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B4 State of the Center Report D4 Survey Prioritization

Robert Foy, Alaska Fisheries Science Center Director

*North Pacific Fishery Management Council Meeting
April 2025*



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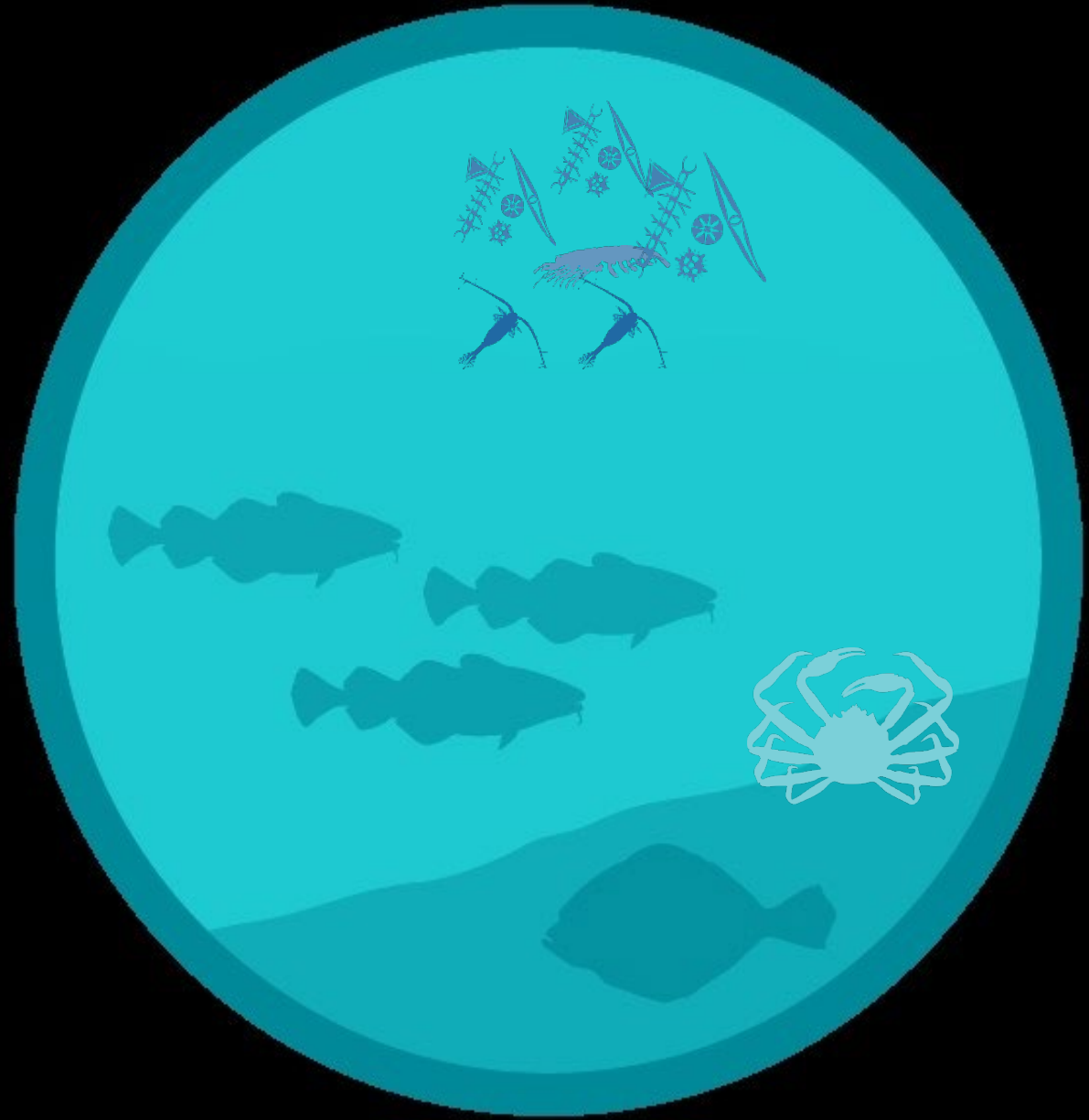
B4 State of the Center Report D4 Survey Prioritization

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2025 Research Plans

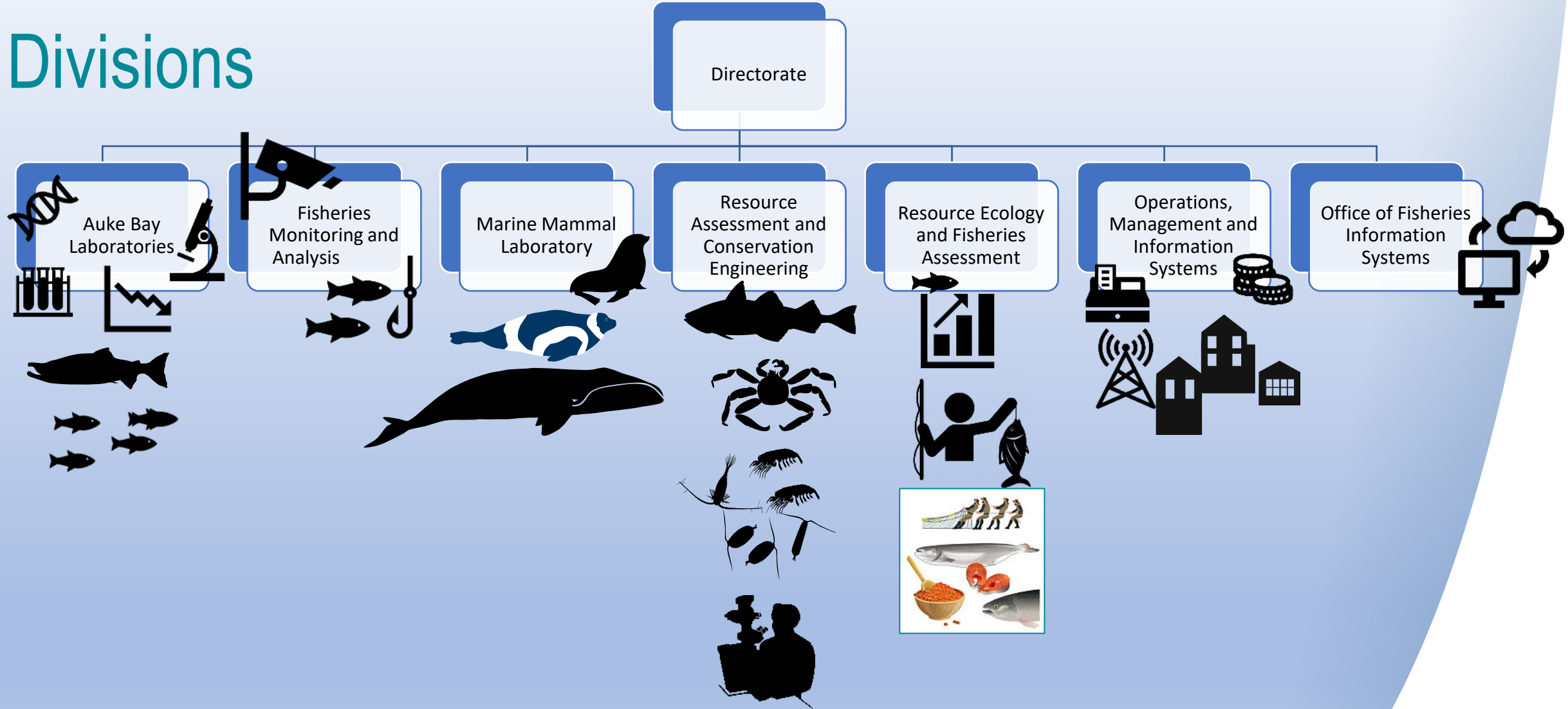
- Still assessing impacts of staffing losses and budget uncertainty
 - **Shelikof Pollock Acoustic Survey** Completed
 - Planning for scheduled surveys but prioritizing and contingency planning if we can't fully execute all surveys
- Planning **Survey Modernization** efforts
- Planning **other mission critical research**



Alaska Fisheries Science Center Locations

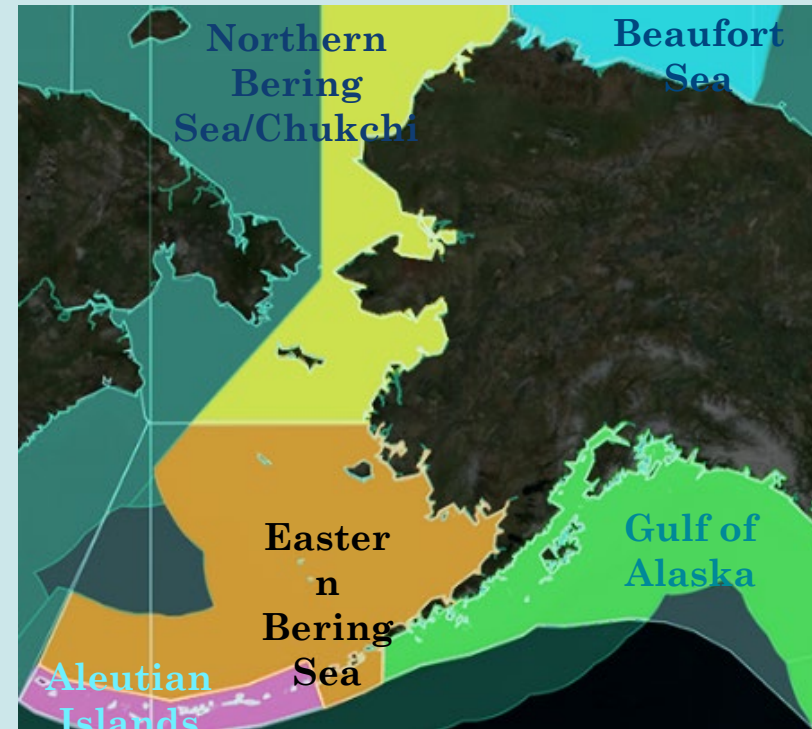


AFSC Divisions



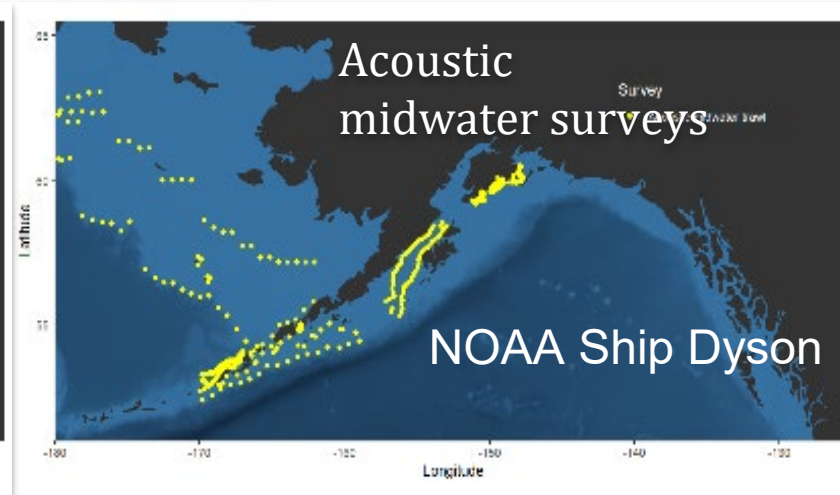
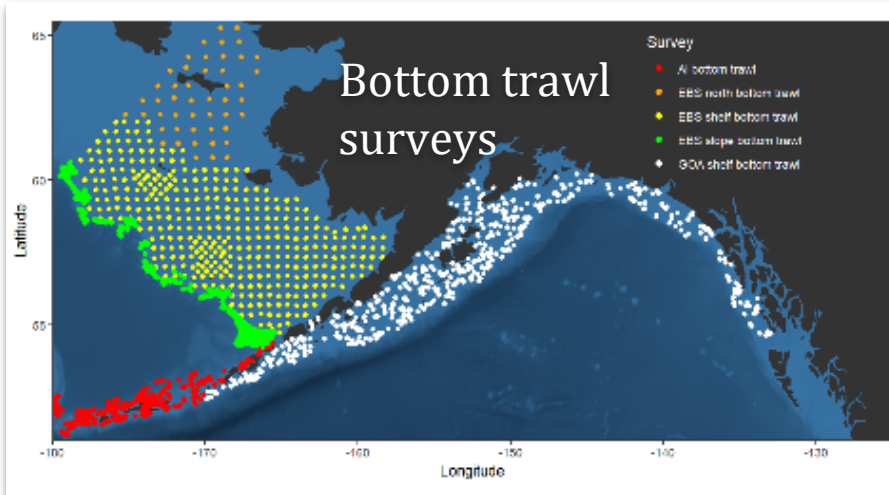


Alaska Fisheries Science Center Fisheries and Ecosystem Survey Priorities



- Alaska EEZ = 1.5 million nm²
- 5 Large Marine Ecosystems

AFSC stock assessment surveys

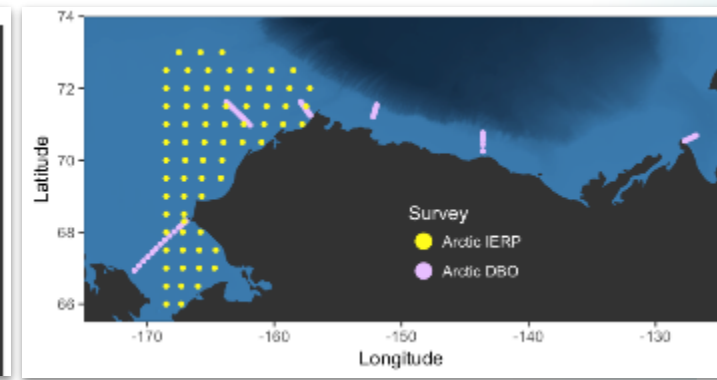
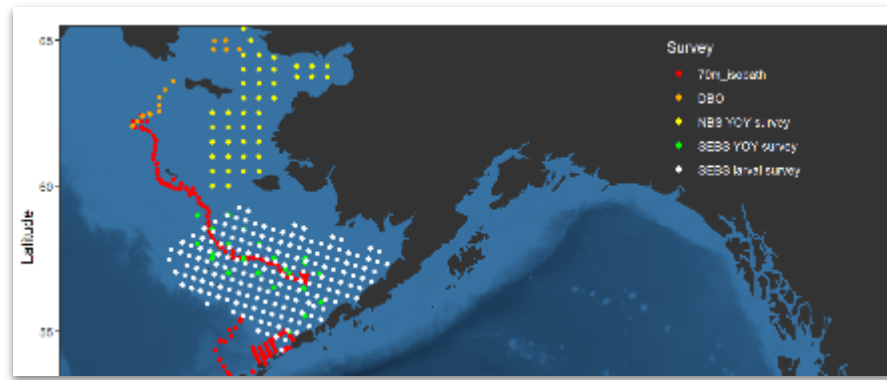


- Gulf of Alaska Shelf Bottom Trawl (**Biennial** May-Aug)
- Eastern Bering Sea Shelf Bottom Trawl Survey (May-Aug)
- Northern Bering Sea Shelf Bottom Trawl Survey (August)

- Winter Acoustic Trawl Survey (Gulf of Alaska, March)
- Summer Acoustic-Trawl Survey EBS (**Biennial** May-Aug)
- ~~Summer Acoustic-Trawl Survey GOA (**Biennial** May-Aug)~~
- Northern Bering Sea Mid-Water Acoustic Survey (Northern Bering Sea to Southern Chukchi, **periodic**)

- Longline Survey (Gulf of Alaska, Bering Sea, May-June)

AFSC ecosystem/process surveys



- Spring Ichthyoplankton Surveys (Shelikof Strait, Sea Valley, Gulf of Alaska, May, FSV Dyson)
- Southeast Alaska Coastal Monitoring (Gulf of Alaska and inside state waters of SE Alaska, June-Sept) (ADF&G vessel R/V Medeia)
- Fall Juvenile Fish Survey (Coastal Gulf of Alaska, odd years, Aug-Sept, FSV Dyson)

- Spring/Fall Mooring and Ecosystem Observation Survey (70m isobath, Apr-May/PMEL, FSV Dyson)
- Multiple projects (uplooking sounders, etc.)

- Arctic Ecosystem Observations -- DBO (Chukchi, August, USCGC Healy); **periodic**
- Arctic Integrated Ecosystem Survey (completed in 2019)



Survey Priorities

- As part of our **survey modernization** effort, AFSC has prioritized surveys
- We are interested in hearing the Council's perspective on the following questions
 - What information and data are needed for Council management decisions?
 - What data collection efforts are a priority to meet these requirements?
 - How do we link these data to communities/industry?

Bering Sea

[illegible]

Gulf of Alaska

[illegible]

Aleutian Islands

Platform	Survey	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Charter	GAP Aleutian Islands Bottom Trawl Summer																
Charter	MESA Gulf of Alaska & Eastern Bering Sea & Aleutian Islands Longline Summer																
NOAA Ship	EcoFOCI Alaska Movement of Key Fishes Summer																





Other Survey Modernization Efforts to Support Sustainable U.S. Fisheries



Planned Survey Modernization Efforts in 2025

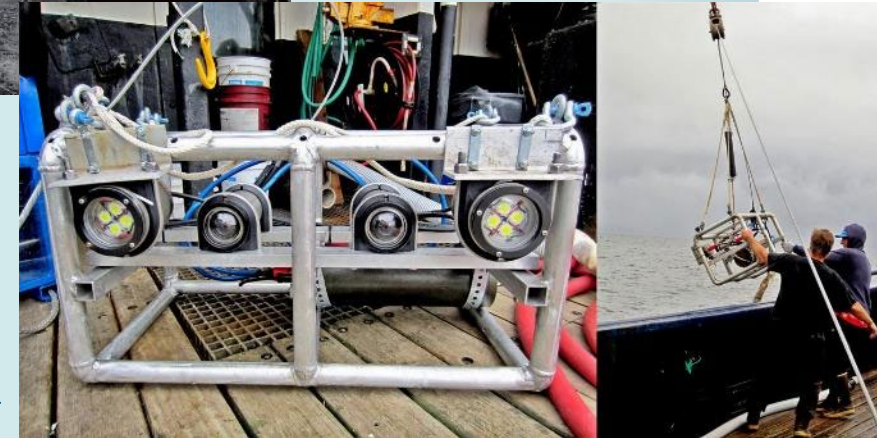
Cross-Center Effort to Improve Efficiencies and Respond to Changing Ocean Conditions



Low-Cost Echosounder Moorings to track fish movements



Towed Camera Systems for Fish Estimation



**Enhanced Acoustics for Species ID
Cloud-Computing and Acoustics Data Management**

Planned Survey Modernization Efforts in 2025

AI and zooplankton – data generation

Data collection



CPICS



Microscope/Scanner imaging

Individual ROI



Individual or full frame



Research Goals

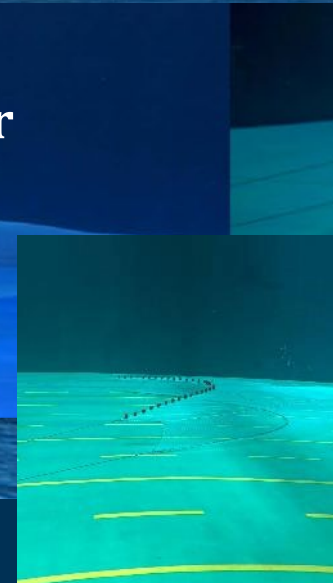
- Expand spatial and temporal zooplankton estimates
- Provide near real-time estimates of the zooplankton community
- Resolve euphausiid abundance
- Replace RZA on cruise
- Extract size and lipid information

Planned Survey Modernization Efforts in 2025

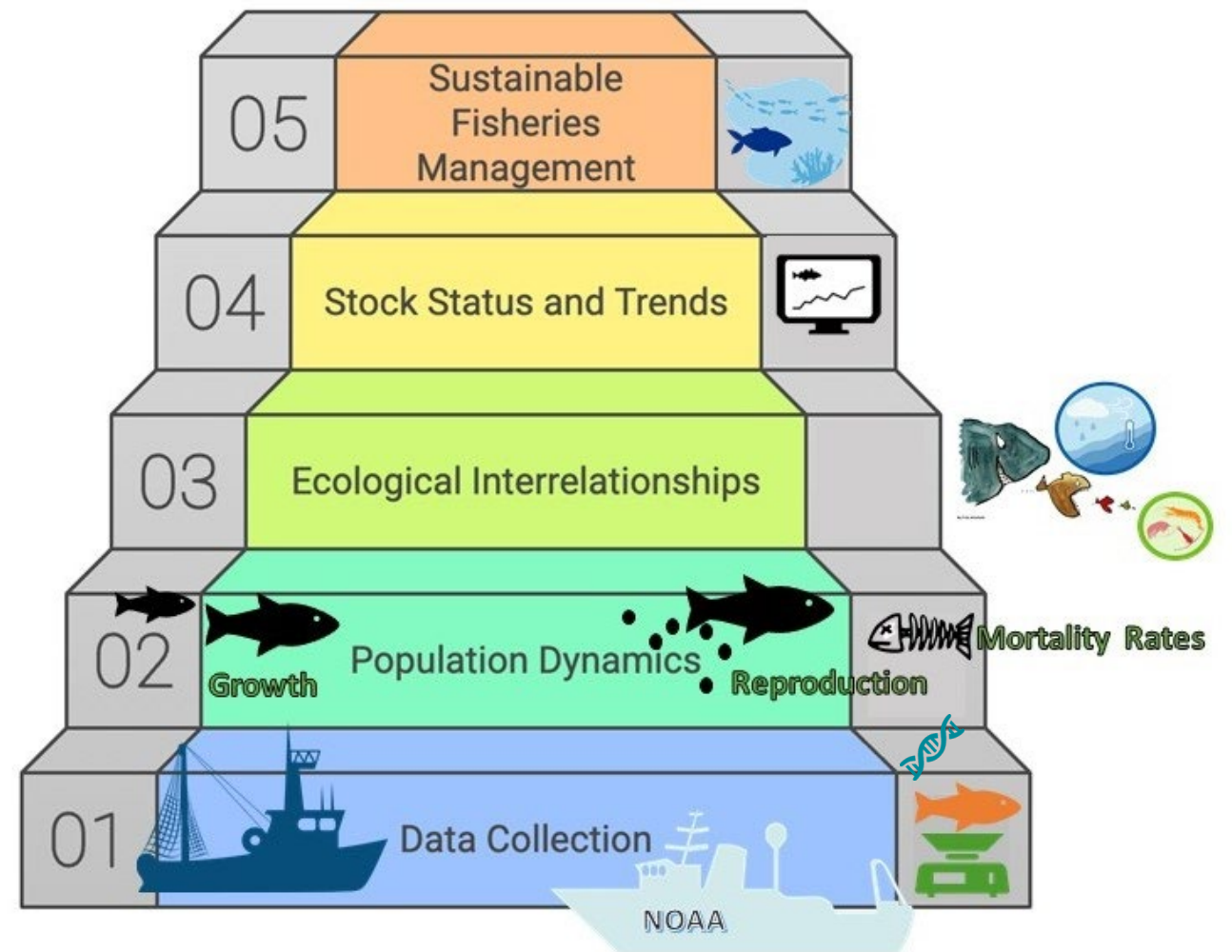
Bottom Trawl Surveys



Flume Tank Comparative Gear Studies

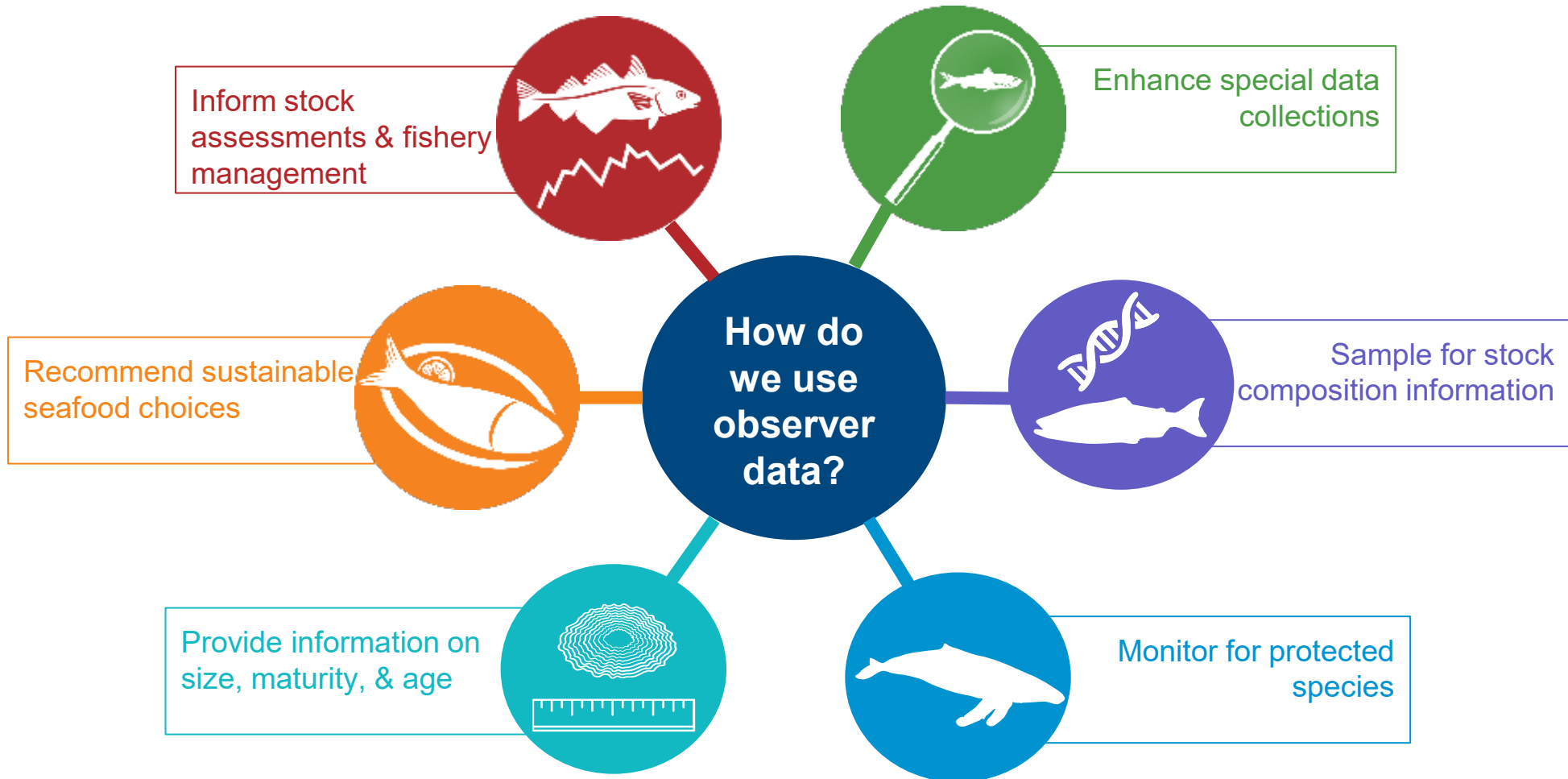


Other continuing research to support sustainable fisheries resource management . . .



Planned Research in 2025

Fishery-Dependent Data Collection



Observer & Electronic Monitoring (EM) data provide unique & independent information Collected at sea & at shoreside processors Critical to the effective management of our marine resources Data **support sustainable fisheries & protected species recovery.**

Planned Research in 2025

Fishery-Dependent Data Collection

- **Observer Declare and Deploy System (ODDS) Improvements** to reduce bias and uncertainty in fisheries monitoring.
- **Vessel Survey and Observer Check-In web Application Improvements**
- **Alaska Marine Mammal Observer Program for Southeast Alaska**
- **First full Year of Trawl EM Process Plant Monitoring** for more accurate salmon accounting, to move Gulf of Alaska's salmon enumeration to all EM offloads.



Planned Research in 2025

'Omics Research



Nonpelagic Rockfish:

Bottom-dwelling species found on or near the ocean floor, usually in rocky or boulder-covered habitat. Generally long-lived (up to 10-25 years old).

Quillback Rockfish¹



Brown body mottled with yellow, a long, pointed spine on a high dorsal fin. Length to 24 inches.

Copper Rockfish¹



Olive brown to copper with pink or yellow blotches, white on sides and belly. Dorsal fin dark copper, spines to black with some white. Base third of lateral line is light. Length to 27 inches.

Silvergray Rockfish¹



Greenish to silver-gray body, belly white, tinged with soft orange or pink. Slender body fish with a long lower jaw protruding well beyond upper jaw. Length to 26 inches.

Tiger Rockfish²



Light pink with five dark red stripes along the side. Two dark bars extend from each eye. Length to 24 inches.

Yelloweye Rockfish¹



Orange red and orange yellow, bright golden yellow eye. Line may be black at tips. Juveniles have two light bands along the side, one on the lateral line and a smaller one below the lateral line. Length to 30 inches.

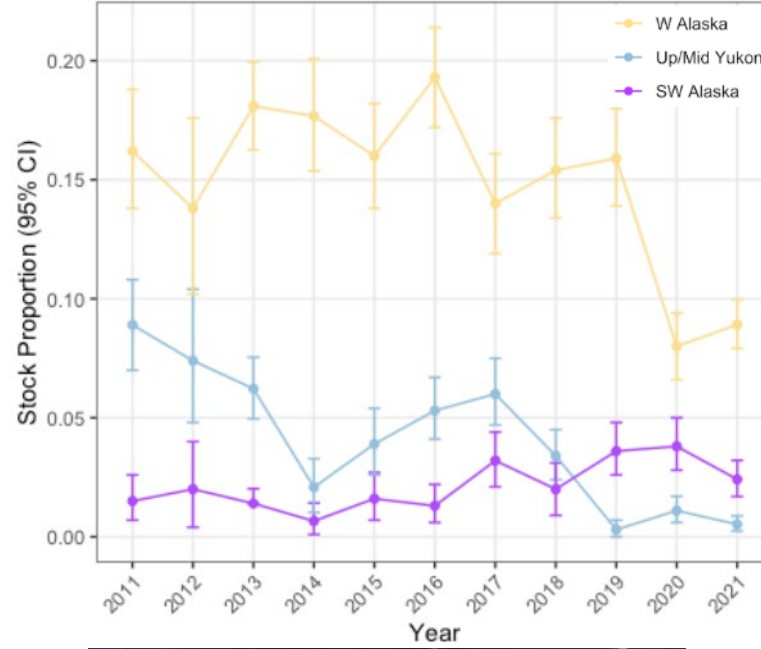
China Rockfish¹



Mostly black, with bright yellow and white blotches and a yellow stripe along most of the lateral line. Length to 17 inches.

Anglers are responsible for knowing the regulations for the areas they fish. If the rockfish caught is not one of the pelagic species listed on the opposite side, then it is a non-pelagic rockfish. Learn more about rockfish at: www.adfg.alaska.gov

Rockfishes: Your Choice (PDF), Take Care of Your Rockfish, The Rockfish (PDF)



Genetic stock identification of salmon caught as bycatch



eDNA to improve estimates of diversity and distribution in a changing ecosystem

Population structure of assessed species



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Planned Research in 2025

'Omics Research

- **Integrate eDNA into Stock Assessments**
- Collaborate with ADF&G to **Update Baseline** for more precise estimates of salmon stock of origin, useful for understanding bycatch impacts in western Alaska
- **Analyze 4 YRS of eDNA Data** to understand influence of interannual high latitude environment on fish communities and abundance
 - Compare eDNA species to data collected from surface trawl nets



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Planned Research in 2025

Data Processing and Analysis

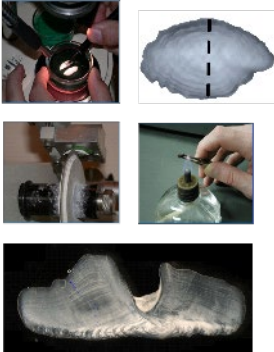


efficiency
gains

>>>
600 –
800%

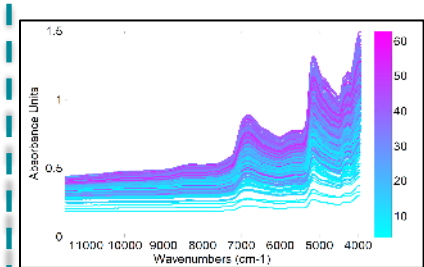


Old

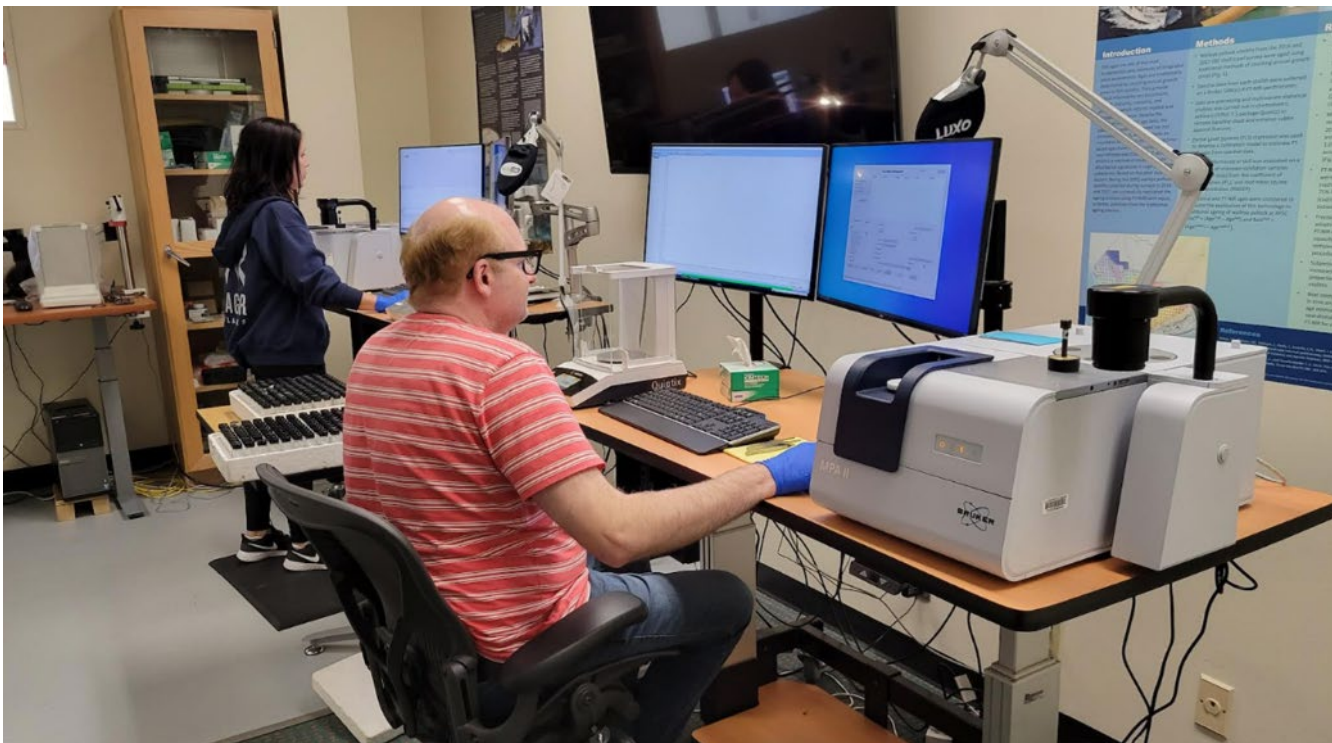
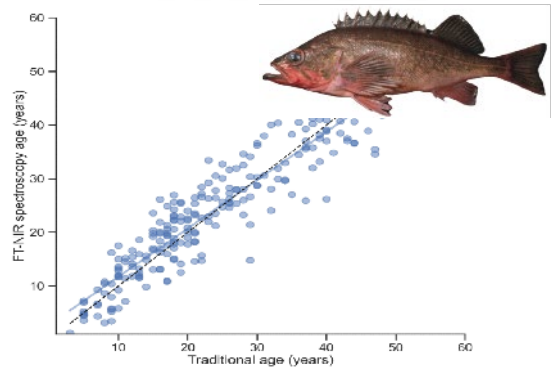
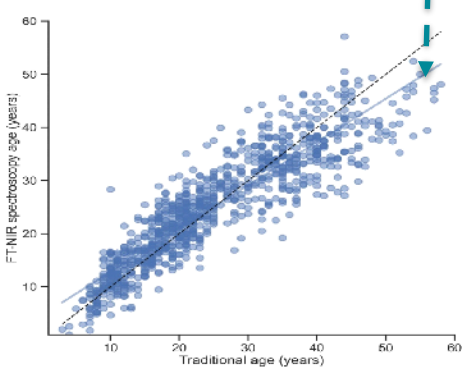


AI and advanced technologies (FT-NIRS) to estimate fish age with greater efficiency and predictability

FY25 Focus: Pollock, Pacific cod, Northern Rockfish, Yellowfin Sole, Sablefish



Species	Age	FT-NIRS	Traditional	FT-NIRS	Traditional	FT-NIRS	Traditional	FT-NIRS	Traditional
Pollock	10	10	10	10	10	10	10	10	10
Pollock	20	20	20	20	20	20	20	20	20
Pollock	30	30	30	30	30	30	30	30	30
Pollock	40	40	40	40	40	40	40	40	40
Pollock	50	50	50	50	50	50	50	50	50
Pollock	60	60	60	60	60	60	60	60	60
Pollock	70	70	70	70	70	70	70	70	70
Pollock	80	80	80	80	80	80	80	80	80
Pollock	90	90	90	90	90	90	90	90	90
Pollock	100	100	100	100	100	100	100	100	100

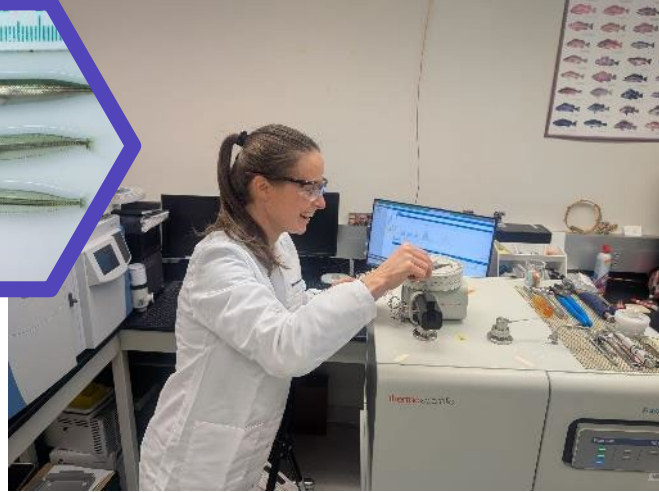


Planned Research in 2025

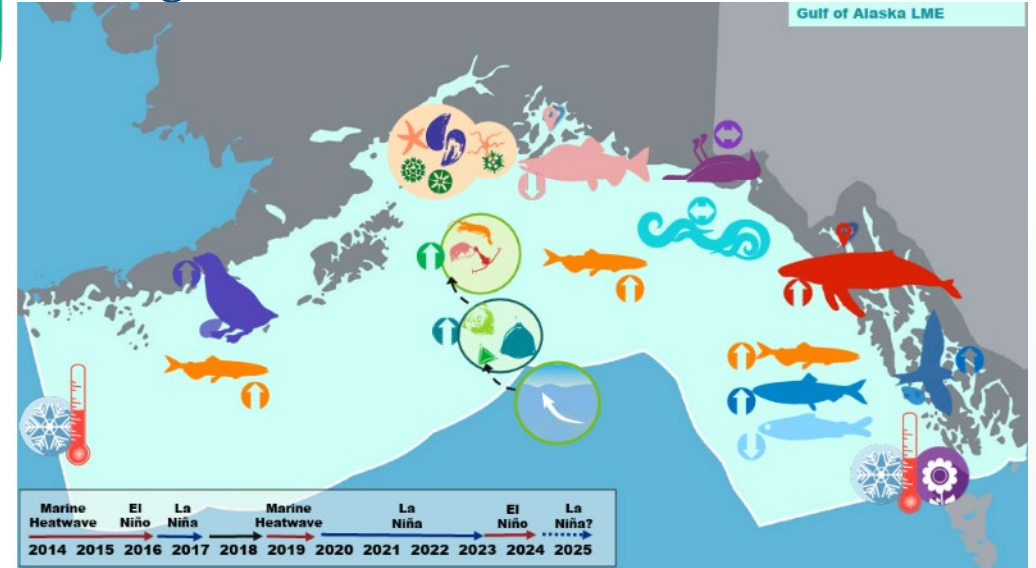
Data Processing and Analysis



AI for Diet Data collection and New Software to more quickly process survey data



Rapid Lipid Analysis in fish to provide data more quickly for fish stock management



Ecosystem-Status Reports (ESRs) & Ecosystem and Socio-Economic Social Profiles (ESPs)



Crab Risk Table Development

Planned Research in 2025

Field and Lab Studies



- **GOA Pacific Cod Seasonal Migrations, Stock Connectivity, Habitat Use** via winter satellite tagging
- **GOA Pacific Cod Recruitment Monitoring** via beach seine
- **Mariculture research**
- **Field-Collected Larval Fish Analysis** to determine the influence of temperature and prey availability on spawn timing and growth



Planned Research in 2025

Field and Lab Studies

- **Genetically Distinct Ecotypes Study of GOA Pacific Cod** to understand population stability from environmental stressors
- **Juvenile Sablefish Capture/Release Studies** to assess stressors
- **Energy Use Study on Sub-Adult Snow Crab** to better understand risks to Bering Sea crab population due to marine heatwaves
- **Integrated Distribution and Movement Model Presentation** for crab to provide insights into crab distribution, movement, and unobserved fishing mortality

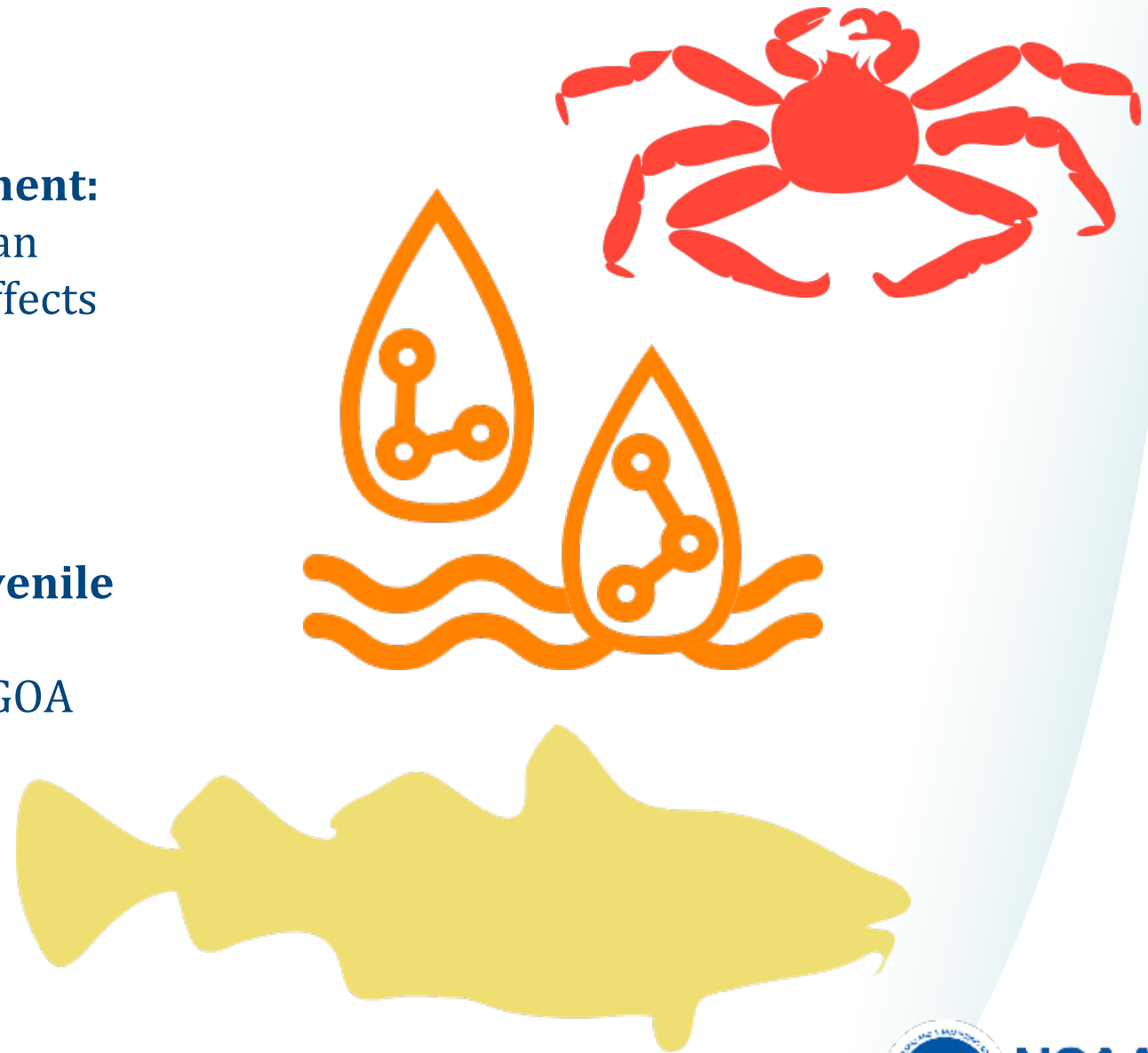


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Planned Research in 2025

Field and Lab Studies

- **Bristol Bay Red King Crab Stock Recruitment:** Integrate lab studies, ocean models and ocean chemistry observations to understand OA affects
- **Golden King Crab Experiments** to better understand the effects of OA
- **Temperature and OA Effects Study on Juvenile Pacific cod Metabolic Rates** to improve understanding of environmental drivers of GOA population productivity



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Planned Research in 2025

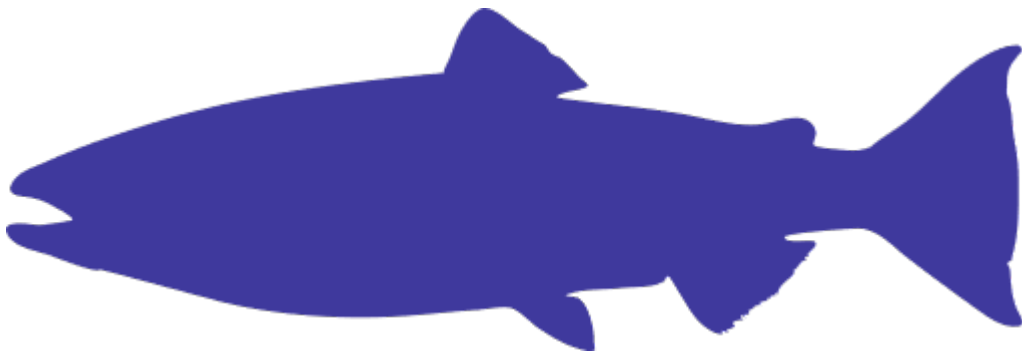
Salmon Research

- **New Program Manager**
- **Chinook Salmon Smolt Release** to support local fisheries (largest in 50yr History)
- **Study to ID Drivers of Yukon River Chinook Marine Survival and Fitness**
- **Scientific Advice and Analyses:** U.S./Canada Pacific Salmon Treaty, N. Pacific Anadromous Fish Commission and NPFMC

Planned Research in 2025

Salmon Research

- **Coded Wire Tagged Salmon Results** to support salmon management
- **Environment and Genetics Studies** on Alaskan salmon stocks
- **Thiamine Deficiency Studies** on marine survival of Chinook salmon



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Planned Research in 2025

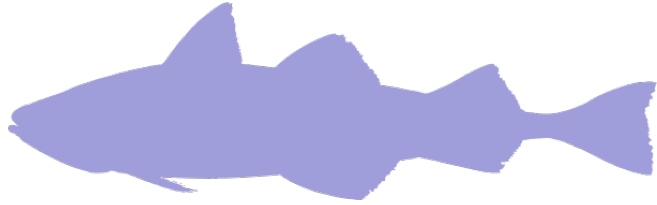
Socio-Economic Research



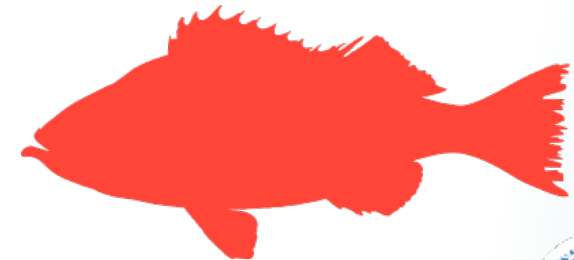
- **Multi-Regional Assessment:** Alaska fisheries economic contribution
- Multiregional Economic Impact Analysis of snow crab collapse & rebuilding
- **AI/Machine Learning** to collect fishing trip characteristics & price info from marine charter fishing websites
- **Alaska Saltwater Angler Surveys** evaluate Alaska visitation & associated economic activity to inform mgt of Pacific halibut charter fishery
- **National Geospatial Inventory of Physical and Human Capital** to support fishing/seafood industry and working waterfronts in Alaska

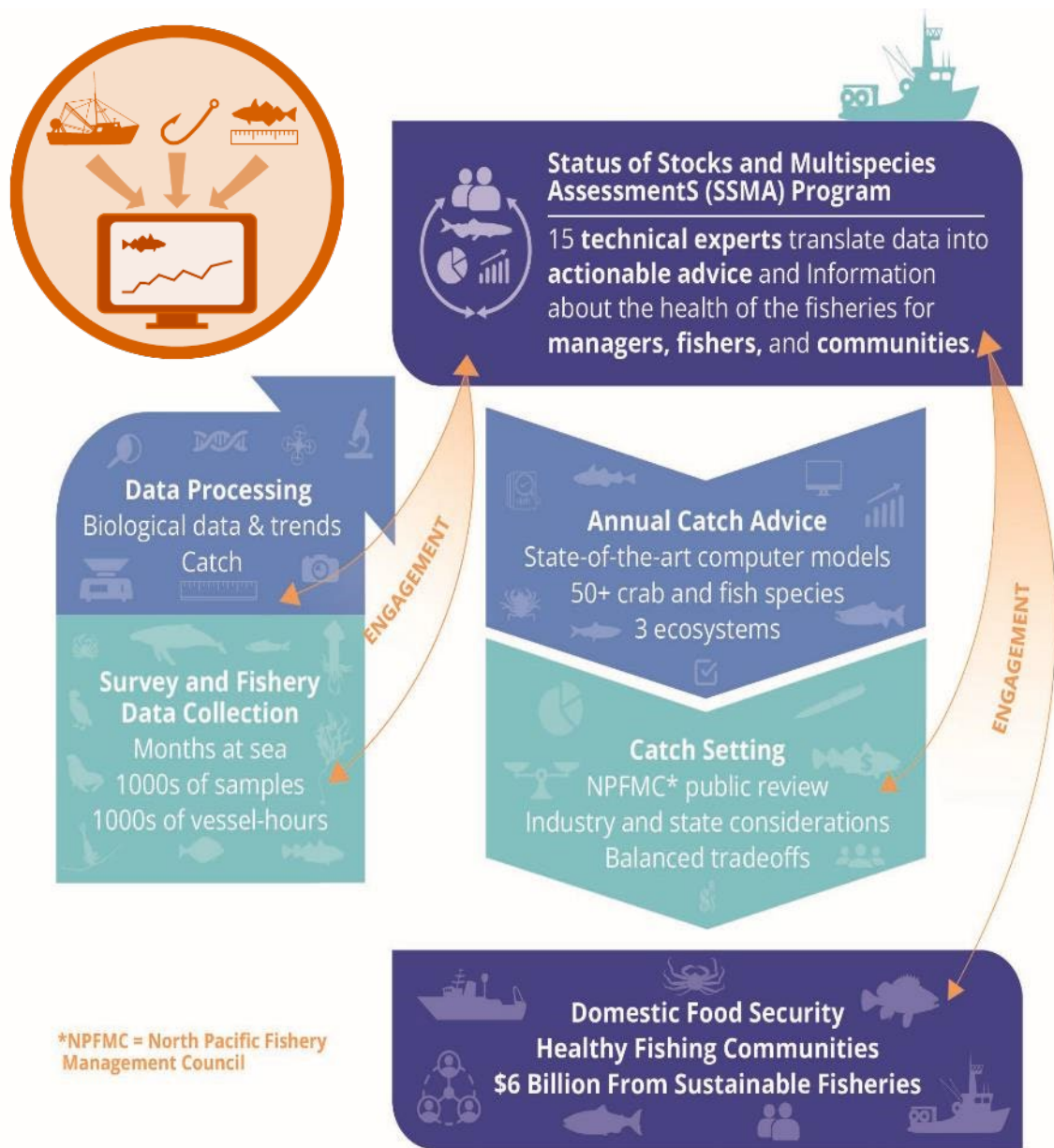
Planned Research in 2025

Socio-Economic Research (cont'd)



- **Community-Led Resilience Initiatives** focused on
 - workforce development, energy innovation, fisheries access and sustainability, environmental stewardship, and localized science
- **Bioeconomic Models** to forecast effects of OA on Alaska crab and groundfish
- **Global Markets and U.S. Trade Balance Monitoring** for Alaska seafood products (i.e., Alaska pollock, flatfish, rockfish, king crab, snow crab)





Planned Research in 2025

Stock Assessments

- **Stock Assessments:** North Pacific fish & crab populations, **Scientific Advice** on catch levels for 2026 & 2027
- [NOAA Fisheries Center for Independent Experts](#) for Eastern Bering Sea walleye pollock & Gulf of Alaska Rex sole fisheries stock assessments
- **Machine Learning/AI** to improve statistical models, increase forecasting accuracy, & understand fisheries spatial & temporal trends
- **Streamline Stock Assessment Process** using open data science tools
- **Next-Generation Stock Assessment Software Development** for Alaskan crab & groundfish to improve efficiencies & provide for consistent modeling platforms

Thank You!



2025 Survey Prioritization Discussion

- History of SSC survey meetings, discussions, and recommendations
- Questions for SSC discussion
 - Criteria for moving to biennial surveys (EBS, NBS)?
 - Biomass index vs ecosystem surveys?
 - Thresholds for remote data vs biological data?
 - ABC/TAC index for prioritization?
 - Stock trend and temporal variance for prioritization?
- Further SSC considerations for metric of uncertainty?
 - What analyses should stock assessment authors consider to help prioritize data sources



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SSC: “If NOAA is unable to provide sufficient funds for at least four boats annually, it may be necessary to examine ALL field and laboratory activities to assess their contributions to the basic requirement of providing assessments of fish stocks to the North Pacific Fishery Management Council.”



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History of SSC survey meetings, discussions, and recommendations

- September 10, 2018; [Report of NPFMC SSC Sub-Committee Meeting with AFSC on Trawl Survey](#)
- October 2020, 2023, December 2023 stock specific notes
- December 2024 loss of survey data across multiple stocks



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September 10, 2018; Report of NPFMC SSC Sub-Committee Meeting with AFSC on Trawl Survey

Questions

1. What are the ranked order of priorities for our present suite of bottom trawl surveys: the eastern Bering Sea shelf, eastern Bering Sea slope, northern Bering Sea shelf, Gulf of Alaska, and Aleutian Islands?
2. If the Center has four, rather than five charter vessels on contract in FY19, we propose to put two vessels on the eastern Bering Sea shelf and two in the Gulf of Alaska. If additional funds are available, then these will be used to support a northern Bering Sea survey. Do you agree?
3. Given the answer to Question #2, which surveys should we prioritize for FY20 under a four-boat scenario?
4. If the Center is only able to fund 3 charter vessels in FY19, which survey(s) should we attempt?
5. Given the answer to Question #4, which surveys should we attempt in FY20 under a three boat scenario?



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Comments

- “A thorough evaluation should also be performed to determine the impacts of reducing sample size during surveys, including dropping depth strata (as has been frequently done in the Gulf of Alaska), before modifications to the standing survey schedule are implemented”
- Stock assessment priorities based on stock assessment frequency and current survey frequency. If this frequency is changed, decisions regarding stock assessment priorities would have to be revisited.
- “In addition, it is possible that a reduction in survey frequency or station density could lead to tier changes for some stocks in Tiers 1-5 (for groundfish).”
- If the underlying ecosystem state is rapidly changing, it is important to document how the system is changing to assess whether the underlying assumptions of the models are still reliable.
- Ecosystem surveys provide a wealth of valuable information on production at lower trophic levels and changing environmental conditions.



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Possible analyses

- Model mimicking reductions in survey frequency;
- Statistically evaluate thinning of samples on a systematic basis;
- Data weighting to address model conflicts;
- VAST to address data inconsistency;
- Exploration of harvest control rules that are explicitly linked to survey and assessment uncertainty and the lag between surveys and assessments.
- More?



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Priorities?

- Is the goal to maximize accuracy, or to minimize the likelihood of missing a significant change in a stock? **Skipping years may allow for funding of better coverage within a year, but leaves the Council vulnerable to missing a major change in a stock.**
- With climate change and warming occurring much faster than initially expected, recent experience supports the notion that **frequent surveys may be the only way to monitor the impacts** of these events on fish stocks.
- The sub-committee suggested the following priority list: 1) eastern Bering Sea shelf; 2) Gulf of Alaska; 3) Aleutian Islands; 4) northern Bering Sea; and 5) Bering Sea slope.



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Priorities?

- “...the least bad option seem to be to pick either the EBS or the GOA and **do a very thorough survey in one region only**. Another alternative would be to **change the survey frequency to triennial, although this time step proved to be problematic** in the past in the GOA and AI.”
- There is no good choice between the eastern Bering Sea shelf and the Gulf of Alaska surveys. The sub-committee very reluctantly supported the option of surveying the **Gulf of Alaska with two boats and the Bering Sea slope with one boat** under this hypothetical scenario.
- Missing biennial surveys generally produced a larger effect than missing annual surveys, implying a **greater loss of information when biennial surveys are missed**, commensurate with the gap between surveys.



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Other SSC comments 2020-2024

- “Any opportunities to survey the AI during odd years, when Kamchatka Pink salmon abundances peak biennially, would be valuable...”
- “...the SSC requests that AFSC scientists consider ways to replace the data streams provided by the summer acoustic survey.” AVO pollock, euphausiid index, surveys of opportunity.
- Misc spp specific survey needs blue king crab, leopard skates, sablefish (logbook and survey)
- Lower Tier (fewer aging requirements) vs reliance on a consistent survey



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Questions for SSC discussion

- Criteria for moving to biennial surveys (EBS, NBS)?
- Biomass index vs ecosystem surveys?
- Thresholds for remote data vs biological data?
- Catch/ABC index for prioritization?
- Stock trend and temporal variance for prioritization?
- Tier, risk table, considerations



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