



Modernizing fisheries-independent groundfish/shellfish surveys in Alaska.

Presenter: Stan Kotwicki

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

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

The 2024 FLC symposium



Fisheries-independent surveys are important!

Foundational to modern fisheries management, and fisheries and ecosystem research.

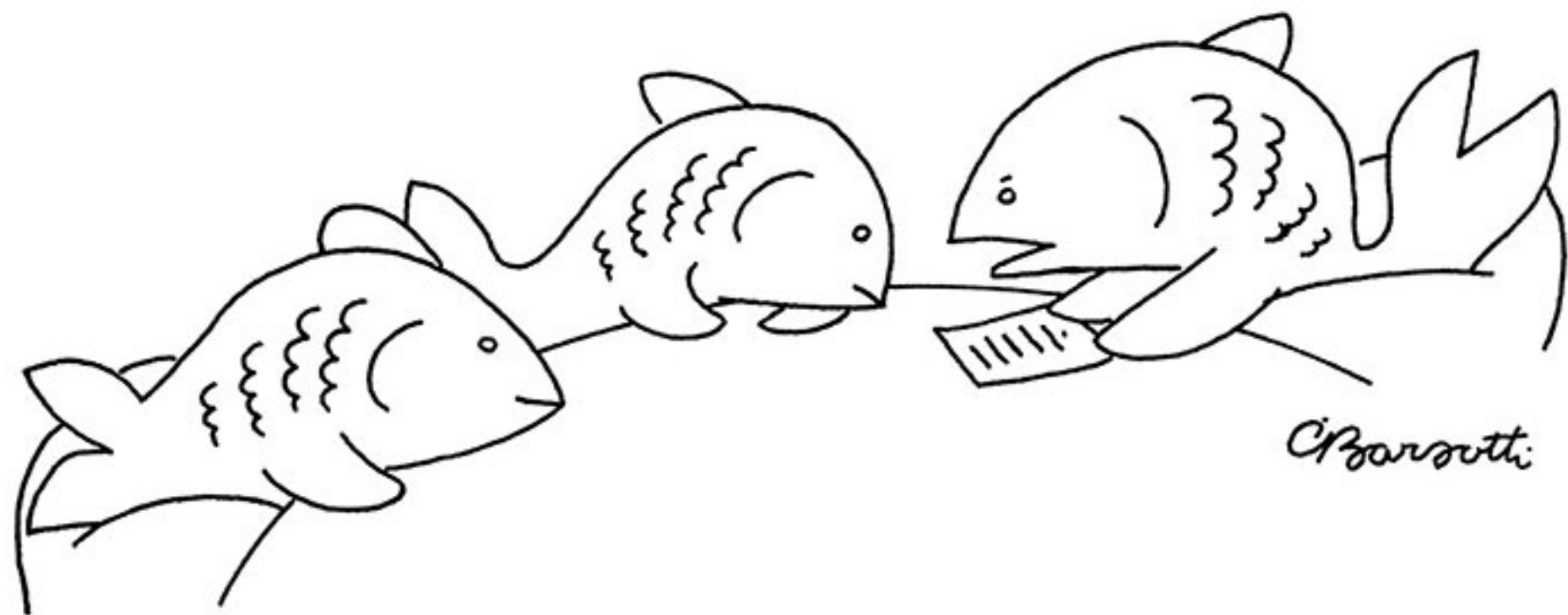
Conducted worldwide to study the status of marine populations and ecosystems.

The primary role of surveys is to provide **consistent** time series of data for use in stock and ecosystem assessments. Survey data are the irreplaceable for research on ecosystem change.



Consistency and standardization

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...



C. Barvotti

"OCEANS ARE RISING, LANDMASS IS SHRINKING ~
SO FAR SO GOOD."



Changes to survey are often unavoidable and necessary

Dealing with changes to survey effort, WKUSER (2020, 2022) reports:

https://ices-library.figshare.com/articles/report/Workshop_on_unavoidable_survey_effort_reduction_WKUSER_/18618323

https://ices-library.figshare.com/articles/report/Workshop_on_Unavoidable_Survey_Effort_Reduction_2_WKUSER2_/22086845

WKUSER3 planed for 2025, contact Stan.Kotwicki@noaa.gov if interested

Drivers of change



Changes are happening despite our wishes leading to conclusion - consistency through standardization is still important, but it can hinder the progress.

new survey technologies



survey gear becoming obsolete



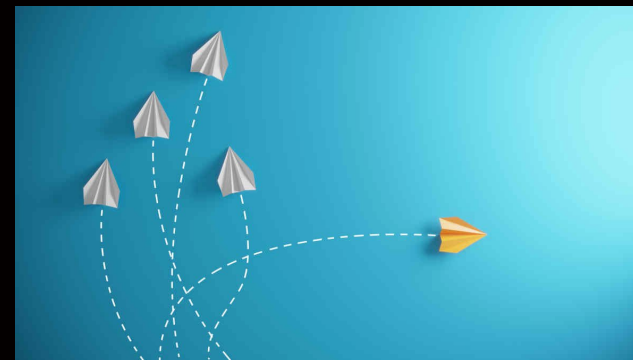
loss of traditional sampling ability: MPAs, wind farms, bottom trawling bans;



changes in ecosystems, expansion of stocks into new areas



changes in survey objectives



Drivers of change



new statistical methods, AI

Machine Learning Vs. Statistics



need for new data types, e.g. EBFM



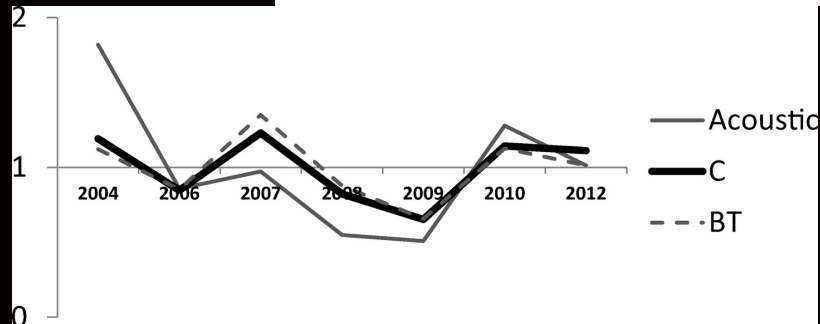
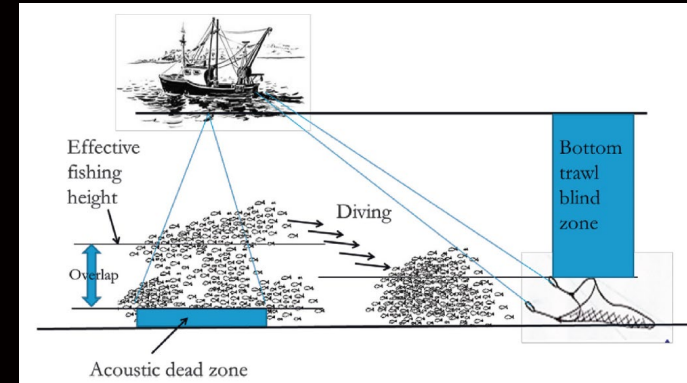
politics and social considerations



management of artisanal fisheries



necessity to combine different survey techniques



Techno-optimism: fishful thinking about technology replacing existing surveys



Fisheries of the future

Looking 30 years ahead, the authors foresee fishing fleets and fish being brought together by a central computing and forecasting office. Supplied with information from a network of buoys and remote-controlled submersibles, this office would keep a constant watch on schools of fish and on the physical conditions at sea

by Dayton L. Alverson
US Bureau of Commercial Fisheries
and Dr Norman J. Wilimovsky
Institute of Fisheries, University of British Columbia

NW SCIENTIST (No. 342), 6 JUNE 1963

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Credit: Saldrone Inc

Pathways to modernizing surveys

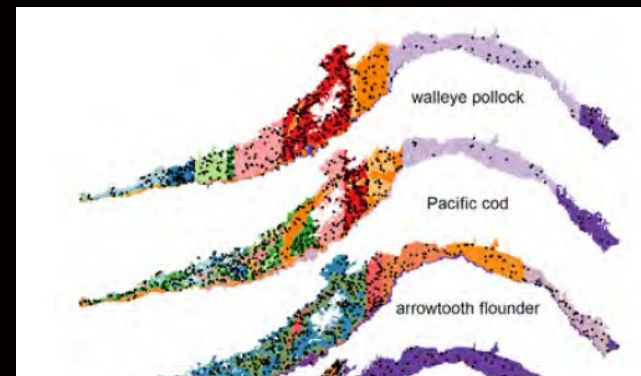


Get public and decision makers support

Research:

Develop new designs for modern surveys

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

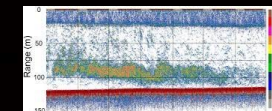
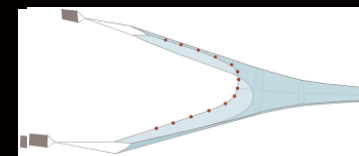
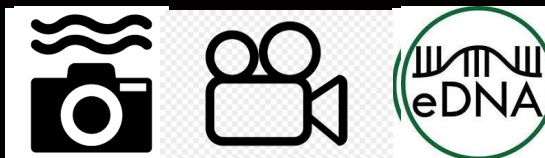
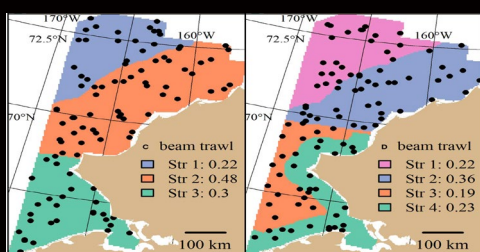
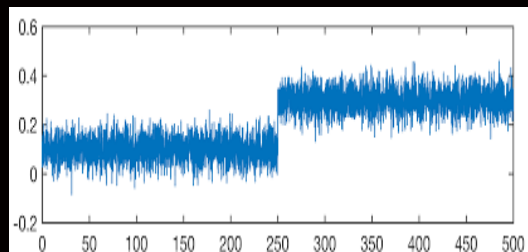


How to deal with change in surveys

Evaluation of survey designs and methods

Incorporate new technologies -

Combine multiple surveys, platforms or technologies



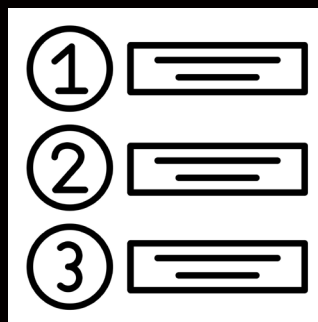
Pathways to modernizing surveys



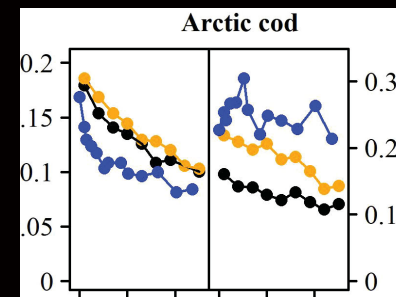
QA, Variance estimation, propagation!



Prioritize objectives



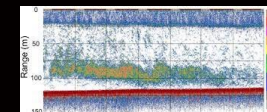
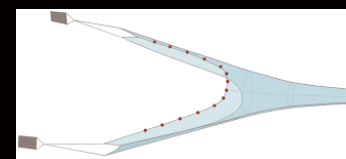
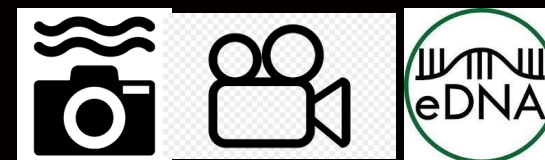
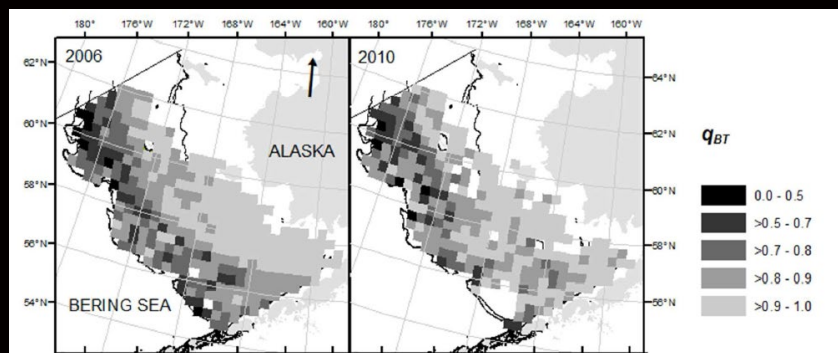
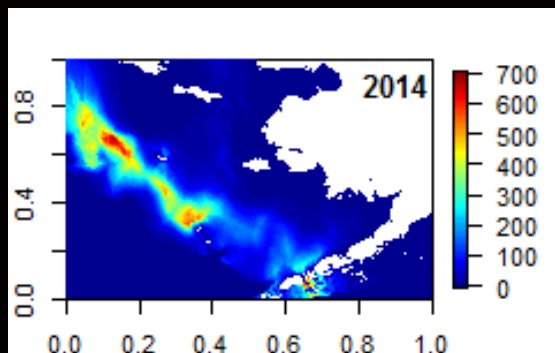
Testing new surveys – in the field and through simulations

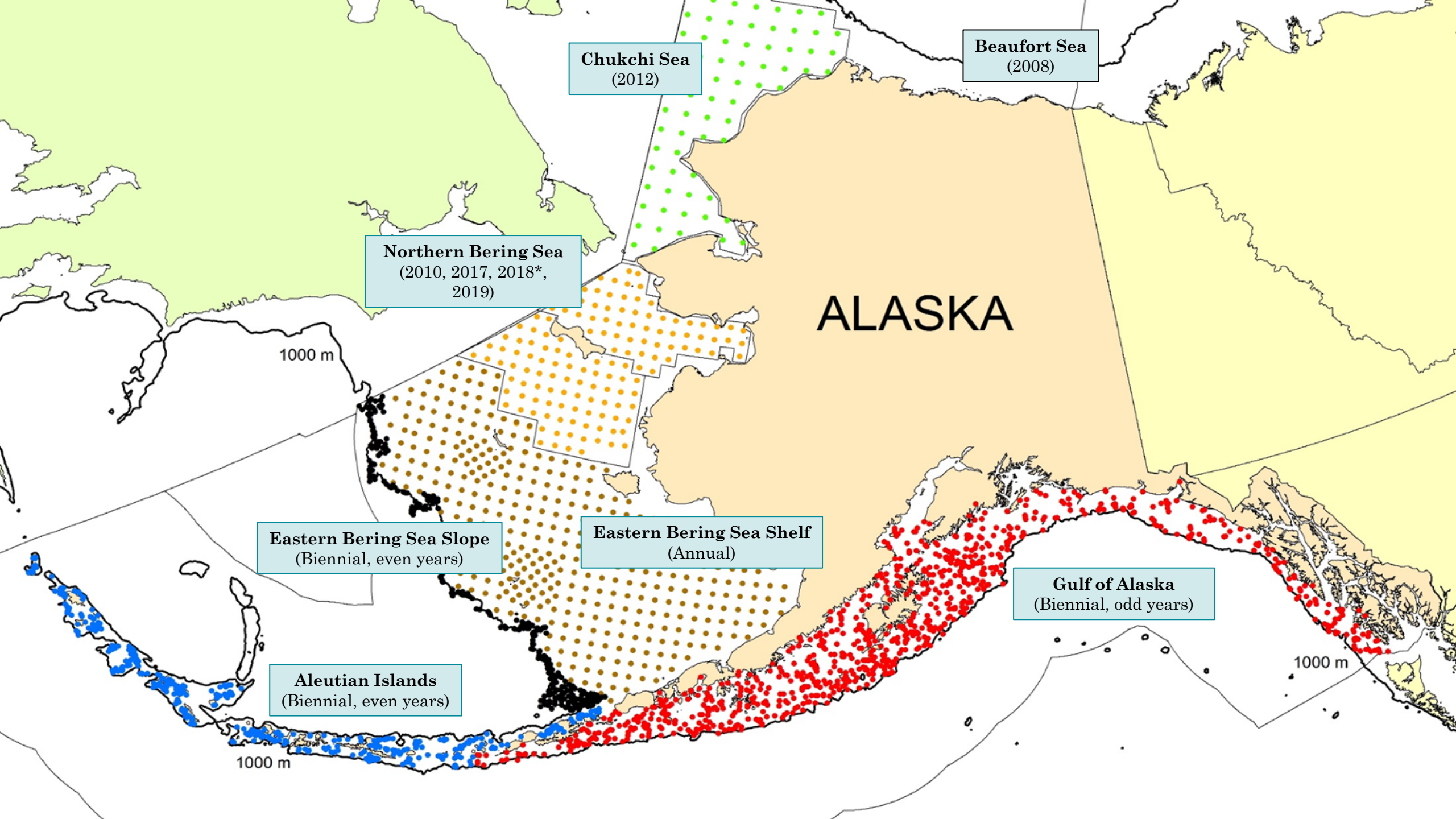


Improving data products: models, covariates, other auxiliary information

Estimating variation in catchability

Transitions from destructive or lethal survey methods.







How to implement the change?

- Money, time, and people (it may take few years and require 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)
- Testing, a lot.
- Transition period. Prepare for transition with calibration experiments
- Examples in progress: GOA, Bering Sea



Gulf of Alaska Bottom Trawl Survey (1953-present)



- Long standing, standardized survey (1990 - present)
- Stratified random design: 59 subjectively designated strata
- Since 1990 there have been:
9 surveys \leq 1,000 m (3 trawlers)
6 surveys \leq 700 m (2 trawlers)
- Future expectation: 2-boat surveys to 700 m... & more changes



Restratisfying the GOA Trawl Survey Oyafuso et al. (2022)*

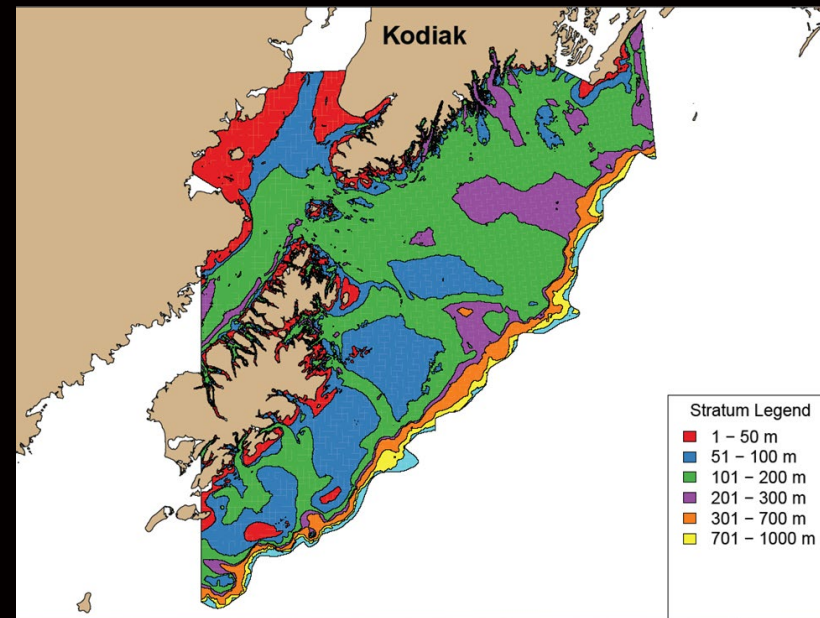
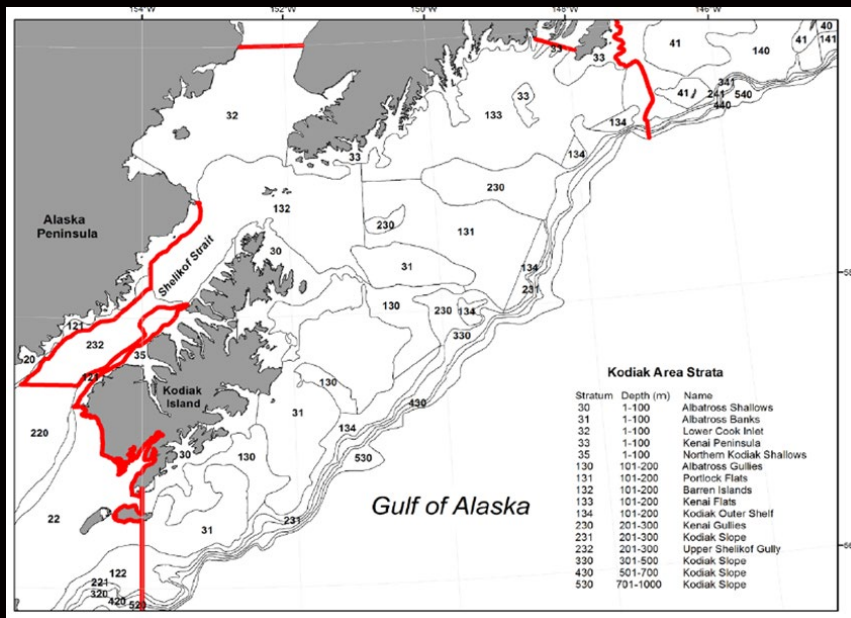
- Optimization
 - Historical survey distributions
 - Multiple groundfish species
 - Criterion to minimize CV (optimize information content) of biomass estimate for species set
- Simulation of multiple effort levels (one, two, and three boat models)



*<https://repository.library.noaa.gov/view/noaa/38939>



Summary of GOA Restratification



- Historical Strata (N = 59)
- INPFC Areas
- Neyman allocation

- 2025 Strata (N = 30)
- NMFS Areas
- Bethel algorithm allocation
- More flexible, minimized CV

Bering sea

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,

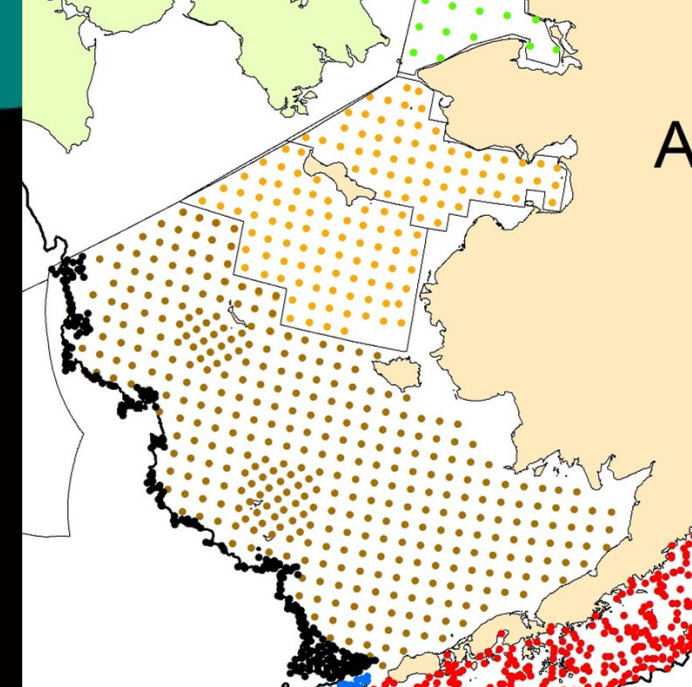
Design flexible survey that will be **responsive to assessment data needs and ready for incremental adaptation of new technologies**

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 and number of tows with split catch.





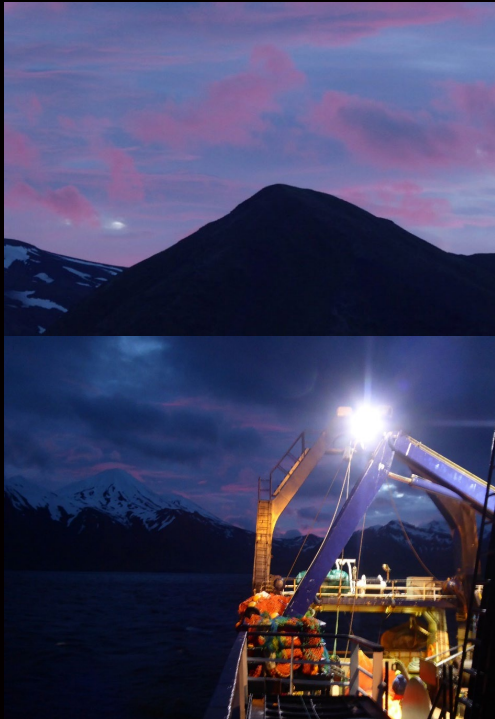
Timeline for Bering Sea Survey Modernization (Optimistic Version)

- 2023 - 2025: New door testing
- 2025-2026: Door & Trawl testing
- 2021-2025: 15/30 min calibration
- 2023-2025: Slope/Shelf gear calibration and standardization
- 2026-2028: Standardization of new methods, testing new survey design, new gear calibration
- 2029- ... : transition to new survey



Difficulties:

- Testing and calibration activities are expensive
- Testing and calibration replace other activities (need to drop something)
- Concerns of data users – how to include new data into assessments
- Transition to new methods will create additional uncertainty in management advice



Summary of Everything Slide

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



EBS modernization teams

Facilitator: Alix Laferriere

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

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

WG2: 15/30 Working Group: Rebecca Haehn, Sean Rohan, Chris Long, Duane Stevenson, Stan Kotwicki

WG3: Shelf/Slope Working Group: Sean Rohan, Rebecca Haehn, Lukas DeFilippo, Daniel Vilas, Emily Ryznar, Jerry Hoff, Shawn Russell, Stan Kotwicki, Duane Stevenson, Lewis Barnett

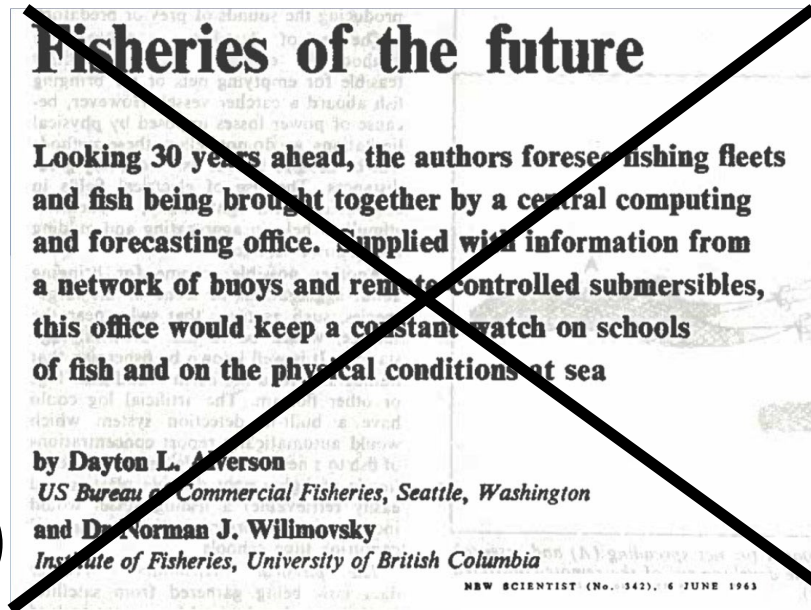
WG4: Survey Gear Working Group: Shawn Russell, Nicole Charriere, Connor Cleary, Zack Oyafuso

WG5: Gear Calibration Working Group: TBD

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

Future surveys in 30 years? New things.

- Multi-platform, multi-method
- Using advanced tech (Acoustics, Cameras, eDNA)
- Collecting more data
- Move from design-based to model-based estimation. Changing survey design to be more appropriate for models.
- Using AI for data analysis and to produce data products
- Responsive to the stakeholders needs
- Fewer people out at sea, but more expertise
- Less lethal, less destructive



Future surveys in 30 years? Old things.

~~Fisheries of the future~~

~~Looking 30 years ahead, the authors foresee fishing fleets and fish being brought together by a central computing and forecasting office. Supplied with information from a network of buoys and remote controlled submersibles, this office would keep a constant watch on schools of fish and on the physical conditions at sea~~

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~~NEW SCIENTIST (No. 342), 6 JUNE 1963~~

- Still need to catch fish (including bottom trawling)
- Collecting age samples, stomachs, measuring fish condition, etc.
- Subsampling
- Understanding stats
- Dealing with bad weather and breakdowns
- Going out to sea (just fewer of us) and coming back home.