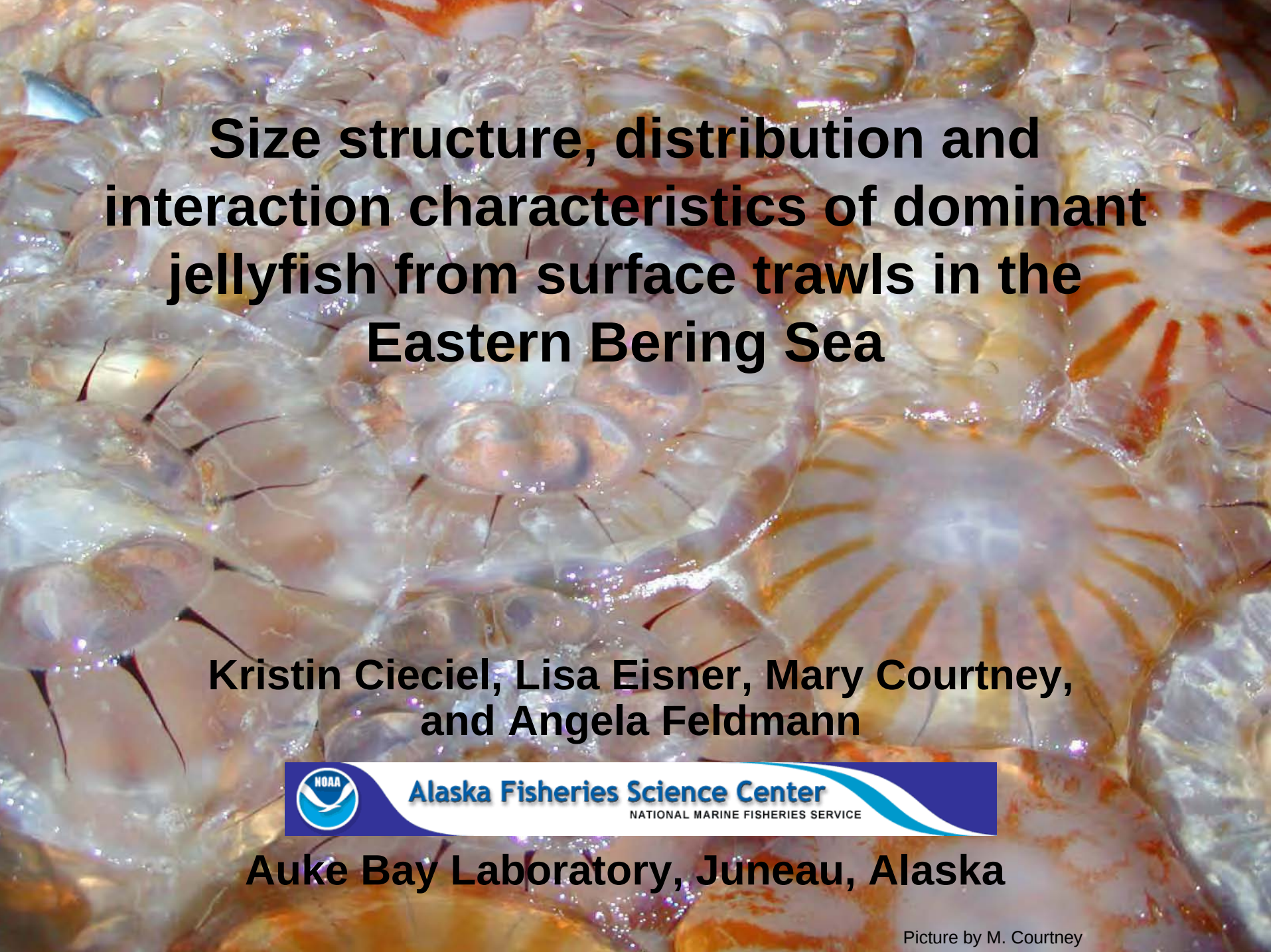




Size structure, distribution and interaction characteristics of dominant jellyfish from surface trawls in the Eastern Bering Sea

**Kristin Cieciel, Lisa Eisner, Mary Courtney,
and Angela Feldmann**

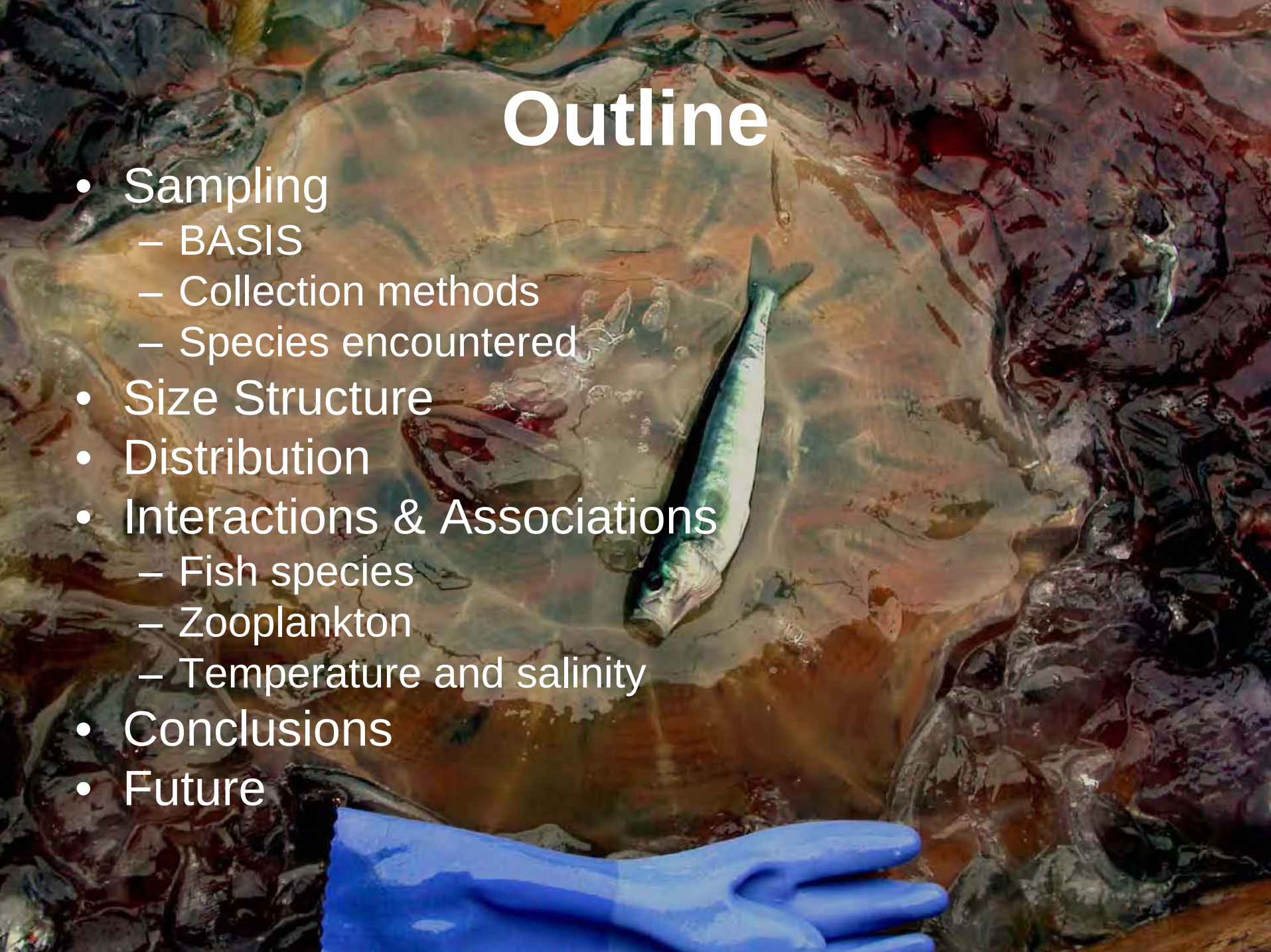


Alaska Fisheries Science Center
NATIONAL MARINE FISHERIES SERVICE

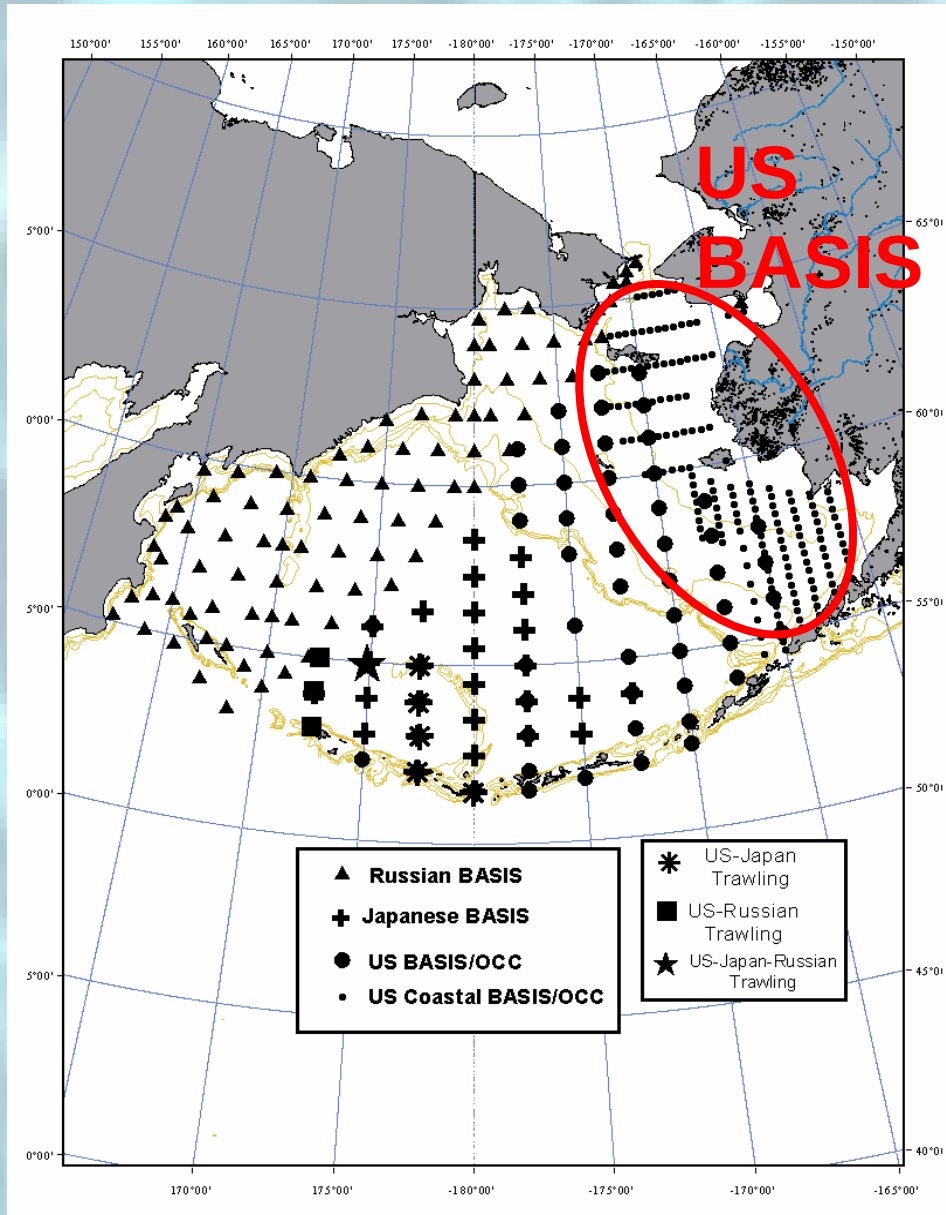
Auke Bay Laboratory, Juneau, Alaska

Outline

- Sampling
 - BASIS
 - Collection methods
 - Species encountered
- Size Structure
- Distribution
- Interactions & Associations
 - Fish species
 - Zooplankton
 - Temperature and salinity
- Conclusions
- Future



Survey design and vessels



2002-2005: BASIS
(Bering Aleutian Salmon
International Survey)

- Commercial trawlers
- Mid-Aug to mid-Oct

BASIS Sampling Components



Surface Rope Trawl:

- Juvenile salmon, pelagic fish, jellyfish
- Surface trawl (50m wide X 18m deep)

Zooplankton

- Bongo net – oblique tow (335 and 505 μm)
- Juday net – vertical tow (160 μm mesh)
- Paravet-vertical tow (150 μm mesh)

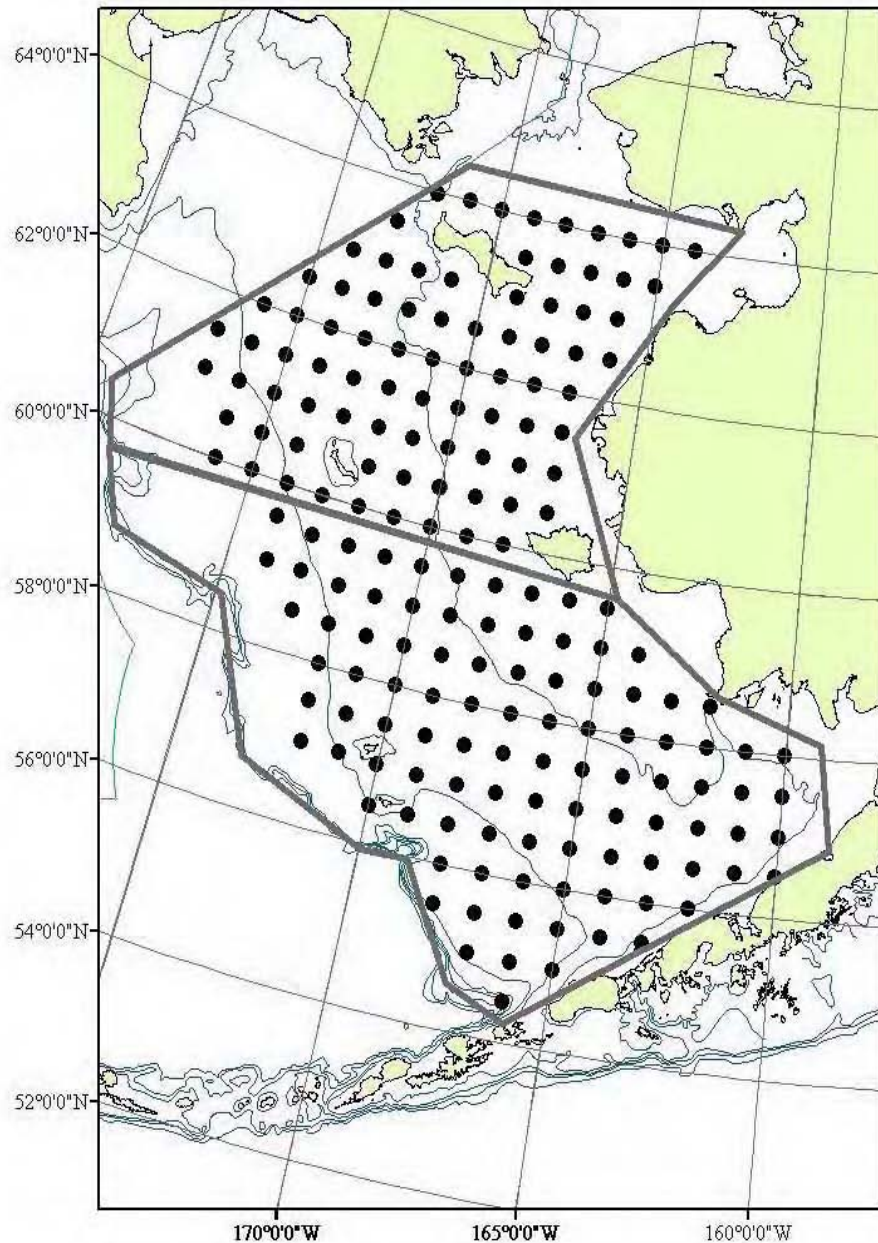
Oceanography

- Thermosalinograph (3m)
- CTD (Chl a, beam c, PAR, DO)

Water samples (2003-2005)

- Microzooplankton
- Phytoplankton
- Chl a: > 0.7 μm (GF/F), > 2 μm , > 5 μm , > 10 μm size
- Nutrients (N, P, Si)

U.S. BASIS Stations



Number of Sampling Stations

2004 = 143

2005 = 127

2006 = 158

- Sampling is weather dependent
- Stations are 30 nautical miles apart
- Bristol Bay in late Aug to early Sept
- Saint Lawrence in late Sept to early Oct



Methods

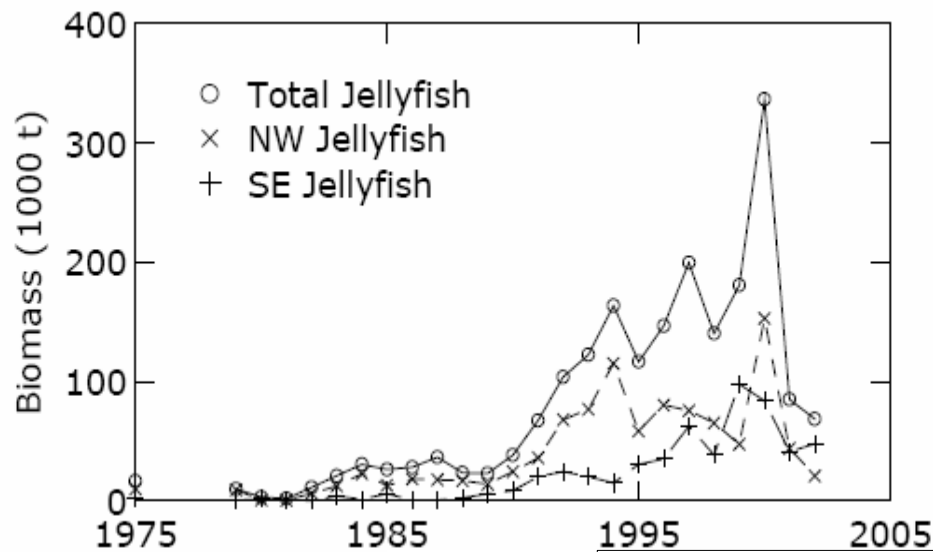
- All jellyfish are caught in a surface trawl (~18m).
- Sorted by species, weighed, and measured for bell diameter.
- Diameter measurements are only made on intact individuals.
- Based on Suchman and Brodeur methods for trawl surveys.



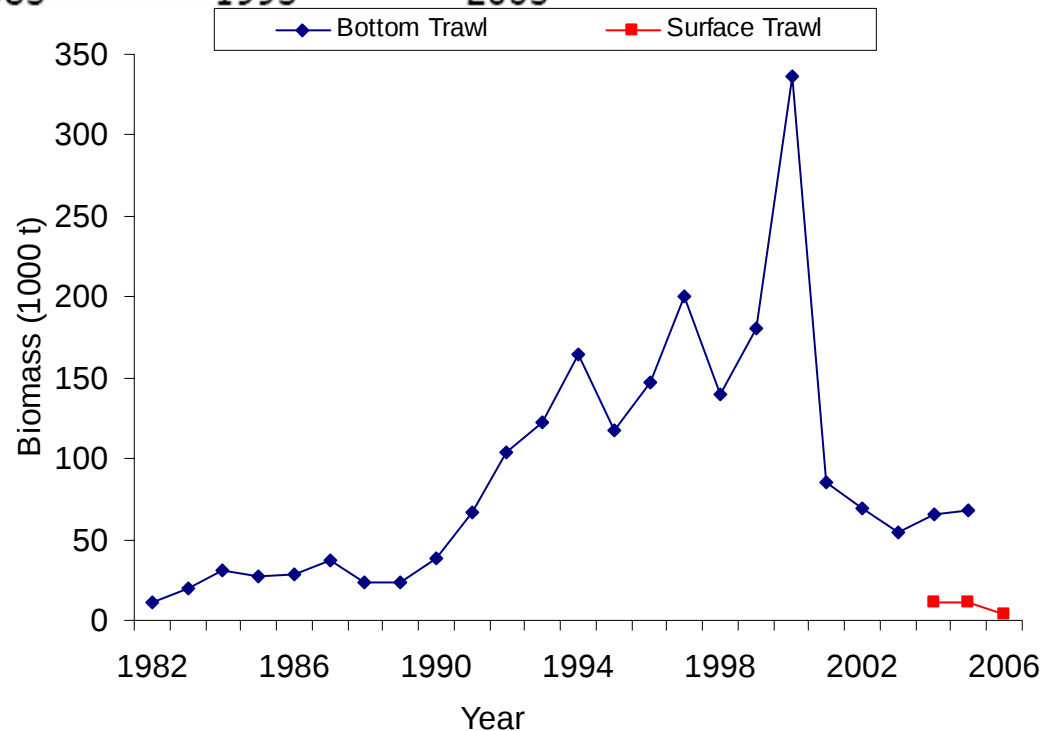
Jellyfish typically caught in trawl



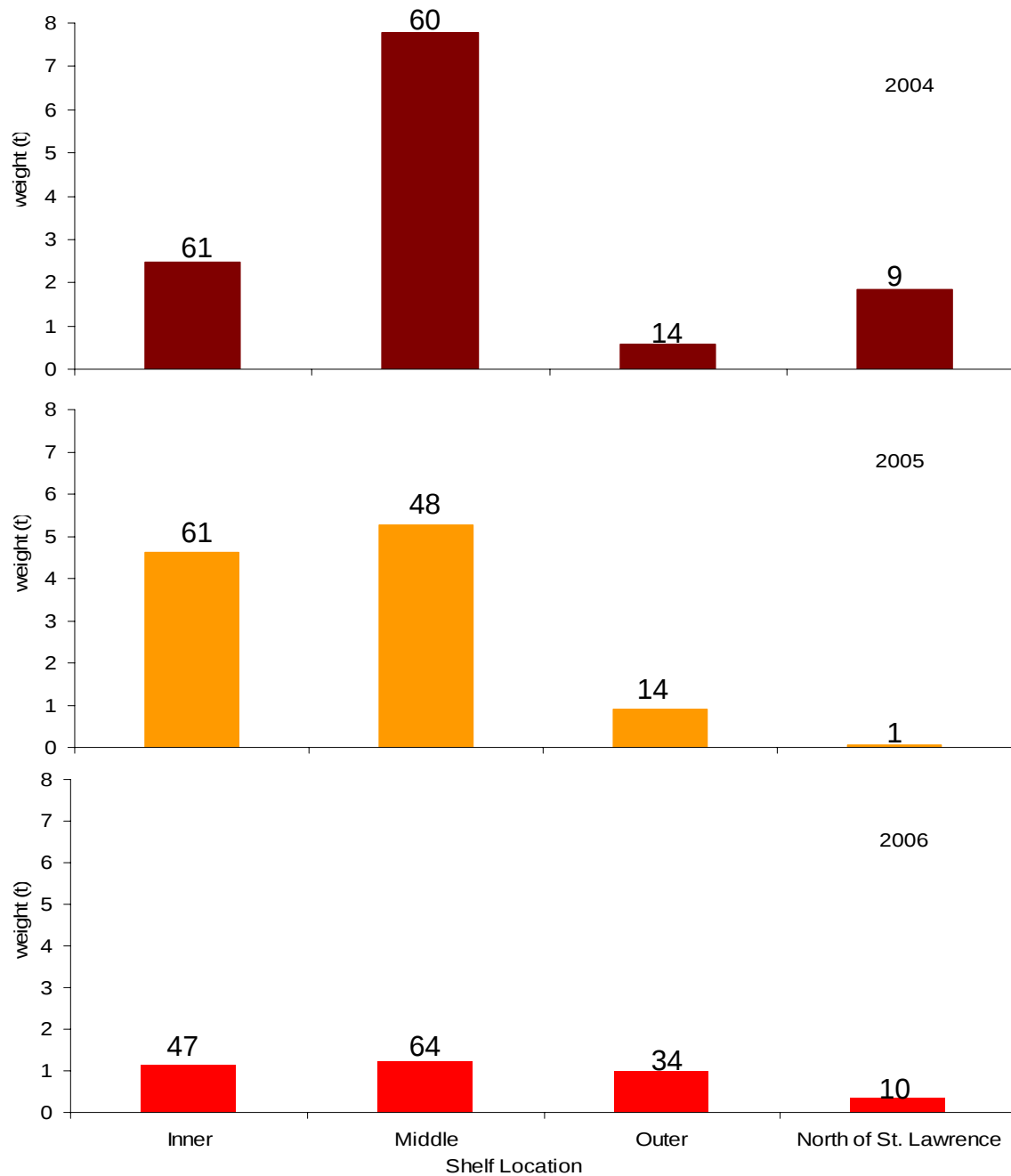
Bering Sea Jellyfish Biomass



Index of large medusae biomass during the NMFS bottom trawl survey in the Bering Sea (PICES scientific report #28, 2005)



Distribution of Jellyfish catch on shelf



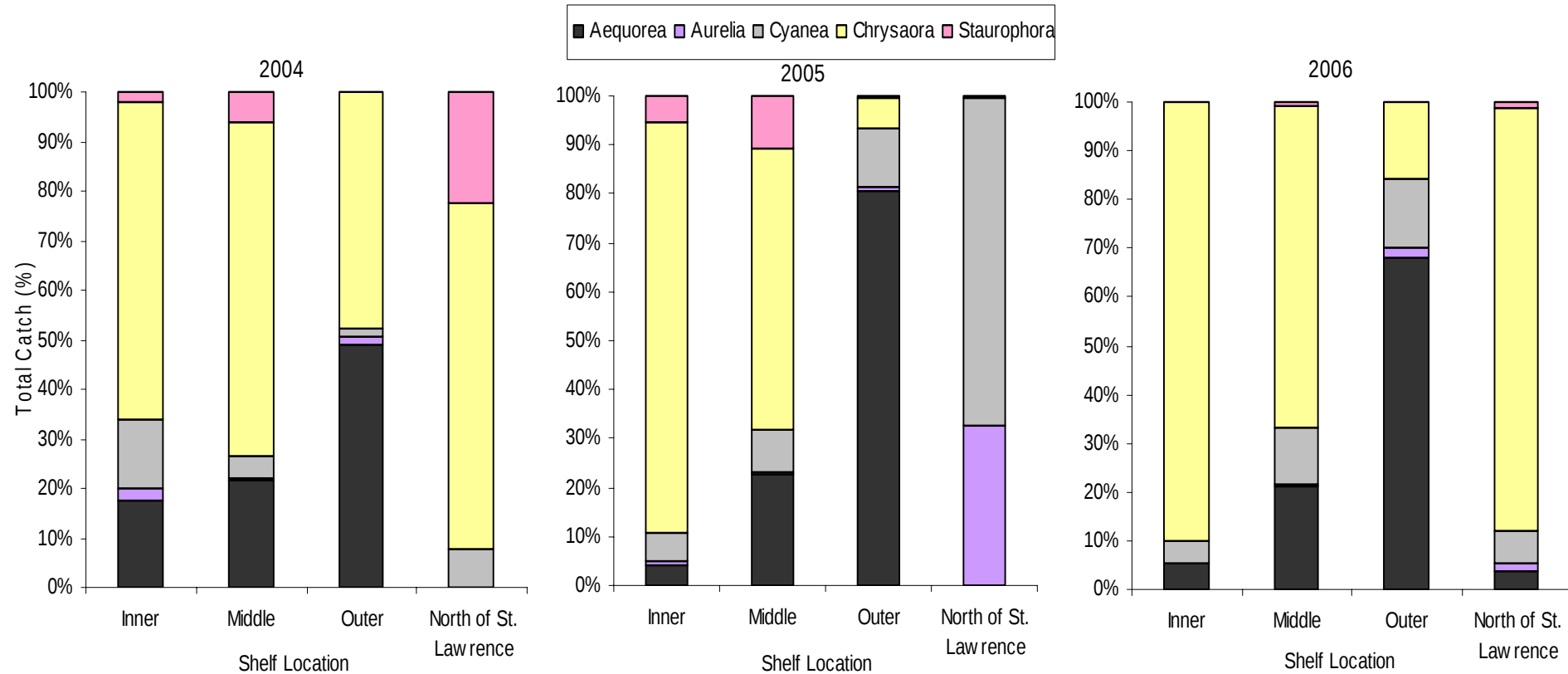
Frequency of Species Occurrence



Frequency of Occurrence (%)

	Aequorea	Aurelia	Chrysaora	Cyanea	Staurophora	Phaeccellophora	n
2004	53	34	96	65	24	4	143
2005	66	45	93	80	56	0	127
2006	50	22	81	54	20	14	158

Species Composition by Location



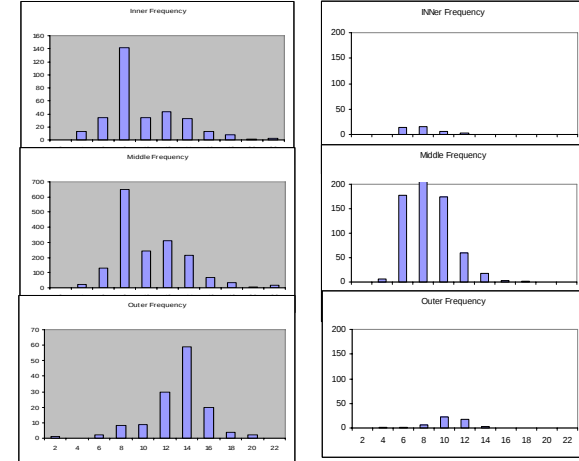
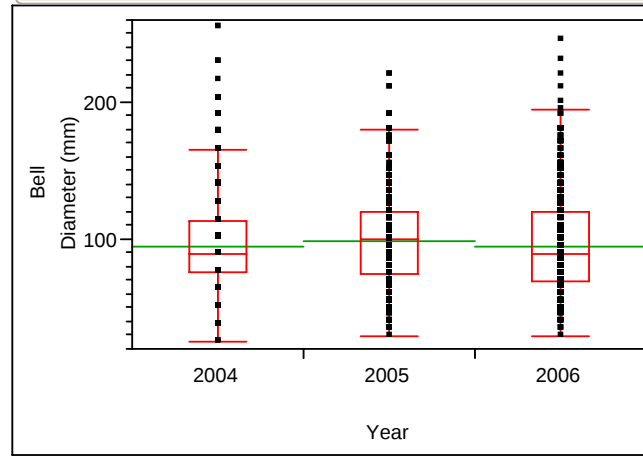
SIZE STRUCTURE



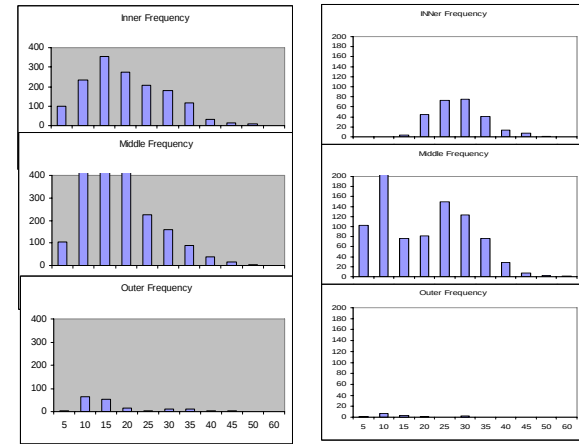
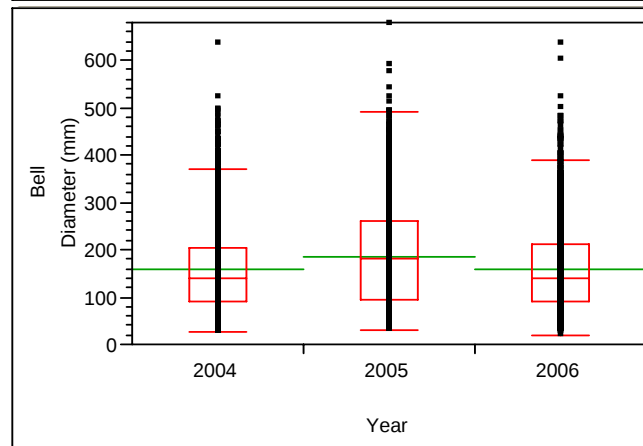
Aequorea sp.



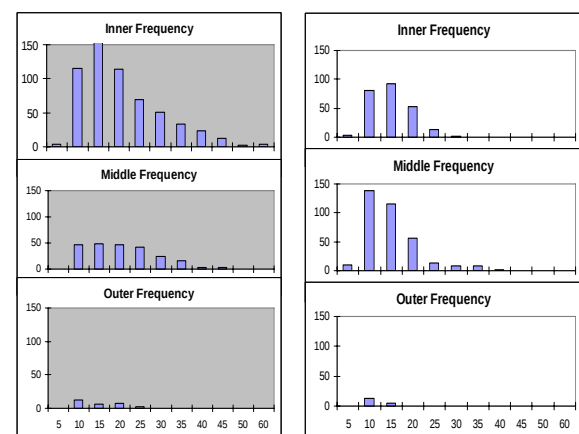
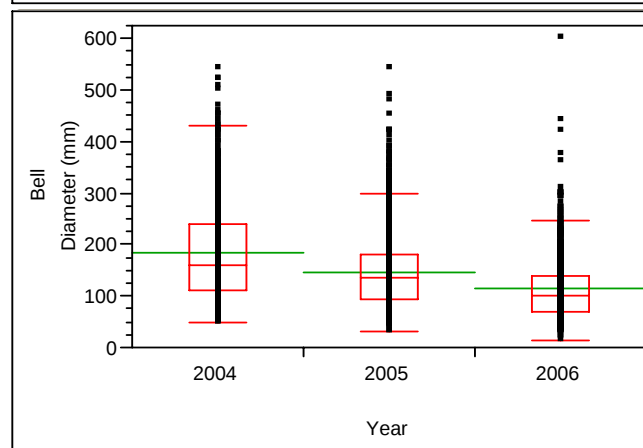
Oneway Analysis of Bell Diameter (mm) By Year

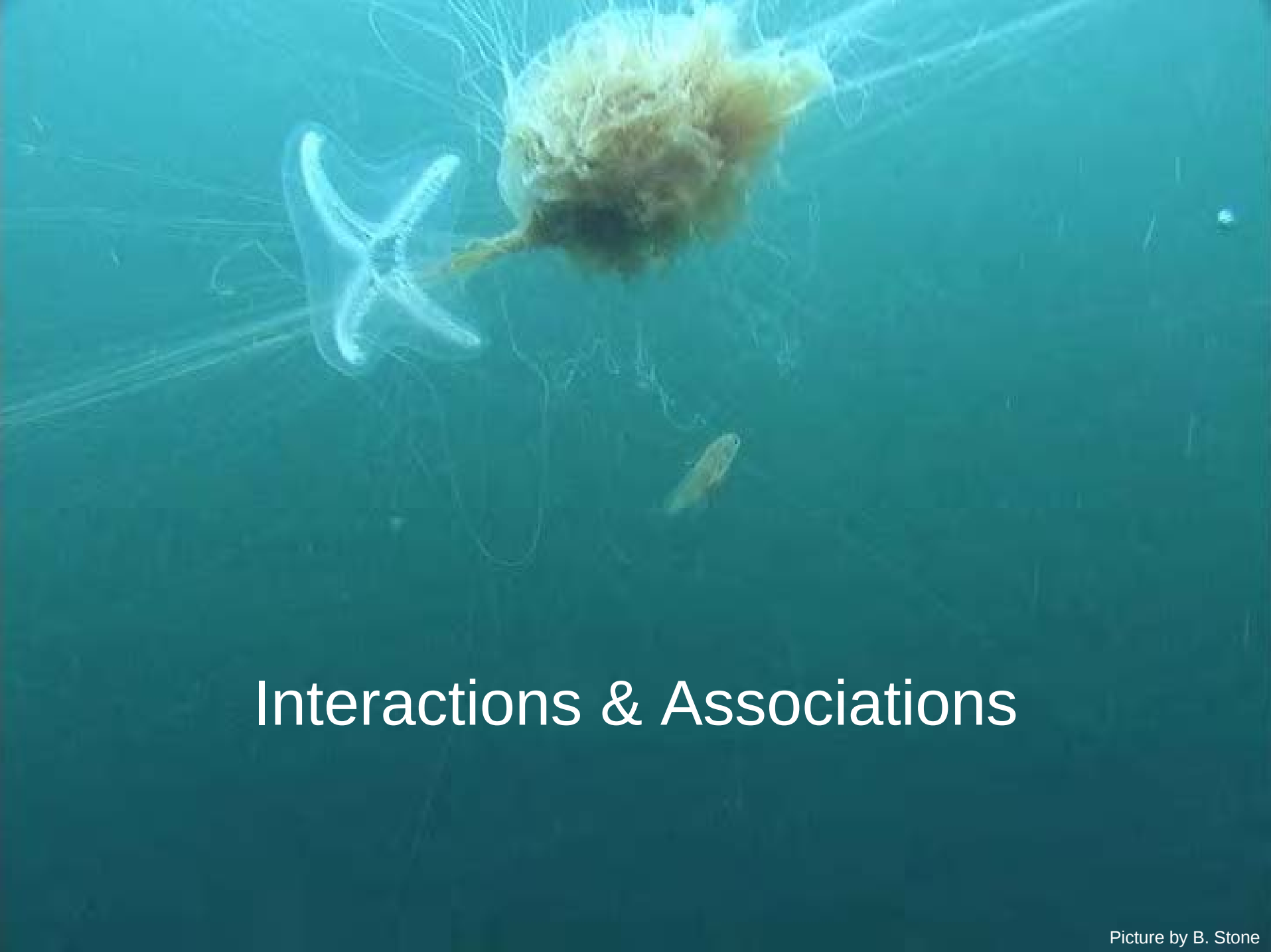


Chrysaora melanaster



Cyanea capillata





Interactions & Associations

Trawl catches



Theragra chalcogramma



Spirinchus thaleichthys



Clupea pallasii



*Pleurogrammus
monopterygius*



Fish Species



Trichodon trichodon



Ammodytes hexapterus



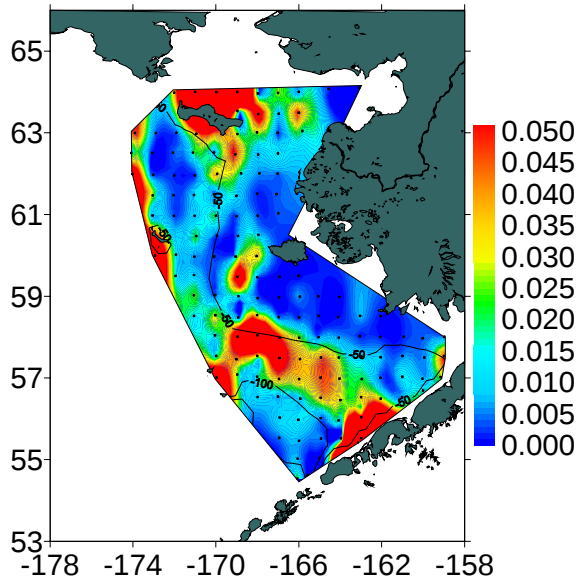
Mallotus villosus



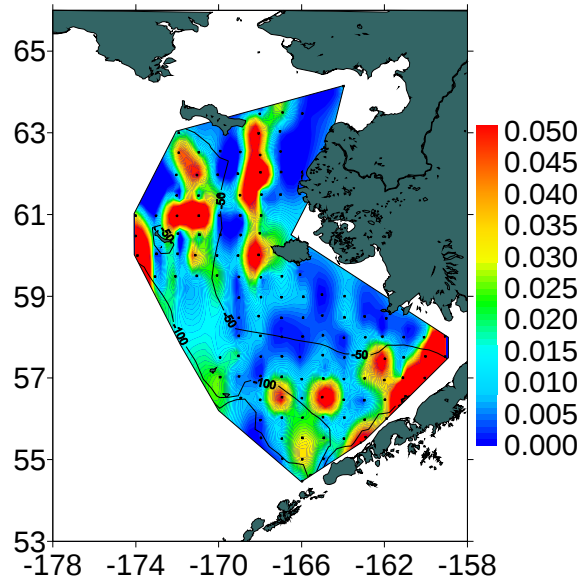
Biomass Distributions 2004-2006

Jellyfish

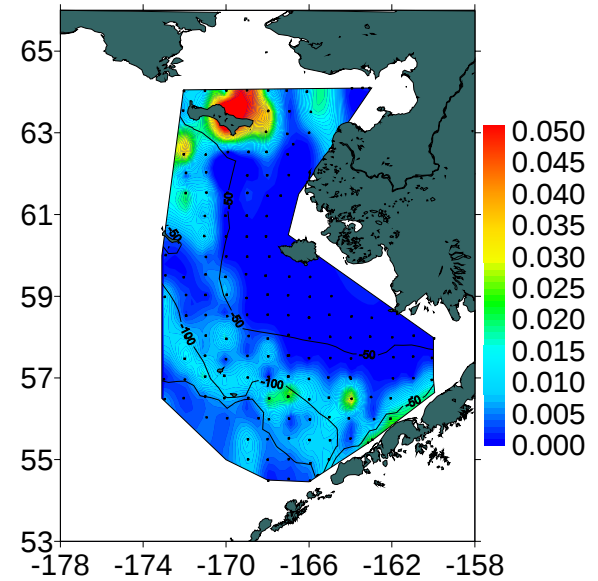
2004



2005

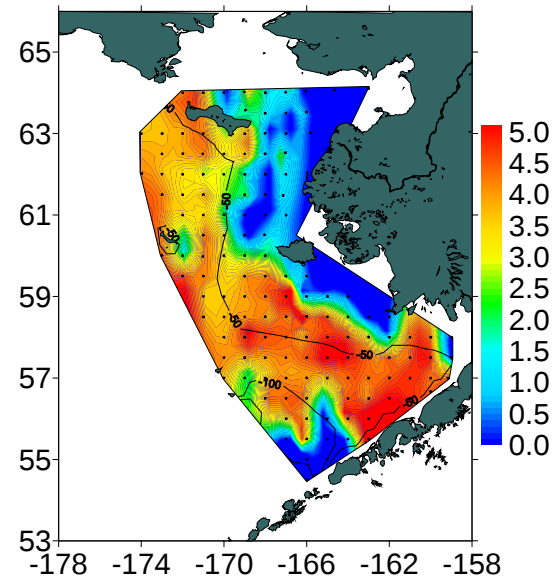


2006

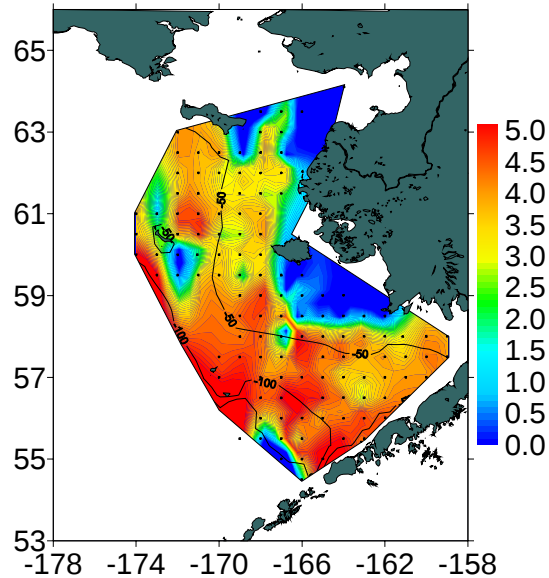


Pollock

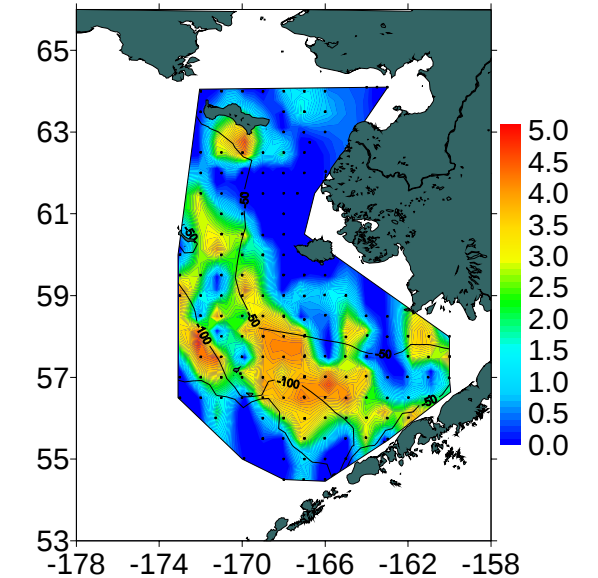
2004



2005

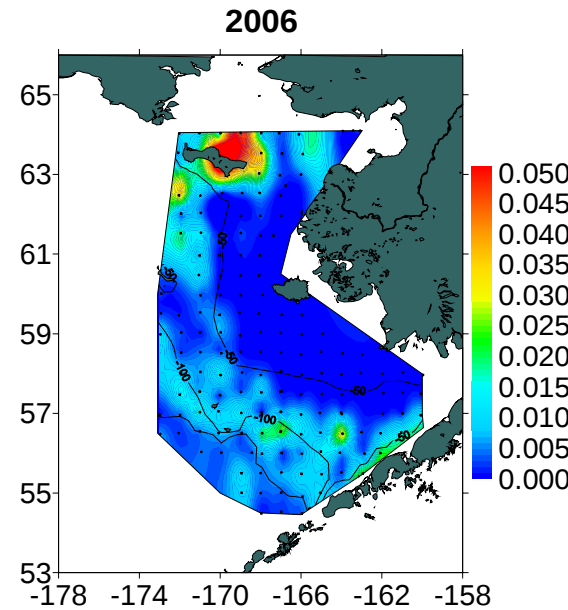
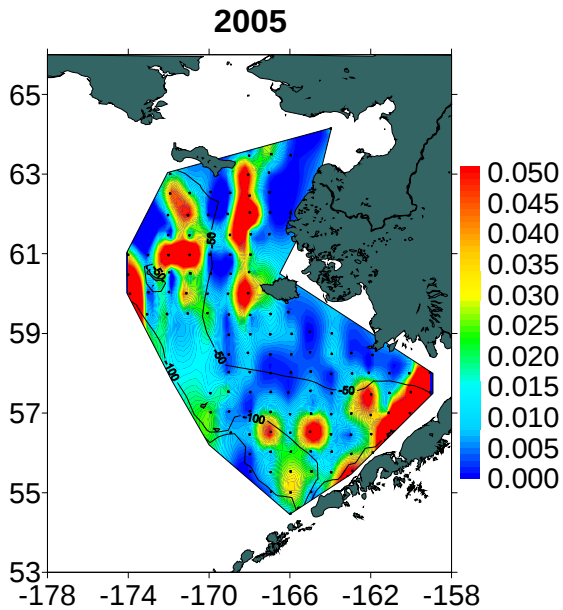
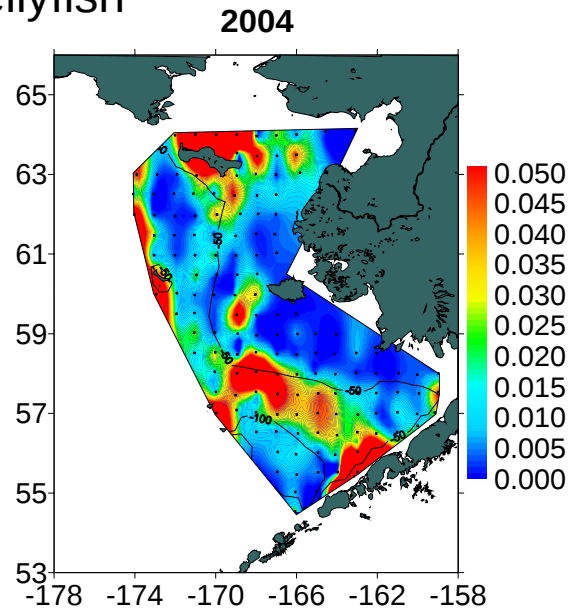


2006

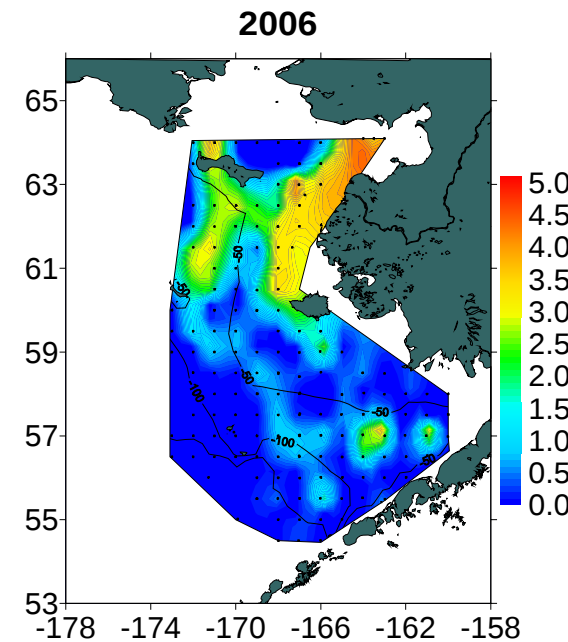
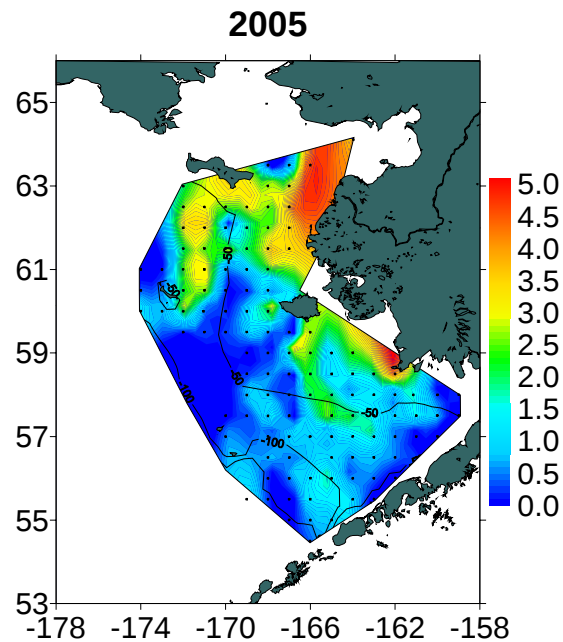
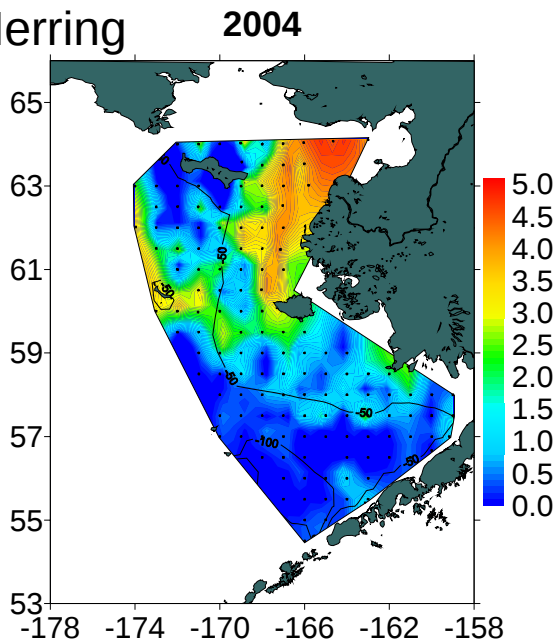


Biomass Distributions 2004-2006

Jellyfish

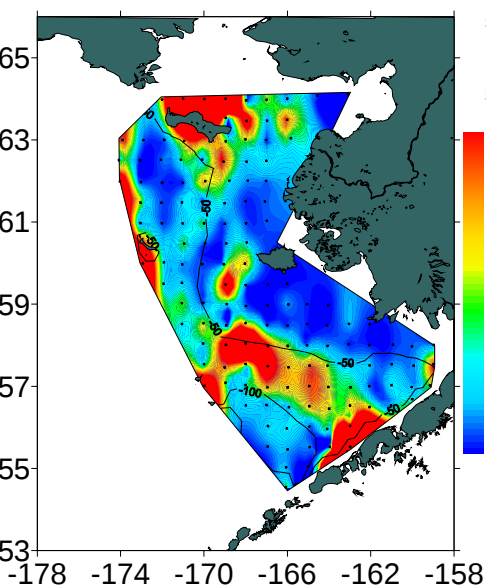


Herring

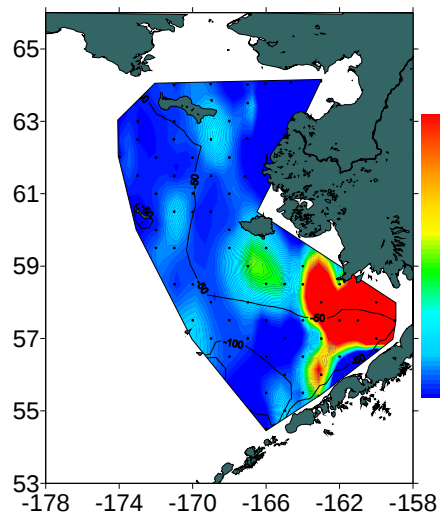


Large Medusae

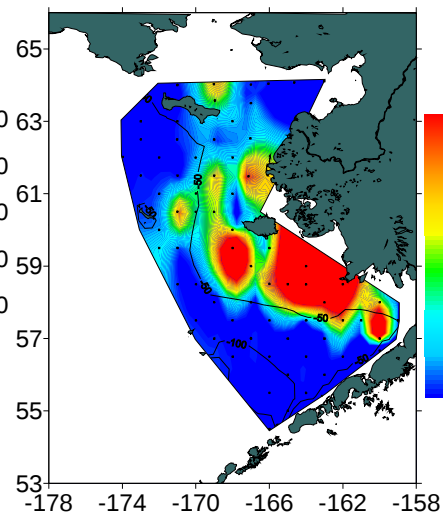
EBS 2004, Biomass (g m^{-3})



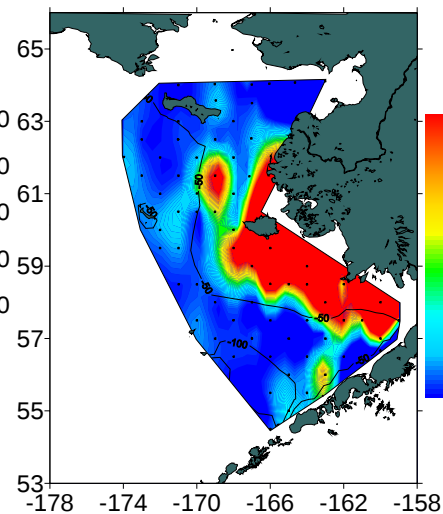
EBS2004; Abundance (No m^{-3})
Acartia longiremis; Bongo 335



EBS2004; Abundance (No m^{-3})
Centropages abdominalis; Bongo 335



EBS2004; Abundance (No m^{-3})
Pseudocalanus sp.; Bongo 335

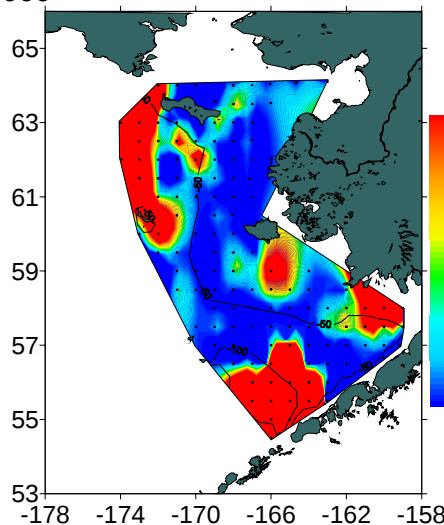


Small Copepods

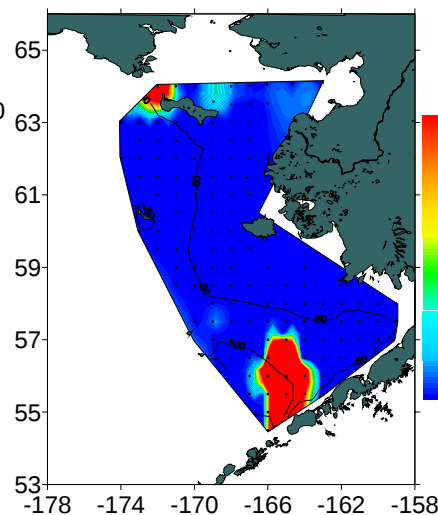
2004

Large Copepods

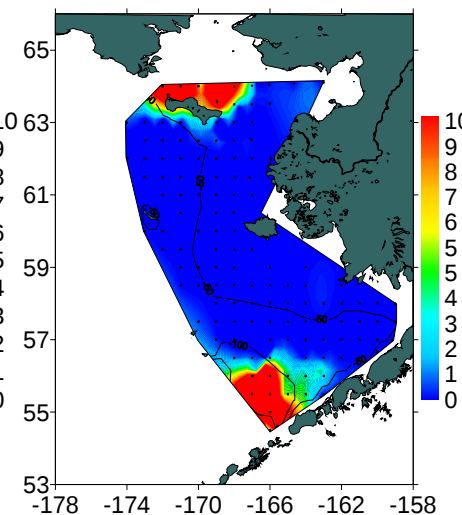
EBS2004; Abundance (No m^{-3})
Calanus marshallae; Bongo 505



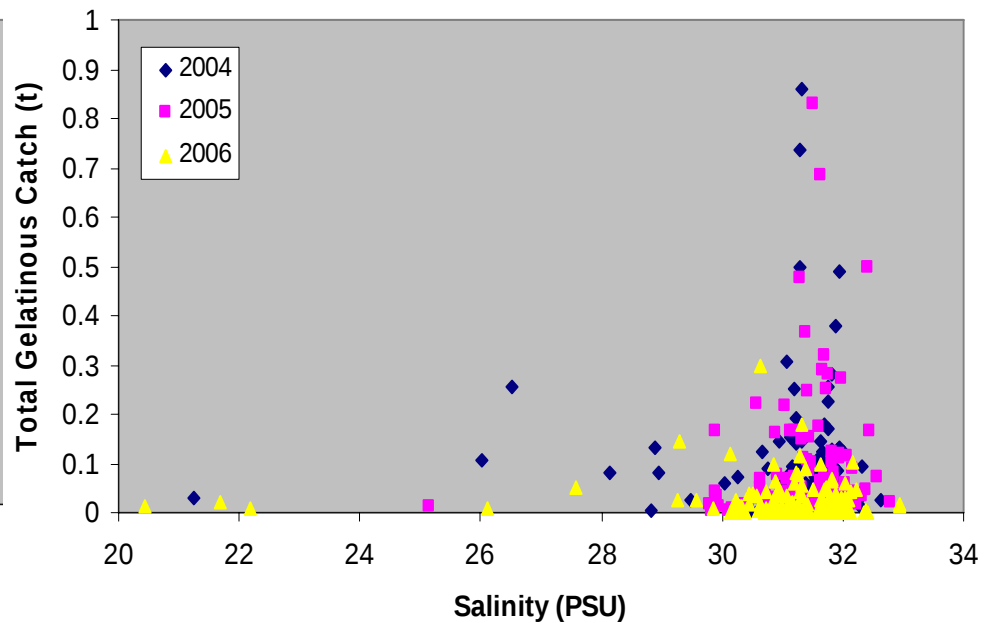
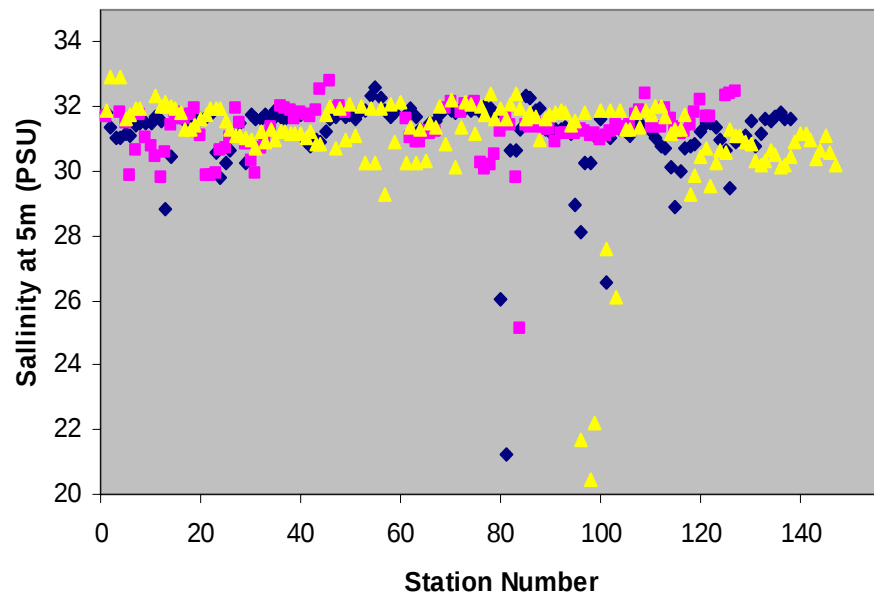
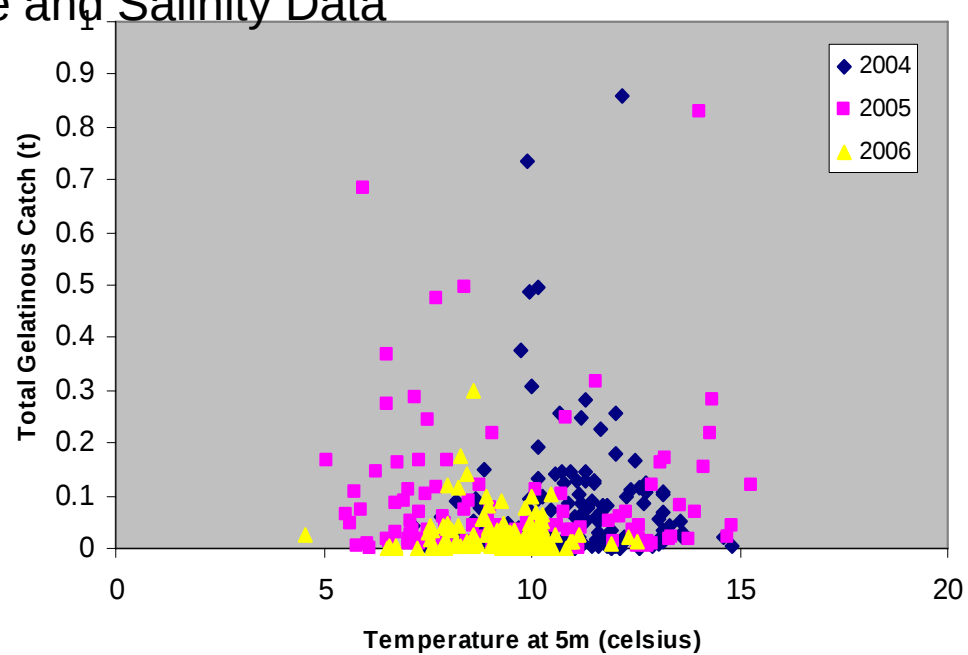
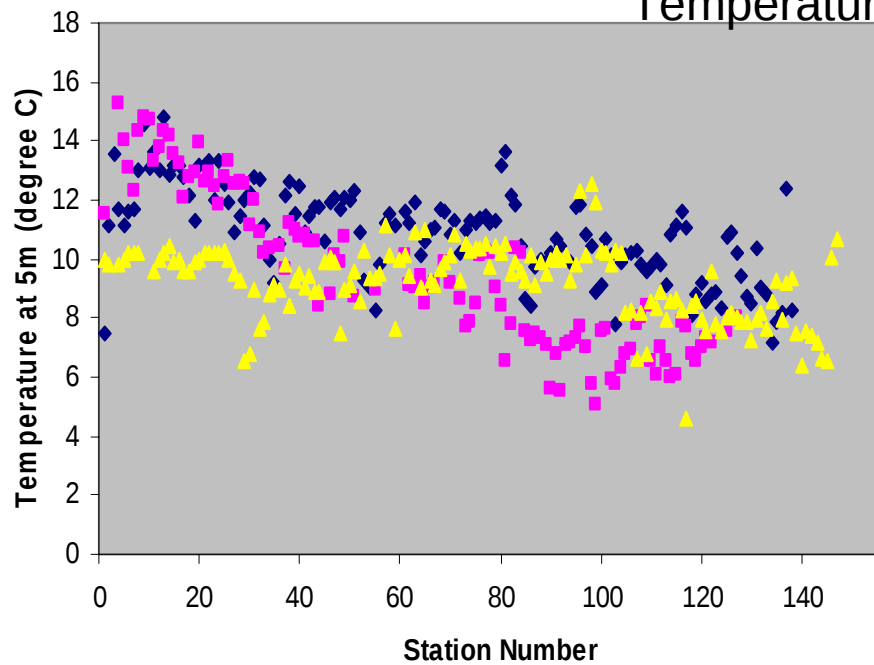
EBS2004; Abundance (No m^{-3})
Metridia pacifica; Bongo 505



EBS2004; Abundance (No m^{-3})
Eucalanus bungii; Bongo 505



Temperature and Salinity Data



Conclusions

- Compared with previous years, 2006 shows a notable decline in jellyfish biomass
- Bell diameters remained relatively the same for most abundant species, with the exception of *Cyanea*
- The relationship between most forage fish catches and jellyfish catches is unclear
- The middle shelf has the highest concentrations of jellyfish and lowest abundance of copepods
- Physical ocean factors seem to influence jellyfish distributions
- Fluctuations in biomass seem to be occurring at an earlier life stage that our survey does not observe

Future Research

- Continuation of sampling in 2007
- Analyze collected oceanographic data of past years
- Examine possible relationships between other fish species and jellyfish
- Explore density-depth relationship of jellyfish



Fin

Acknowledgements

**Ocean Carrying Capacity Program
Crews of the Sea Storm & North West
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**Dr. S.K Shotwell, Dr. Bruce Wing, Cara
Rodgveller, & Peter Hochstoeger**