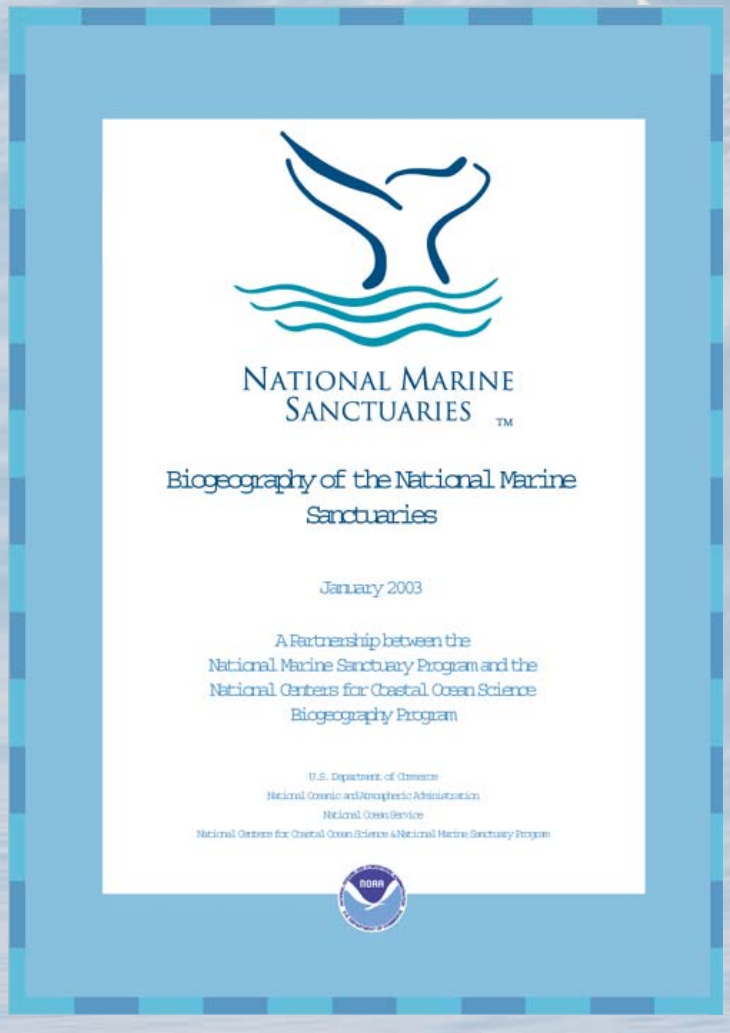
Randy Clark, Bryan Costa, Tim Battista, Simon Pittman, Ian Hartwell, Arthur Desch
CENTER FOR COASTAL MONITORING & ASSESSMENT (CCMA)
NOAA | National Ocean Service | National Centers for Coastal Ocean Science

An Ecological Characterization of the Stellwagen Bank National Marine Sanctuary Region

A Report to the SBNMS Sanctuary Advisory Council
October 10, 2007

How and Why are we Working with the National Marine Sanctuaries


NATIONAL MARINE SANCTUARIES ™

Biogeography of the National Marine Sanctuaries

January 2003

A Partnership between the
National Marine Sanctuary Program and the
National Centers for Coastal Ocean Science
Biogeography Program

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service
National Centers for Coastal Ocean Science & National Marine Sanctuary Program

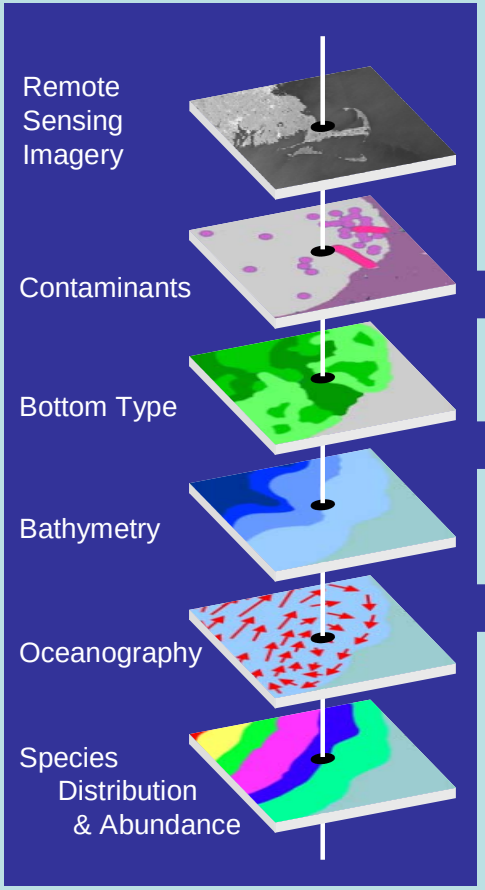
Developed a 5-yr. plan with NMSP to work with each individual Sanctuary to incorporate the latest data and technology in an effort to address:

- **Management Plan Revisions**
- **environmental characterizations**
- **boundary evaluations**
- **zoning**
- **threat assessment.**

Sanctuary Efforts to-date

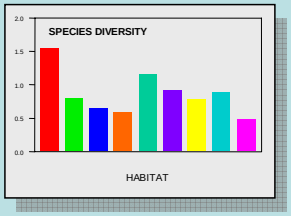
The Biogeographic Process

Biogeographic Data Layers

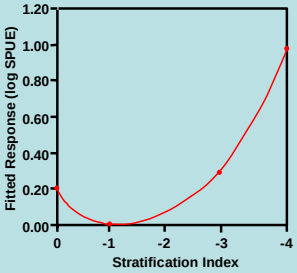


Analyses

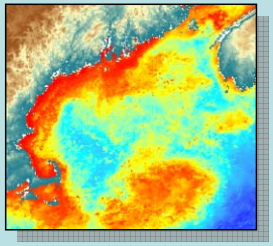
Community Analyses



Predictive Modeling



Geo-spatial Mapping

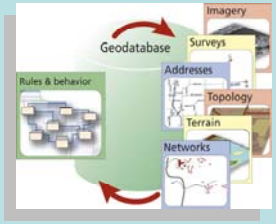


Analytical Products to meet Sanctuary Objectives

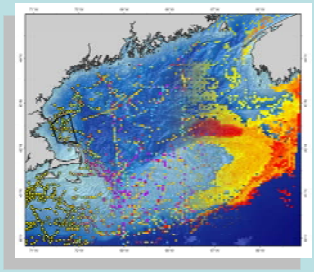
Products

Report

Geodatabase

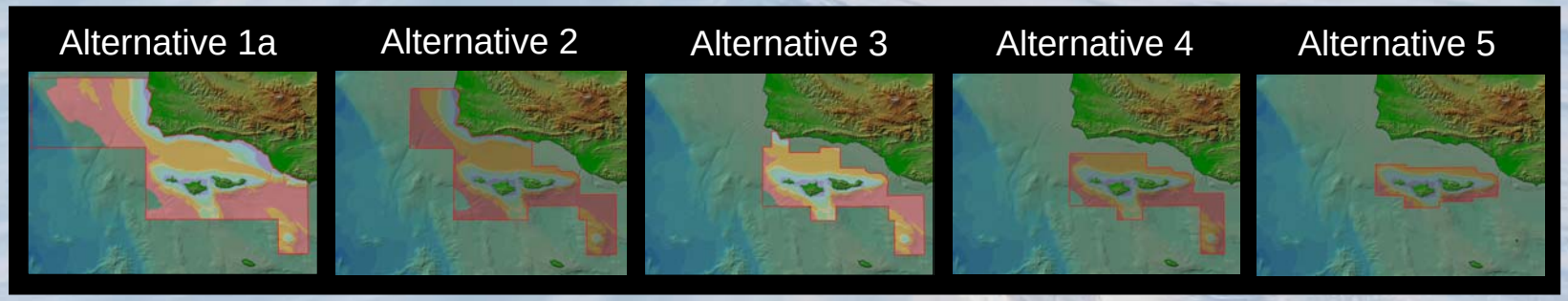


Geo-spatial Products

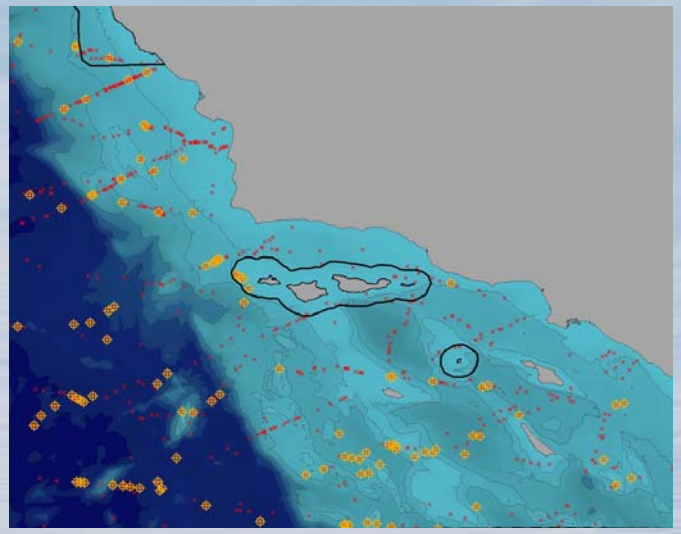


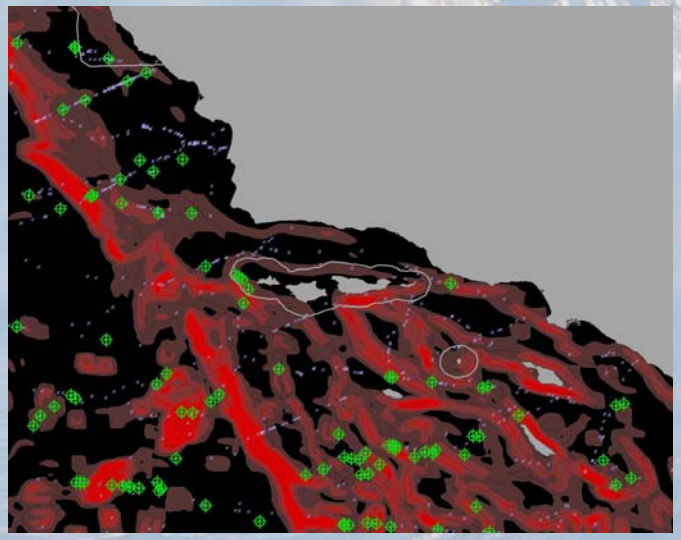
Biogeographic Concepts

Distribution among boundary concepts

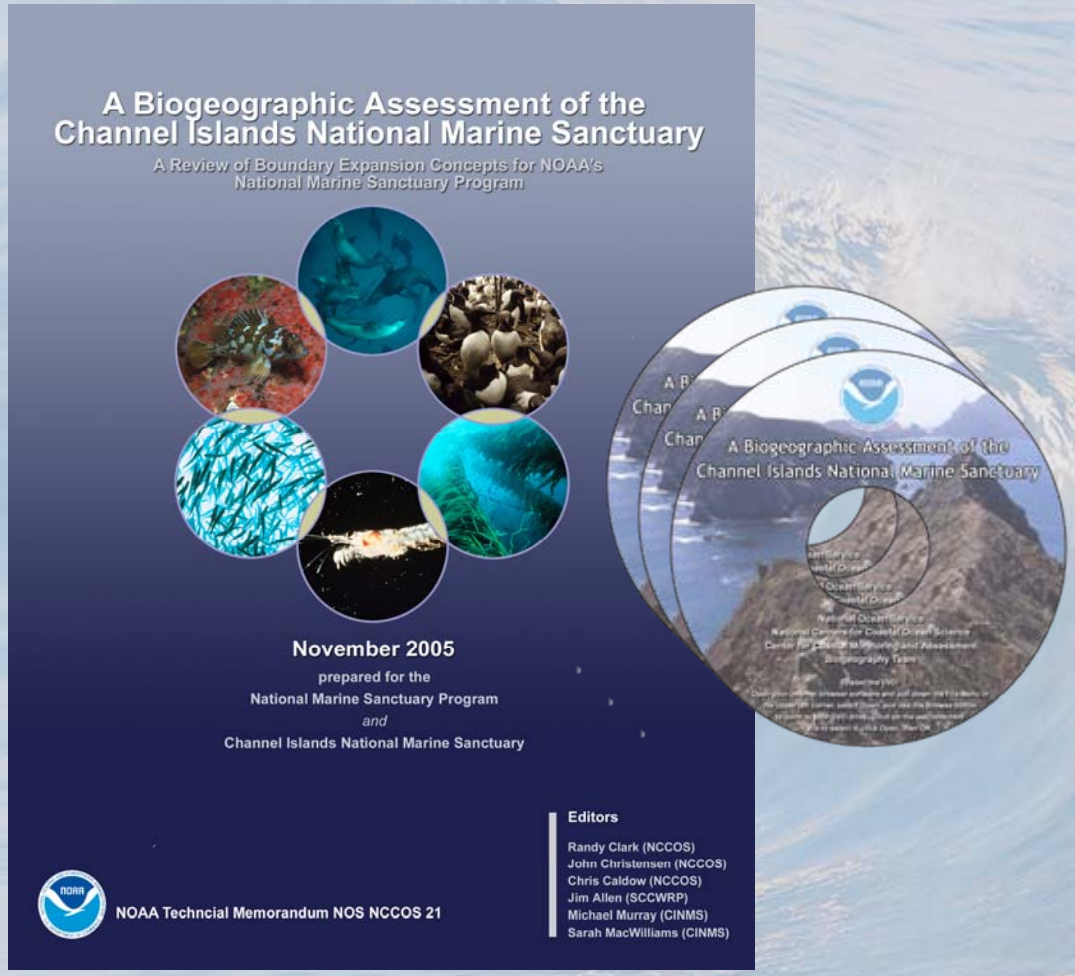


Correlate distribution with physical features





Products

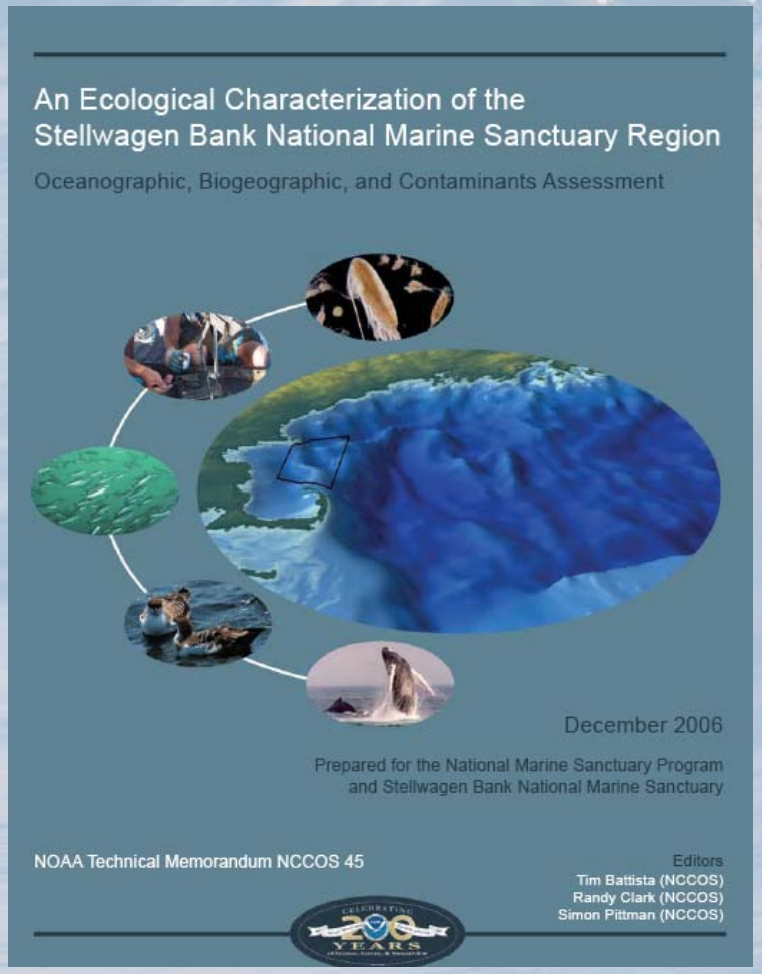

A Biogeographic Assessment of the Channel Islands National Marine Sanctuary
A Review of Boundary Expansion Concepts for NOAA's National Marine Sanctuary Program
November 2005
prepared for the
National Marine Sanctuary Program
and
Channel Islands National Marine Sanctuary
Editors
Randy Clark (NCCOS)
John Christensen (NCCOS)
Chris Caldow (NCCOS)
Jim Allen (SCCWRP)
Michael Murray (CINMS)
Sarah MacWilliams (CINMS)
NOAA Techncial Memorandum NOS NCCOS 21

It Takes a Village……

Partners and Collaborators

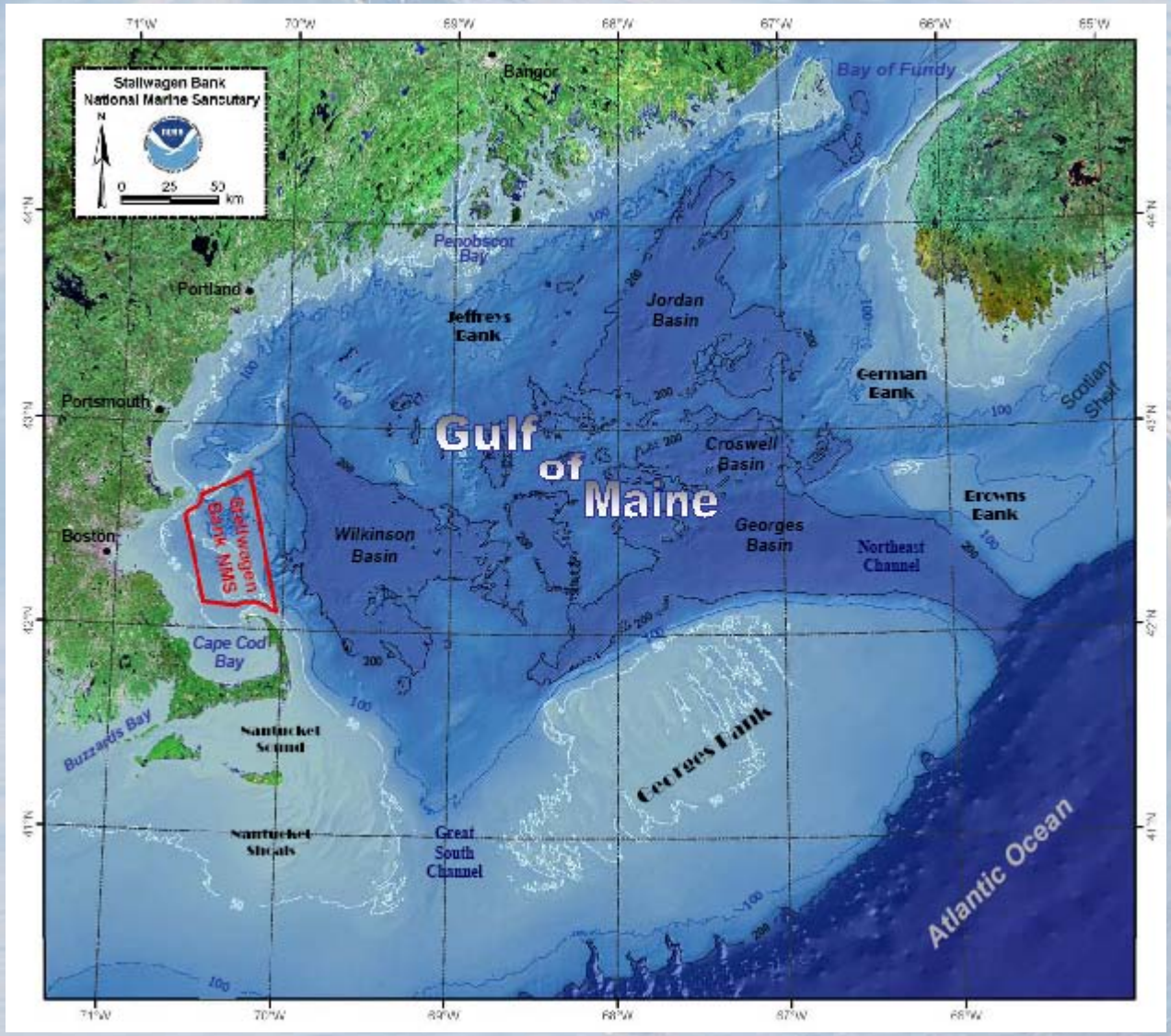
- NMSP
- NMFS/NEFSC
- WHOI
- NESDIS
- USGS
- USFWS
- Bedford Institute of Oceanography
- Mass. DMF
- Maine DMR
- MWRA
- Manomet Center for Cons. Sci.
- Univ. of Connecticut
- Univ. of Mass.-Boston
- Univ. of New Hampshire
- Univ. of Alaska-Fairbanks
- Univ. of Rhode Island
- Duke Univ.
- Mem. Univ. of Newfoundland
- Middlebury College
- Univ. of New Brunswick
- National Audubon Society

Characterization Design

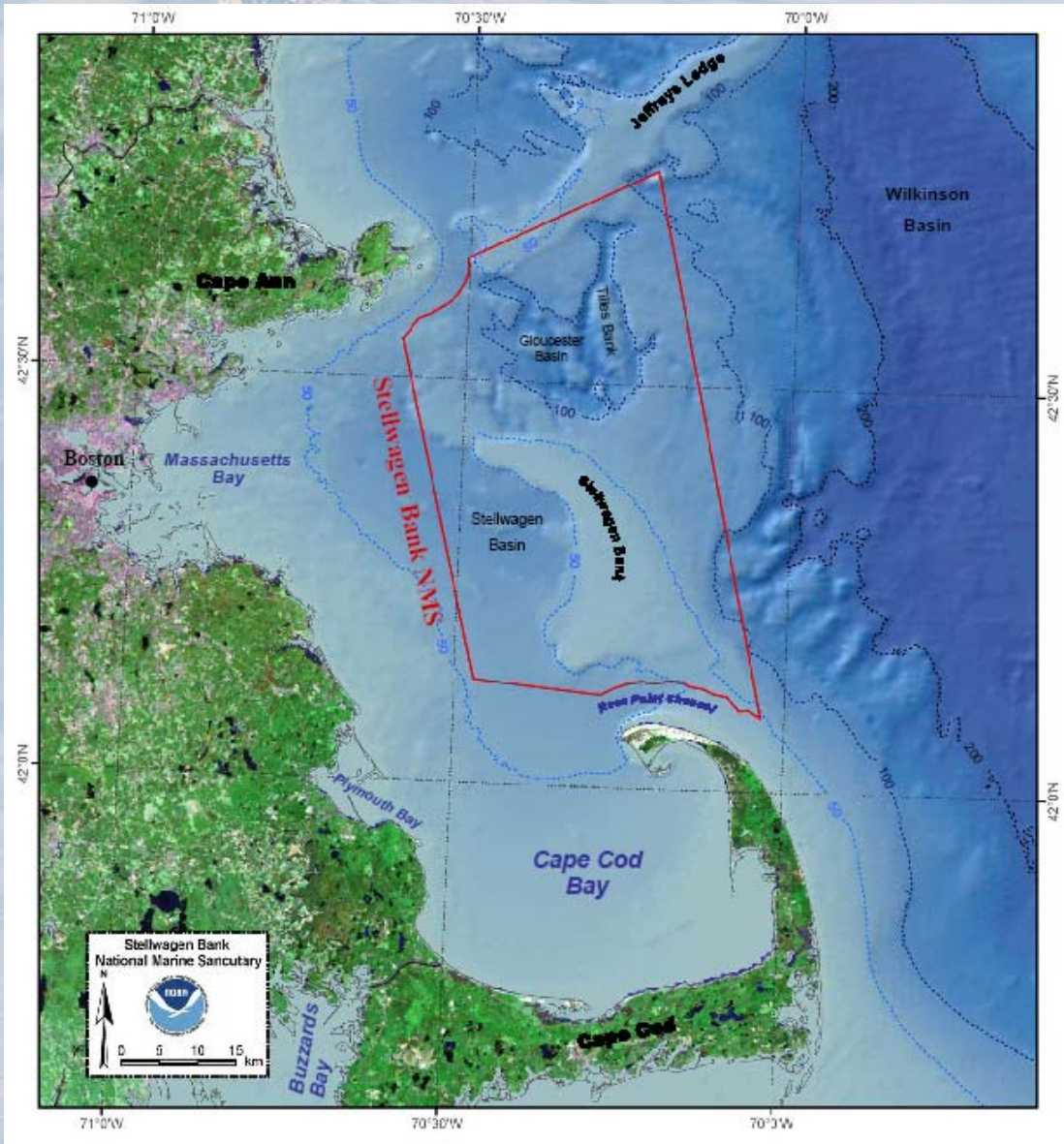


- **Physical & Oceanographic Setting**
  - Climate & Weather
  - Bathymetry & Benthic Substrates
  - Temperature, Currents, Ocean Color
- **Chemical Contamination**
  - Sediment Contamination
  - Fish Tissue Histopathology
  - Impacts to Benthos
- **Marine Fishes**
  - *Community Structure*
  - *Population Time-Series*
  - *Ichthyoplankton Dynamics*
- **Seabirds**
  - *Community Structure*
  - *Threats & Ecological Linkages*
  - *Conservation Status*
- **Cetaceans**
  - *Sightings*
  - *Population Models*

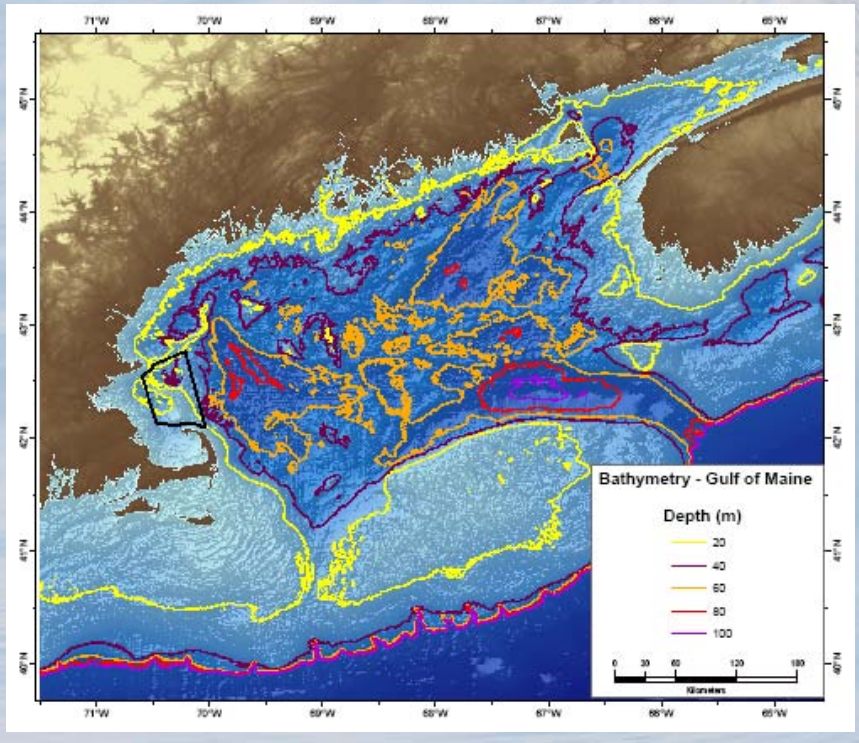
Study Area

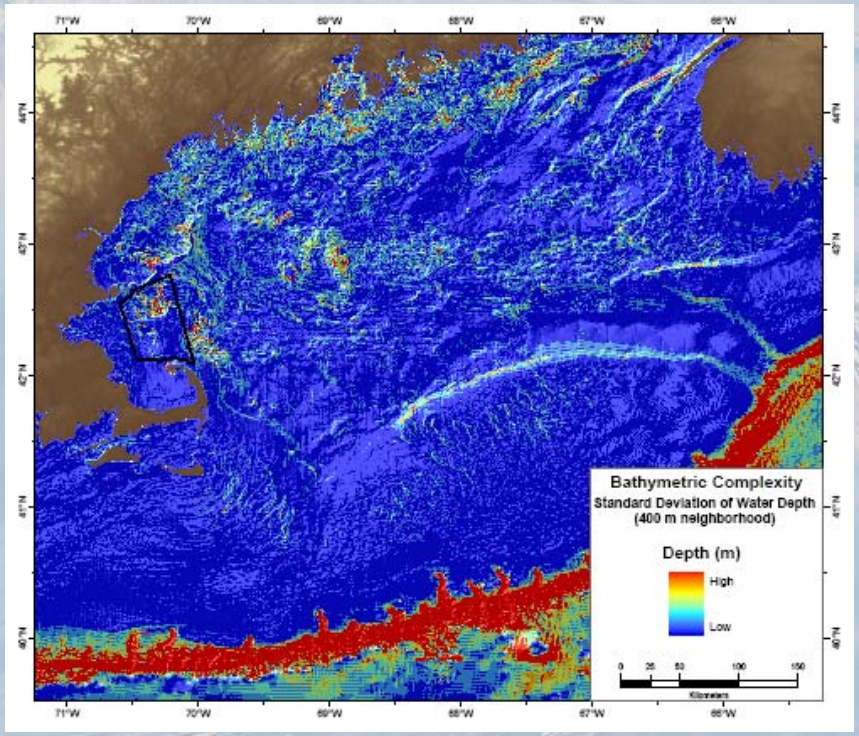

Stellwagen Bank
National Marine Sanctuary
N
0 25 50 km
Bangor
Bay of Fundy
Penobscot Bay
Portland
Portsmouth
Boston
Jeffreys Bank
Jordan Basin
German Bank
Scotian Shelf
Gulf of Maine
Croswell Basin
Browns Bank
Stellwagen Bank NMS
Wilkinson Basin
Georges Basin
Northeast Channel
Cape Cod Bay
Buzzards Bay
Nantucket Sound
Georges Bank
Nantucket Shoals
Great South Channel
Atlantic Ocean
71°W
70°W
69°W
68°W
67°W
66°W
65°W
44°N
43°N
42°N
41°N

Study Area Focus

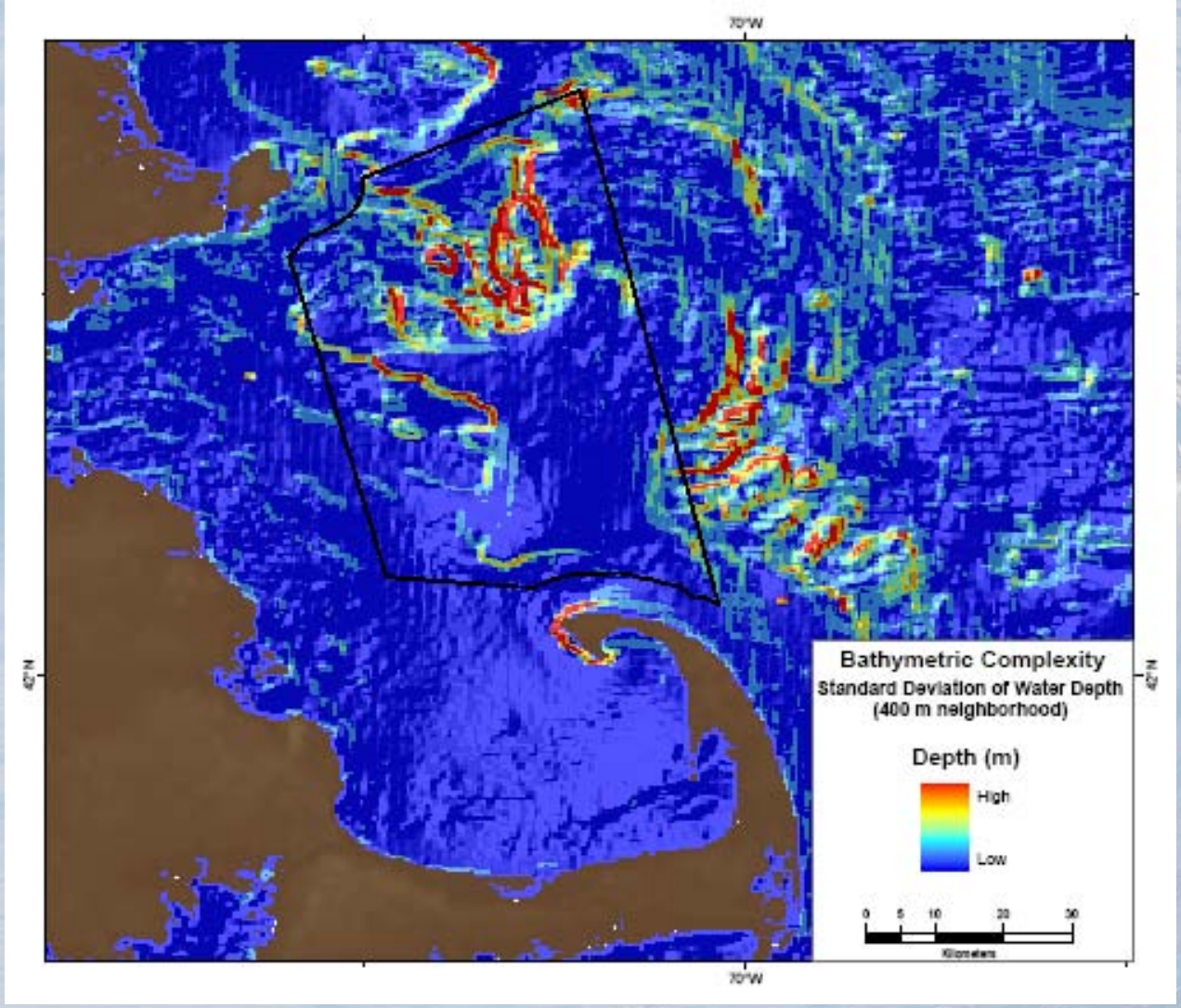


Physical Setting
Bathymetry

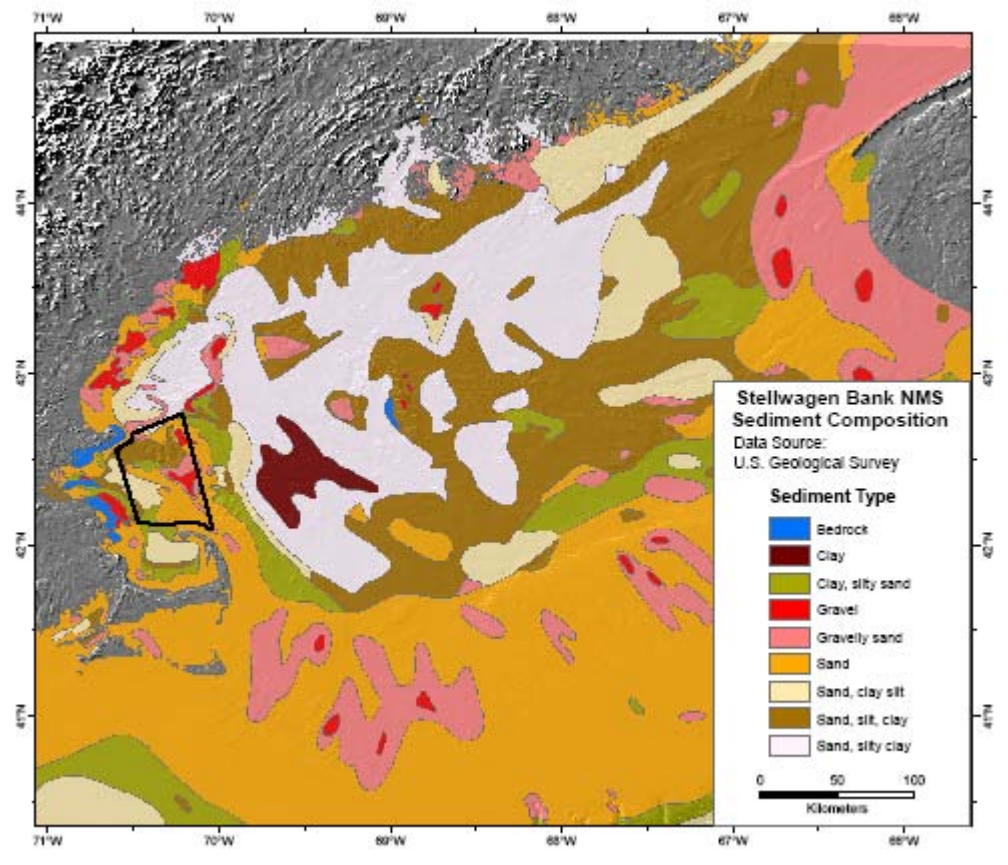




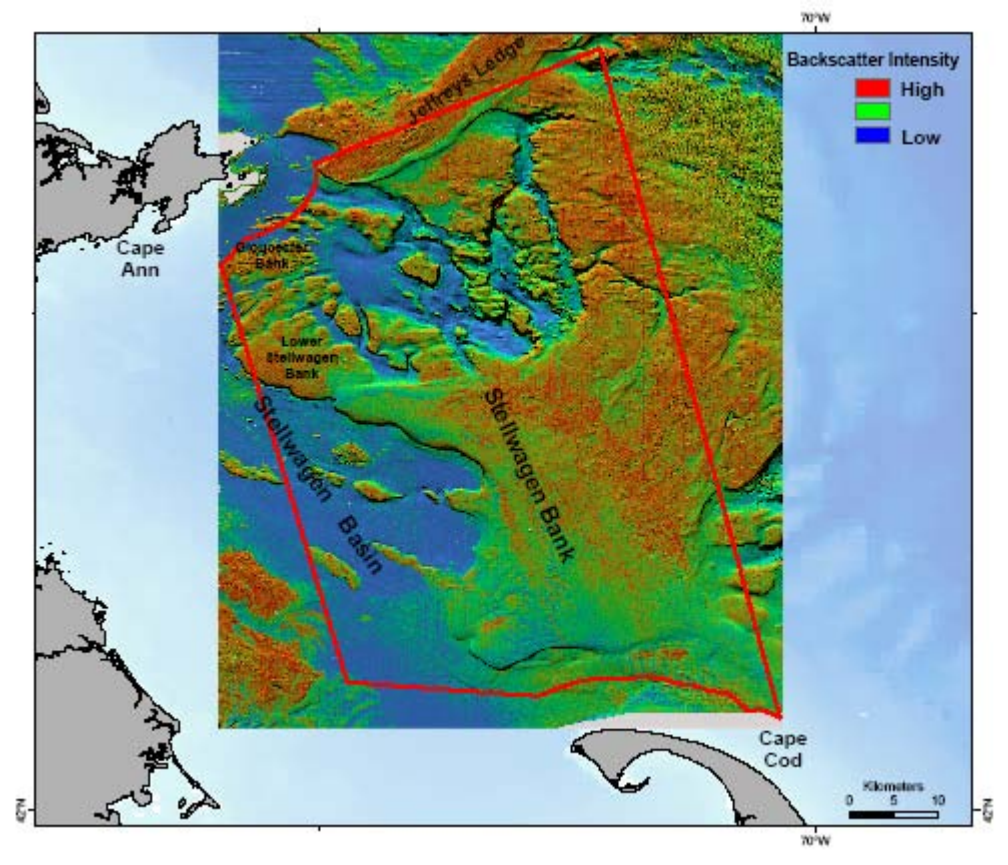
Physical Setting
SBNMS Complexity



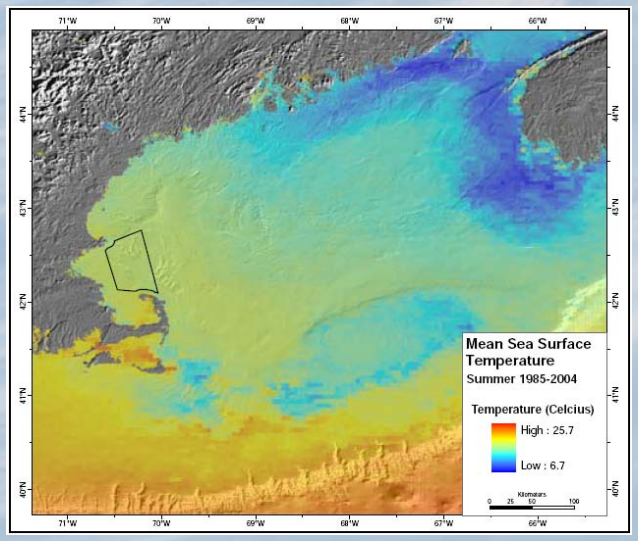
Physical Setting
Benthic Substrate
Broad-scale Low Resolution

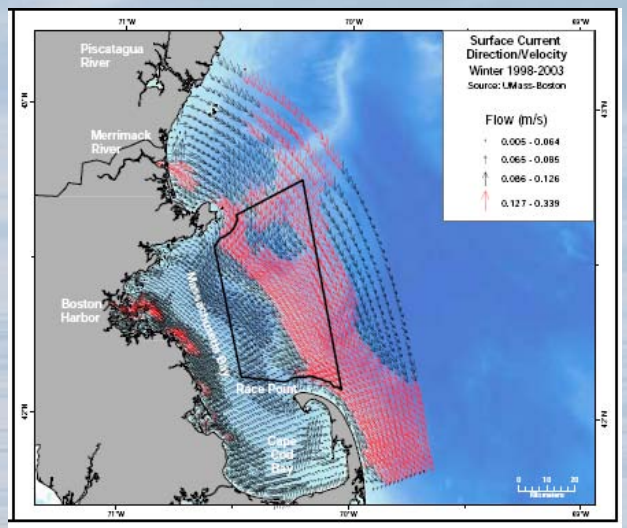


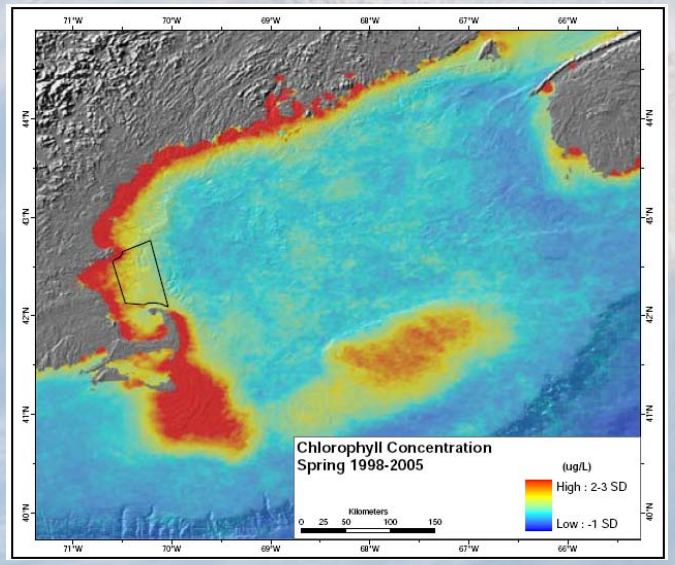
Physical Setting
Benthic Substrate
Sanctuary-scale High Resolution



Oceanography





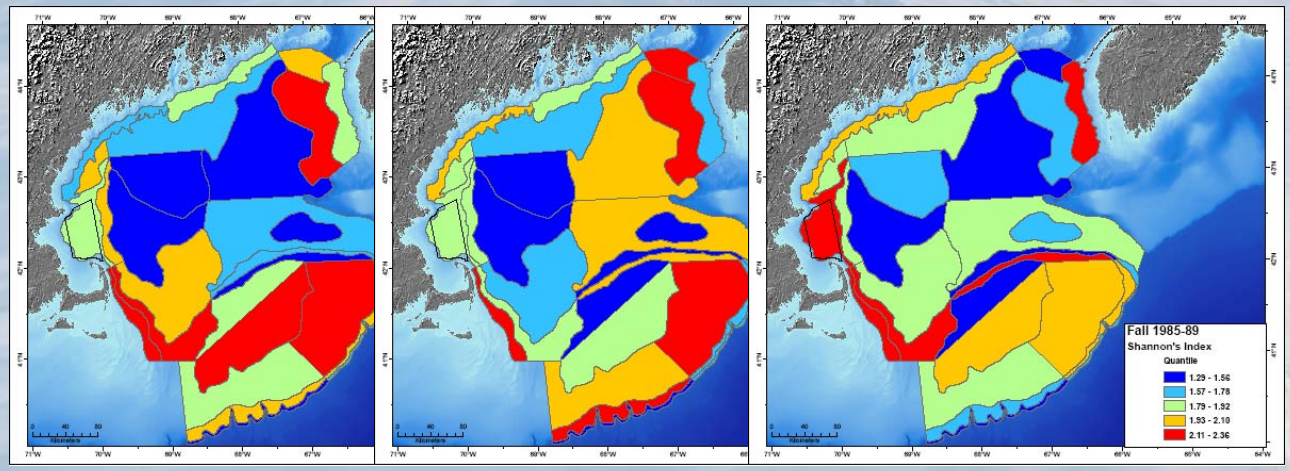


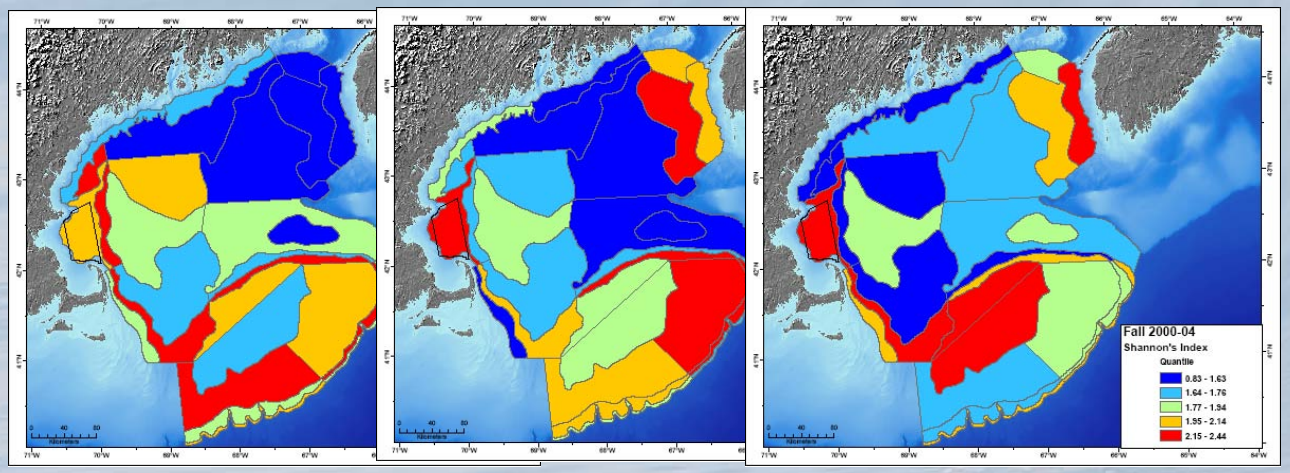
- 20 yrs SST Data
- Simulated currents
- 8 yrs Ch-a Data
- Density Stratification
- Internal Waves

Anthropogenic Effects

- Examined import of trace elements and organic contaminants into the Sanctuary
- In shallow waters, contaminants are significantly lower than in Mass Bay
- In deeper waters, no patterns for trace metals and PAHs. Reductions in DDTs and chlordane
- Source: Probably Boston Harbor
- Overall, minimal impacts at SBNMS

Biological Characterization
Fish Community Structure

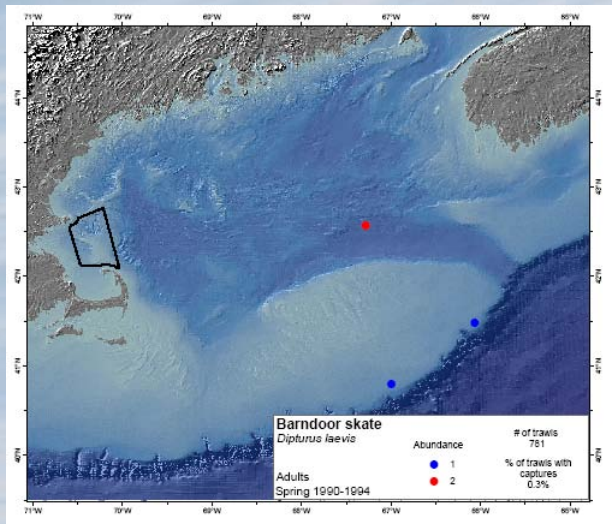


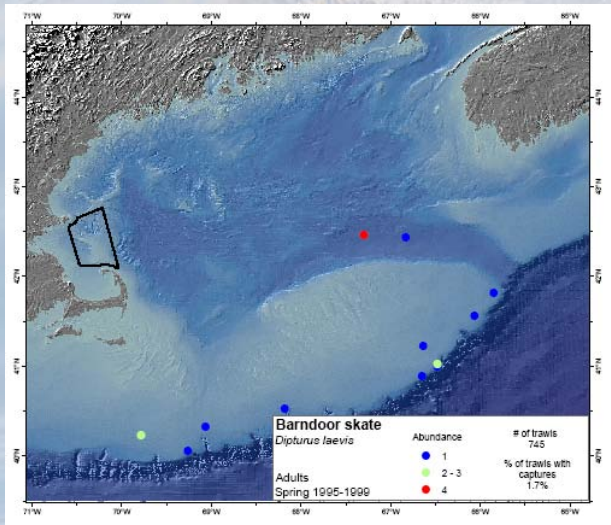


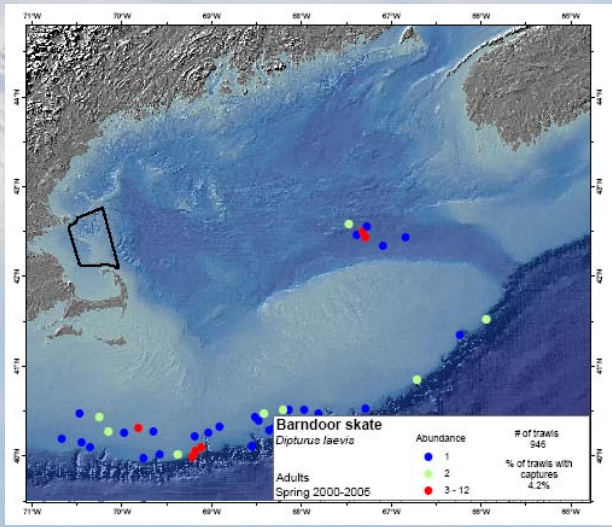
- 35 years of trawl data
- 6 diversity metrics
- Shifting ecological hotspots

Biological Characterization
Ecologically Important Species

Barndoor skate

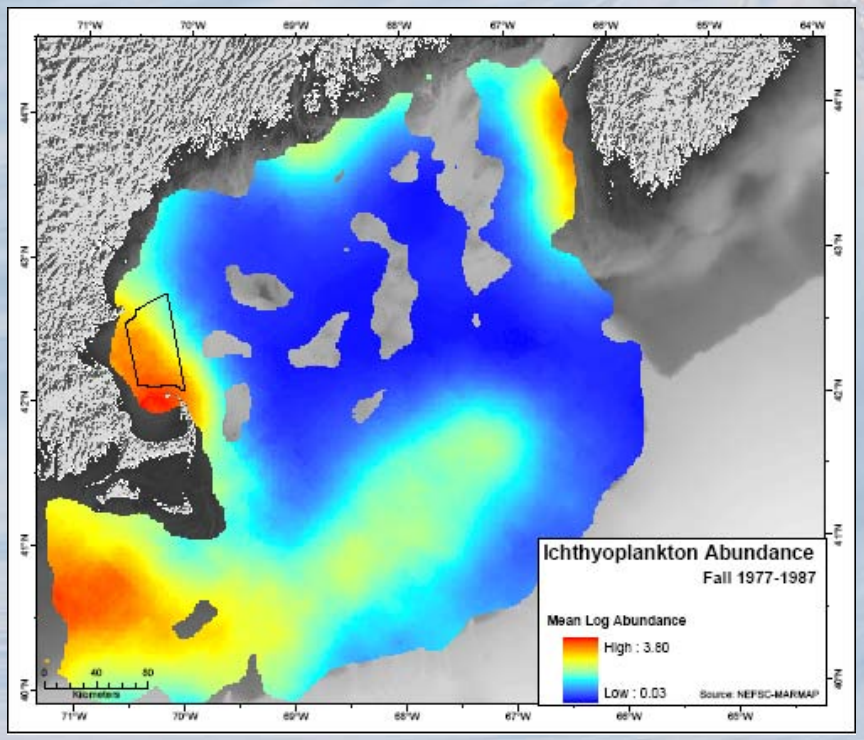
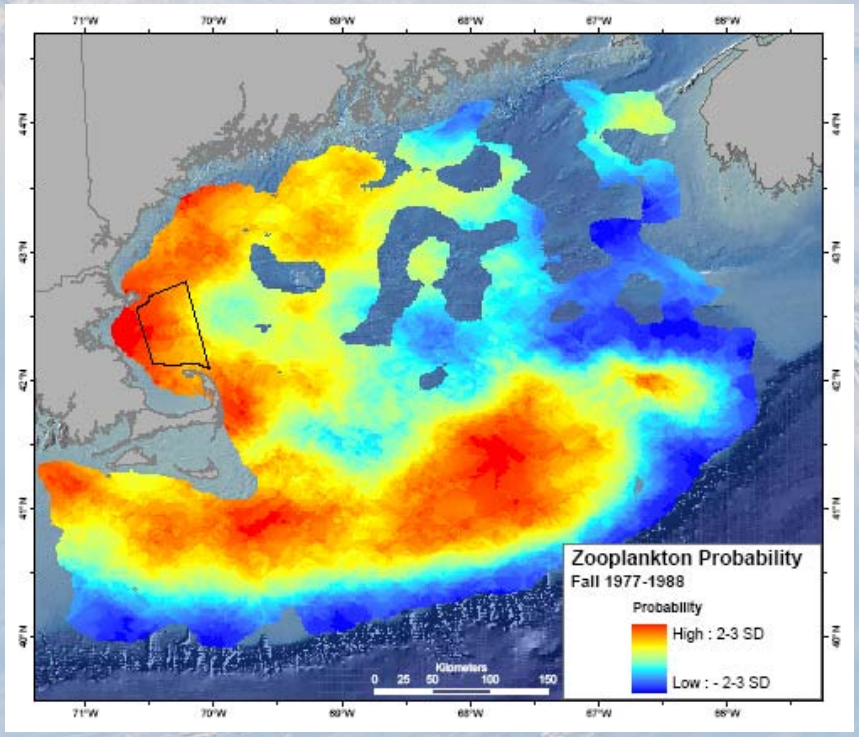






Biological Characterization
Secondary Productivity - Historical

Ichthyoplankton



Zooplankton