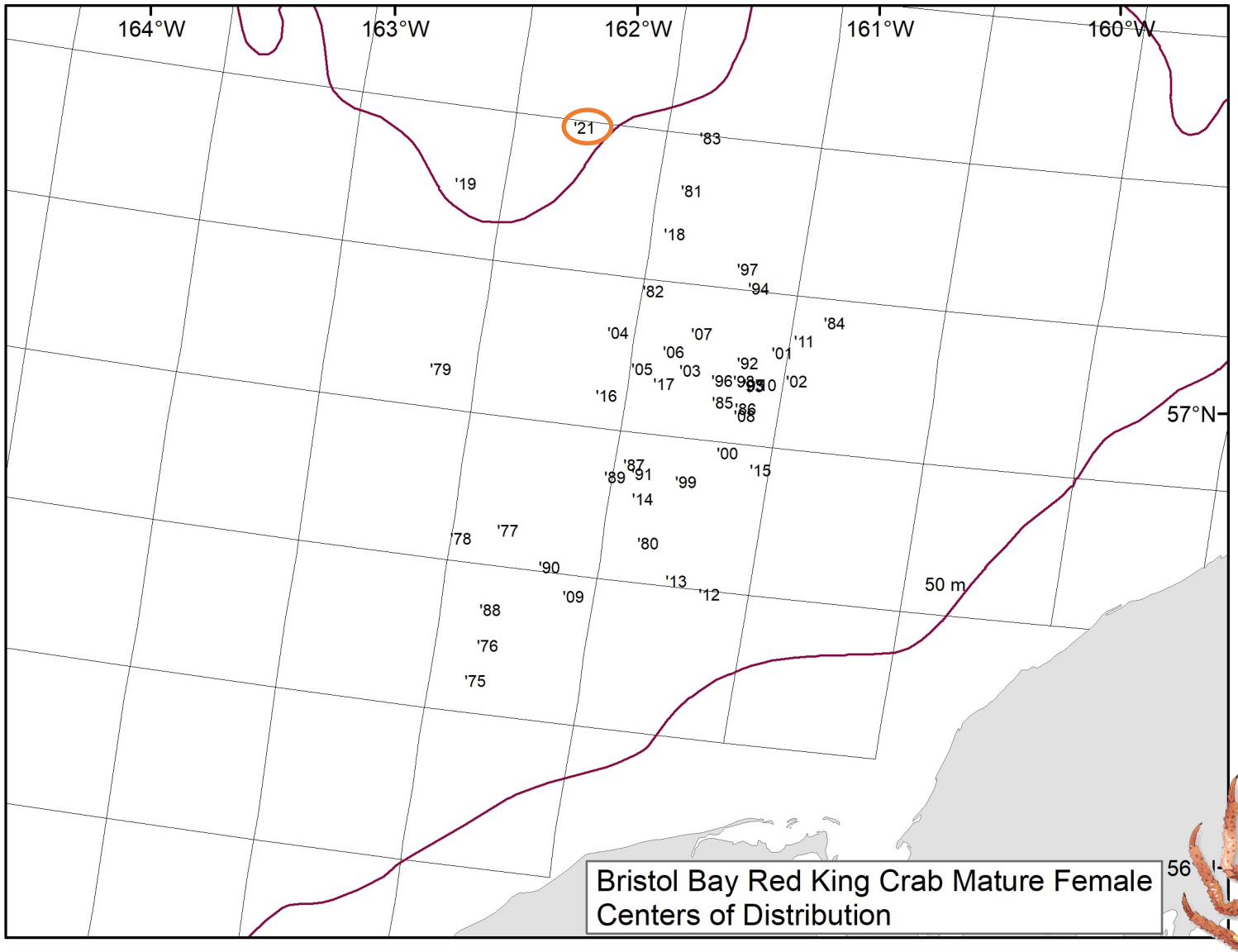


Northern District

- Estimated legal male abundance: 0.3 ± 0.2 million

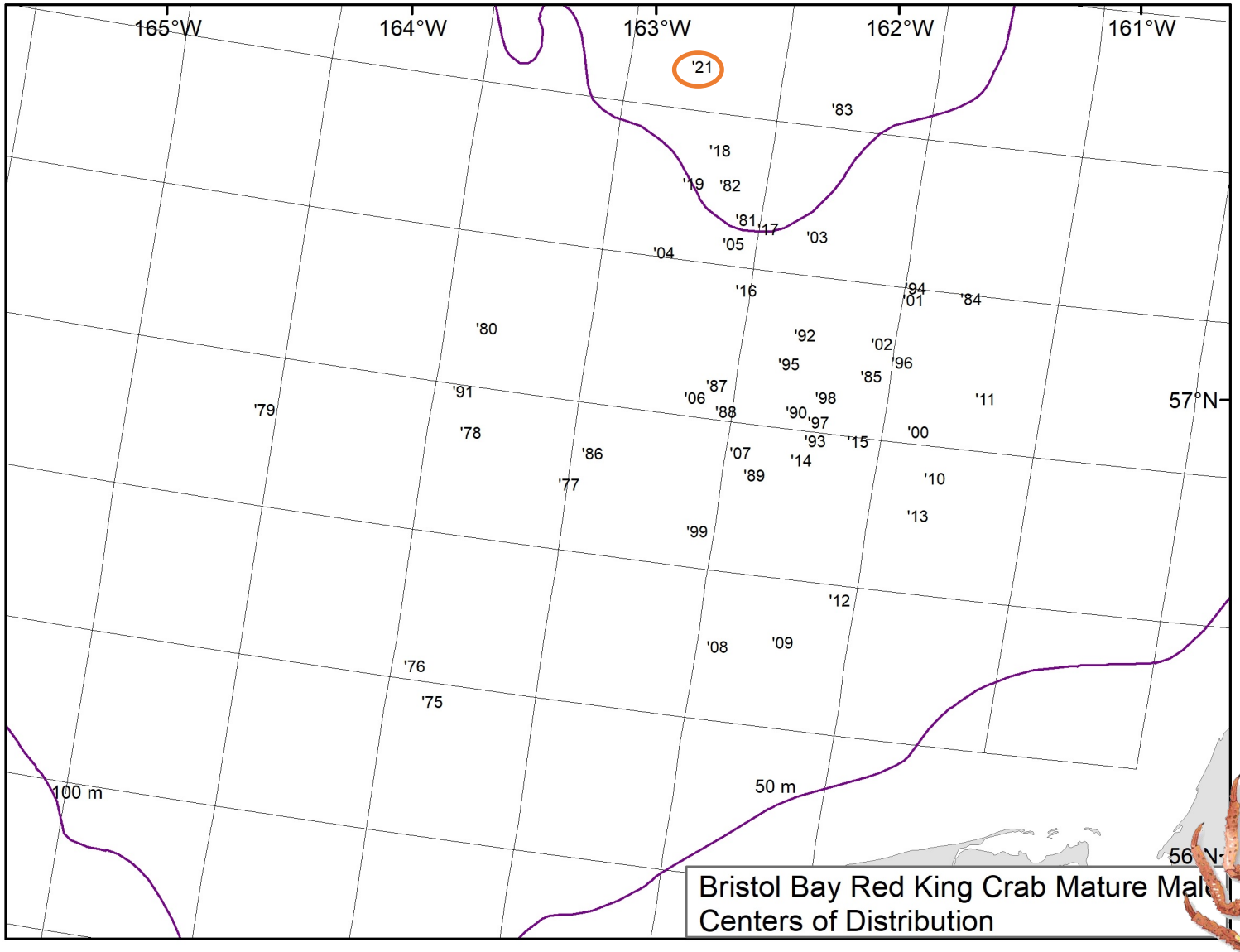
Red King Crab

Mature female center of distribution

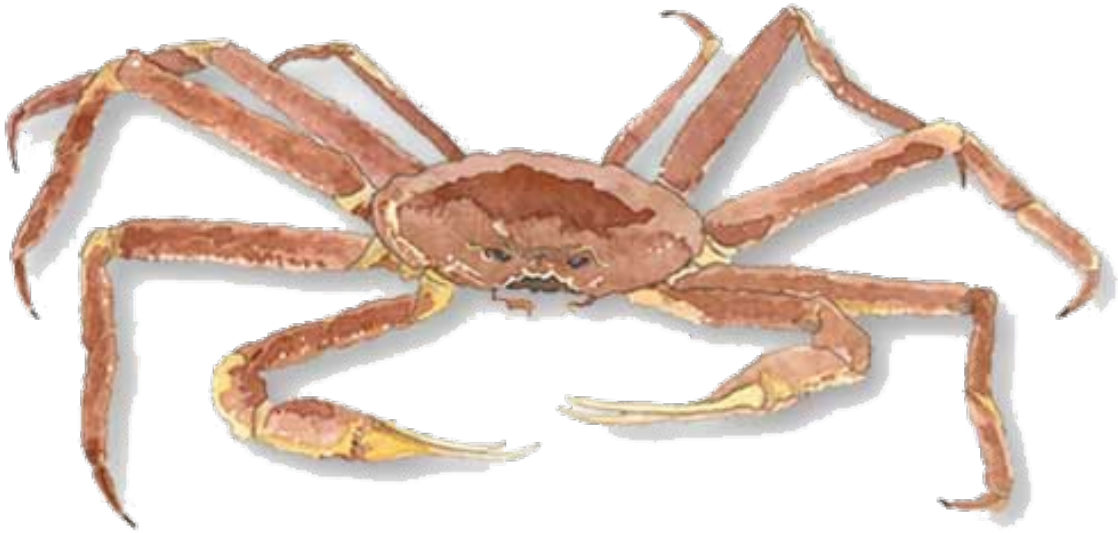


Red King Crab

Mature male center of distribution



Tanner Crab



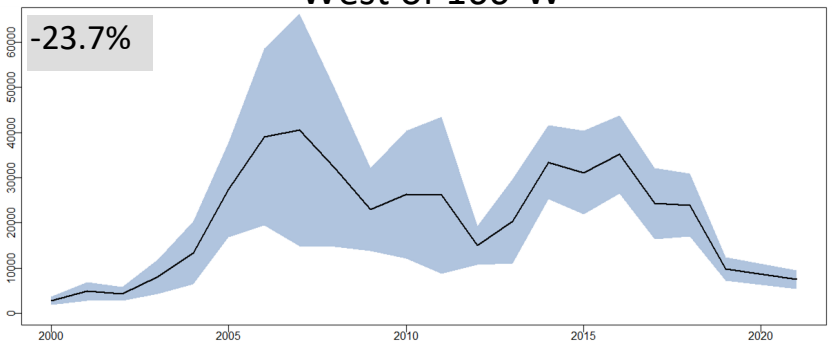
Tanner Crab

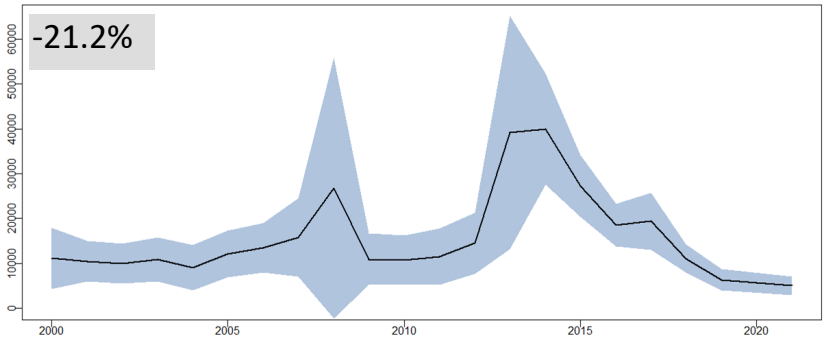
Abundance changes from 2019

West of 166°W

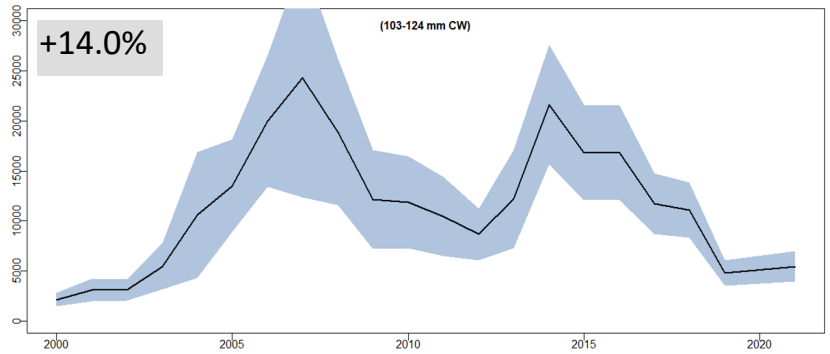
East of 166°W

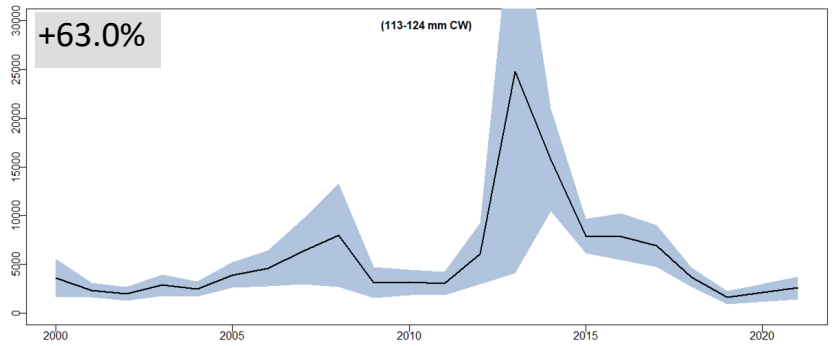
Abundance (millions)



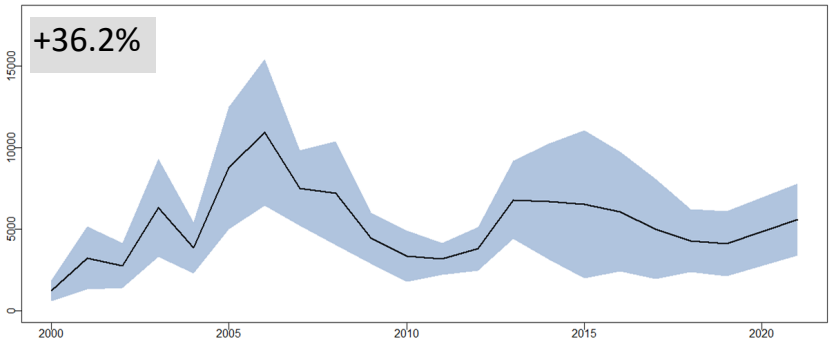


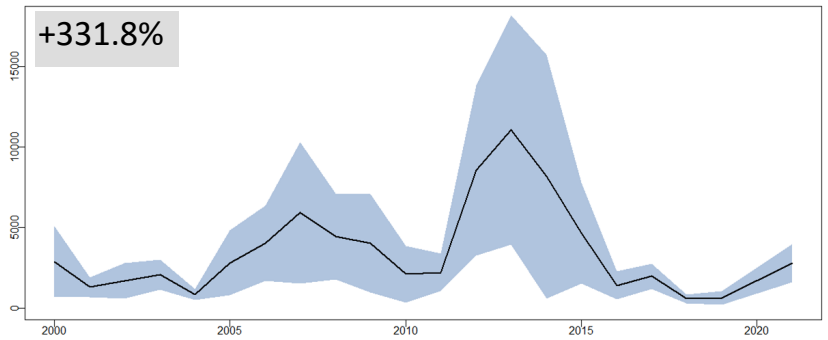
Mature male



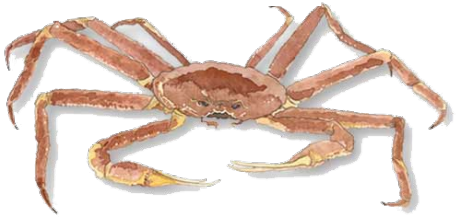


Pre-recruit male



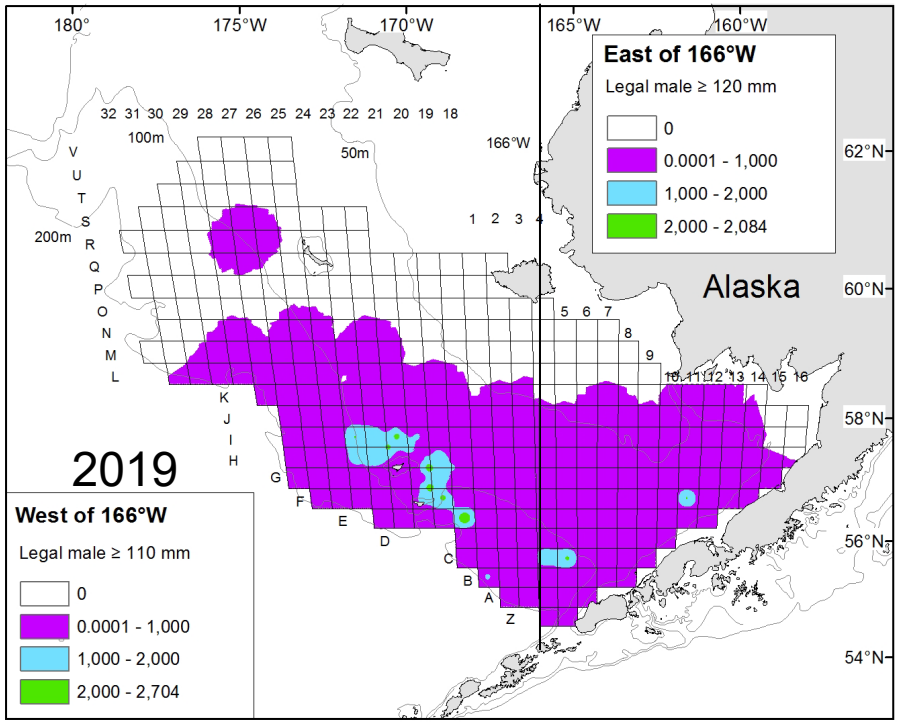


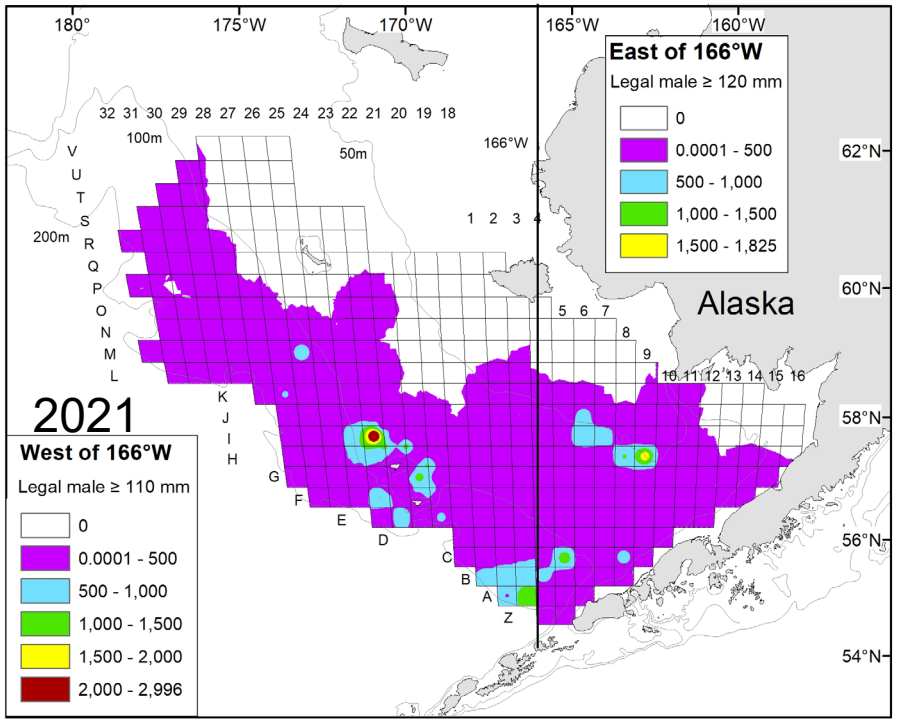
Mature female



Tanner Crab

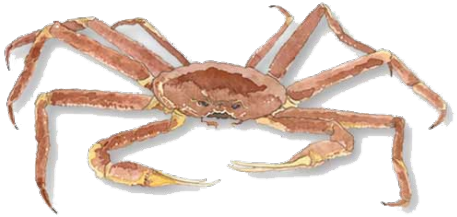
Legal male abundance





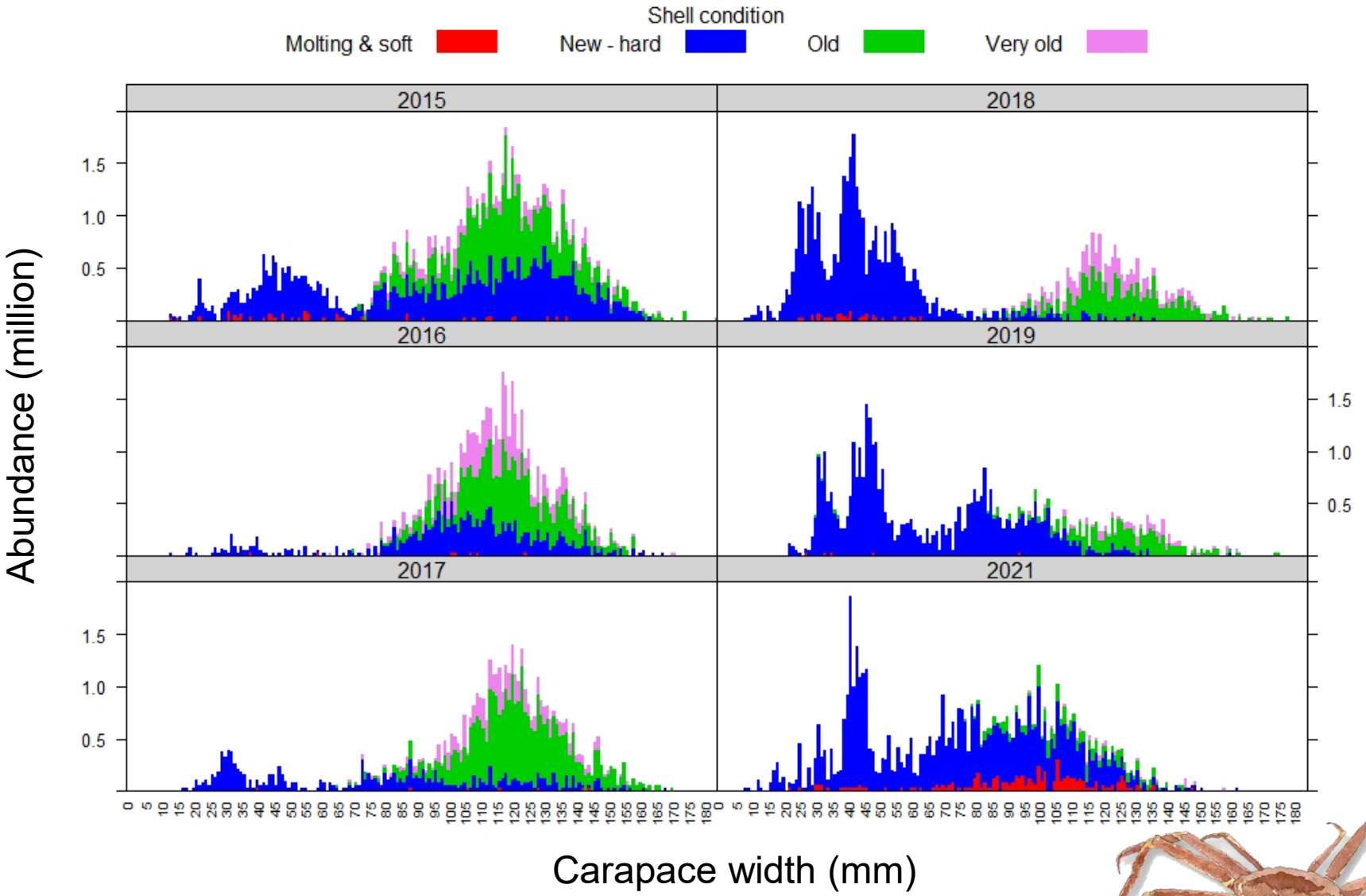
Note – Different scales in each year

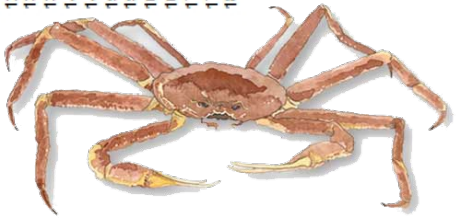
- East of 166: 5.4 ± 2.4 million (95% CI), 28% decline from 2019
- West of 166: 9.9 ± 2.8million (95% CI), 32% decline from 2019



Tanner Crab

Males – East of 166°W





Other Stocks

St. Matthew Blue King Crab

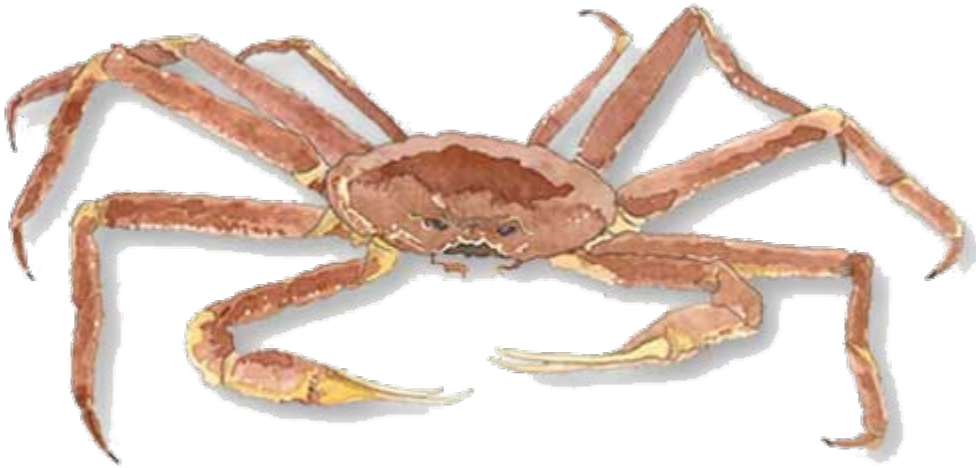
- Legal male abundance estimate = 0.7 ± 0.5 million (95% CI)
- 42% decline from 2019

Pribilof Red King Crab

- Legal male abundance estimate = 1.1 ± 0.7 million (95% CI)
- Biomass below 20-year mean

Pribilof Blue King Crab

- Legal male abundance estimate = 0.1 ± 0.1 million (95% CI)
- Slightly below 20-year mean



Questions