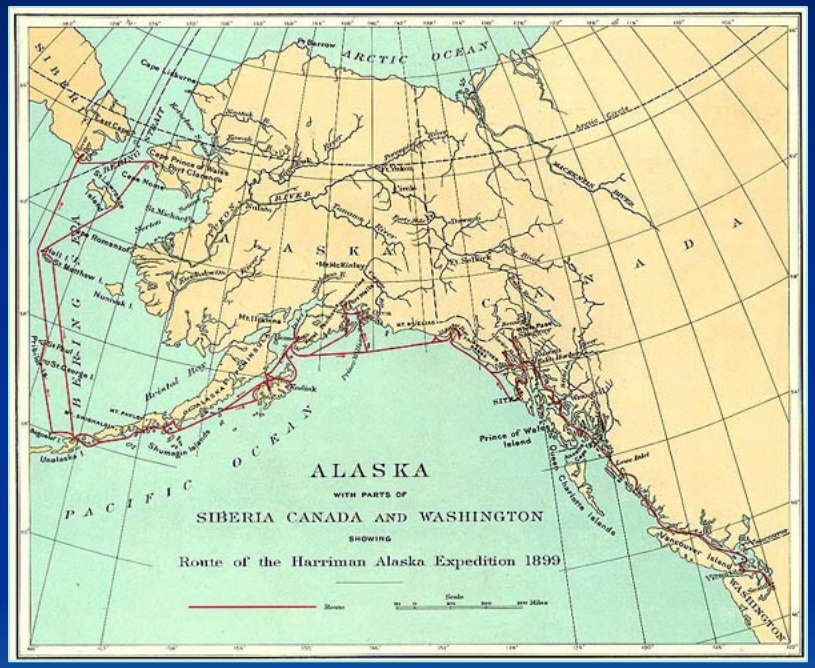
The Gulf of Alaska in 2011: the view from GOAIERP



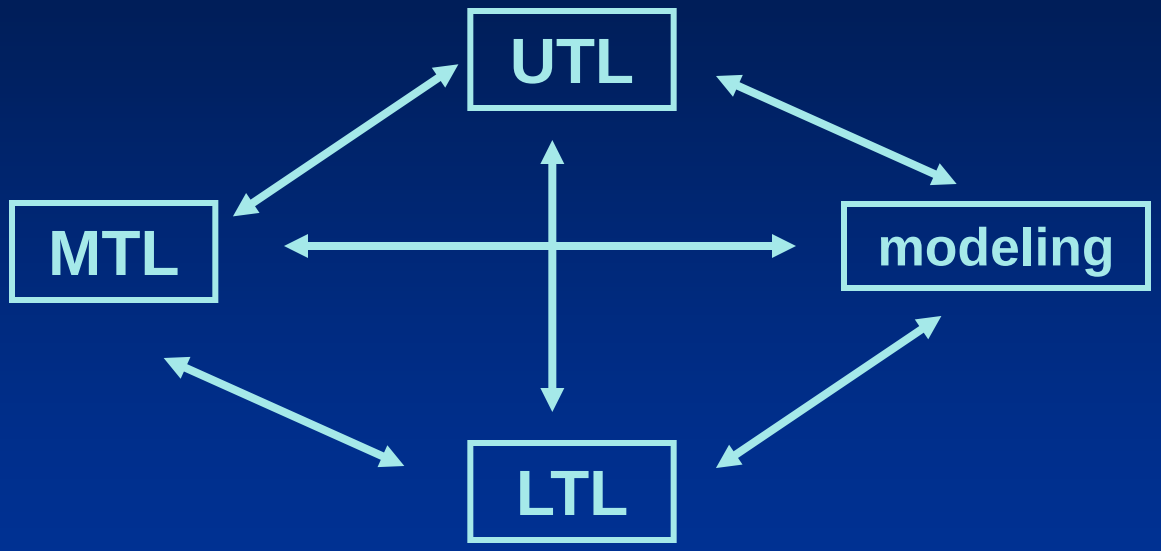
Olav A. Ormseth, NMFS/AFSC

Alaska Marine Science Symposium 2013

overview

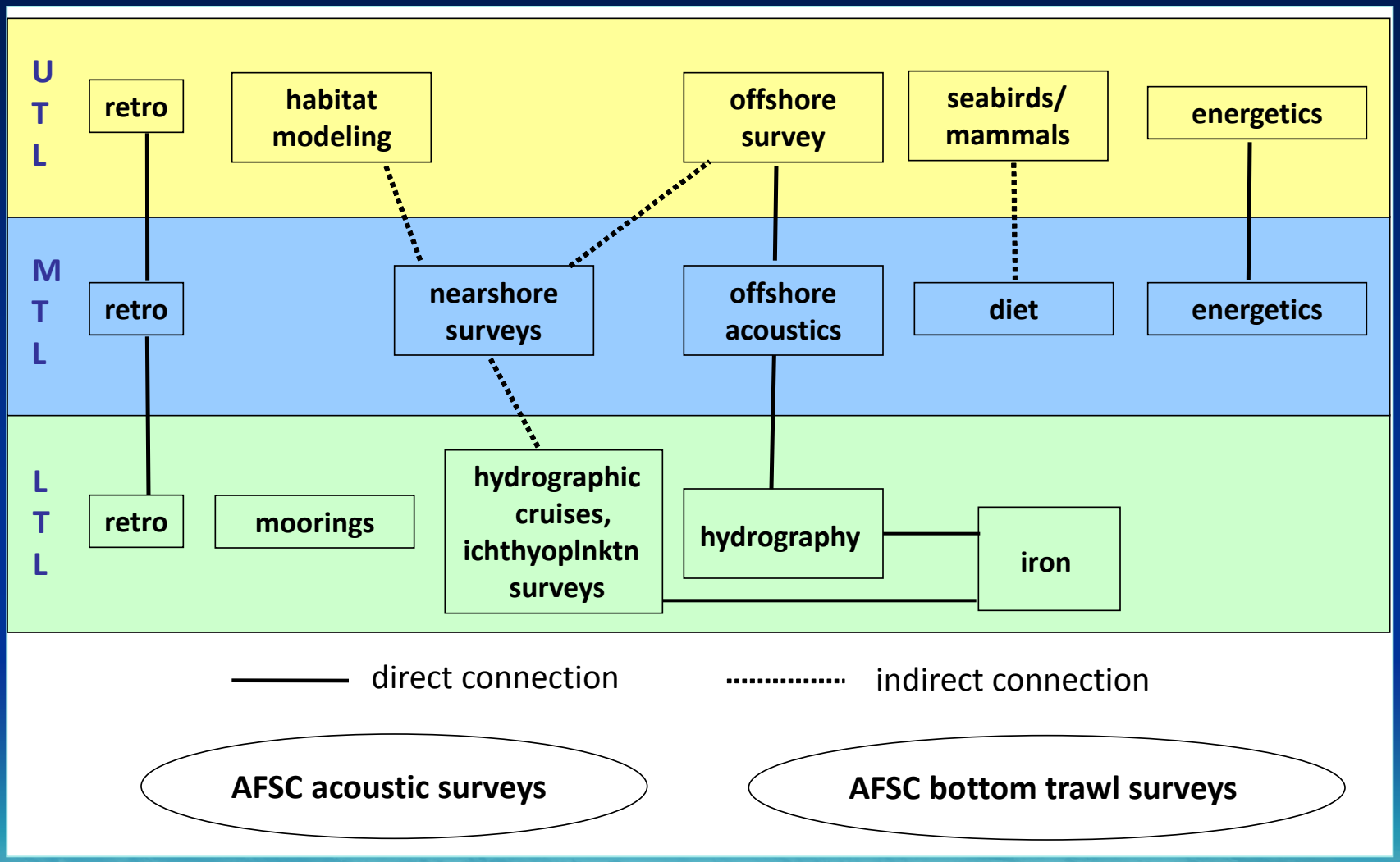
- GOAIERP concepts and structure
- sampling designs
- 2011: anomalous year?
- a smattering of results
- parting thoughts

GOAIERP structure



- duration 2010-2015
- main field years 2011 & 2013
- limited fieldwork 2010 & 2012
- hopes for limited long-term monitoring

observations

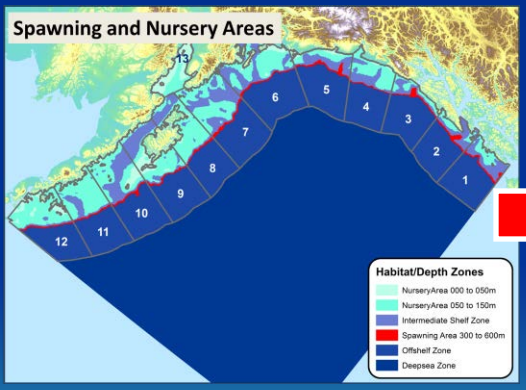


modeling overview

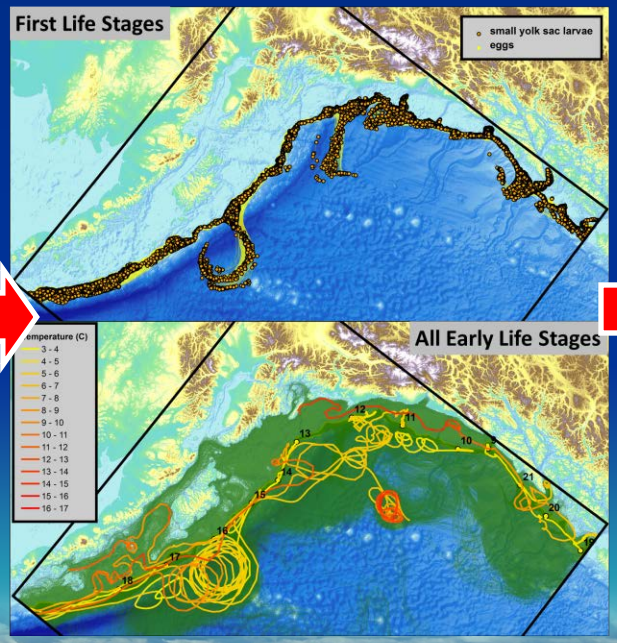
H1. Recruitment primarily depends on connectivity between spawning and recruitment sites.

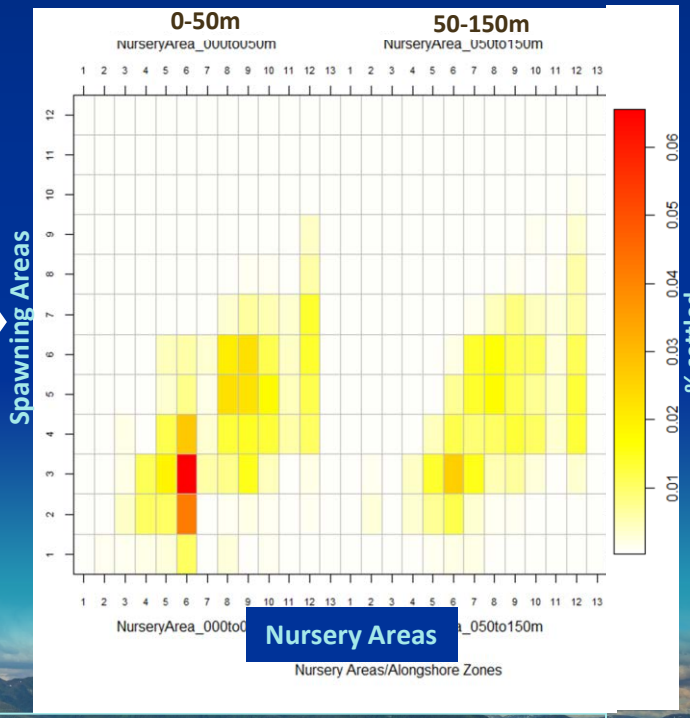
H2. Recruitment secondarily depends on biological and physical conditions encountered during transport of young fish.

Individual Based Models (IBMs) of target groundfish coupled to physical and lower trophic level models.



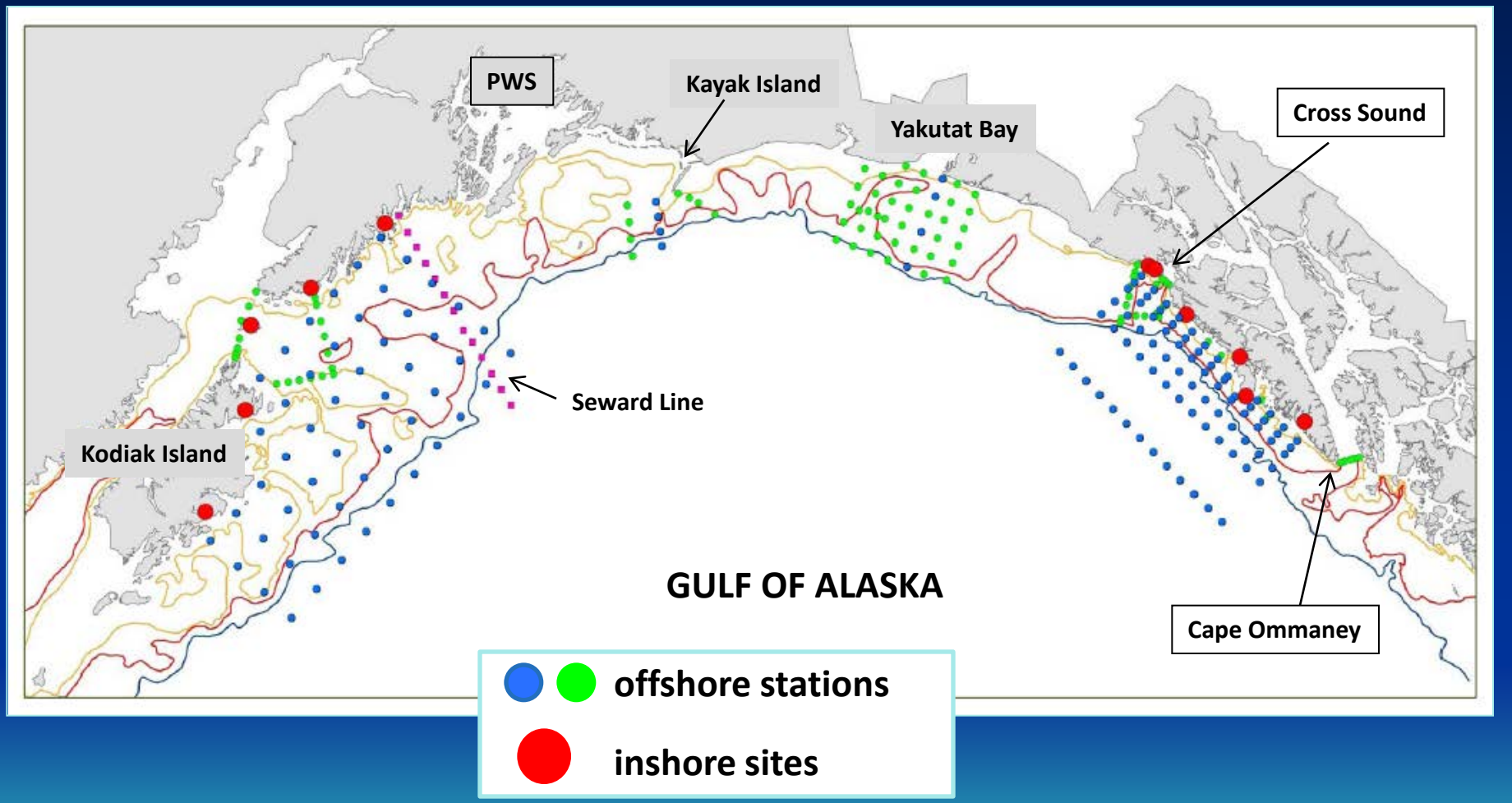
example for arrowtooth flounder



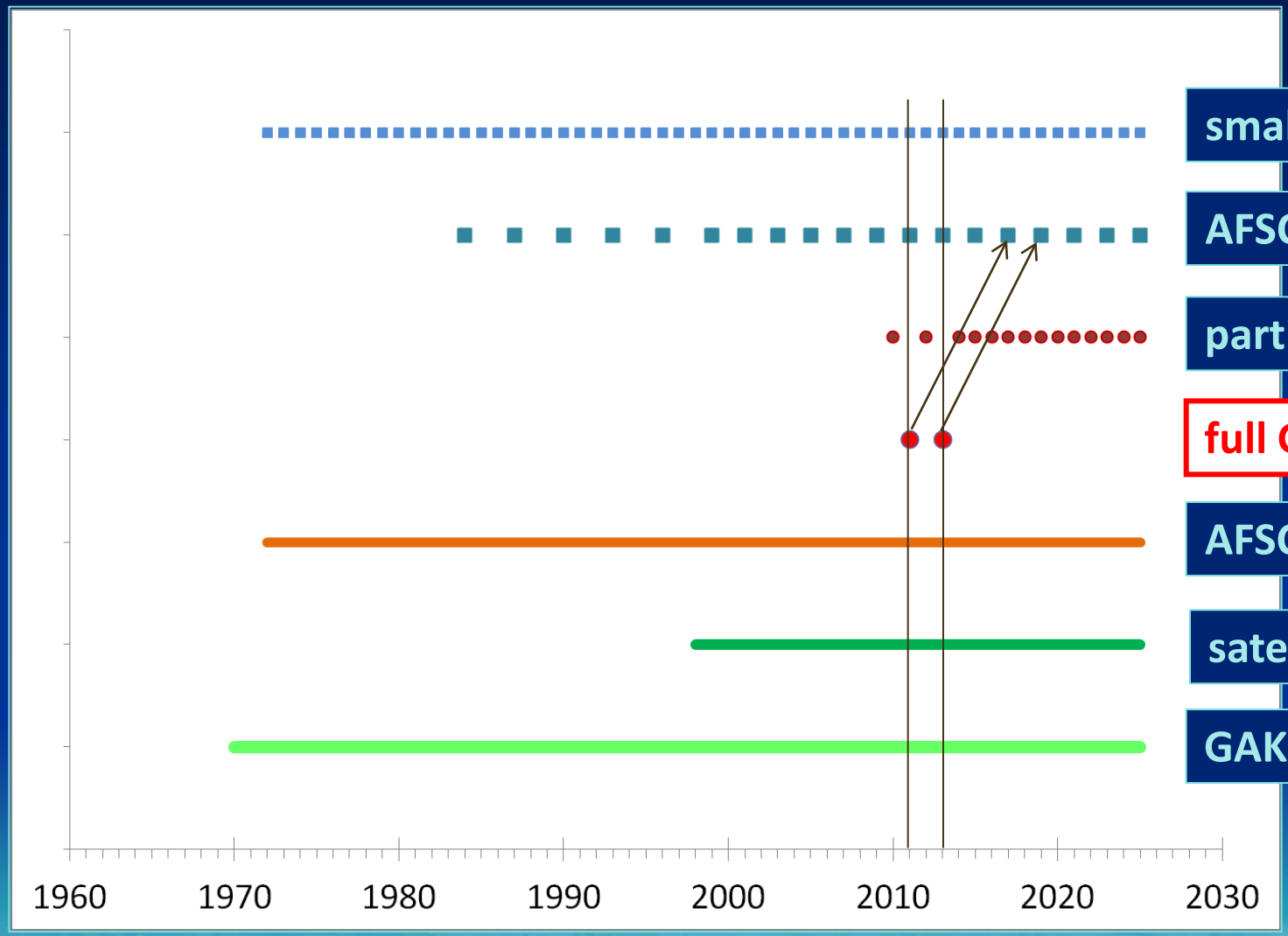


G. Gibson, S. Hinckley, W. Stockhausen, C. Parada, K. Coyle, A. Hermann, C. Ladd

the map


PWS
Kayak Island
Yakutat Bay
Cross Sound
Seward Line
Kodiak Island
GULF OF ALASKA
Cape Ommaney
offshore stations
inshore sites

context



small-mesh survey

AFSC trawl survey

partial GOAIERP

full GOAIERP

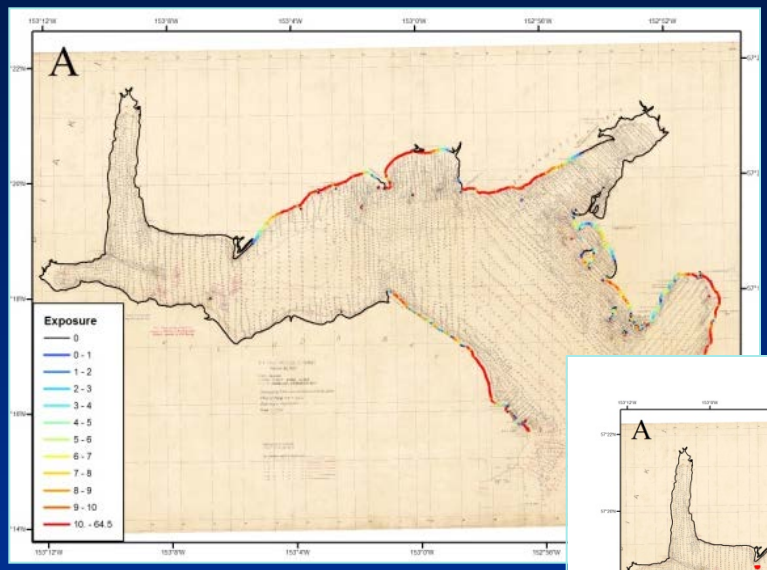
AFSC ichthyoplankton

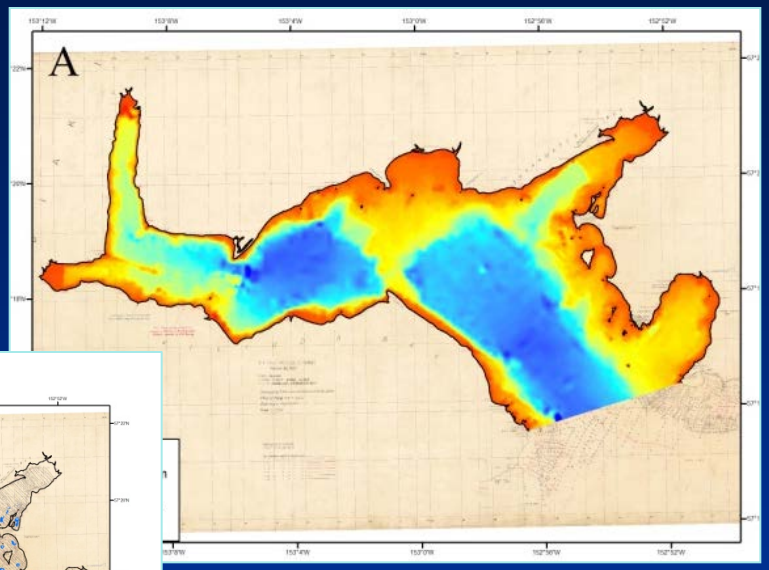
satellite data

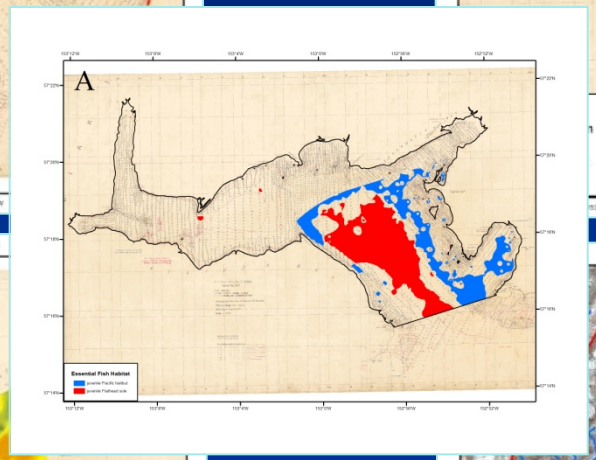
GAK 1

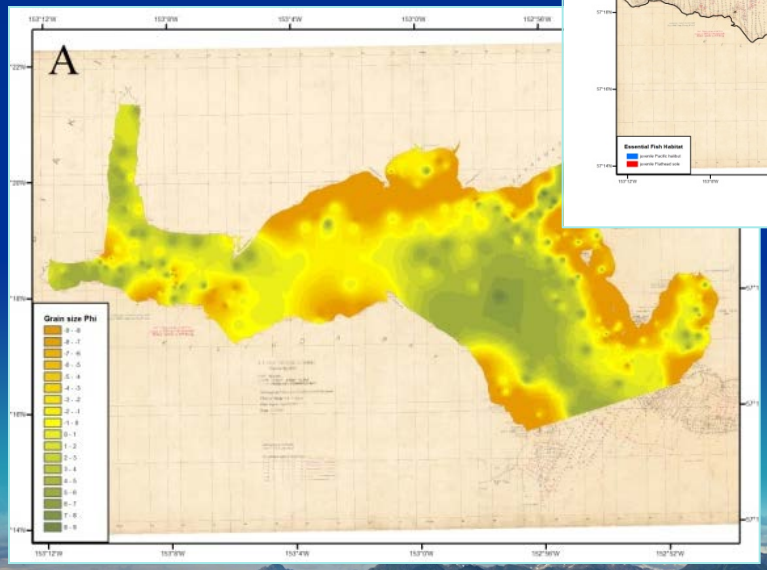
TIME

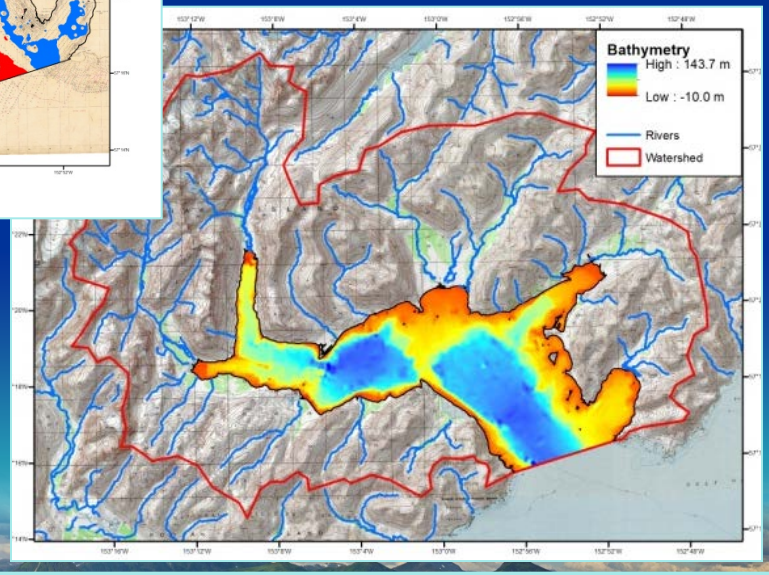
habitat modeling





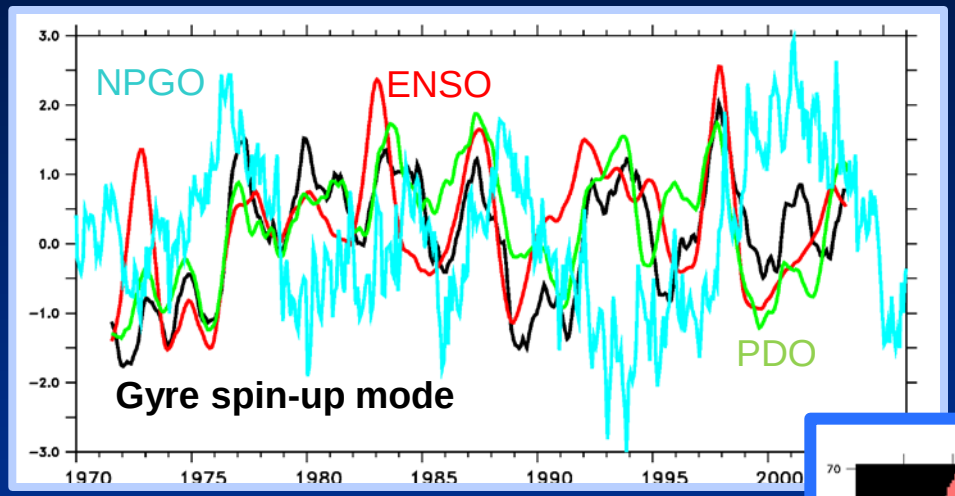






(Zimmerman, Shotwell, Reid, Golden)

modeling - pattern analysis



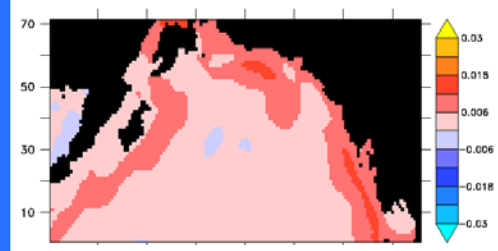
El Niño and PDO are dominant contributors to GOA variability

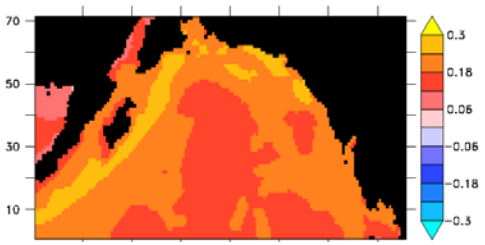
primary pattern relates to "gyre spin-up"

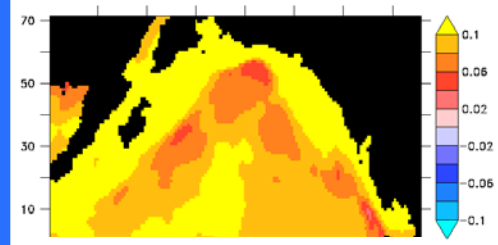
El Niño years correlated with:

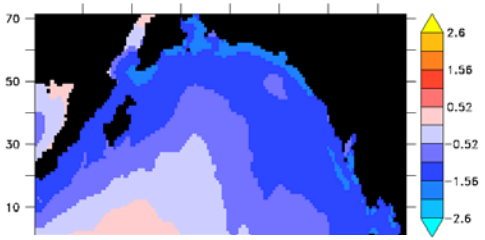
- stronger NW-ward wind stress
- stronger Alaska Gyre
- warmer SST
- deeper mixed layer
- increased coastal SSH

2011 negative ENSO
2013 neutral?


Sea Surface Height

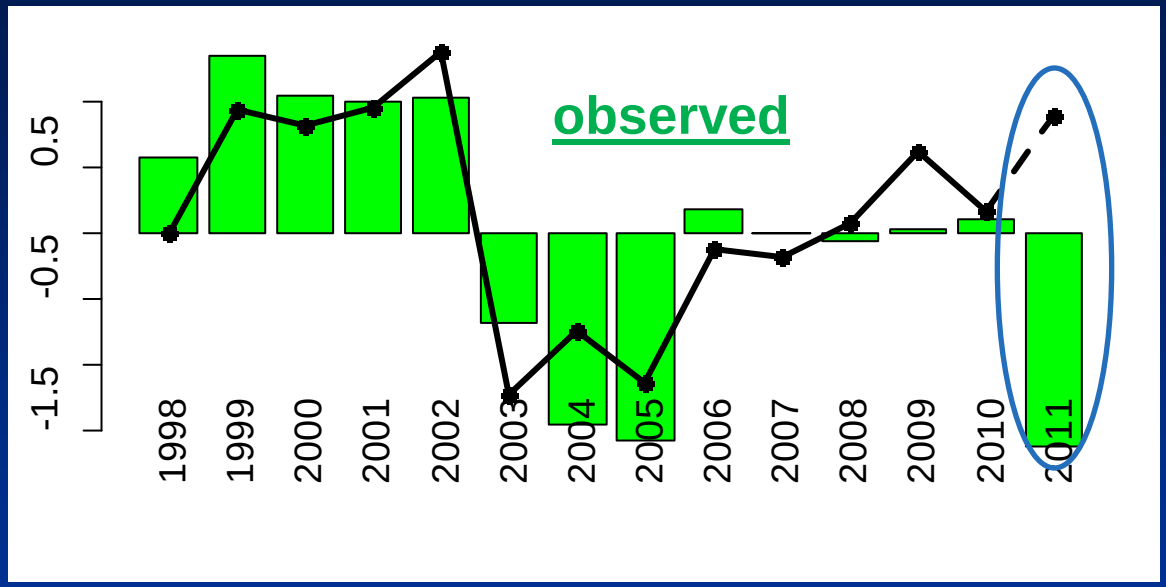

Sea Surface Temp

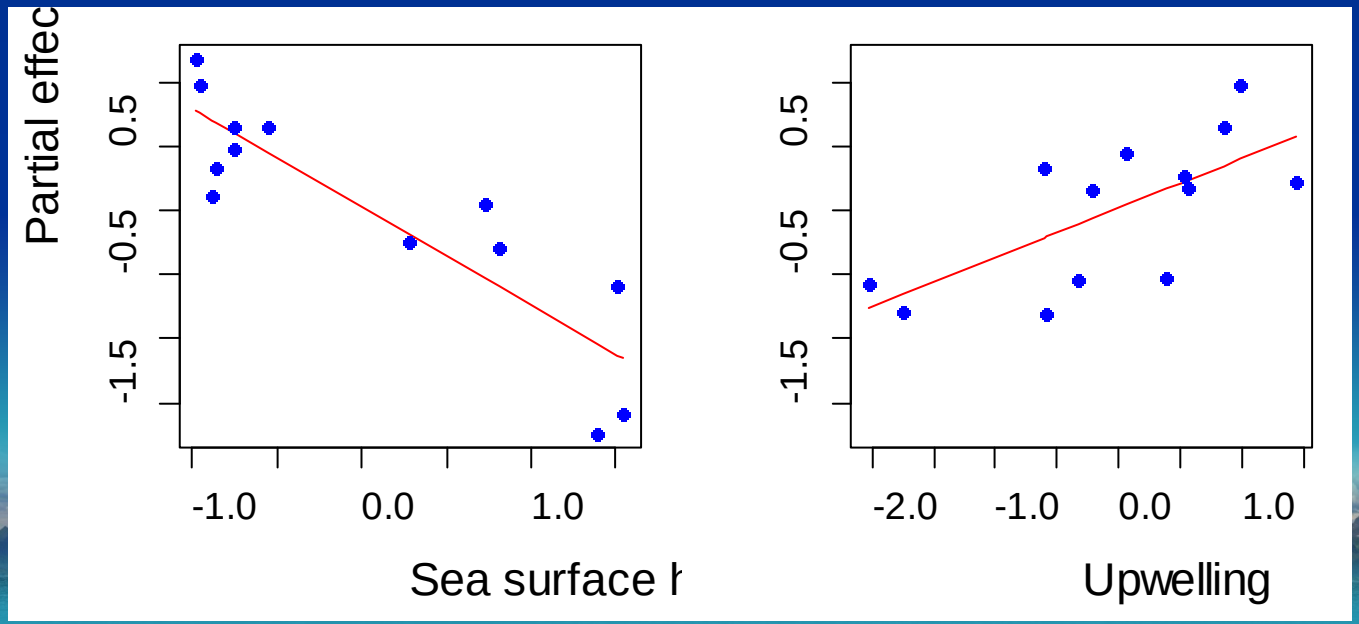

Sea Surface Salt


Mixed Layer Depth

(Hermann, Ladd)

retrospective – satellite chl-*a*

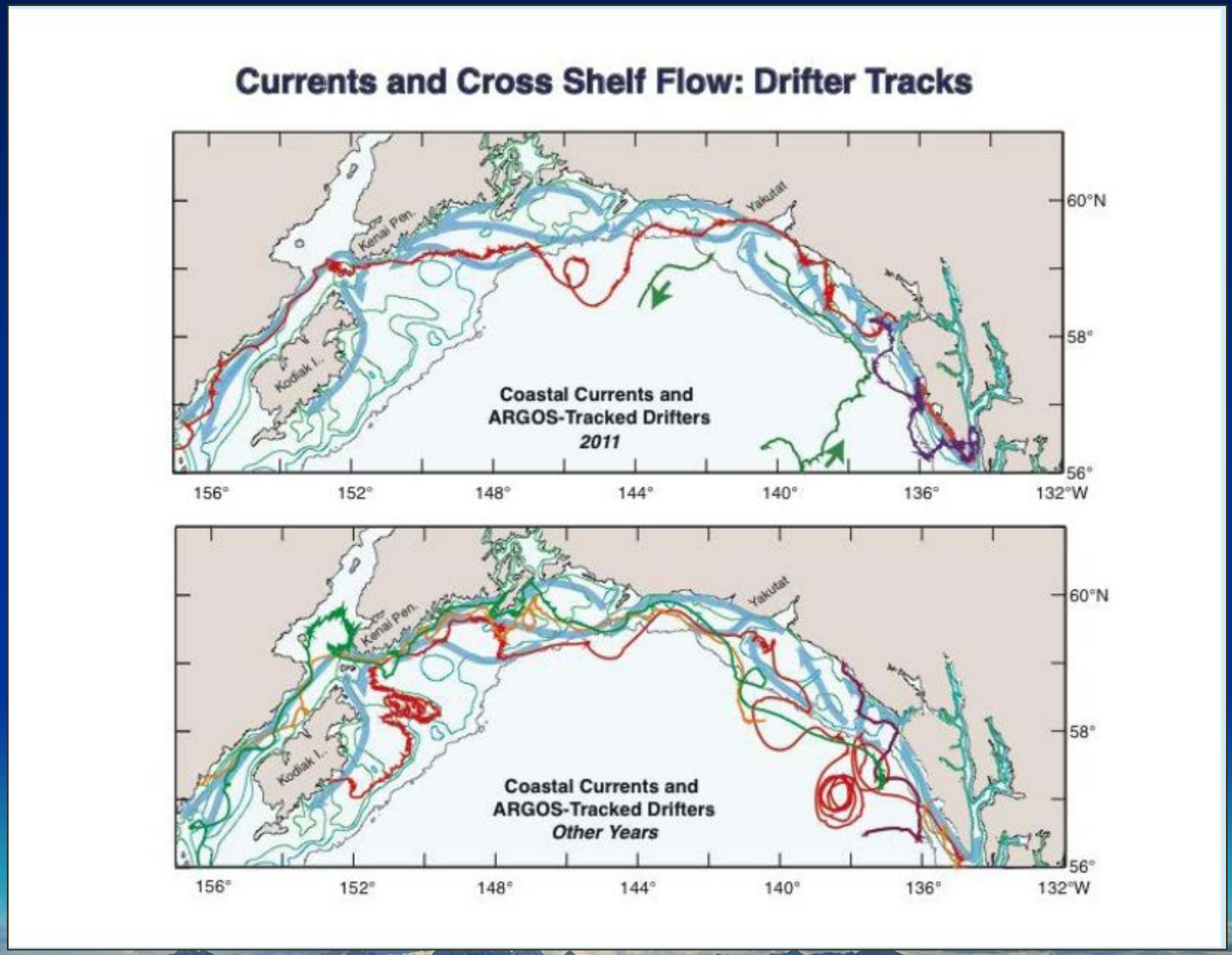




without 2011 outlier:
$R^2 = 0.79$

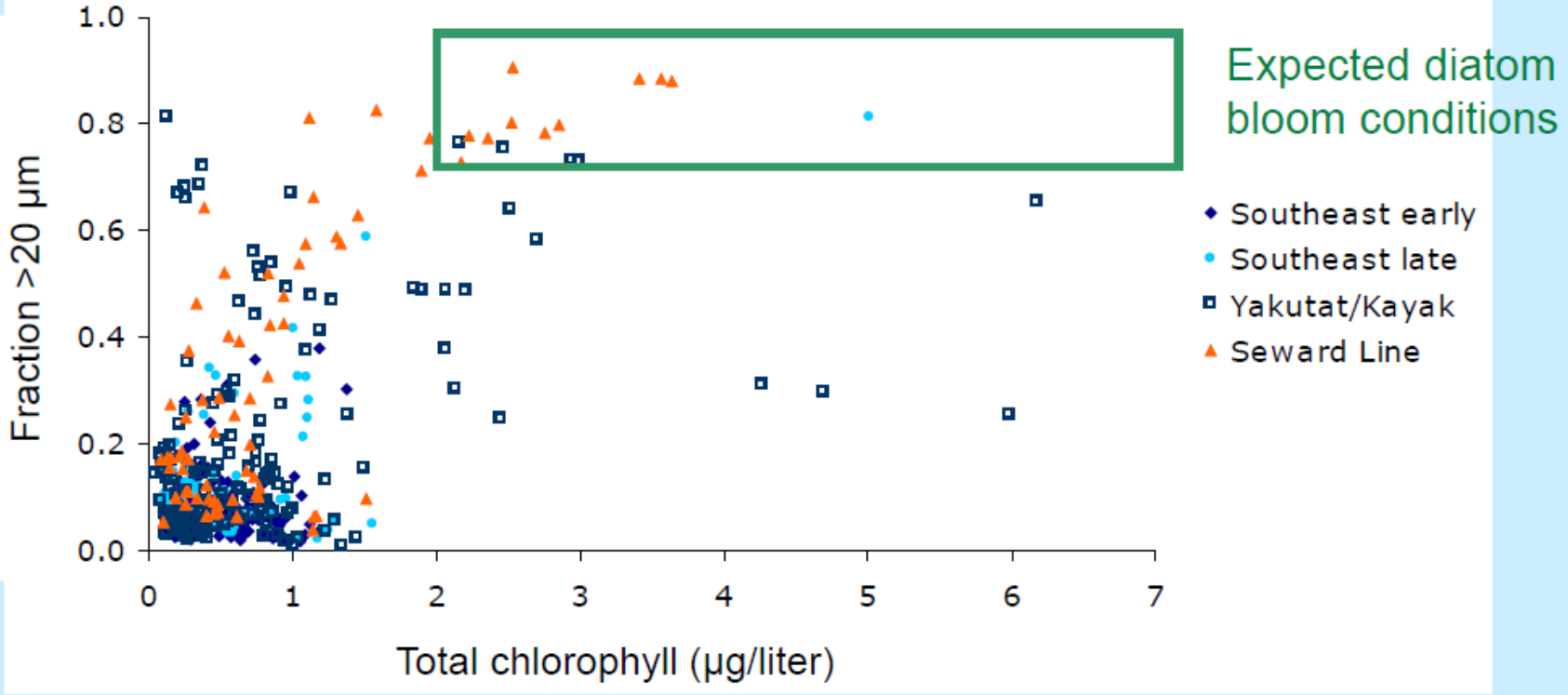
(Waite, Mueter)

2011 oceanography - discontinuous ACC



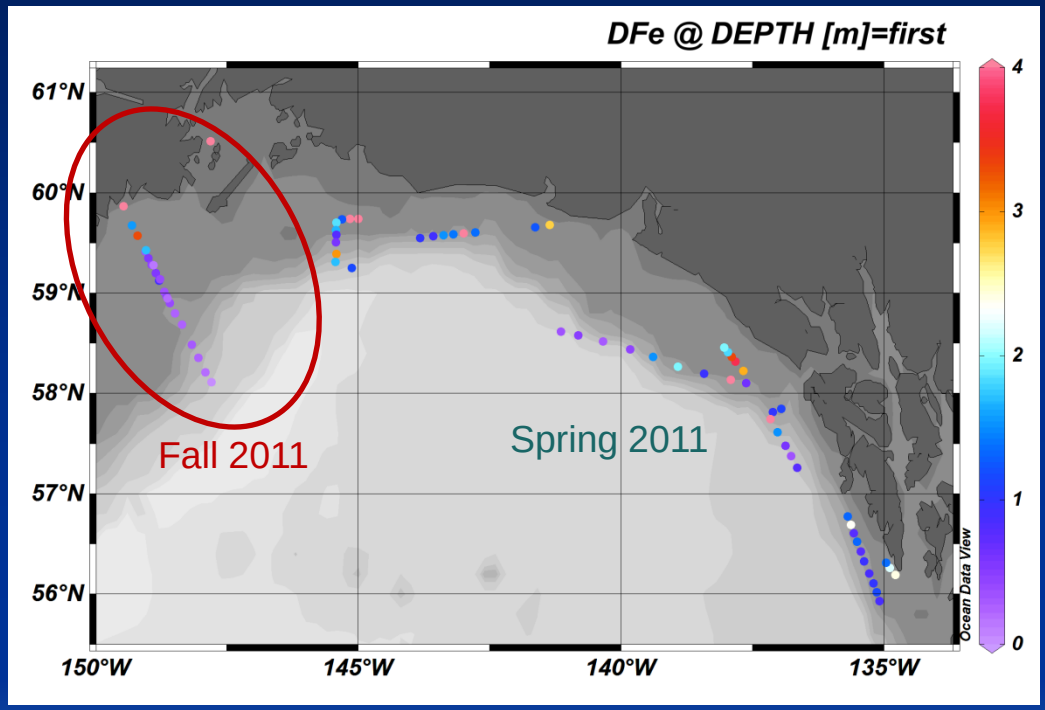
(Stabeno, Kachel)

2011 bloom – the few and the small



(Strom)

Was iron a factor in the lack of a spring diatom bloom?

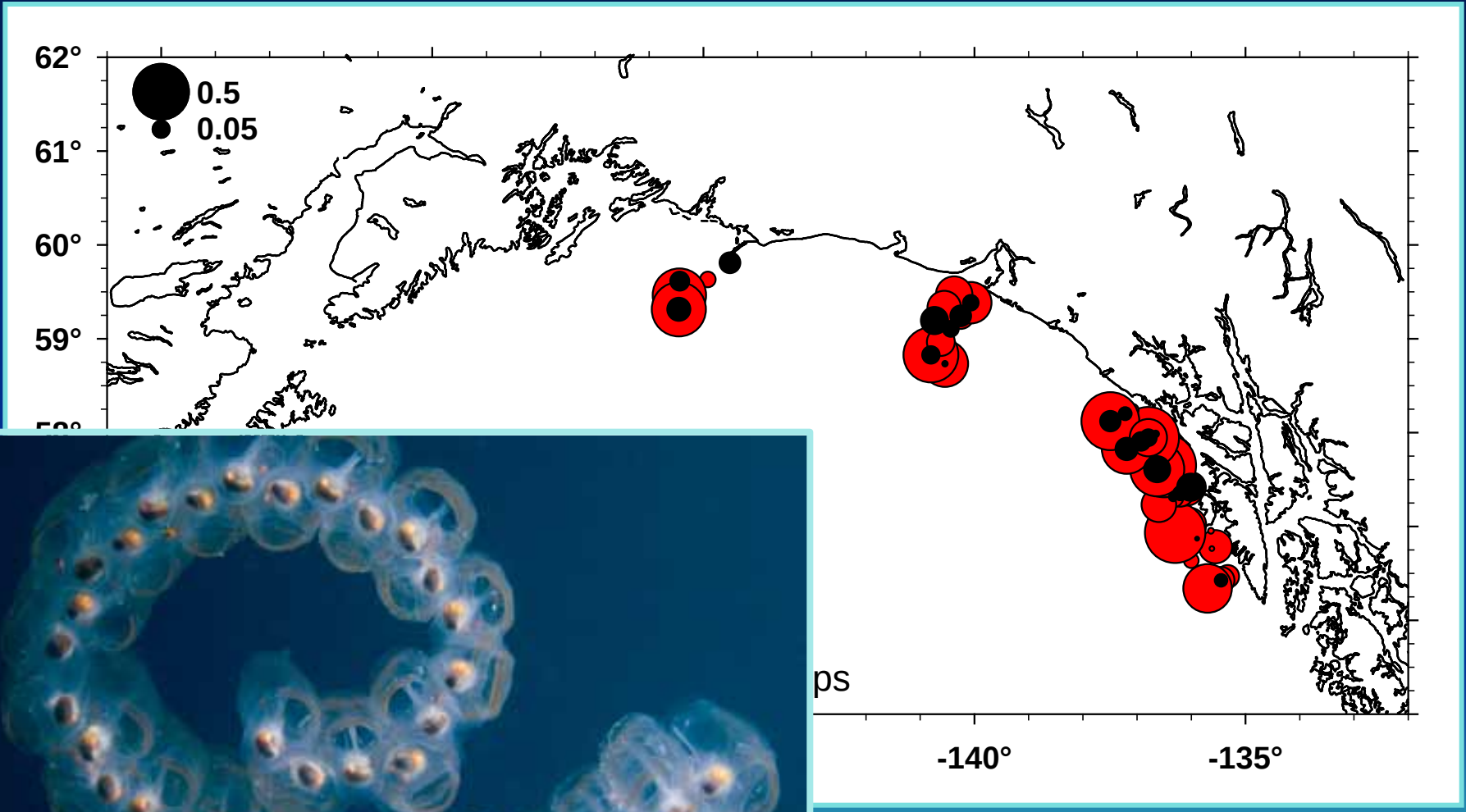


Surface dissolved iron concentrations (nM) in 2011

- iron (Fe) can be a limiting nutrient for phytoplankton
- in seawater dissolved Fe (DFe) is considered bioavailable
- during the spring of 2011, relative to available nitrate the concentration of DFe was not limiting
- during the fall of 2011 DFe was at limiting concentrations offshore along the Seward Line
- DFe was strongly complexed by organic compounds during spring and fall 2011

(Aguilar-Islas)

a 2011 megaplanktonic surprise – salps!



(Hopcroft)

LTL larval surveys 2011

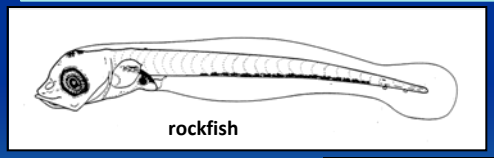
Bongo net

Neuston net

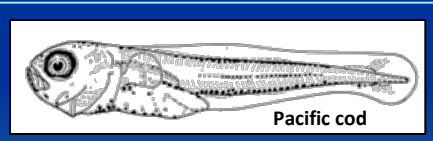
spring cruises

Larvae of all 5 target species collected

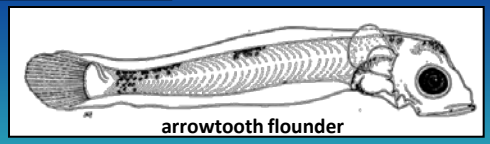
- Rockfish most abundant and most frequently collected
- Sablefish second most frequently collected
  - bongo larvae smaller (6.5–16.5 mm)
  - neuston larvae larger (7.2–19.8 mm)
- Walleye pollock larvae highest abundance in WGOA
  - eggs in all three 3 cruises
- Arrowtooth flounder collected all 3 cruises
- Pacific cod only in WGOA



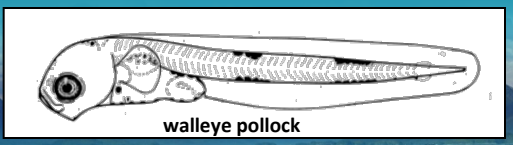
rockfish



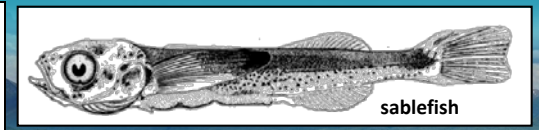
Pacific cod



arrowtooth flounder



walleye pollock



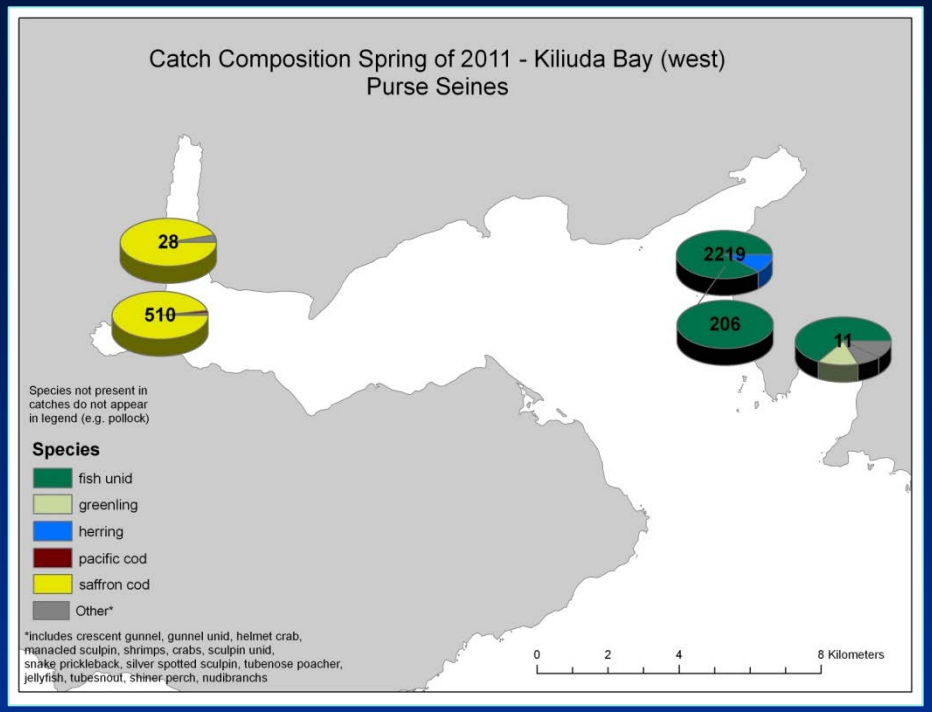
sablefish

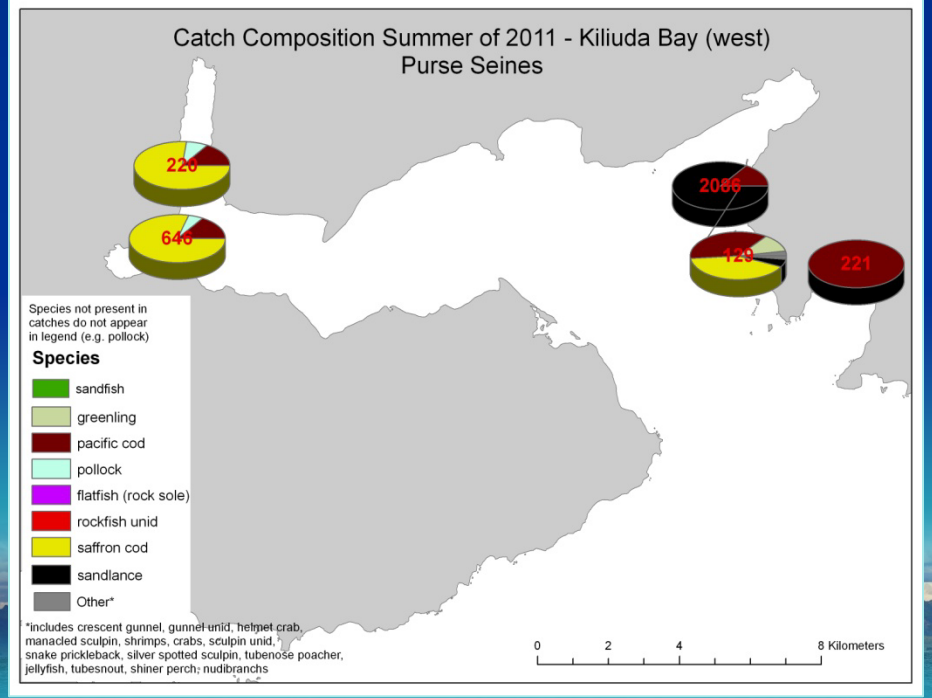
summer cruises

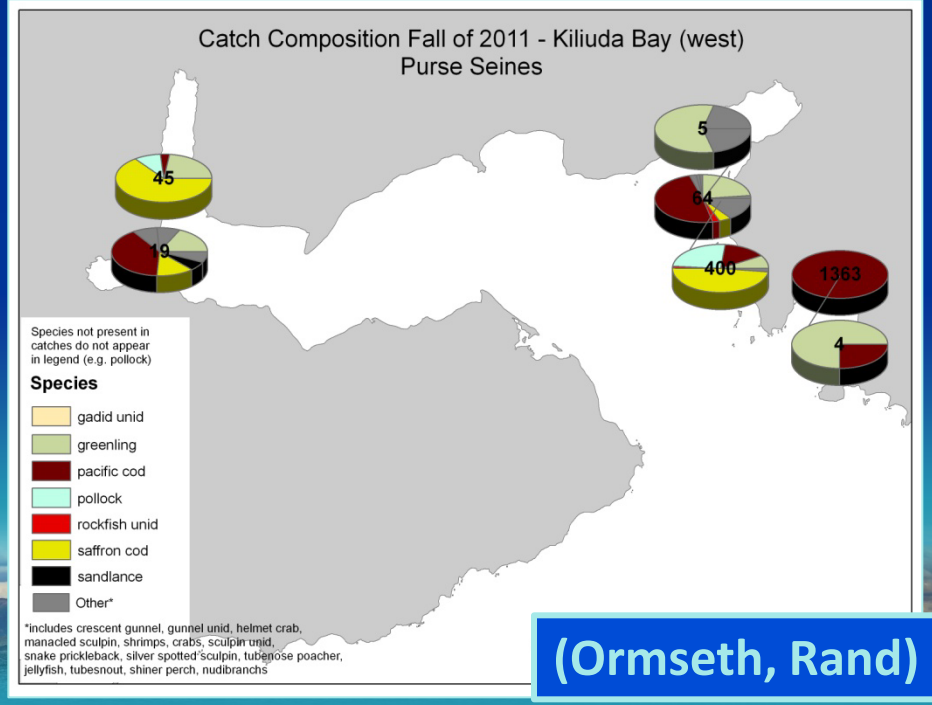
- Only rockfish and sablefish larvae collected with rockfish much more abundant
- Average length of rockfish larvae (3.75 mm, 75%<4.0mm) smaller than in spring (5.78 mm,75%>5.0 mm)

(Matarese, Napp, Doyle)

inshore purse seining Kiliuda Bay 2011

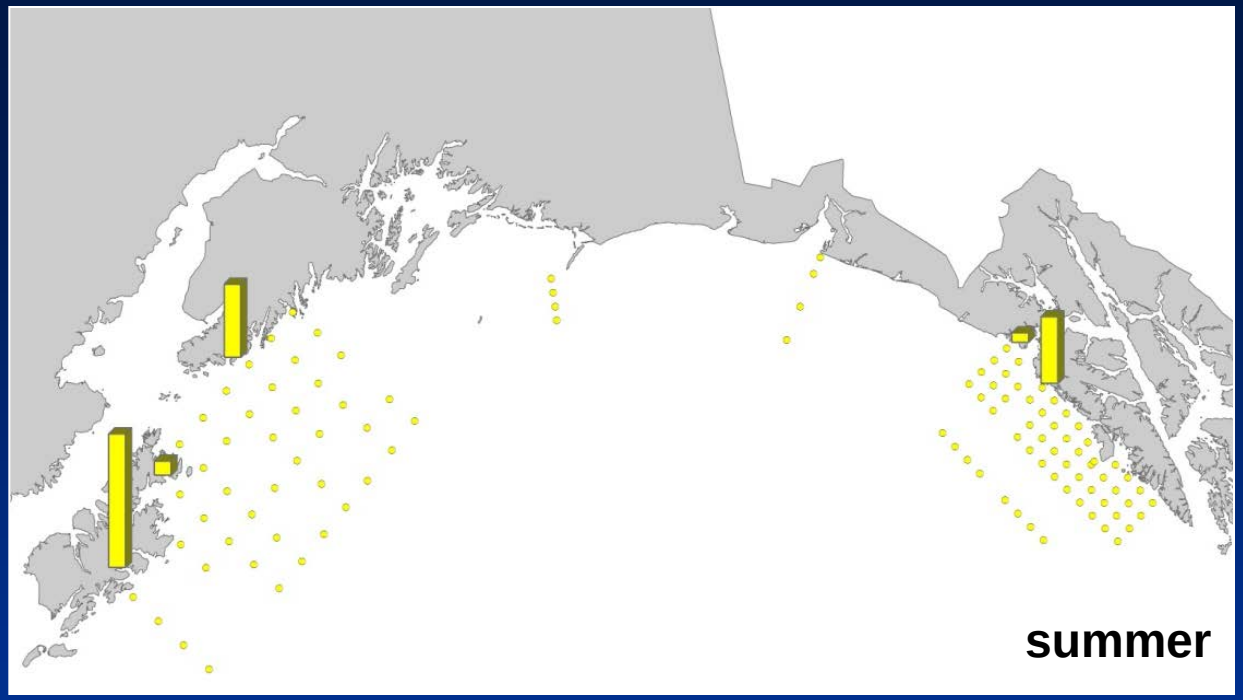




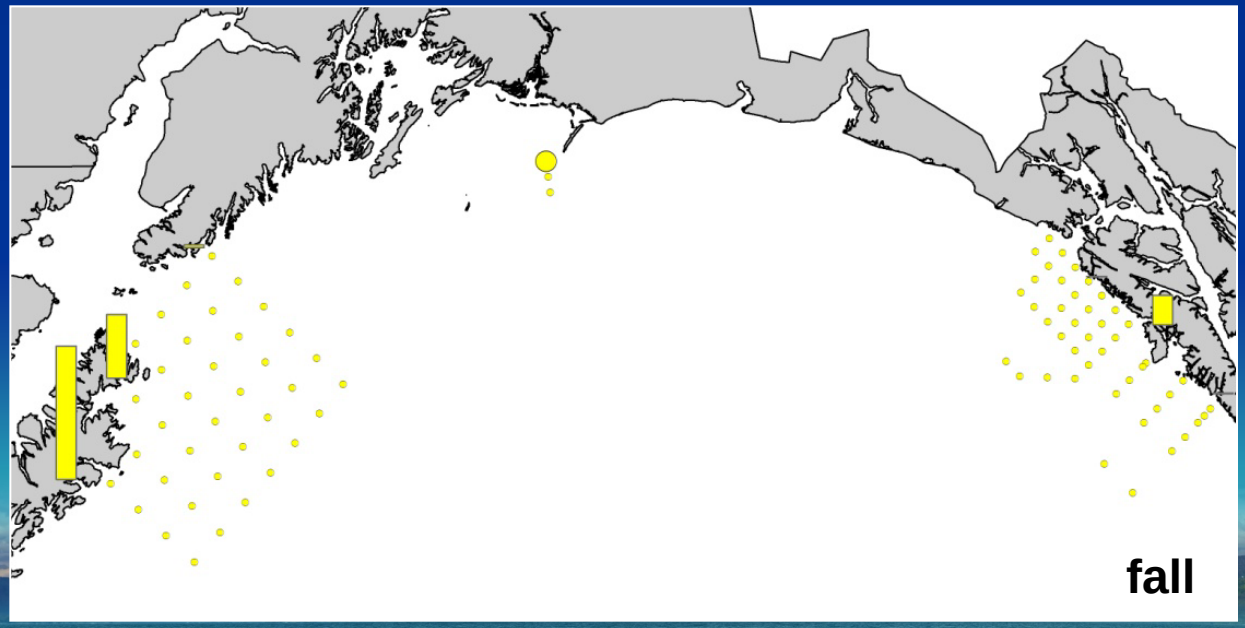


(Ormseth, Rand)

YOY Pacific cod
2011



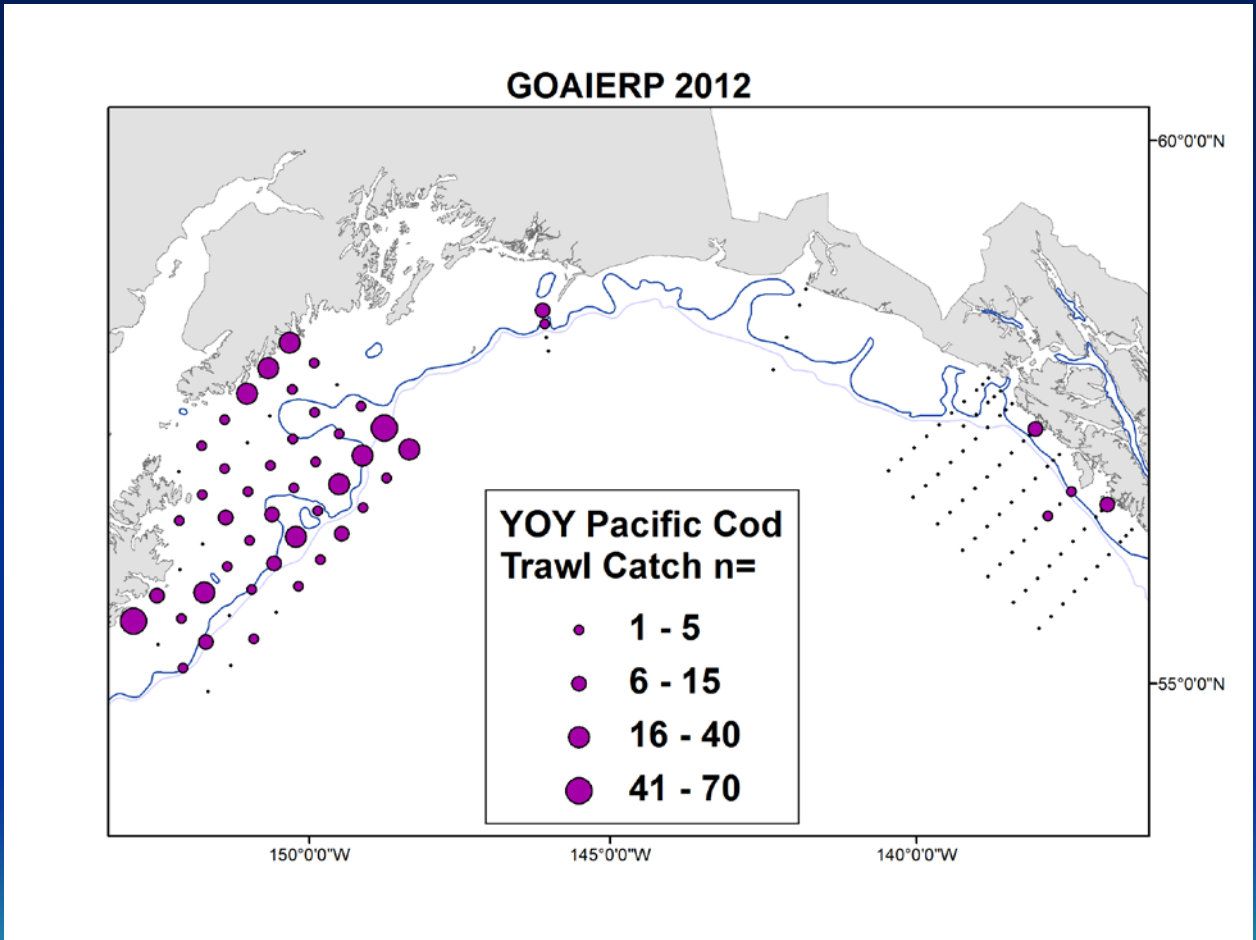
	mean	range
offshr	0	0
inshr	58	9-131



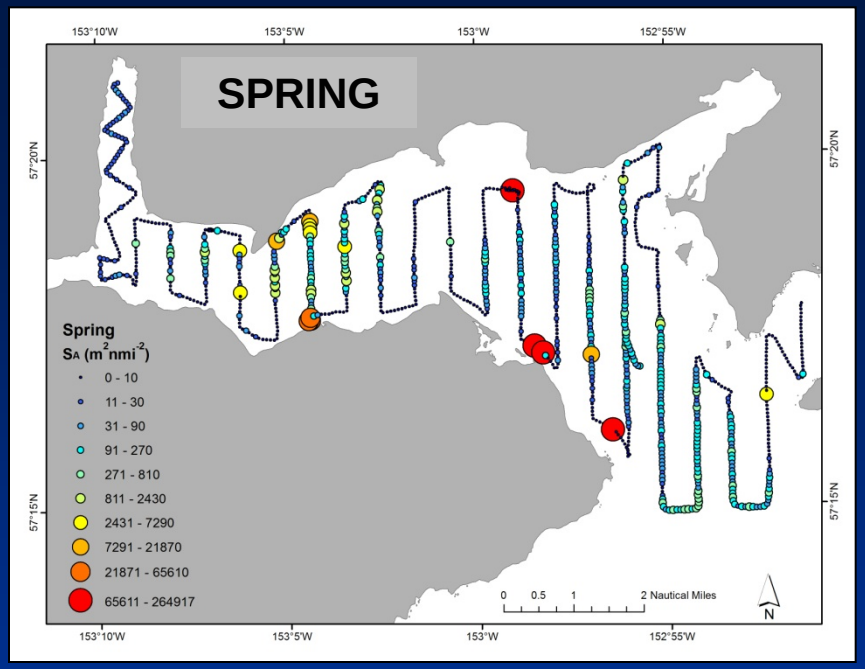
	mean	range
offshr	0	0-1
inshr	70	1-243

(Ormseth, Moss)

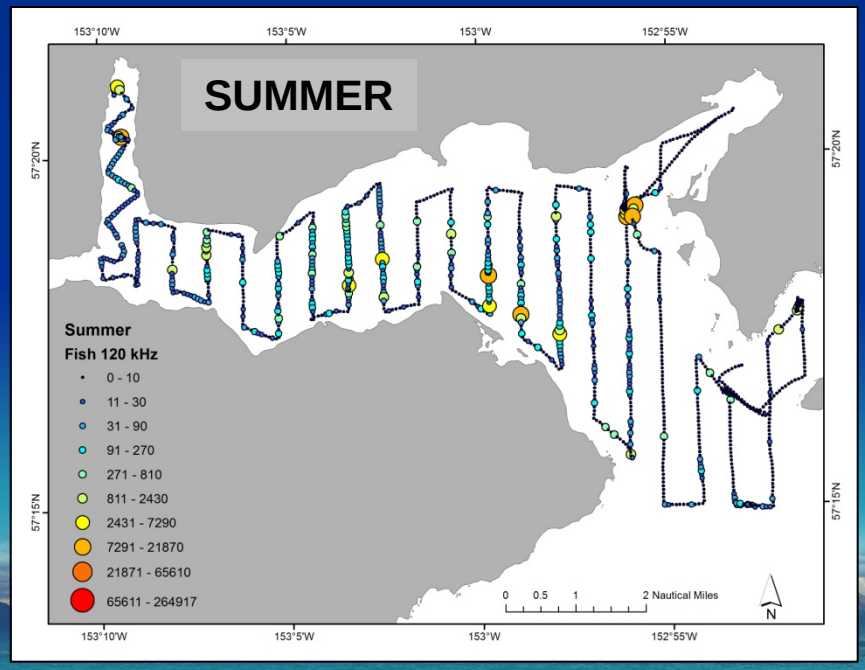
YOY Pacific cod – offshore - 2012 summer

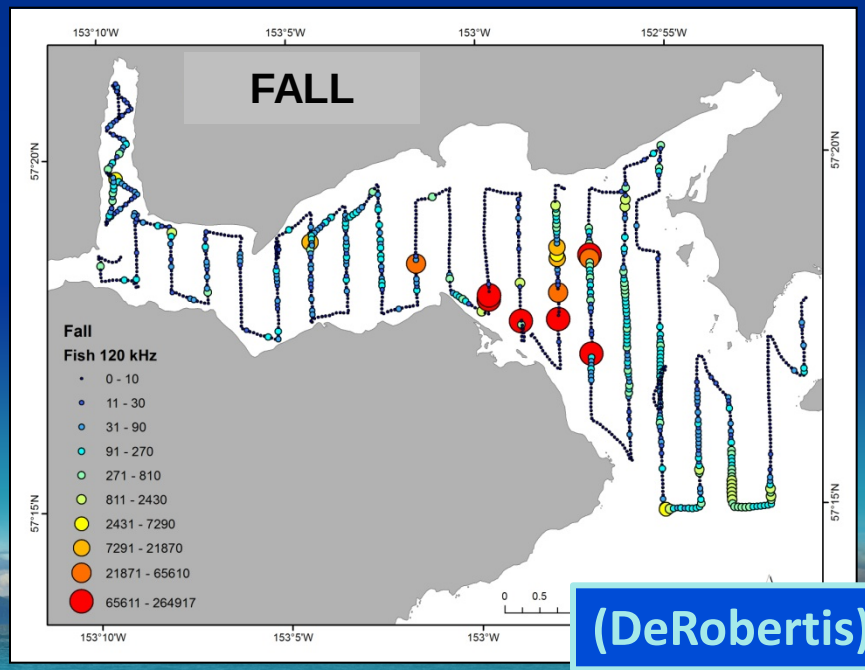


(Moss)



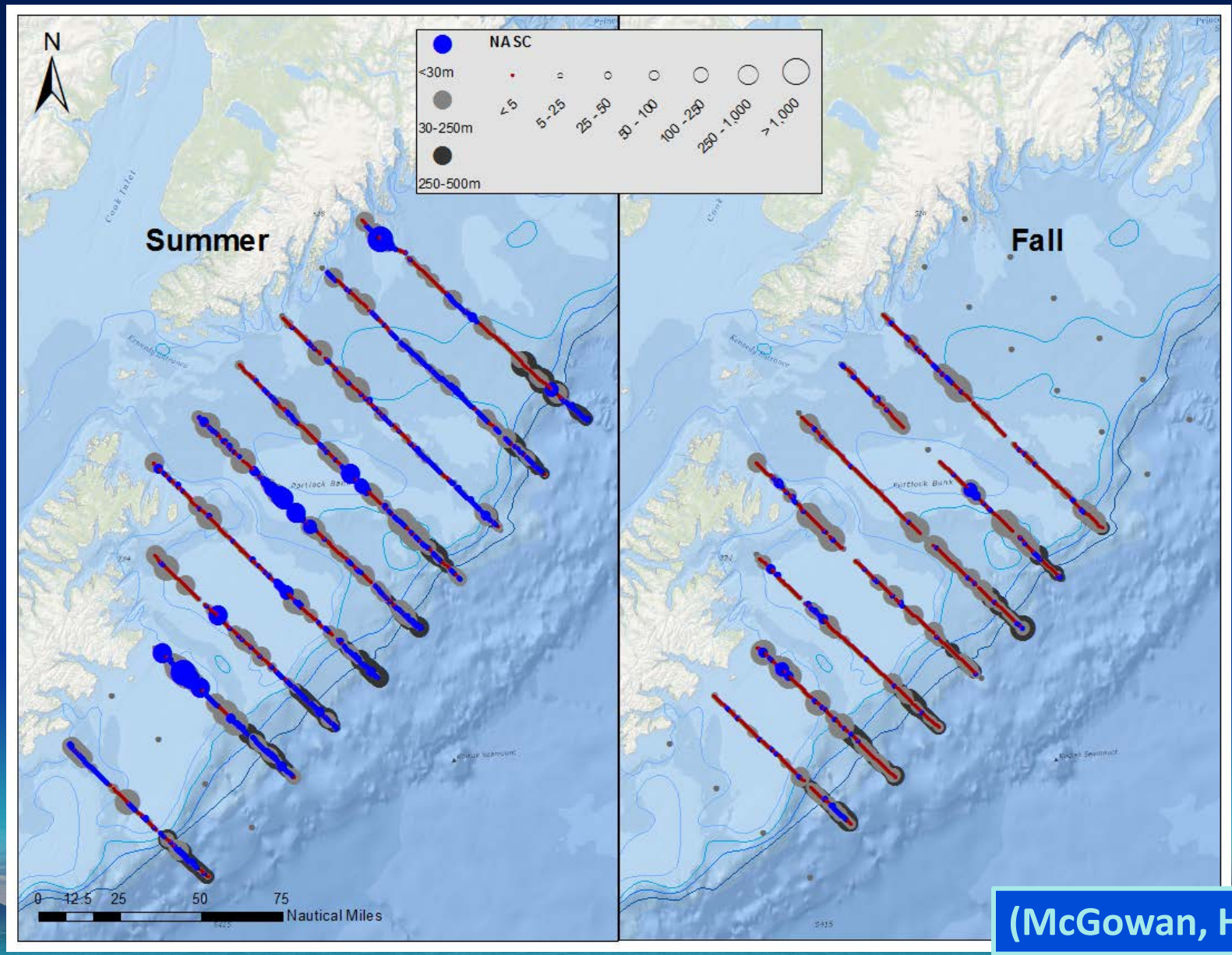
inshore fish backscatter Kiliuda Bay 2011





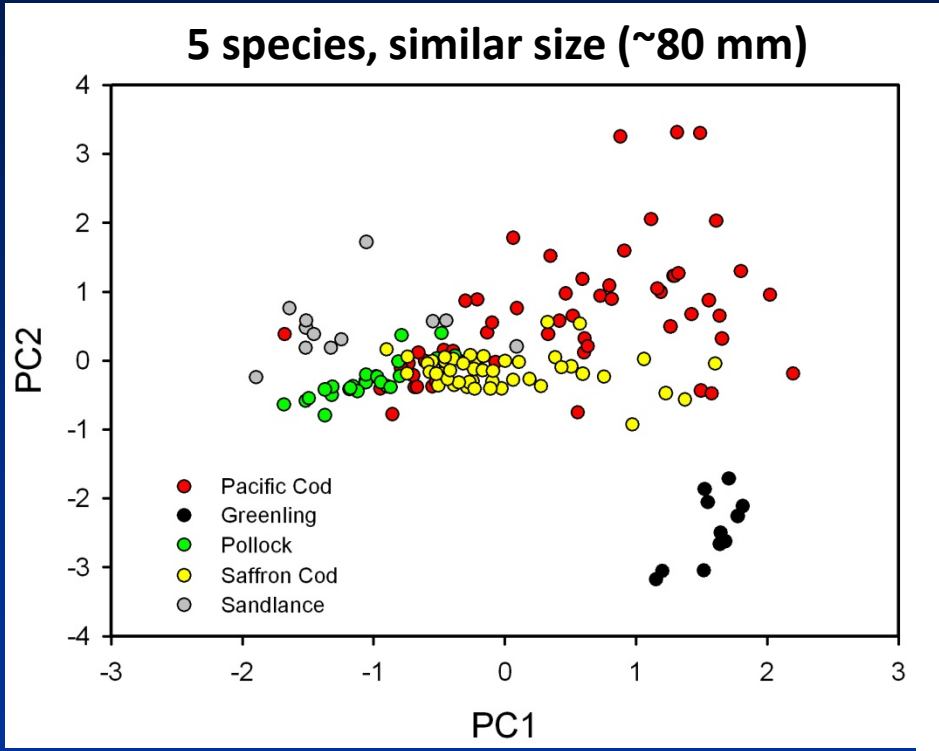
(DeRobertis)

offshore backscatter – 2011 west

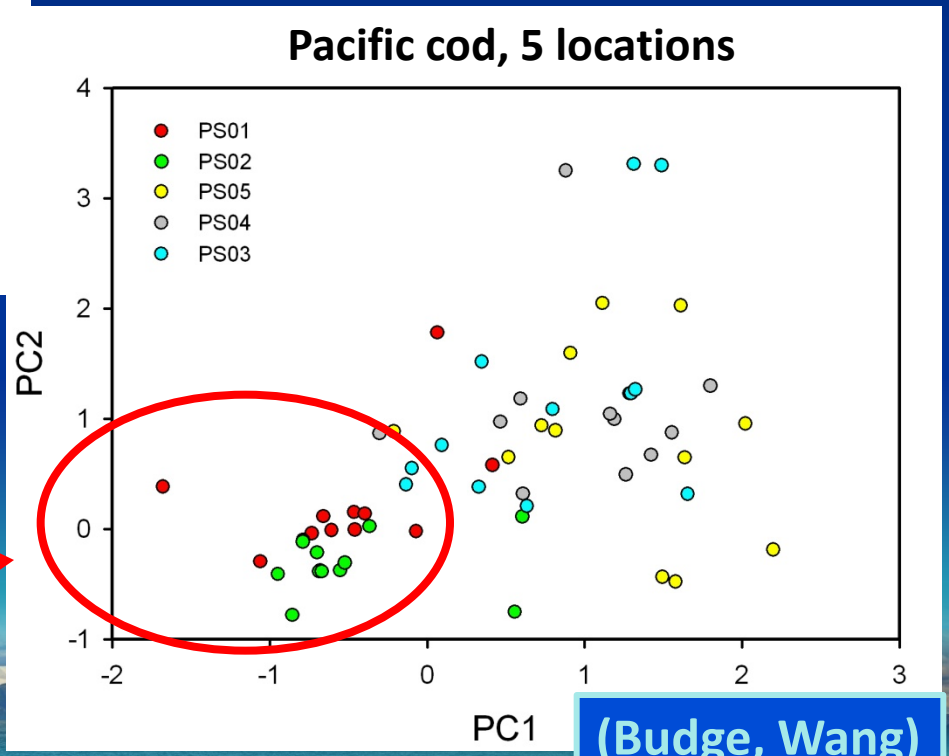


(McGowan, Horne)

inshore – Kiliuda Bay fish diets



PCA (multivariate analysis) of fatty acid composition

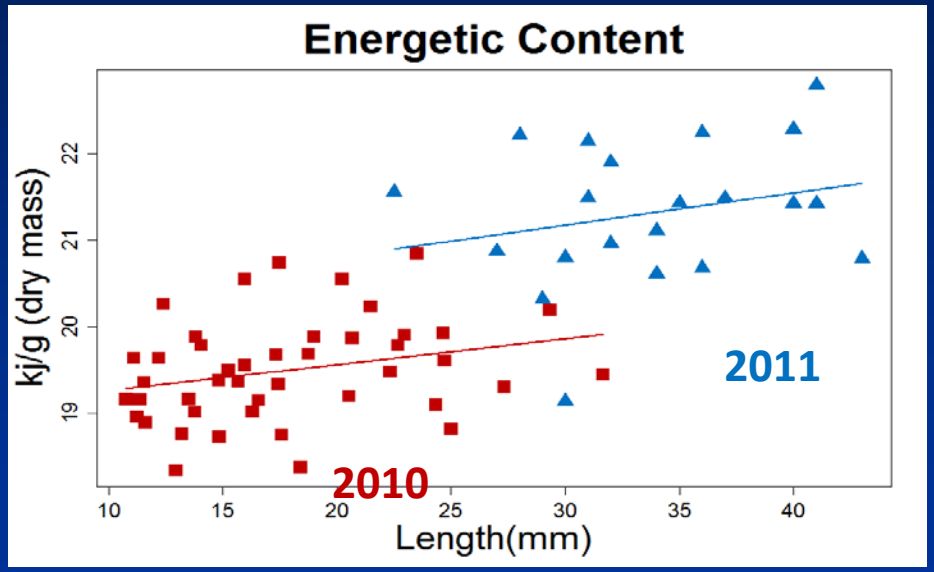


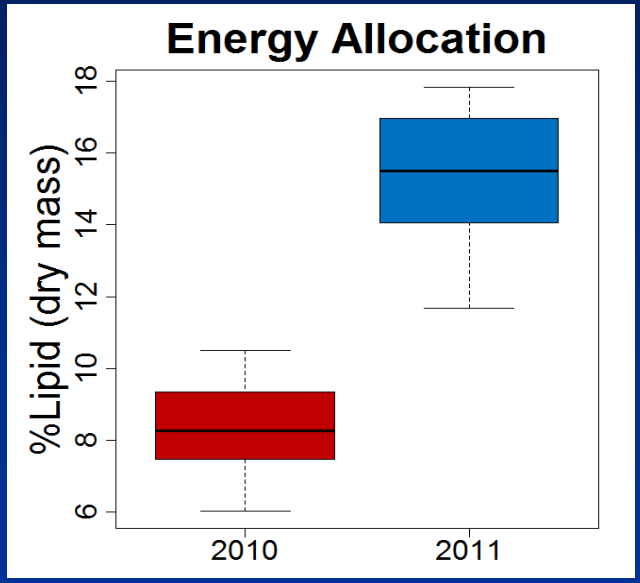
"inner Kiliuda"

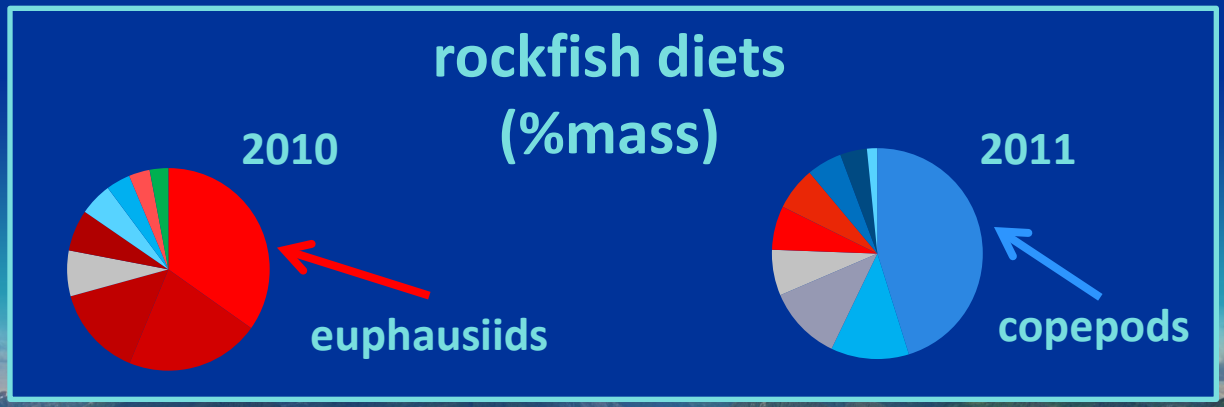
(Budge, Wang)

YOY rockfish, 2010 vs. 2011

Rockfish catch decreased in 2011. Size, energetic density, and lipid content was elevated relative to 2010 pilot study



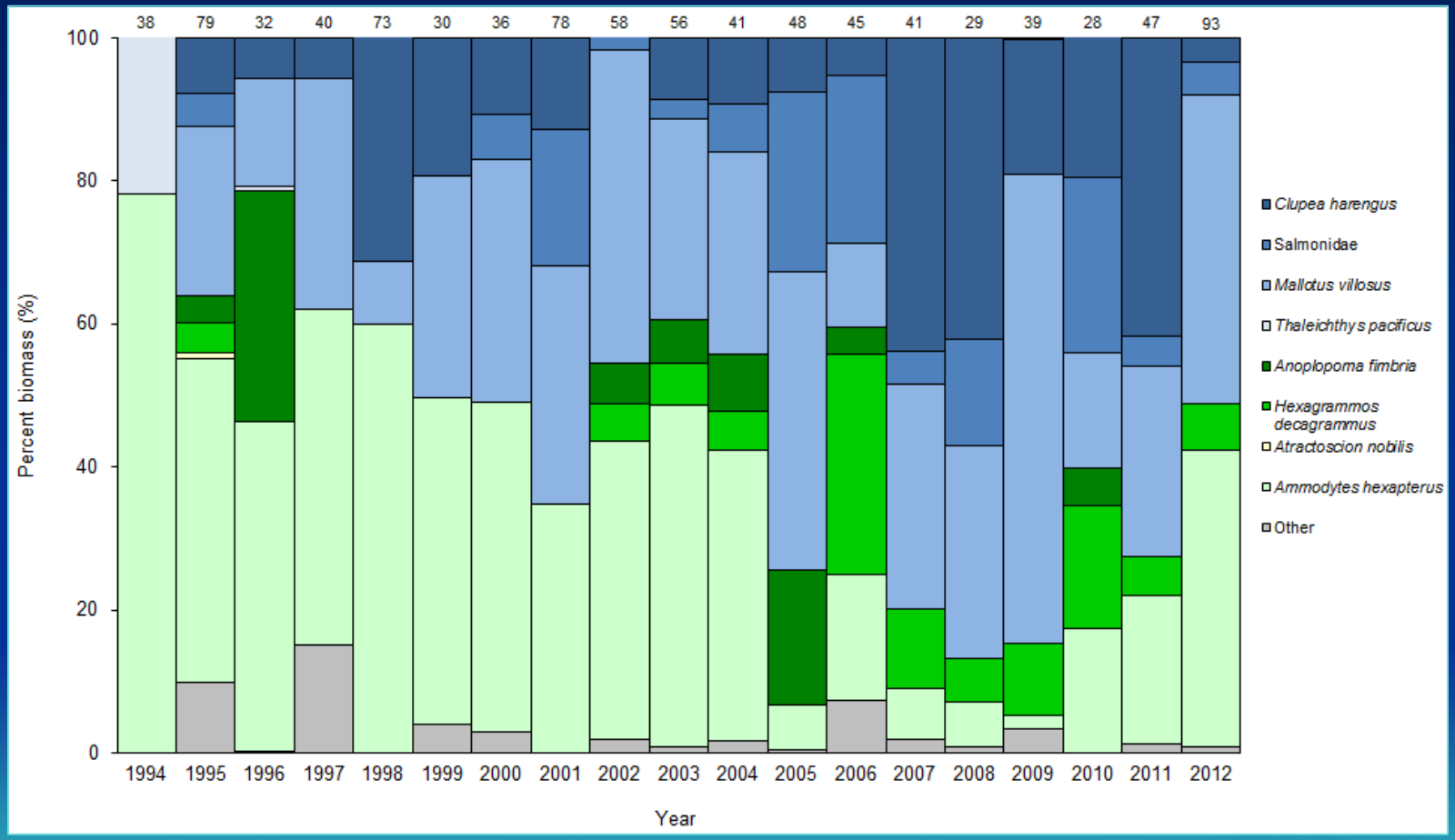




(Fournier)

seabird chick diets, 1994-2012

rhinoceros auklets, St. Lazaria Island, SE Alaska



(Slater)

summary

- GOAIERP is multidisciplinary & synoptic
- 2011 in the GOA was odd in many ways
- 2013 will be important for contrast
- “context” of GOA timeseries will be critical