

Gelata on the Bay

Mike Ford

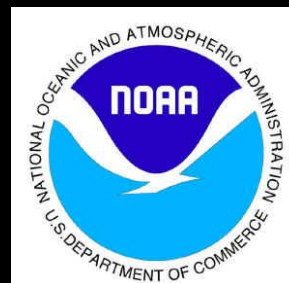
NOAA Representative to STAC

NOAA/NMFS

SERC



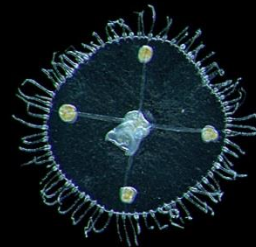
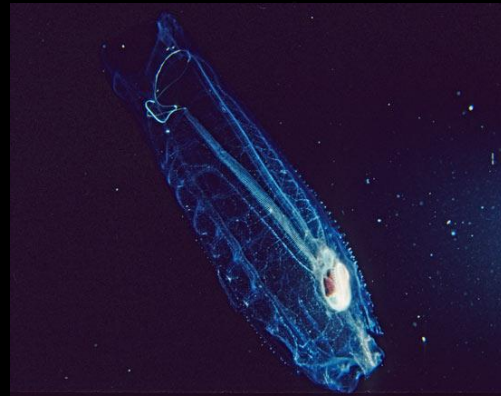
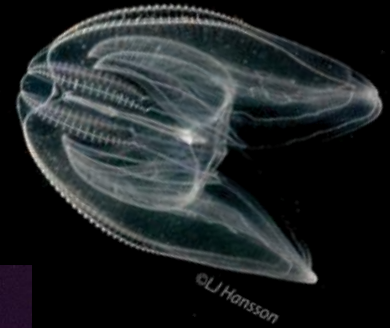
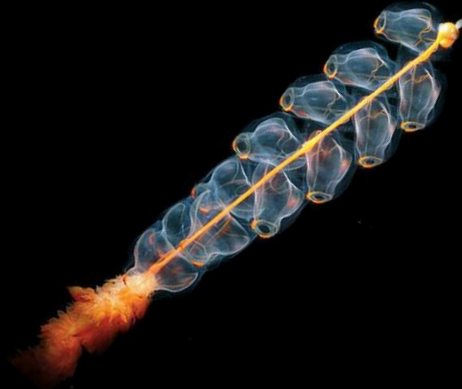
Smithsonian Institution



- Why this?, Why now?
- What happened with CB jellyfish last season?
- What can we detect?
- What would we do if we did detect something?

Gelata: Diverse, beautiful, and a triple-threat

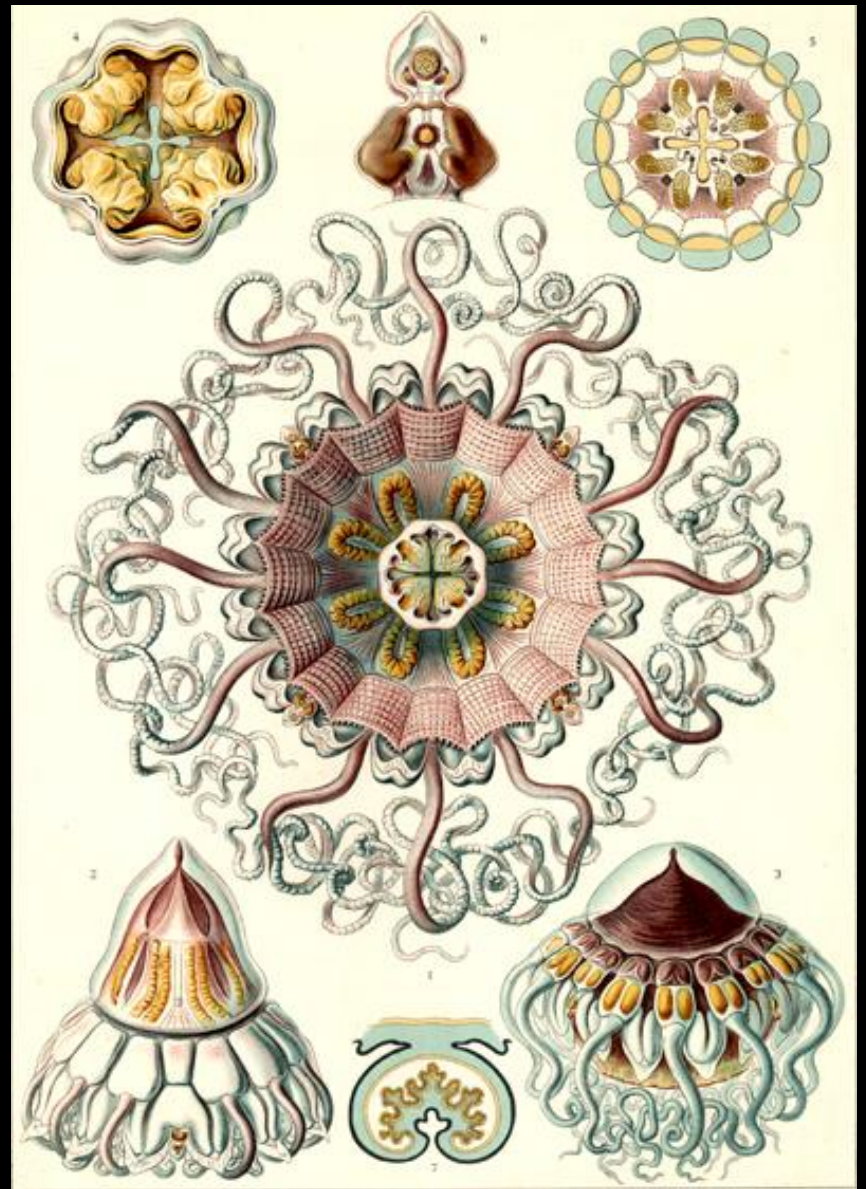
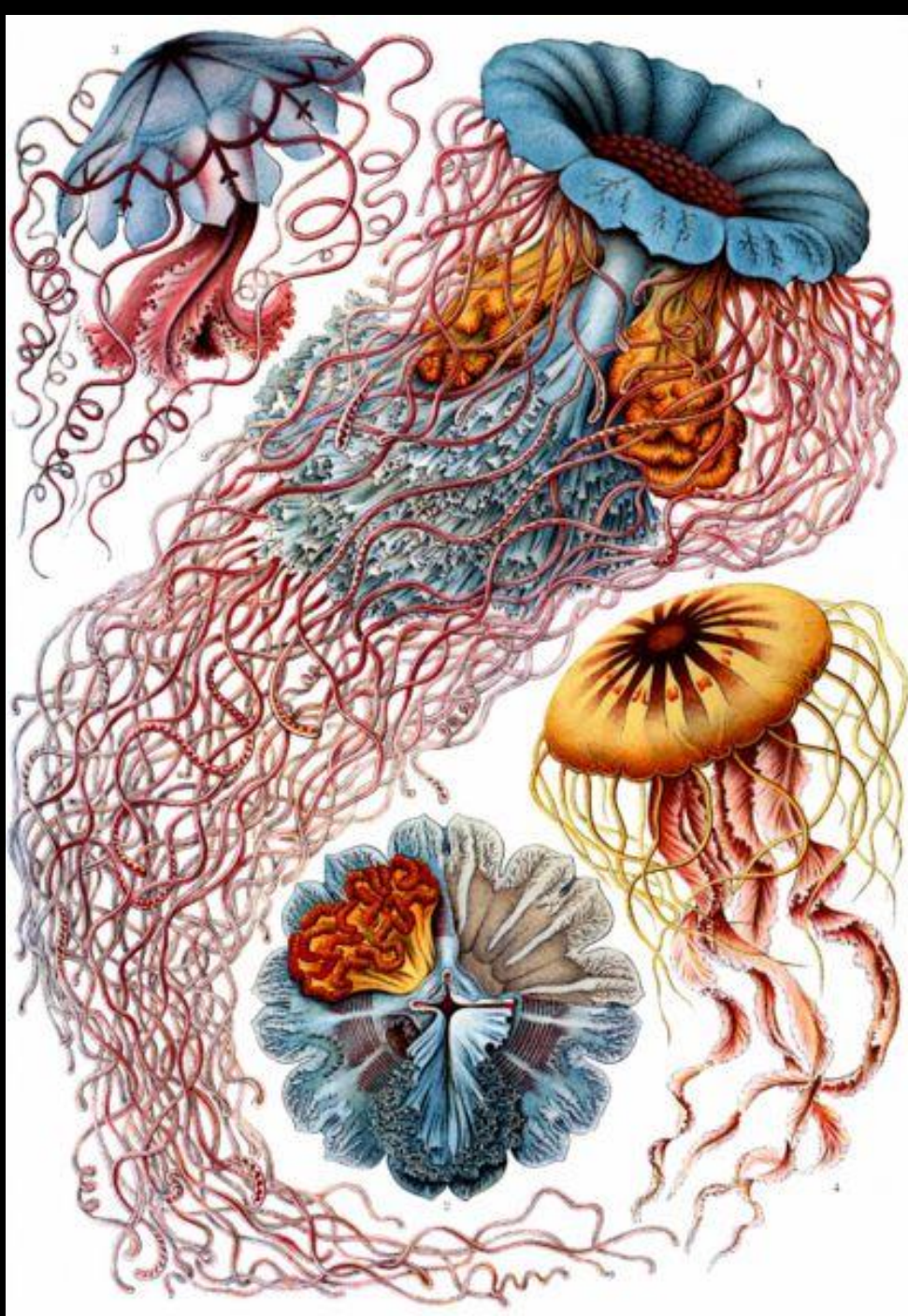
“Gelata”



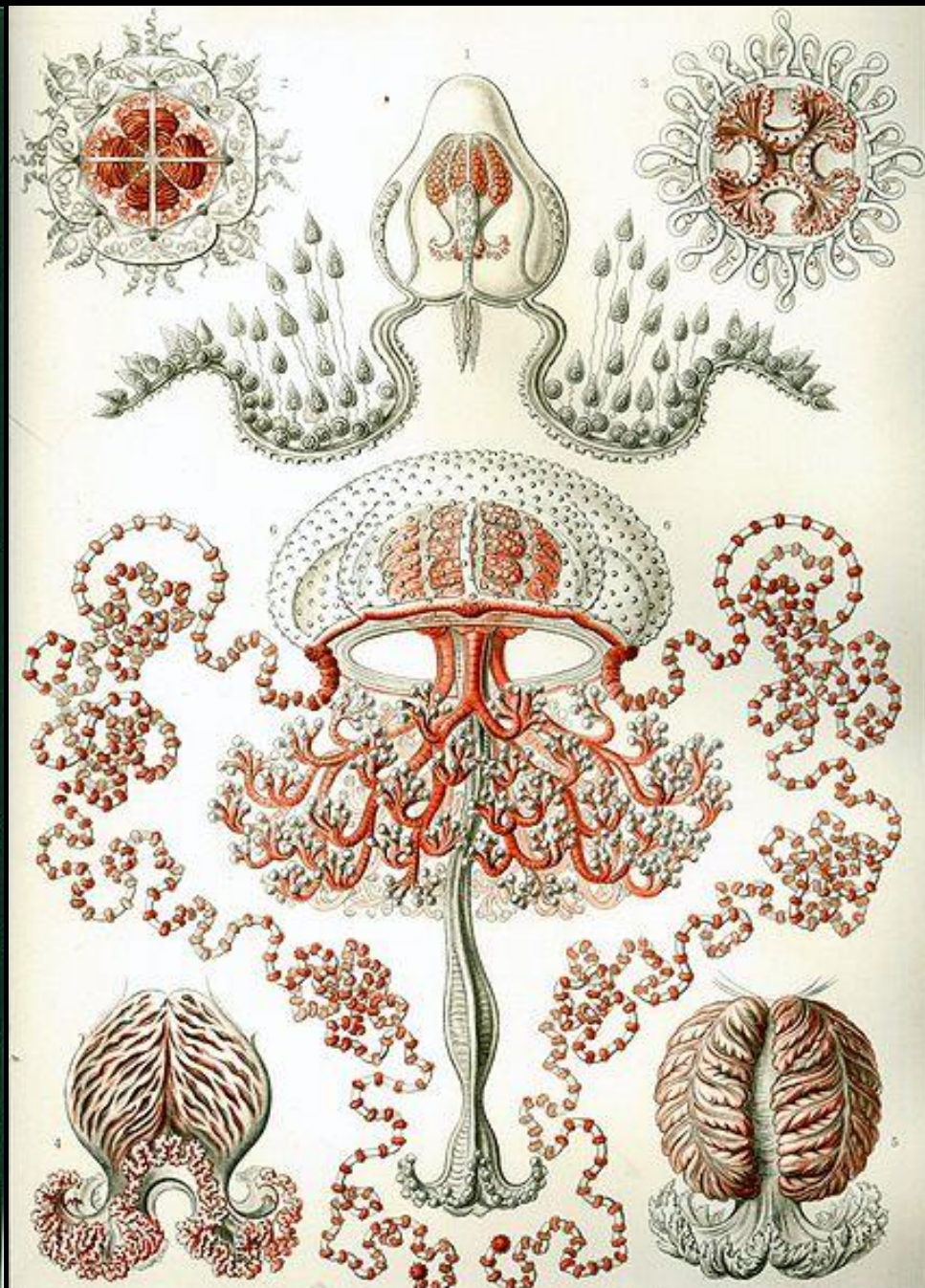
Obelia longissima
Hesperia/UAFCoM

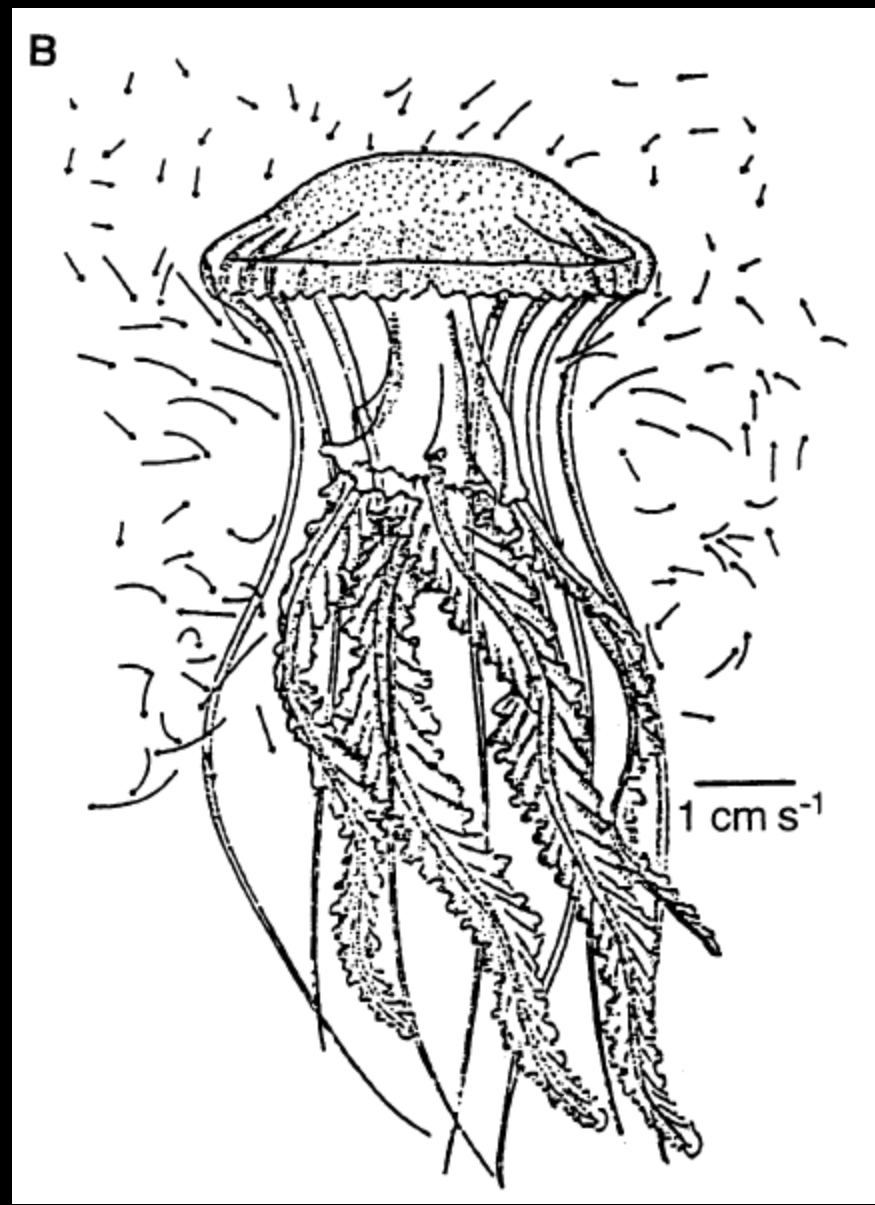
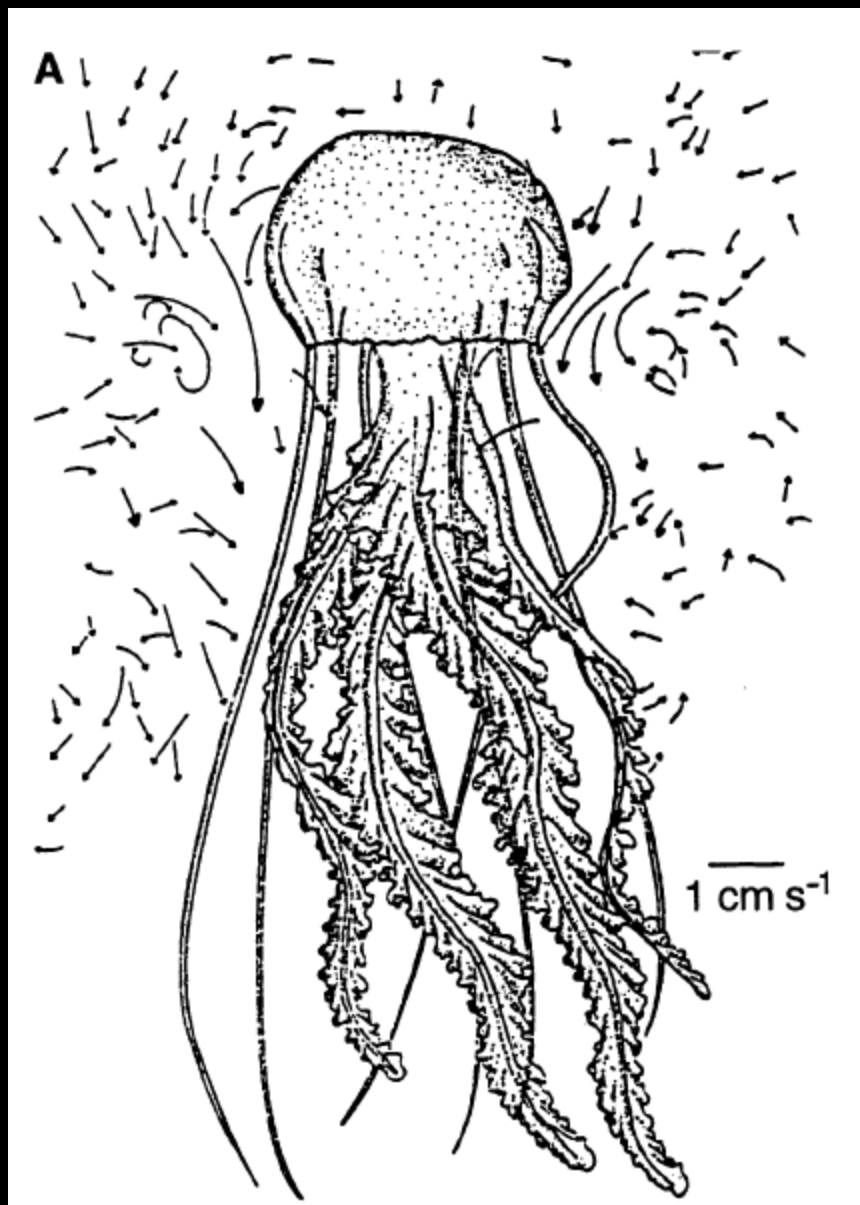


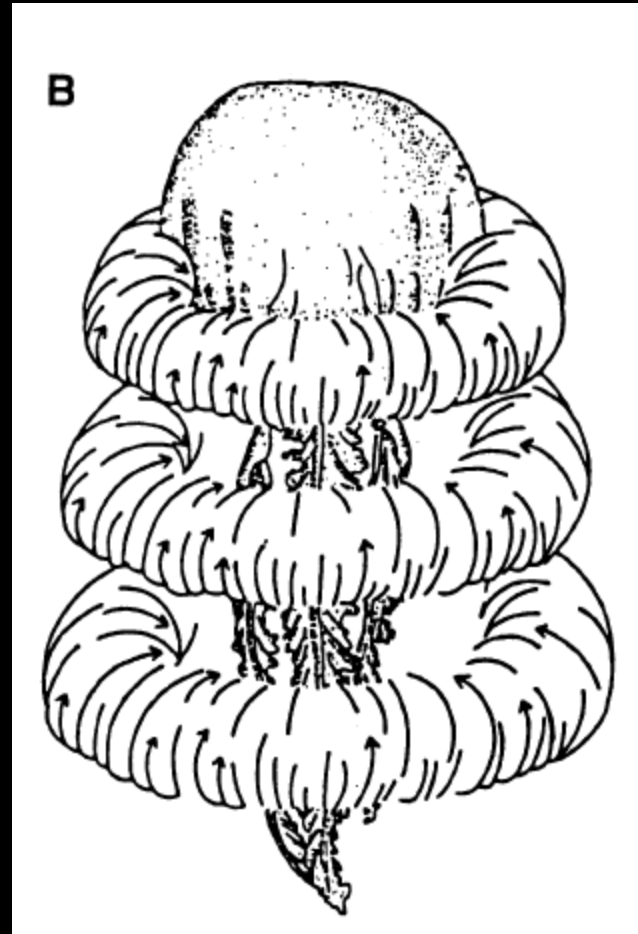
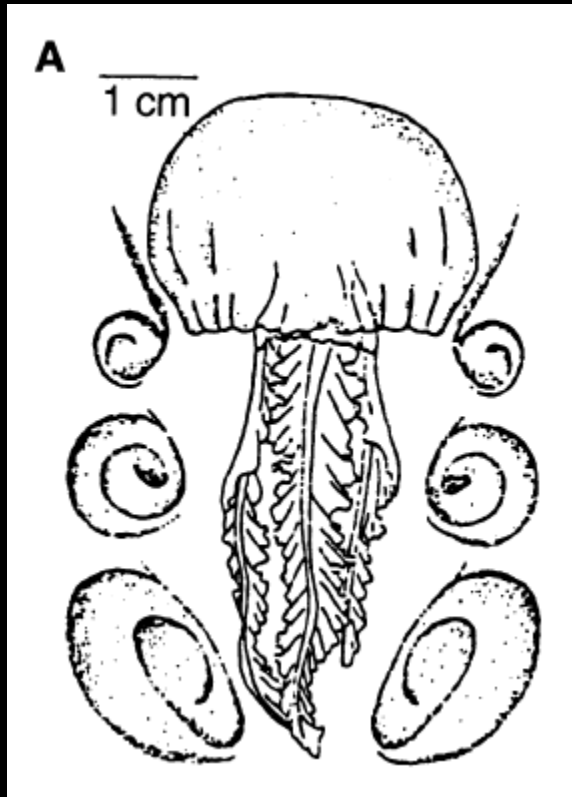
Mike Ford

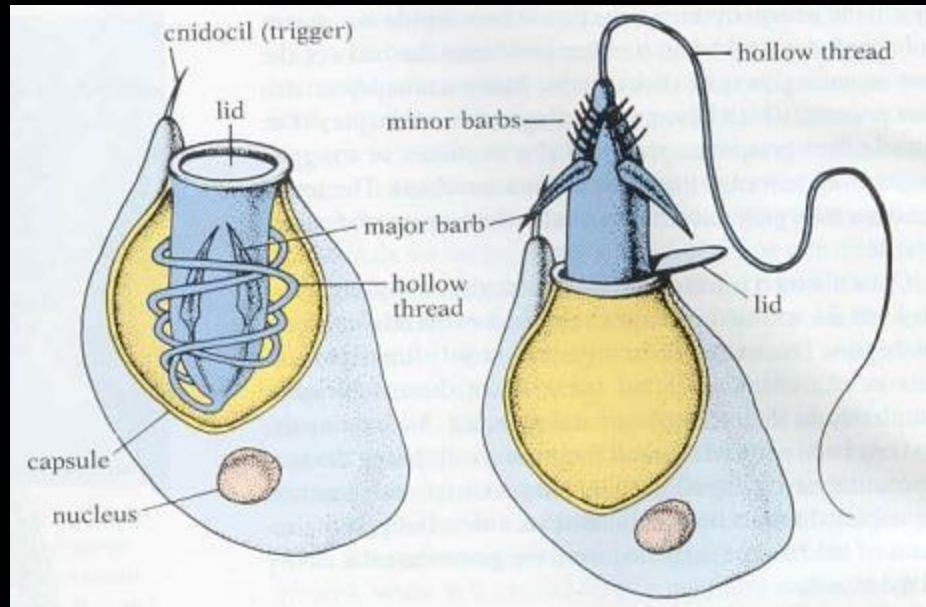


Haeckel

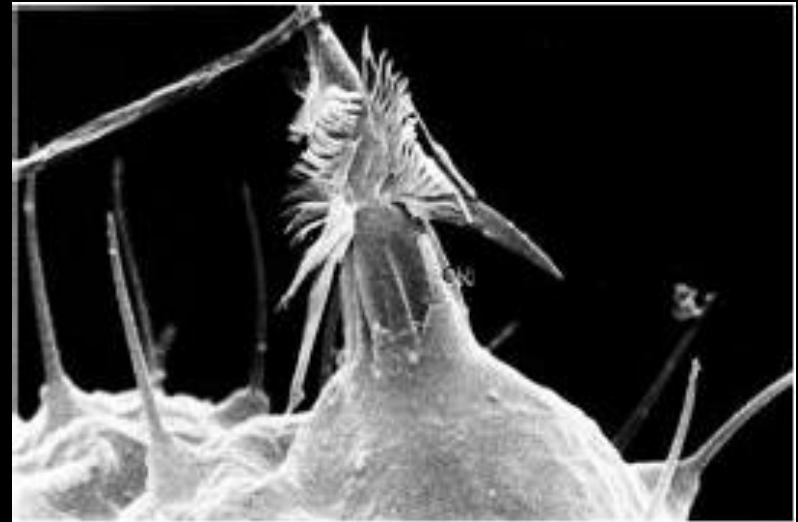








Fires in 700 nanoseconds
(billionth of a second)
5,000,000 g





x130

200 μm 

8kV

31mm



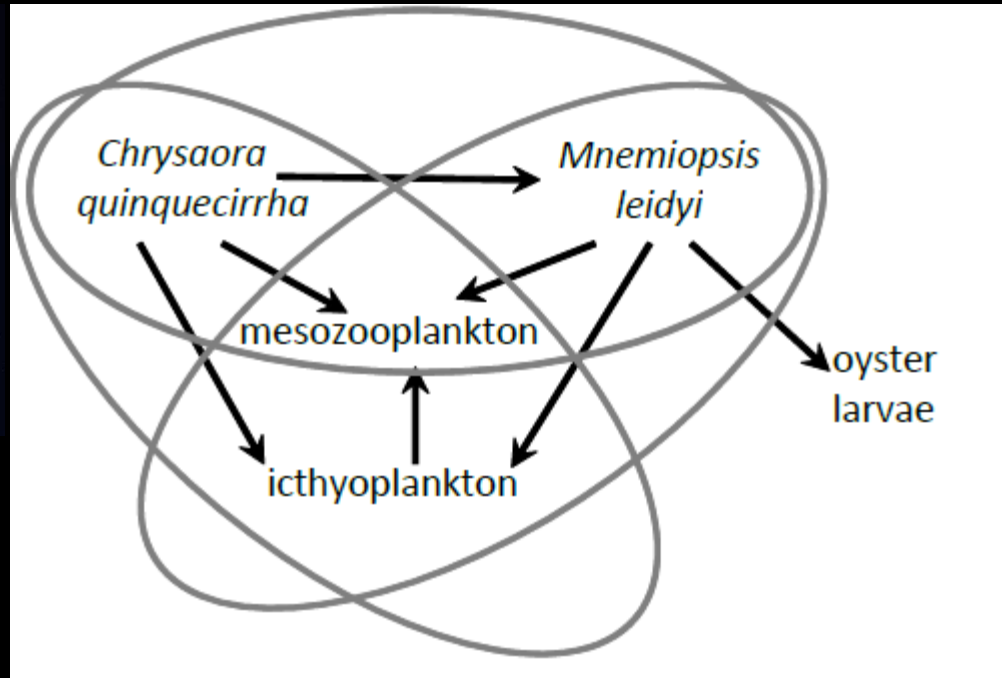
Sea Gooseberries, *Pleurobrachia pileus*



Triple Threat:

- Fast reproduction
- High clearance rate
- Physiological tolerance

Leidy's comb jelly, *Mnemiopsis leidyi*



Breitburg & Burrell 2014

Three overlapping intraguild predation webs

Seasonally, *C. quinquecirrha* can increase to control *M. leidyi* and thus switch the dominance of the intraguild predation web from *M. leidyi* to *C. quinquecirrha*

- Why this?, Why now?
- What happened with CB jellyfish last season?
- What can we detect?
- What would we do if we did detect something?

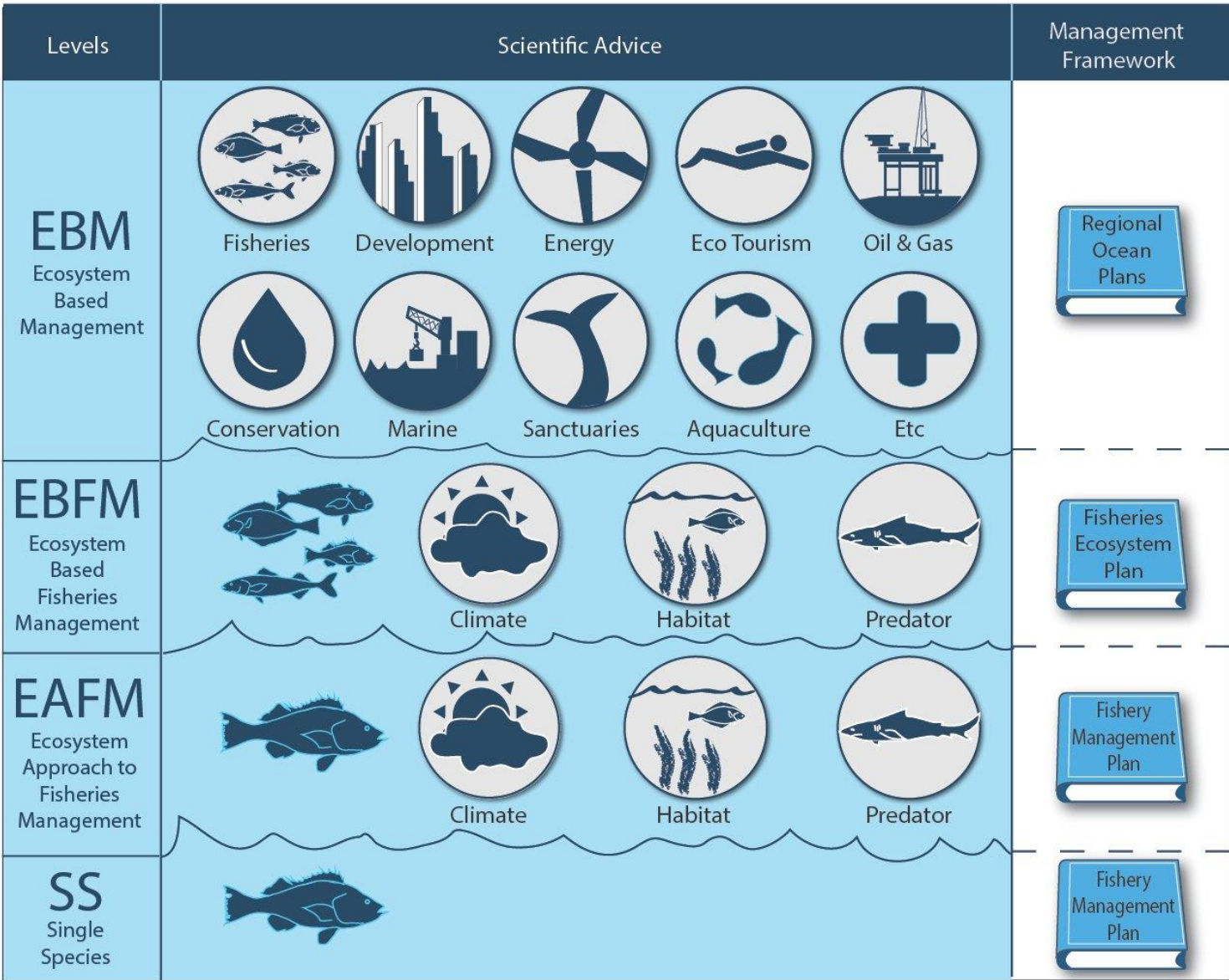


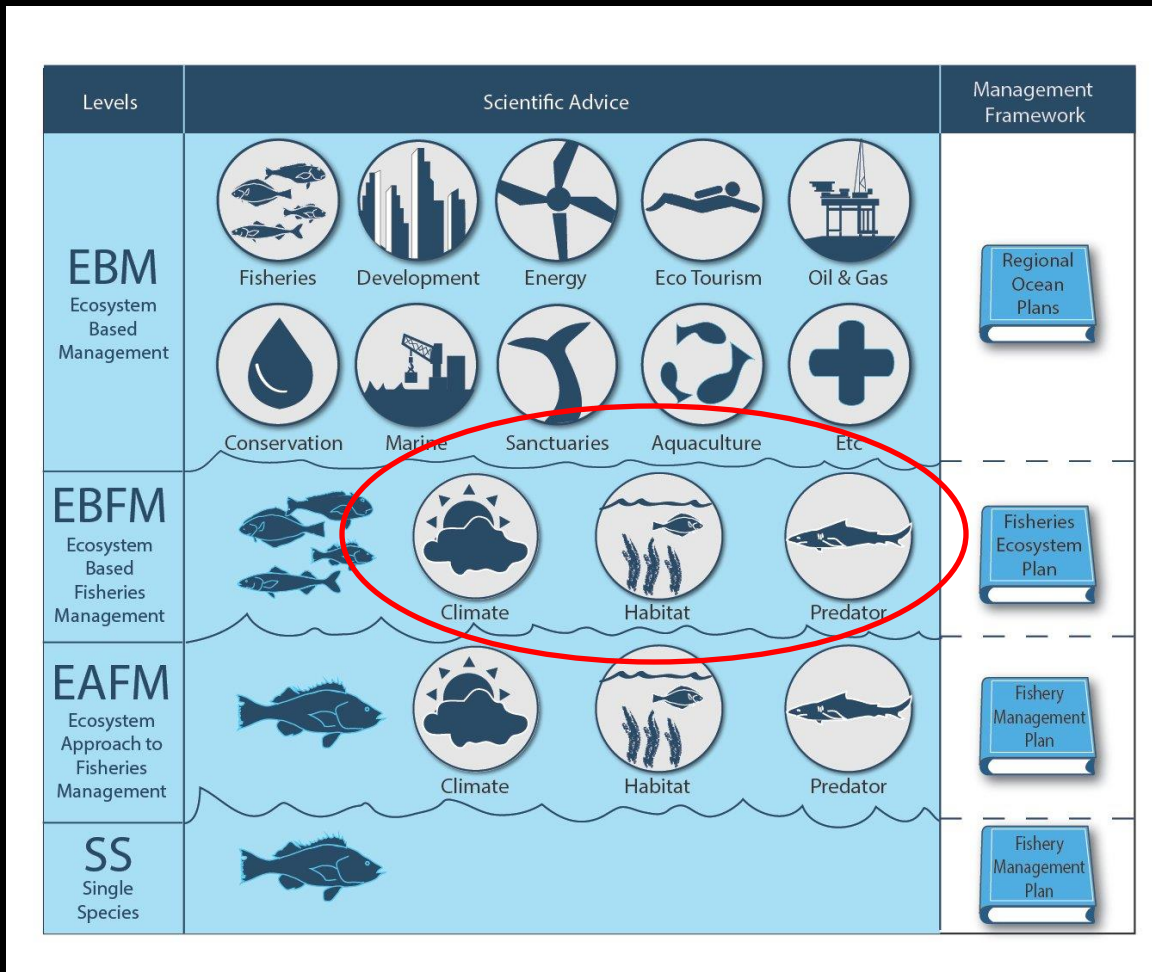


Halistemma sp.
A siphonophore

1976, New England – Stops fishing operations, losses ~ \$300,000 ('76 dollars)







Elements of the ecosystem seem to come together at STAC

Advice, trade-offs, simulations of management actions are informed by consideration of the ecosystem

Solutions exist between the disciplines – at the intersections

- Why this, Why me, Why now
- What happened with CB jellyfish last season?
- What can we detect?
- What would we do if we did detect something?

CBL daily pier counts

Since 1960

We started in July 2013

2014 sea nettle abundance –

Sea nettle ‘no show’

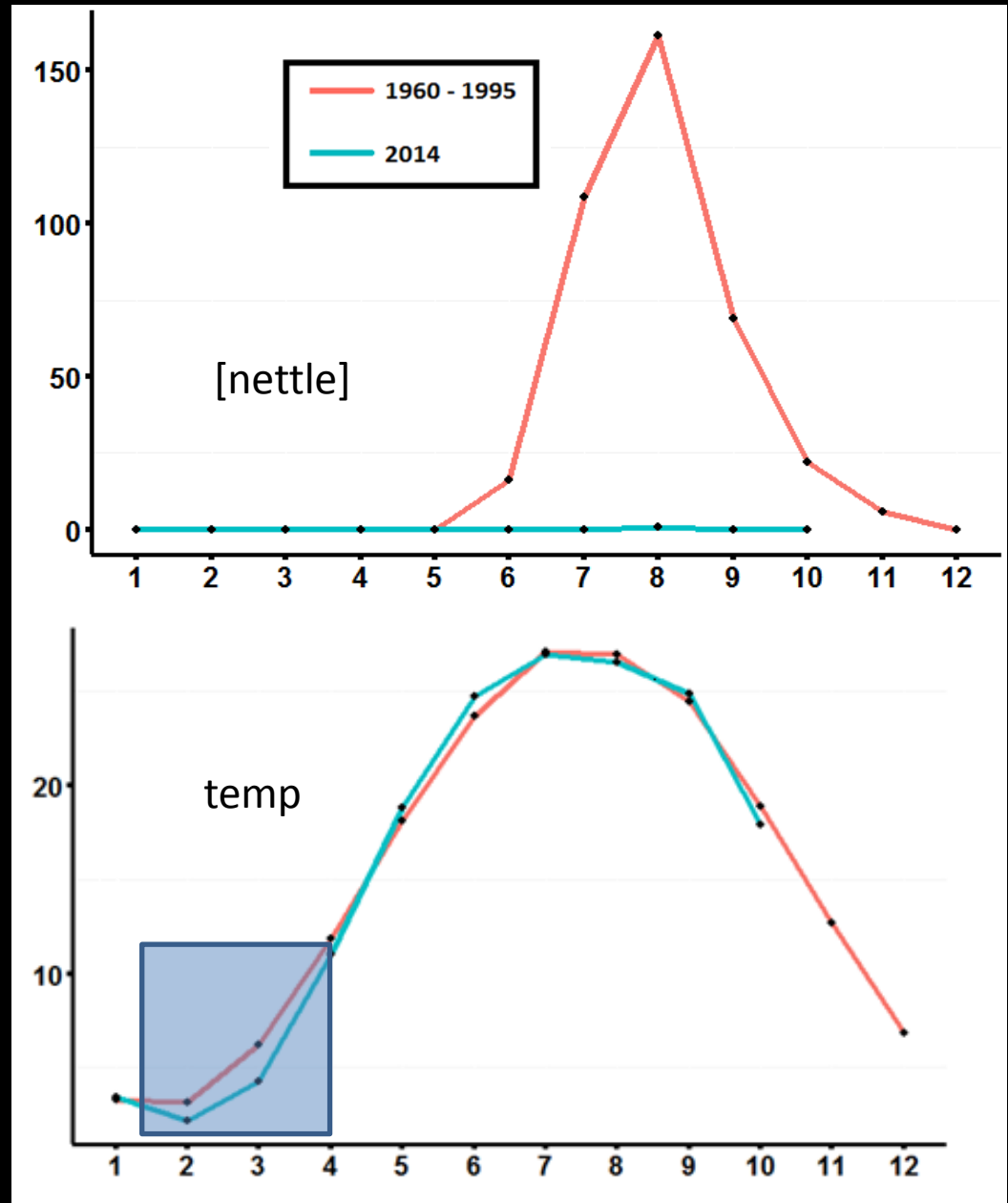
Winter temperature

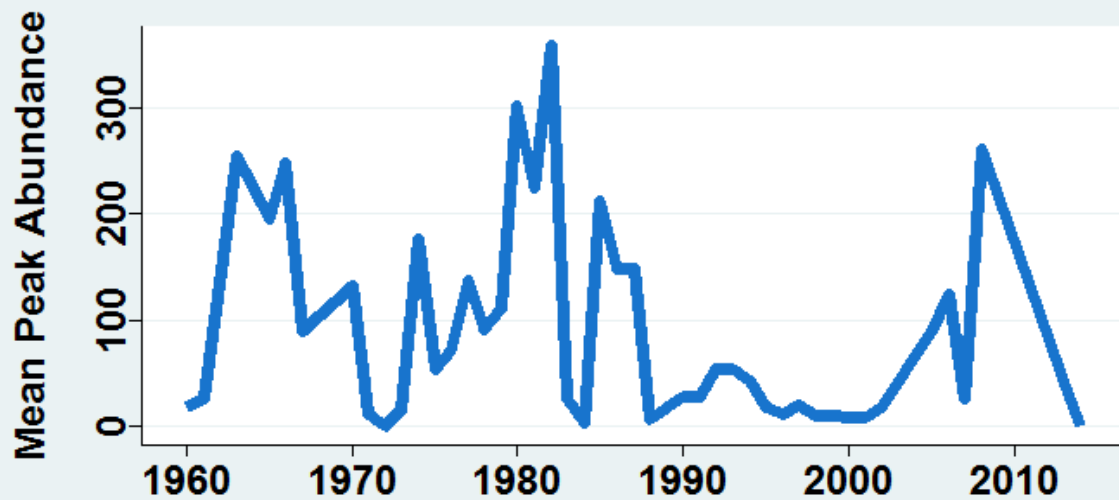
Is that difference enough?

Suzan Shahrestani

Hongsheng Bi

UMD CBL



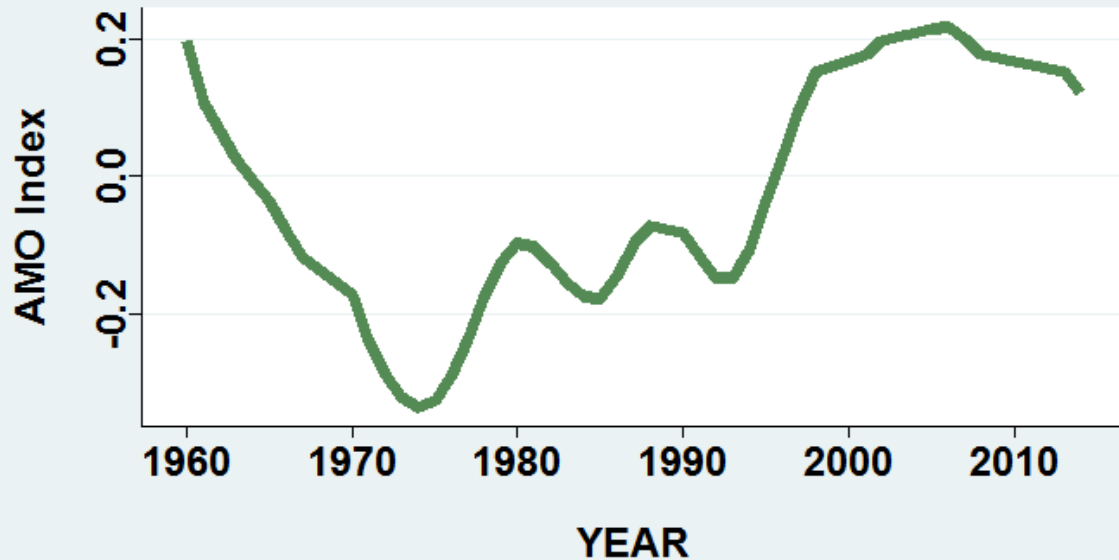


Some possibility of a connection...

Atlantic
Multidecadal
Oscillation

Sea Surface Temp >
Rainfall >
Fresh water injection

People here know
about fresh water
injection into CB



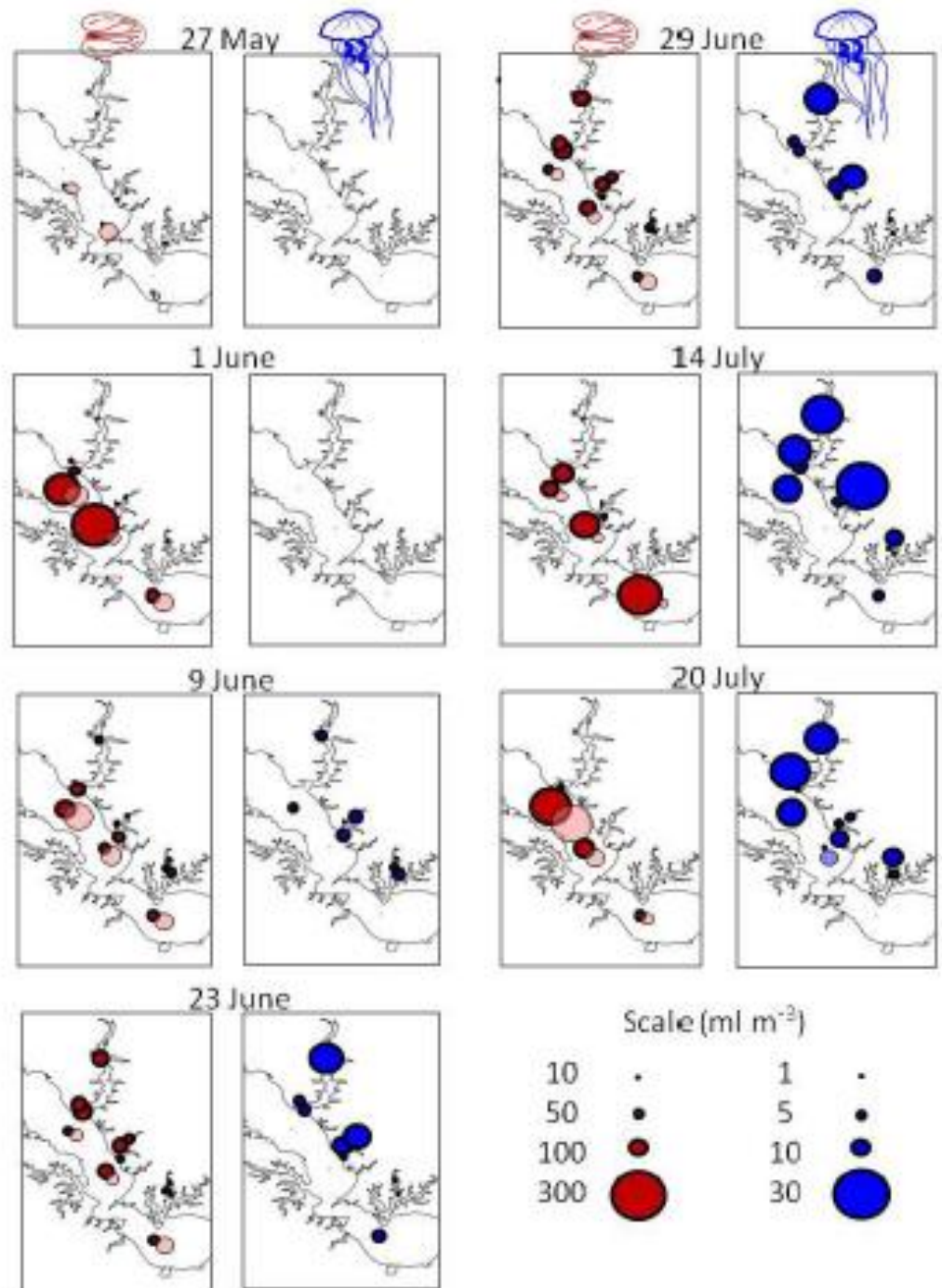
Breitburg & Burrell 2014

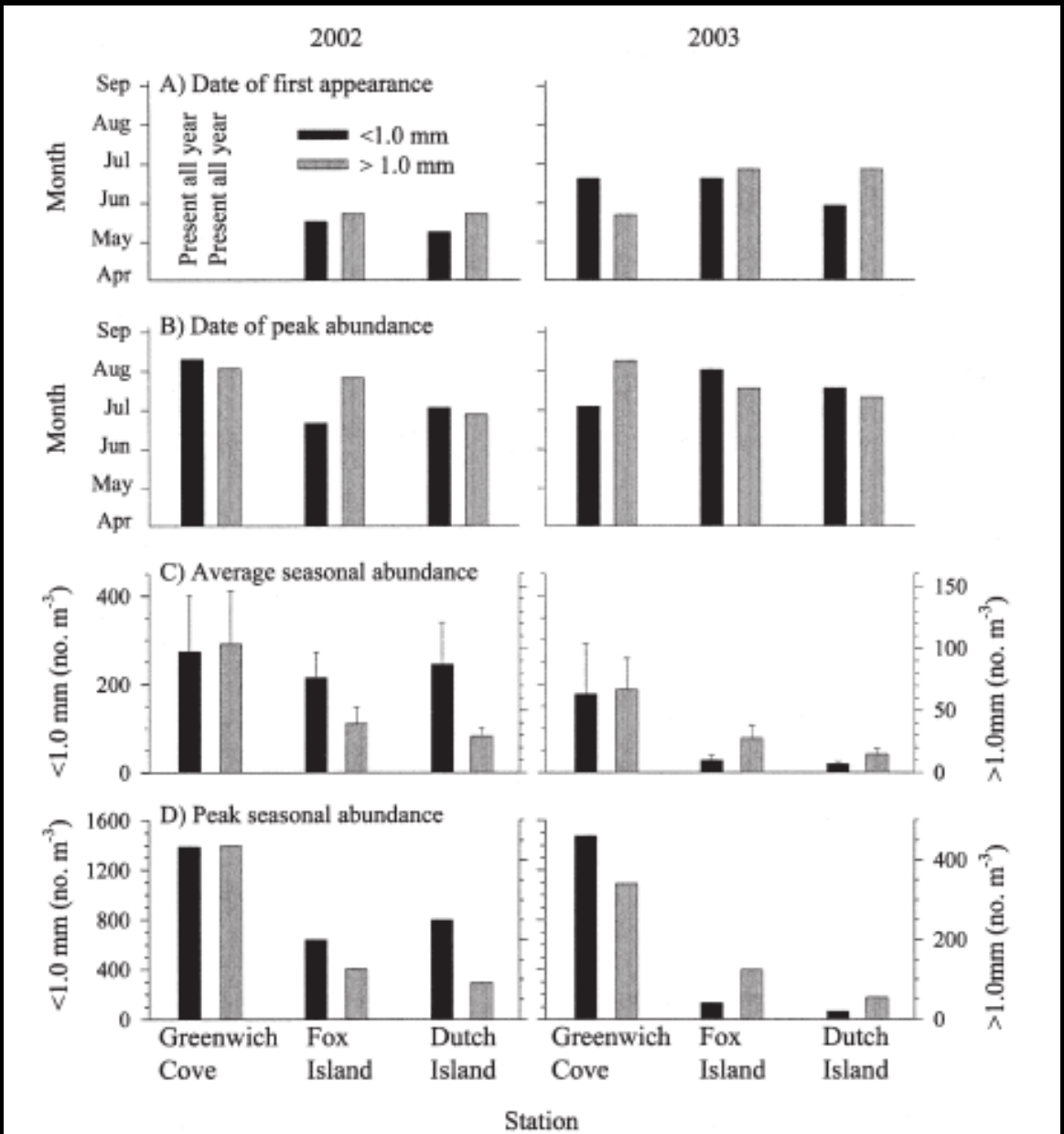
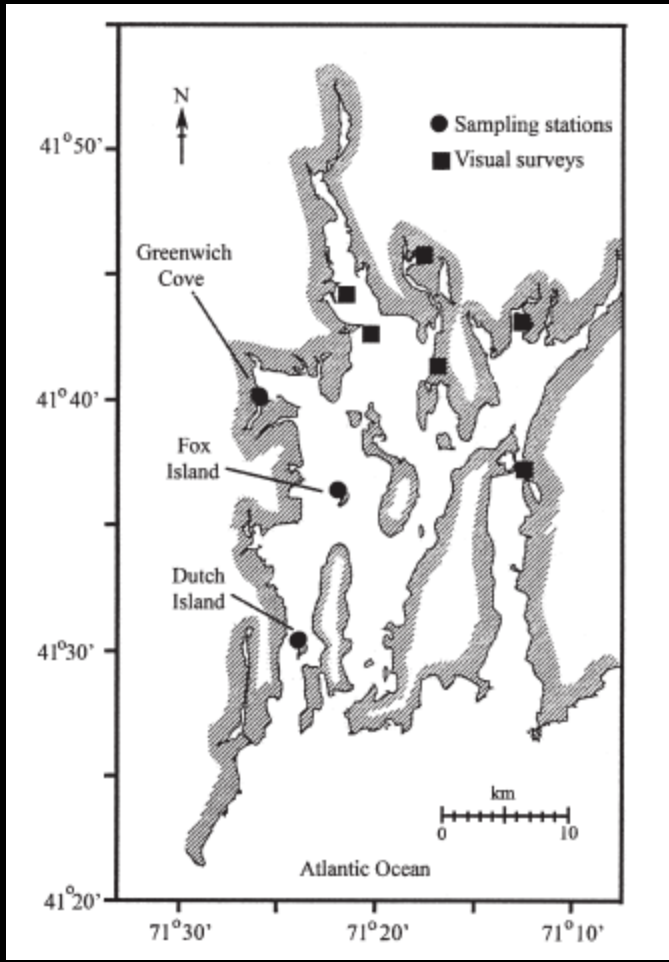
Ctenophores move from
Mainstem to tribs

Sea Nettle move from
Tribb out to mainstem

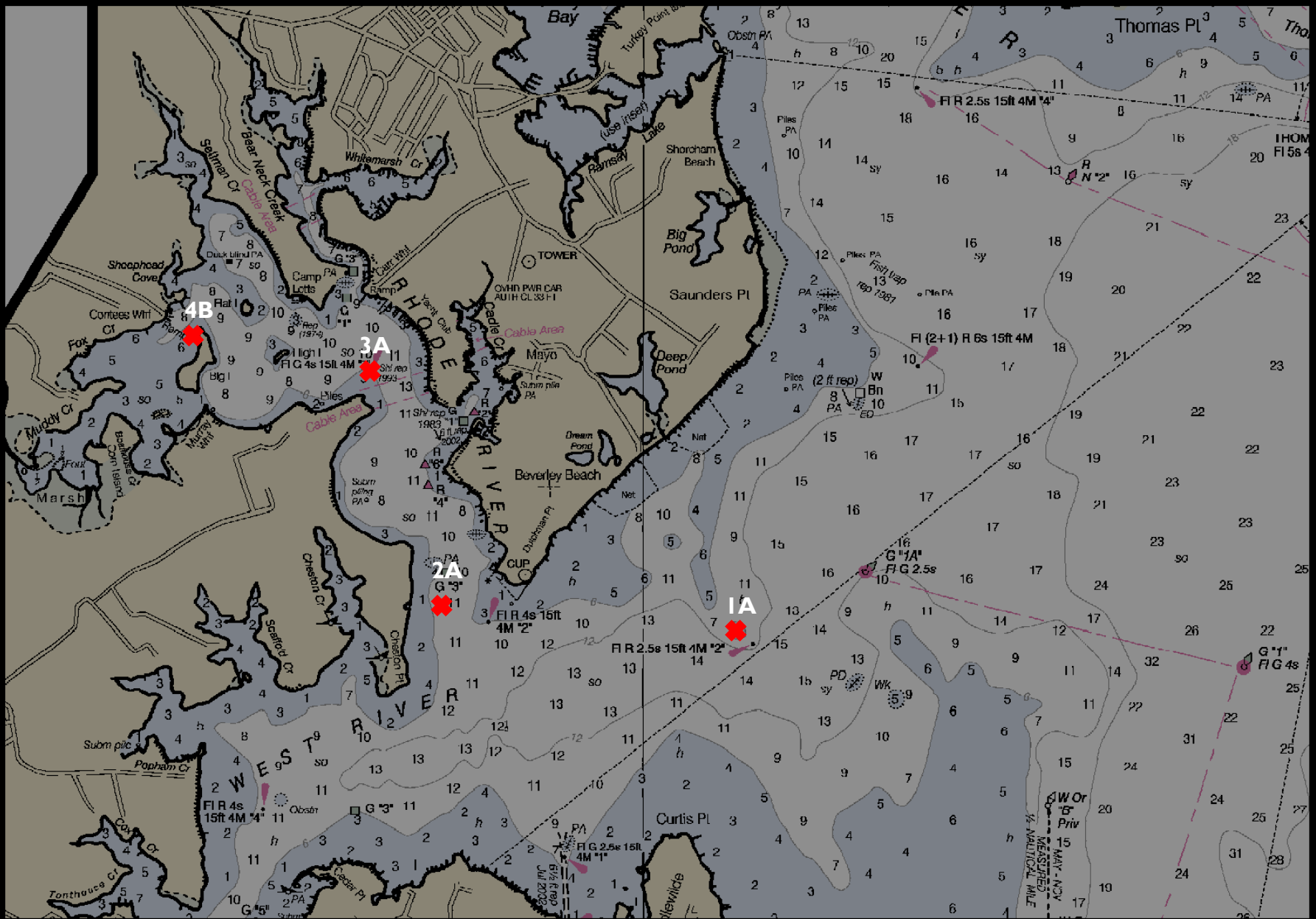
Year-round population of
Ctenophores in mainstem,
Deep channels

Data: 2004





Costello et al. 2006 – Narragansett Bay, RI – Source & Sink Concepts



Soundings in feet

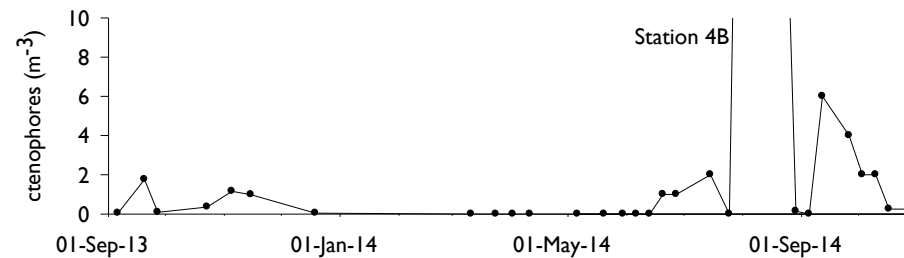
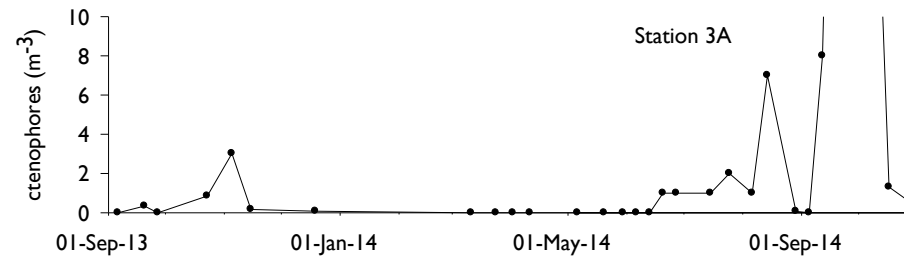
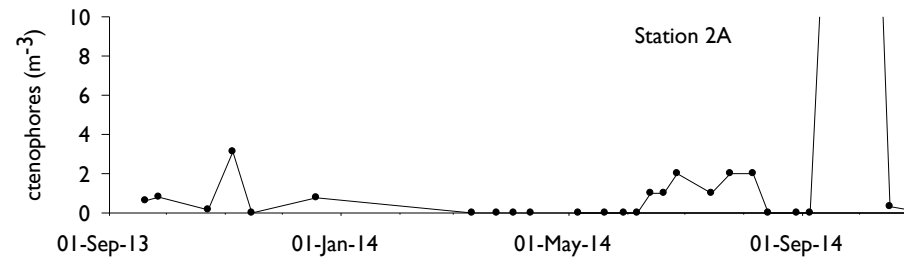
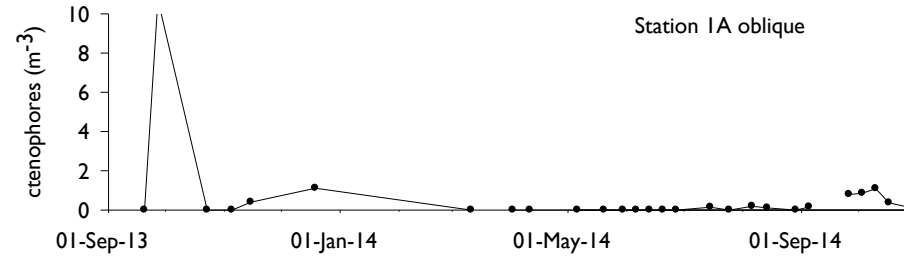
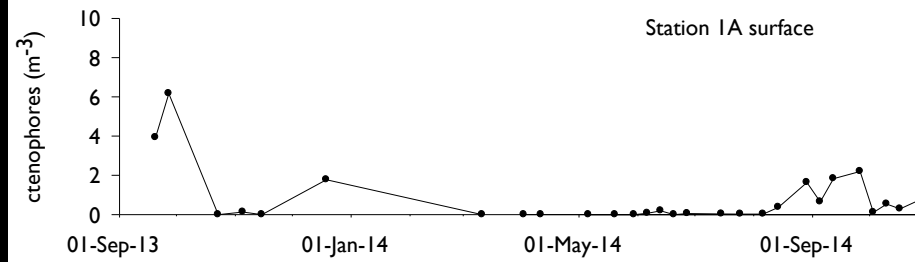


West/Rhode River
2013-2014
Ctenophore Abundance

Peak occurs Oct-Nov in
2013 and 2014

Abundance is lower than
2004, 2005

Ford, Breitburg, Bi
NOAA/SERC/UMD



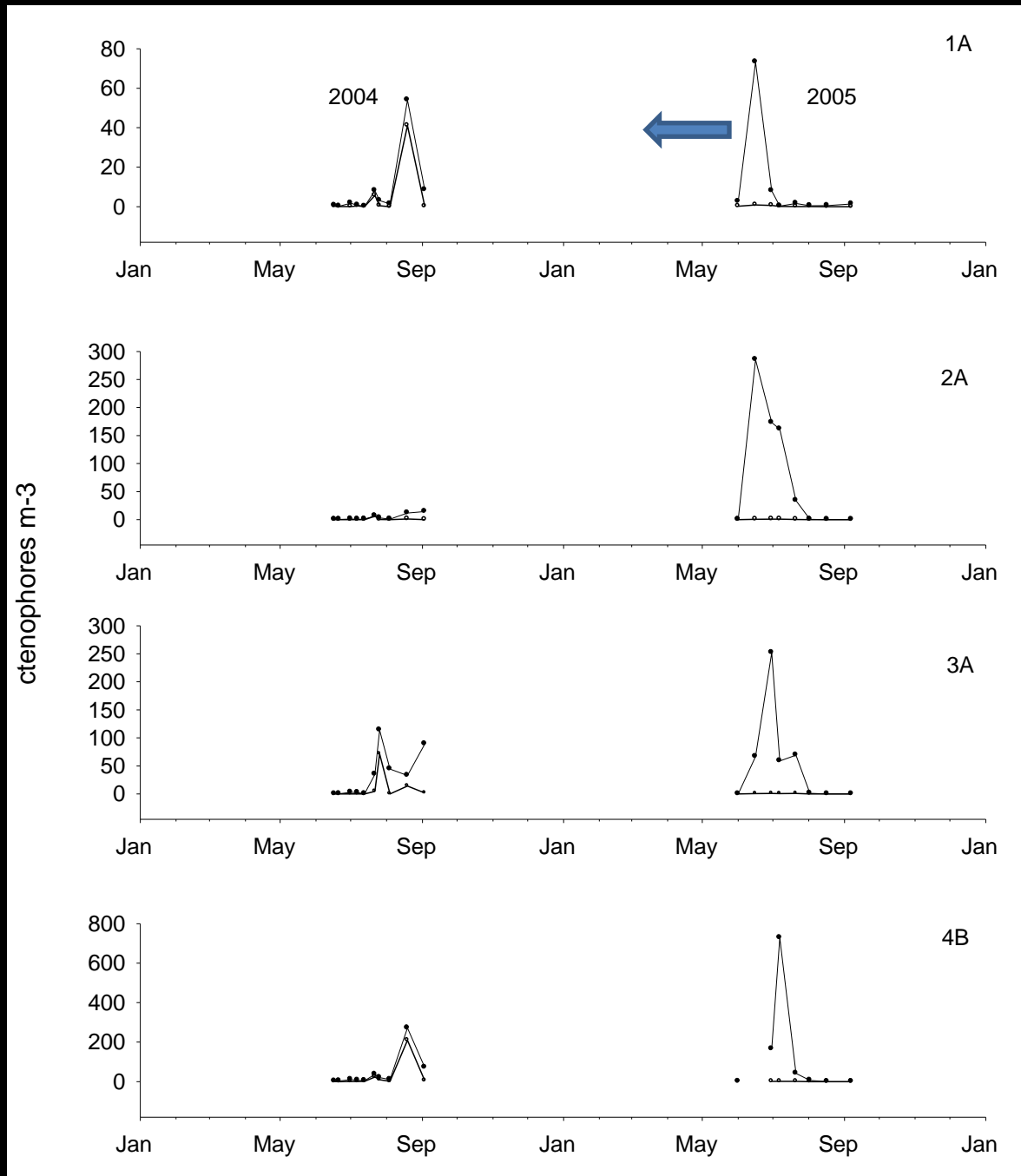
Near
mainstem

Creek

2004, 2005
West/Rhode River
Ctenophore Abundance

Higher abundance than
2013-2014
Peak occurs Aug, 2004
Peak occurs Jul, 2005

Breitburg et al.
SERC



Near
Main-
stem

Creek

- Why this, Why me, Why now
- What happened with CB jellyfish last season?
- **What can we detect?**
- What would we do if we did detect something?

- CBL Pier Counts
- HPL Pier Counts
- Research Efforts – cruises

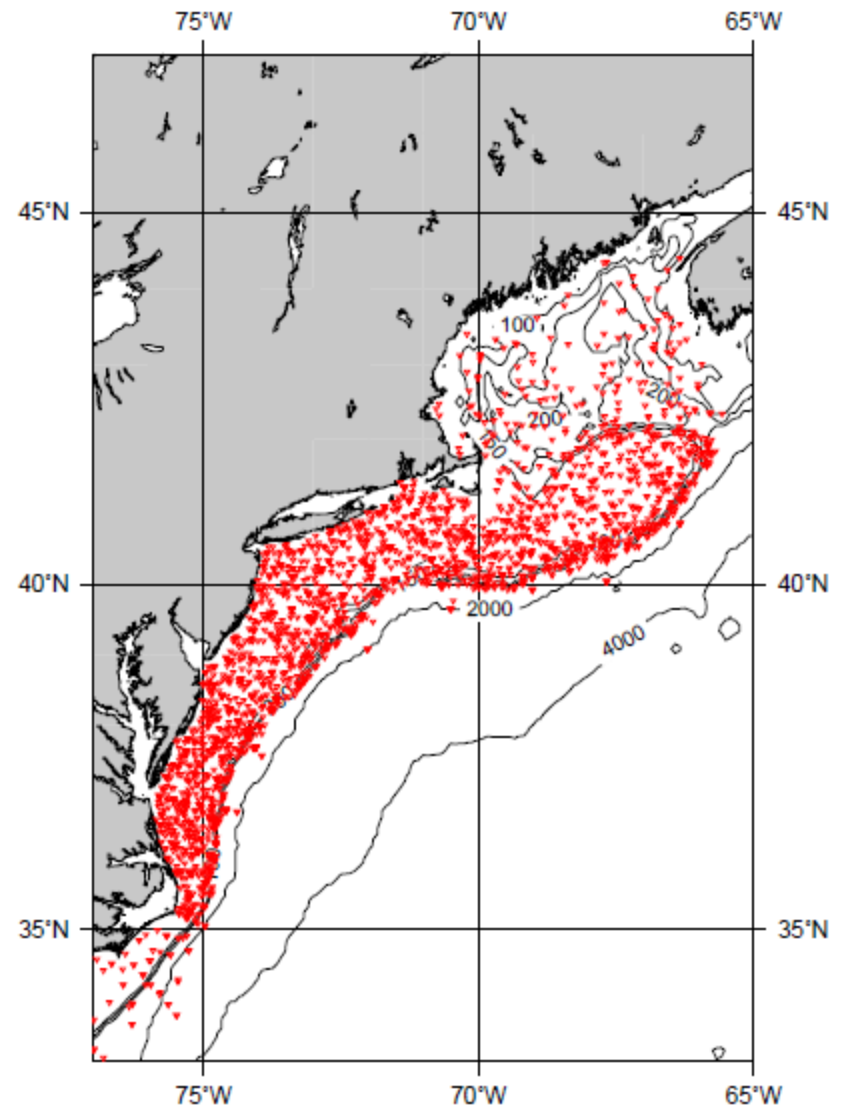
- Are these enough to form a diagnostic?
- Are these enough to produce good scientific advice?

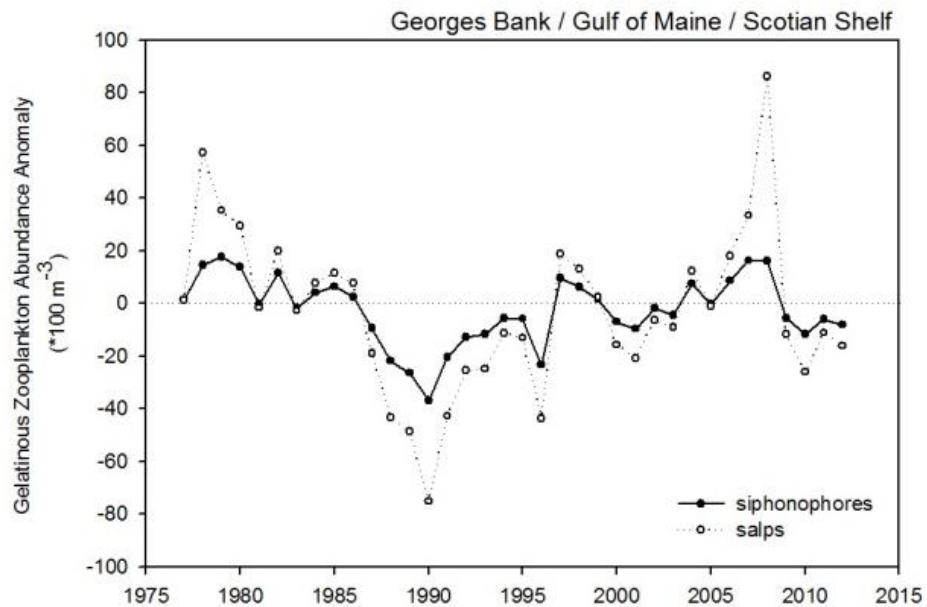
How others detect Gelata in Ecosystems

Salps, Siphonophores

1977-2000

Northeast Fisheries Science Center

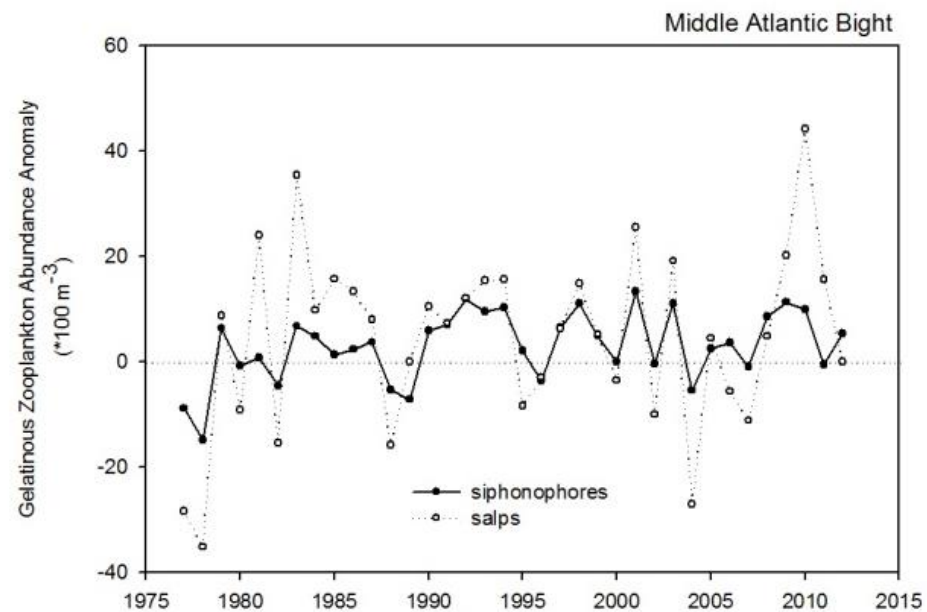




2014 Ecosystem Status Report: NE Cont. Shelf

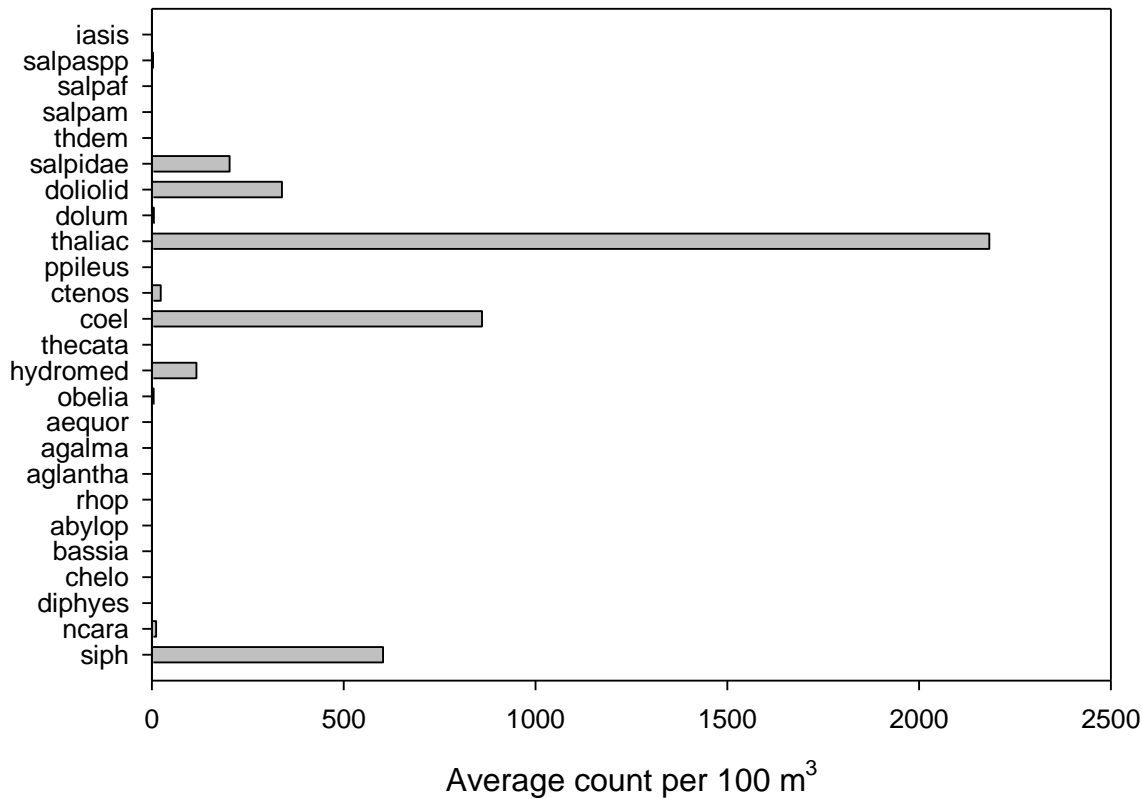
More resolution on taxa

Nod to the baseline



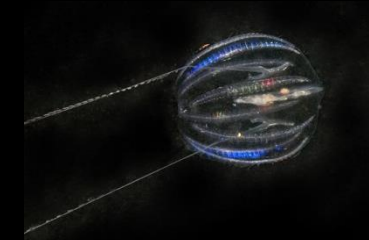
Summary:
Beginning to add detail to gelatinous zooplankton grouping

MARMAP – U.S. NE Cont. Shelf

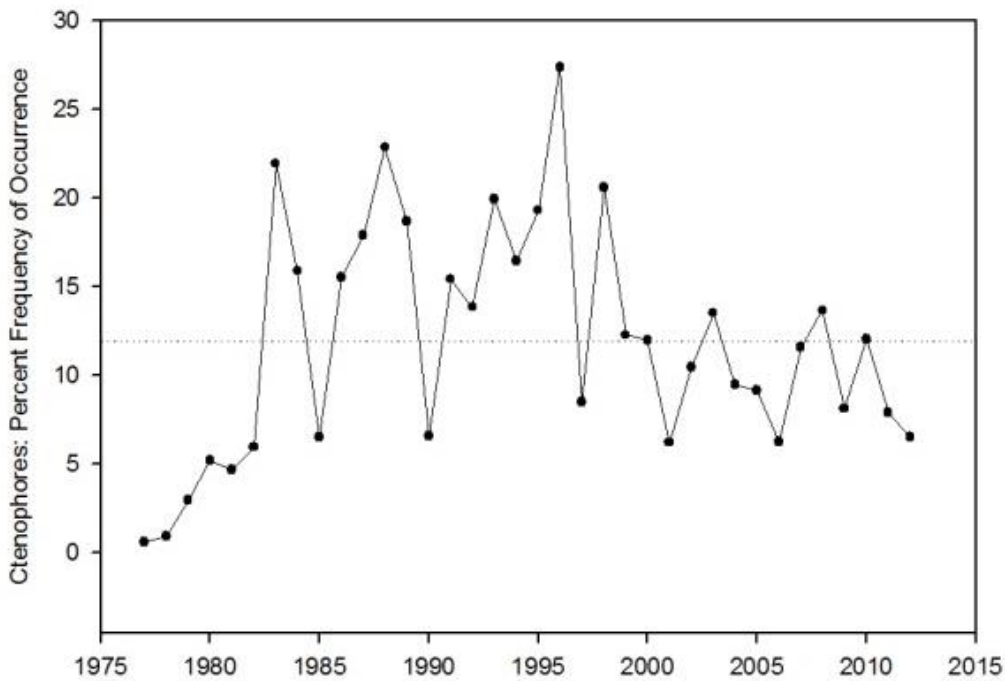


- 1977-present
- Bongo nets





- dogfish index
- 'sees' what Bongos cannot
- Frank, 1986 found similar %freq in 1983, 1984 off Nova Scotia
- In 2014 ESR
- warning up to 2000?

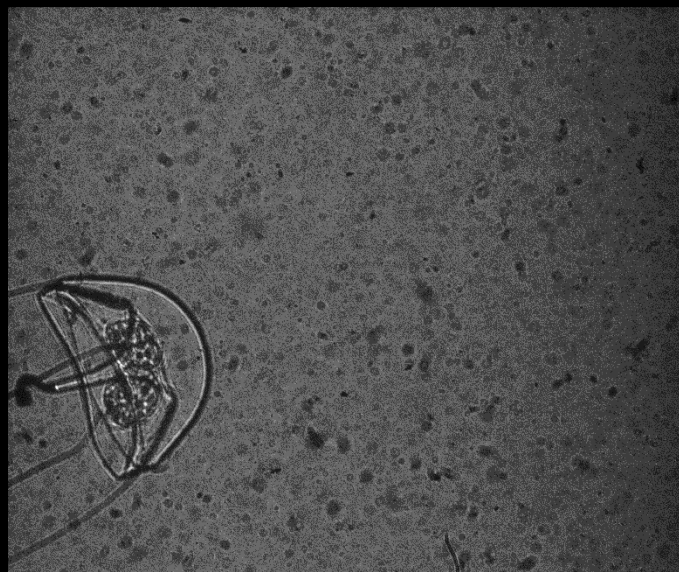
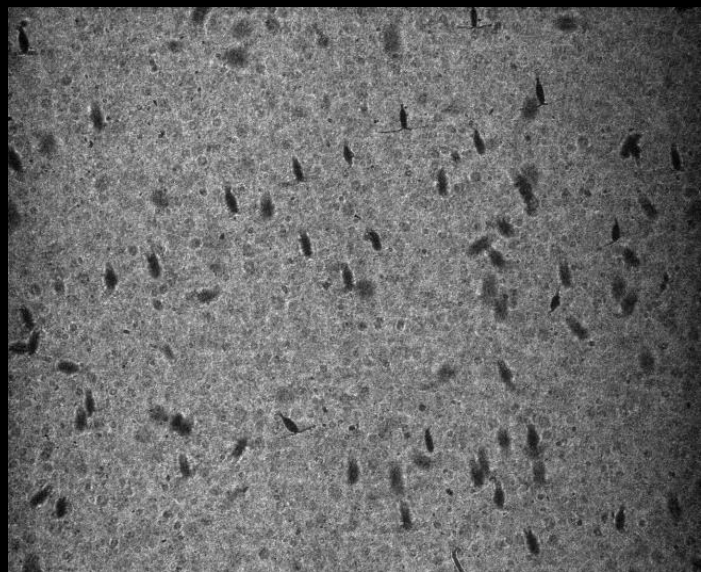


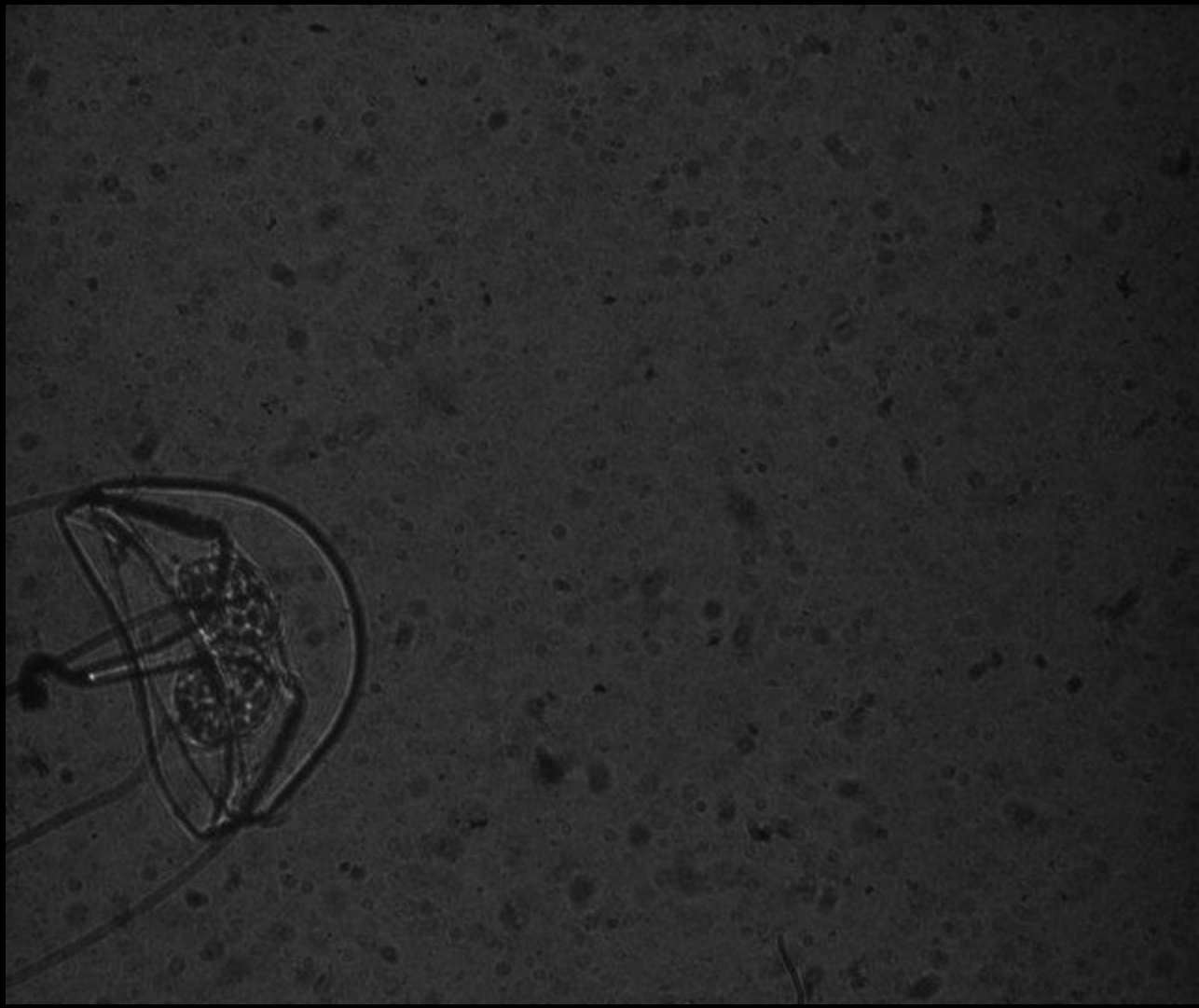
New technologies – survey enough, well enough, cheap enough



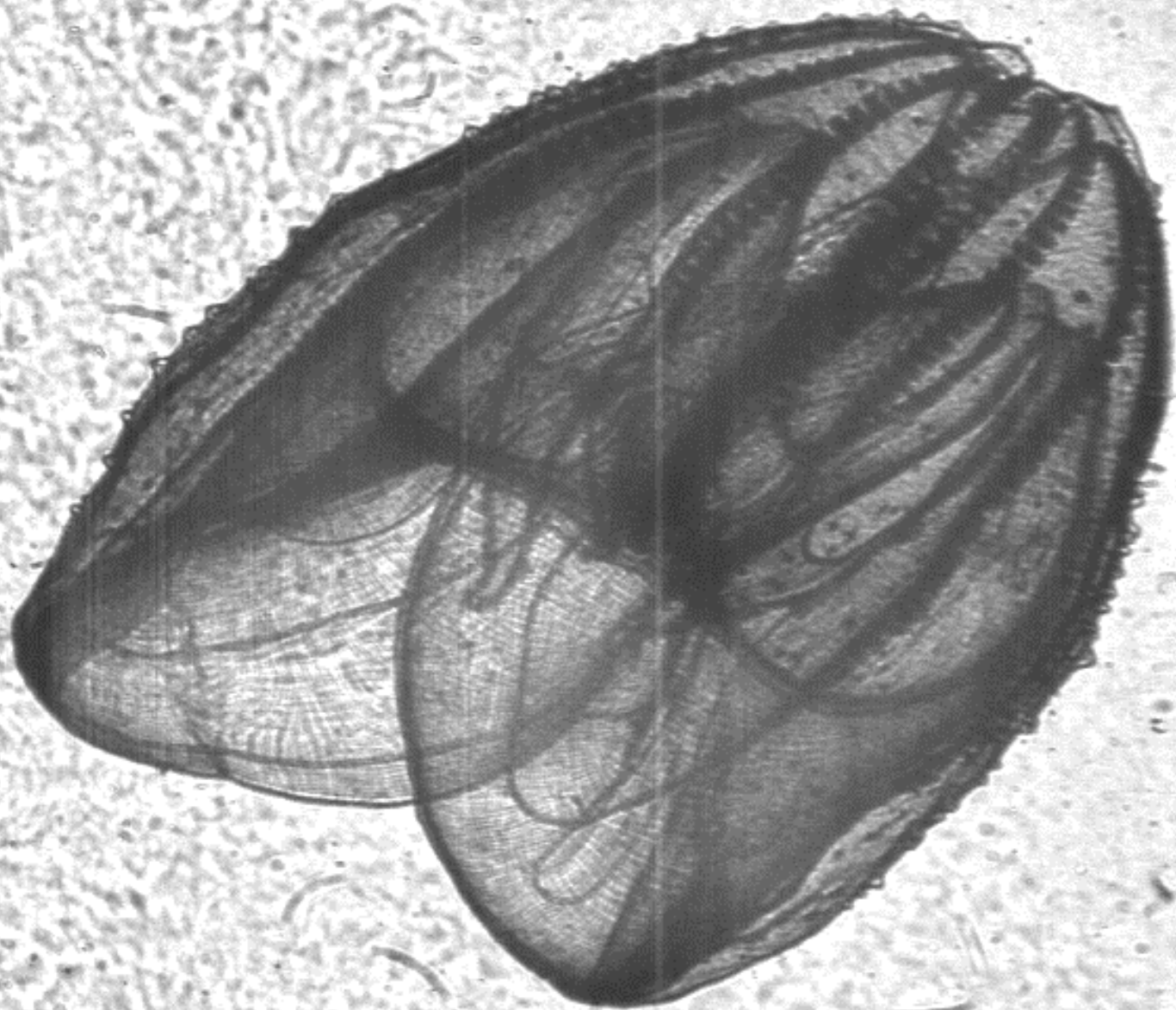
ZOOVIS





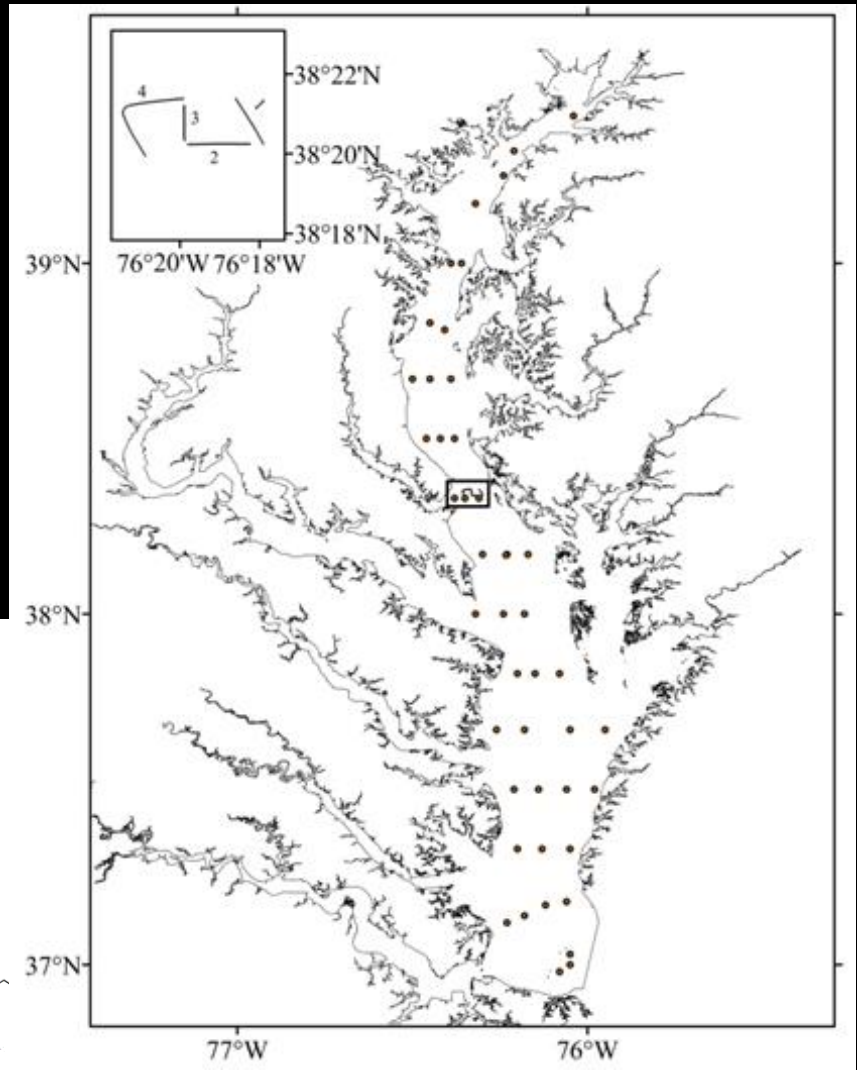
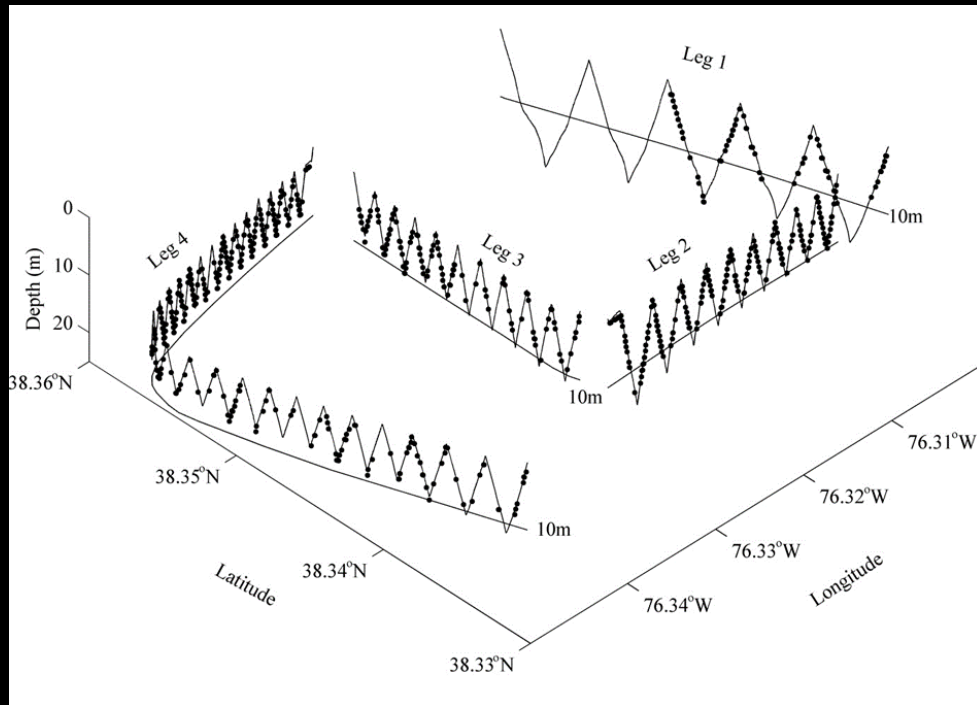






20 mm

Towed systems like ZOOVIS might allow a shift to transects



- Why this, Why me, Why now
- What happened with CB jellyfish last season?
- What can we detect?
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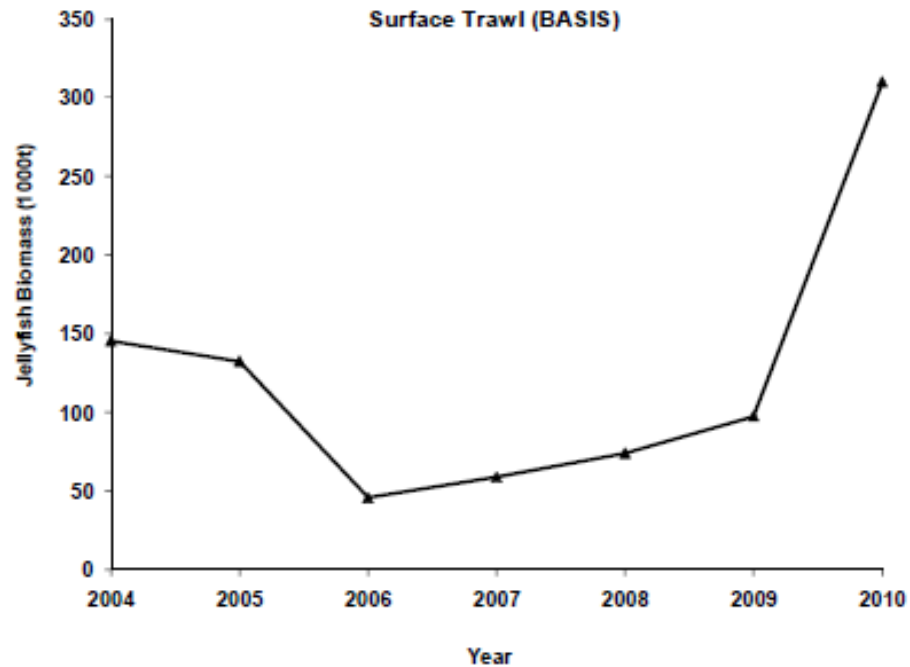


Figure 90: Total jellyfish biomass (1000 t) by year. Includes combined species caught in surface trawls in the Eastern Bering Sea during August-October. Biomass was calculated using average effort per survey area in km² by year.



Northeast Fisheries Science Center Reference Document 12-07

Ecosystem Status Report for the Northeast Shelf Large Marine Ecosystem - 2011

by the Ecosystem Assessment Program

April 2012

Salp, siphonophore information ready for
Ecosystem Status Report

Every 2 years

Nimble, cross-disciplines

Similar reports on west coast delivered to
Fisheries Management Councils

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FISHERIES ECOSYSTEM PLANNING FOR CHESAPEAKE BAY

*The Chesapeake Fisheries Ecosystem Plan
Technical Advisory Panel*

with support of the NOAA Chesapeake Bay Office

Trends in Fisheries Science and Management 3



A SUMMARY BRIEF FROM THE STRIPED BASS SPECIES TEAM



ECOSYSTEM-BASED FISHERIES MANAGEMENT IN CHESAPEAKE BAY

Striped Bass

Striped bass have recently been hailed as one of the greatest success stories of fisheries management in Chesapeake Bay. The Atlantic coast striped bass fishery collapsed in the 1970s and early 1980s and in response Maryland and Virginia imposed a harvest moratorium on the species. The fishery was re-opened in 1990 to commercial watermen after recruitment levels rebounded. The population was considered fully restored in 1995. The recovery was likely a result of both successful management and environmental conditions favorable for early life survival. Precautionary management since that period has allowed the population to support a large commercial and recreational fishery in Chesapeake Bay. Currently the stock is actively managed through a Baywide quota, which covers the three jurisdictions in the Chesapeake Bay (Maryland, Potomac River, and Virginia waters) for both the recreational and commercial fisheries. The Chesapeake Bay hosts a year-round adult striped bass population and is an important spawning and nursery habitat for both the Bay stock and the larger Atlantic Coast population. Striped bass are long lived — reaching ages of 30-plus years and weights in excess of 100 pounds. They are considered excellent recre-

ational sport fish and are targeted by commercial watermen for consumption sale. In 1965 the striped bass was designated Maryland's state fish by the Maryland General Assembly. Although the current population level is estimated to be well above target (148% in 2008), high rates of disease and recruitment fluctuations continue to cause concern.

Striped bass was selected as the pilot species for this EBFM project. Maryland Sea Grant assembled a team of scientists and managers to consider an ecosystem approach for management. The team laid the groundwork for the project by implementing a new systematic approach to fishery management — identification of ecosystem issues impacting the species in Chesapeake Bay and recommendations for indicators and reference points that managers may use to address the issues. The striped bass team identified ecosystem issues within four critical areas: habitat suitability, stock dynamics, foodwebs, and socioeconomics. We summarize their findings below.




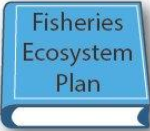




Habitat Issues and Drivers

Climate Change and Warming

The Chesapeake Bay has experienced nearly a 2° C rise in mean surface water temperature over the past 70 years and a rise of similar magnitude is predicted by 2080. Striped bass are dependent upon favorable recruitment conditions. Disruption in the match between the timing of spawning and conditions favorable to recruitment may be caused by future winter and spring warming and may negatively impact the population. Similarly, a mismatch among seasonal fisheries regulations, migration patterns, and population distributions may occur due to warming. Those may



Figure 1. Striped bass (*Morone saxatilis*). Credit: Duane Raver, U.S. Fish & Wildlife Service.

Levels	Scientific Advice	Management Framework
<p>EBM Ecosystem Based Management</p>	 <p>Fisheries Development Energy Eco Tourism Oil & Gas</p> <p>Conservation Marine Sanctuaries Aquaculture Etc</p>	
<p>EBFM Ecosystem Based Fisheries Management</p>	 <p>Climate Habitat Predator</p>	
<p>EAFM Ecosystem Approach to Fisheries Management</p>	 <p>Climate Habitat Predator</p>	
<p>SS Single Species</p>		

- Oyster mortality
- Bay Anchovy
- Menhaden
 - Can we build in advice on effects of Gelata?
 - Consultation
 - Modified natural mortality factors
 - Change in catch advice?

“Eventually, single-species reference points that serve as management targets and thresholds will be supplemented by indicators and reference points that represent ecological attributes of managed taxa, **interacting species**, and the structure of the ecosystem itself. New dynamic indicators or reference points, in addition to providing standards for individual fisheries, can represent expressions of **pressure on the ecosystem’s state** – for example trends or levels in productivity, carrying capacity, **status of water quality or critical habitats, predator-prey relationships**, community structure, and biodiversity”

– Ed Houde, *Managing the Chesapeake’s Fisheries*, 2011

Co-Conspirators

- Denise Breitburg, SERC
- Hongsheng Bi, UMD CBL
- Suzan Shahrestani, UMD CBL
- Jason Link, NMFS
- Brian Smith, NMFS Woods Hole
- NOAA SHIP OKEANOS EXPLORER
- Jack Costello, Providence College
- Ric Brodeur, NMFS, Oregon
- Rebecca Sparks, Rhode Island College
- ...Many who served on NOAA Ships and survey vessels and collected samples

Thank You

fordm@si.edu
michael.ford@noaa.gov

