Fifty years of ship-of-opportunity observations on the northeast U.S. continental shelf: results and management applications

Jon Hare, Jack Jossi and Joe Kane
NOAA NMFS
Narragansett Laboratory

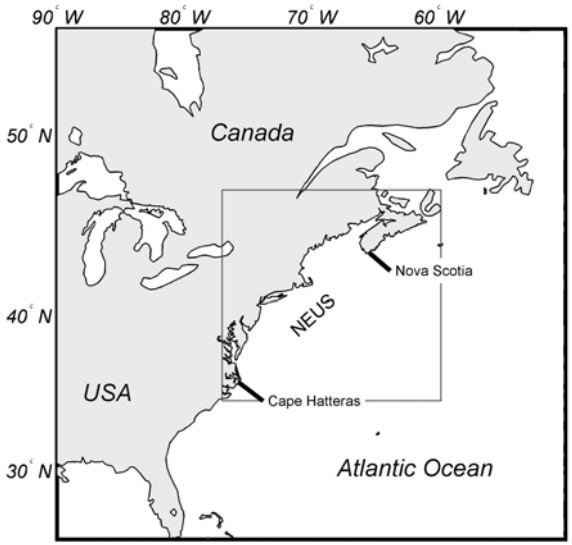
Outline

- Overview of the program
- Highlights of scientific results
- Summary of management applications
- Future Directions

Overview of the program

Northeast Fisheries Science Center Ecosystem Monitoring Program

- To monitor the fishery-relevant components of the plankton in the northeast U.S. shelf ecosystem
- To characterize baseline planktonic conditions and their variability
- To index the seasonal, annual, and decadal changes in planktonic conditions of the ecosystem



Overview of the program

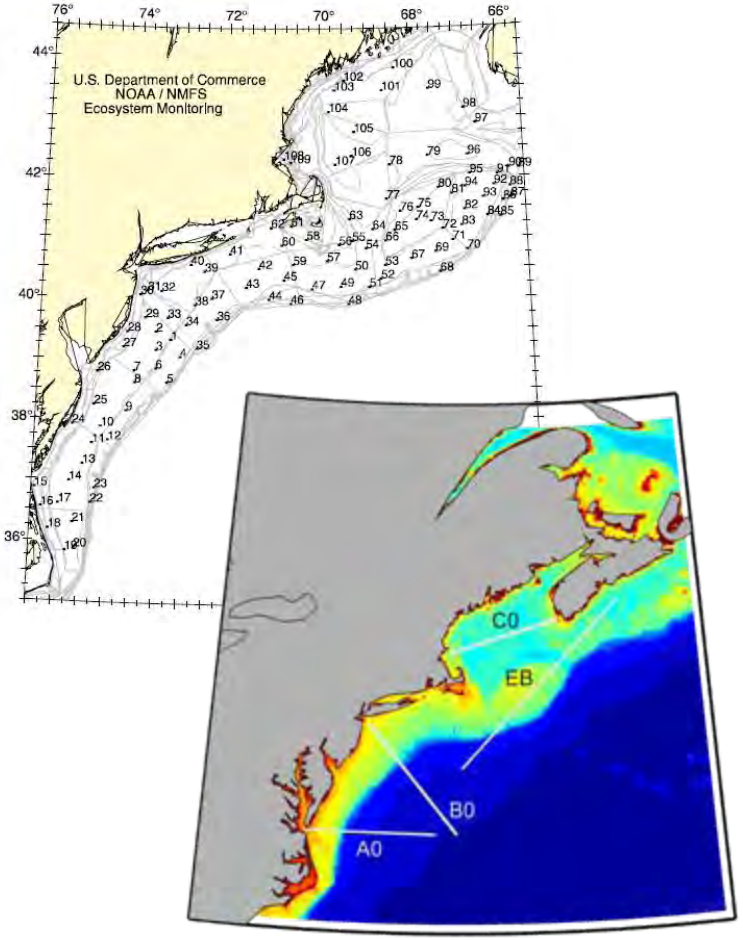
Northeast Fisheries Science Center Ecosystem Monitoring Program

Research Vessel Surveys

- 6-7 shelf wide surveys per year
- ~120 stations per survey
- 1977 to present

SOOP Surveys

- Monthly transects
- Gulf of Maine and Mid-Atlantic Bight
- 1961 to present



Overview of the program

Northeast Fisheries Science Center Ecosystem Monitoring Program

Part of Larger NMFS Observational Effort in Ecosystem

- Fall and spring trawl surveys
- Acoustic survey
- Dredge surveys
- Protected species ship-based and aircraft surveys
- Benthic habitat and mapping surveys

Overview of the program

Northeast Fisheries Science Center Ecosystem Monitoring Program

Research Vessel Surveys

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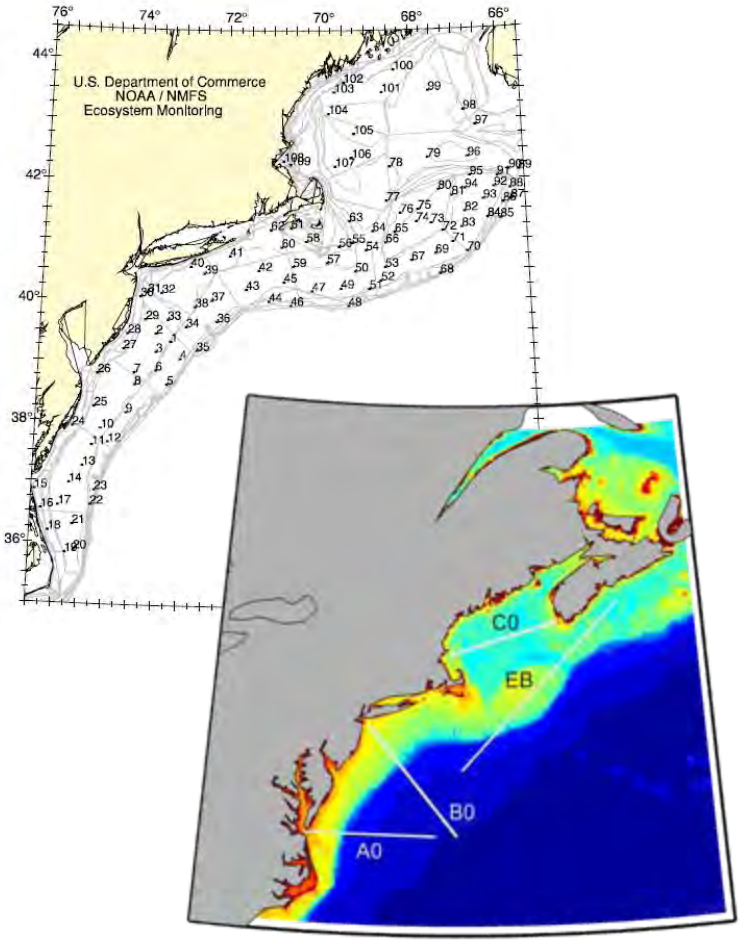


Overview of the program

Four routes have been sampled by NMFS in Northwest Atlantic Ocean

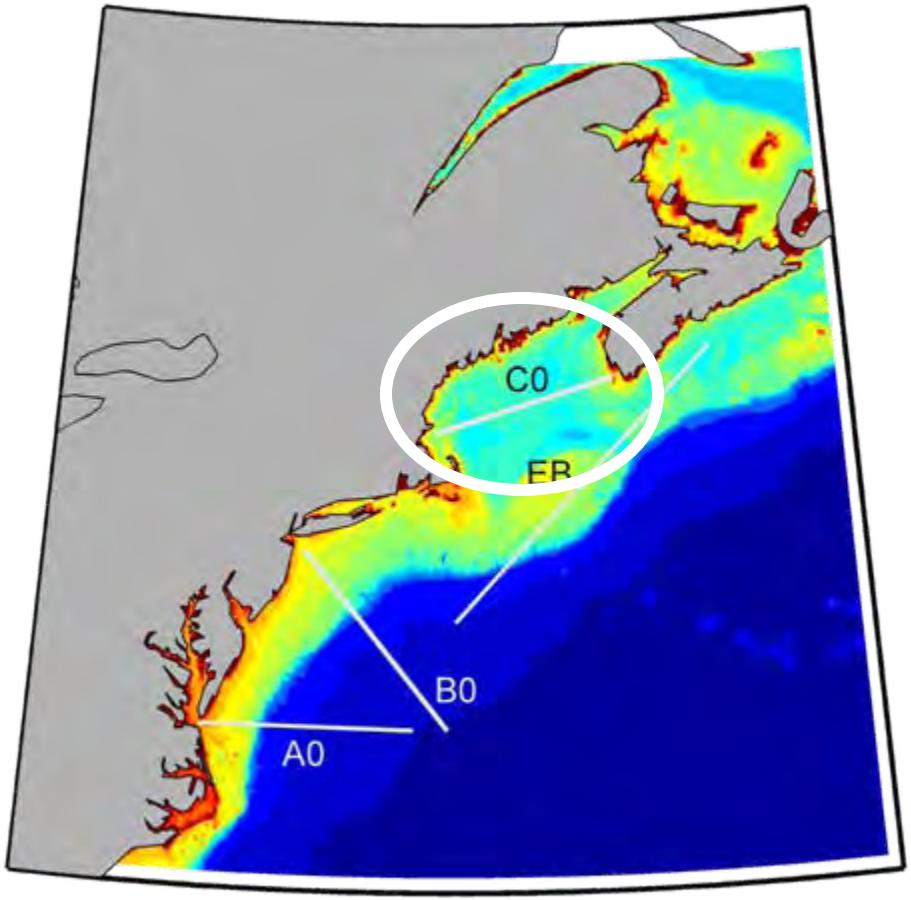
Route C0

1961-1974

Oceanographic Laboratory in Edinburgh, Scotland

1977-present

NOAA NMFS in Narragansett, USA



Overview of the program

Four routes have been sampled by NMFS in Northwest Atlantic Ocean

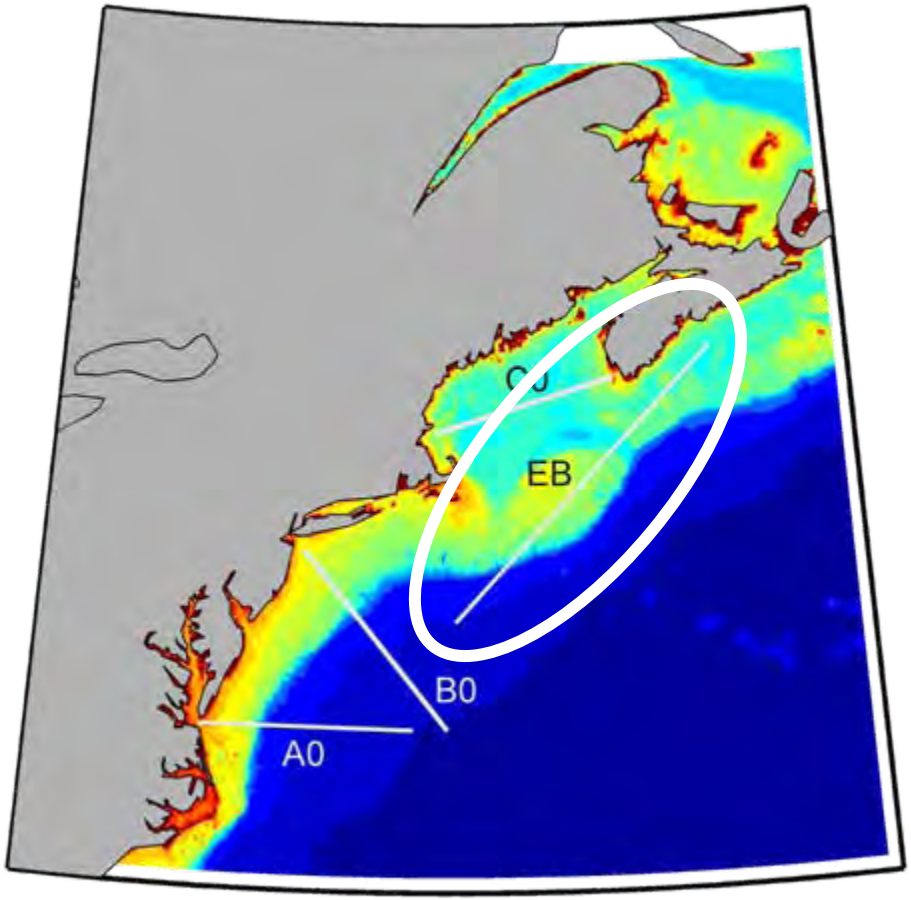
Route EB

1961-1974

Oceanographic Laboratory in Edinburgh, Scotland

1991-present

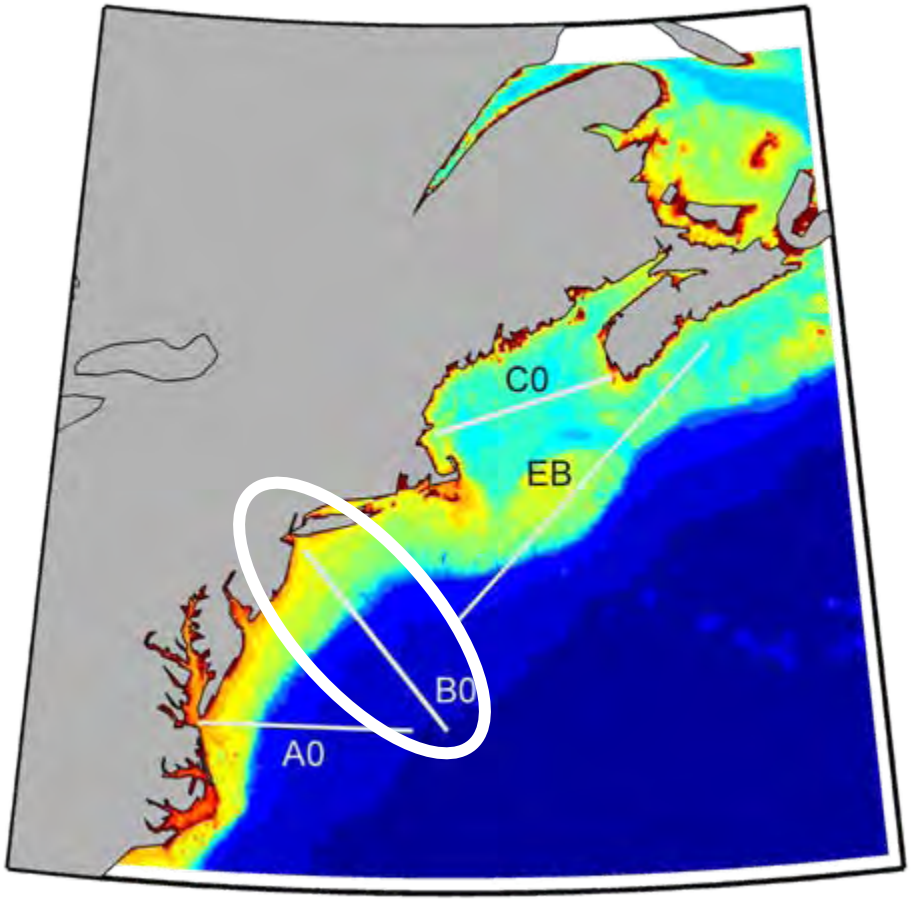
SAHFOS, Plymouth, UK



Overview of the program

Four routes have been sampled by NMFS in Northwest Atlantic Ocean

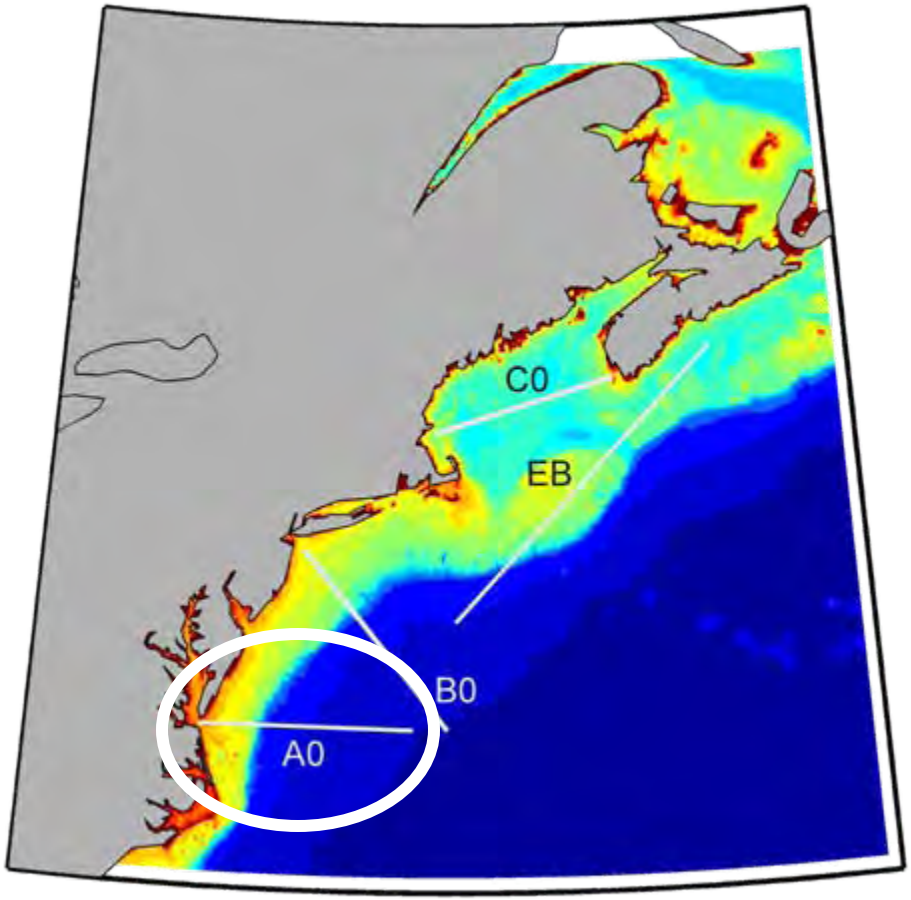
Route B0
1976-present
NOAA NMFS in
Narragansett, USA



Overview of the program

Four routes have been sampled by NMFS in Northwest Atlantic Ocean

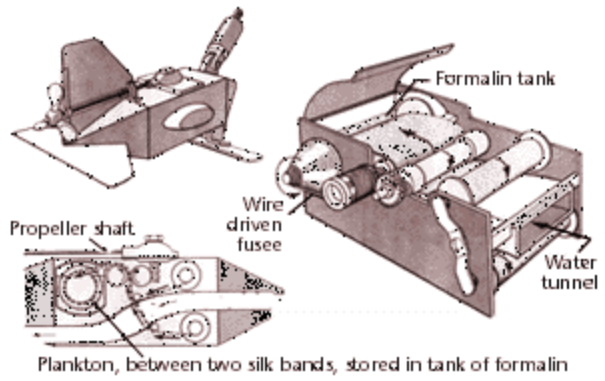
Route A0
1974-1980
NOAA NMFS in
Narragansett, USA

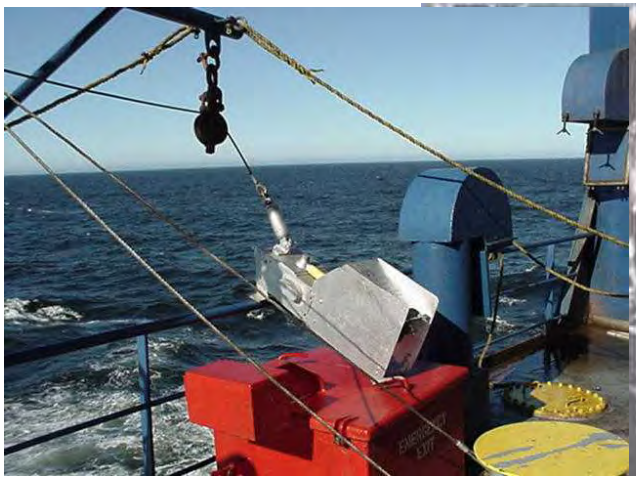


Overview of the program

Continuous Plankton Recorder

- Zooplankton species counts
- Phytoplankton species counts
- SAHFOS Sister Survey
- In collaboration with SAHFOS and Morski Instytut Rybacki - Gdynia Poland



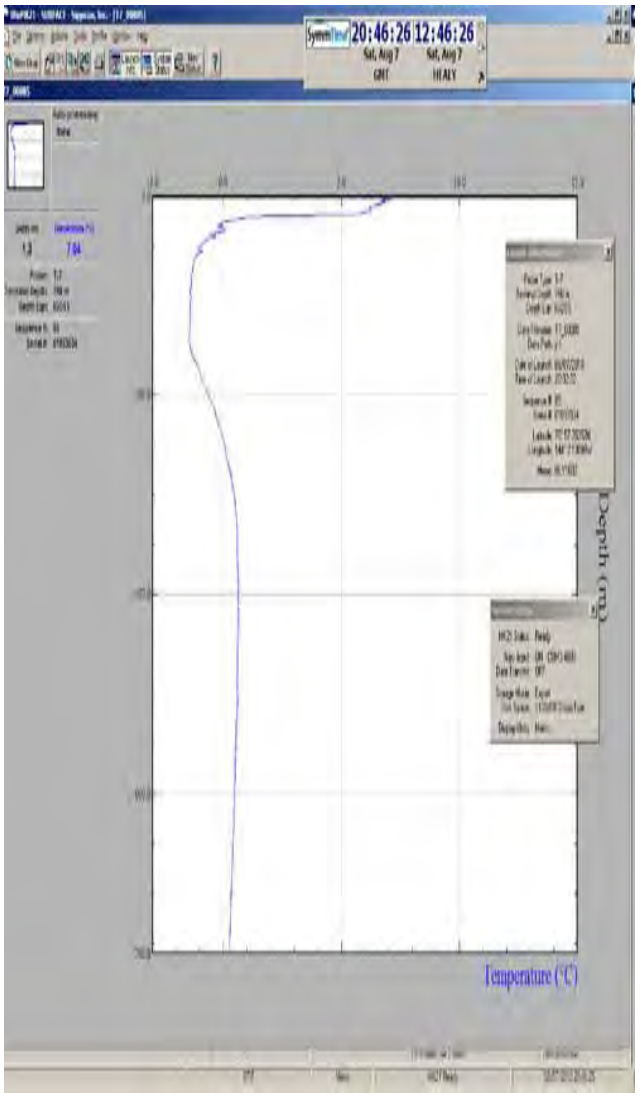


Overview of the program

Hydrographic Sampling

Expendable Bathythermographs (XBT) and Thermosalinographs

In collaboration with NOAA Atlantic Oceanographic and Meteorological Laboratory, Miami and Laboratoire d'Etudes en Géophysique et Océanographie Spatiales, Toulouse

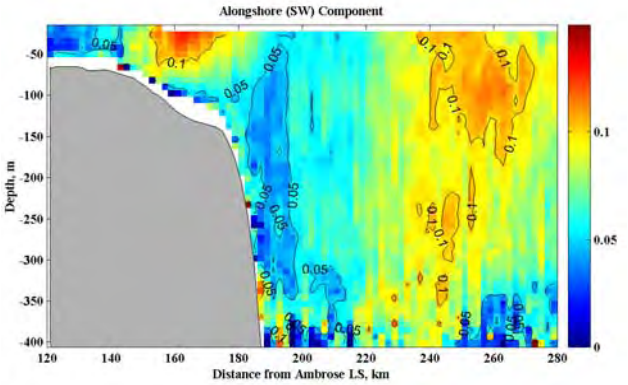


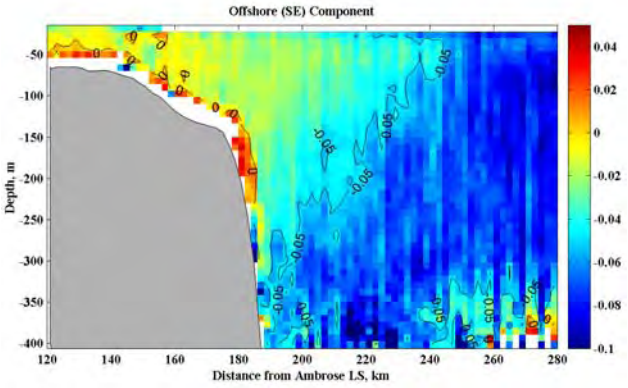
Overview of the program

Ocean Current Sampling

75kHz Ocean Surveyor ADCP on B0 route (in collaboration with URI/SUNY Oleander Project)

Drifters are deployed (in collaboration with NOAA Global Drifter Program)





10 year average along B0 line (Flagg et al. 2006)

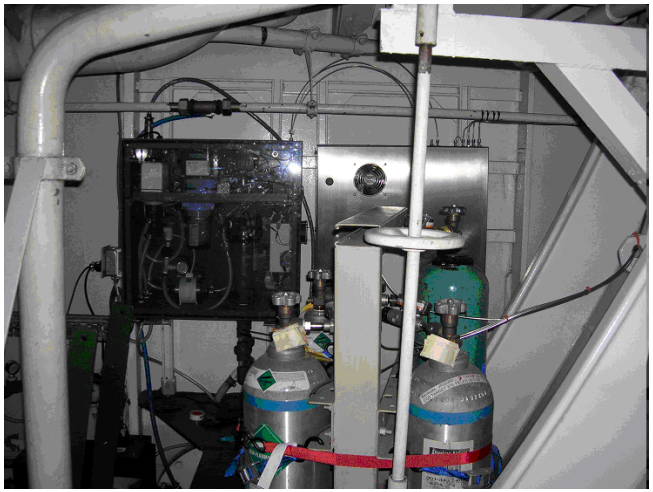
Overview of the program

Water Sampling

Water samples for TSG calibration

pCO_2 systems (in collaboration with Bermuda Biological Station and AOML)

Working to expand ocean acidification monitoring efforts



Outline

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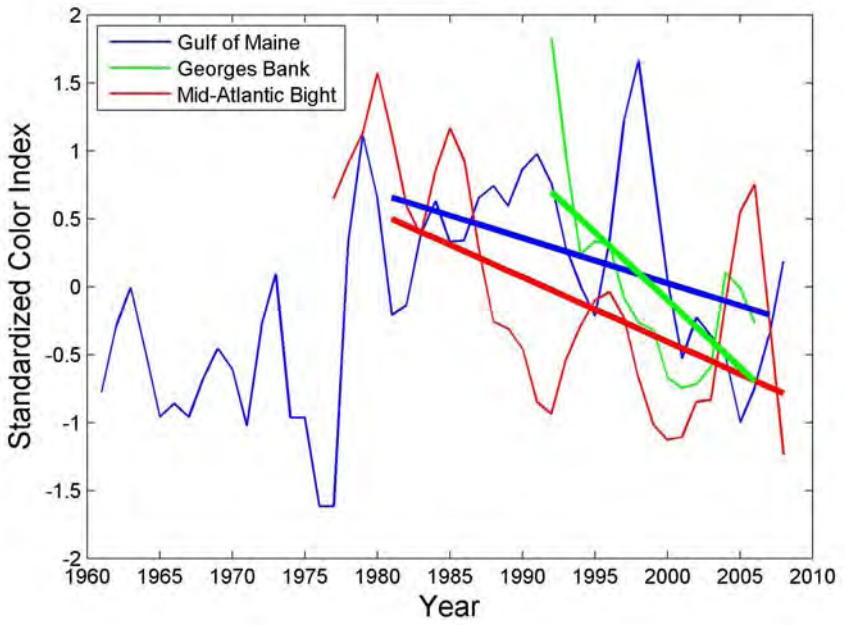
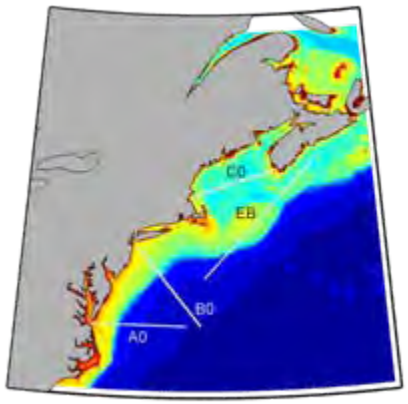
- Highlights of scientific results
- Summary of management applications
- Future Directions

Highlights of current results

Phytoplankton Abundance & Timing

Decreases in system-wide color index (measure of total amount of large-fraction chlorophyll)



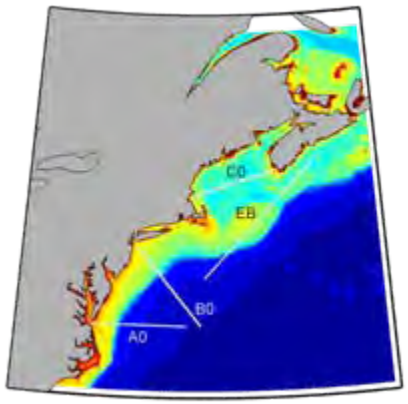


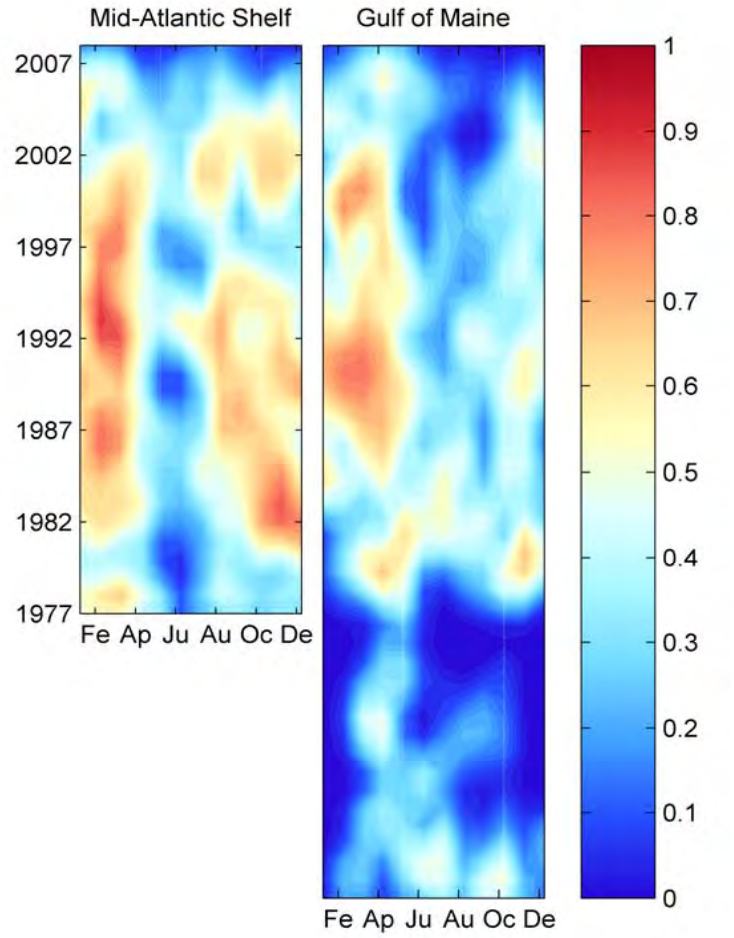
Hare et al (in prep)

Highlights of current results

Phytoplankton Abundance & Timing

Variability and overall decreases in the percentage of diatoms (remember large-fraction bias)



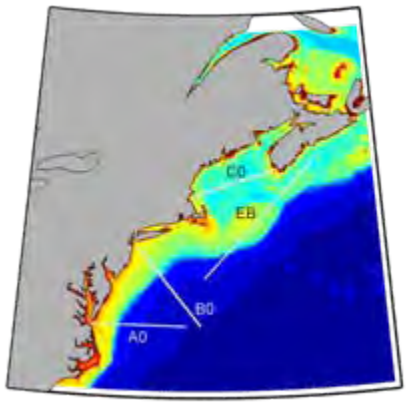


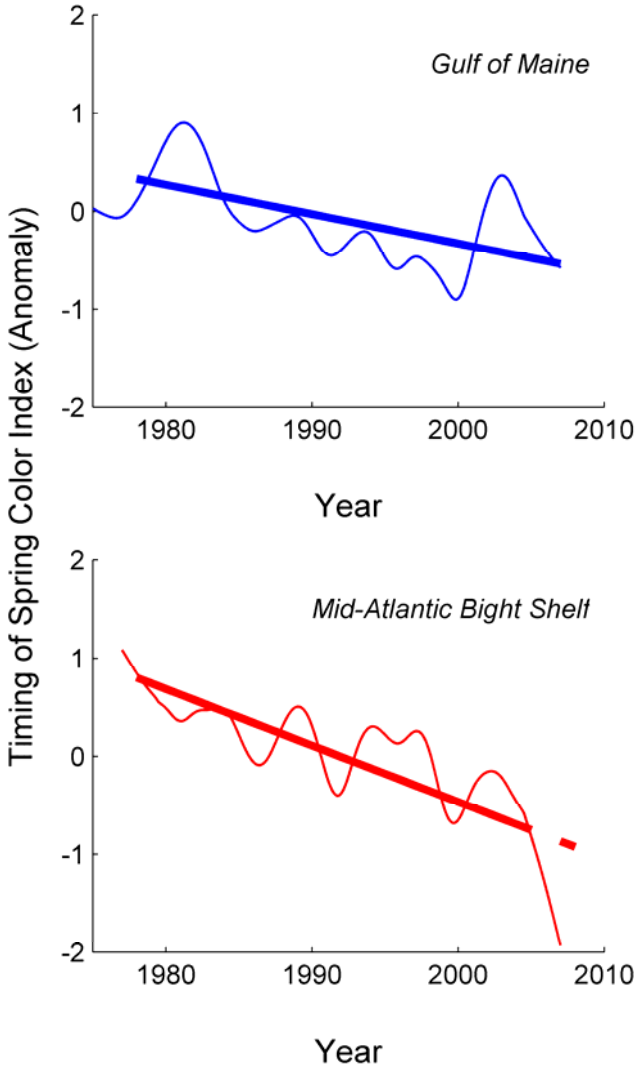
Hare et al (in prep)

Highlights of current results

Phytoplankton
Abundance & Timing

Shifting of spring bloom to earlier (more than 1 month over course of time series)



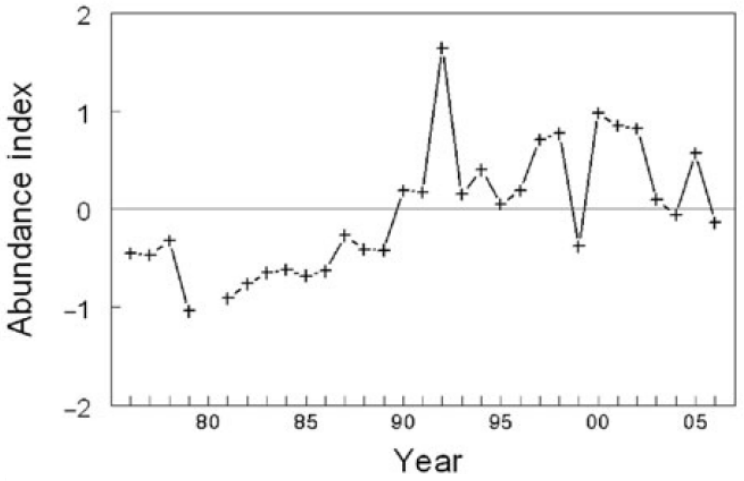


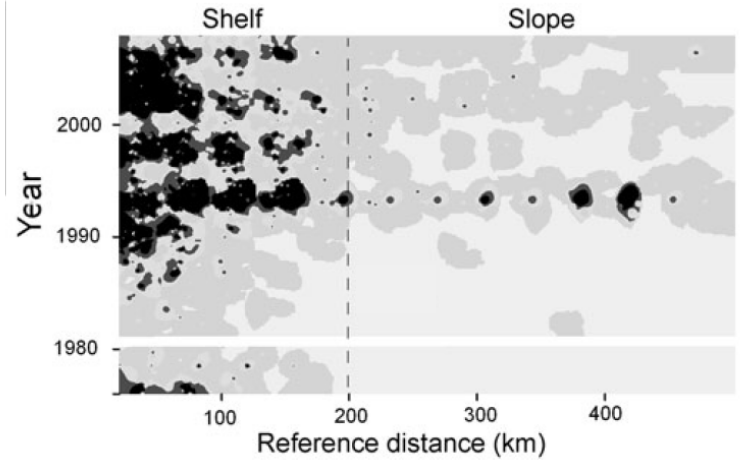
Hare et al (in prep)

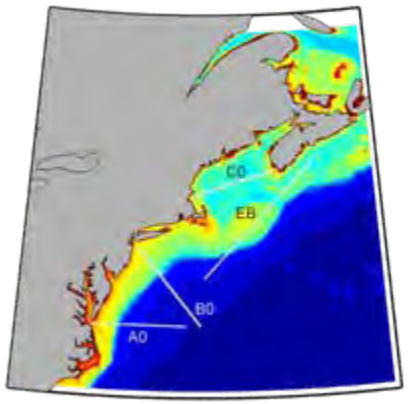
Highlights of current results

Zooplankton Abundance & Timing

Increase in *Temora longicornis* abundance and expansion of distribution



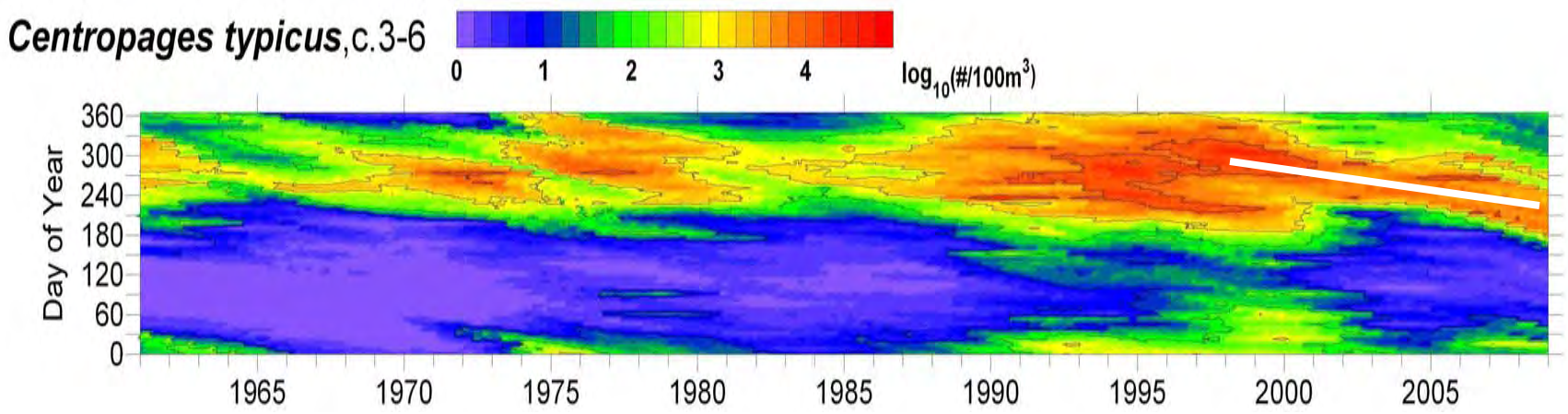


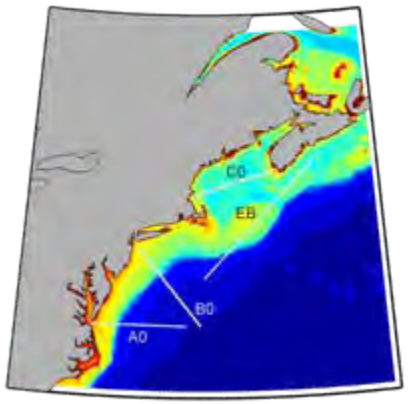


Kane and Prezioso (2008)

Highlights of current results

Zooplankton Abundance & Timing





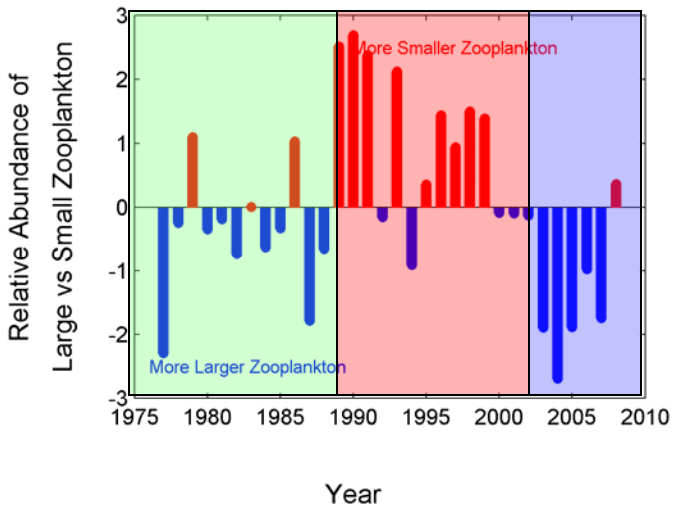
Variability in *Centropages typicus* abundance and a change in timing

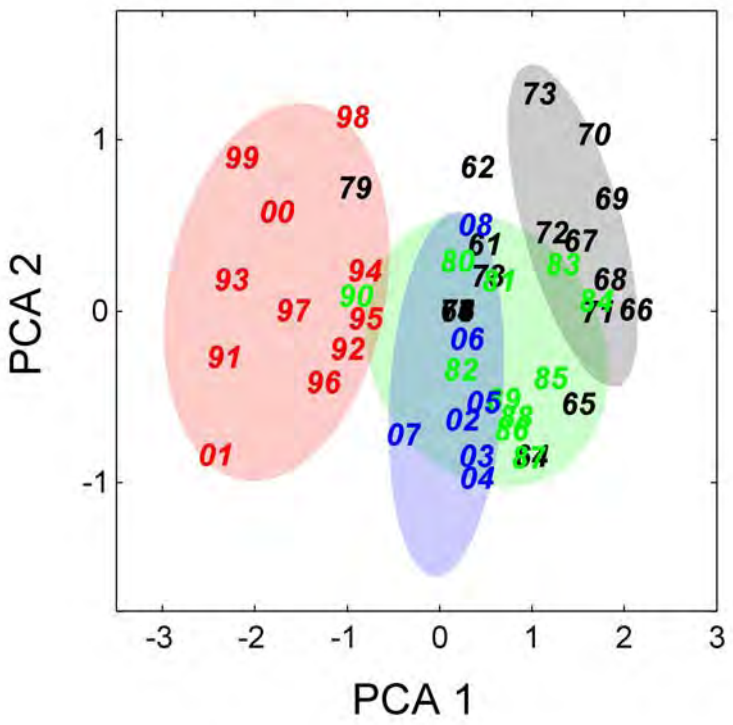
Jossi and Kane (in prep)

Highlights of current results

Zooplankton Abundance & Timing

Distinct temporal zooplankton assemblages related to contrast between smaller and larger species



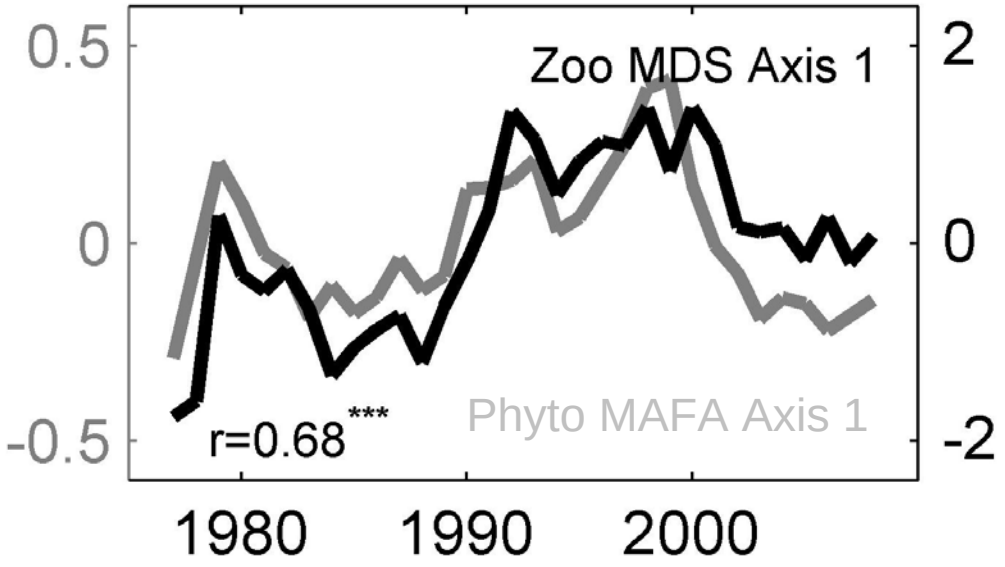


Re-analysis of Pershing et al. (2005)
From Hare and Kane (in review)

Highlights of current results

Phytoplankton – Zooplankton Relation

Primary axes of variation in phytoplankton and zooplankton are related



Currently evaluating both bottom-up and to-down hypotheses

Hare et al. (in prep)

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Management Applications

Data Products

- NEFSC Ecosystem Assessment Products
- ICES Zooplankton and Oceanic Hydrography Reports
- NOAA Contributions to GOOS

Northeast Fisheries Science Center Reference Document 09-11

Ecosystem Advisory
For the Northeast Shelf Large Marine Ecosystem

Northeast Fisheries Science Center, Narragansett, Rhode Island — Advisory 2010-No.1

Summary of Conditions of the Northeast Shelf Ecosystem

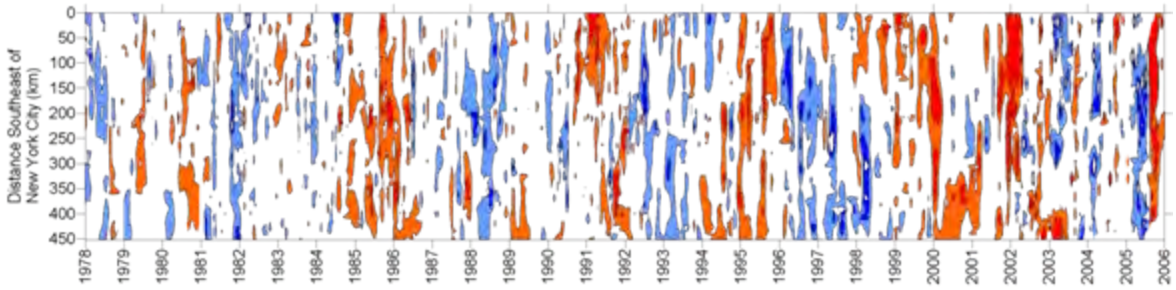
- Sea surface temperature (SST) in the Northeast Shelf Large Marine Ecosystem during the second half of 2009 alternated between moderately warm and cool conditions.

Ecosystem Status Report

Iortheast U.S. Continental Shelf Large Marine Ecosystem

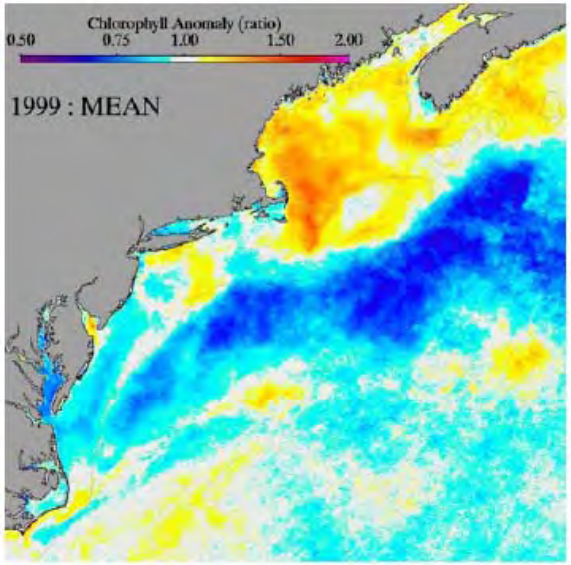
by the Ecosystem Assessment Program

July 2009

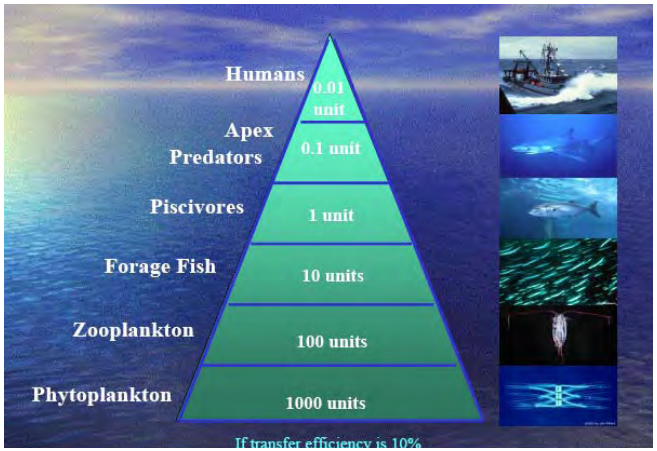


Management Applications

Potential inclusion in system-wide trophic-transfer model



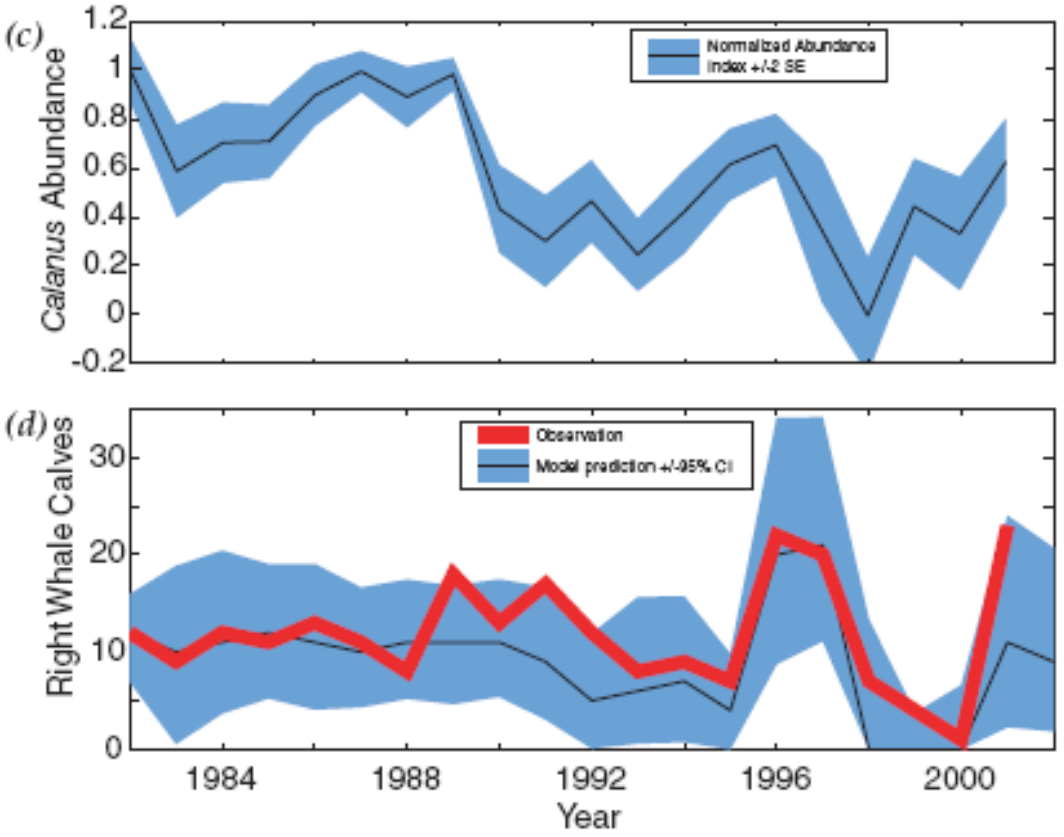
- Currently working on blended CPR, CZCS, *in situ* chlorophyll, SeaWIFS product
- Will be used in a trophic transfer model to estimate system-level fisheries productivity over time
- Will be provided to Fishery Management Council's as part of Fishery Ecosystem Plans



Management Applications

Right-whale calving rate model

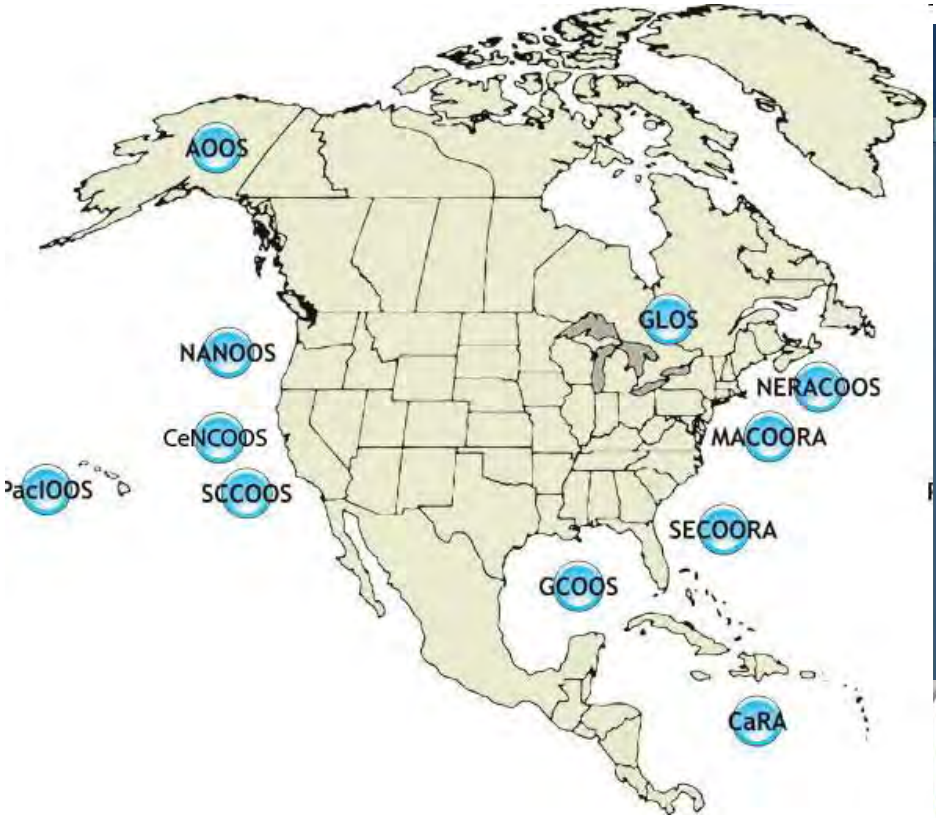
- Calving rate of endangered right whale function of *Calanus finmarchicus* abundance
- Working on operational model to extend initial work



Greene et al. (2004)

Management Applications

Integrating with Regional Ocean Observing Systems



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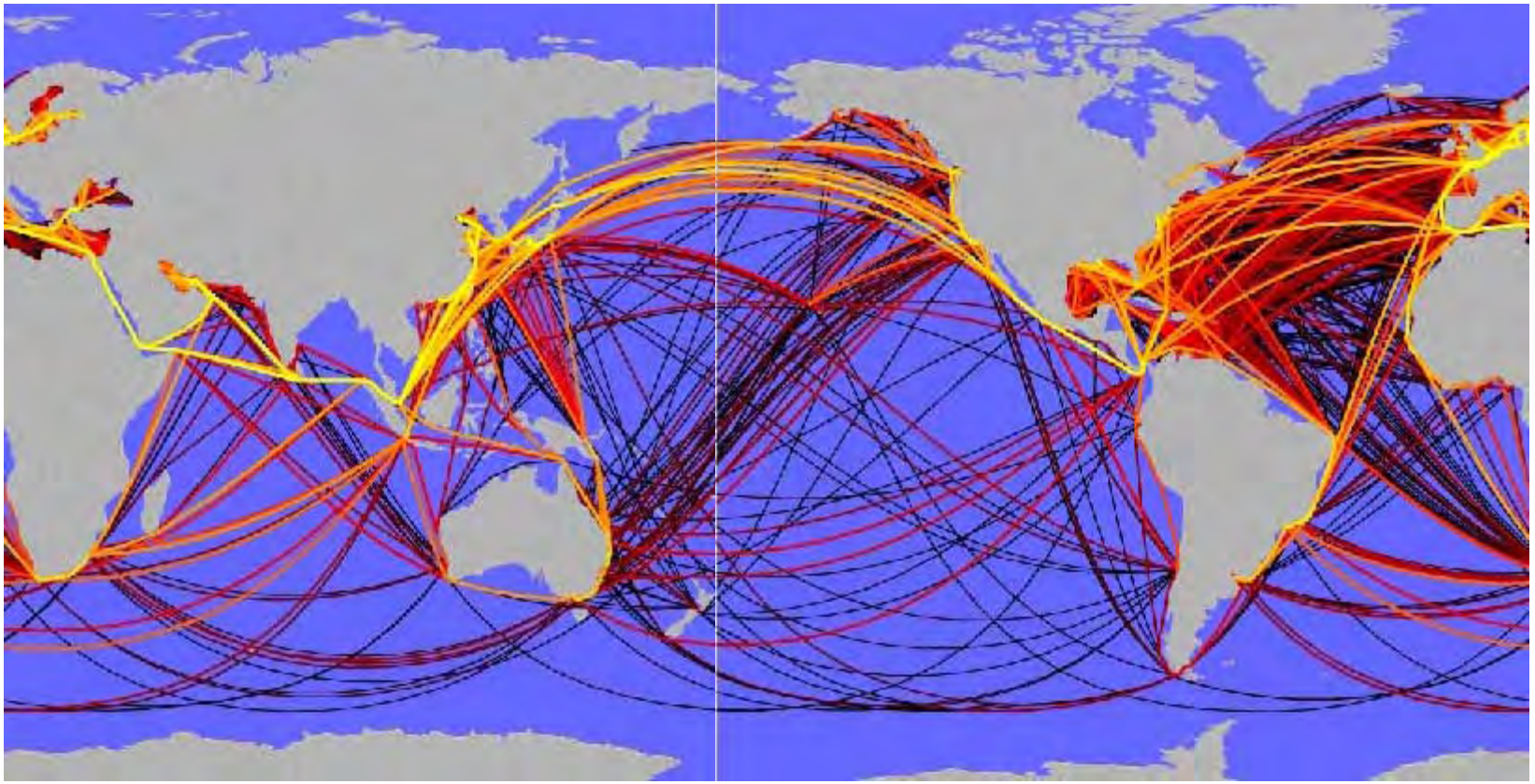
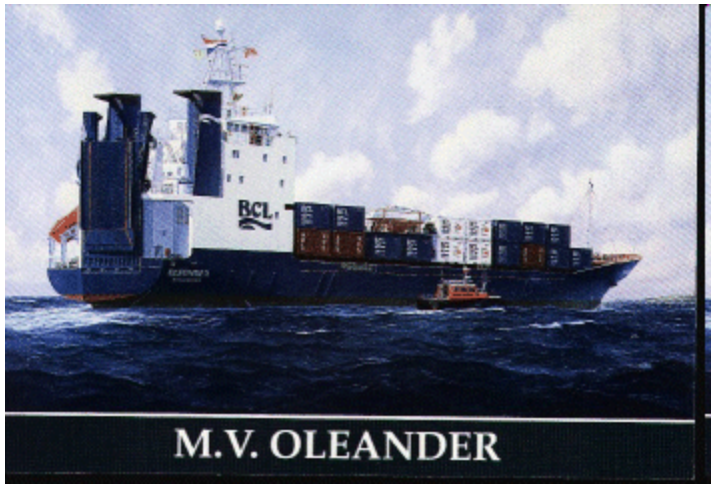
Future Directions

Ships of Opportunity present **opportunities**



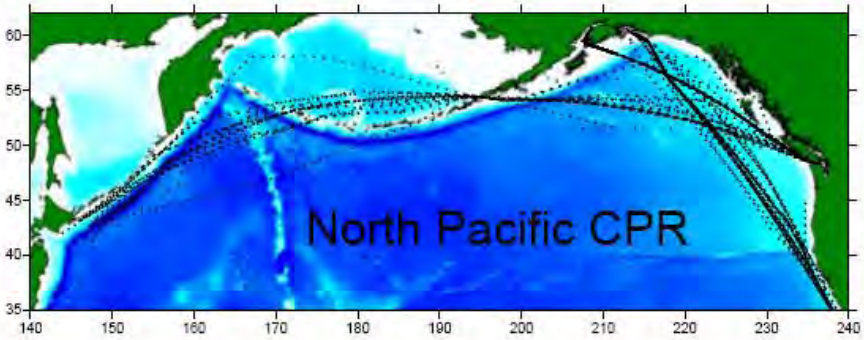
Future Directions

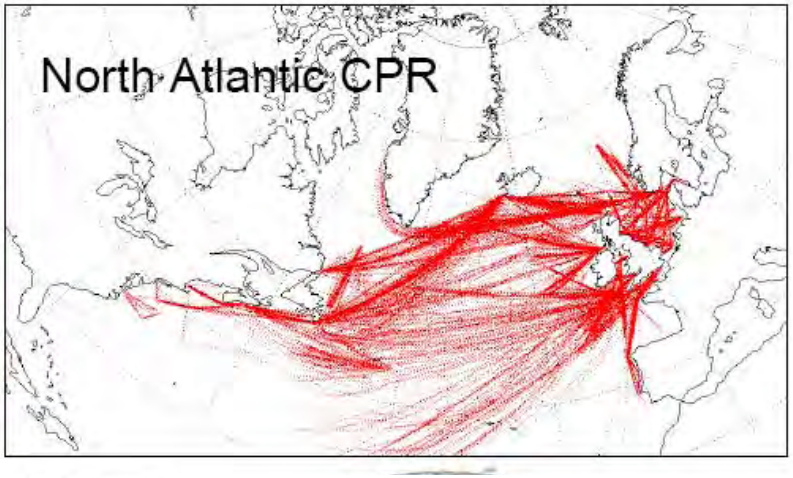
Collaborative platforms for sustained ocean observations

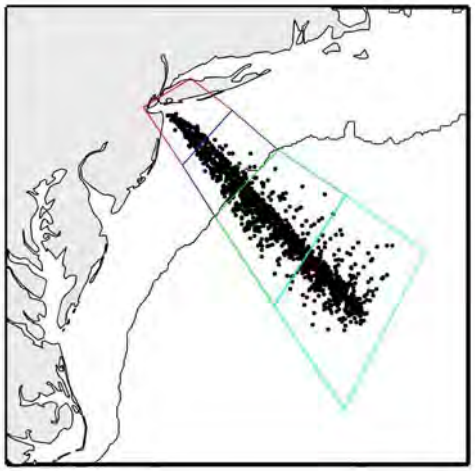


Future Directions

Interested in contributing to increased CPR operations in the Pacific







Future Directions

Contributing to trial CPR tow on NOAA Ship Okeanus Explorer

Guam to Hawaii / Hawaii to West Coast