

Crab Foundation – Research Update – What we are doing to help May CPT - 05.18.23



Scott Goodman | Executive Director
Bering Sea Fisheries Research Foundation

Crab Foundation – BOD & Advisors



1. Scott Goodman, ED
2. Dr. Gary Stauffer
3. Dr. Gordon Kruse
4. Ms. Madison Heller-Shiple
5. Dr. Tim Loher
6. - additional staffing soon -

1. Doug Wells – CP Baranof, Pres.
2. Edward Poulsen – FVs Patricia Lee/Aleut. #1, V. P.
3. Frank Kelty – City of Unalaska, V.P.
4. Garry Loncon – Royal Aleutian Seafoods, Treasurer
5. Lenny Herzog – Fvs Saga/Tempo Sea, Secretary
6. Gary Painter – FV Trailblazer
7. Mark Casto – FV Pinnacle
8. Louie Lowenberg – FV Arctic Lady
9. Heather McCarty – Central Bering Sea Fish. Assoc.
10. Owen Kvinge – FV Arctic Sea
11. Shannon Carrol – Trident Seafoods
12. Sinclair Wilt – Westward Seafoods

Monthly Board Meetings – 3rd THU

Timothy Loher, PhD

Martingale Marine Ecological Research
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EDUCATION

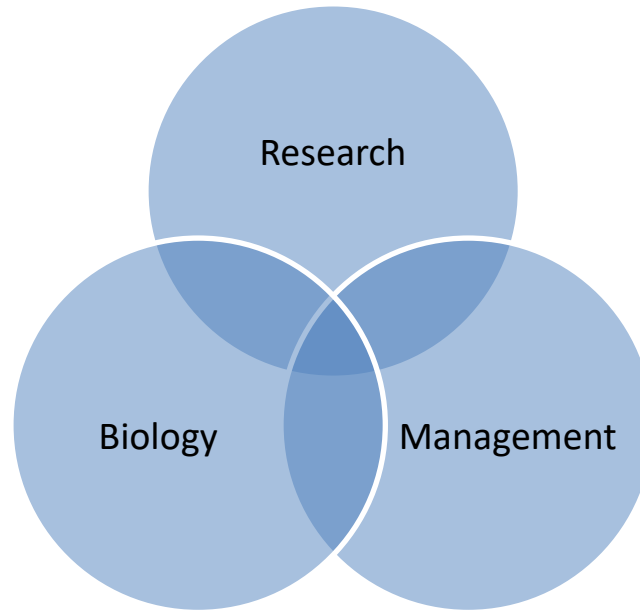
PhD in Fisheries, University of Washington, Seattle, Washington. 2001. Dissertation: Recruitment variability in southeast Bering Sea red king crab (*Paralithodes camtschaticus*, Tilesius 1815): the roles of early juvenile habitat requirements, spatial population structure, and physical forcing mechanisms.

MS in Marine Biology, Northeastern University, Boston, Massachusetts. 1992. Thesis: Cunner (*Tautoglabrus adspersus*) predation in the rocky subtidal: effects on juvenile barnacles and mussels.

BS in Biology (with minors in Chemistry and Secondary Education), State University of New York, Geneseo, New York. 1987.

BSFRF → our status & what we are trying to accomplish

Annual
Research
\$1 m/yr



Research
Reserves
\$1 m/yr

- Typical annual research revenues 0.7-1.0 million
- Last year we budgeted \$125k, cut our budget in half
- This year we budgeted \$40k, but there are new funds
- Our calendar year planning is more flexible – open now

Current BSFRF Status and Plans – Research Funds

-- managing plans now w/ upcoming options --

\$mil

- \$1.40 ➤ Year-end reserve 2022, low revenues from crab landings
- \$2.75 ➤ CDS research support funds coming this year
- \$0.75 ➤ NPRB projects coming online, multiple years
- \$0.13 ➤ BREP projects continuing, likely smaller scale
- \$1.30 ➤ Disaster relief research funded projects, increasing scale
- \$0.85 ➤ Urgent research projects, underway now
- \$2.00 ➤ Further new research funds/plans, underway now

➤ Seeking research funds, focused areas

PROJECT – Description

CRAB MOVEMENT RESEARCH – smart tags (satellite/acoustic) and smart monitoring (drone) technology along with other traditional means to tag release and recover BBRKC and snow crab, are needed. Efforts to date have been limited by funds and sample size. A primary project would be to increase the number of sampled tags scaled 1x, 3x, 5x, or 10x to get more tagged crab out and to better cover the crab distribution in areas of particular interest. **Focus species: BBRKC, snow crab**

CRAB SURVEY RESEARCH – currently the BSFRF is determining a plan to conduct trawl survey, pot survey, and other survey efforts that would fill critical information gaps in the winter and spring periods when and where fishery or summer survey information does not exist. NMFS summer surveys provide a rich, long time series, but don't cover winter grounds, nor provide insight on mating/molting activity in time and space, which is needed now to consider necessary protections for crab. Surveys would also enable us to set tag results into the context of population densities. **Focus species: BBRKC, snow crab**

HABITAT & RECRUITMENT RESEARCH – understanding of specific areas of crab habitat is lacking context with recent ecosystem and climate changes, and current fishing activities. Proposed tagging and survey research could be further specified to focus on precise areas (BBRKC: Amak Island, Black Hills, nearshore AK Peninsula, and snow crab: Pribilof Islands areas, canyon areas) that may reflect important breeding, nursery, and/or juvenile areas that may require designation. This research will help to fill huge gaps in knowledge about important recruitment areas. **Focus species: BBRKC, snow crab, Tanner crab, other king crab stocks**

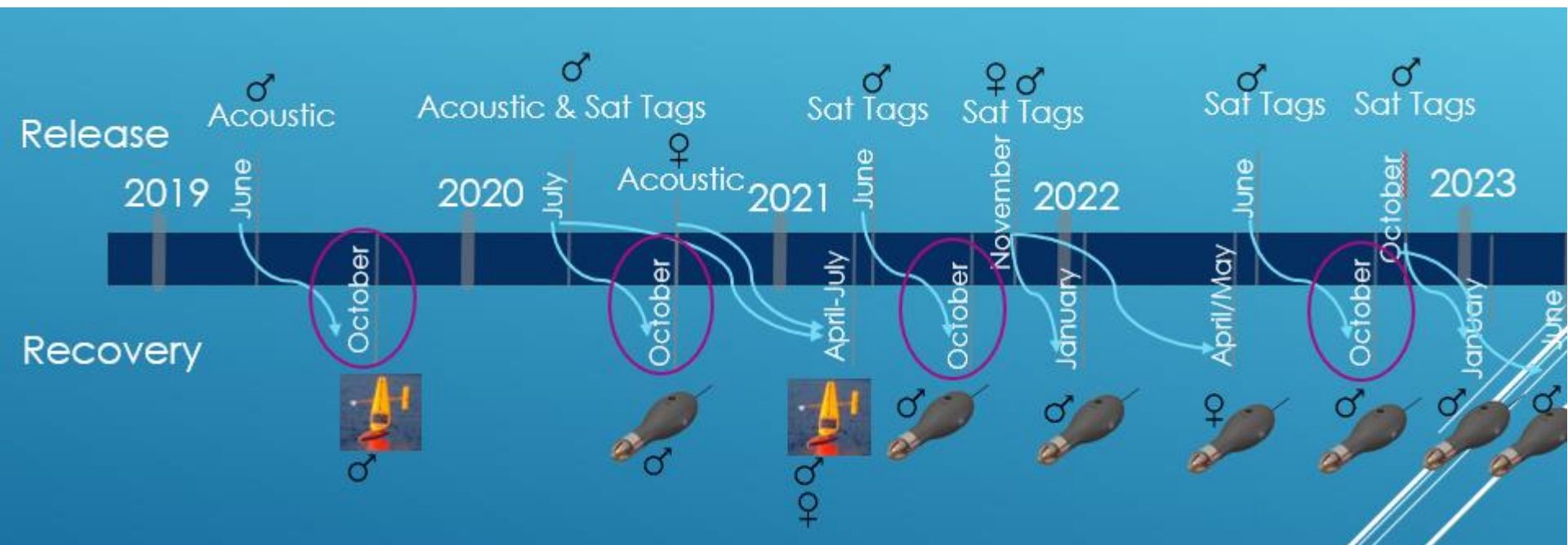
BYCATCH RESEARCH – research has been completed to roughly estimate handling and discard mortality for crabs that are captured and released in both target and non-target fisheries. Given poor stock status, a research focus on bycatch and fishing impacts would provide more precision to these important estimates of mortality for sustainable fishery management. **Focus species: BBRKC, snow crab, Tanner crab, other king crab stocks**

CRAB PREDATION – longstanding research on cod stomachs provides a limited understanding for how much crab are eaten by groundfish (cod). Major gaps in time and space requires a focus on molting periods, when crab are most vulnerable, and nearshore areas occupied by young crab that have not been studied. This information is particularly critical now given changing ocean conditions that are affecting the overlap of groundfish predators with crab. **Focus species: snow crab, Tanner crab, BBRKC, other king crab stocks**

➤ Focused Research Areas

CRAB MOVEMENT RESEARCH – smart tags (satellite/acoustic) along with other traditional means to tag, release and recover BBRKC and snow crab, are needed. Efforts to date have been limited by funds and sample size. Increasing the number of sampled tags scaled is needed to get more tagged crab out and to better cover the crab distribution in areas of particular interest.

Focus species: BBRKC, snow crab



➤ Focused Research Areas

CRAB SURVEY RESEARCH – new efforts are needed to fill critical information gaps in the winter and spring periods. Summer surveys provide a rich, long time series, but don't cover winter grounds, or mating/molting activity in time and space, which would update protections for crab, and enable us to set tag results into the context of population densities. **Focus species: BBRKC, snow crab**



CPS1 Project

– the first Collaborative Pot Sampling project in the winter-spring for Bristol Bay red king crab

➤ Focused Research Areas

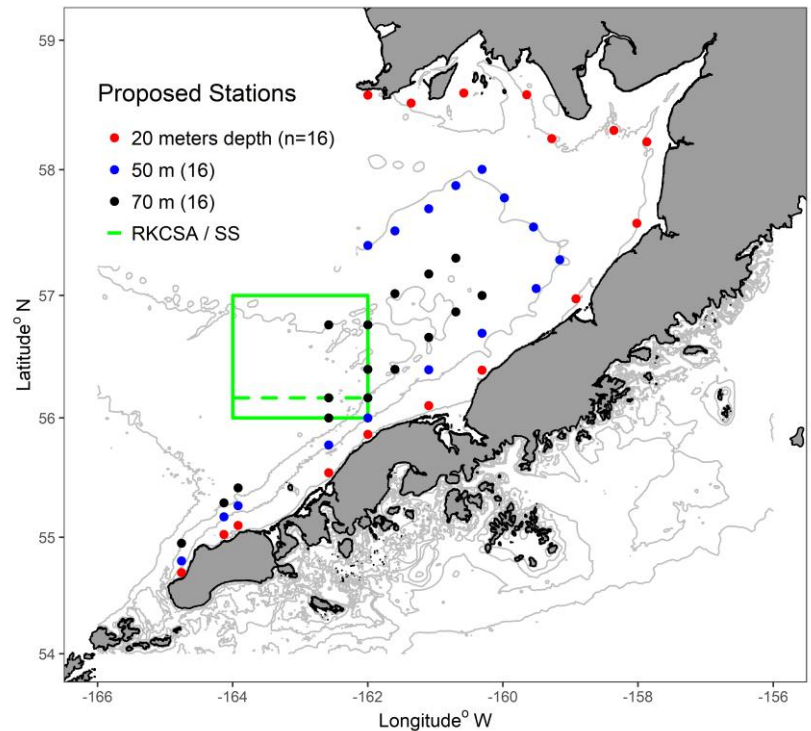
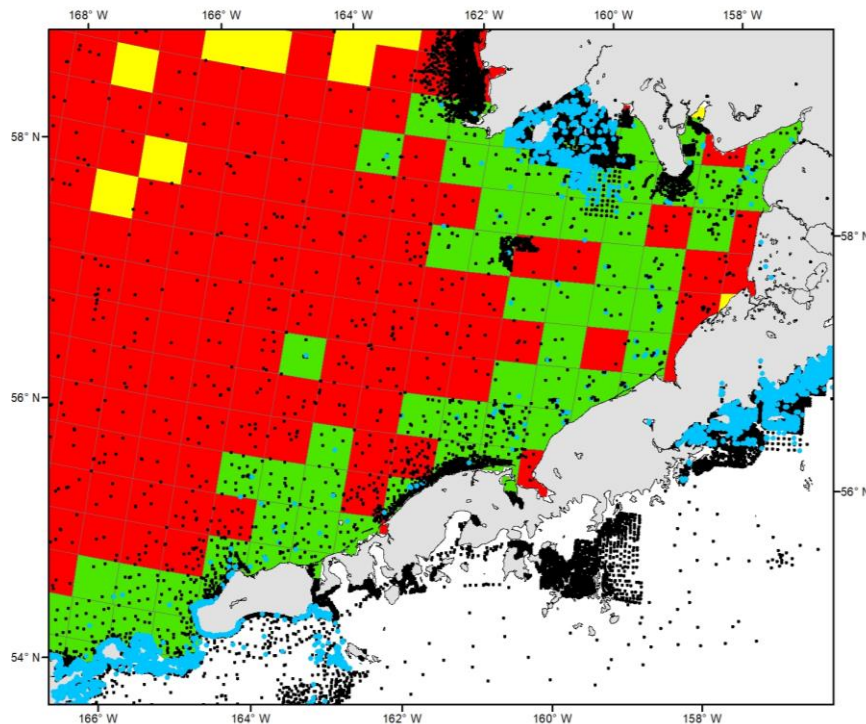
HABITAT & RECRUITMENT RESEARCH – understanding of specific areas of crab habitat is lacking context with recent ecosystem and climate changes, and current fishing activities. Surveys, tagging, and new research may reflect important breeding, nursery, and/or juvenile areas. This research will help to fill huge gaps in knowledge about important recruitment areas. **Focus species: BBRKC, snow crab, Tanner crab, other king crab stocks**

Research is a blend of current plans on tagging/movement/survey work, and focused NPRB projects that are pending (start in early 2024)

➤ Focused Research Areas

HABITAT & RECRUITMENT RESEARCH

Research is a blend of current plans on tagging/movement/survey work, and focused NPRB projects that are pending (start in early 2024)



BSFRF charters are part of this project plan...

➤ Focused Research Areas

BYCATCH RESEARCH – there are estimates of handling and discard mortality for crabs in target and non-target fisheries. Given poor stock status, further focus on bycatch and fishing impacts would provide more precision. **Focus species: all BSAI crab stocks**

Unobserved Fishing Mortality – UFM research

BREP/Similar Projects – specific gear research

Camera/Sensors - gear performance/some working ideas

Collaborative approaches with other sectors



➤ Focused Research Areas

CRAB PREDATION – understanding is limited for how much crab are eaten by groundfish (cod). Major gaps in time and space requires a focus on molting periods, when crab are most vulnerable, nearshore areas with young crab that have not been studied - this is particularly critical now given changing conditions that are affecting the overlap of groundfish predators with crab. **Focus species: all BSAI crab stocks – parts of this are connected to Madi's research**



➤ Recent Survey Research Just Completed



CPS1 – Collaborative Pot Sampling Project

- This is the first pot ‘survey’ project for BBRKC in the winter/spring
- Almost completely paid for by government funds (ADFG/NMFS)
- Two crabbers out for ~25 day charters for sampling and tagging
- More like this is coming

➤ Recent Survey Research Just Completed

What did we learn?

- We can pull together good projects fast
- Science teamwork was key/lots of coordination
- Vessel selection was solid, high interest
- Coordination at sea was excellent
- Communications planning is important



F/V Silver Spray



F/V Summer Bay

➤ Recent Survey Research Just Completed

- Total project actual costs were about \$850k [likely ~\$1 million w/everything]
- Charters were about \$635k total inc. fuel
- Tagging costs were \$166k for 100 tags
- Other costs were about \$40k labor, travel, gear
- Our options - next steps are likely similar/bigger



➤ Recent Survey Research Just Completed

README / Data Use Statement / Public Today

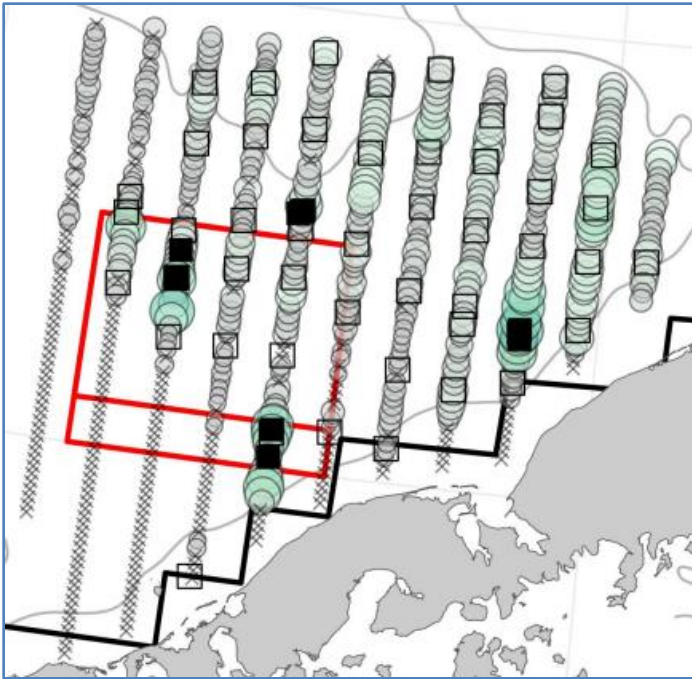
- **The data from this project are public and shareable but will continue to be updated through github repository.**
- **The number of red king crab caught per pot (CPUE) during sampling used red king crab pots which were modified (smaller mesh, and escapes closed) for a controlled soak time (~30 hrs) so comparisons with red king crab fishery CPUEs are relative.**
- **Comparisons to NMFS summer trawl survey densities or distribution should note the substantial differences in methods, timing, and spatial coverage.**
- **Interpretations of these data are limited to their representation as a 'first sampling' in one season (Mar 19 - Apr 4, 2023) across a core but incomplete portion of the Bristol Bay red king crab distribution.**
- **The project should be referenced as "CPS1" - as the first Collaborative Pot Sampling winter-spring project for crab, and was supported primarily by ADFG and NMFS, in collaboration with BSFRF and ABSC.**

CPS1 – Preliminary Results

- Catch and effort summary, TAGS placed
- Area sampled, bathymetry, plans
- Current boundaries, savings area, survey area
- Temperature measurements, across area
- BBRKC catch/pot CPUE by sex/size
- Bycatch spp maps – primary fish catches
- Bycatch spp maps – bairdi and oplilio
- Relationships to dependent variables

CPS1 – Preliminary Results – Effort & TAGS

- 637 total pot lifts (338 SS / 299 SB)
- 10,191 total RKC caught during survey
- 3,498 legal male RKC (>135 mm CL)
- 7,824 males v. 2,367 females (77% v. 23%)
- 100 tags placed during sampling



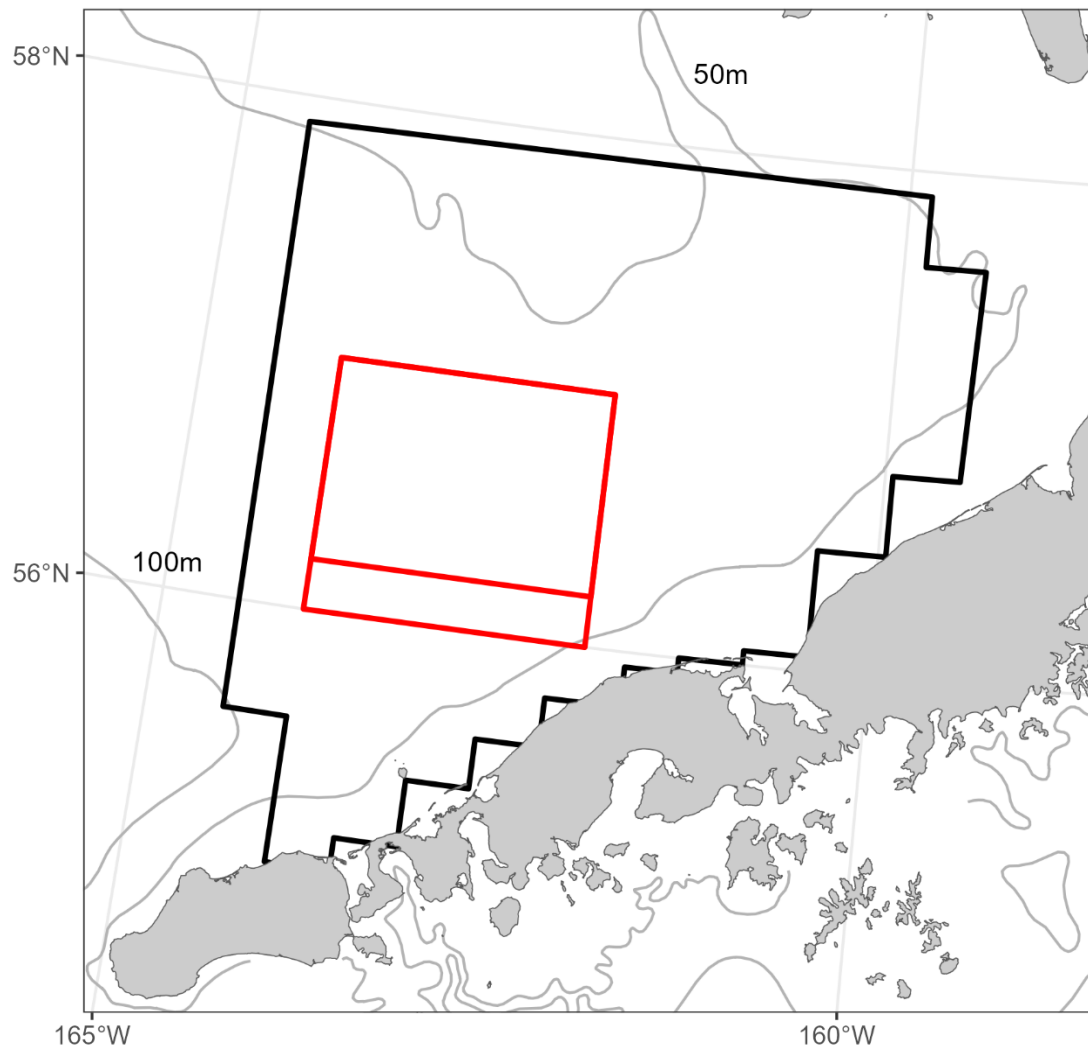
- Mature male RKC tagged
- >50 sites w/ tags
- 8 sites w/ >1
- Part of ongoing tagging & movement research (>1,000 tags out currently)



CPS1 – Preliminary Results

Sampling
Boundary

2023 BBRKC Collaborative Pot Sampling

Survey extent



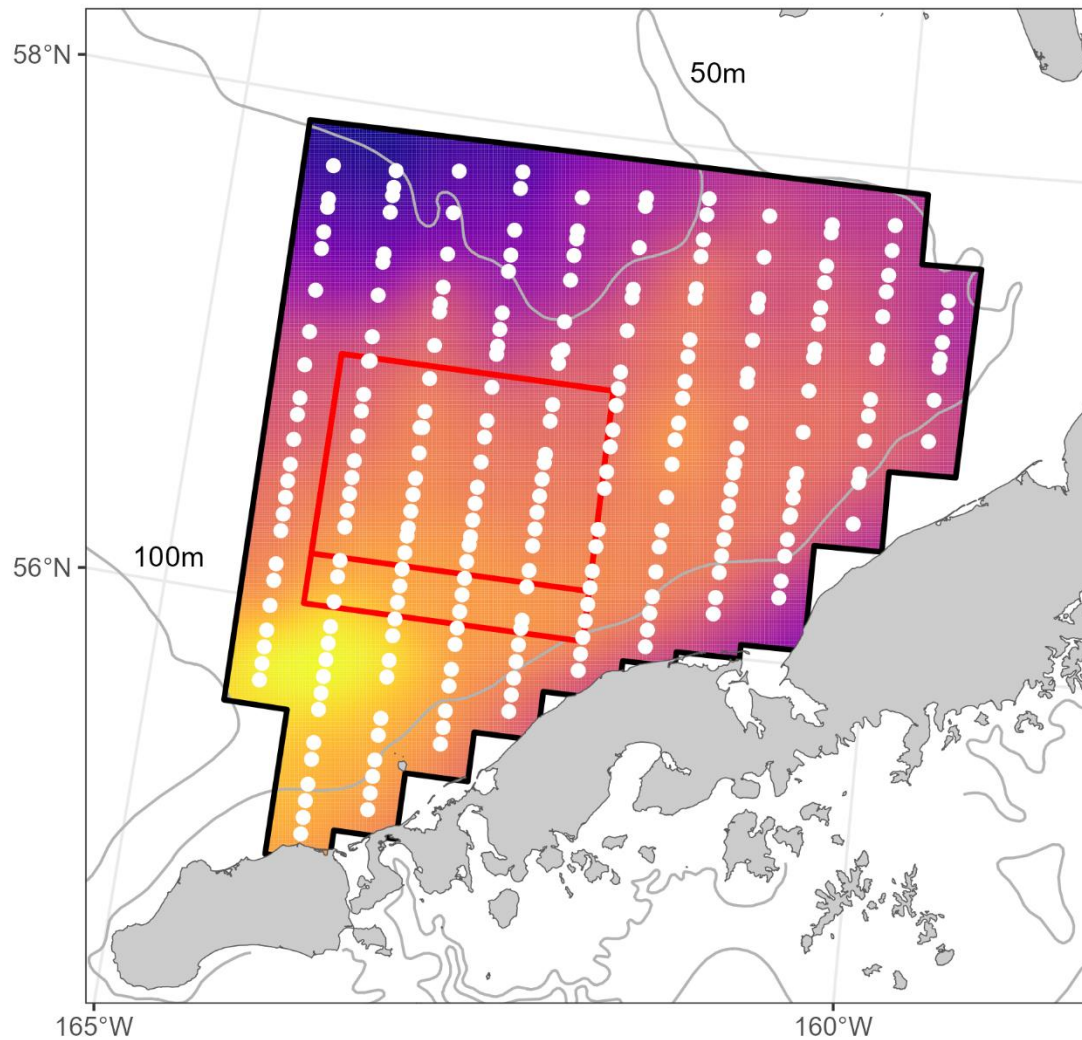
-  CPS1 survey boundary
-  Red King Crab Savings Area

CPS1 – Preliminary Results

2023 BBRKC Collaborative Pot Sampling

Temperature logger locations

Temp Map
with Logger
Locations



□ CPS1 survey boundary
□ Red King Crab Savings Area

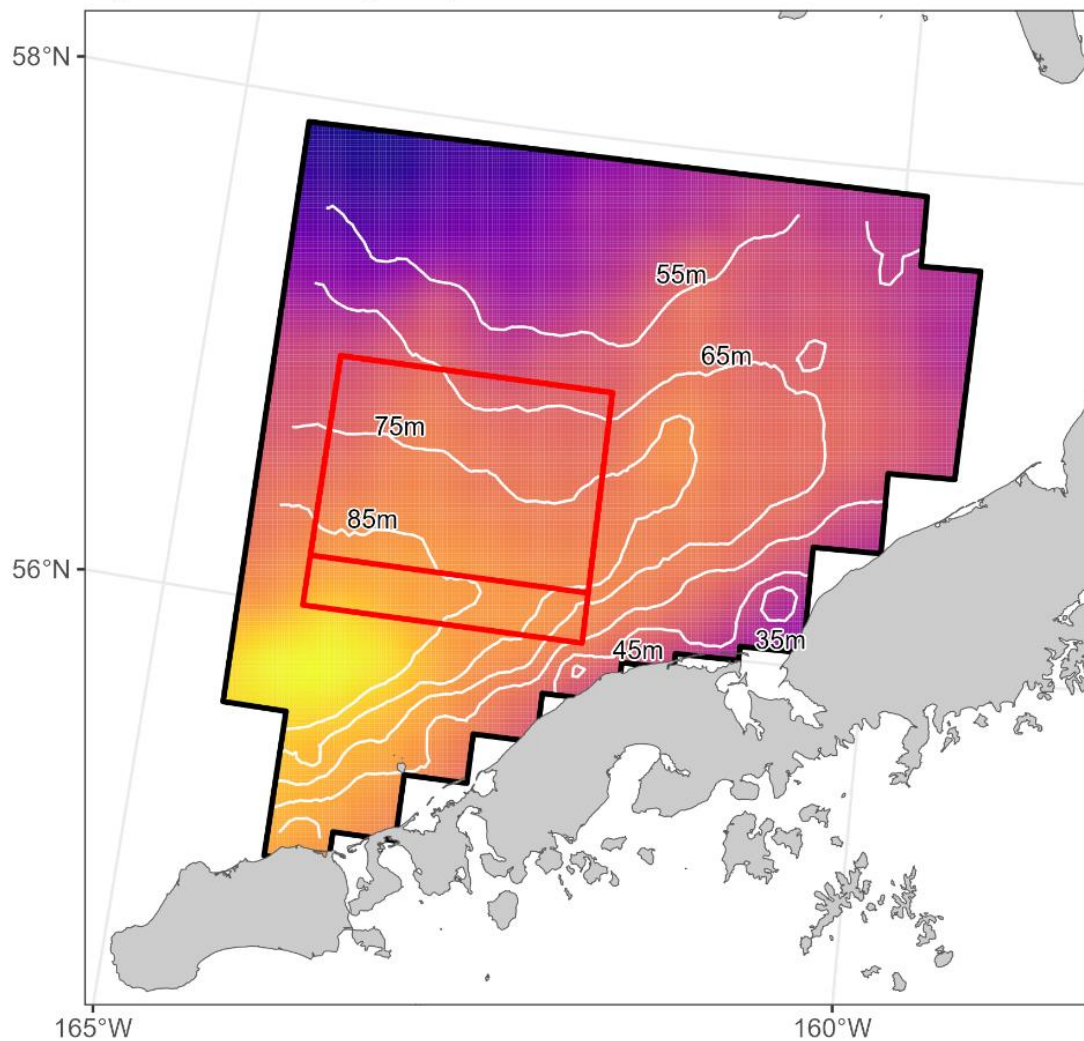
TEMPERATURE (°C)
-1 0 1 2 3 4



CPS1 – Preliminary Results

Temp Map with
Higher Res
Bathymetry

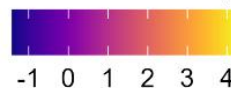
2023 BBRKC Collaborative Pot Sampling

High resolution bathymetry



-  CPS1 survey boundary
-  Red King Crab Savings Area

TEMPERATURE (°C)

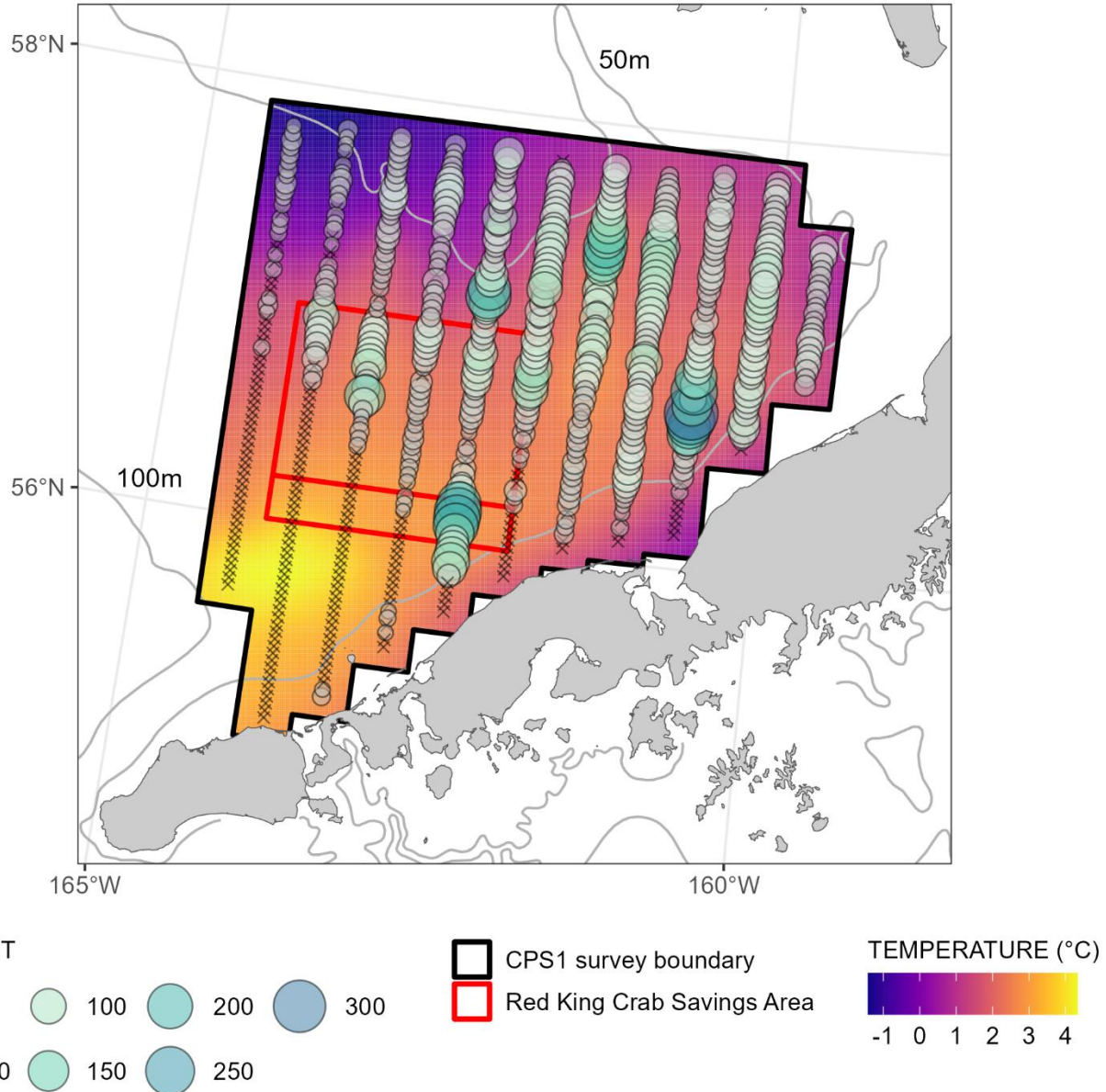


CPS1 – Preliminary Results

All BBRKC

2023 BBRKC Collaborative Pot Sampling

All crab

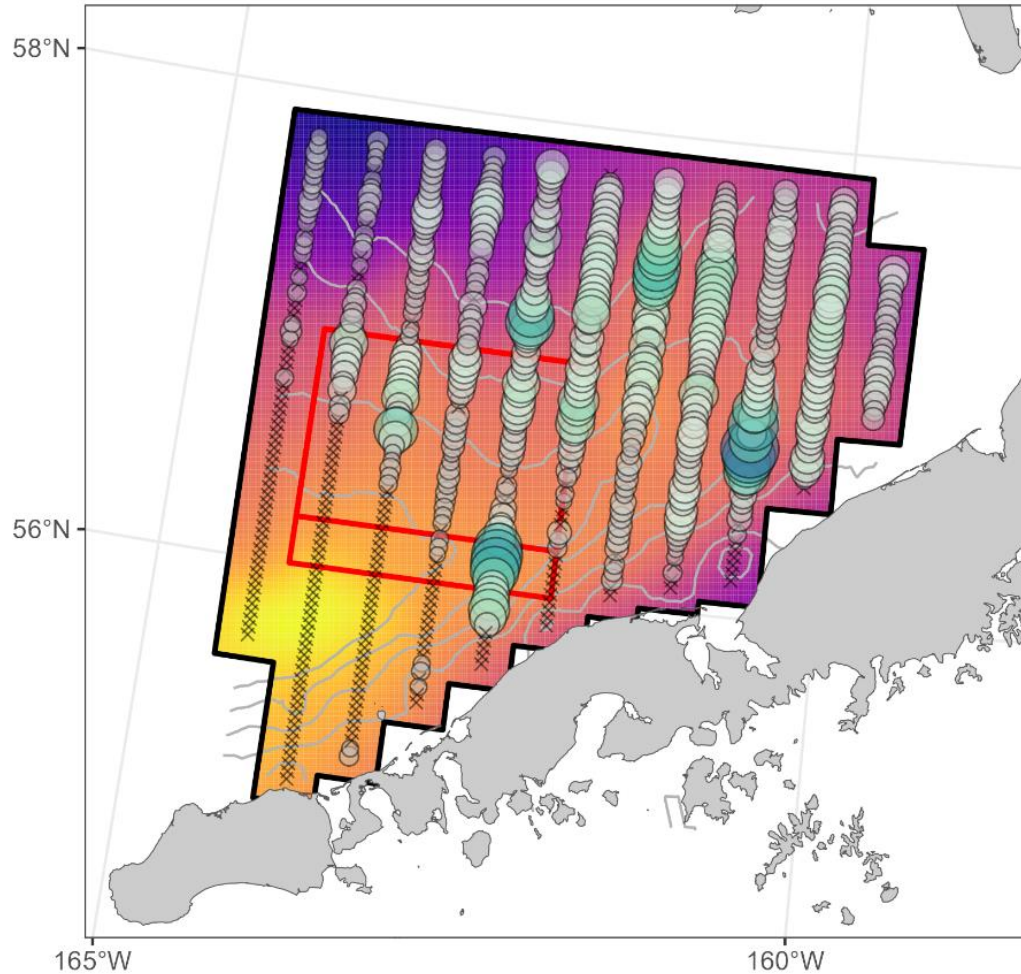


CPS1 – Preliminary Results

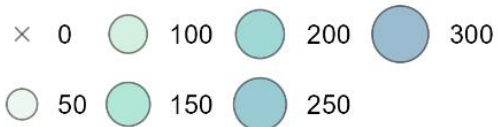
2023 BBRKC Collaborative Pot Sampling

All crab

All Crab with
High Res
Bathymetry



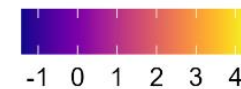
COUNT



□ CPS1 survey boundary

□ Red King Crab Savings Area

TEMPERATURE (°C)

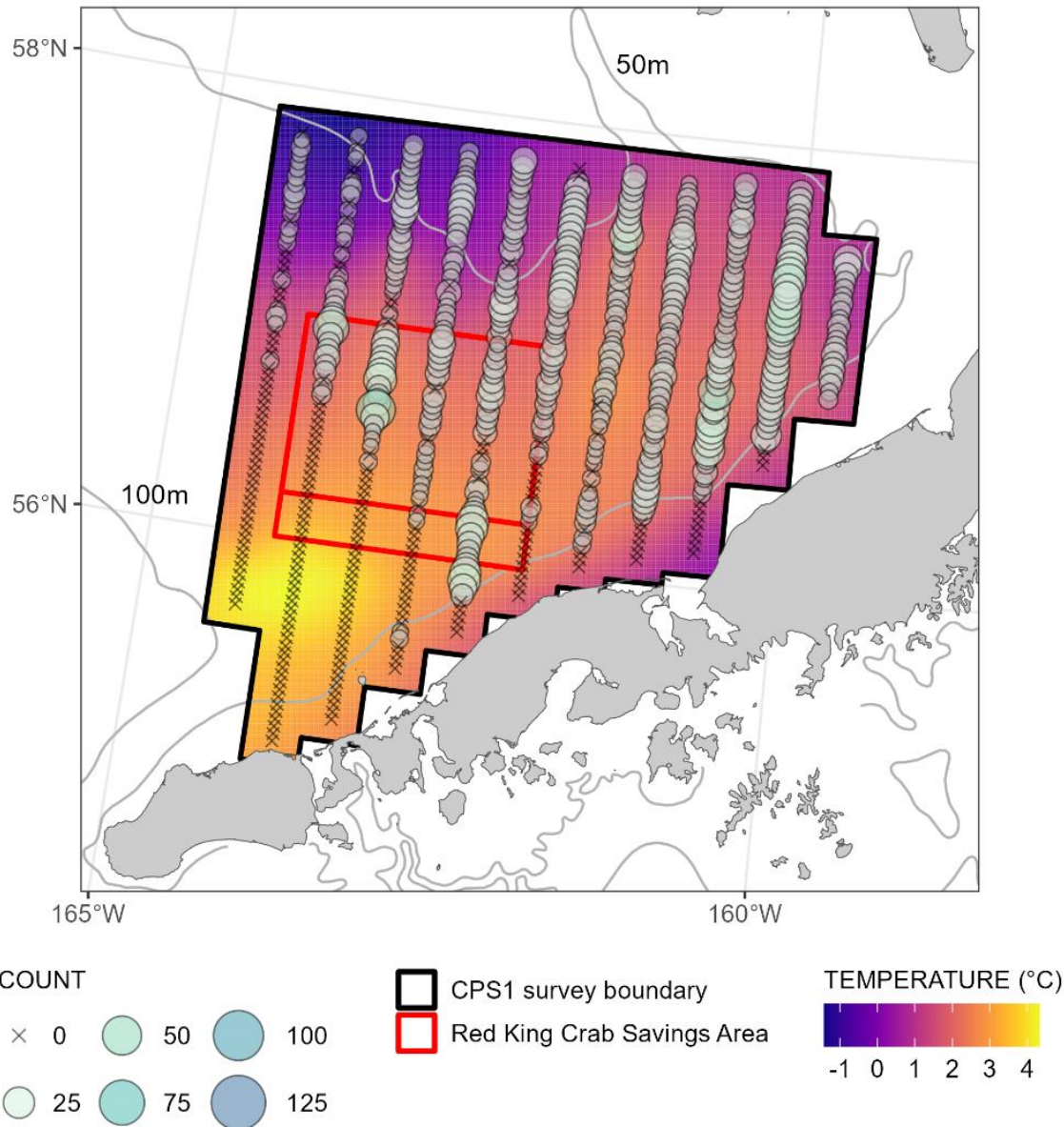


CPS1 – Preliminary Results

2023 BBRKC Collaborative Pot Sampling

Legal male ($\geq 135\text{mm}$)

Legal
Male
Catch

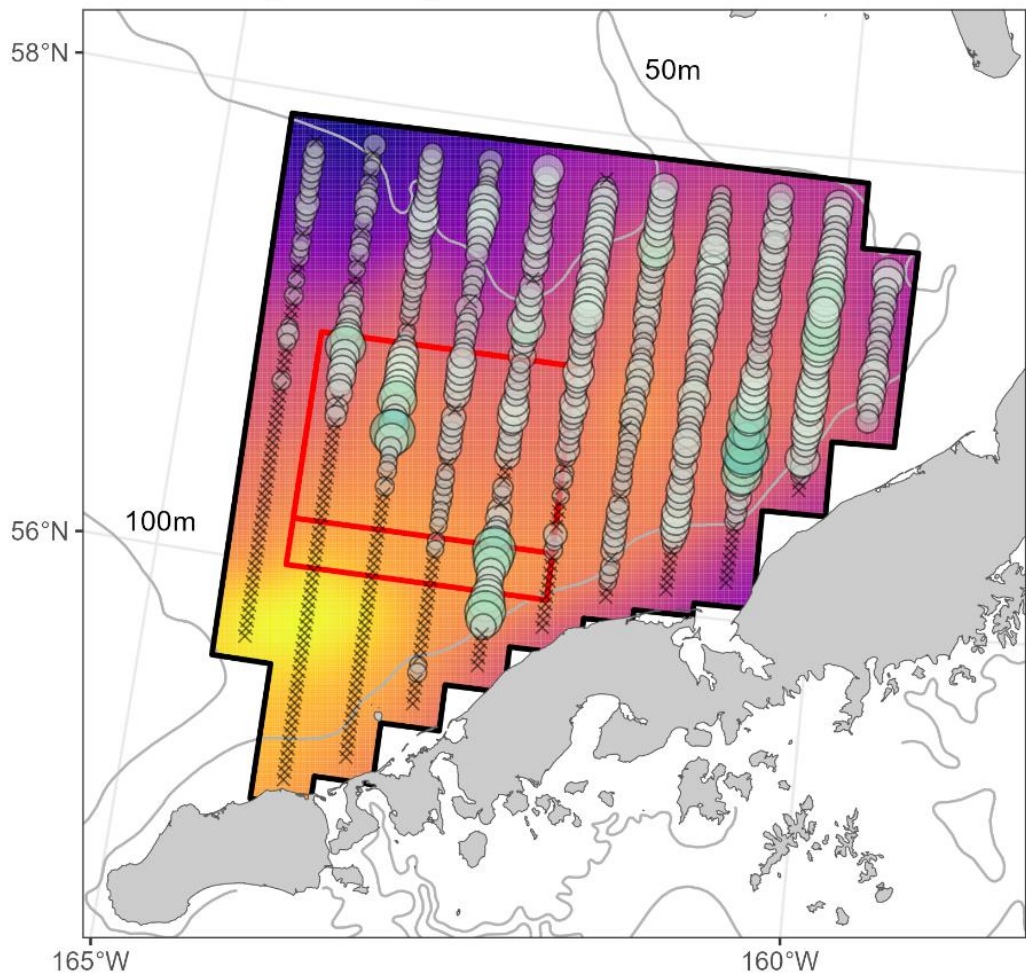


CPS1 – Preliminary Results

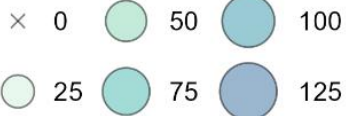
2023 BBRKC Collaborative Pot Sampling

Mature male ($\geq 120\text{mm}$)

Mature
Male
Catch



COUNT



□ CPS1 survey boundary

□ Red King Crab Savings Area

TEMPERATURE (°C)



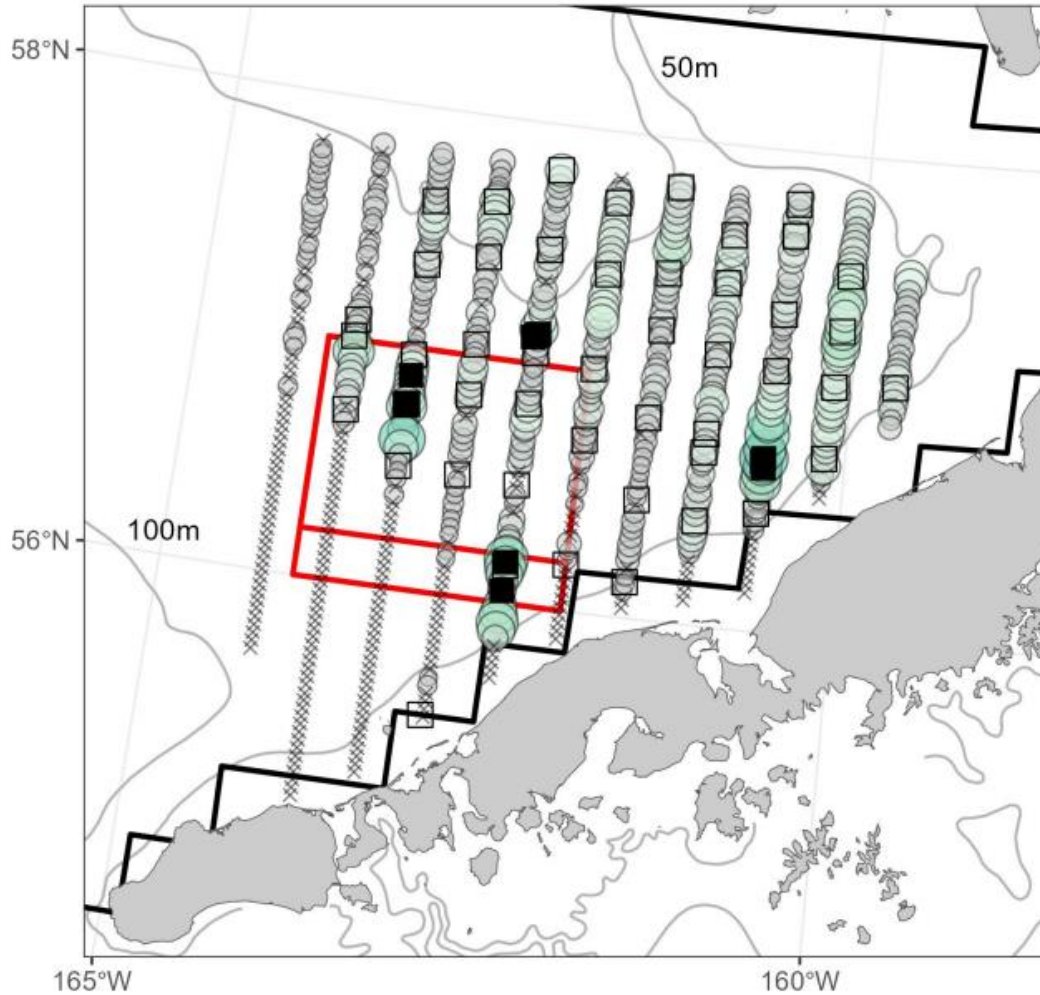
CPS1 – Preliminary Results

2023 BBRKC Winter/Spring Pot Survey

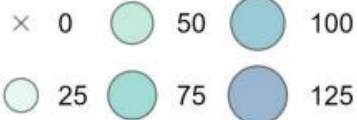
Mature male ($\geq 120\text{mm}$)

Mature
Male
Catch

Showing
Tagging
Locations



COUNT



□ EBS Summer Survey Boundary
□ Red King Crab Savings Area

TAG RELEASE

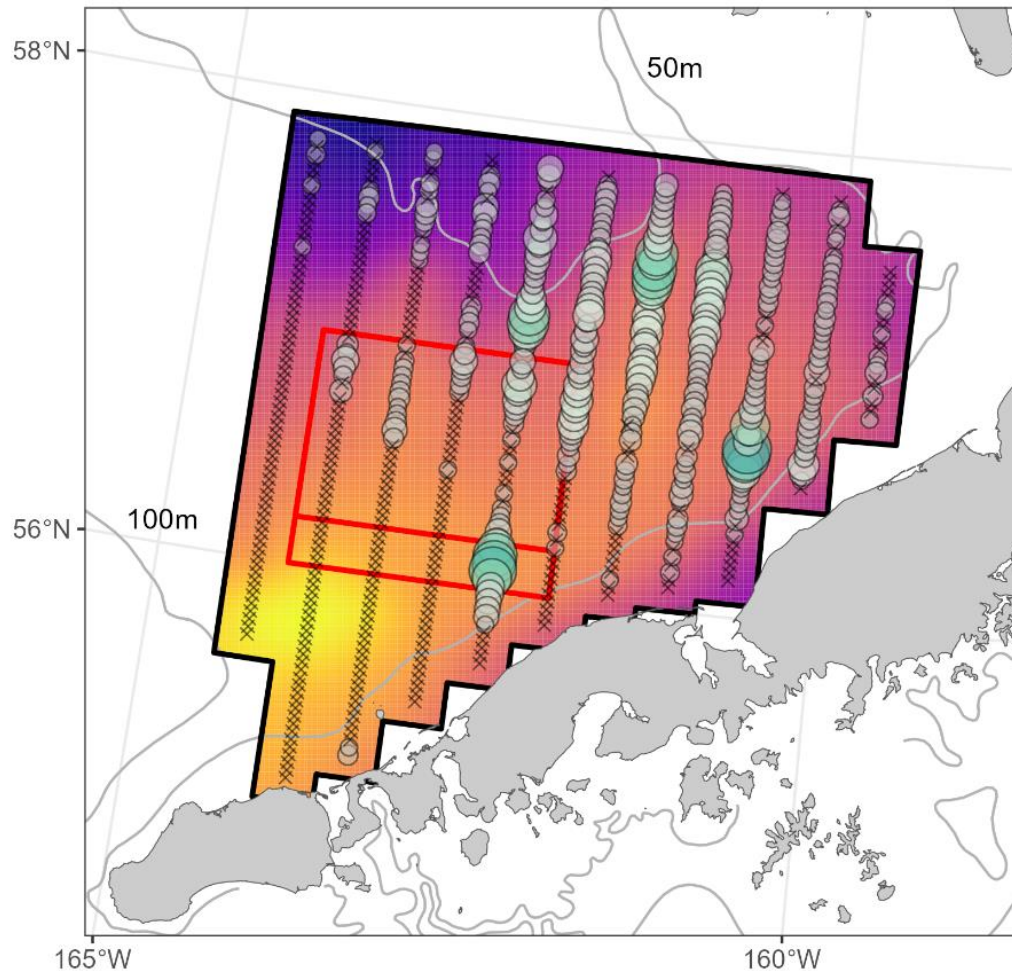
■ $n > 1$
□ $n = 1$

CPS1 – Preliminary Results

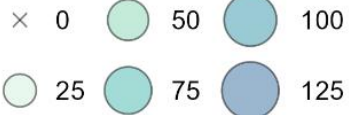
2023 BBRKC Collaborative Pot Sampling

Immature male (< 120mm)

Immature
Male
Catch



COUNT

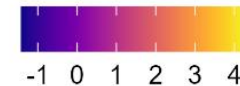


CPS1 survey boundary



Red King Crab Savings Area

TEMPERATURE (°C)

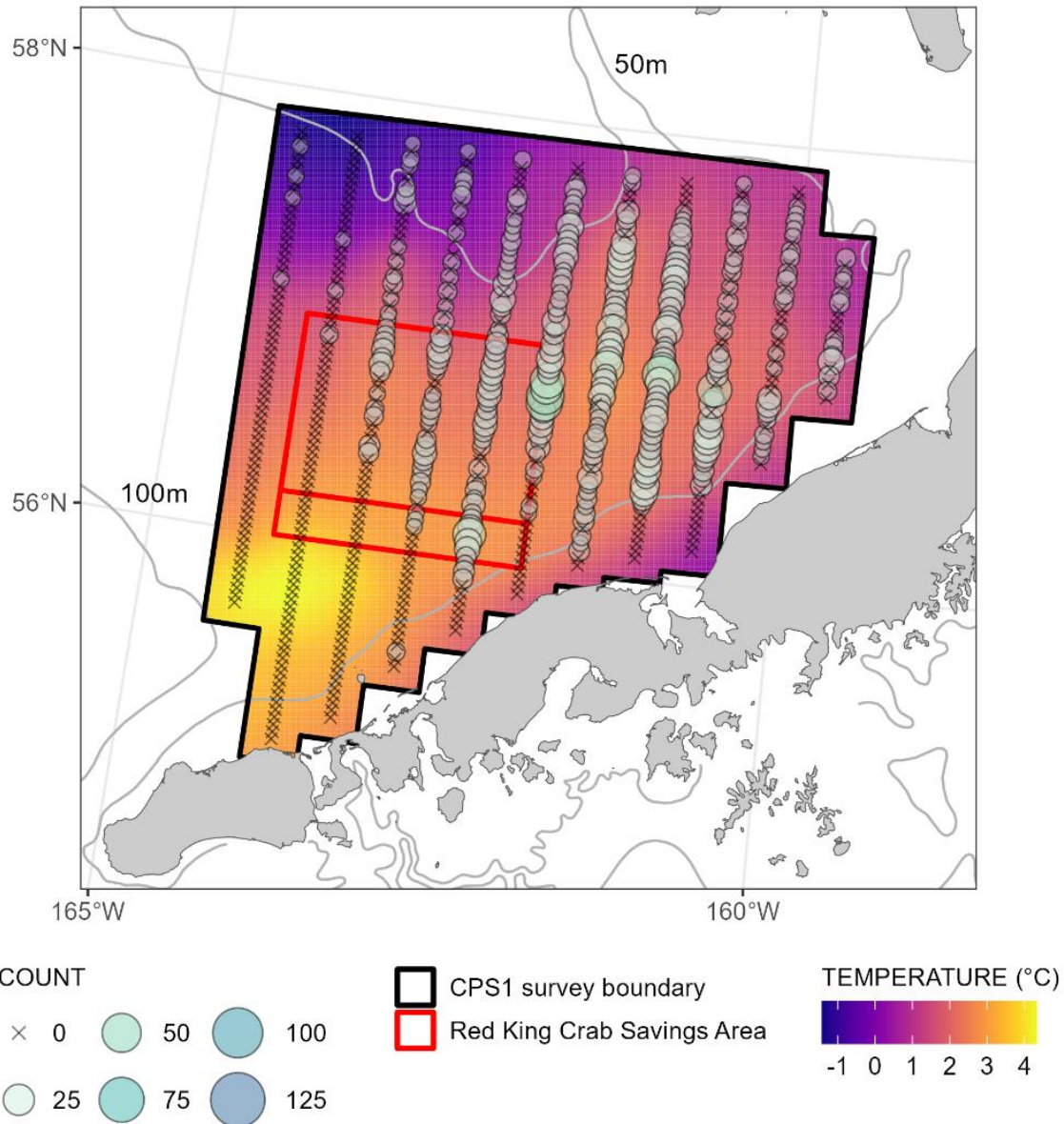


CPS1 – Preliminary Results

2023 BBRKC Collaborative Pot Sampling

Mature female

Mature
Female
Catch

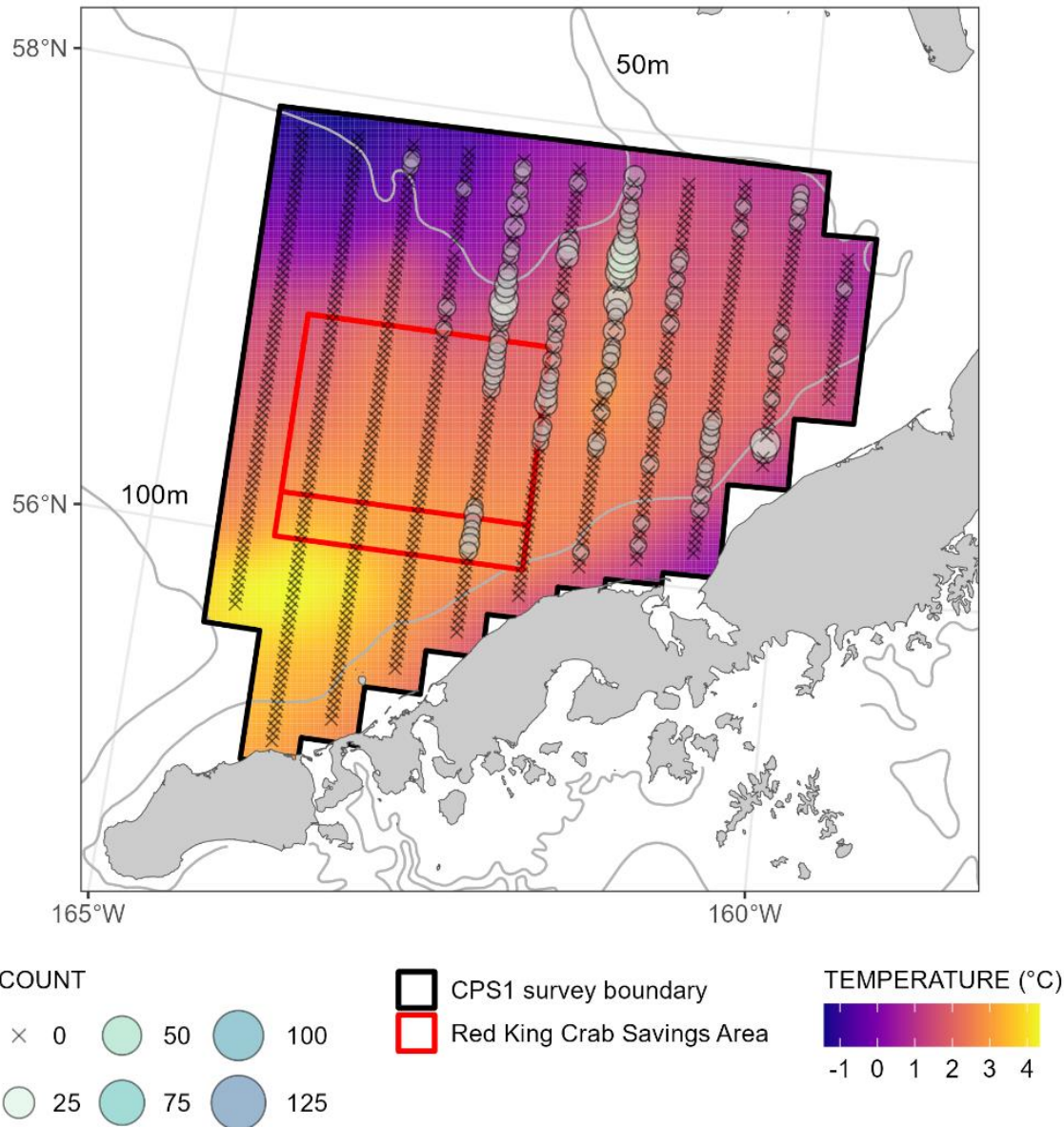


CPS1 – Preliminary Results

2023 BBRKC Collaborative Pot Sampling

Immature female

Immature
Female
Catch

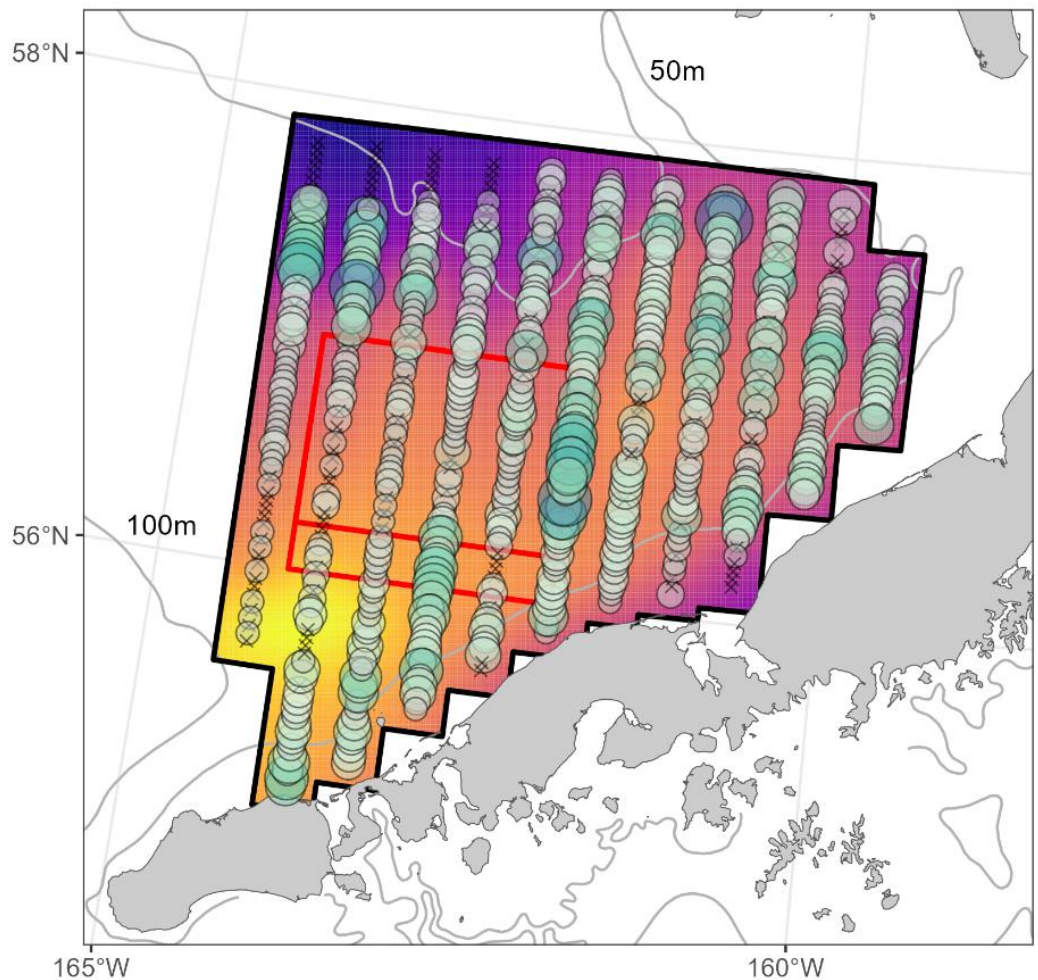


CPS1 – Preliminary Results

2023 BBRKC Collaborative Pot Sampling

Pacific Cod

Pcod
Catch



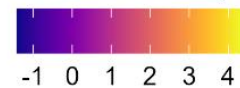
COUNT



□ CPS1 survey boundary

□ Red King Crab Savings Area

TEMPERATURE (°C)

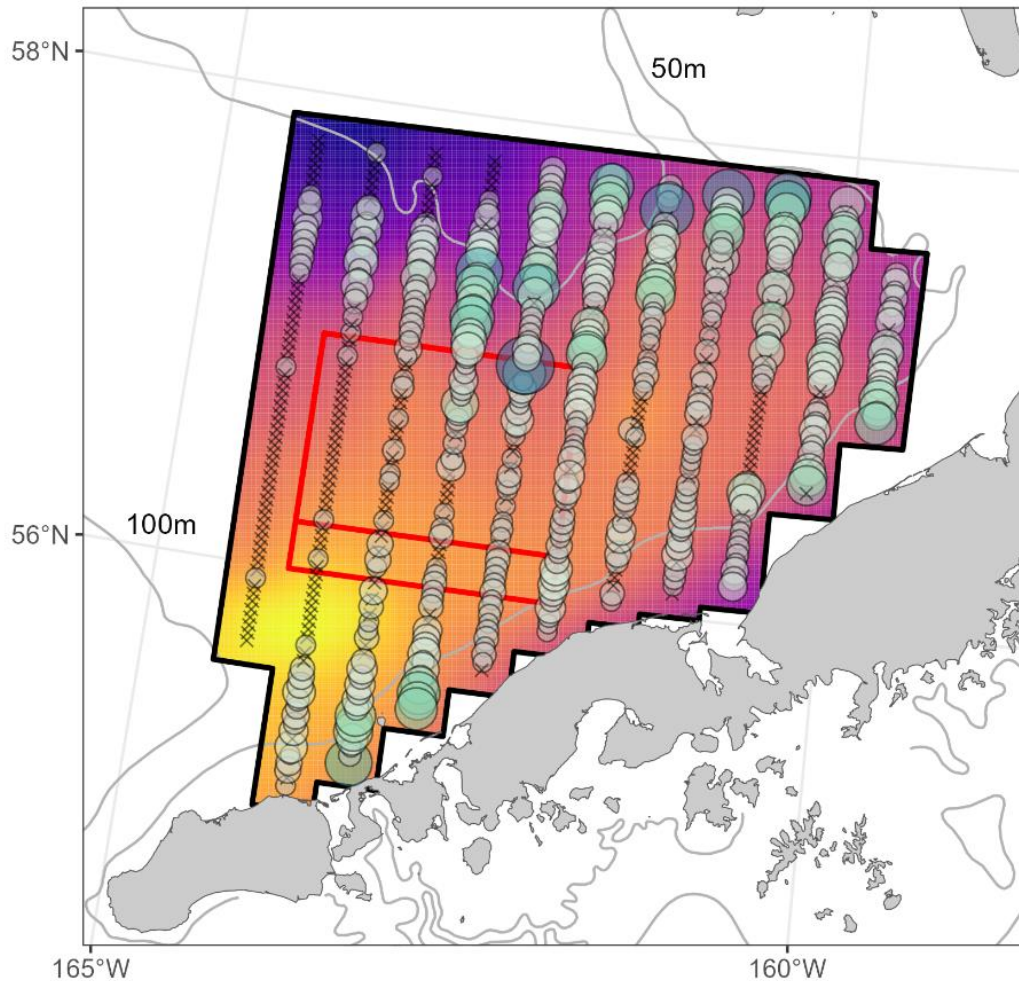


CPS1 – Preliminary Results

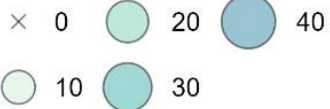
2023 BBRKC Collaborative Pot Sampling

Yellowfin Sole

Yellowfin
Sole
Catch



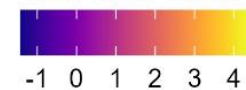
COUNT



□ CPS1 survey boundary

□ Red King Crab Savings Area

TEMPERATURE (°C)

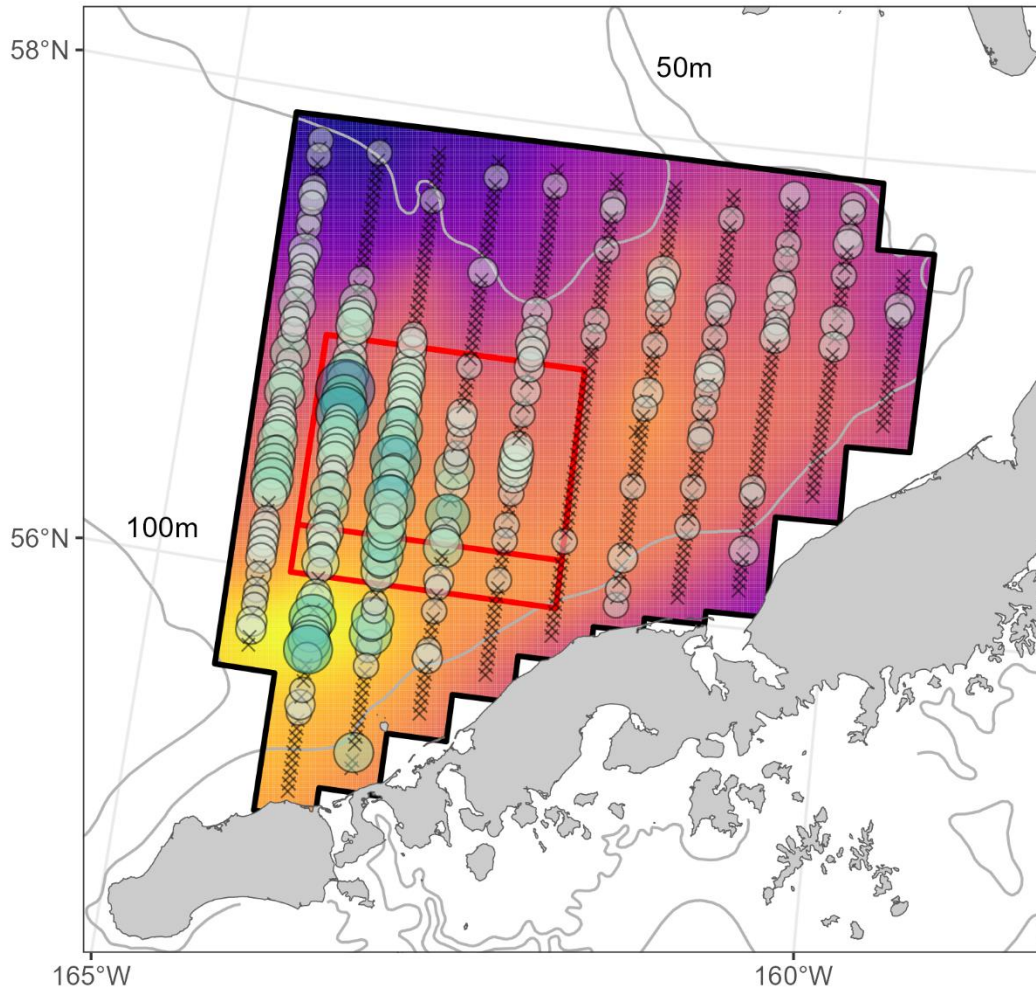


CPS1 – Preliminary Results

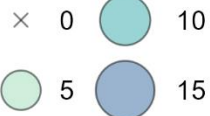
2023 BBRKC Collaborative Pot Sampling

Tanner crab

Bairdi
Catch



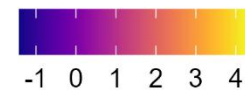
COUNT



CPS1 survey boundary

Red King Crab Savings Area

TEMPERATURE (°C)

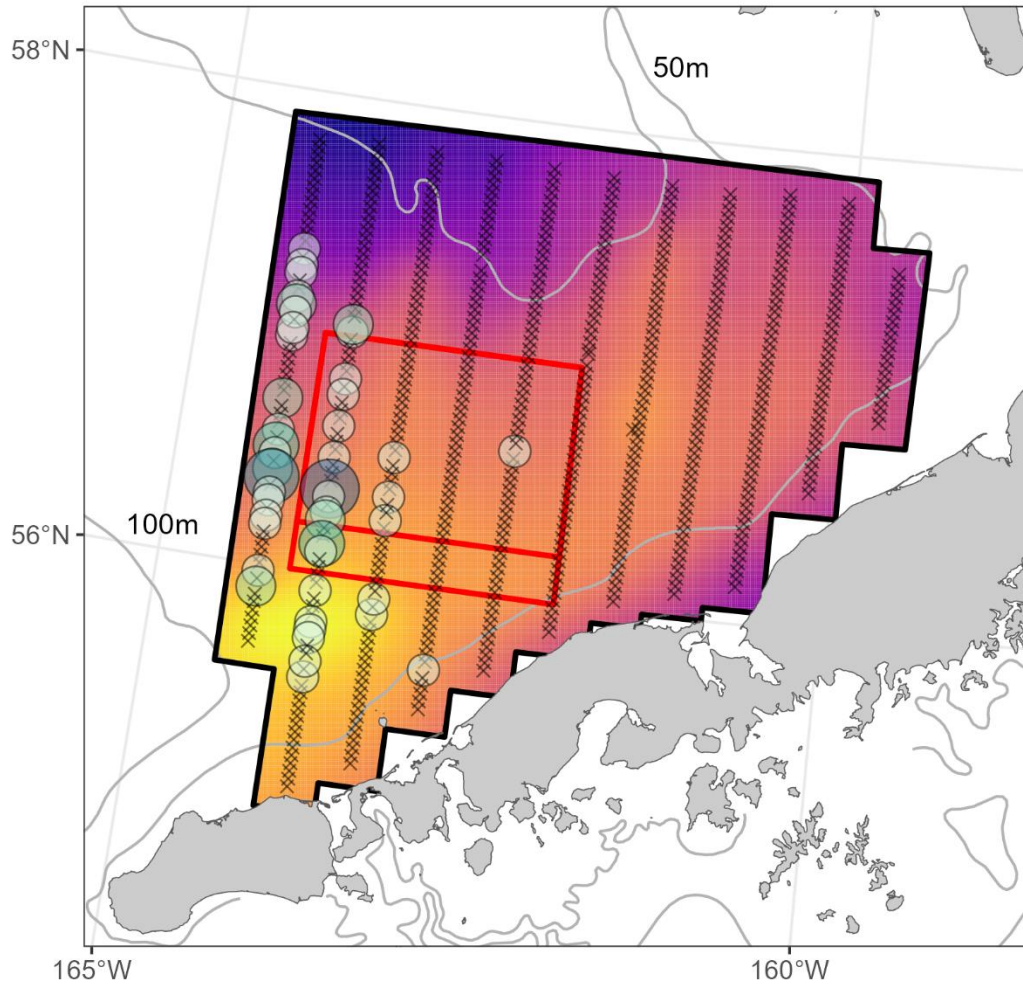


CPS1 – Preliminary Results

2023 BBRKC Collaborative Pot Sampling

Snow crab

Opilio
Catch



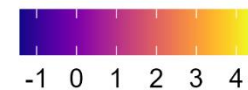
COUNT



CPS1 survey boundary

Red King Crab Savings Area

TEMPERATURE (°C)



-1 0 1 2 3 4

CPS1 – Preliminary Results

2023 BBRKC Collaborative Pot Sampling

Temperature logger locations

West of RKCSA

- Immature female: 0
- Immature male: 0
- Legal male: 8
- Mature female: 0
- Mature male: 8

All RKCSA (including subarea)

- Immature female: 33
- Immature male: 514
- Legal male: 689
- Mature female: 336
- Mature male: 979

RKCSA subarea only

- Immature female: 9
- Immature male: 252
- Legal male: 66
- Mature female: 74
- Mature male: 122

North of RKCSA

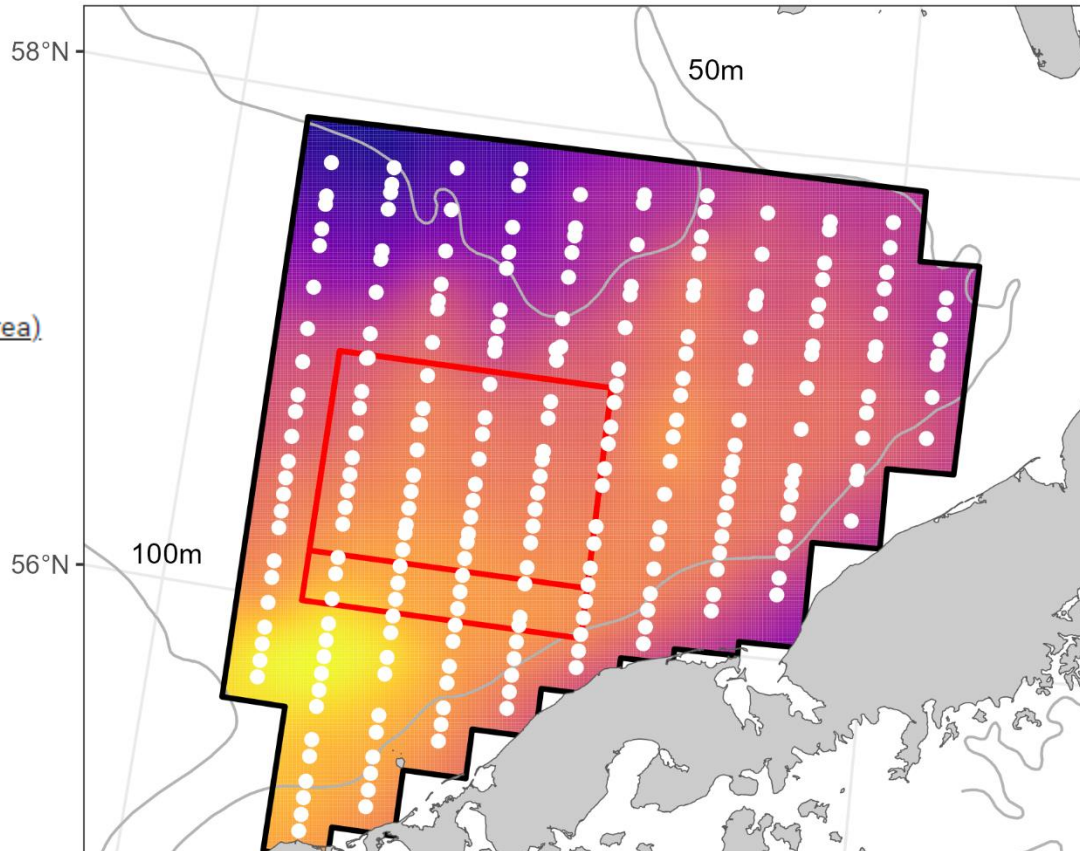
- Immature female: 93
- Immature male: 404
- Legal male: 548
- Mature female: 119
- Mature male: 756

East of RKCSA

- Immature female: 307
- Immature male: 1858
- Legal male: 2160
- Mature female: 1466
- Mature male: 3098

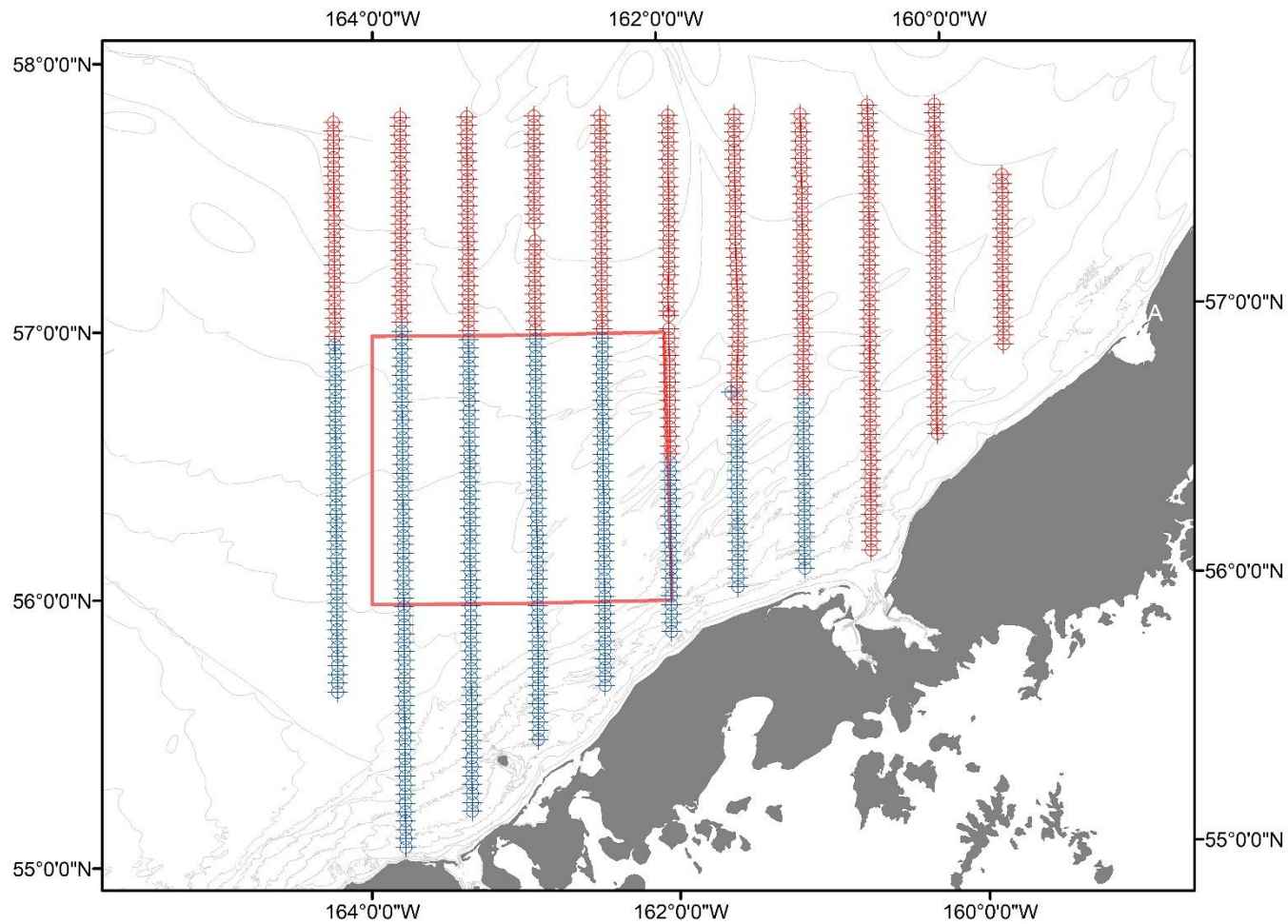
South of RKCSA

- Immature female: 0
- Immature male: 48
- Legal male: 93
- Mature female: 13
- Mature male: 159



Prelim analyses suggest temperature and latitude are important predictors across all size/sex rkc groups, further analyses underway (cod v crab, etc)

CPS1 – Preliminary Results



Vessel coverage over sampling area – SS red, SB blue

CPS1 – Acknowledgements-Thanks

ADFG/NOAA for direct project funding

Science team for planning

Science parties onboard for sampling

Vessels, captains, crews for their excellent work & help

Chris Siddon ADFG	Mike Litzow NOAA	Gary Stauffer BSFRF
Ben Daly ADFG	Leah Zacher NOAA	Silver Spray crew
Jared Weems ADFG	Emily Ryznar NOAA	Summer Bay crew
Vicki Vanek ADFG	Erin Fedewa NOAA	BSFRF Board of Directors
Katie Palof ADFG	Jamie Goen ABSC	ABSC Board of Directors
Mark Stichert ADFG	Charlie Heller NRC/BSFRF	Trident Seafoods
Ethan Nichols ADFG	Madison Heller-Shipley BSFRF	Fleet coordinators
Andy Nault ADFG	Gordon Kruse BSFRF	NOAA Seattle cameras
Corey Lescher ABSC	Scott Goodman BSFRF	Ocean Data Network

Big thanks to Emily Ryznar for coding/mapping/analyses

➤ Upcoming Research

- What's on the horizon?
- Several options to be ready for
- Pot sampling, camera work, trawl sampling, tagging charters, gear work, other research
- Coordinating with State of Alaska and NOAA and stakeholders - what next projects may be
- Charter options may be similar or more selective depending on the project(s)
- We are firming up research project plans now through June, CDS funds likely available 8/1

May Crab Plan Team Update, Juneau AK



Please feel free to reach out with questions anytime

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