Gelatinous zooplankton in Alaskan waters: from nets to ROVs

Russ Hopcroft
& Dhugal Lindsay
(plus students, technicians & associates)

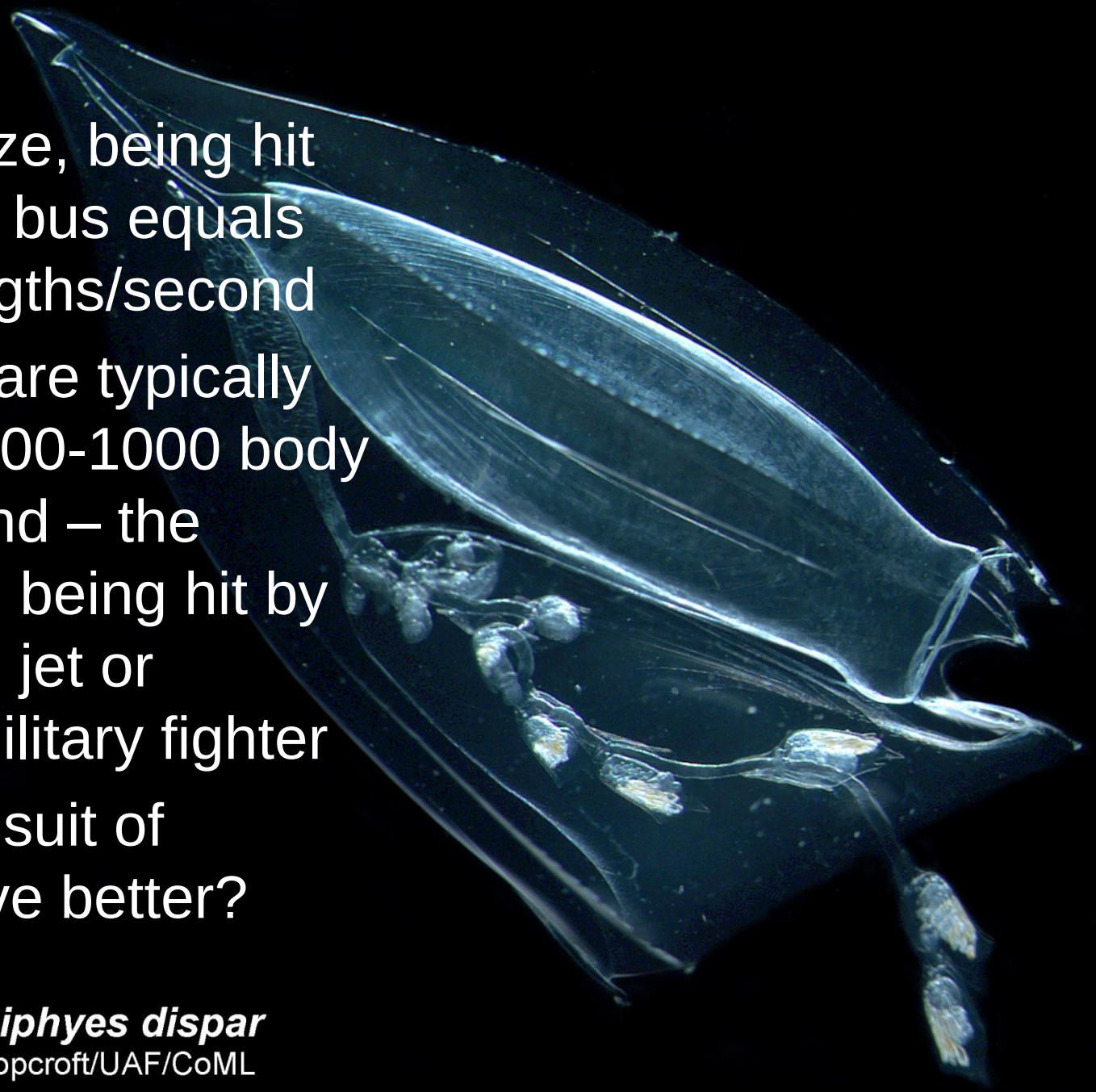
UNIVERSITY OF ALASKA FAIRBANKS

JAMSTEC

The crustacean exoskeleton allows them to to take a great deal of abuse….
and still look great!

Other species may be more fragile, highly deformable, or lack easily observed differences

- Scaling for size, being hit by a highway bus equals ~16 body lengths/second
- Zooplankton are typically collected at 100-1000 body lengths/second – the equivalent of being hit by a commercial jet or supersonic military fighter
- Will jello or a suit of armour survive better?

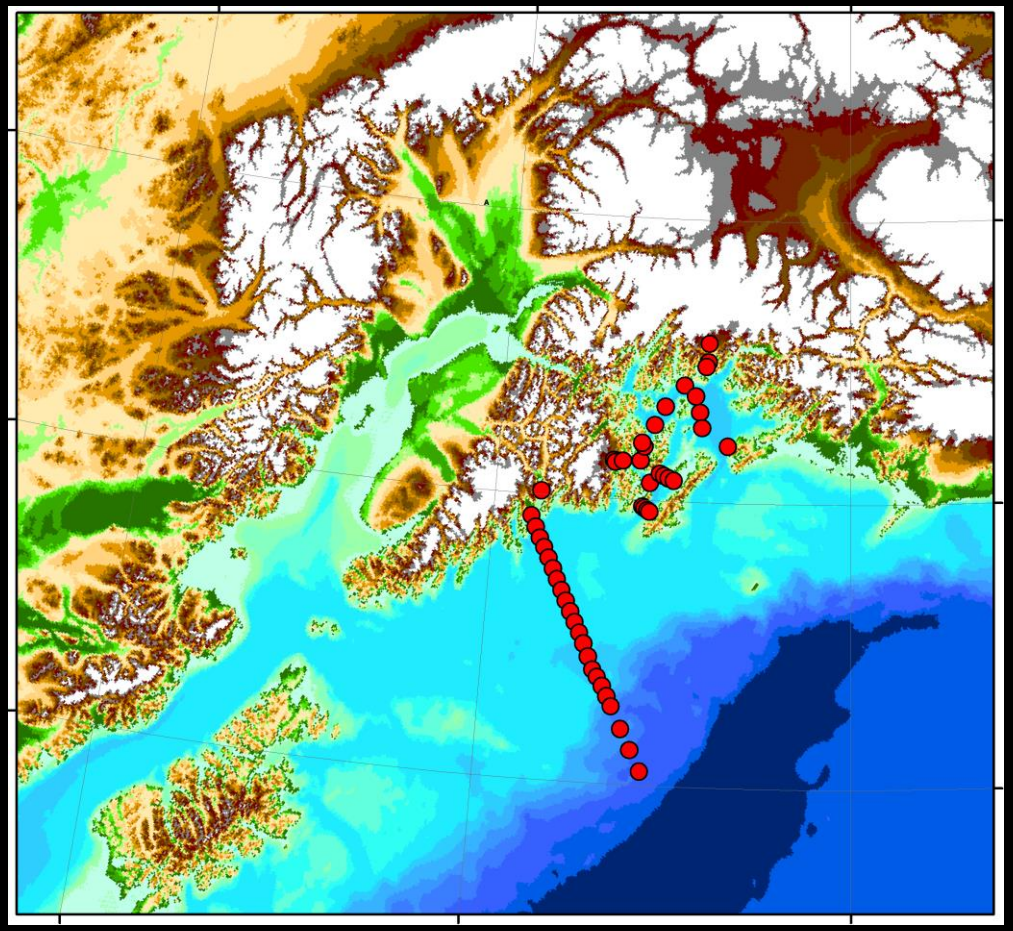


Diphyes dispar
Hopcroft/UAF/CoML


The Players


Canada
Basin
Beaufort
Chukchi
Bering
Gulf of Alaska

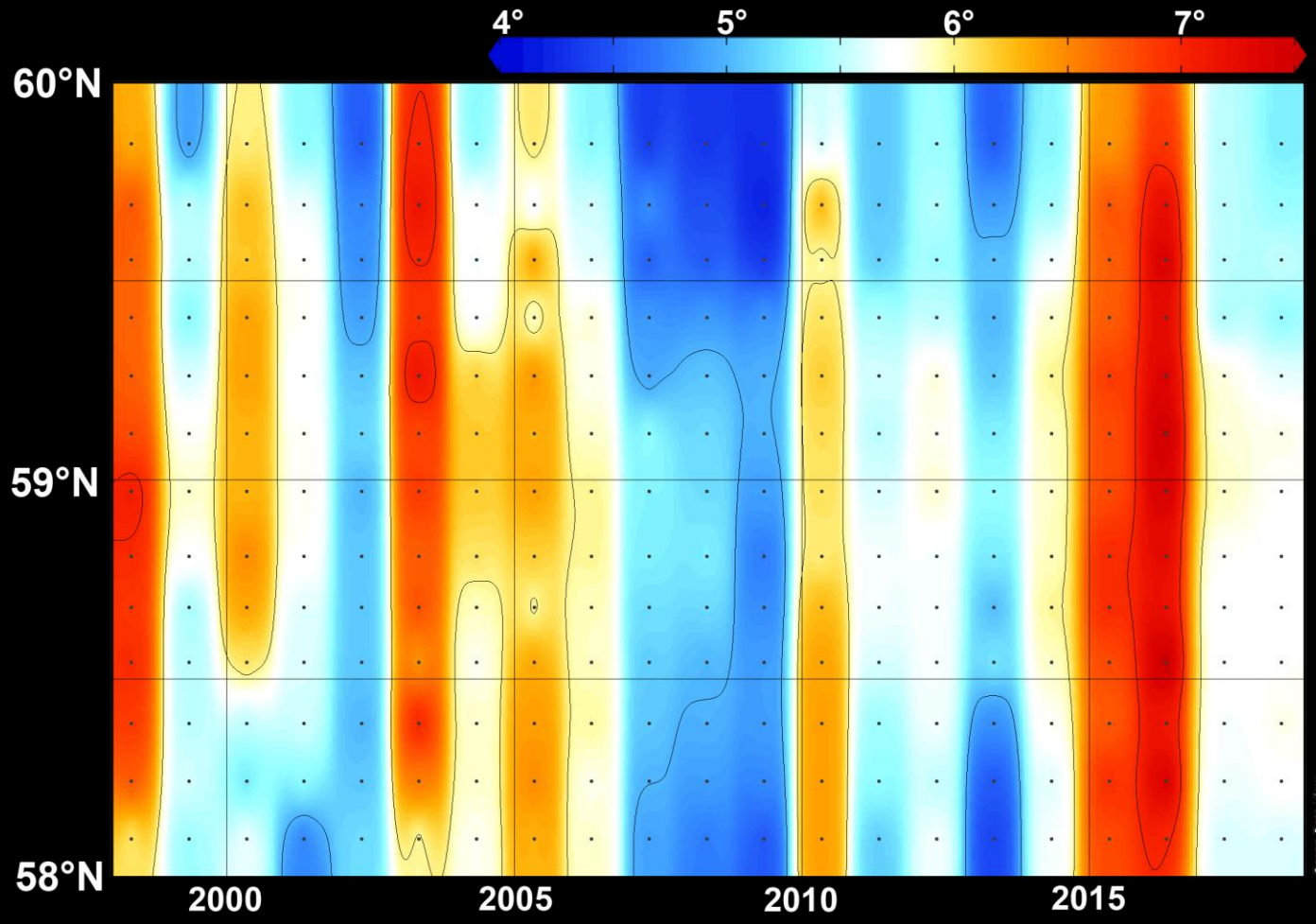
Seward Line



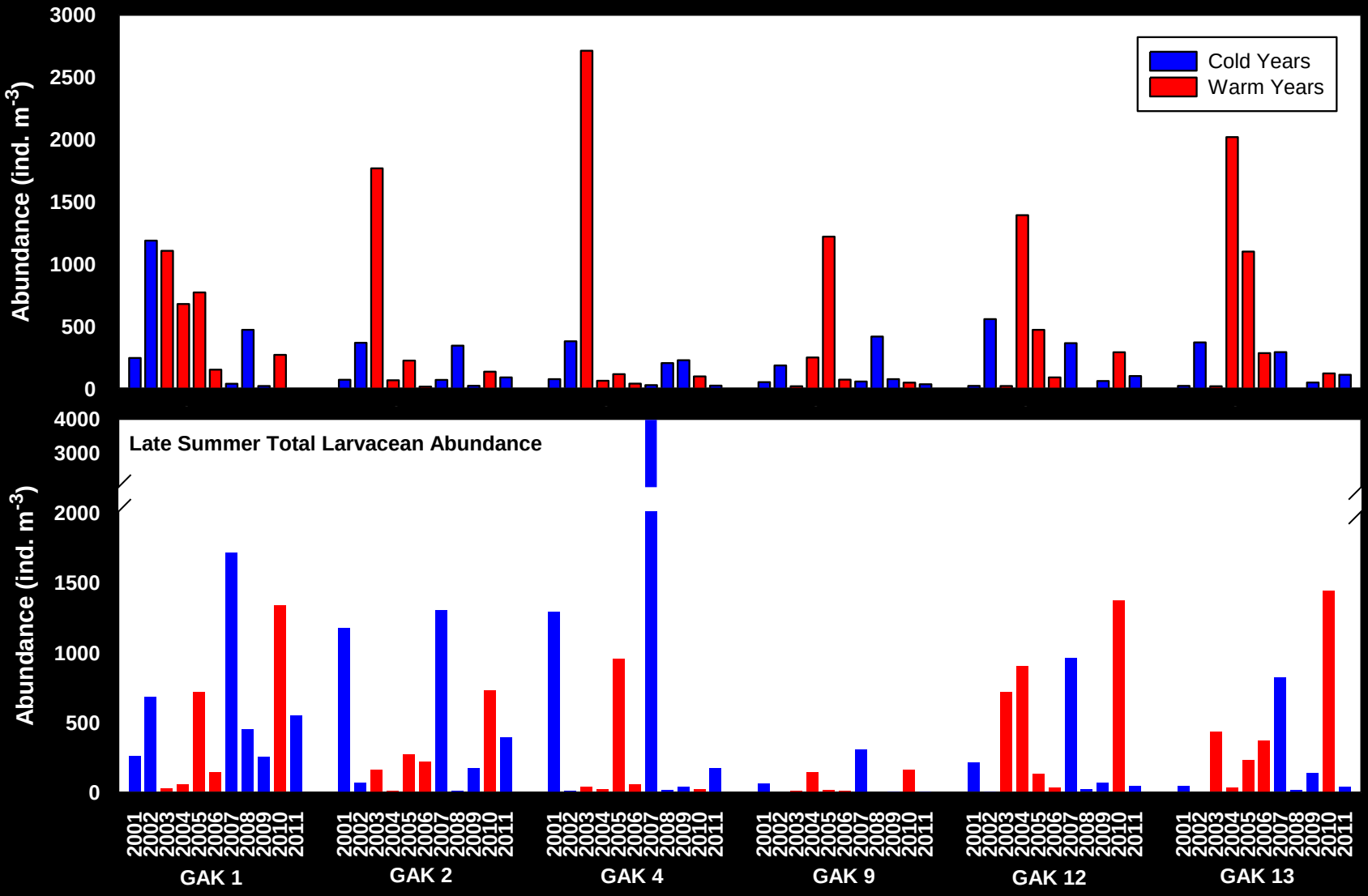
- Alaska's most deeply multidisciplinary oceanographic time-series
- Physical data over 5 decades (anchored by GAK1)
- Chemical & biological data ~2 decades
- GLOBEC 1997-2004 sampled 6-7x yearly
- 2005-2017 sampling reduced to early May & mid September
- Beginning in 2018, NSF LTER allows for program expansion

Seward Line May Temperatures

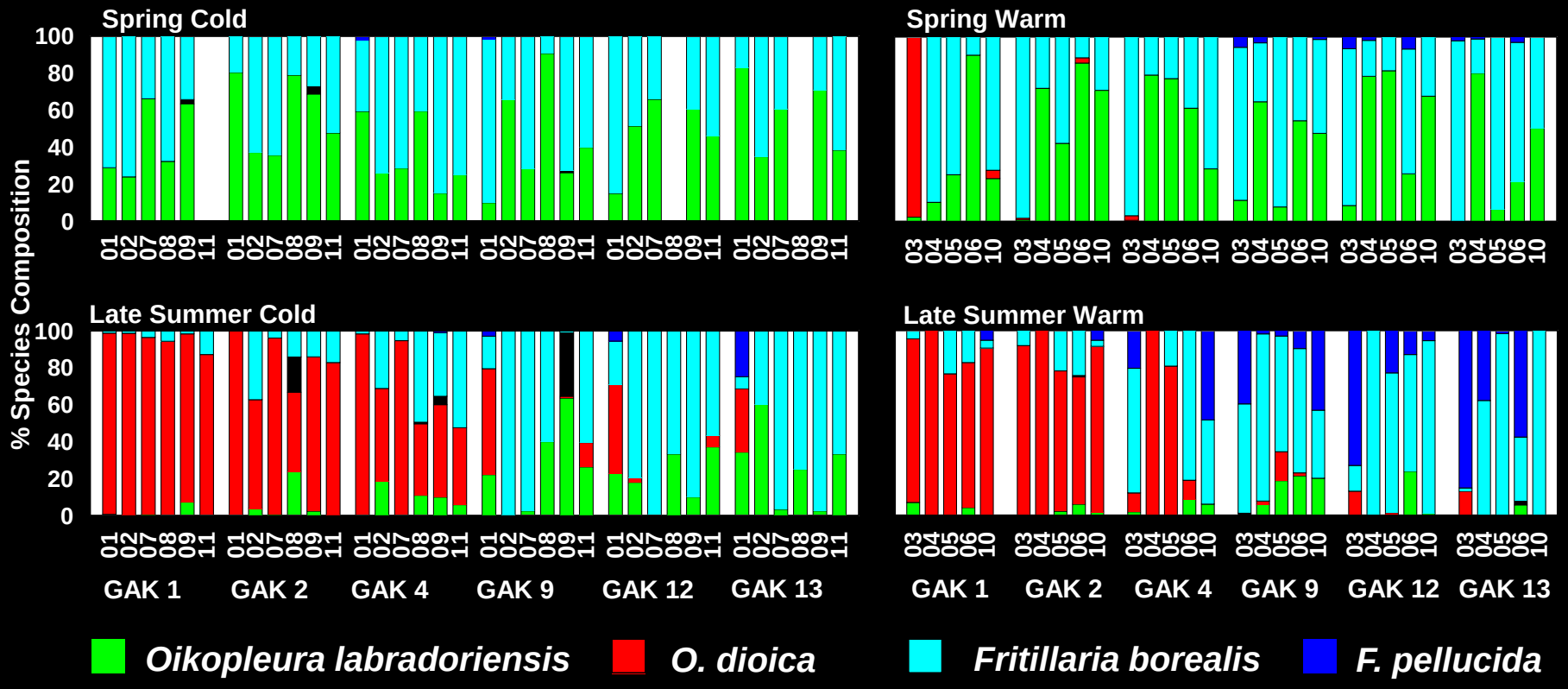
(aver. upper 100m)



Pelagic Tunicates: larvaceans

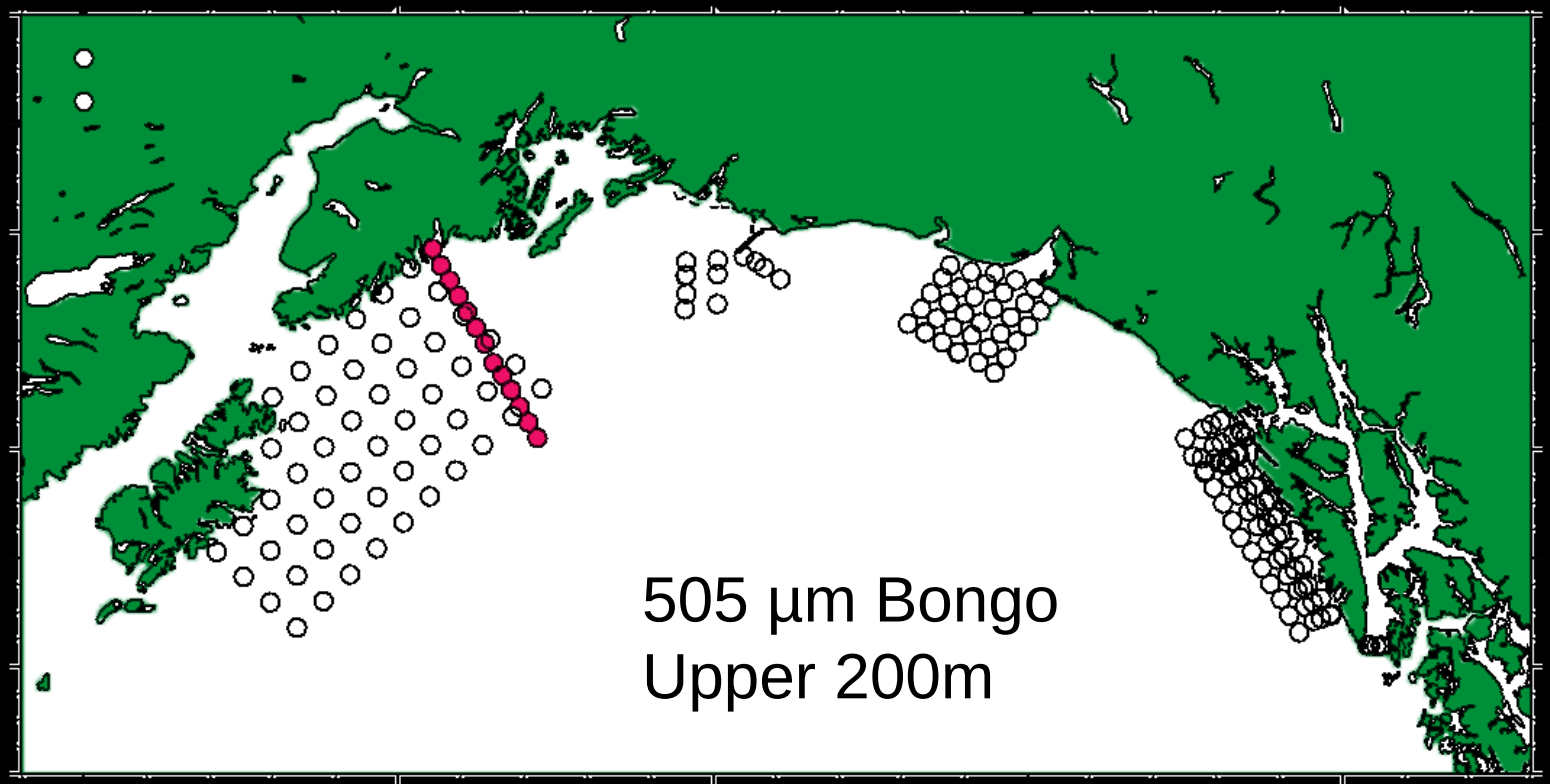


50 µm net



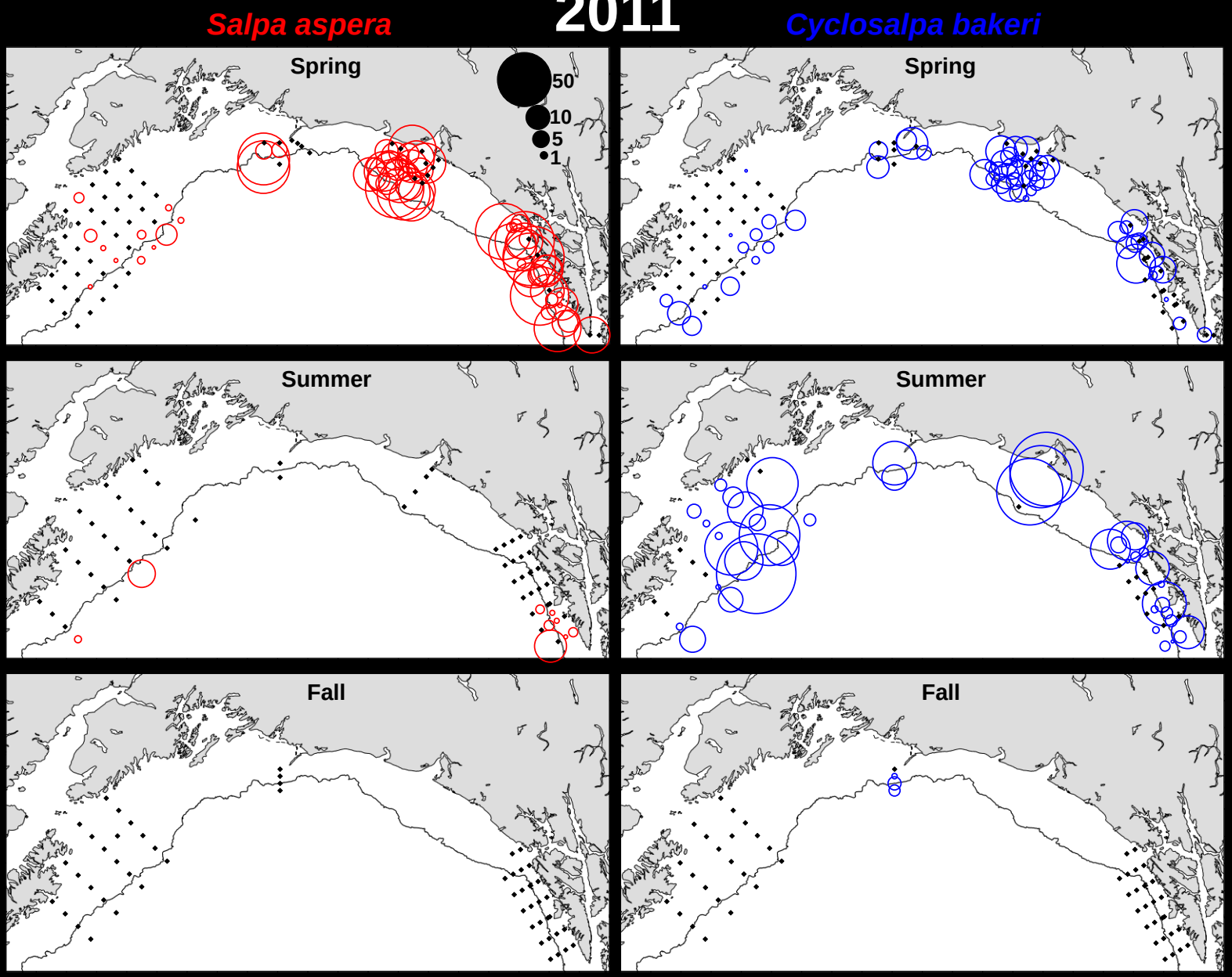
- Spring dominated by large cold-water *O. labradoriensis*, summer by small eurythermal *O. dioica*
- Summers have strong cross-shelf gradient
- Warm summers have reduced *O. labradoriensis* and larger contributions by warm-water *F. pellucida*

Gulf of Alaska Project



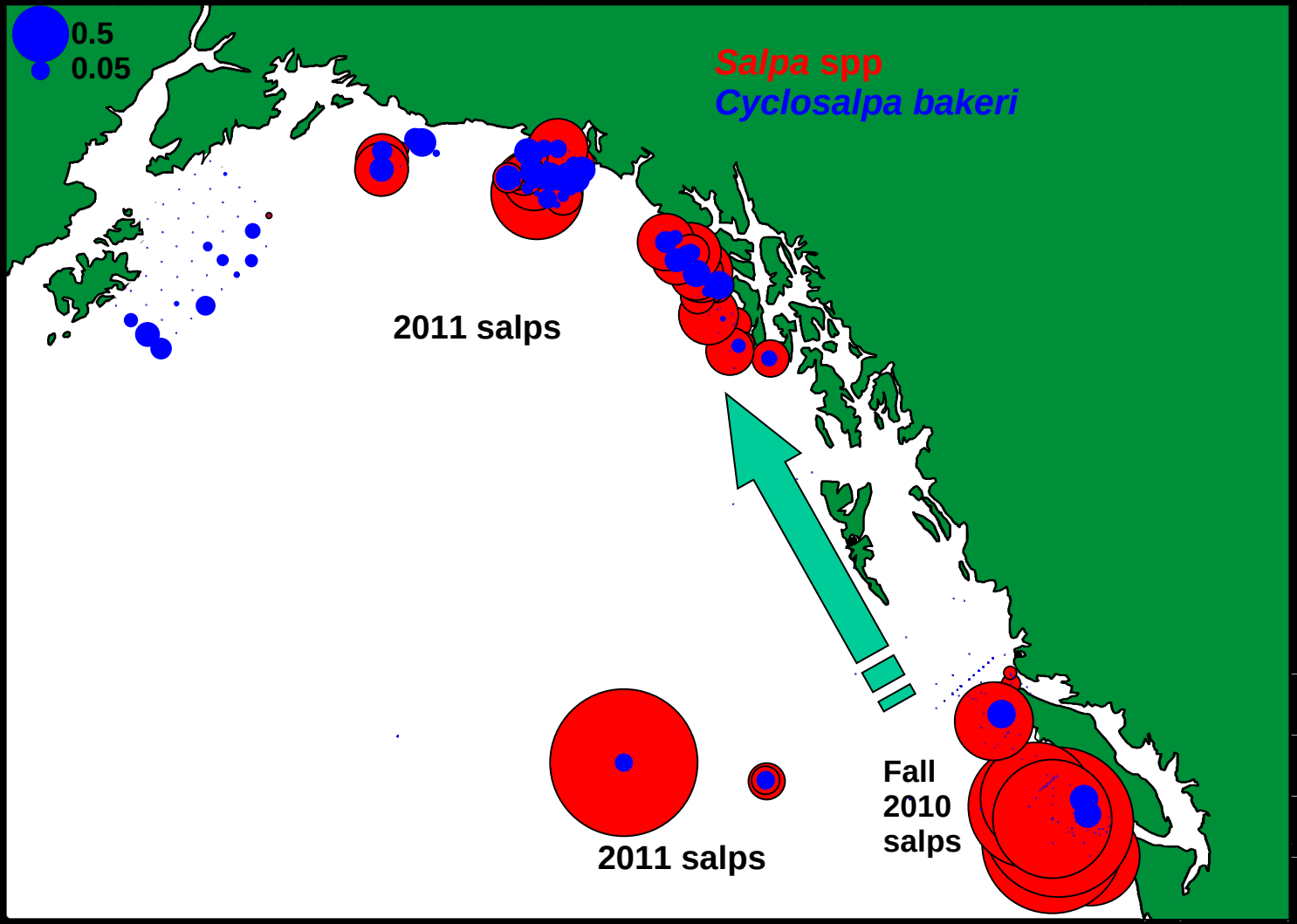
- Connection between oceanography and fish
- Three full surveys in 2011 and 2013

2011

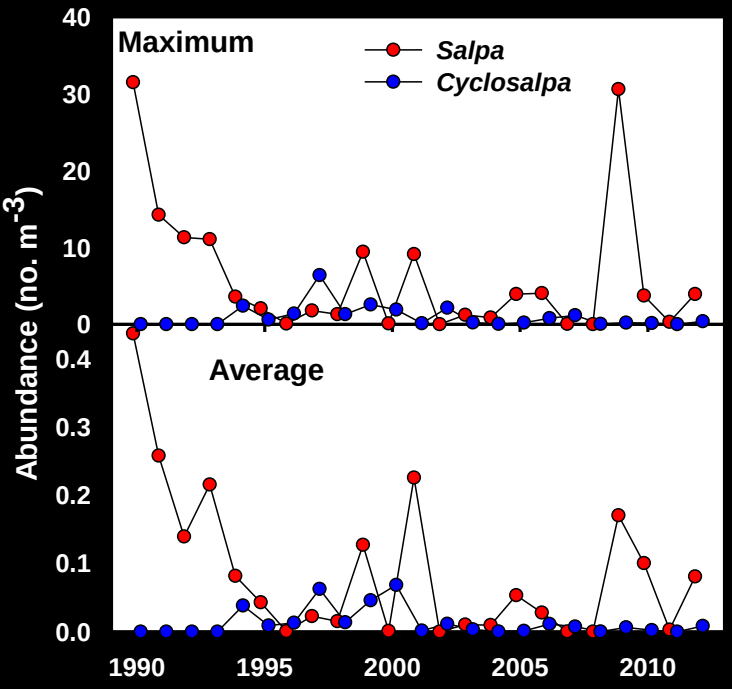


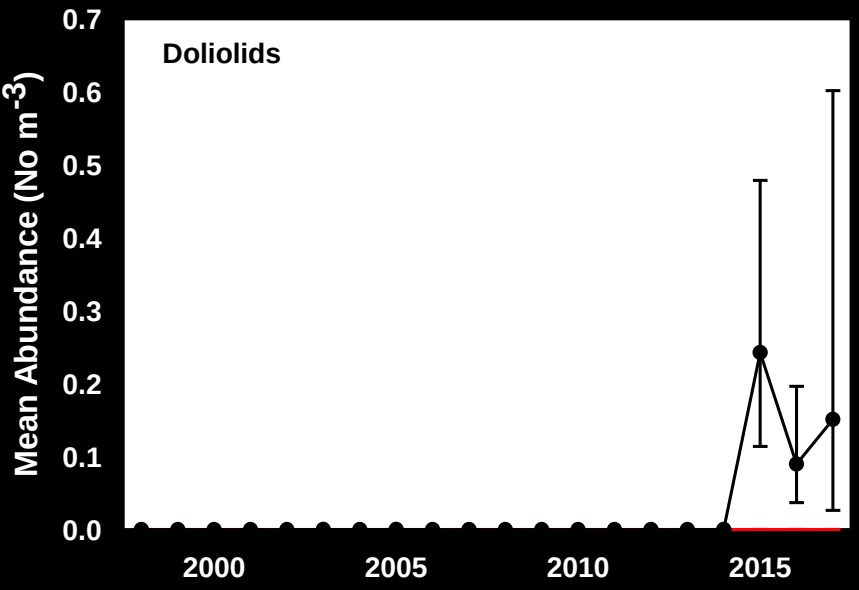
During spring 10-20% of upper waters filtered daily

Where did they come from?

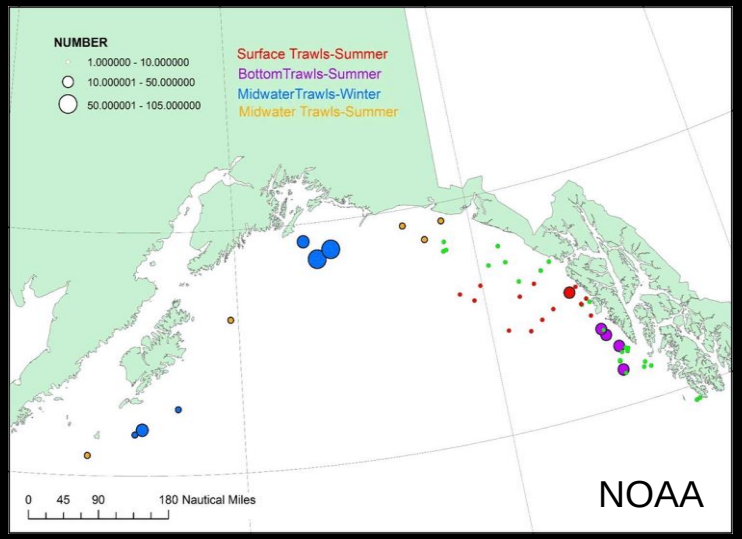


How common are Salps in the transition zone?

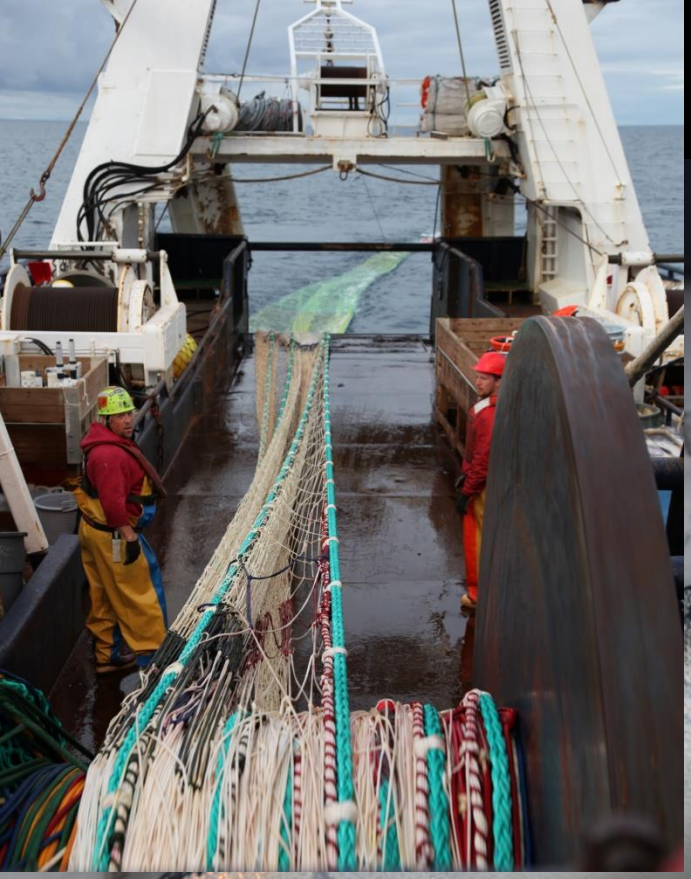




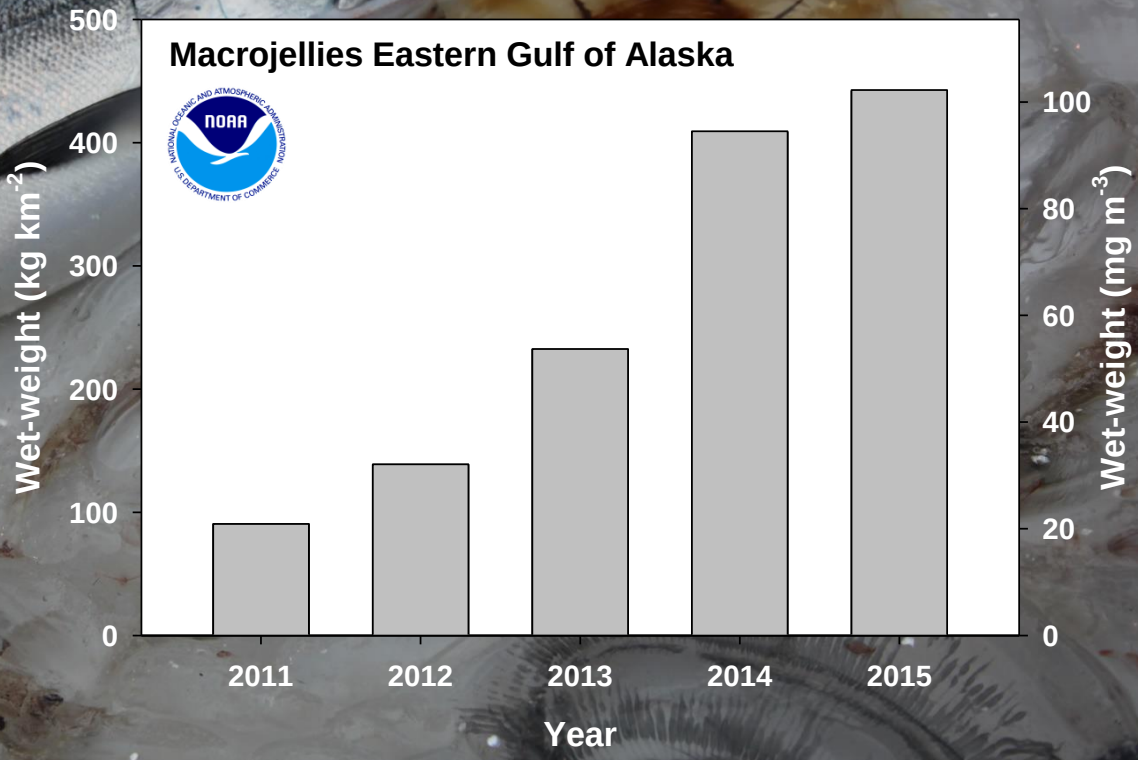
- Both genera of salps are common in the region where the North Pacific current bifurcates
- 2010 & 2011 were **NOT** particularly unusual in abundance of salps



“Commercial” trawling



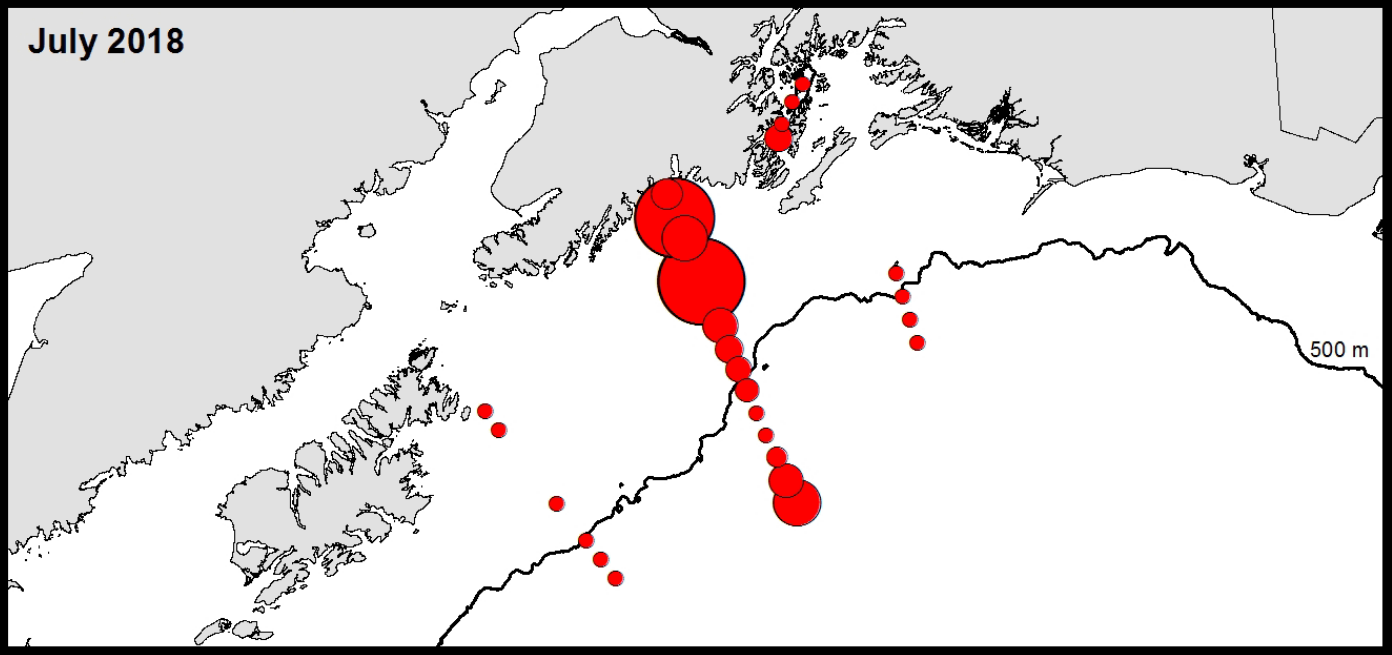
Jellyfish biomass typically exceeds fin-fish

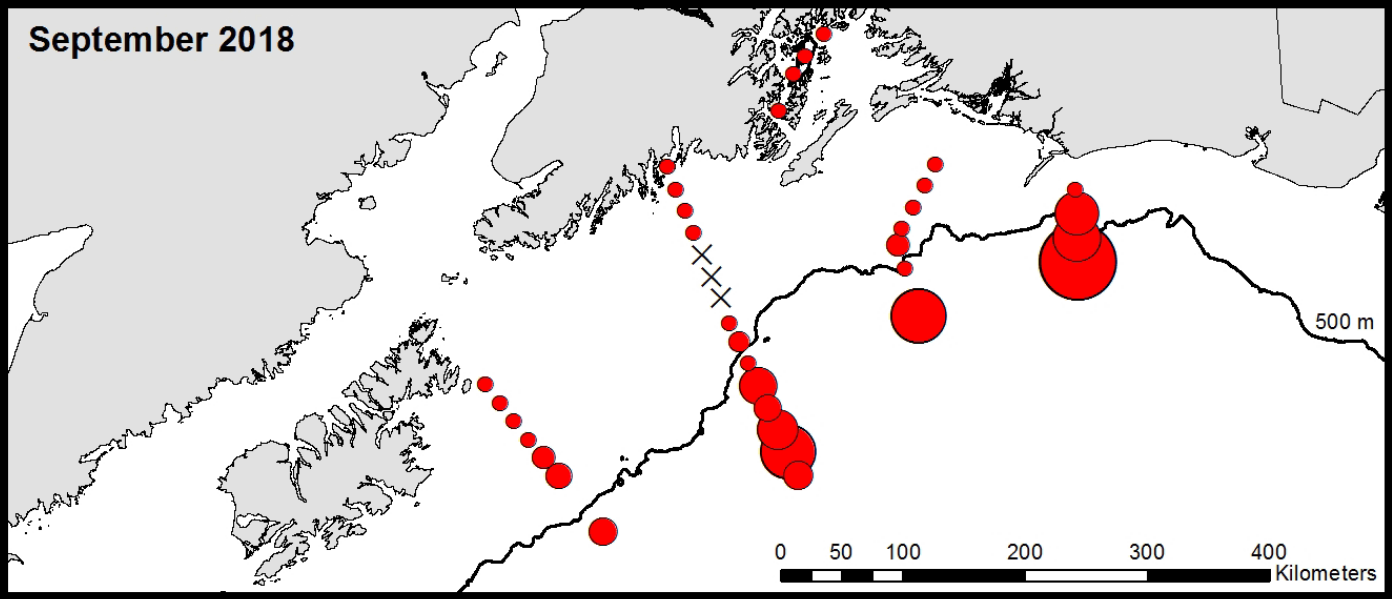


Methot trawl

- 5 m^2 towed @ 2-3 knots
- 20-30 min. filters 10,000 m^3

Aequorea



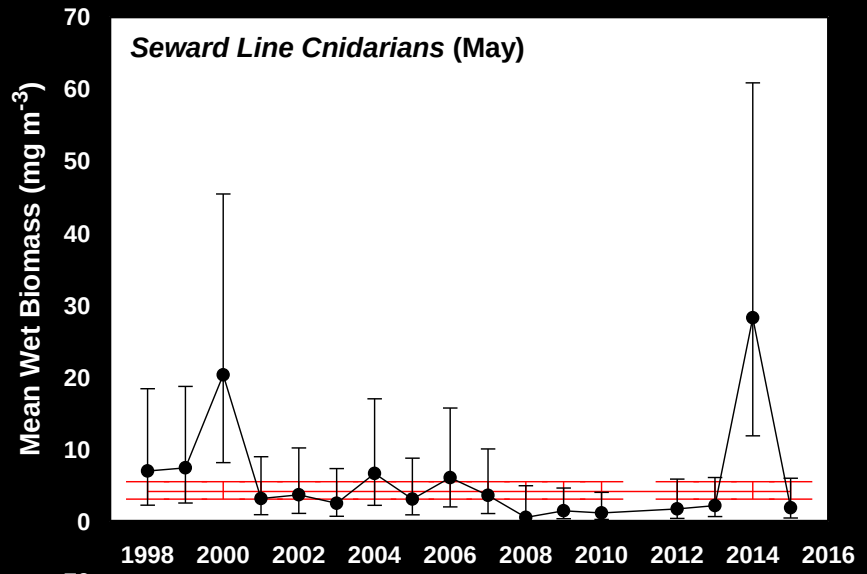


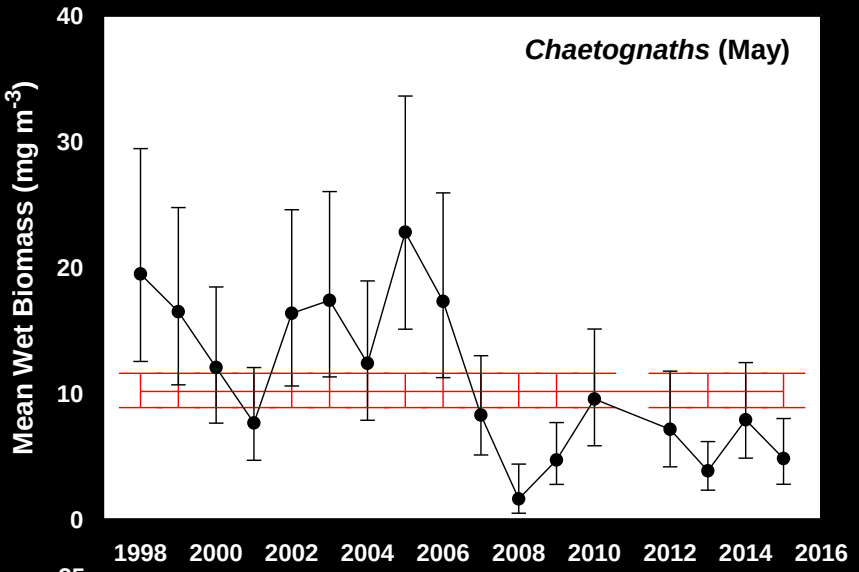
Wet Weight ($g\ m^{-3}$)

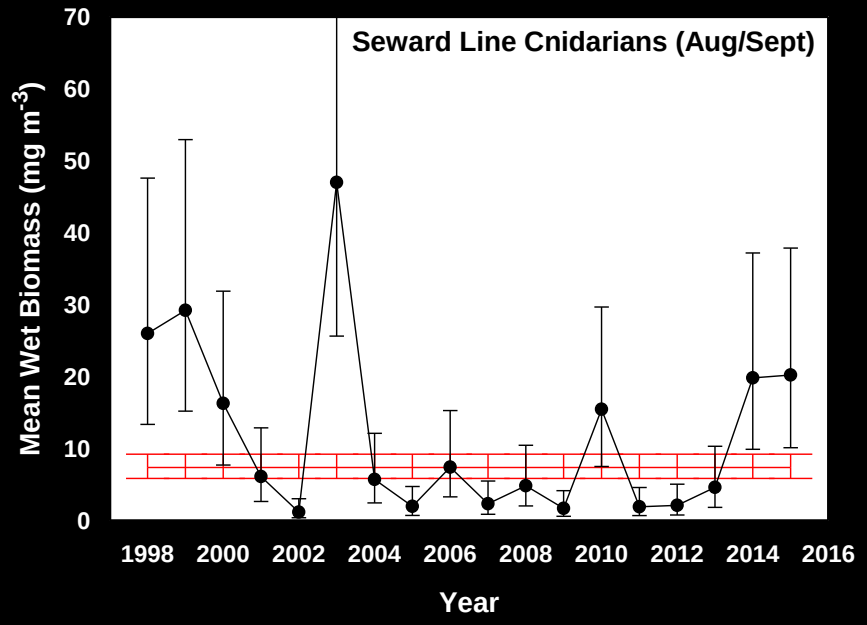
- <0.5
- 1
- 5
- 10

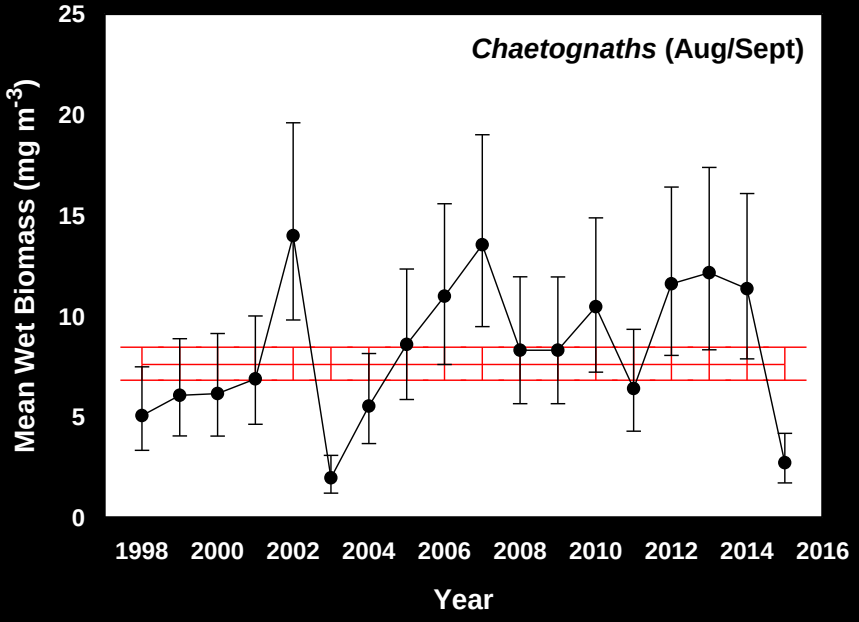
X - Not present

How do macro-jellies compare to smaller predators?

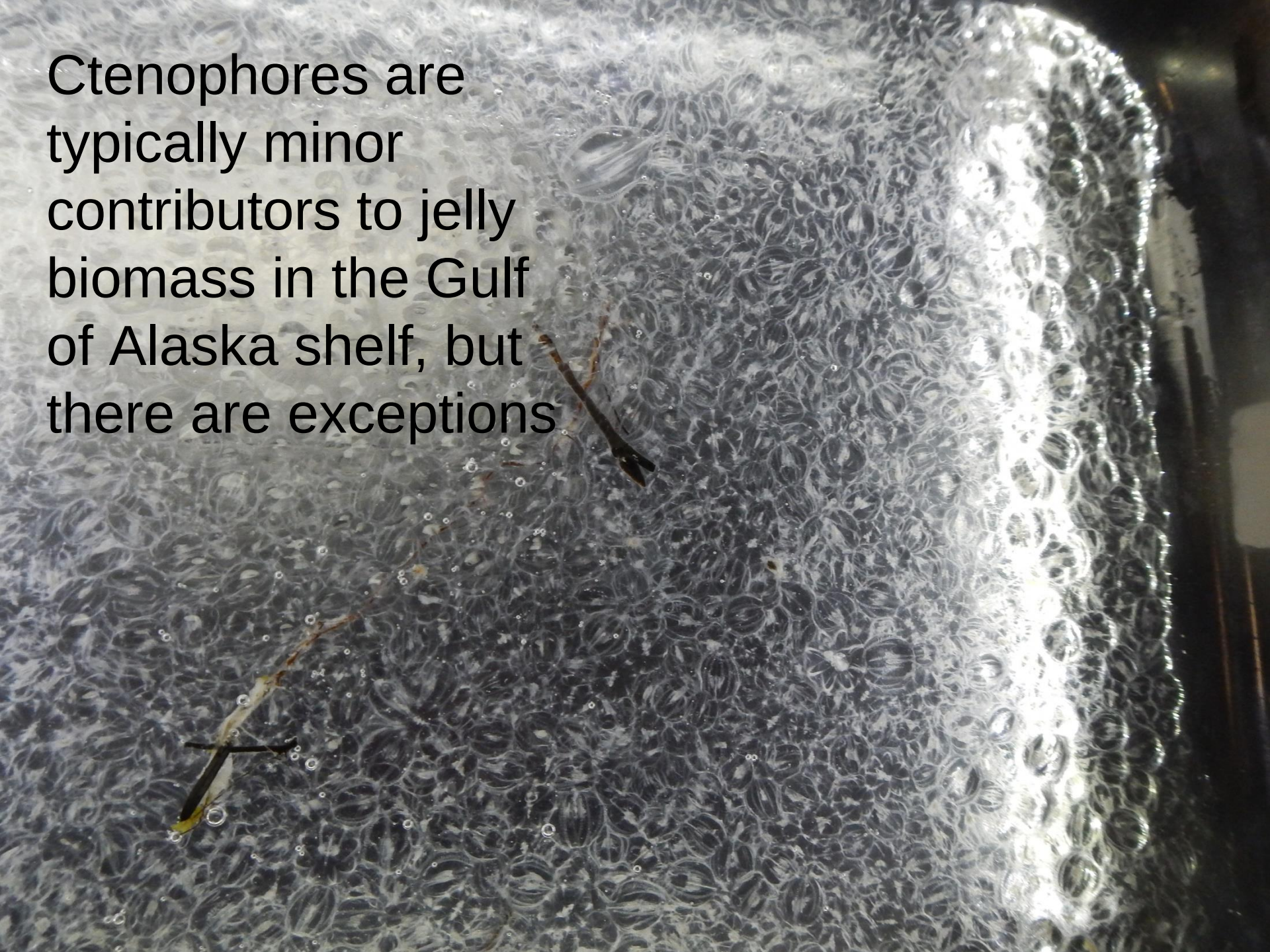








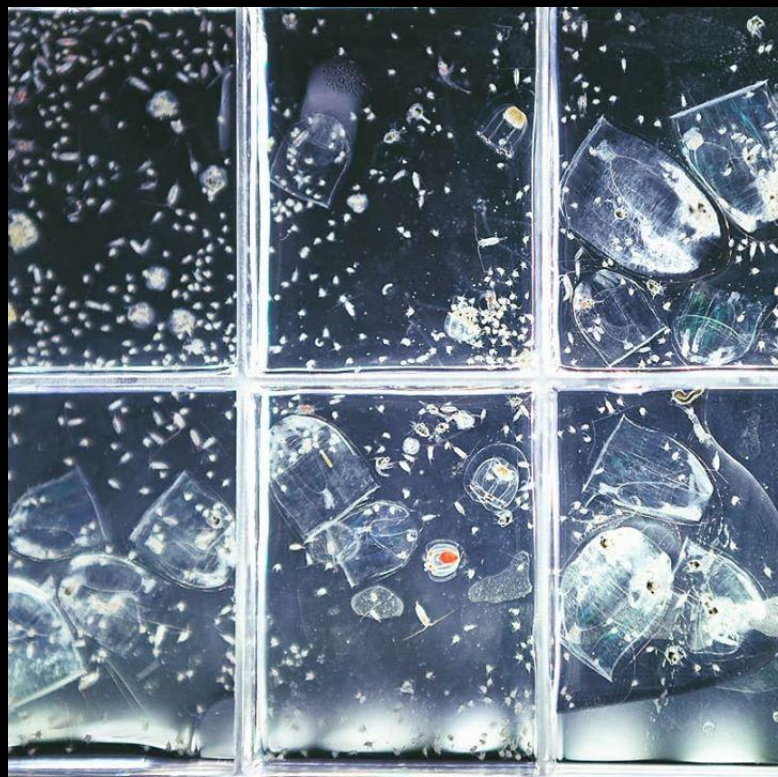
c.f. to gram last slide


Ctenophores are typically minor contributors to jelly biomass in the Gulf of Alaska shelf, but there are exceptions

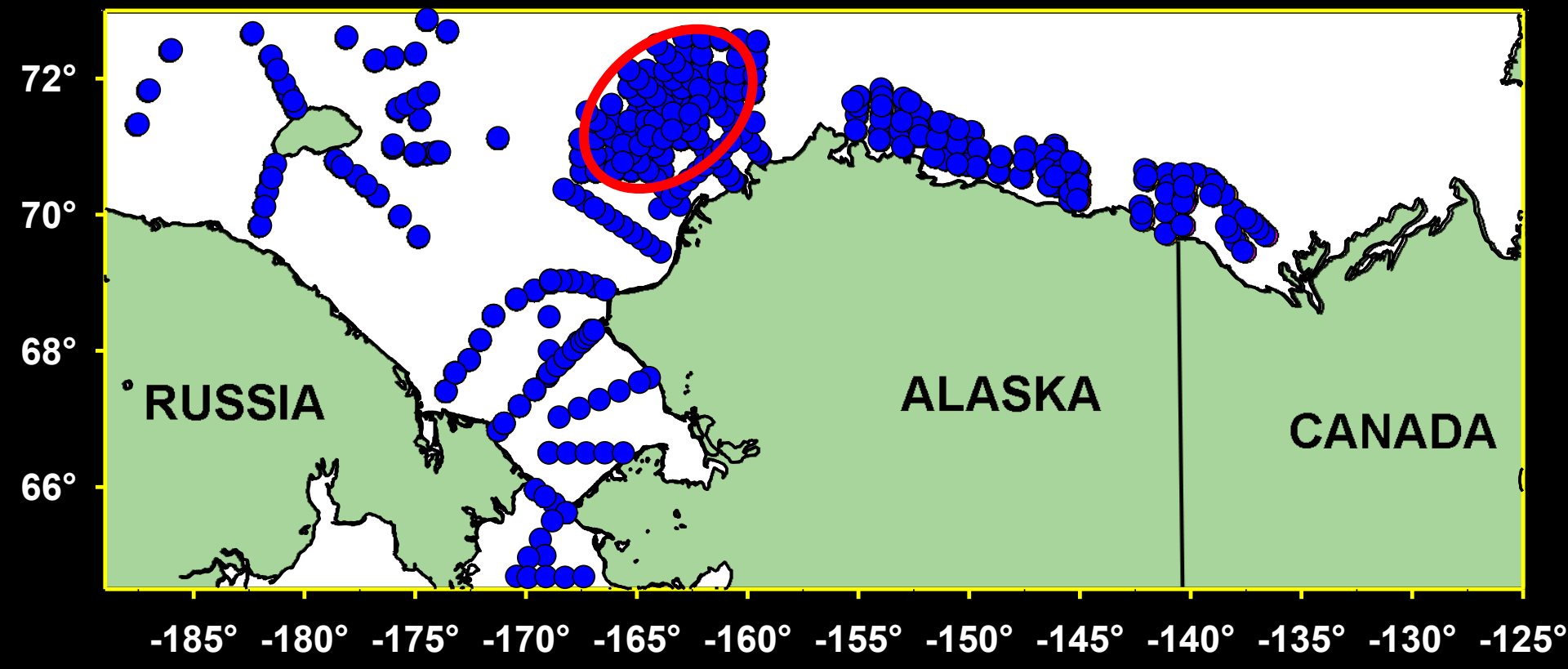
Arctic Shelves

- Traditional nets (150µm & 505 µm)
- Light table sorting, ID & measurement of Bongo nets

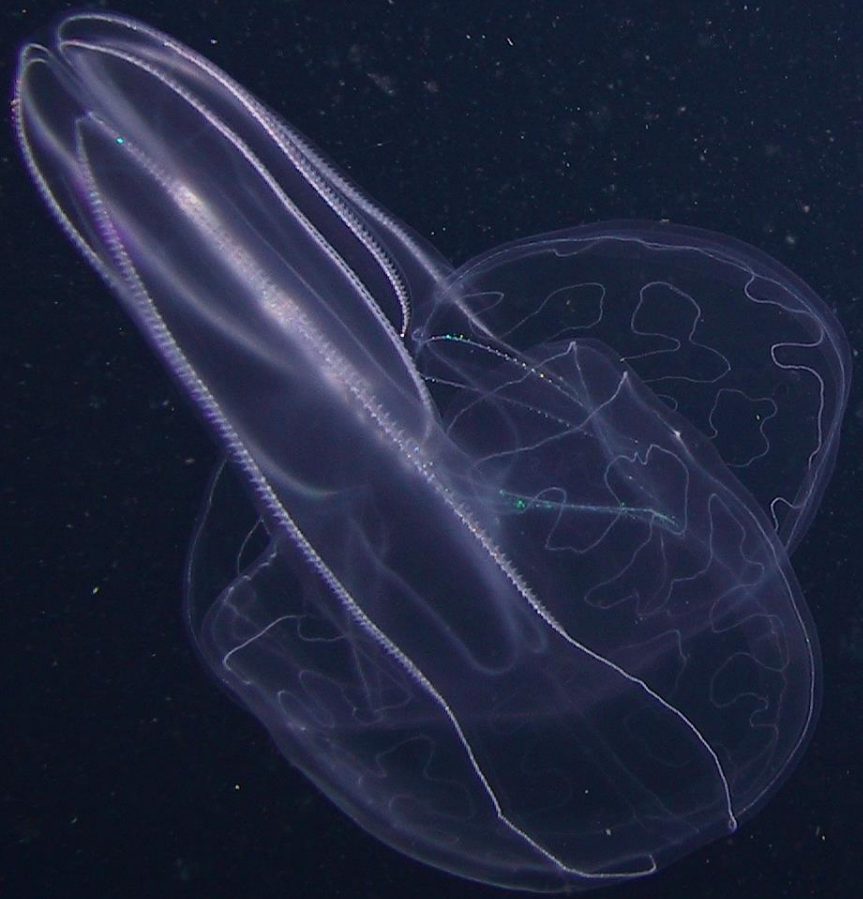
- In particular, this documents contributions of ctenophores to these shallow-water systems
- esp. *Mertensia ovum* and *Bolinopsis infundibulum* that do not preserve well



Samples examined

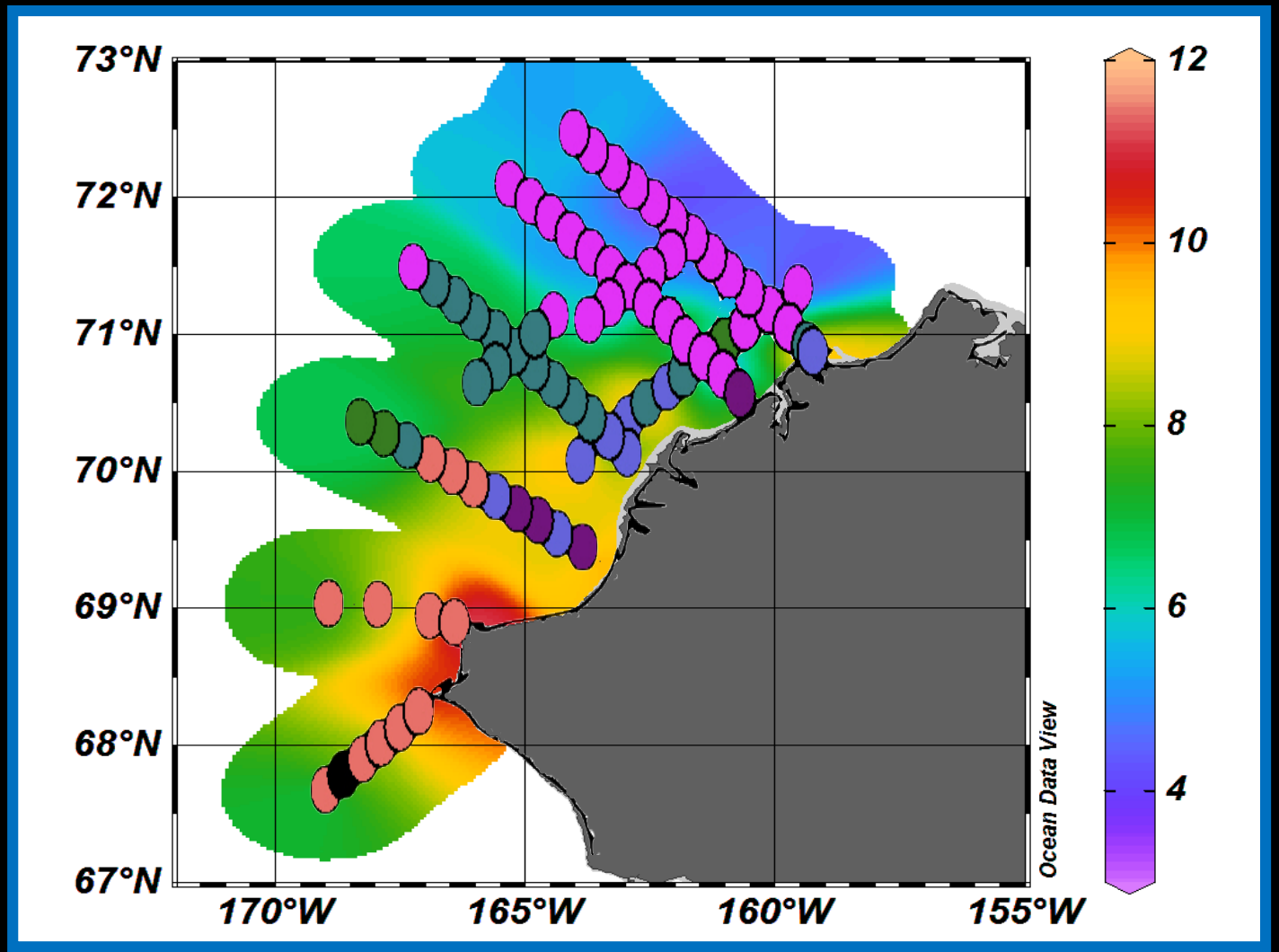


The average?



- Over 15 years of sampling highlights extreme variability in relative importance of gelatinous zooplankton
- Larvaceans are typically important
- Some years jellies and/or ctenophores are rare, other years they are the entire catch of Bongo nets displacing 100’s of ml

Done in near real-time, multivariate analysis of jelly communities can show the same community boundaries as will the crustacean communities (analyzed many months later)



Arctic Basins

- Multinets to bottom
- ROV to 3000m
- Molecular sequencing

Video