



**NOAA
FISHERIES**

**Alaska Fisheries
Science Center**

2020 Recruitment Processes Alliance (RPA) surveys: Gulf of Alaska, Bering Sea

RPA: Ecosystems and Fisheries-Oceanography Coordinated Investigations (EcoFOCI), Ecosystem Monitoring and Assessment (EMA), Recruitment, Energetics & Coastal Assessment (RECA), Fisheries Behavioral Ecology (FBE)

Presenter: Rob Suryan, Ellen Yasumiishi, Lauren Rogers

September 8, 2020

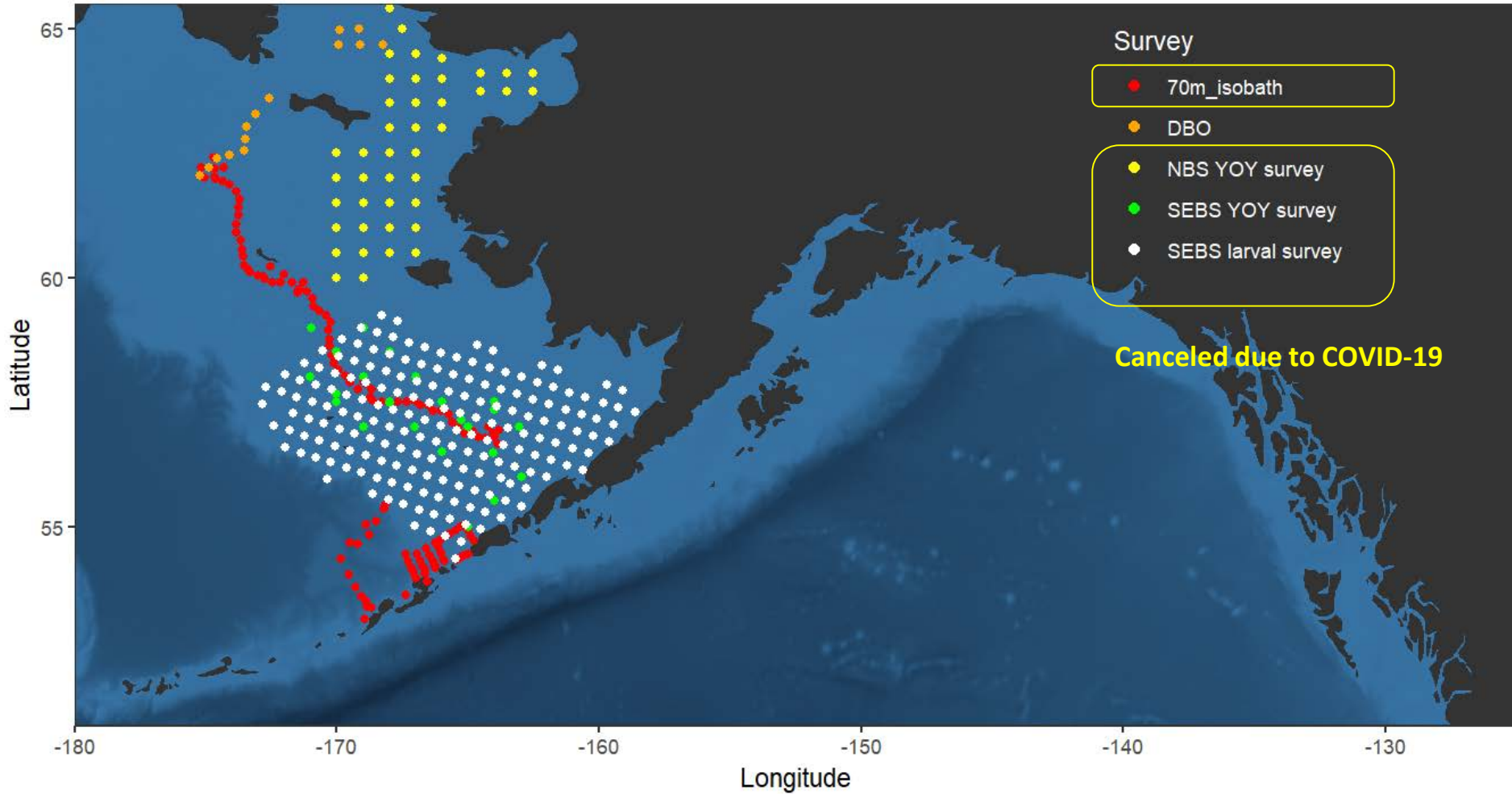
Goal & Objectives

Goal: To provide recent information on ecosystem conditions affecting recruitment processes.

Objectives:

1. Provide update on RPA-related surveys that occurred in 2020.
2. Encourage discussions of data/indicators most useful for stock assessments, ESRs, ESPs.
3. Update on efforts to integrate recruitment models and indicators into stock assessments.

EBS Ecosystem Surveys



2020 Eastern Bering Sea, NBS, Arctic Mooring & DBO survey

Contact : Janet Duffy-Anderson

Moorings & DBO

“Distributed Biological Observatory”

Combined survey to turn around moorings (e.g. M2, mammal moorings) and sample DBO stations.

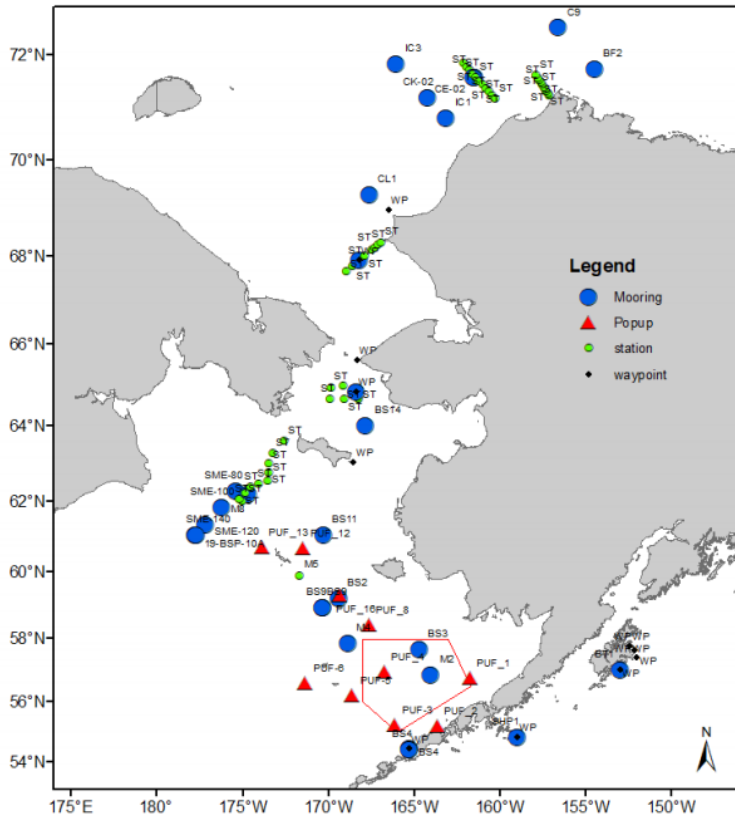
Reduced scientific crew (PMEL/AFSC)

When: August - September

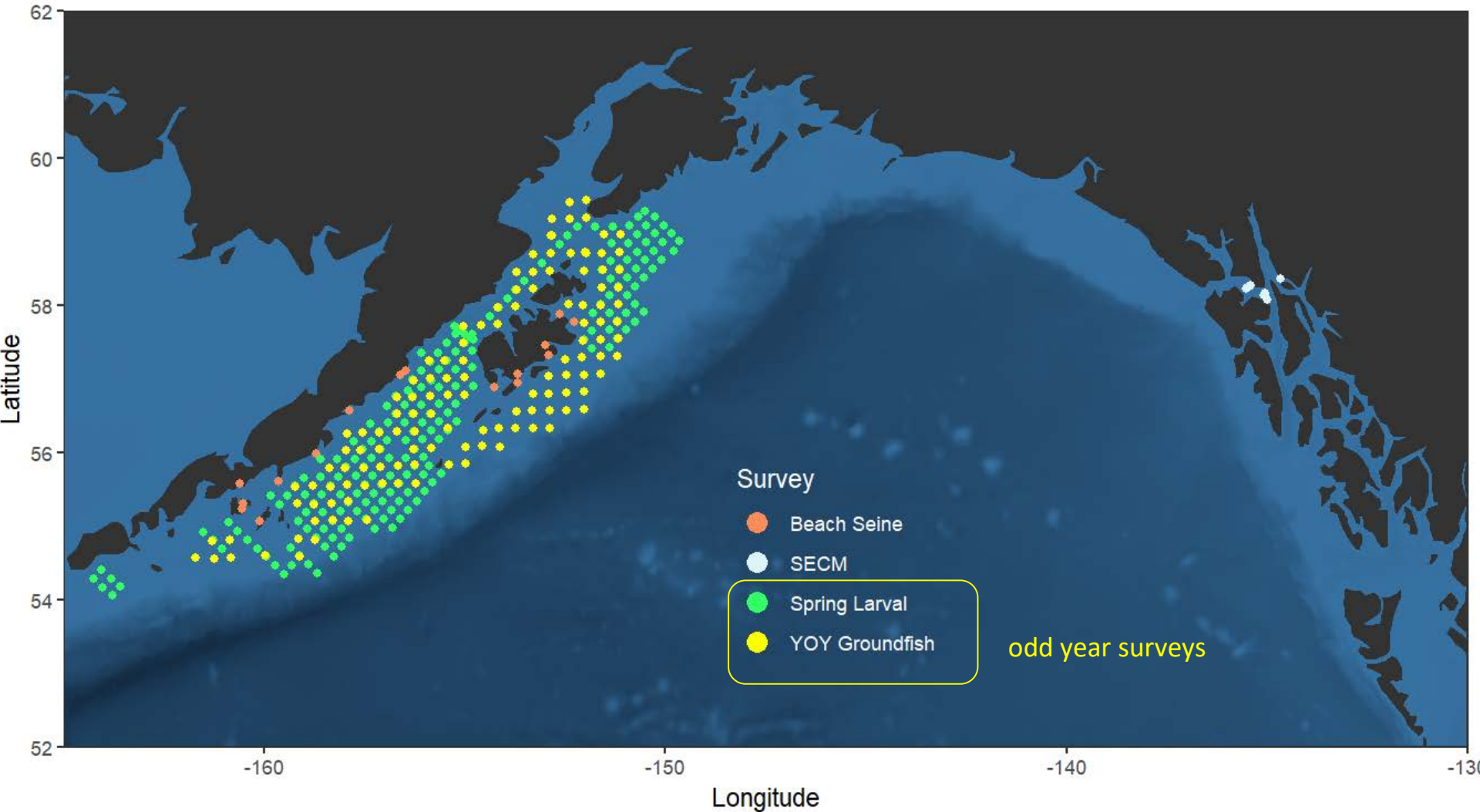
Operations: Surface, subsurface moorings and instrumentation (incl Prawler), CTDs, Bongos, Pop-up floats

Indicators: Integrated chl a ; Temp, Sal, O $_2$, zooplankton (no RZA)

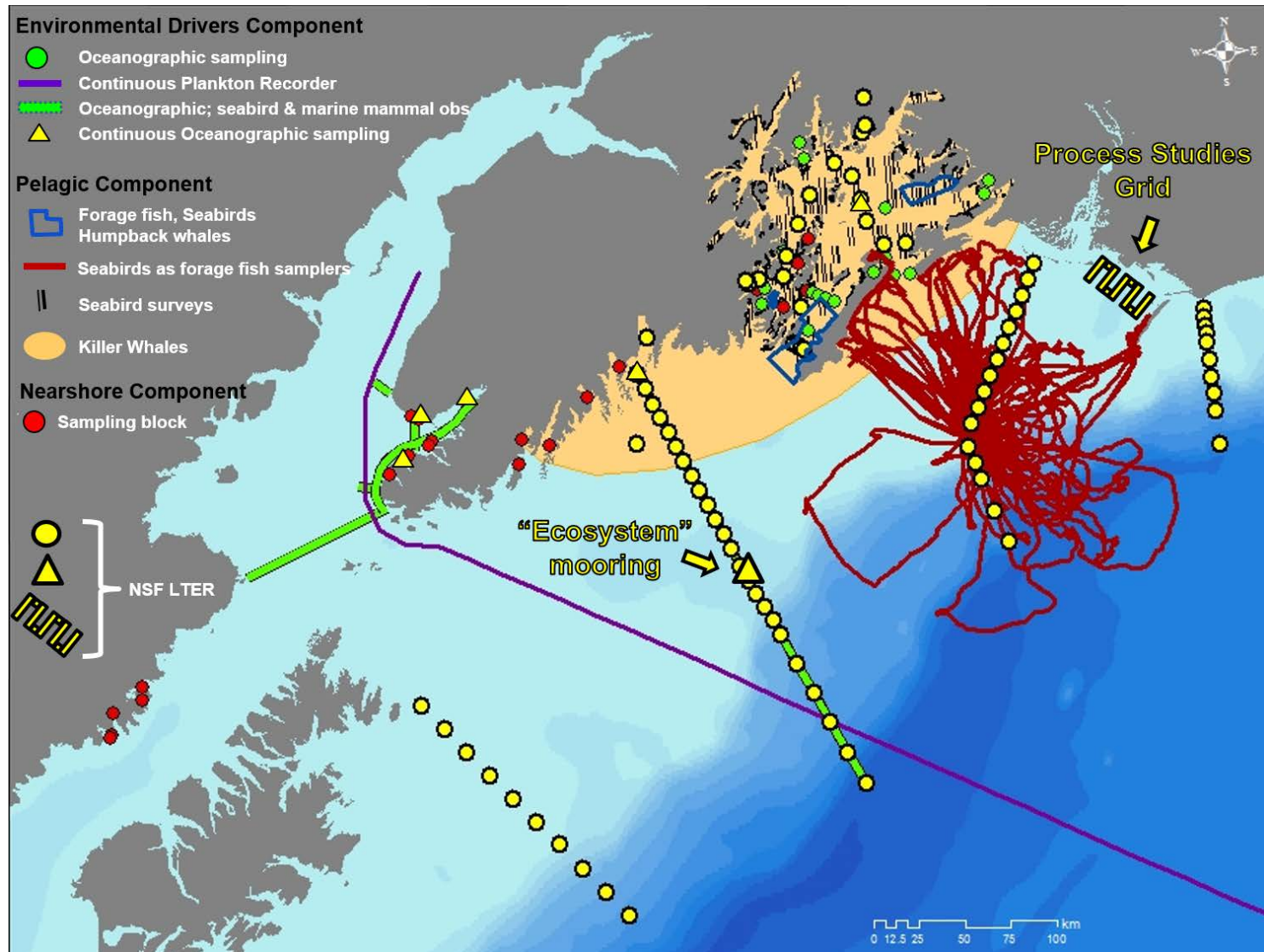
Figure 1. Draft DBO/EcoFOCI sampling map for the Oscar Dyson Aug-Sept Arctic cruise



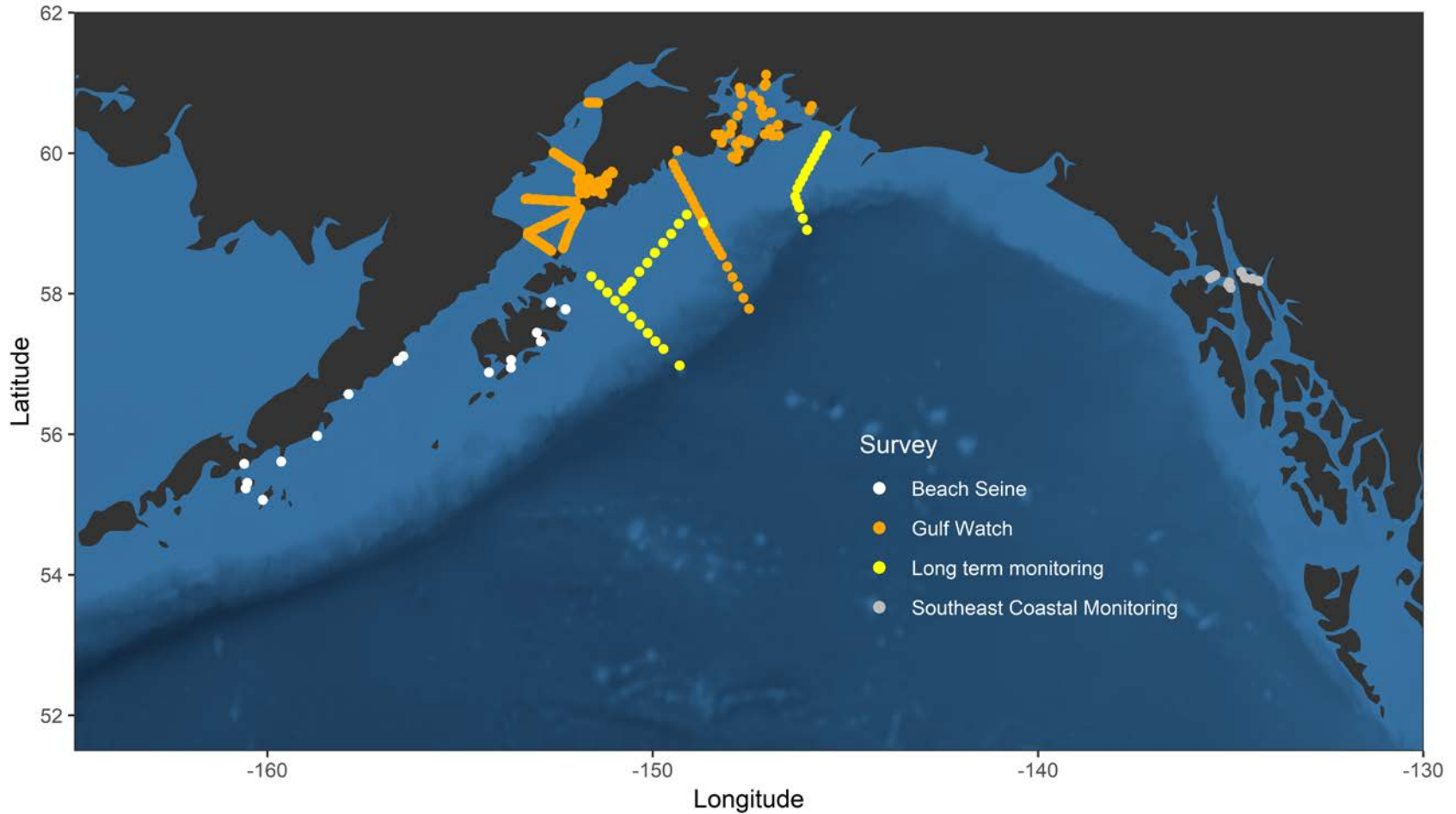
NOAA GOA Ecosystem Surveys



Gulf Watch Alaska & N. GOA Long Term Ecological Research (LTER) Surveys



2020 GOA Ecosystem Surveys



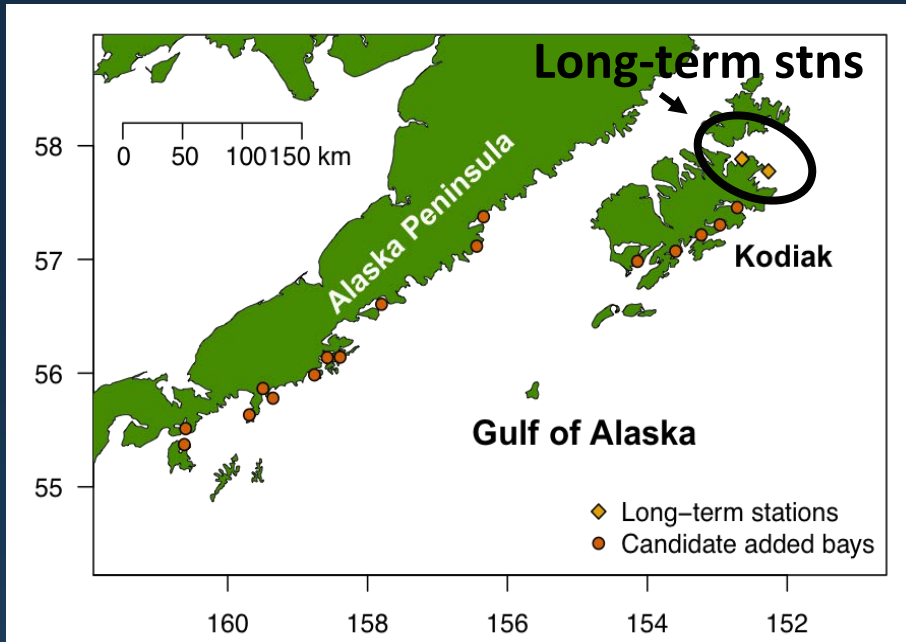


Western Gulf of Alaska

Beach Seine Surveys 2006-2020

Contact : Ben Laurel, Mike Litzow, Alisa Abookire

2020 beach seine surveys



Focus: YOY gadids (Pacific cod, saffron cod, pollock)

When:

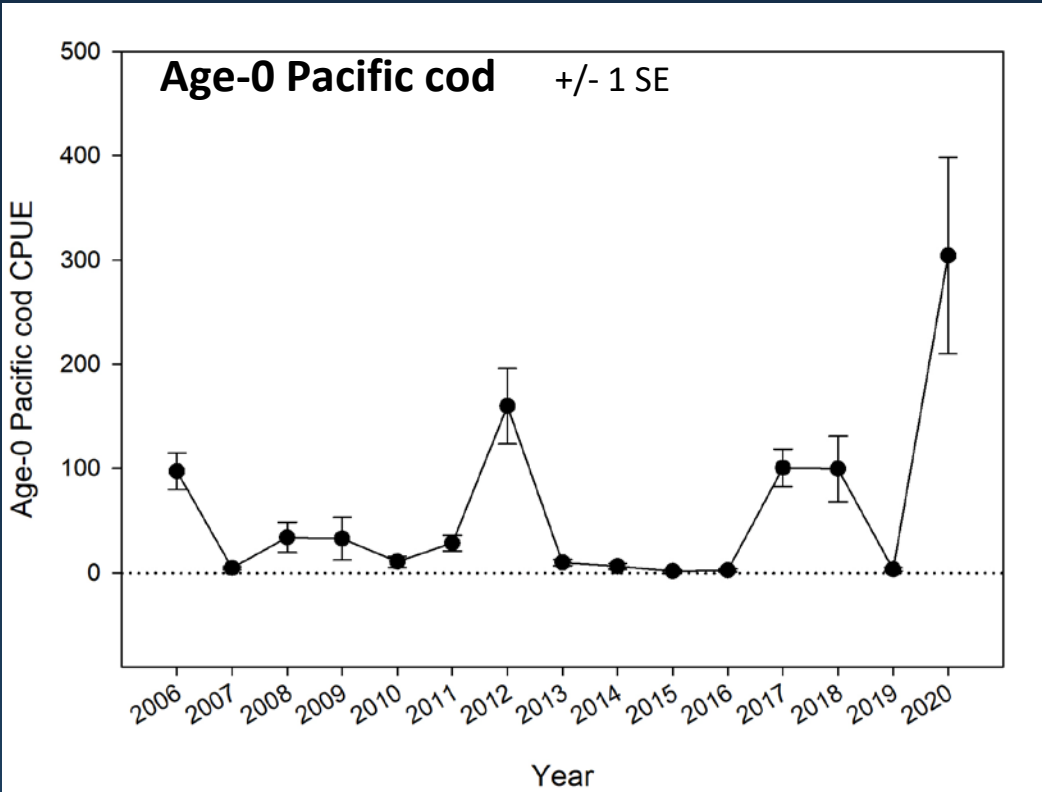
Kodiak: July/Aug (4 surveys, 16 sites across 2 bays) 2006-2020

Expanded WGOA: July/Aug (75 sites across 14 bays) 2018-2020

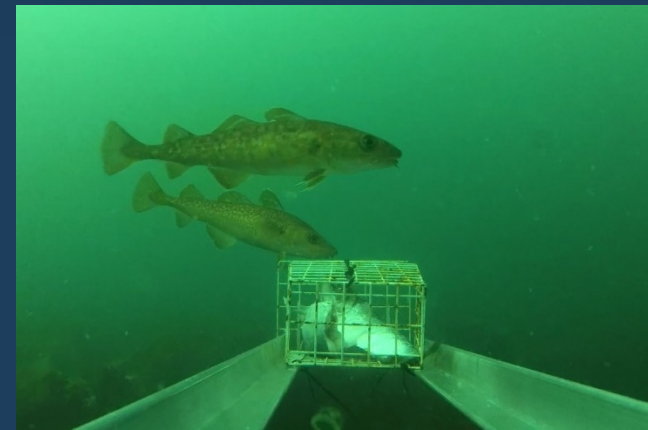
Operations: Beach seine, CTD, baited cameras

Indicators: abundance & size, genetics, diets, temperature, salinity, oxygen

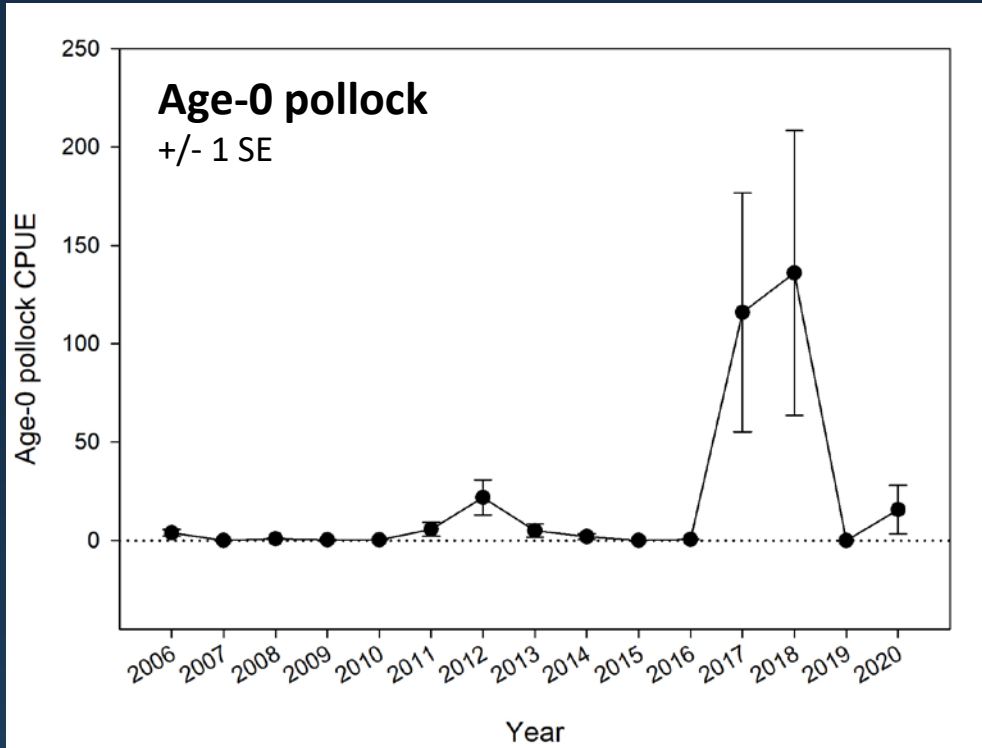
Kodiak: Age-0 Pacific cod



- High catches of Age-0 Pacific cod in beach seine catches near Kodiak
- Caveat: only 18 of 64 hauls completed.
- Baited camera survey results pending (age 1+)



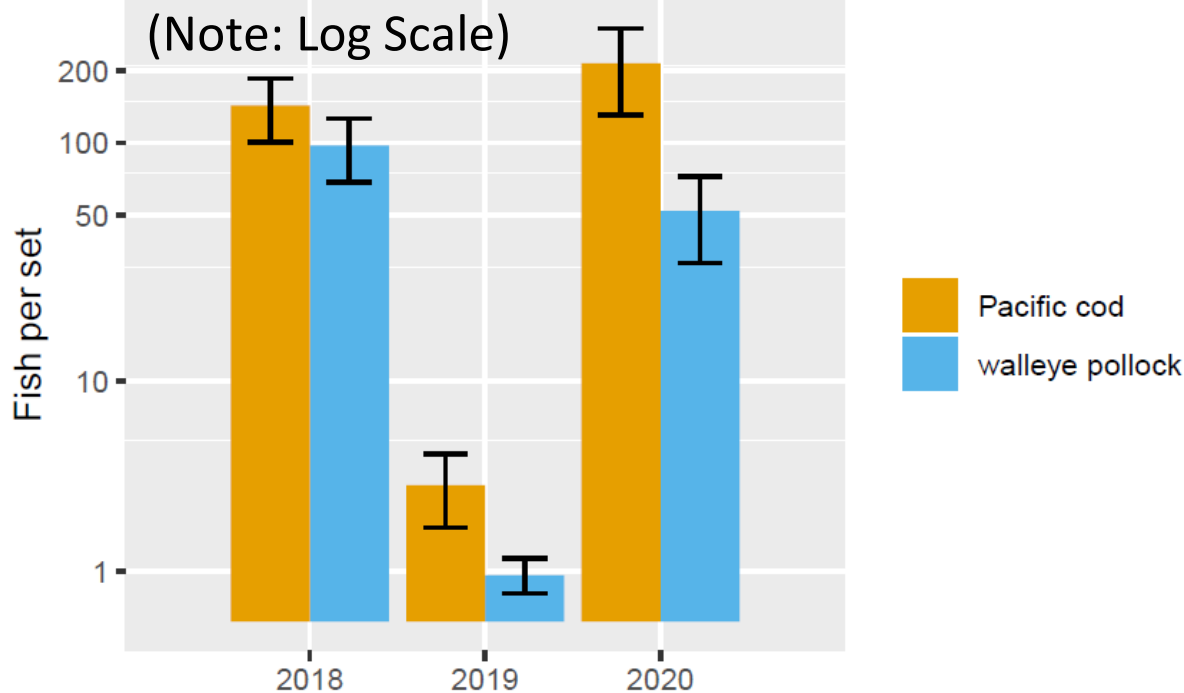
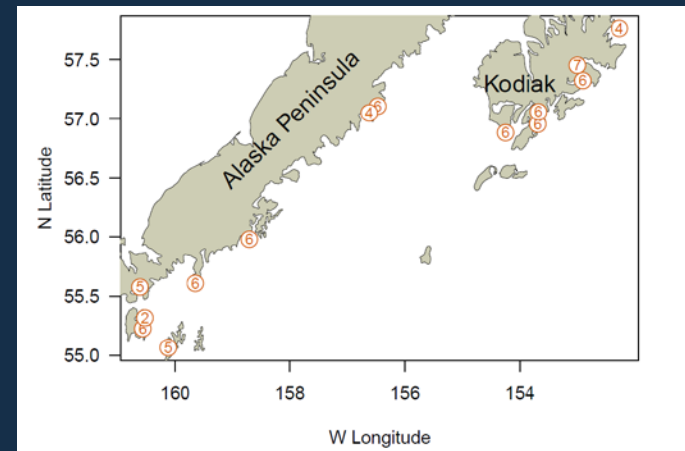
Kodiak: Age-0 pollock



- Survey has captured strong year-classes of pollock.
- 2020 CPUE similar to 2012, but lower than 2017 and 2018.



Expanded WGOA beach seine survey



High catches of YOY cod and pollock throughout the sampling region. Similar to 2018.

Additional sampling for body condition, diets, otolith microchemistry, daily growth, hatch timing, genetics.

Gulf of Alaska:

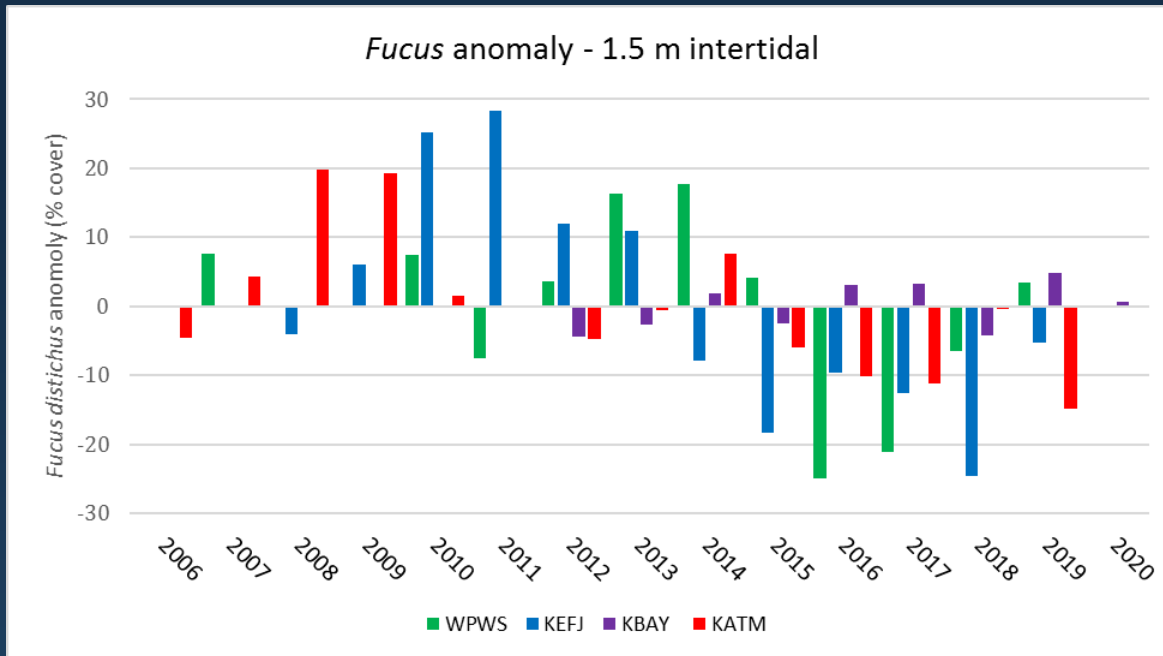
Gulf Watch Alaska and N. GOA LTER
2020

Contact: Rob Suryan



Nearshore Habitats

- Macroalgal cover appears still reduced in 2020



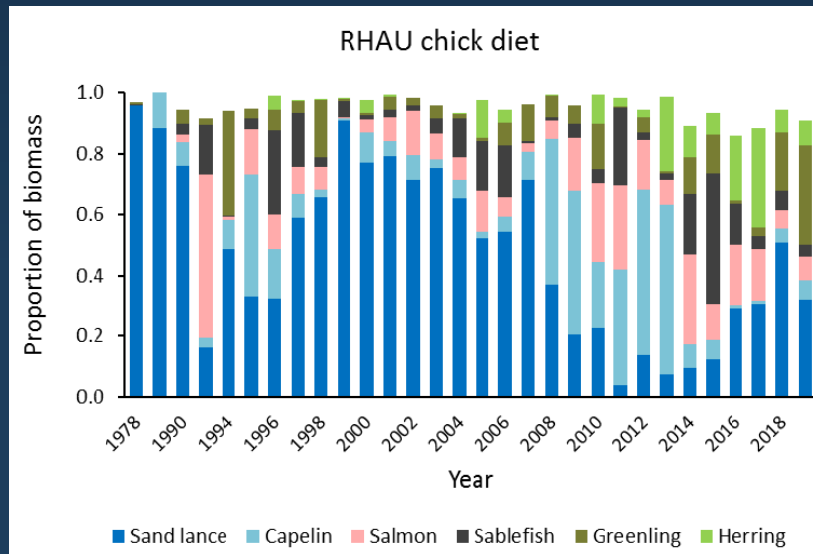
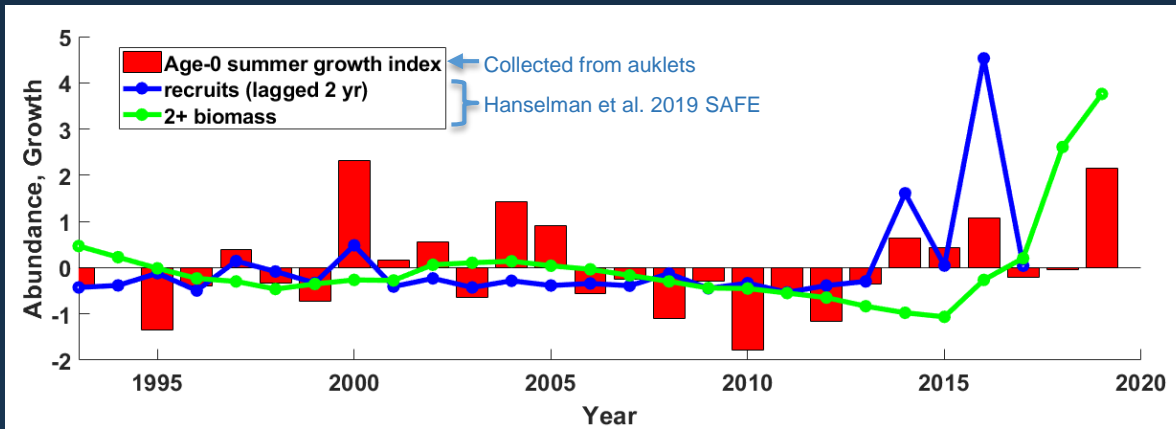
W. Prince William Sound (WPWS) , Kenai Peninsula (KEFJ), Kachemak Bay (KBAY), Alaska Peninsula, (Katmai; KATM) - **Preliminary data for KBAY only in 2020





Prey

- ↑ age-0 sablefish growth in warm years
- ↓ capelin biomass in warm years – still no return post heatwave



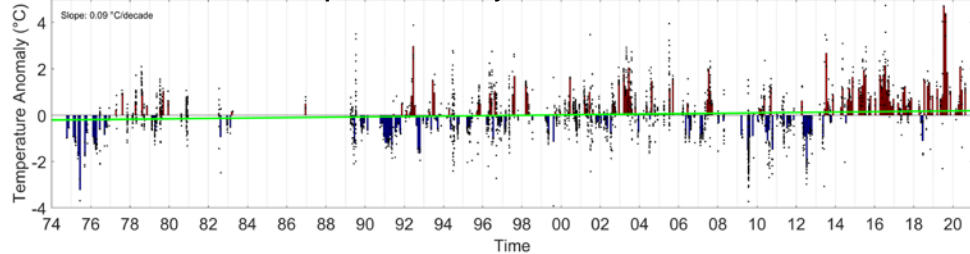


Environmental Drivers

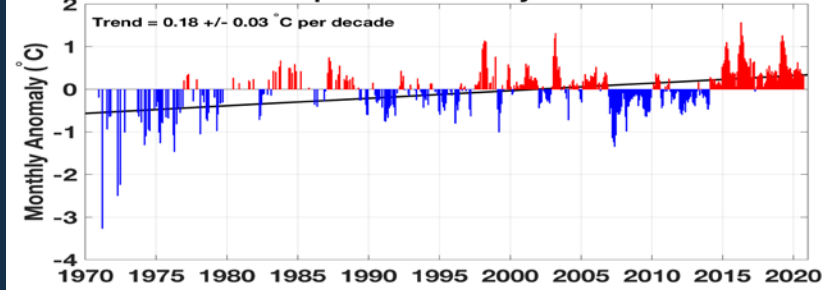


Prince William Sound & GAK1 – 50 year monthly time series

PWS Temperature Anomaly: Surface

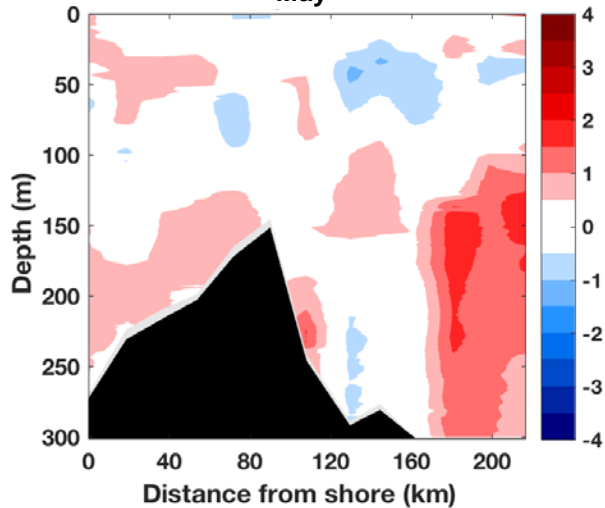


GAK1 Temperature Anomaly: 200 to 250 m.

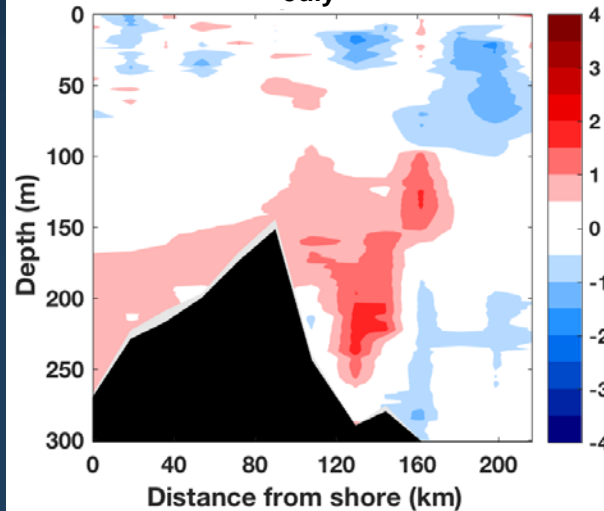


Seward Line 2020 – cross shelf transect temperature anomaly profile

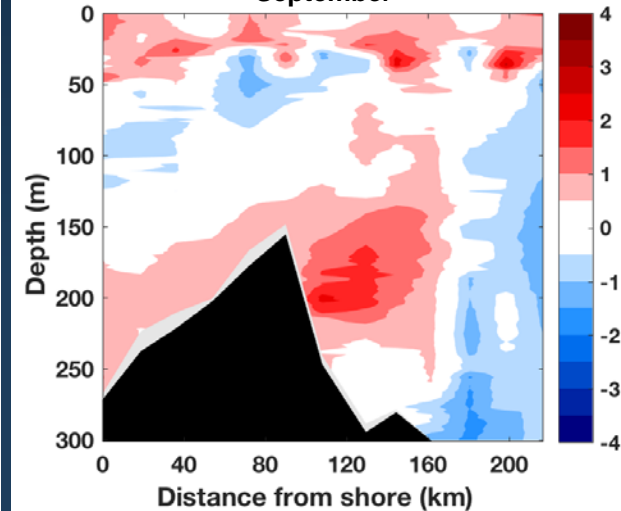
May



July



September



Eastern Gulf of Alaska

Southeast Coastal Monitoring 2020

Contact: Andrew Gray

1997-2020 SECM survey

Oceanographic Indices

(temperature, chlorophyll, & zooplankton)

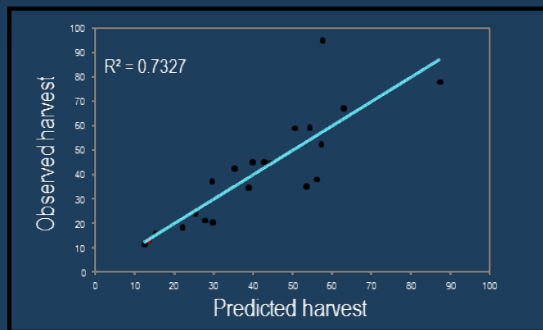


Surface Trawl Catch Data

(distribution, abundance, origin)

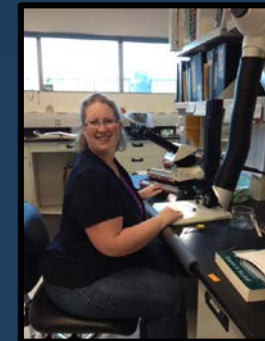


SEAK Pink Salmon Harvest Forecast



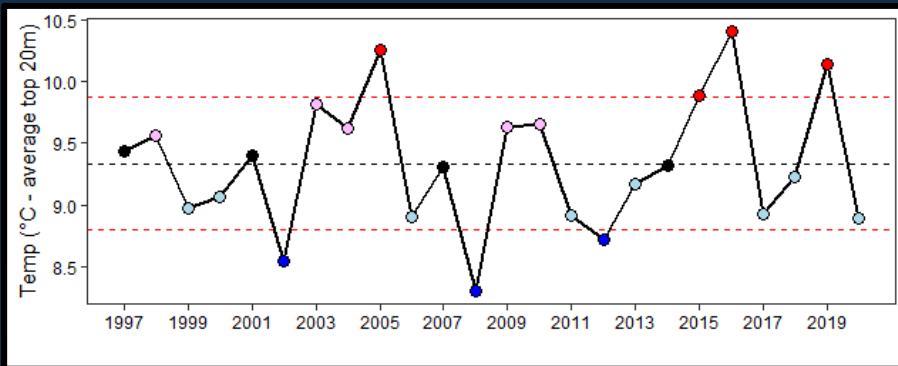
Salmon Bioenergetics

(growth, diet, and condition)

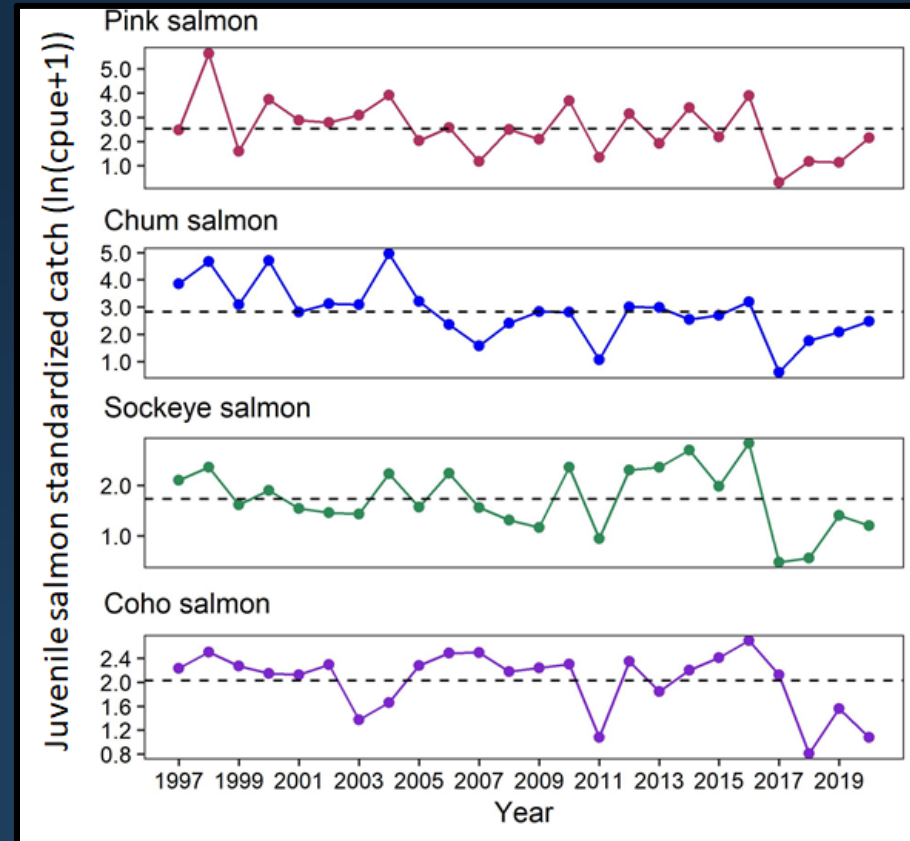


SECM 2020 observations

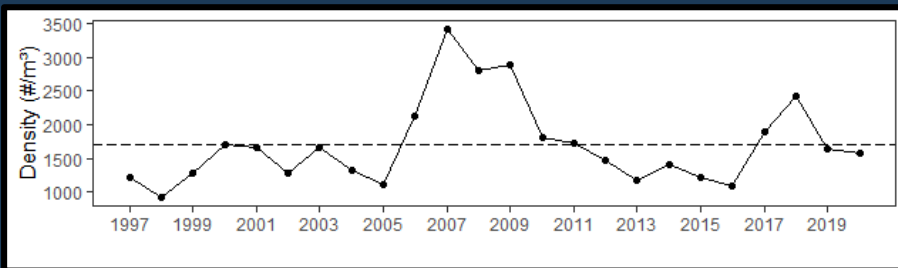
- Temperatures below average



- Juvenile salmon catches below average
- Pink & chum trending up



- Zooplankton density average - similar to 2019



Gulf of Alaska summary

No return of the Blob



- **Water Temperature:** *Inshore* = warm; *Shelf* = spring & summer upper water column near long-term mean, but warm in fall; *Bottom water* over shelf warm summer and fall
- Average **zooplankton densities** for 2020 - but southern (warm) species still prevalent in fall (through 2019 – Seward Line)
- **Prey abundance** appears improved from recent years
- Strong **Pacific cod** age-0 year class
- Average to below average juvenile salmon catches
- Still consider potential **recruitment** carry-over effects of 2019 heatwave

Implications

Near average conditions for feeding and growth

Highlighted RPA projects

Contact : Ed Farley, Janet Duffy-Andersen, Rob Suryan, Tom Hurst

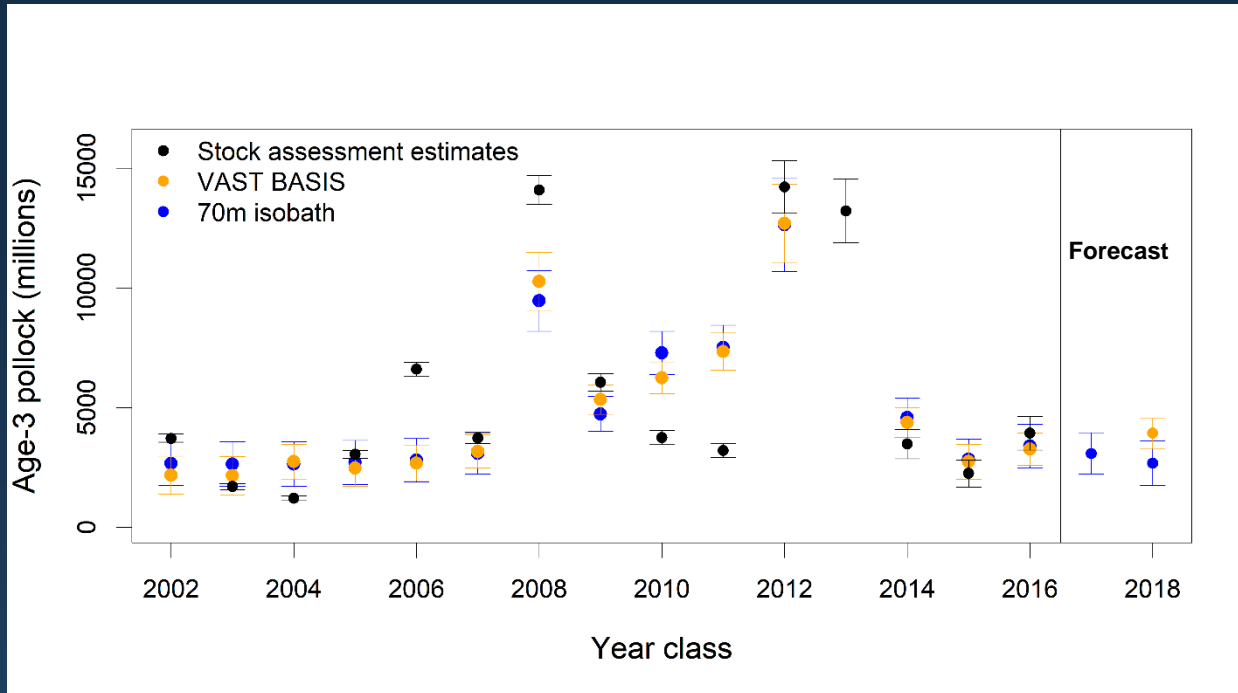
Recruitment models and linking to stock assessment

- AI Machine learning & AI stock assessment project
- NEW 70 m isobath copepod index
- Is prey limited for large copepods
- Estimating phytoplankton from satellite data
- Pop-up floats and Pacific cod spawning habitat
- Pollock spawn timing and survey catchability
- Indicators for ESPs

Machine Learning / Artificial Intel.

- Microsoft AI for Earth grant (C. Stawitz, C Bassin, P. Lynch et al)
- Explore potential for AI methods for recruitment forecasts
- Initial model development improving pink salmon forecasts
 - Particularly helpful for exploring which different env. features (e.g., wgoa v. cgoa v. egoa) most valuable
- Next steps groundfish (AK pollock, West Coast: sablefish, hake, petrale sole)

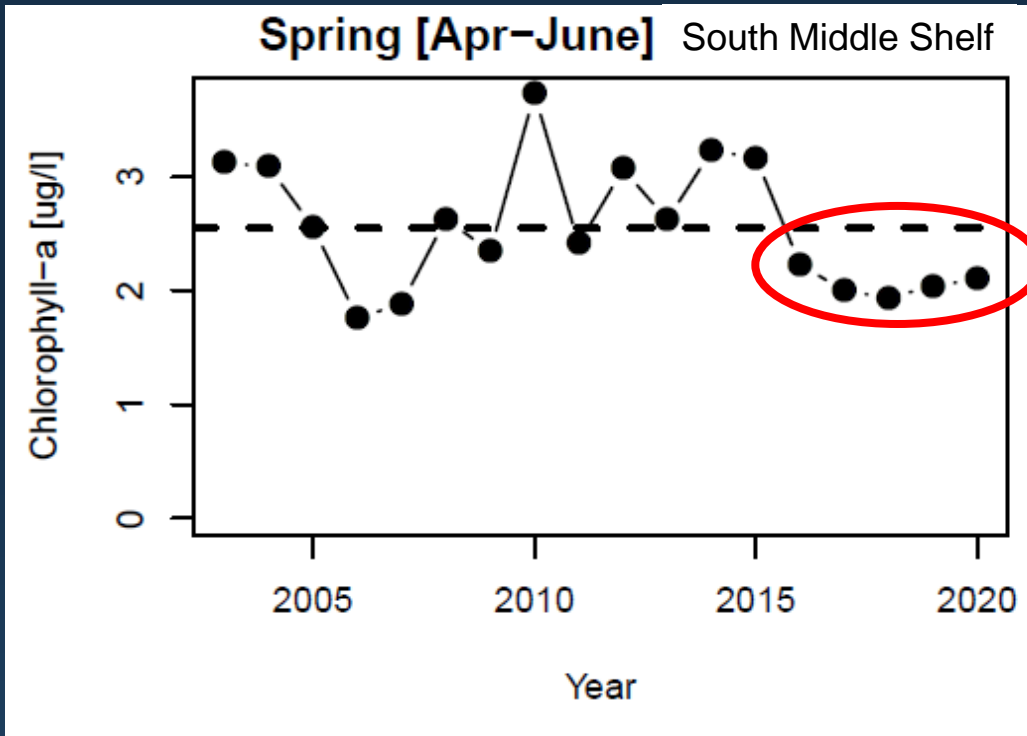
NEW: large copepod index from 70 m isobath survey to predict EBS Pollock recruitment



- Age-0 Pollock eat lipid rich copepods.
- Large copepod densities from BASIS predict recruitment of pollock to age-3.
- **2020**: We explored large copepod densities from the 70 m isobath line and found similar results as BASIS zooplankton data.

Contact: Ellen Yasumiishi, Lisa Eisner, Dave Kimmel

Phytoplankton Biomass ~ satellite chlorophyll *a*

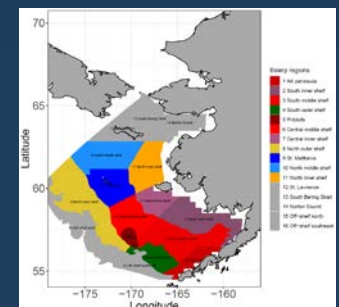


Phytoplankton form the base of the food web (initial source of carbon/energy).

Phyt → Zoo → Fish

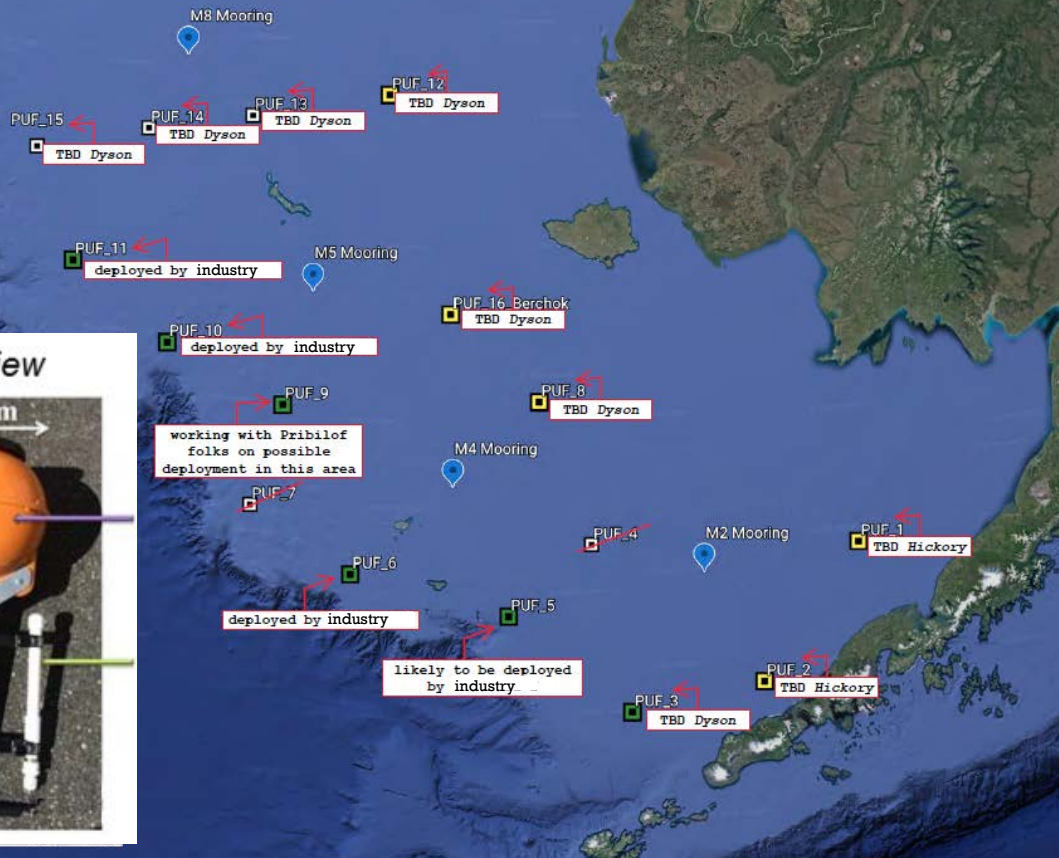
Chla is a proxy for phytoplankton biomass, a balance of phytoplankton growth and loss (e.g. grazing by zooplankton).

Data from the red areas:



New project: Pop-up floats and Pacific cod spawning habitat

2020 collaborative effort to deploy instruments:
Industry, USCG, Dyson



Lack of spatially-resolved bottom temperature measurements, esp in winter/spring.

Pop-up floats (PMEL) record bottom temps for ~1 year, then pop-up to transmit data.

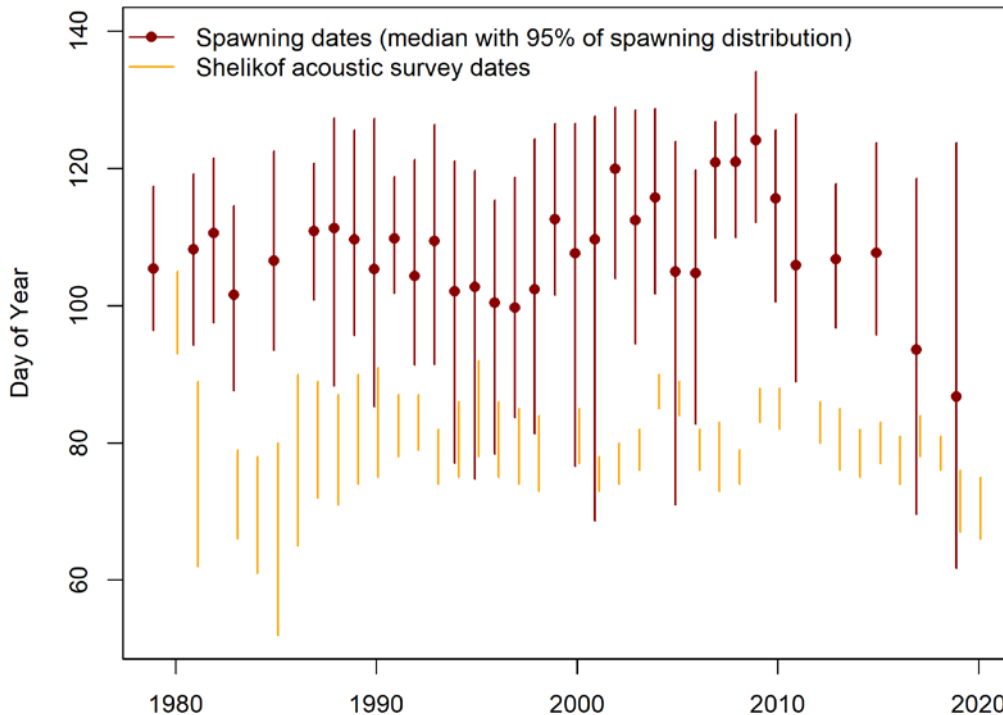
Data will be used to refine ROMS, model spatio-temporal changes in P cod spawning habitat.

Eventually → ESPs, risk table, climate-informed reference points (via CEATTLE)

Contact: Lauren Rogers, Phyllis Stabeno

GOA Pollock spawn timing and availability to the winter acoustic survey

Pollock spawn timing and survey timing (Spawn timing derived from larval ages)



Pollock spawn timing in Shelikof varies by >3 weeks and depends on temperature and age of the spawning stock (Rogers and Dougherty 2019)

Spawn timing may affect availability of pollock to the MACE winter acoustic survey.

Currently developing indicators of spawn/survey timing mismatch to test as catchability covariates in assessment model.



Acknowledgements

Thank to everyone who helped collect these data (too many to list)

NOAA Contacts:

Ed Farley

Rob Suryan

Janet Duffy-Anderson

Ben Laurel

Mike Litzow

Tom Hurst

Discussion – Future RPA updates

- What is most useful for the Plan Team to see/hear from the RPA at September meetings
 - Are survey updates useful?
 - Are science updates useful?
 - Indicator development
 - Ecosystem science with relevance to assessments/management
 - Process studies