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Groundfish and Shellfish Assessment Programs

Modernizing fisheries-independent groundfish/shellfish bottom trawl surveys in Alaska.

Projects leads: Lewis Barnett, Lyle Britt, Meaghan Bryan, Nicole Charriere, Rebecca Haehn-Tam, Ned Laman, Mike Litzow, Stan Kotwicki, Zack Oyafuso, Sean Rohan, Shawn Russell, Paul Spencer, Duane Stevenson

EBS modernization Steering Committee: Mike Litzow (co-chair), Duane Stevenson (co-chair), Lyle Britt, Melissa Haltuch, Stan Kotwicki, Chris Lunsford, Shawn Russell

NPFMC SSC, 3/31/2025

We welcome feedback

- Spatial extent of the EBS survey (e.g. desirable depth extent on the slope)
- Desired precision of survey data products (index, age-comps, etc.).
- Comments on future EBS survey design with respect to statistical design, stratification, effort allocation.
- Advice on how to deal with misalignment between optimal stratification and multiple management areas in EBS. Is there a potential to change management areas in the future?
- Multispecies Optimization (future use, species prioritization)
- Timeline and plan for phased implementation for 15/30
- Approach for intersurvey calibration and transition from old to new survey.

Why are fisheries-independent surveys (FIS) valuable?

Supply universal survey data products that provide consistent information used for:

- stock and ecosystem assessment
- fisheries management
- ecosystem research
- population dynamics
- climate change effects forecasting
- 1000+ papers just since 2023 and just for the “trawl survey”

Continuity/consistency of information is a key to detect change and assure value of FIS.

Abundance and biomass indices (or absolute estimates)

Spatio-temporal distribution maps

Population size, sex, and age composition data

Weight and size at age

Maturity and reproduction

Food habits

Genetics

Biological, chemical, and physical oceanographic and ecosystem data used to monitor change in ecosystems.

Assuring continuity in face of change?

Continuity and consistency of information allows to detect changes in populations and ecosystems - value of survey.

Major survey programs for years concentrated (and still do) on assuring consistency by enhancing standardization (doing the same thing over and over). The idea was that once we standardize surveys enough then we achieved gold standard and no other changes are necessary (ever). Standardization is still very important but…

Change is unavoidable!

The goal of our work is to minimise disruption while implementing a change.

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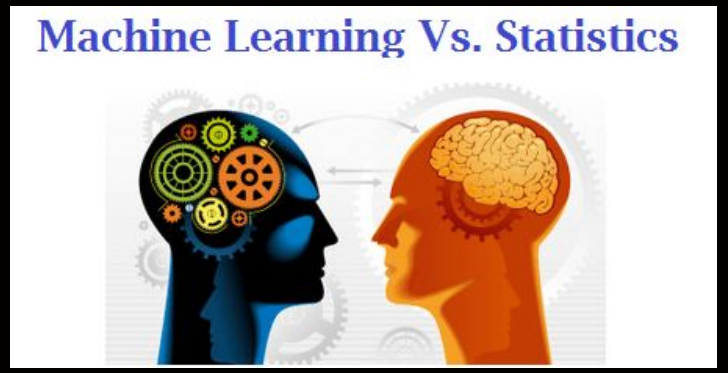
Drivers of change for Alaska surveys

survey gear and methods becoming obsolete

new survey technologies

ecosystem change, expansion of stocks into new areas

new statistical methods, AI



- cost
- increased number of survey objectives
- support subsistence and local communities
- need to combine sampling methods and data types

Where we are going?

Trip to the future surveys.

- Platform-agnostic, multi-platform, multi-method
- Using advanced tech (Acoustics, Cameras, eDNA)
- Responsive to the stakeholders needs
- Collecting more data
- Move from design-based to model-based estimation. Survey design will be more efficient, more appropriate for models
- Using AI for data analysis and to produce data products
- Less lethal, less destructive
- Still need to catch fish (including bottom trawling)

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Working together

Workshop on unavoidable survey effort reduction (WKUSER, ICES – NOAA collaboration)

- WKUSER 1, Seattle 2020 (~80 participants)
- WKUSER 2, Galway, Ireland 2022 (~50 participants)
- **WKUSER 3, Copenhagen, Denmark, Oct 27-31, 2025**

2023 ICES ASC

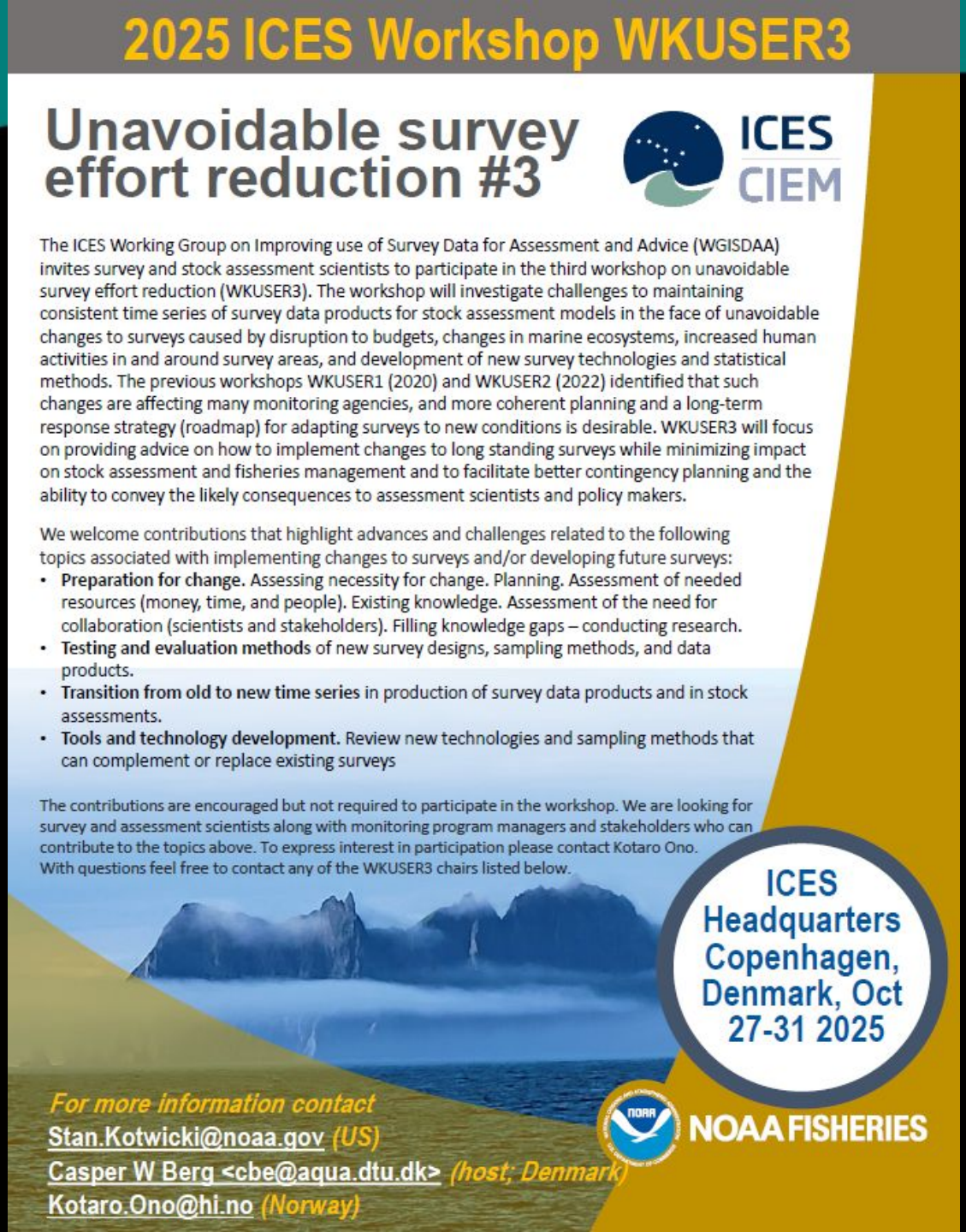
- Future of fisheries-independent surveys - progress in design, technology, estimation, and management. (~60 participants)

2024 AFS

- Fishery-independent surveys: maximizing capabilities and adapting to a changing world (~50 participants)

WKUSER reports (2020, 2022)

WKUSER3 planed in Copenhagen in October 2025, contact Stan.Kotwicki@noaa.gov if interested.



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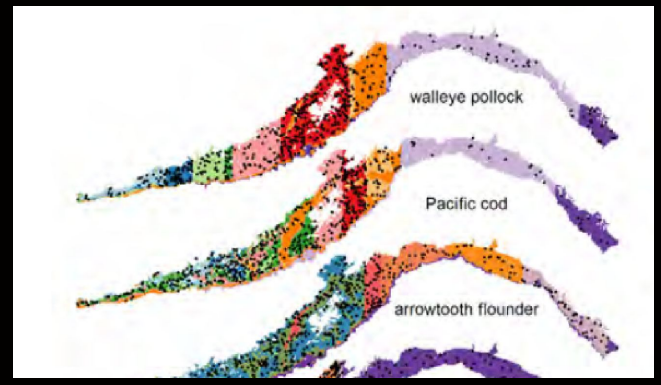
Pathways to modernizing surveys

Research:

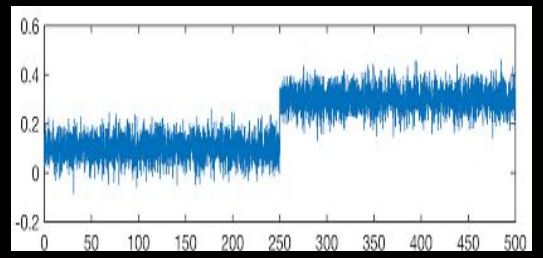
Educate more students on survey issues! – UW SAFS survey class - winter 2026.

Get public and decision makers support

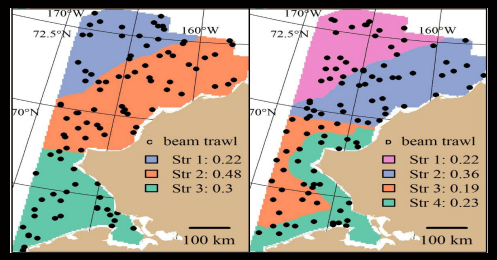
Develop new designs for modern surveys



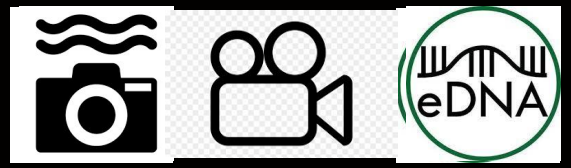
How to deal with change in surveys



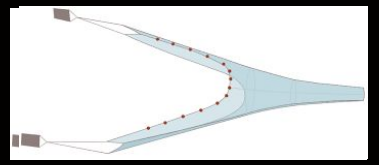
Evaluation of survey designs and methods

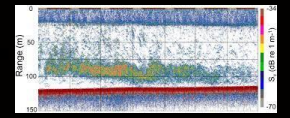


Incorporate new technologies -



Combine multiple surveys, platforms or technologies





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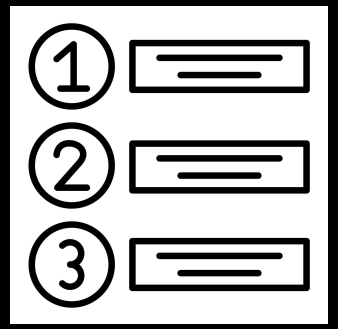
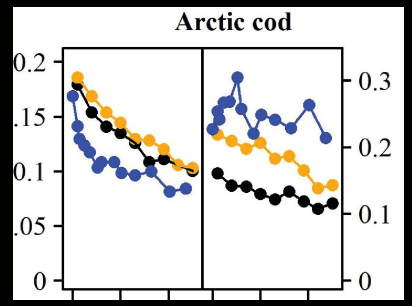
Groundfish and Shellfish Assessment Programs

Pathways to modernizing surveys

Prioritize objectives

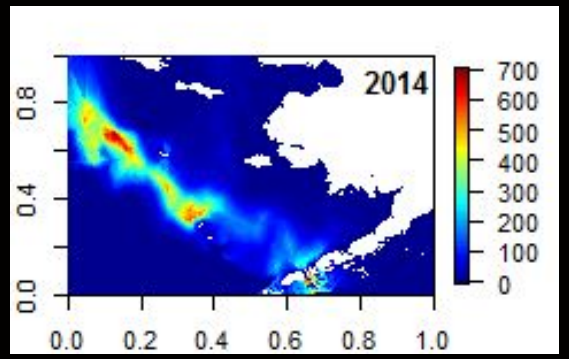


Testing new surveys – in the field and through simulations

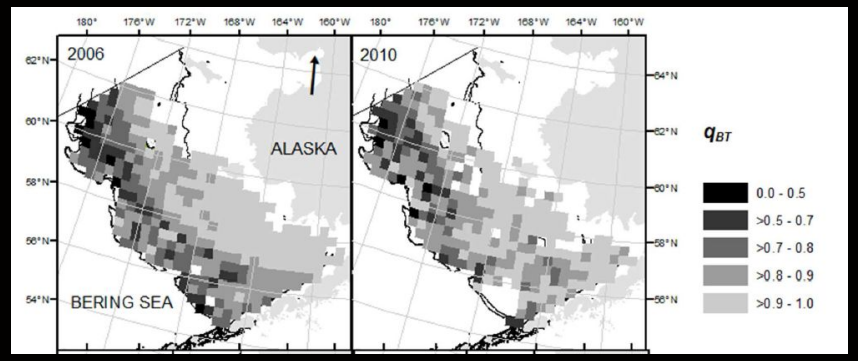


QA, Variance estimation, propagation!

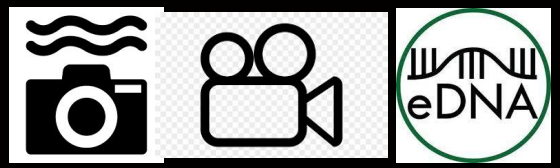
Improving data products: models, covariates, other auxiliary information

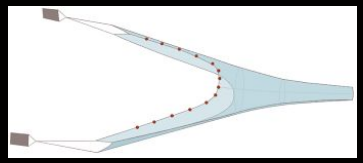


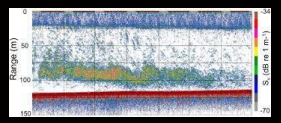
Estimating variation in catchability

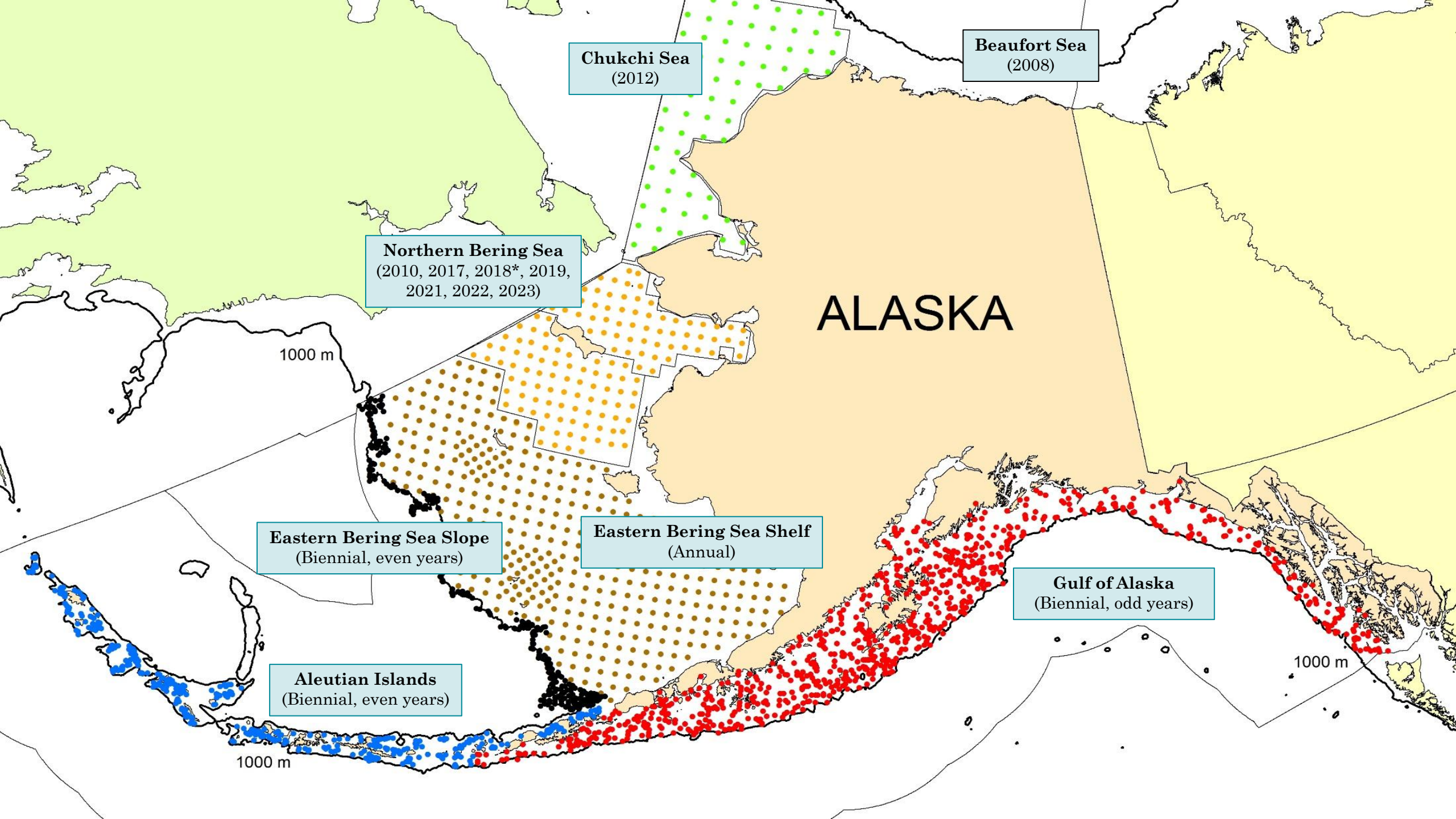


Transition from destructive or lethal survey methods.





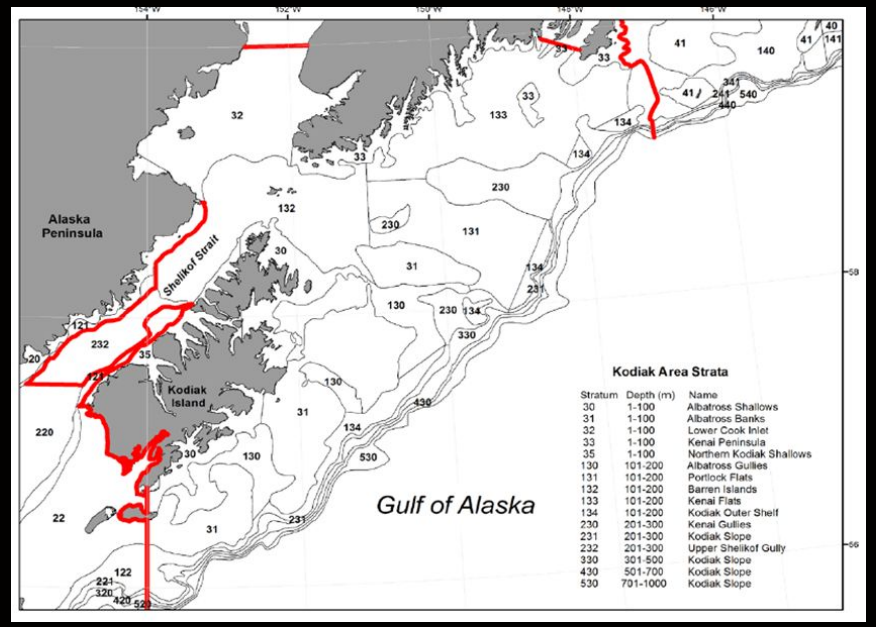


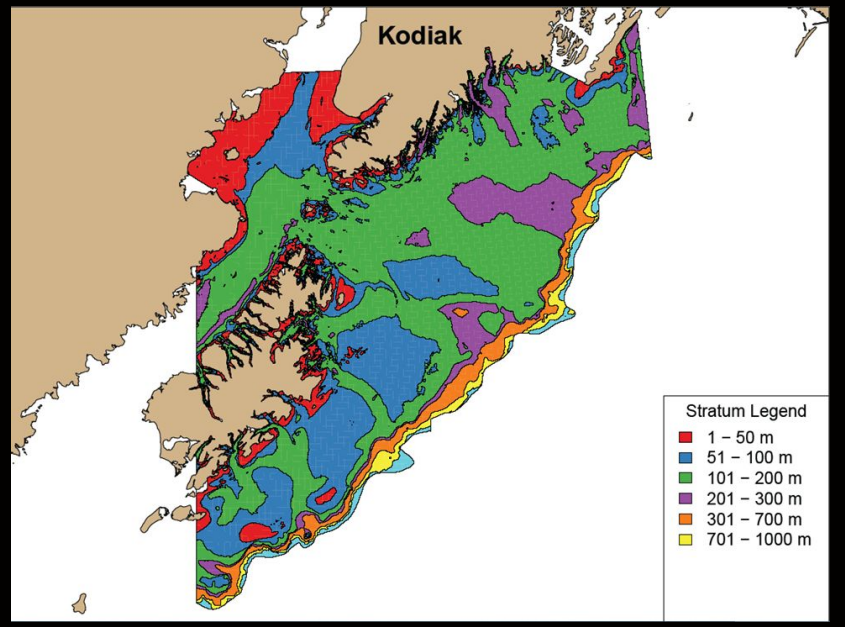

Chukchi Sea
(2012)
Beaufort Sea
(2008)
Northern Bering Sea
(2010, 2017, 2018*, 2019, 2021, 2022, 2023)
ALASKA
1000 m
Eastern Bering Sea Slope
(Biennial, even years)
Eastern Bering Sea Shelf
(Annual)
Gulf of Alaska
(Biennial, odd years)
Aleutian Islands
(Biennial, even years)
1000 m
1000 m

How to implement the change?

- Money, time, and people (it may take few years and reduction in effort, e.g. return to biennial sampling in the NBS).
- Good planning.
- Knowledge and engagement – scientists and stakeholders.
- Research on facets of survey design and implementation (WKUSER I-2019, WKUSER II-2022, WKUSER III-2025)
- Testing, a lot.
- Transition period. Prepare for transition with calibration experiments

Summary of GOA Restratification

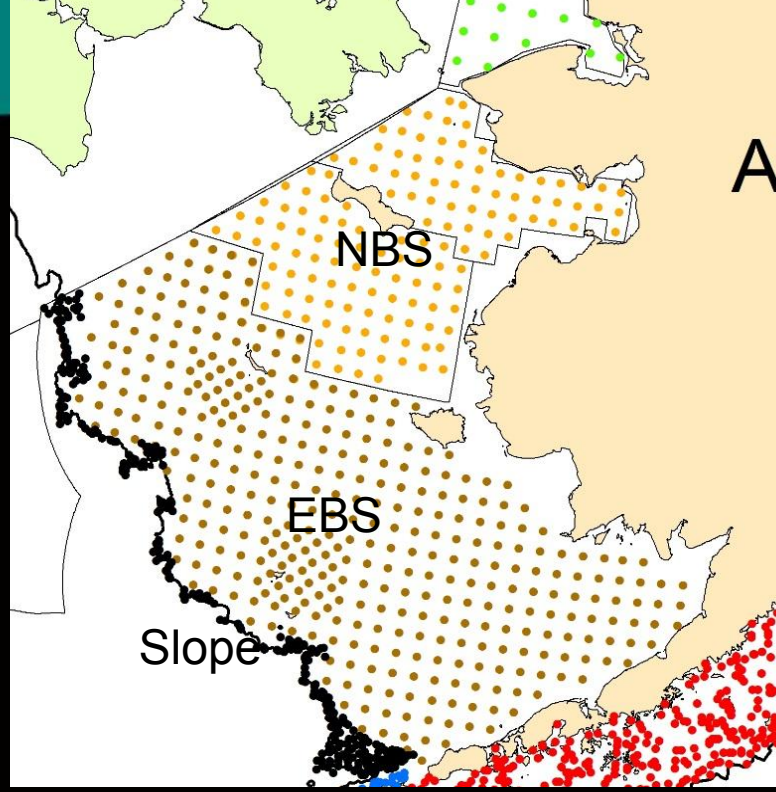




- Old strata (N = 59)
- Arbitrary boundaries
- INPFC Areas
- Neyman allocation

- 2025 strata (N = 30)
- Optimized boundaries
- NMFS Areas
- Bethel algorithm allocation (min CV)
- More flexible

Bering Sea (in progress)



Need to adapt surveys to the new reality:

- Design one survey for all 3 BS regions (EBS, NBS, Slope)
- Increase survey efficiency, optimize effort allocation,
- Design flexible survey that will be **responsive to assessment data needs** and **ready for incremental adaptation of new technologies**

Need to redesign gear and change sampling methods

- Gear is becoming obsolete (doors, floats, nylon mesh, bridles, etc)
- Improve fishing methods (e.g. use autotrawl)
- Need to decrease towing time from 30 to 15 min to reduce catch volume

EBS modernization teams

Facilitator: Alix Laferriere

Steering Committee: Mike Litzow (co-chair), Duane Stevenson (co-chair), Lyle Britt, Melissa Haltuch, Stan Kotwicki, Chris Lunsford, Shawn Russell,

WG1: Sampling Design Working Group: Lewis Barnett, Daniel Vilas, Zack Oyafuso, Megsie Siple, Lukas DeFilippo, Shannon Hennessey, Leah Zacher, Stan Kotwicki, Andre Punt (UW)

WG2: 15/30 Working Group: Sean Rohan, Rebecca Haehn-Tam, Emily Ryznar, Chris Long, Zack Oyafuso, Duane Stevenson, Stan Kotwicki

WG3: Shelf/Slope Working Group: Sean Rohan, Rebecca Haehn-Tam, Emily Ryznar, Lukas DeFilippo, Chris Long, Zack Oyafuso, Jerry Hoff, Stan Kotwicki

WG4: Survey Gear Working Group: Shawn Russell, Nicole Charriere, Connor Cleary, Zack Oyafuso, Stan Kotwicki

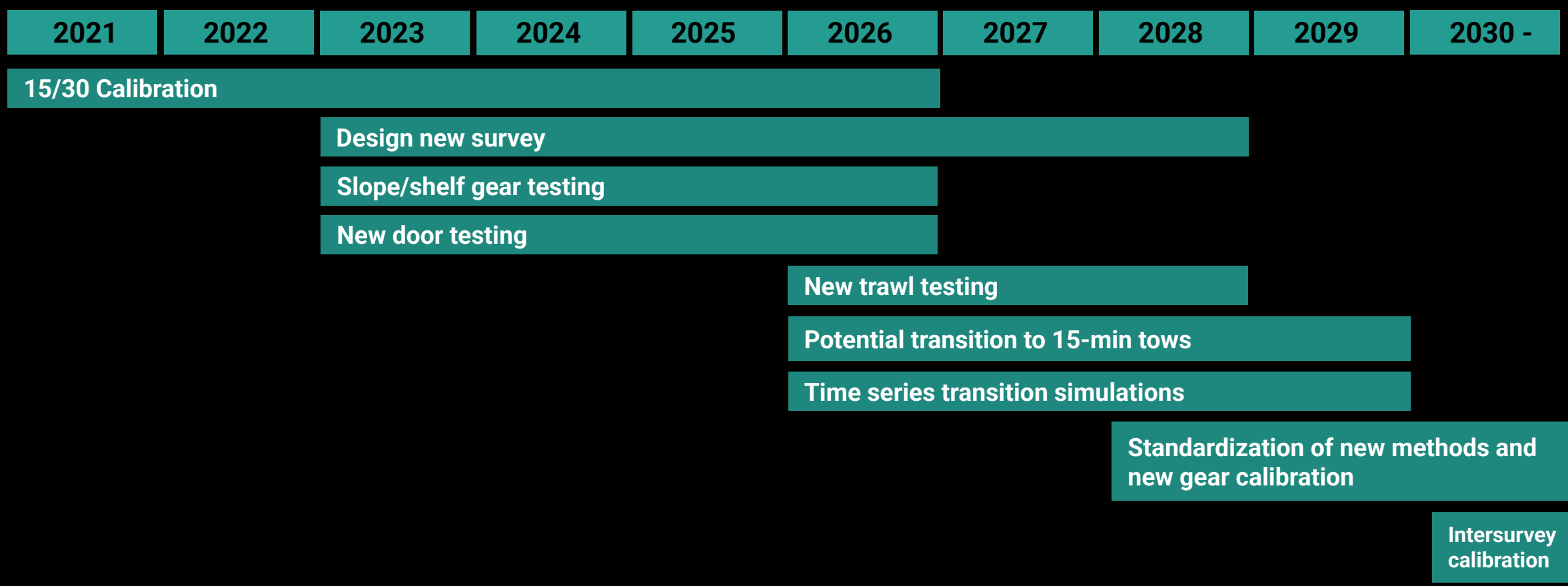
WG5: Gear Calibration Working Group: TBD

WG6: Transition Working Group: Paul Spencer, Meaghan Bryan, Kimberly Fitzpatrick, Melissa Haltuch, Jen Gardner, Chris Lunsford, Stan Kotwicki, Curry Cunningham

Timeline for Bering Sea Survey Modernization (Optimistic Version)

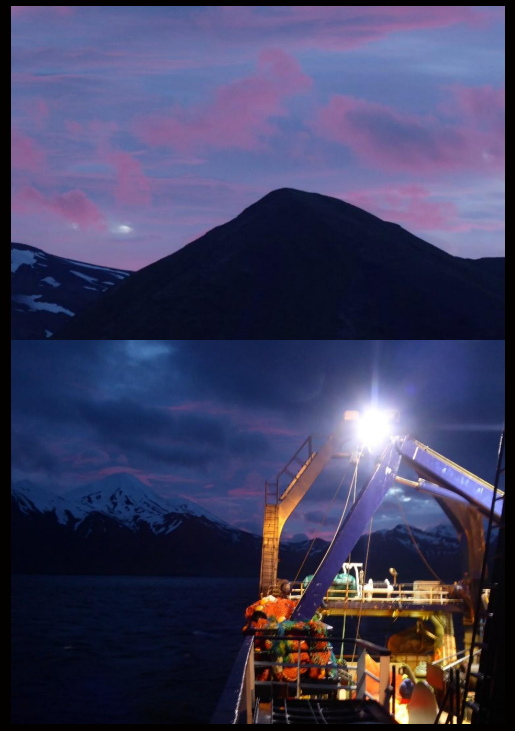
- 2023 – 2028: New survey design
- 2023 - 2026: New door testing
- 2026-2028: New Trawl testing
- 2021-2026: 15/30 min calibration
- 2023-2026: Slope/Shelf gear calibration
- 2026-2028: Time series transition simulations
- 2026 – potential start of the transition to 15 min tows
- 2028-2030: Standardization of new methods and new gear calibration
- 2030- … : Inter survey calibration

Timeline for Bering Sea Survey Modernization (Optimistic Version)



Needs, challenges, risks:

- Money - testing and calibration activities are expensive (IRA funding)
- Time – need to replace other activities (dropped NBS)
- Staff – timely retaining/replacing staff (training new knowledgeable staff takes time)
- Research - concerns of data users, how to include new data into assessments
- Extra uncertainty - transition to new methods will create temporary additional uncertainty in management advice, **but so will inaction**.



Summary

- Advantages
  - Robust and Flexible Designs
  - Multispecies Optimization
  - Improved Data Products
  - Comparability
  - Ready to Adapt New Tech
- Challenges
  - Staff, Time, and Money
  - Many changes at once
- Recommendations
  - Anticipate and Embrace change
  - Pursue Transparency

Progress to date

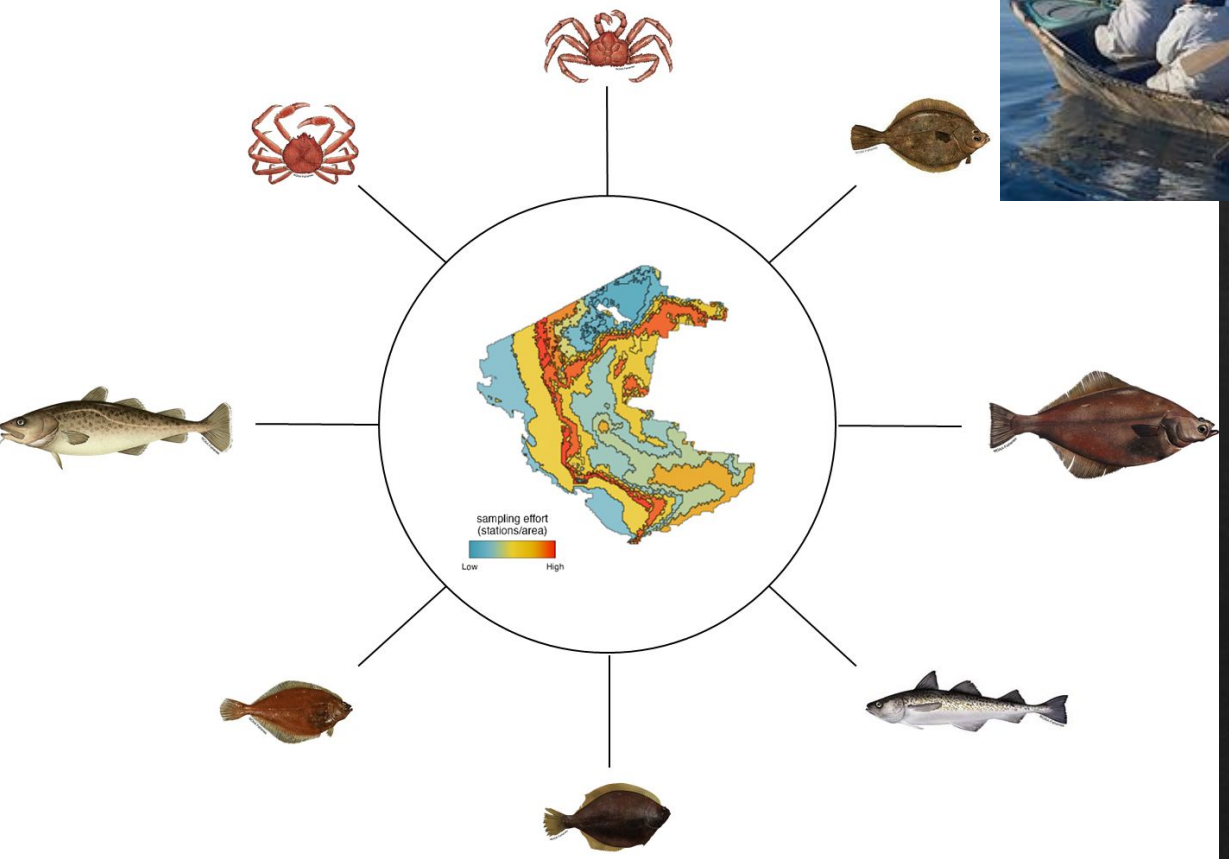
Survey Design (WG1)

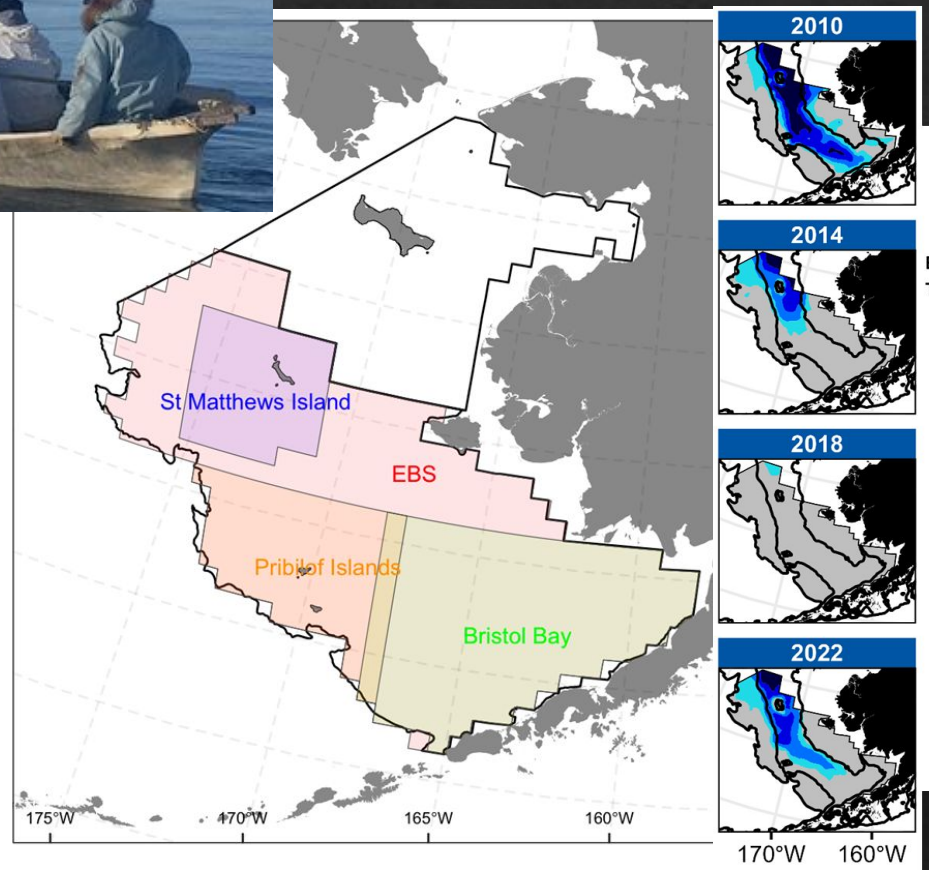
Investigators:

*Lewis Barnett, Daniel Vilas, Zack Oyafuso, Lukas DeFilippo, Leah Zacher, Shannon Hennessey, Margaret Siple, Stan Kotwicki, André Punt

Survey Design Goals and Background (WG1)

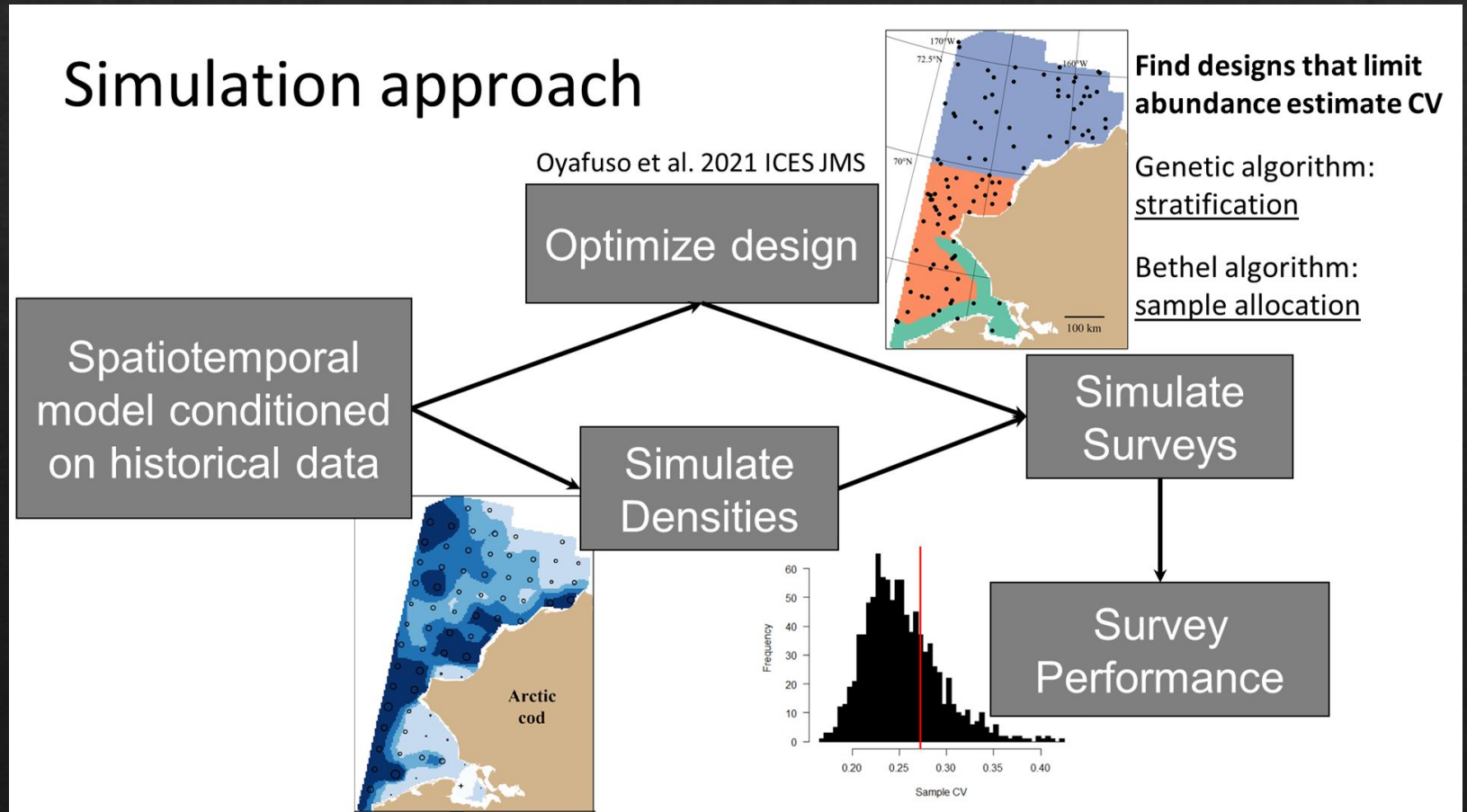
- Goals
  - Unify Bering surveys in a flexible and efficient design
  - Obtain accurate and precise design-unbiased estimates of abundance across FMP species and management regions (e.g., full Bering, EBS, shelf, crab areas)

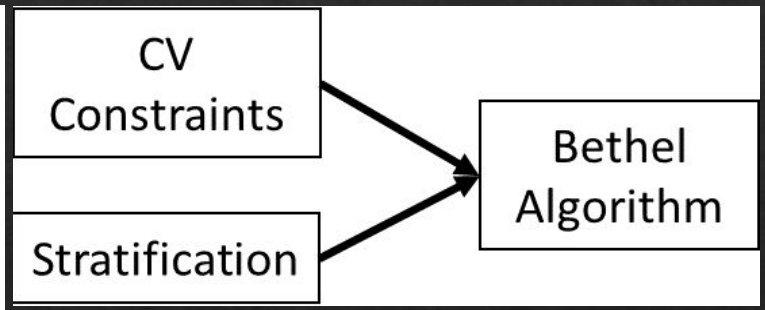


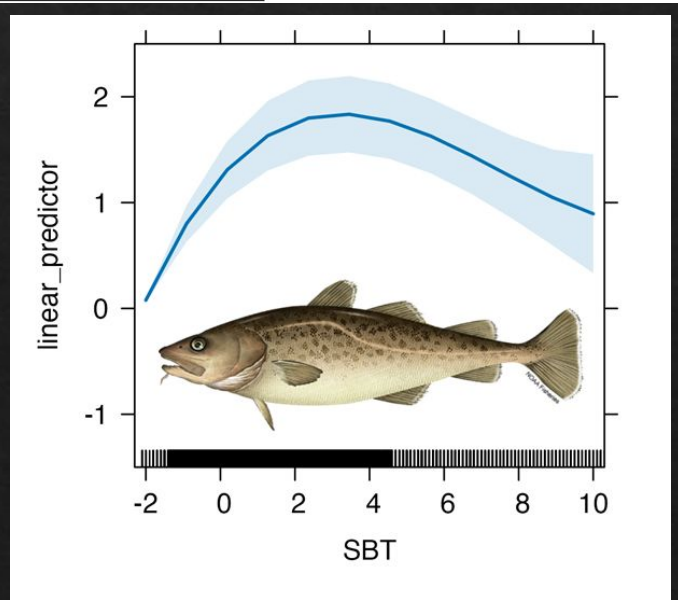


Survey Design Goals and Background (WG1)

- Motivation and guidance for the approach
  - ICES WKUSER 2020, 2023
  - GOA redesign (Oyafuso et al., 2021, 2022) with GPT feedback
  - Chukchi design (Oyafuso et al. 2023)
  - Feedback from stock assessment leads

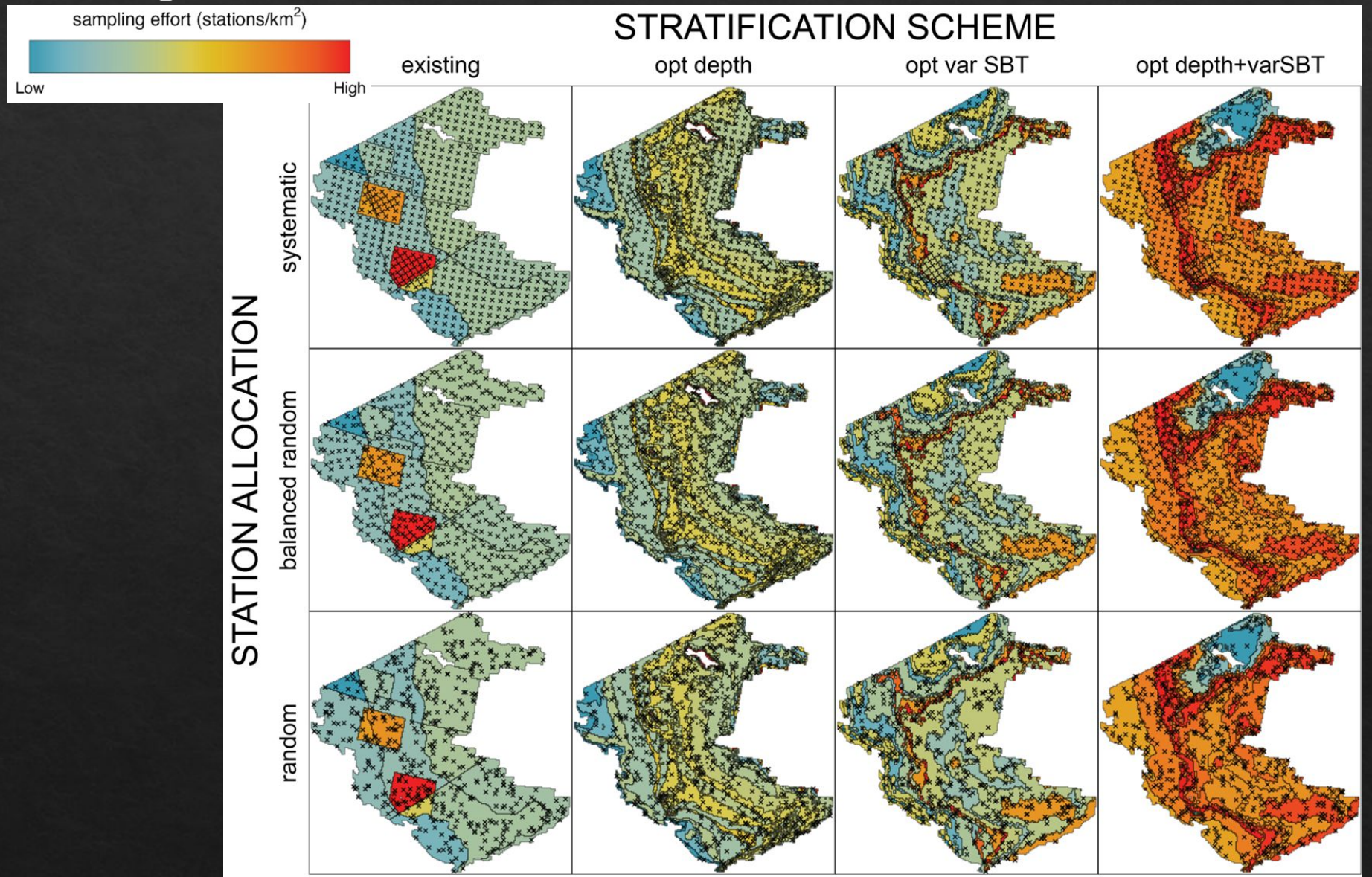






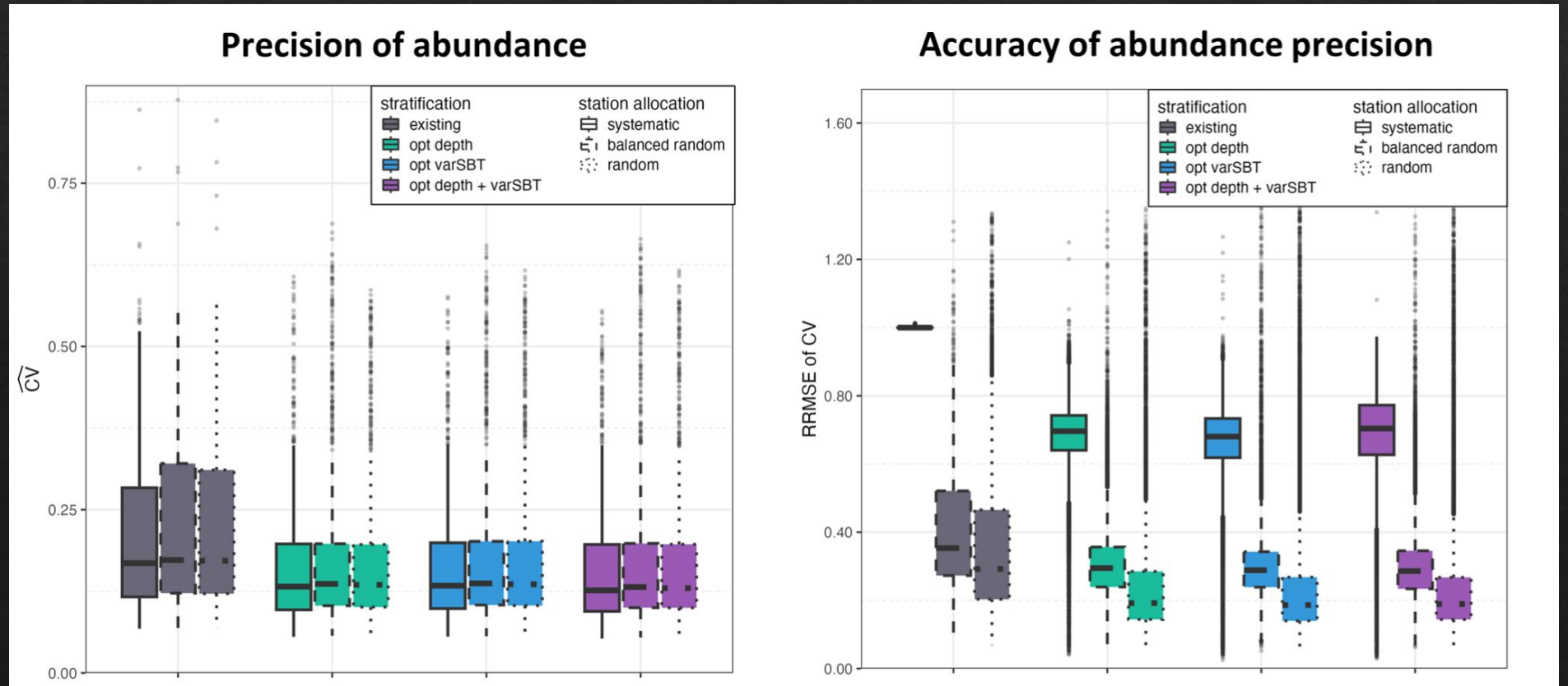
Survey Design Methods

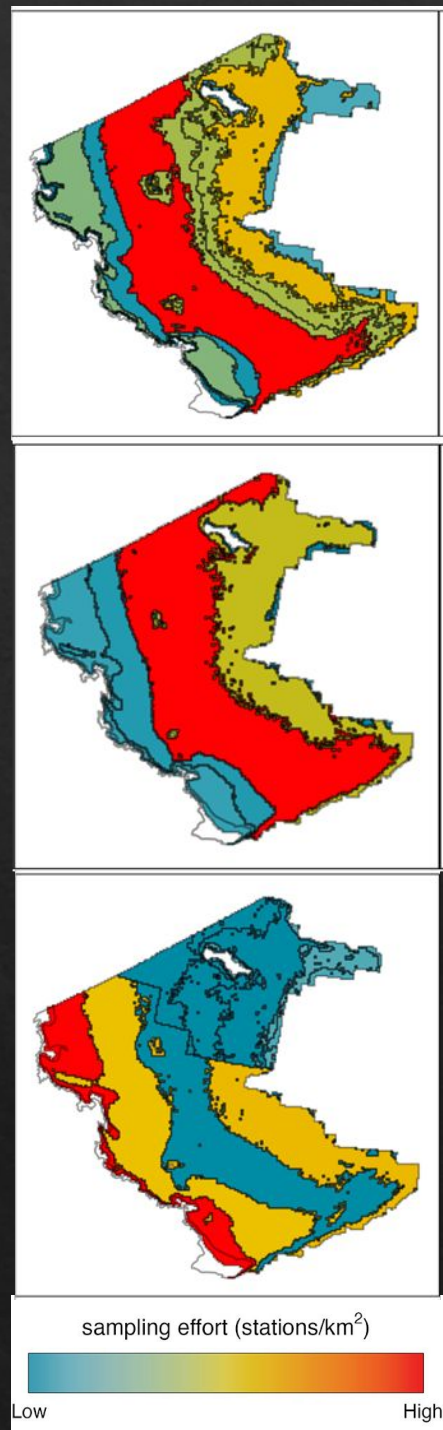
- Optimizing shelf strata and allocation (Vilas et al. 2024)



Survey Design Progress

- Optimizing shelf strata and allocation (Vilas et al. 2024)
  - Best designs were stratified random or spatially balanced stratified random sampling
    - Precision similar or better than existing design for most species, with much more accurate estimates of the variance



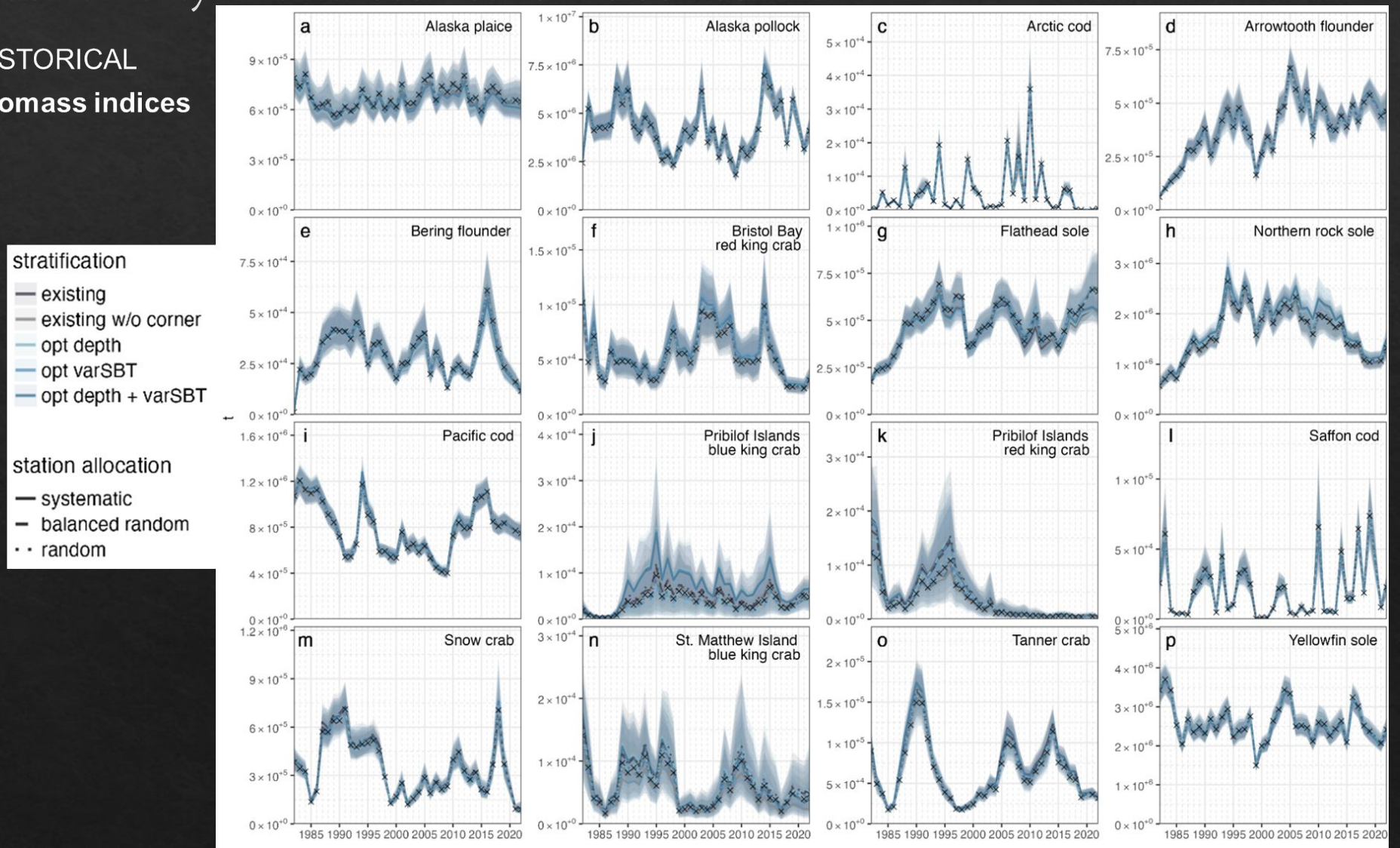


Survey Design Progress

- Abundance estimate scale and trends were very similar across designs, indicating continuity with historical time series

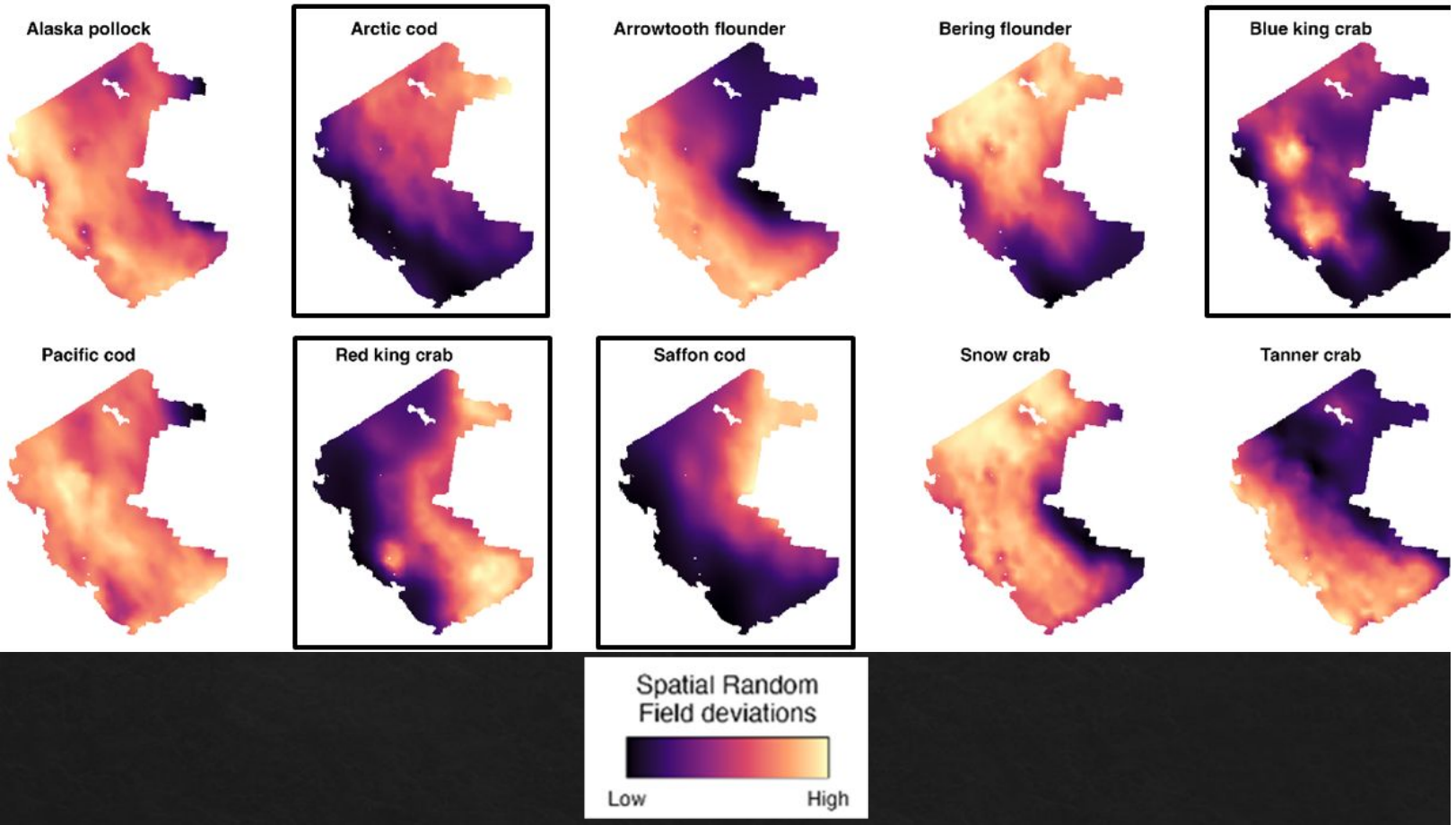
HISTORICAL

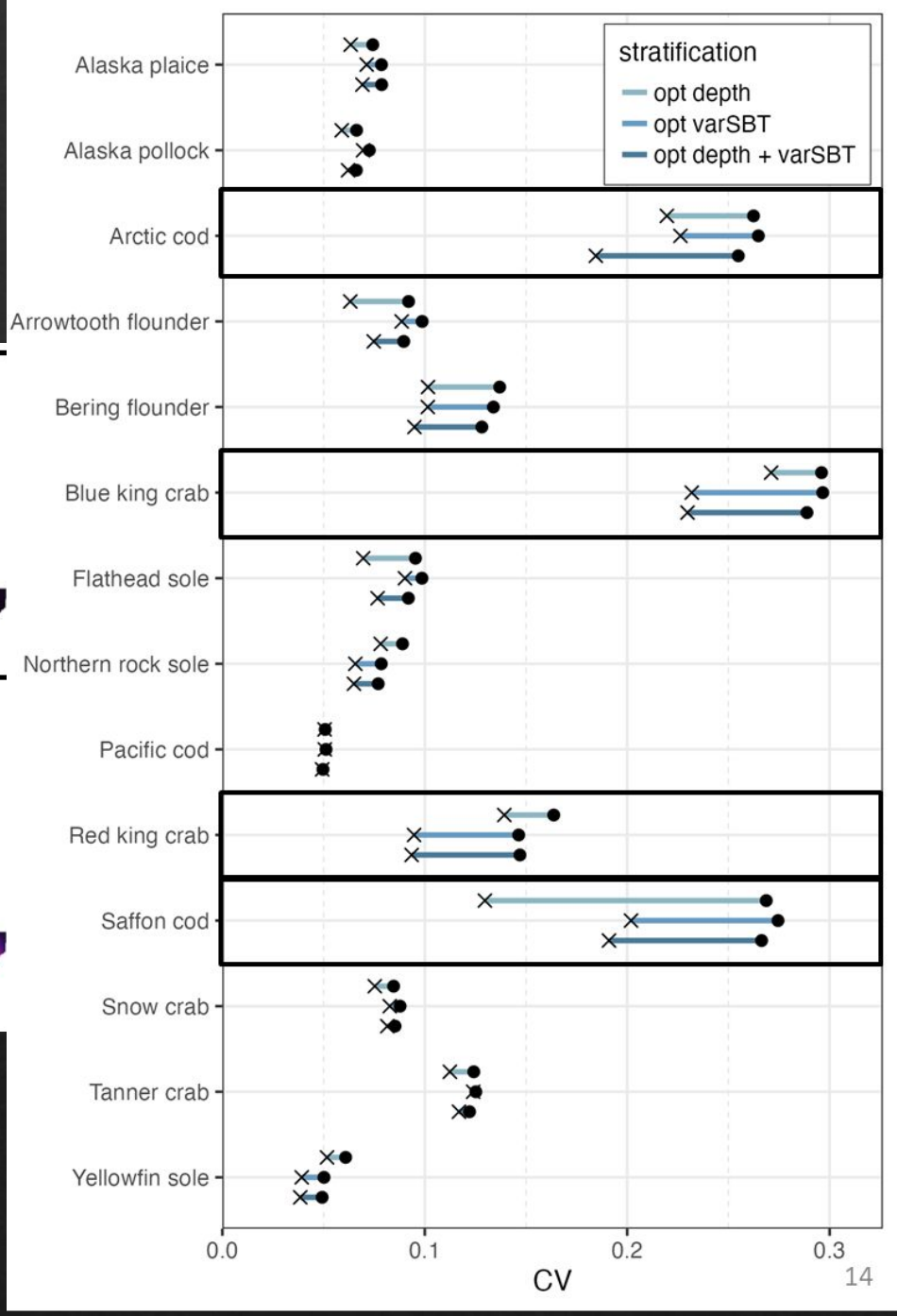
Biomass indices



Survey Design Progress

- Tradeoffs among stocks in precision and accuracy

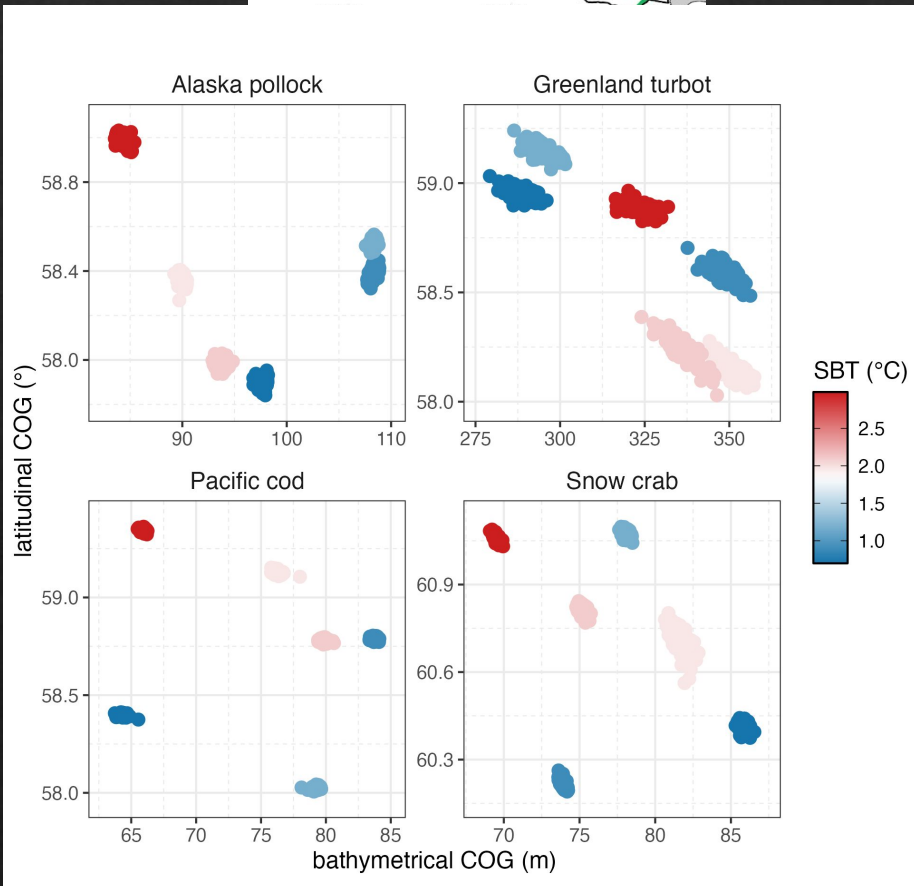




Survey Design Progress: Fresh Results

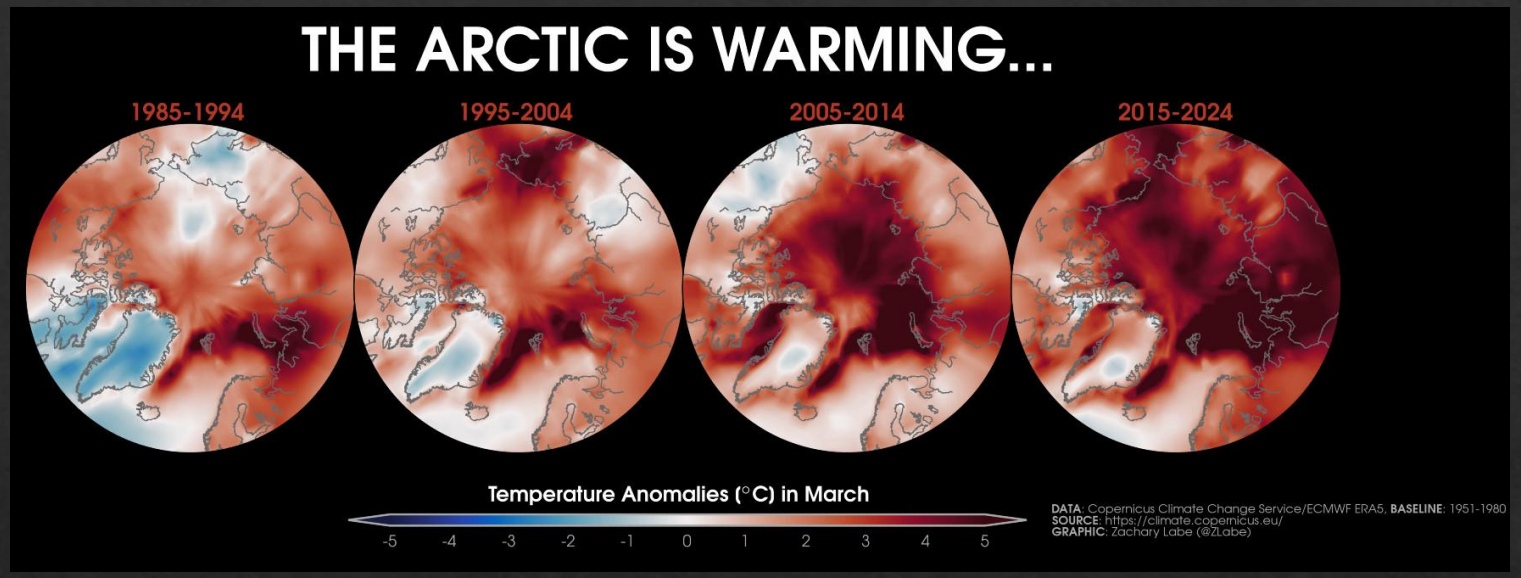
- Including upper slope in design optimization
  - Shelf and slope integrated abundance estimates
    - Integrating selectivity ratios from gear calibration (WG3)

- Dynamic allocation: Do estimates improve when sample allocations among strata are optimized for cold vs warm years?
  - Not much difference in initial results, despite evidence of poleward distribution shifts
  - Did not detect deeper distributions with warming



Survey Design Forward Outlook

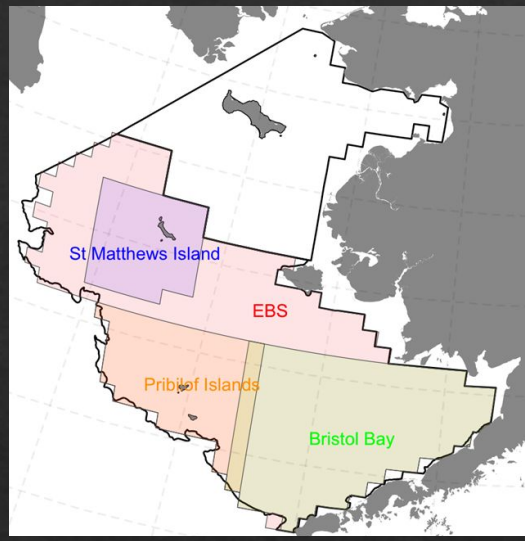
- Challenges
  - Changing environment

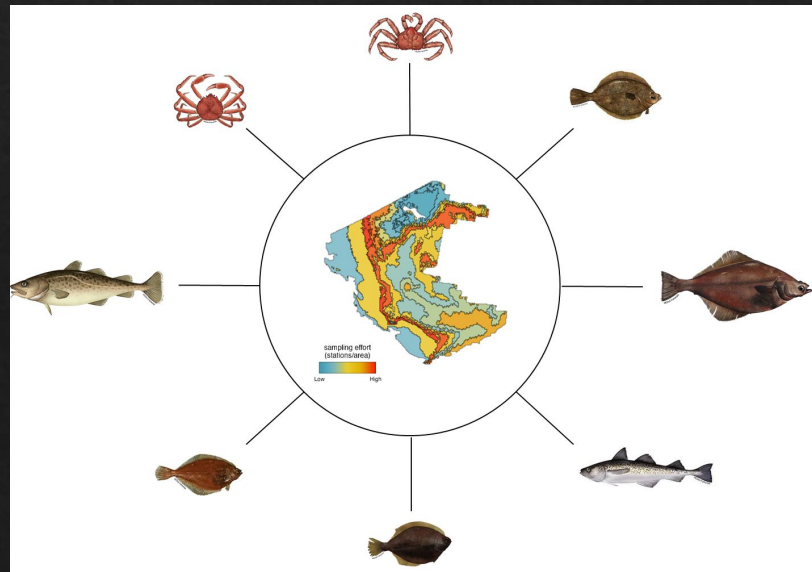


  - Potential unforseen increases in sample variances due to sampling new stations
- Timeline: ~2 years for main results if postdoc funding proceeds
  - Research on static vs dynamic sample allocation
  - Incorporating new shelf/slope gear calibrations
  - Refining OM and candidate designs
    - Incorporating feedback from Plan Teams, Council, stakeholders, Alaska Natives

Topics requested for feedback

- Spatial extent of domain (maximum slope depth?)
- Desired and acceptable precision of abundance indices
- How to approach misalignment of optimal stratum boundaries relative to sub-regional (crab) management areas?
  - Evaluate performance at domain-scale or sub-regional scale?
- Multispecies and multiobjective scope and prioritization
  - Should we consider optimizing over size/sex-specific quantities rather than total biomass for crab stocks?
  - Do we want to weight the optimization toward further minimizing uncertainty for some stocks at the cost of others? In what way(s)?

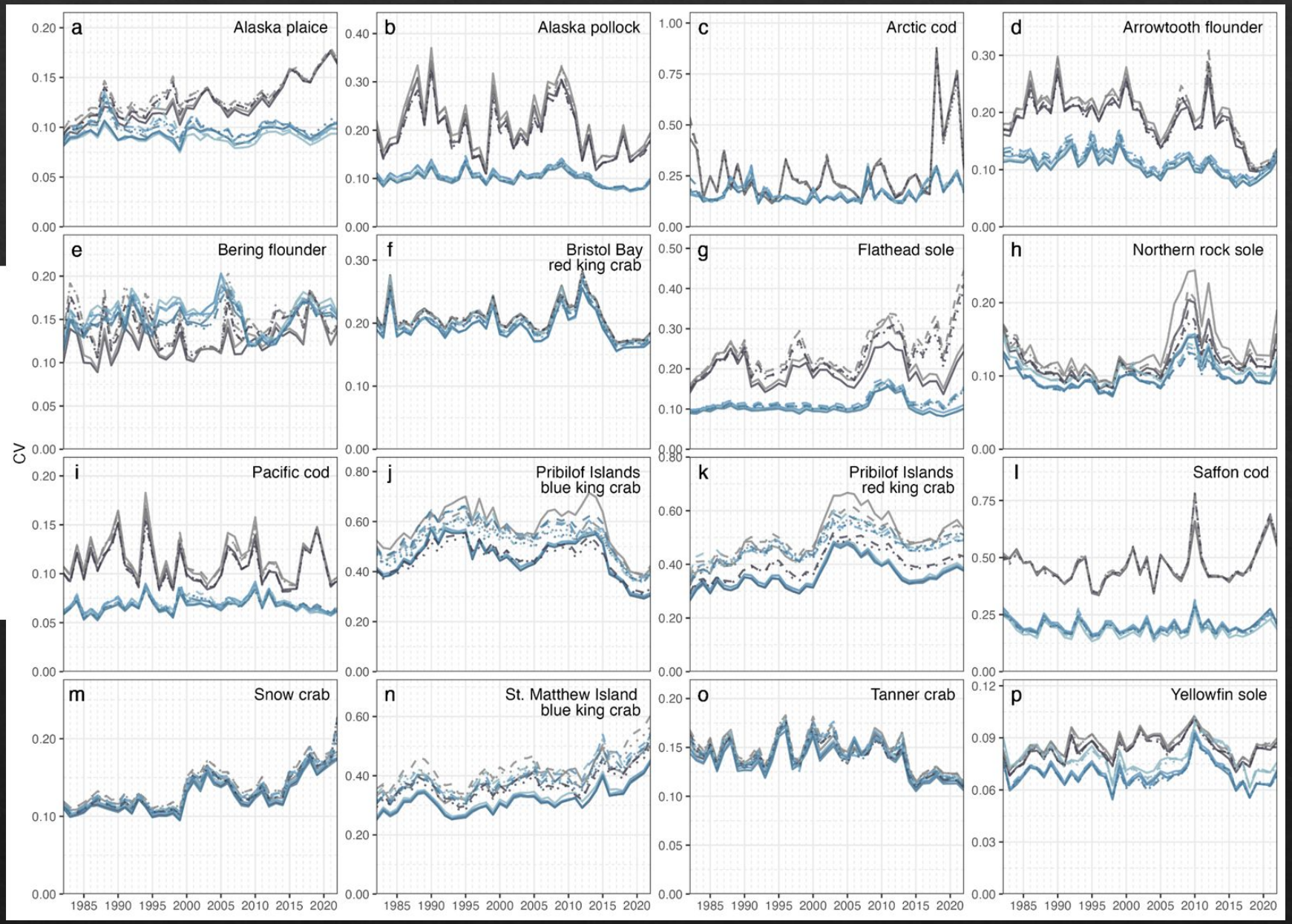




Survey Design Extra slides

HISTORICAL

Index CV

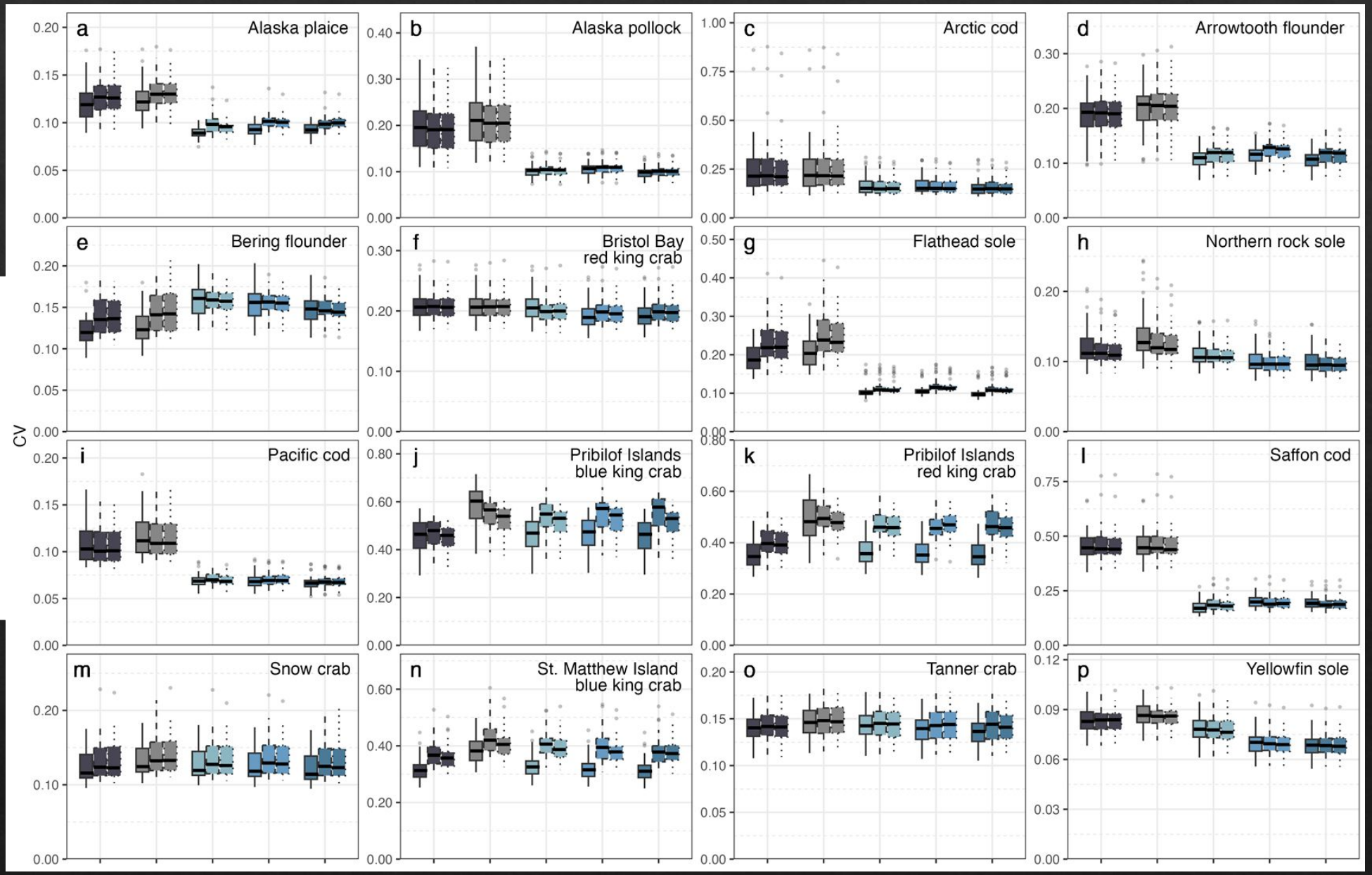


Survey Design Extra slides

HISTORICAL

Index CV

Over all years

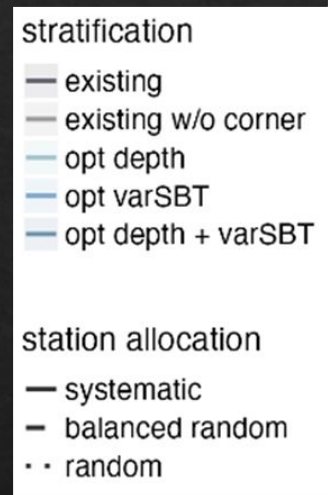


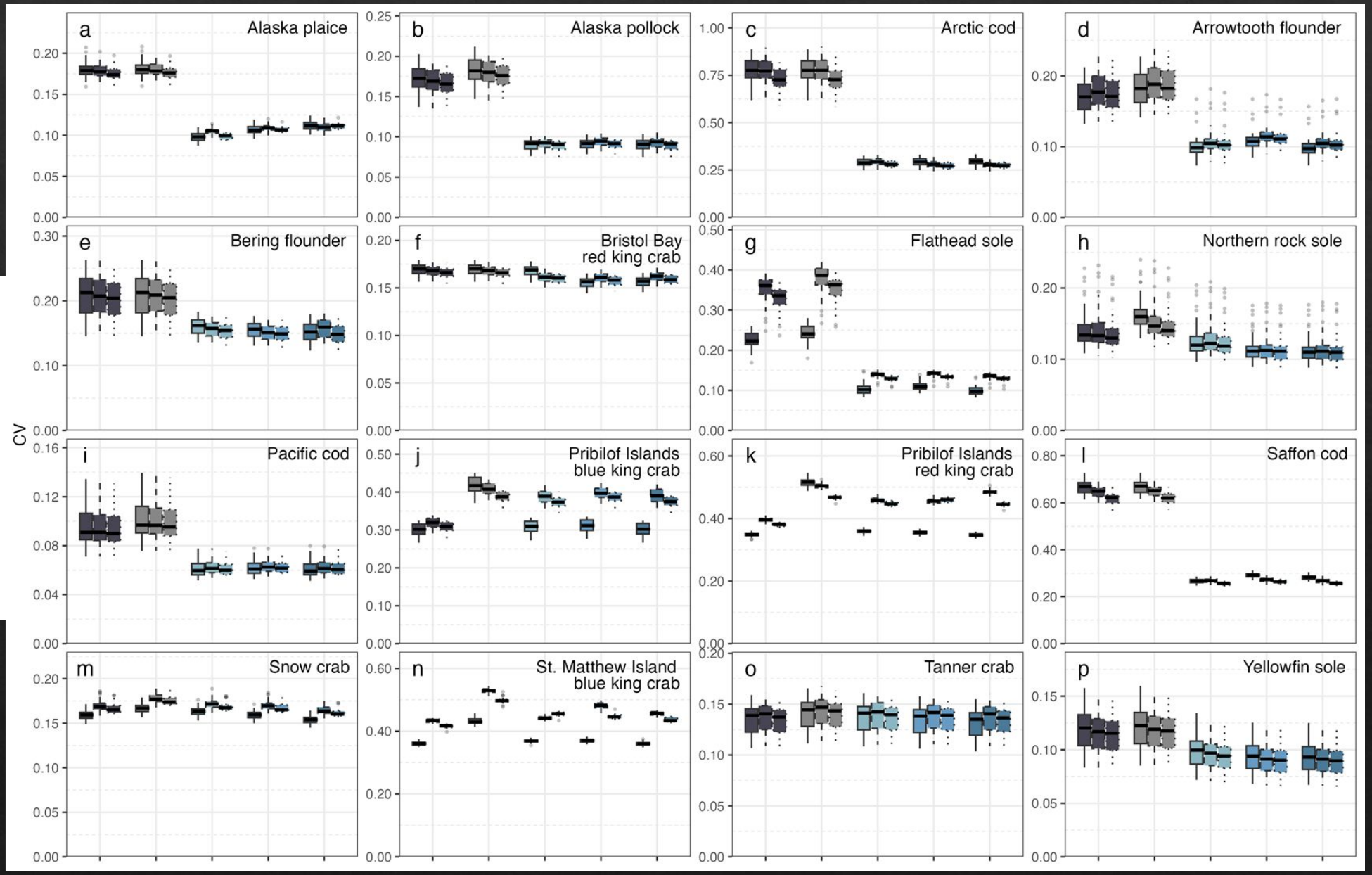
Survey Design Extra slides

FUTURE

Index CV

Over all years, scenarios





Reducing tow duration from 30 to 15 minutes (WG2)

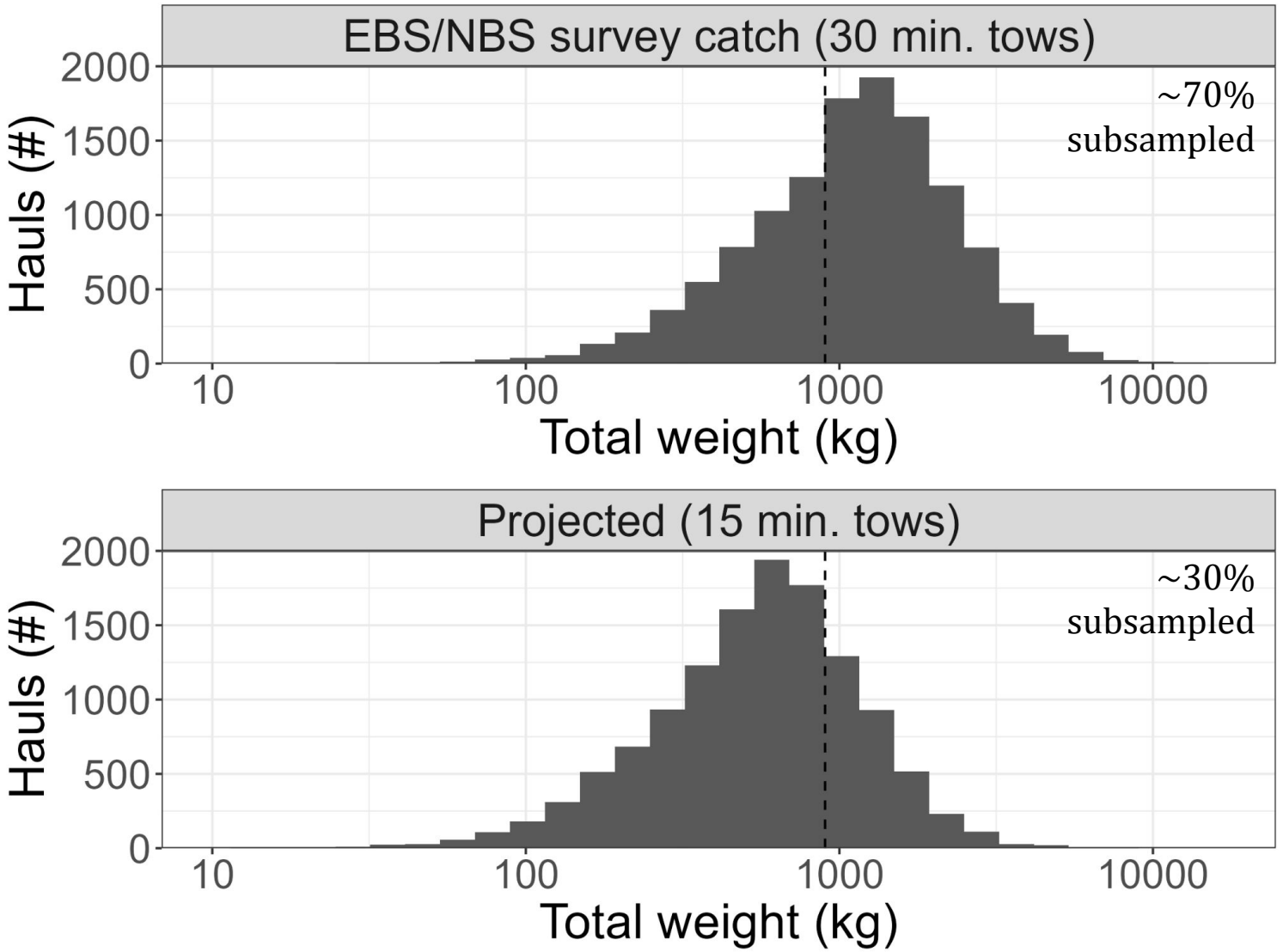
Sean Rohan, Rebecca Haehn-Tam, Emily Ryznar, Chris Long, Zack Oyafuso, Duane Stevenson, Stan Kotwicki

NPFMC Science and Statistical Committee Meeting
March 31, 2025

Why reduce tow duration?

- Reduce potential errors caused by subsampling large catches
- Enable additional data collection
  - Time to collect other types of data
    - e.g., visual maturity, genetics, environment
  - Shorter duration necessary for future stratified-random design
- Reduce ergonomic injuries

Approximately 70% of catches are subsampled



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2012 CIE recommendation: Reduce tow duration

- Recommendation: Reduce tow duration to 15 minutes
- Benefits
  - Mitigate potential subsampling bias
  - Time for additional sampling
  - Reduce wear-and-tear on gear.
- Approach
  - Conduct side-by-side catch comparison study to evaluate effects of reduced tow duration.
  - Evaluate impact of change in tow duration on assessment outcomes (e.g. through simulations).

Chen, Y (2012). CIE Independent Peer Review Report: Eastern Bering Sea Crab and Groundfish Bottom Trawl Surveys. 29 pp. Link
Hall, NG (2012). Review of the eastern Bering Sea crab and groundfish bottom trawl surveys. Center of Independent Experts, May 24, 2012. 37 pp. Link
Volstad, JH (2012) CIE Independent Peer Review Report: Eastern Bering Sea Crab and Groundfish Bottom Trawl Surveys. Center of Independent Experts, May 24, 2012. 26 pp. Link

2012 CIE recommendation: Options for implementation

1. Replicated: Conduct 30 and 15 minute tow duration surveys in parallel for several years, then transition. *Not feasible.*
2. Augmented: Augment the standard survey with a large number of randomly positioned 15-minute tows for several years, then transition to 15-minute tows for standard stations with a large number of randomly positioned 30-minute tows, then transition. *Not feasible.*
3. **Phased: Replace 30 minute tows with 15 minute tows over time; progressively increase the proportion of 15 minute tows. *Feasible.***

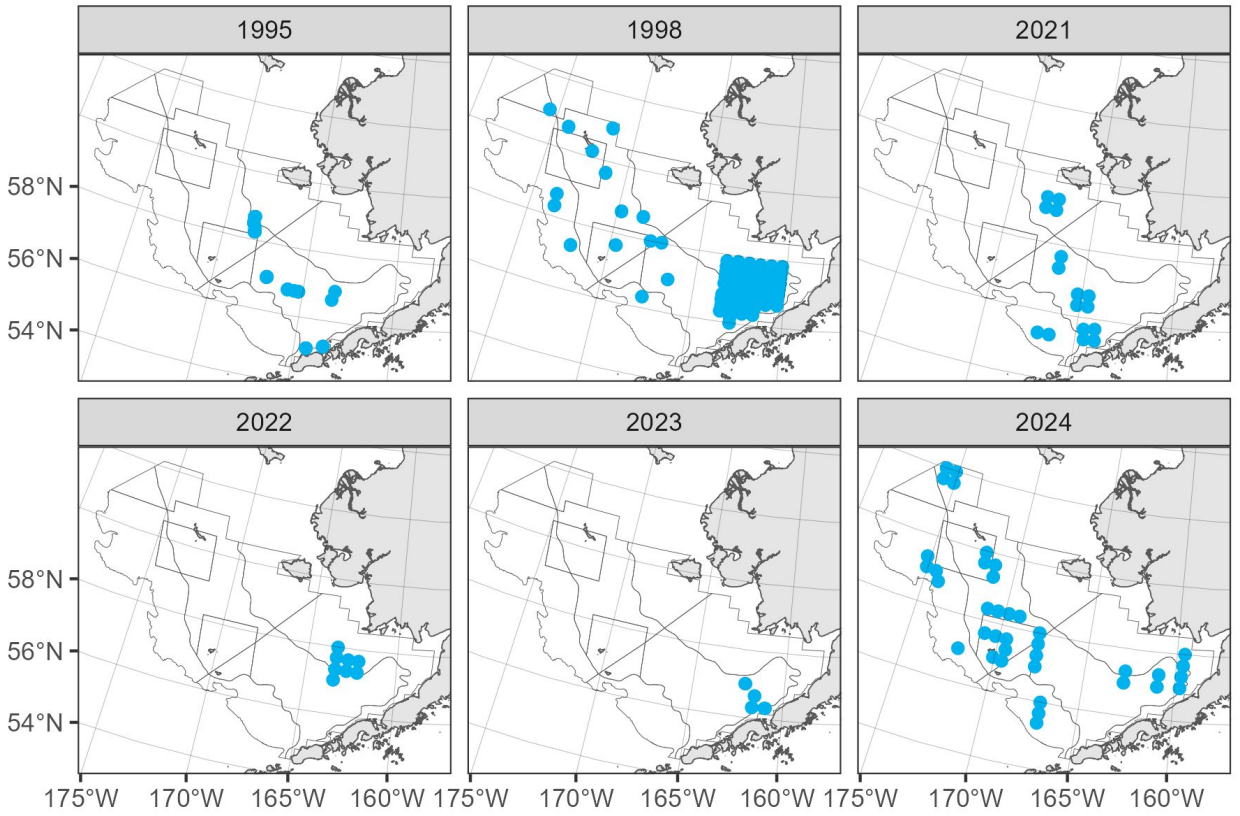
Chen, Y (2012). CIE Independent Peer Review Report: Eastern Bering Sea Crab and Groundfish Bottom Trawl Surveys. 29 pp. Link
Hall, NG (2012). Review of the eastern Bering Sea crab and groundfish bottom trawl surveys. Center of Independent Experts, May 24, 2012. 37 pp. Link
Volstad, JH (2012) CIE Independent Peer Review Report: Eastern Bering Sea Crab and Groundfish Bottom Trawl Surveys. Center of Independent Experts, May 24, 2012. 26 pp. Link

15/30 research and implementation plan

1. Conduct side-by-side catch comparison tows.
2. Evaluate effects of shorter tow duration on survey catch.
3. Develop calibrated design-based indices that can be used to simulate effects of shorter tow duration on assessment outcomes.
4. Phase in 15 minute tows over multiple years, beginning in 2026.

15/30 progress

- Project goals
  - Determine whether there are differences in catchability and selectivity between 30 and 15 minute tows.
  - Develop calibration factors between 30 and 15 minute tows.
  - Provide calibrated design-based index example data products for key species.
- Status
  - Completed 38 paired tows in 2024 (161 total from 1995 to 2024).
  - Calibration factor analyses underway, to be completed in FY25.



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Tentative timeline for phased implementation

2026

Begin phased transition (proposed: 25% of stations)

2026-2027

Survey-level selectivity/catchability analysis to compare 15 and 30 minute tows.

2027-2029

Continue increasing proportion of 15 minute stations, depending on outcomes of analysis.

Feedback on the timeline and plan for phased implementation of 15 minute tows?

Extending EBS shelf sampling to the upper continental slope (WG3)

Sean Rohan, Rebecca Haehn-Tam, Emily Ryznar, Lukas DeFilippo, Chris Long, Zack Oyafuso, Jerry Hoff, Stan Kotwicki

NPFMC Science and Statistical Committee Meeting
March 31, 2025

Survey data gaps in the eastern Bering Sea

- AFSC has not conducted an EBS slope survey since 2016 due to logistical constraints.
- Data gaps for slope-dwelling:
  - Upper slope (200-400 m): walleye pollock, Pacific cod, arrowtooth flounder, rockfishes
  - Middle slope (400-600 m): Greenland turbot, Kamchatka flounder
- Future EBS survey design may be able to fill coverage gaps.
- Was unclear if shelf gear can sample the slope.

Shelf/slope project goals

- Determine if the EBS shelf gear (83-112) can sample the upper slope (to 400 m depth).
- Estimated calibration factors between shelf and slope gears that can be used for the survey redesign operating model and, potentially, to produce calibrated indices for stock assessment.

Shelf/slope research plan

2023

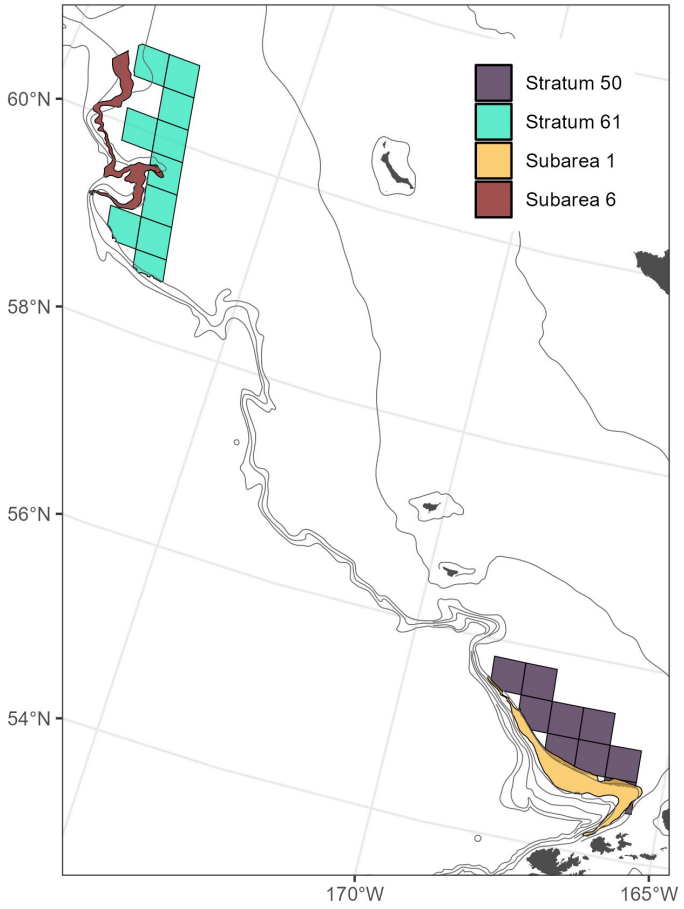
Conduct pilot paired tows in EBS slope stratum 11.

2024

Conduct paired tows in EBS slope strata 11 and 61 (southern and northern slope), EBS shelf strata 51 and 61*.

2025

Analyses to estimate calibration factors between surveys.

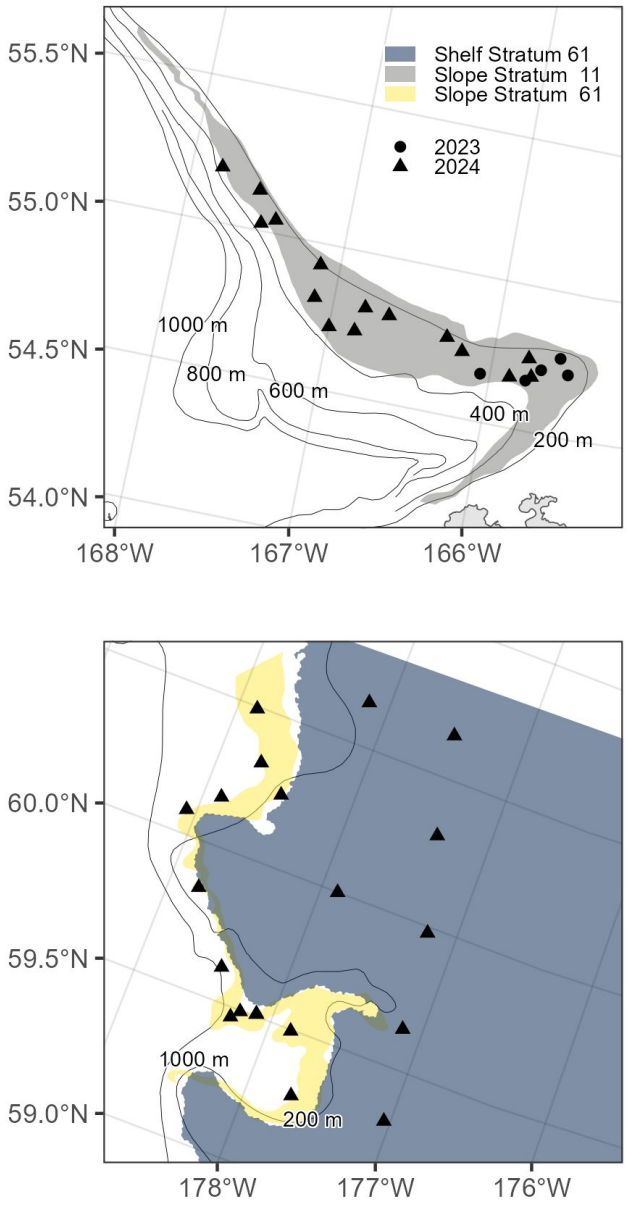


EBS shelf and slope gears

	EBS Shelf	EBS Slope
Gear	83-112	Poly nor'eastern
Opening height	1.6-3.3 m	4.9-8.1 m
Spread	14.0-19.2 m	13.8-18.5 m
Footrope	Cable wrapped with rubber hose	Mudsweep (4" and 8" rubber discs)
Doors	1800 lb 6x9 v-doors	2200 lb 6x9 v-doors
Target tow speed	3.0 knots	2.5 knots
Target tow duration	30 minutes	30 minutes
Autotrawl	No	Yes

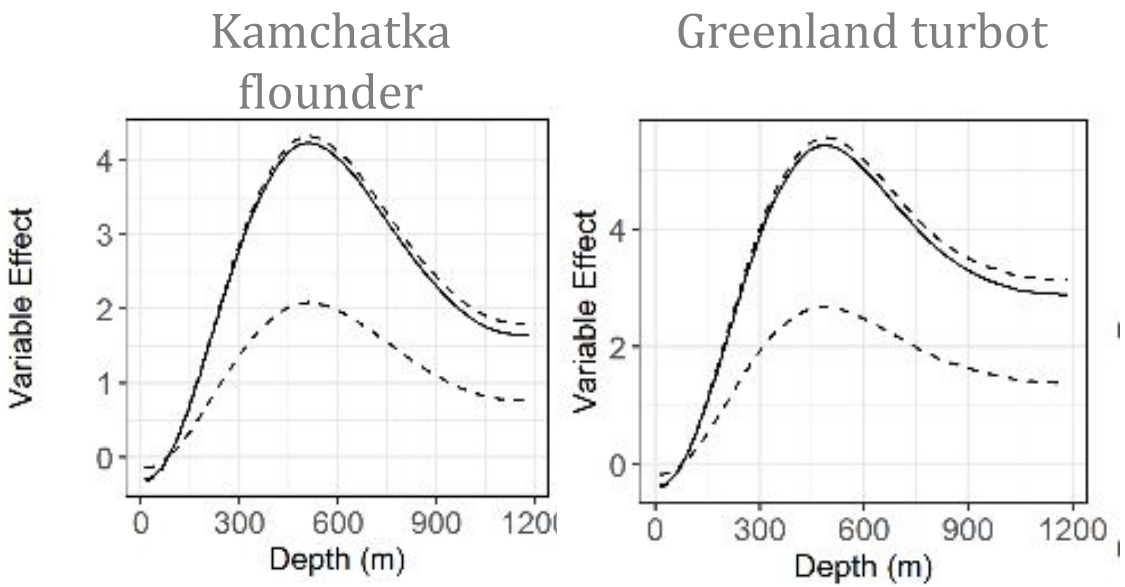
Project status

- The EBS shelf gear/footrope can be used on the upper slope (97% of tows were successful)
- Conducted side-by-side catch comparison tows in 2023 (n = 5 pairs) and 2024 (n = 35 pairs) in shelf stratum 61 and slope strata 11 and 61.
- Calibration factor analyses underway, to be completed in FY25.
- Planning to add the upper slope to the survey in the future survey design (tentatively 2030).



Extending coverage to 600 m

- Assessment authors have requested sampling down to 600 m to improve overlap with Kamchatka flounder and Greenland turbot.



EFH partial predictor effects of depth.

Should the future EBS survey design be extended to 600 m?

Trawl Gear Modernization (WG 4) Goals

Consistent survey data are irreplaceable for forecasting ecosystem change and research.

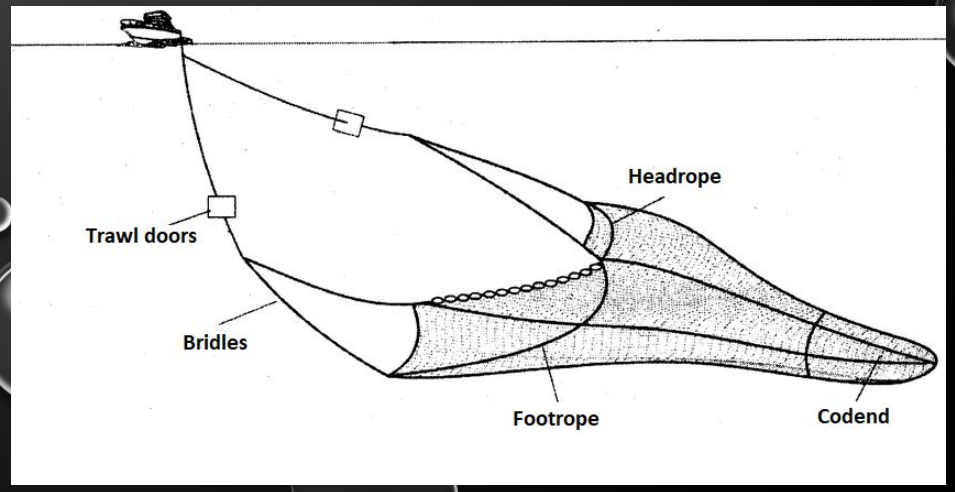
Improved technologies: Materials acquisitions and advancements, operational efficiency, budget constraints all require us to evaluate and adapt to the new reality.

- Consistency
- Cost effectiveness
- Accessible materials
- Optimal serviceability and adjustments
- Non-sophisticated trawl designs
- Universal, multi-species trawl design that applies to all AFSC bottom trawl survey needs

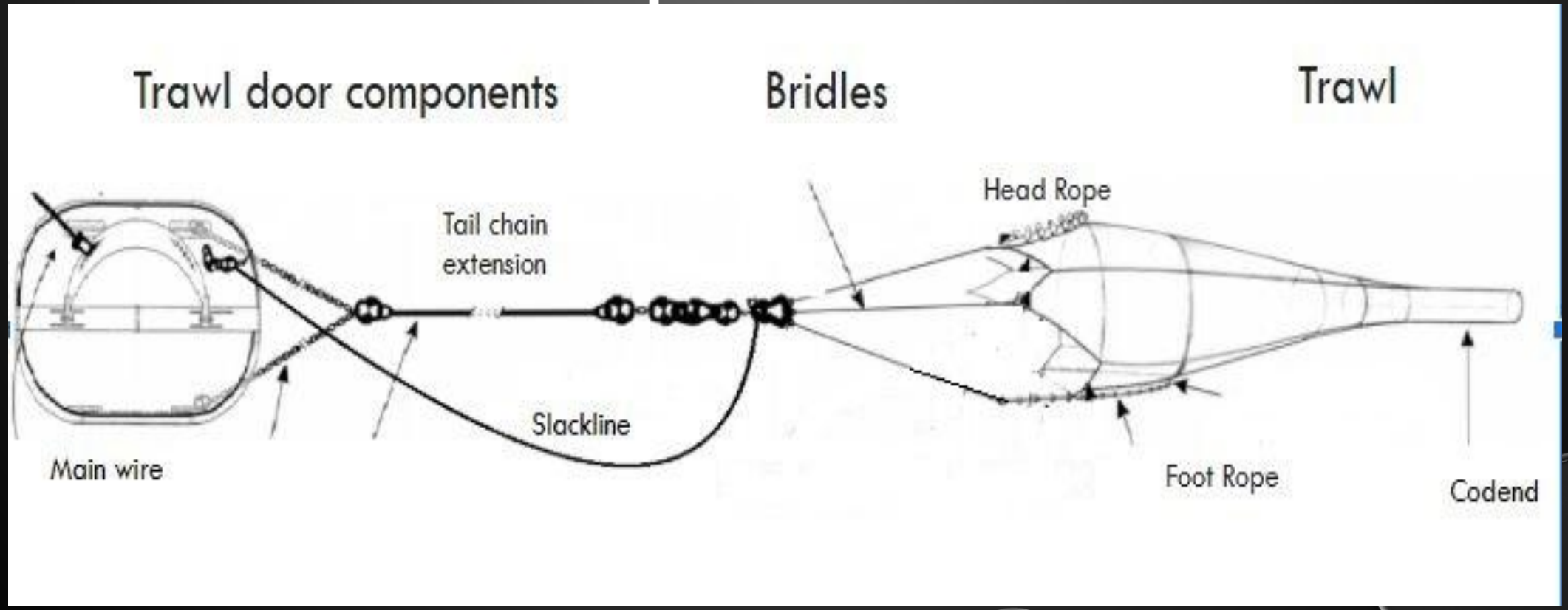
NOAA Fisheries' mission: The stewardship of the nation's ocean resources and their habitat. We need to use best-available science to conduct surveys and improve survey efficiency.

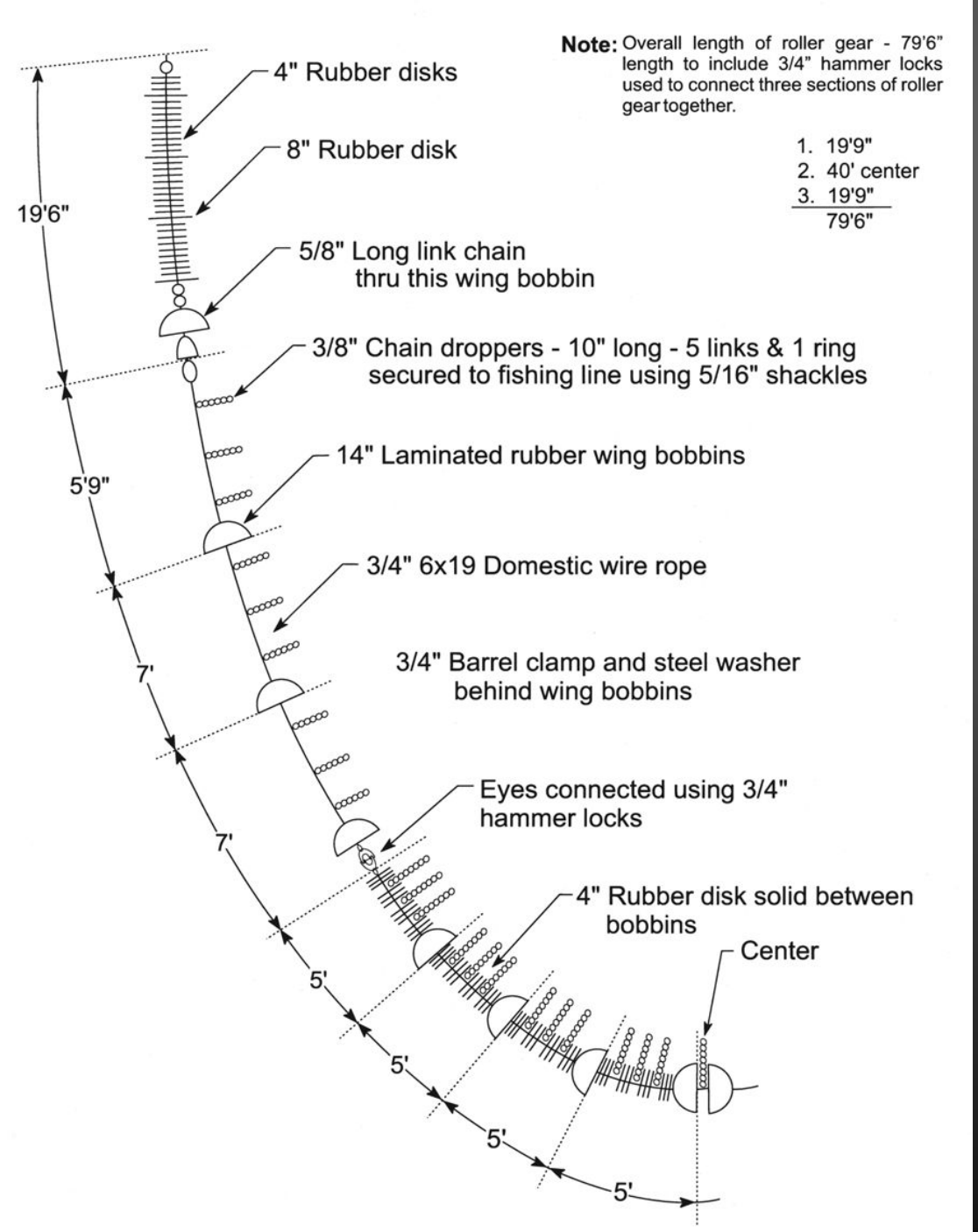
Areas of focus to improve trawl performance:

- Trawl doors
- Bridle rigging
- Flume tank (trawl studies)
- Trawls
- Net mensuration systems
- REDUCING VARIABILITIES

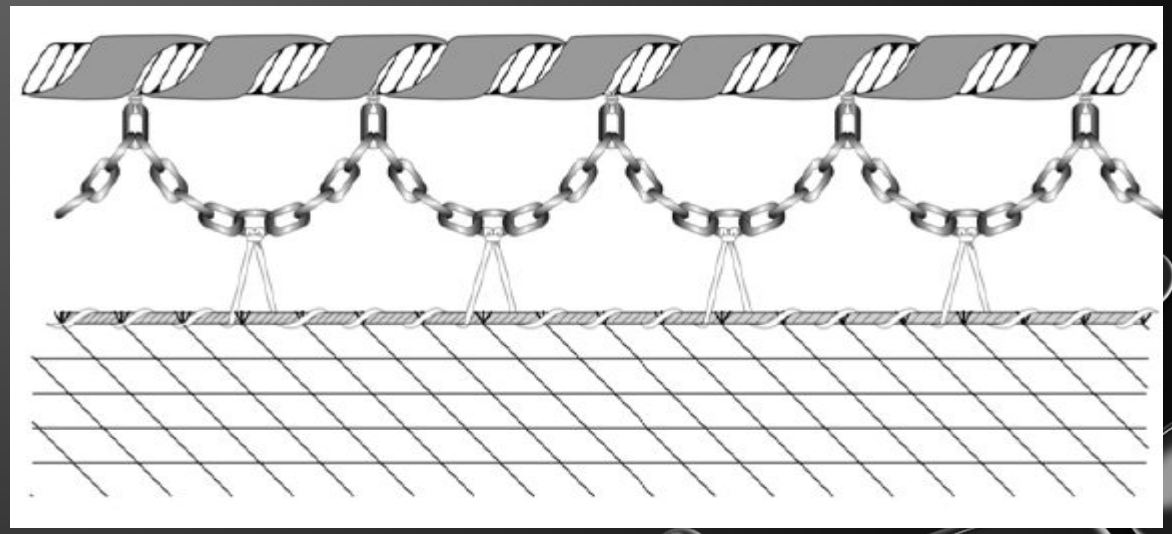


Trawl Gear Compont Identification





Footrope designs:
Poly Nor'easter design diagram (Left)
83-112 EBS design diagram (below)



Trawl Gear Modernization Efforts

2023 (May): Field testing of Hi-Lift trawl doors

- Tested with 83-112 and Poly Nor'eastern
- Various depths, towing speeds, and wire out (scope)
- Required less scope to maintain spread, but observed wing spread values outside expected standards typical to EBS and GOA/AI field values
- Door size in question, but need new trawl to fully test
- Tech memo in progress

1.8m x 2.7m steel "V" doors (current)

2024 (Feb, Mar): Gear modernization workshops

- Two workshops held
- Participation from members of fishing industry and scientific community
- Solicited feedback on potential gear redesigns
- Likely more to come

4.5m x 4.5m Hi-Lift doors

Trawl Gear Modernization Efforts

2025 (Jan): Establish baseline performance stats for the 83-112 (EBS/NBS surveys), Poly Nor'eastern trawl (GOA/AI surveys), and prototype RACE trawl

Factorial Experiments

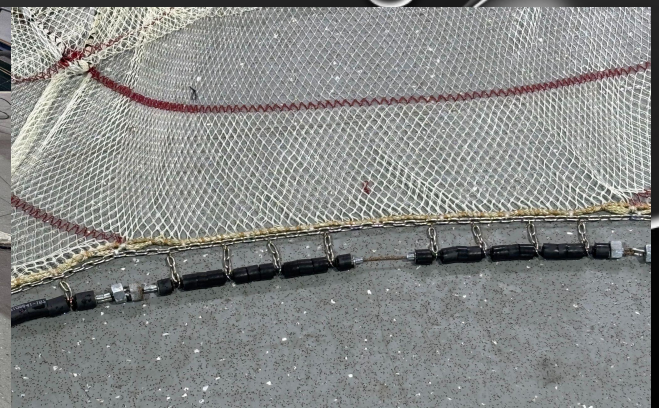
- Towing speed
- Wing spread
- EBS and GOA/AI footropes on experimental trawl
- Bridle configurations
- Trawl mensuration equipment effect
- Catch size simulations

Calculations

- Theoretical door spread estimates
- Upper/middle/lower wing spread
- Headrope height
- Towing tension
- Drag
- Bridle angle of attack

Visual Observations

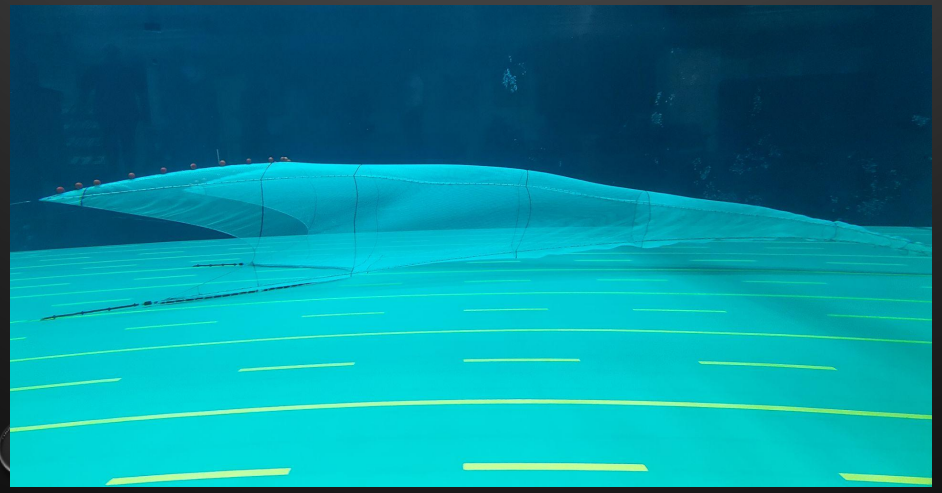
- Webbing/panel behavior
- Trawl body symmetry
- Trawl body behavior
- Footrope on/off bottom
- Bridles on/off bottom



Trawl Gear Modernization Efforts

2025 - Flume tank next steps

1) Further analyze calculations from model trawl performances in flume tank
2) Modifications needed to initial prototype RACE trawl design
3) Modifications needed to Poly Nor'eastern trawl design (secondary prototype trawl option)
4) Test both revised prototype trawl designs in flume tank (budget dependent)



Tentative Timeline Summary

2023 - Trawl door testing with 83-112 and Poly Nor'easter trawl

2025 (Jan.) - Flume tank testing baseline on 83-112, Poly Nor'eastern, and prototype RACE trawl

2025 (Sept.) - Flume tank testing of revised trawl designs of Poly Nor'eastern and prototype RACE Trawl

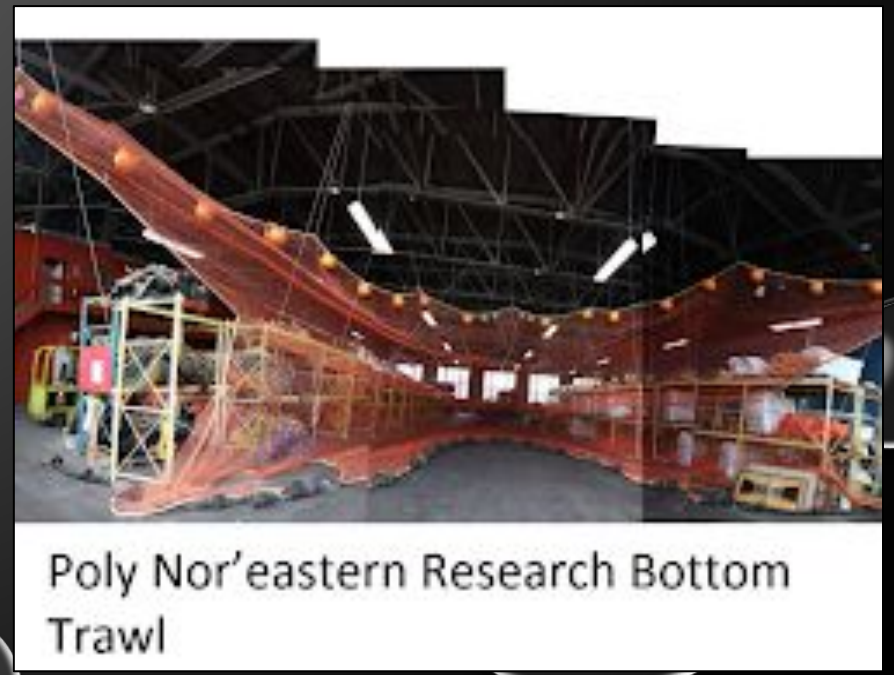
2026 - Field testing prototype design - door sizing determination

- Replace all RACE survey doors with modern doors
- Update net mensuration system
- Trawl-door-to-depth-range influence on trawl geometry

2027 - Continued field testing prototype design.

- Bottom contact detection with new bridles and trawl configuration
- New towing protocols
- Scope-to-depth-range tables
- Possible side-by-side catch comparison

All TIMELINES STRONGLY INFLUENCED BY BUDGET CONSTRAINTS AND FUNDING



Poly Nor'eastern Research Bottom Trawl

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NOAA SURVEY TRAWL TESTING
RACE Trawl
Tow 110
Bridle 2, 3.0 Knots
16 m Spread
GOA-AI footrope V5

January 16th, 2025

MEMORIAL UNIVERSITY

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NOAA SURVEY TRAWL TESTING
83-112 Eastern Trawl

Tow 3
Standard Bridle, 3.0 Knots, 17.5 m

January 13th, 2025

MEMORIAL UNIVERSITY

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NOAA FISHERIES

NOAA SURVEY TRAWL TESTING
PNE Trawl
Tow 34
Standard Bridle, 3.0 Knots
16m Spread

January 14th, 2025

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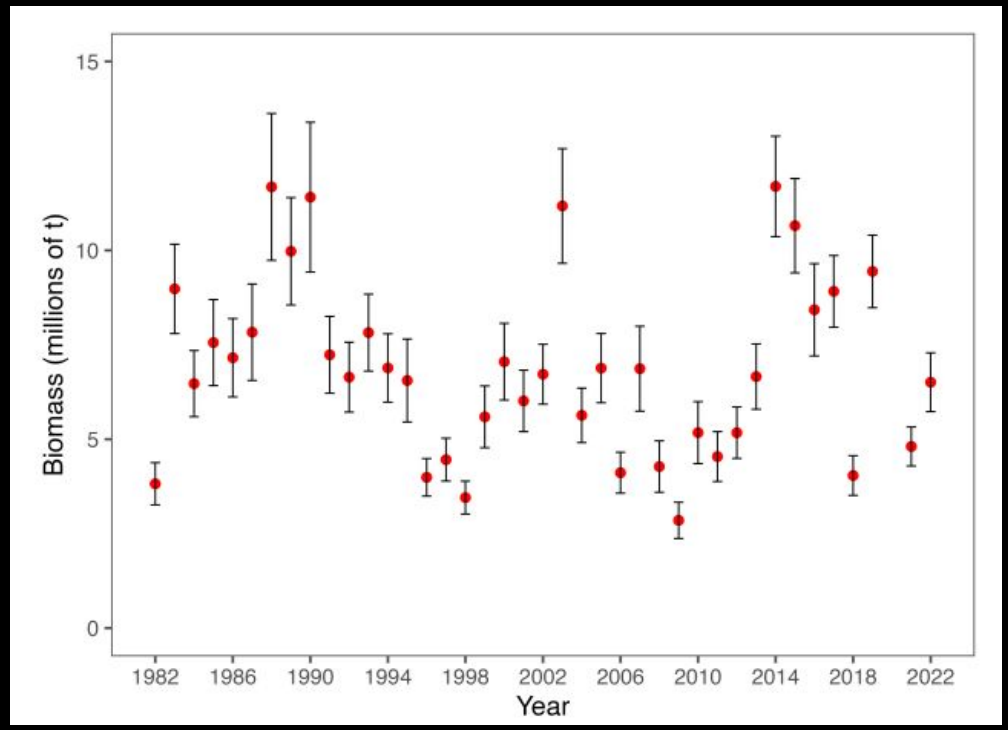
Transition to new survey (WG 6)

- Survey biomass data provides scale information in our stock assessments
- We expect interannual changes in trend and uncertainty
- When a survey design change is implemented, we can no longer assume a change in biomass is due to a change in the population alone
  - Impact due the survey design change and population change are now confounded



Transition to new survey (WG 6)

Accommodate survey design change in stock assessments:

- Develop separate time series (takes several years before the new time series is ready for assessments)
- Develop a bridge between the two time series (temporary, and reliant on calibration factors)
- Understand the impact of change on assessments and management advice

Objective is to develop simulation experiments to address the following:

- Understand the effect of uncertainty in estimated calibration factors on assessments
- Understand the effect of the overall scale of the calibration factor (i.e., the relative change in catchability between the surveys), and the uncertainty in the abundance estimates
- Would a phased approach in shifting to the new survey (i.e., incrementally apply new survey methodology over a number of survey years) be beneficial during the transition period?
- How many years of new survey data are needed before we can use two separate indices of abundance?

Calibrated survey biomass estimates (WG 6)

- The calibrated survey biomass estimates (S_c) depends on the calibration coefficient (i.e., the ratio of survey catchabillities)
- The uncertainty in calibrated survey biomass estimate includes estimation error due design-based sampling variability (ε_{DB}) and estimation error in the calibration coefficient (ε_{CC})

$$S_c = B q_{new} \left(\frac{q_{old}}{q_{new}} \right) e^{(\varepsilon_{DB} + \varepsilon_{CC})}$$

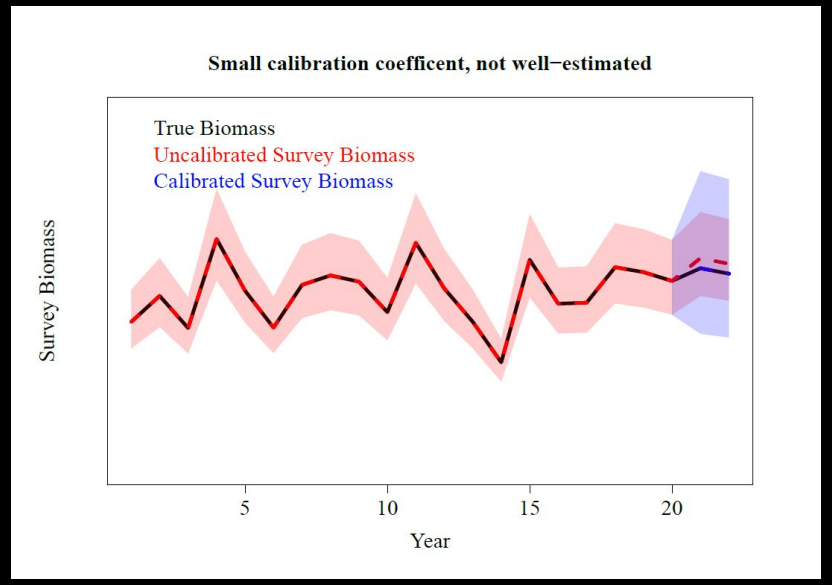
B = biomass

q_{new} = catchability coefficient, new survey gear

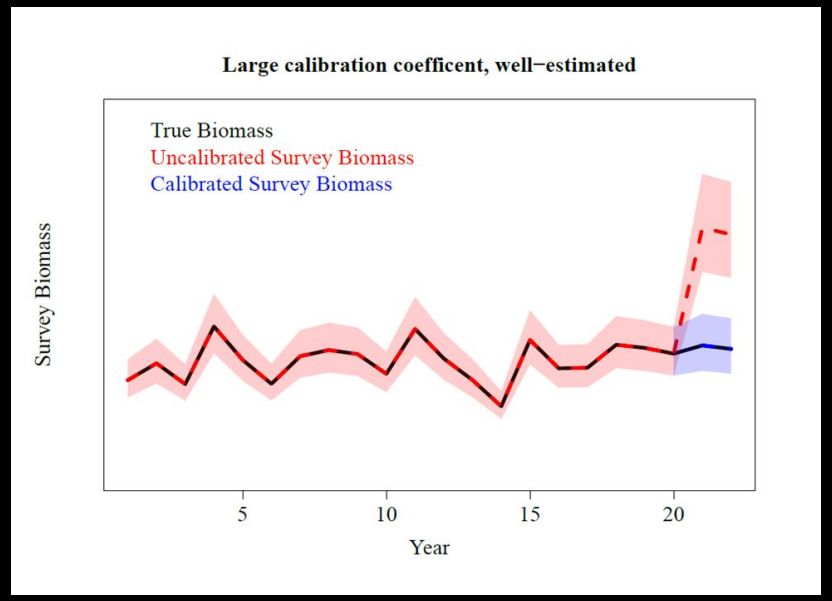
$\frac{q_{old}}{q_{new}}$ = calibration coefficient

- In what cases is it sensible to apply the calibration coefficient?

In what cases is it sensible to apply the calibration coefficient?



Small calibration coefficient, not well-estimated: minimal gain



Large calibration coefficient, well-estimated: substantial gain

Plans for future work

1) Series of simulation experiments to assess the impact on the accuracy and precision of stock assessments outputs, measured with quantities such as Root Mean Square Error (RMSE) and Mean Absolute Error (MAU).

2) Initial experiments will begin with existing data and assessments, explore various hypothesized “breaks” in the survey time series, and evaluate the relative errors in assessment output. Best suited for non-age-structured assessments.

3) More complicated age-structured assessments will require a more detailed survey simulation model to evaluate how potential changes in survey selectivity would affect assessments. Existing survey simulation models developed at AFSC may be modified for this task.

We welcome feedback

- Spatial extent of the EBS survey (e.g. desirable depth extent on the slope)
- Desired precision of survey data products (index, age-comps, etc.).
- Comments on future EBS survey design with respect to statistical design, stratification, effort allocation.
- Advice on how to deal with misalignment between optimal stratification and multiple management areas in EBS. Is there a potential to change management areas in the future?
- Multispecies Optimization (future use, species prioritization)
- Timeline and plan for phased implementation for 15/30
- Approach for intersurvey calibration and transition from old to new survey.