

The background of the slide is a photograph of a lobster underwater. The lobster is the central focus, with its large claws and legs visible. The water is slightly murky, and the lighting is soft, highlighting the texture of the lobster's shell.

**Ecology of the  
Ocean Special Area Management Plan Area:**

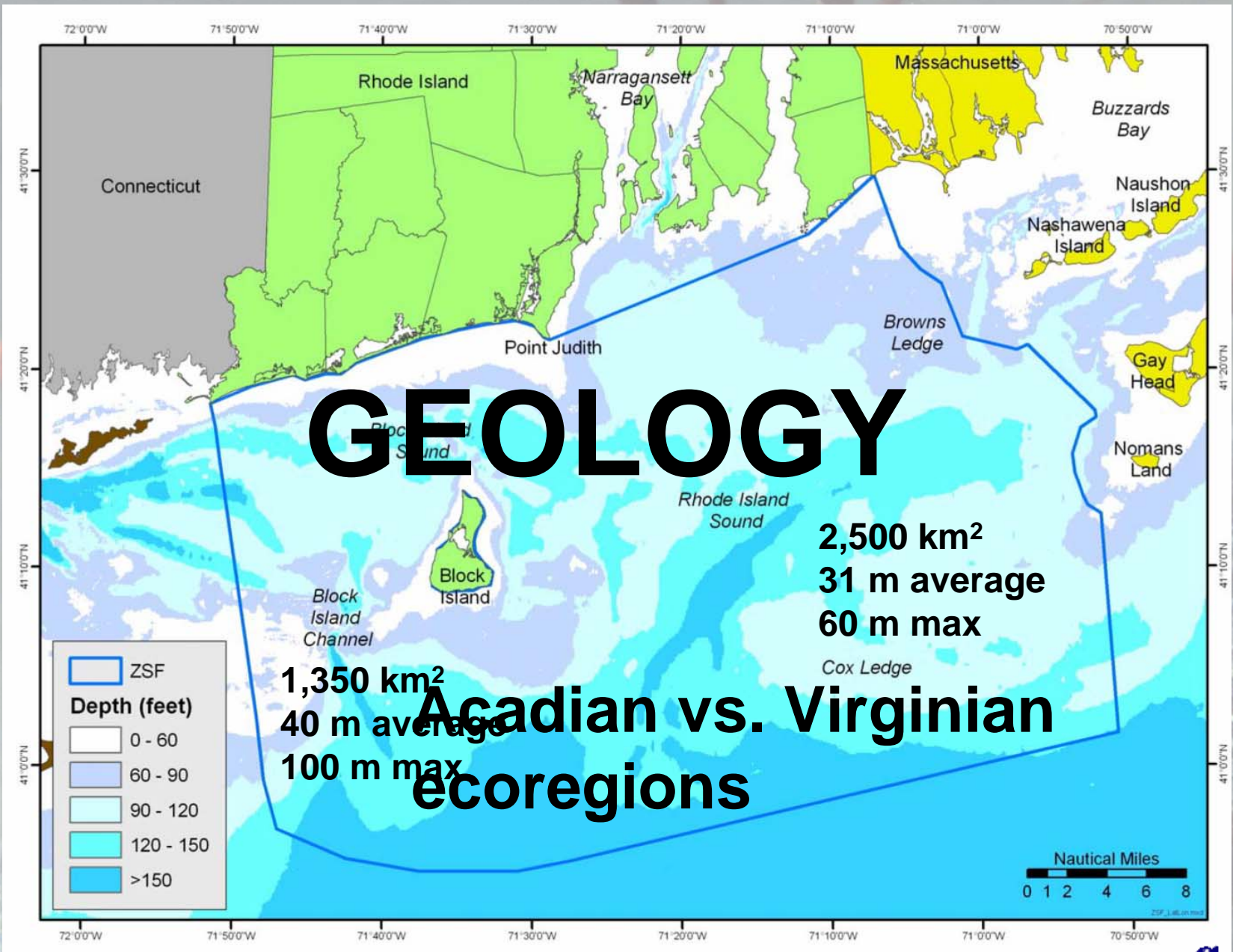
**Block Island Sound  
Rhode Island Sound  
Inner Continental Shelf**

*Alan Desbonnet  
Carrie Byron*

*with help from Elise Desbonnet, Barry Costa-Pierce, Meredith Haas  
and the PELL LIBRARY STAFF and MANY, MANY Researchers*

*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*





# GEOLOGY

**2,500 km<sup>2</sup>**  
**31 m average**  
**60 m max**

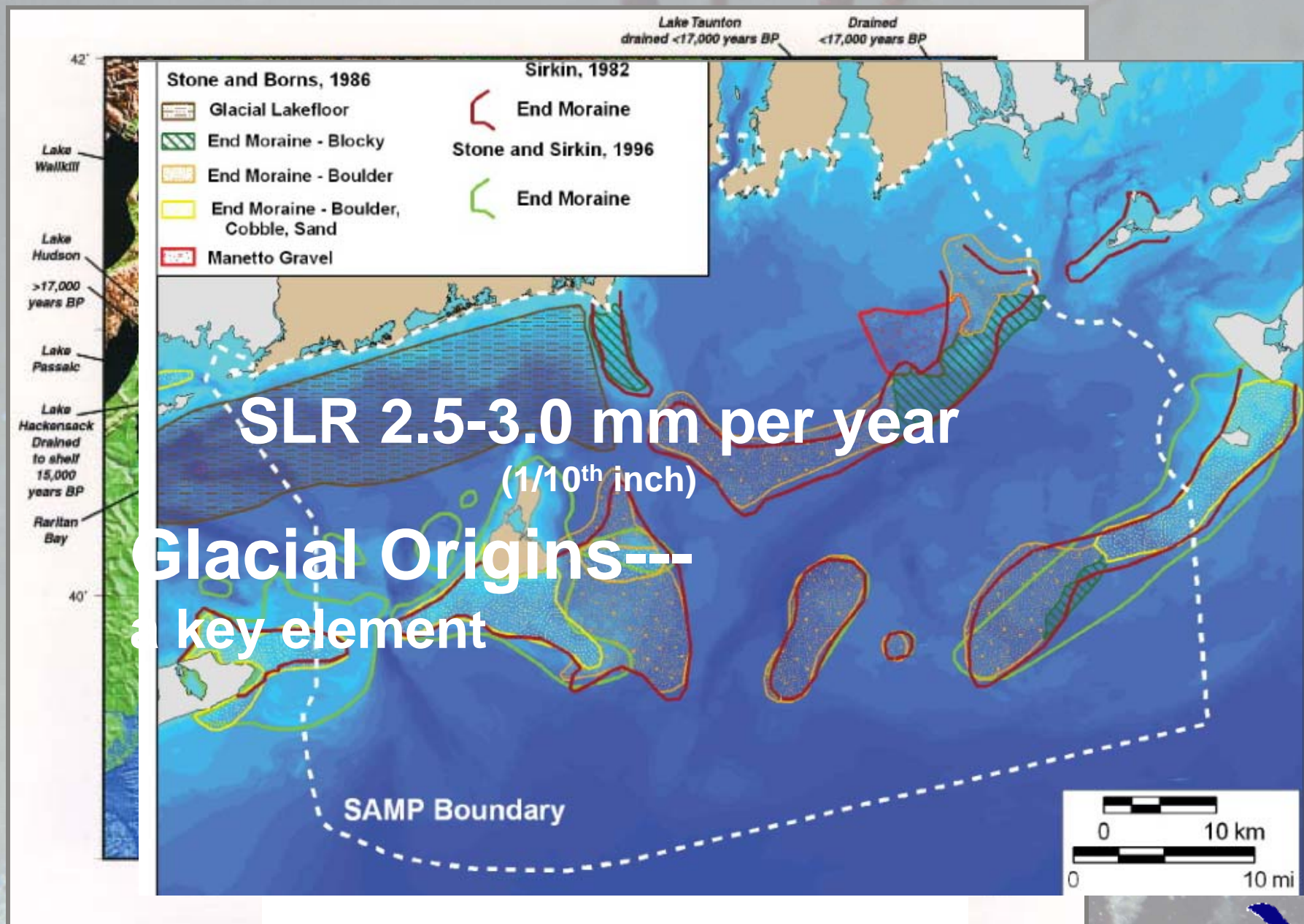
**1,350 km<sup>2</sup>**  
**40 m average**  
**100 m max**

## Acadian vs. Virginian ecoregions

*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

Boothroyd 2008

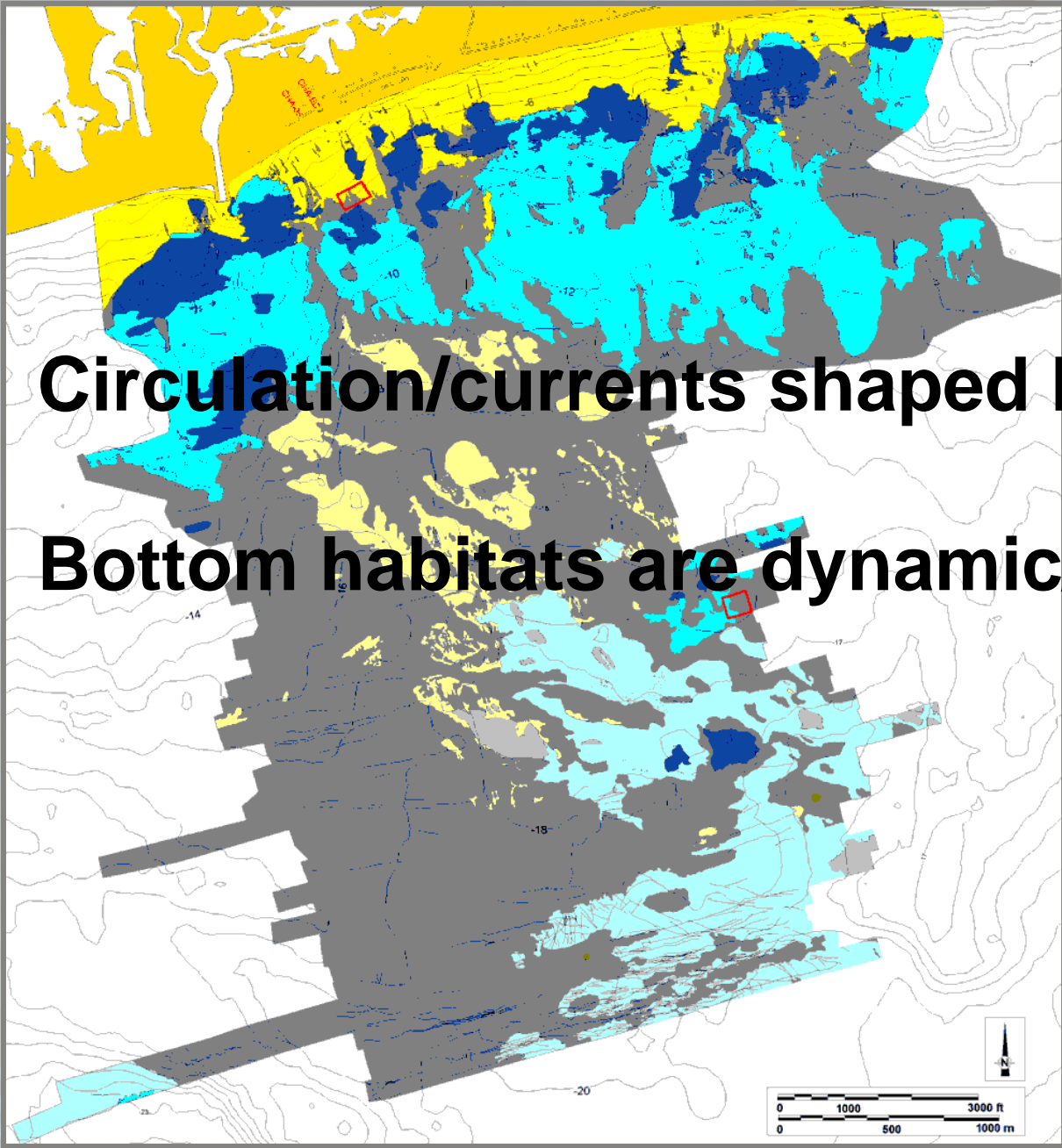




*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

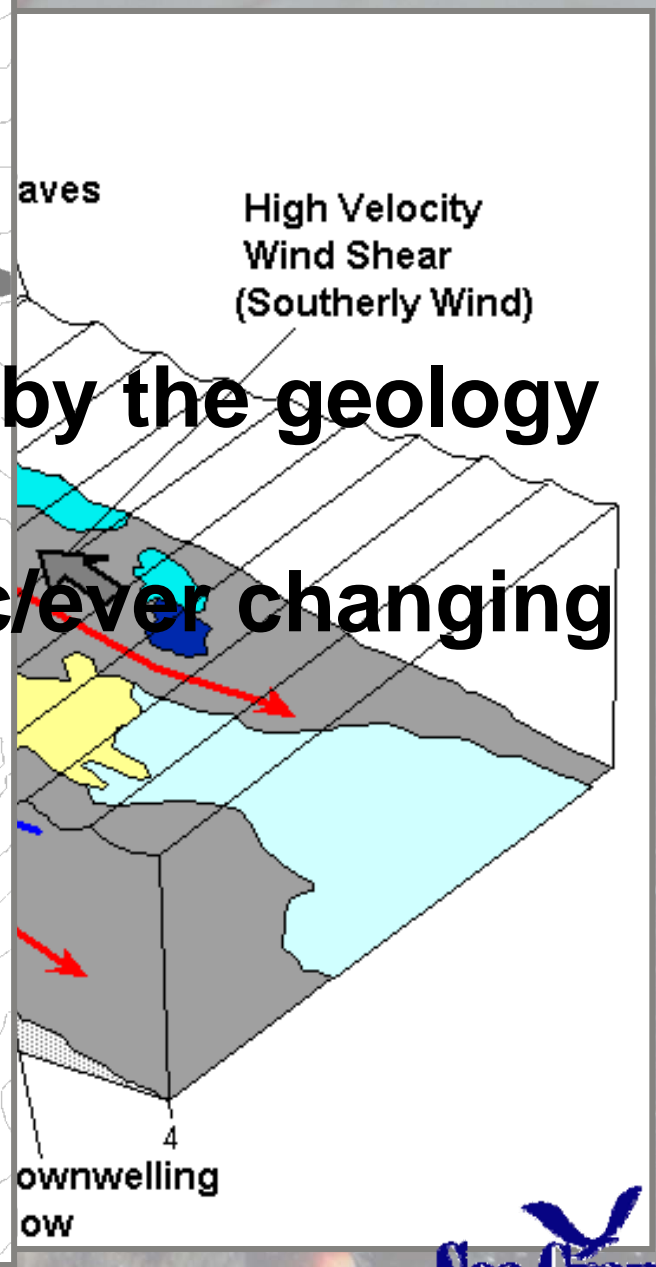
Boothroyd 2009



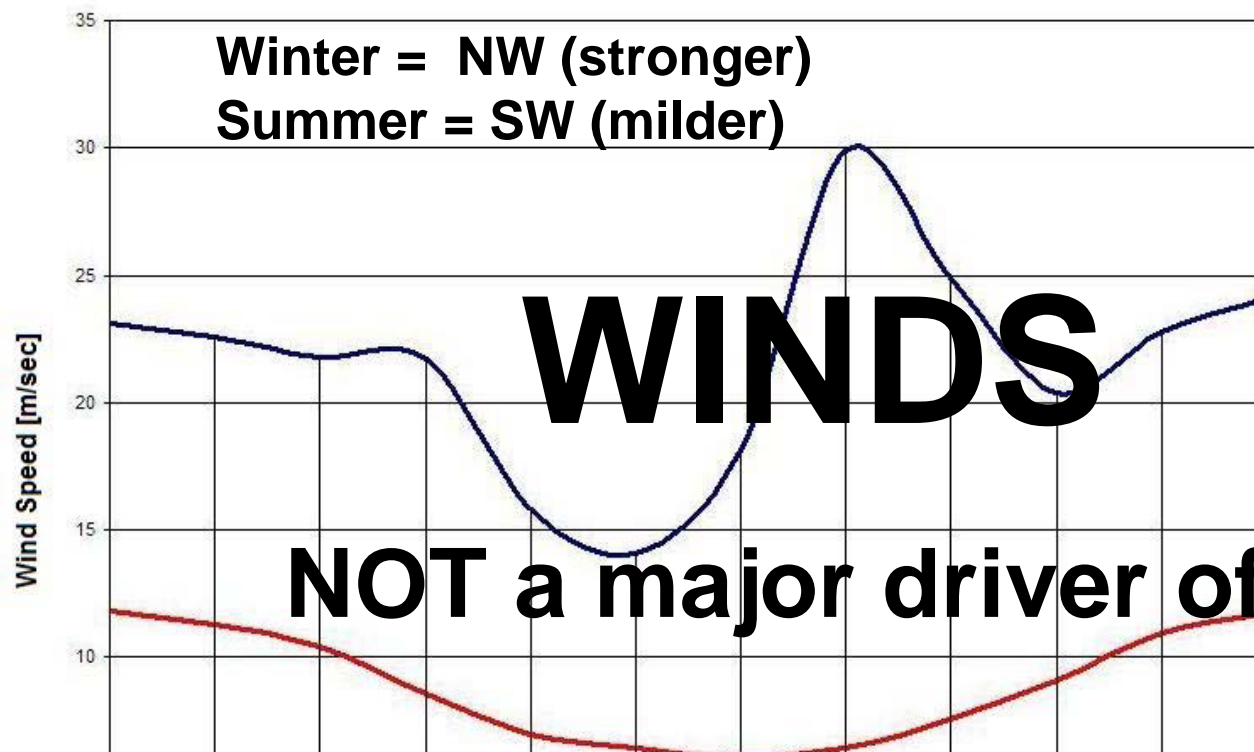


**Circulation/currents shaped by the geology**

**Bottom habitats are dynamic/ever changing**



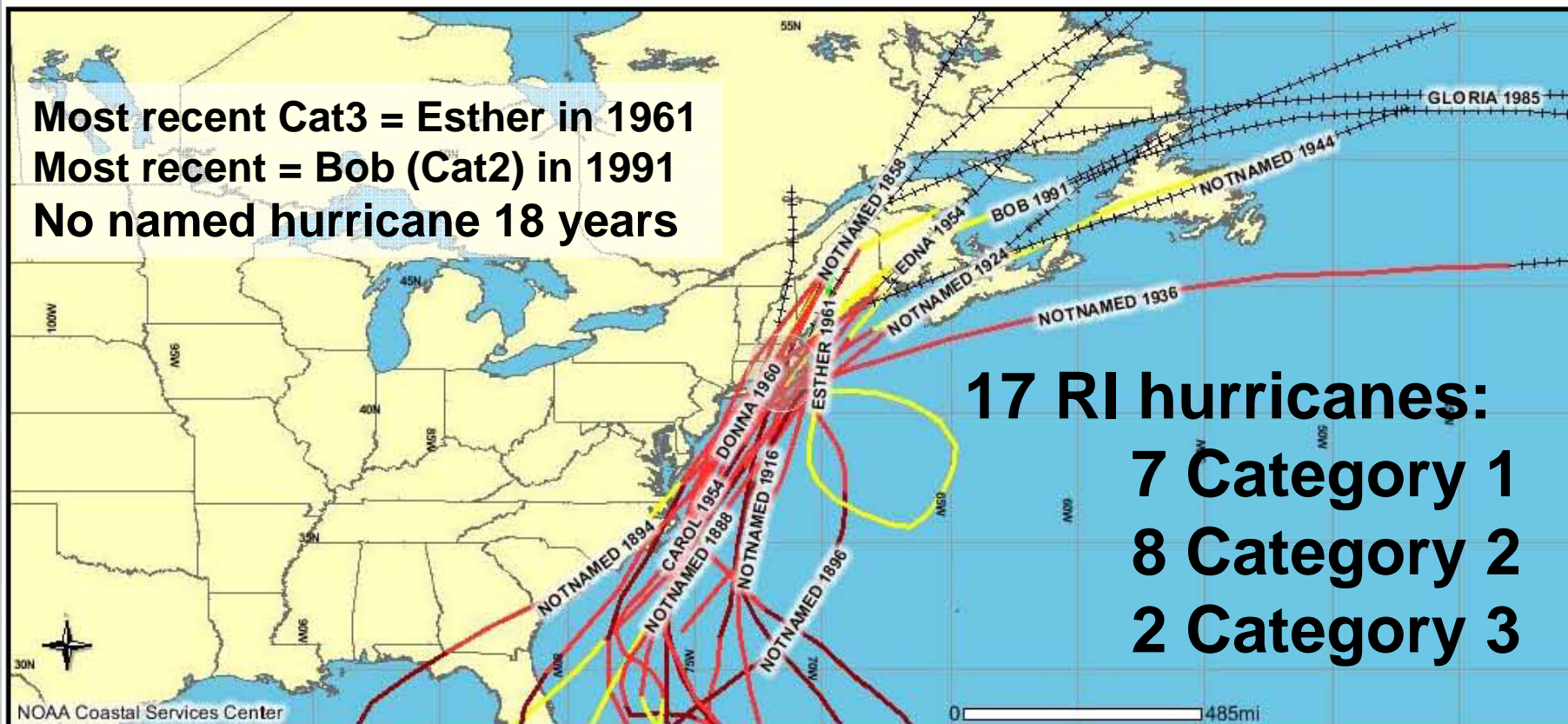
*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*



**Av. Wave height = 1-3 m**

**Max = 7 m (9 m 100 yr. wave)**

**Most recent Cat3 = Esther in 1961**  
**Most recent = Bob (Cat2) in 1991**  
**No named hurricane 18 years**

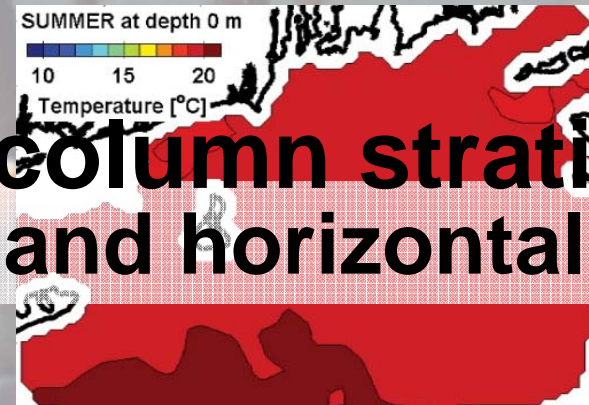
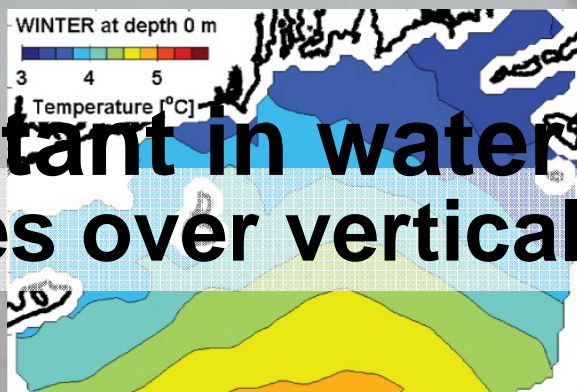


*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

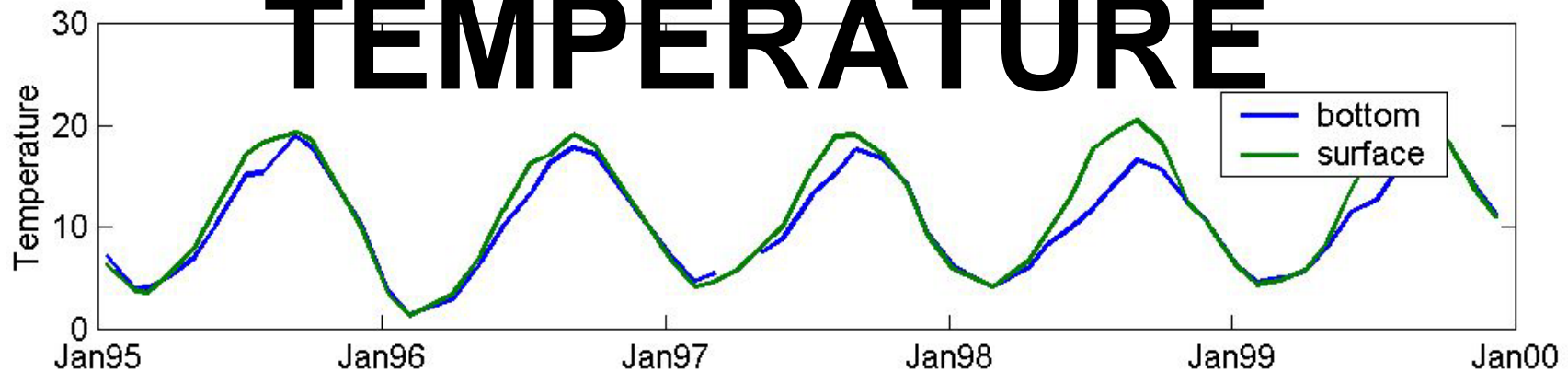
NOAA Hurricane Center online data 2010



**Important in water column stratification  
Varies over vertical and horizontal scales**



# TEMPERATURE



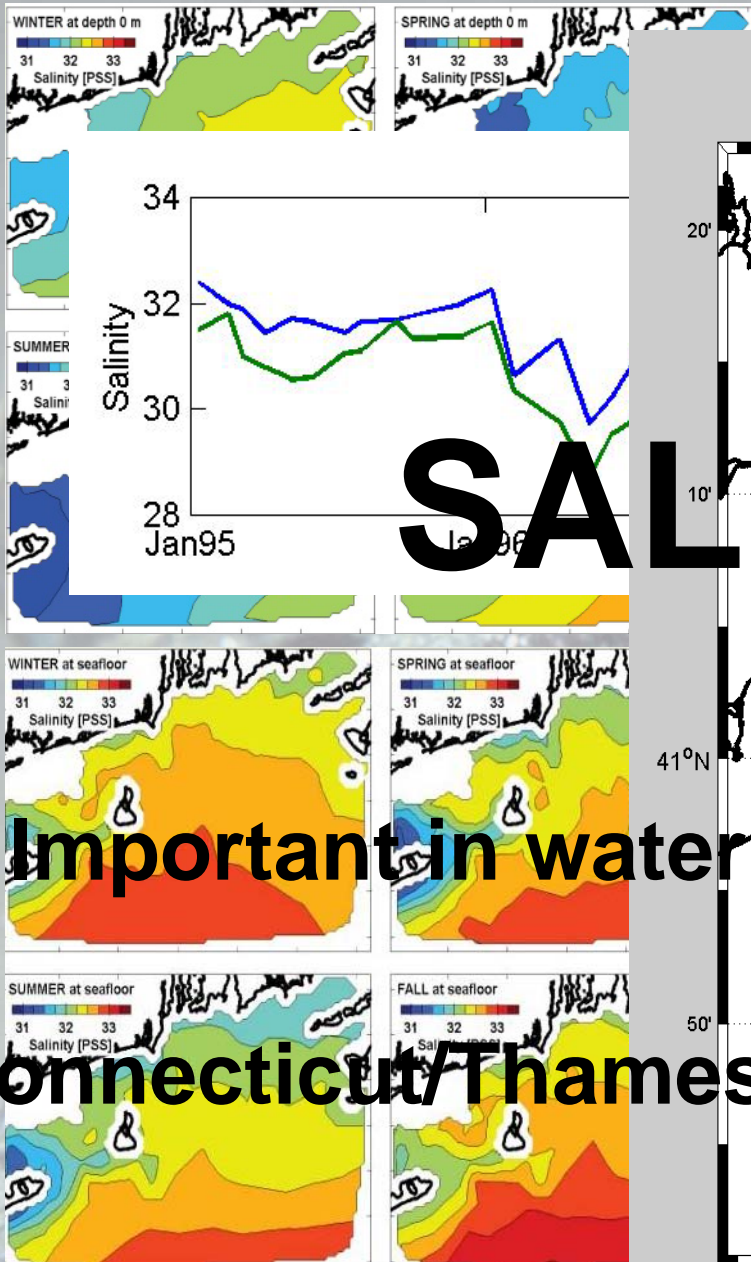
**Highly seasonal**

**Winter warmer at depth**

**Summer cooler at depth**

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Codiga & Ullman 2010; O'Donnell 2008



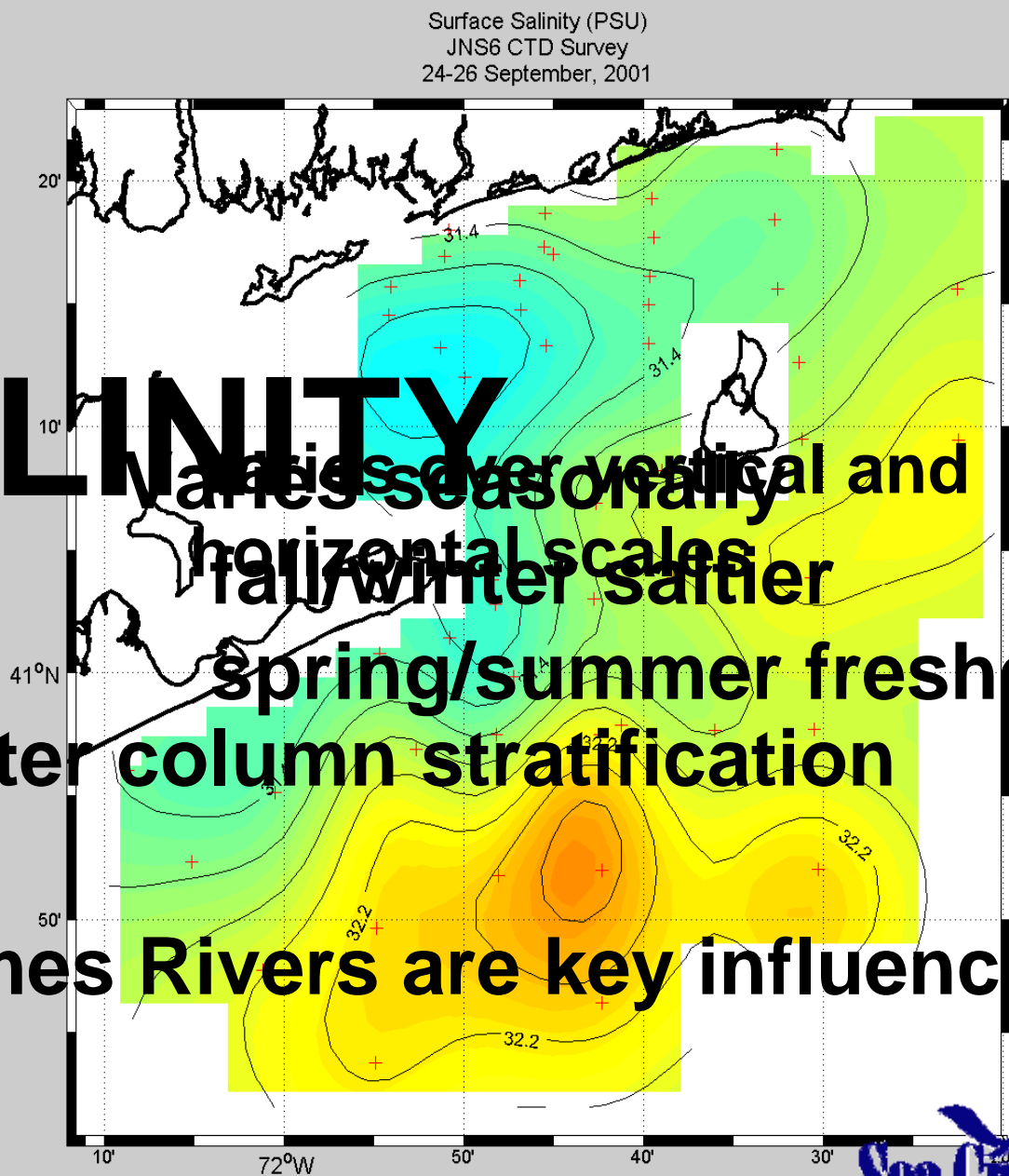
# SALINITY

varies over vertical and horizontal scales  
fall/winter saltier

spring/summer fresher

Important in water column stratification

Connecticut/Thames Rivers are key influences



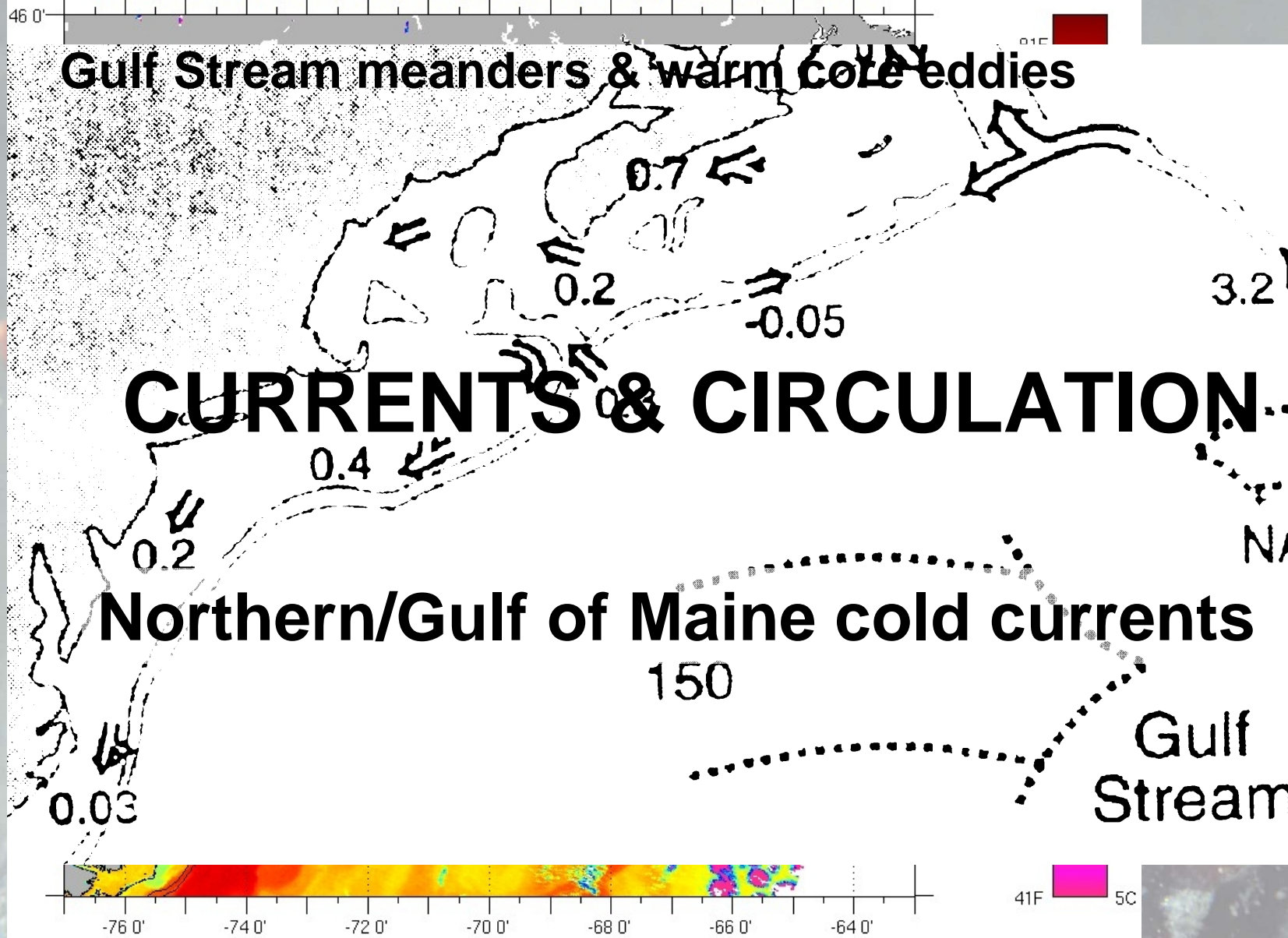
*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

Codiga & Ullman 2010; O'Donnell 2008





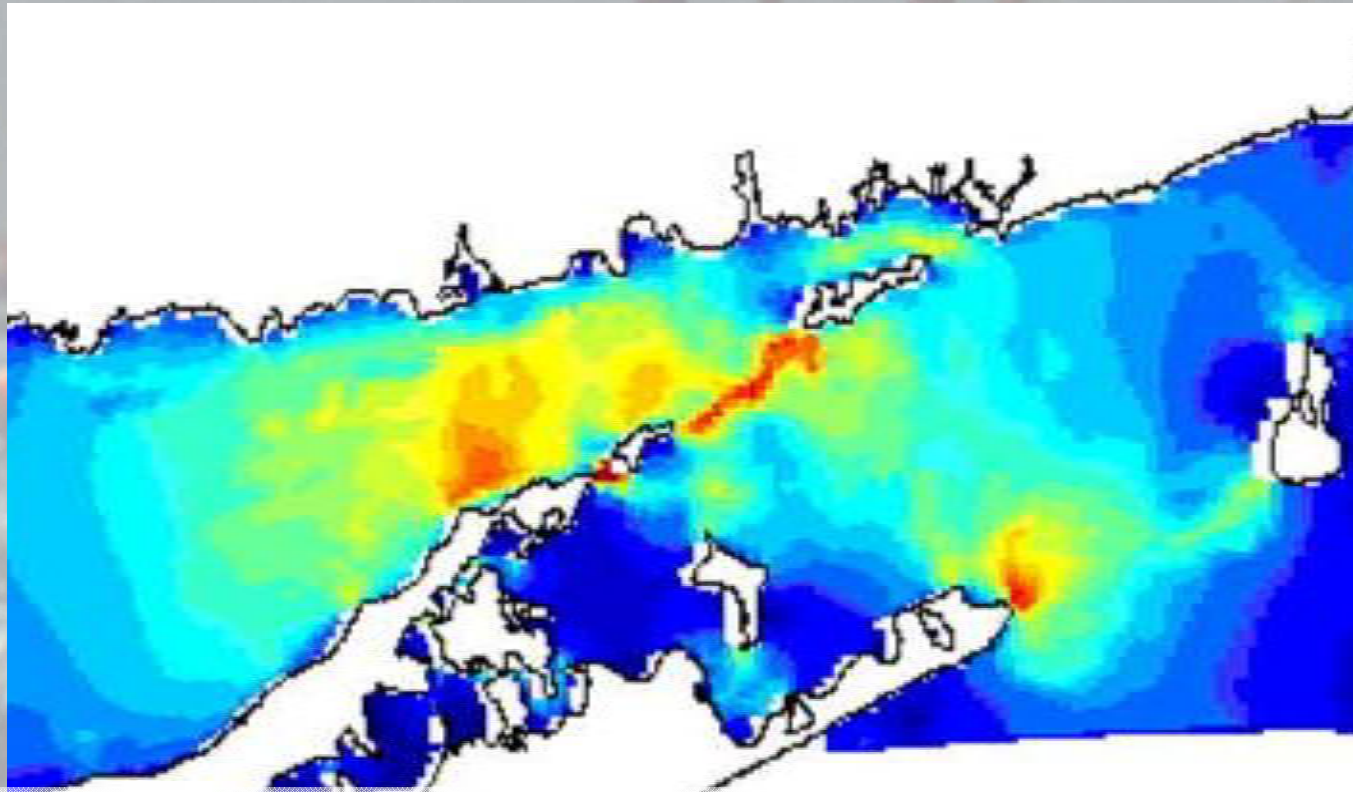
RU COOL NOAA-18 Sea Surface Temperature: May 26, 2008 0730 GMT



*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

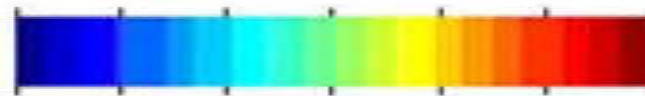
Gawarkiewicz 2008; Loder et al. 1998





# Long Island Sound is a major influence

Water Current Velocity

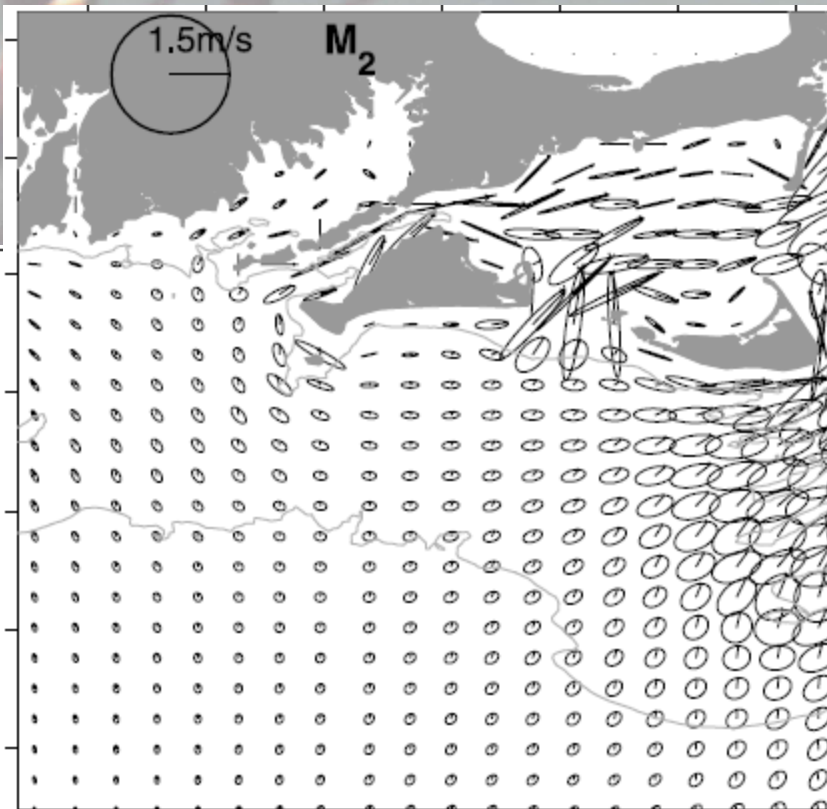
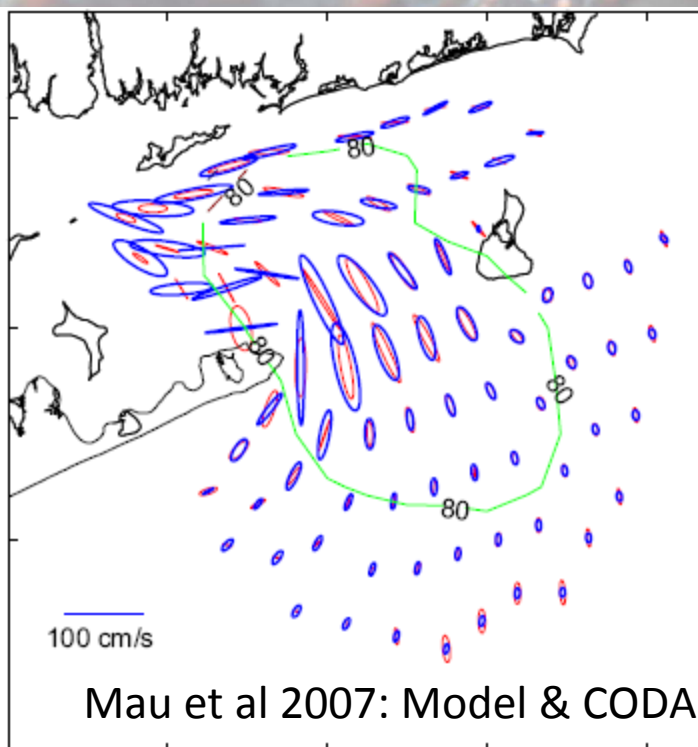


Increasing Velocity →

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Ocean SAMP Renewable Energy Talk

# Block Island Sound is more dynamic, better mixed Less prone to stratification



He & Wilkin 2006: Data-assim. model

[NOTE DIFFERENT SCALES]

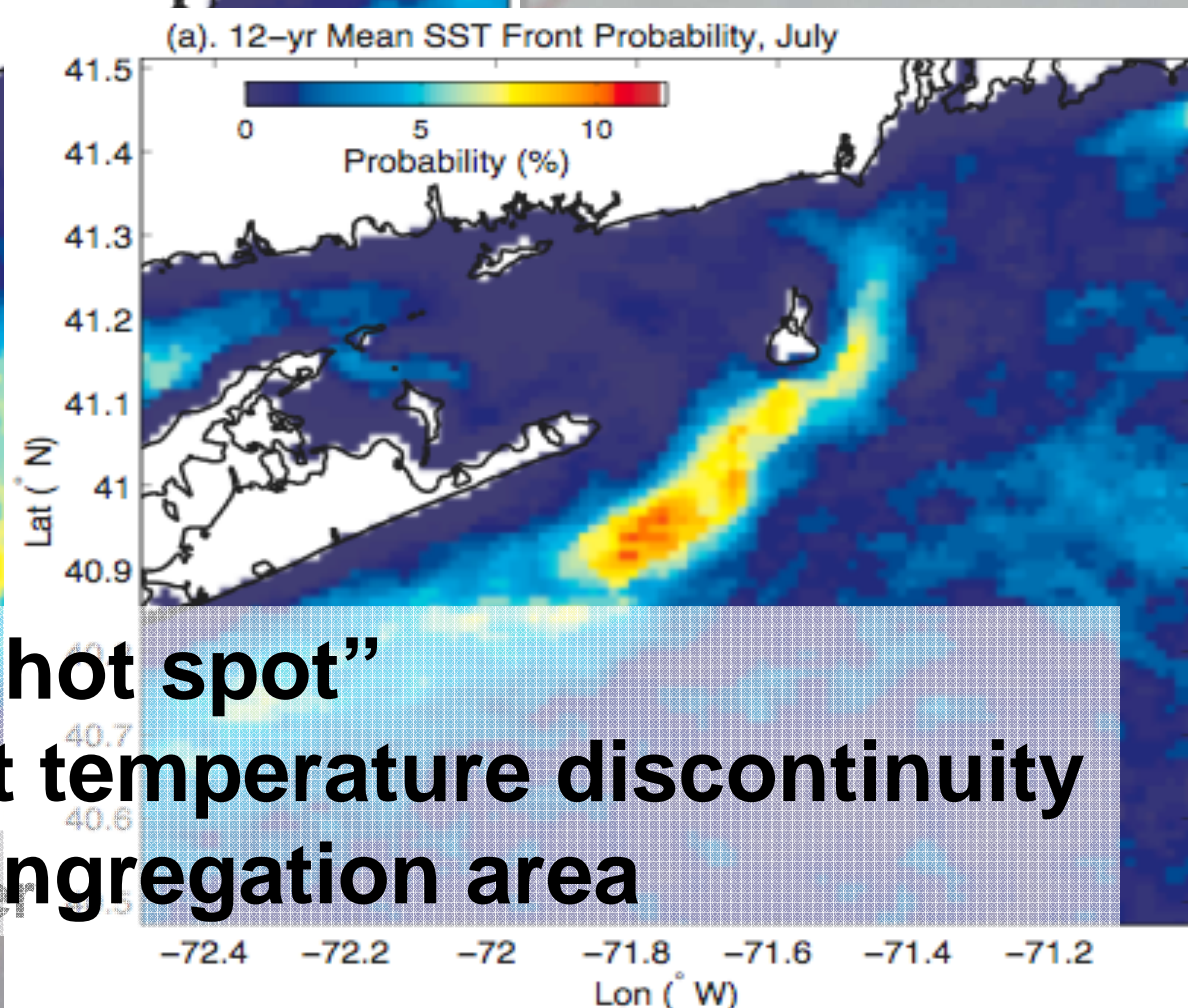
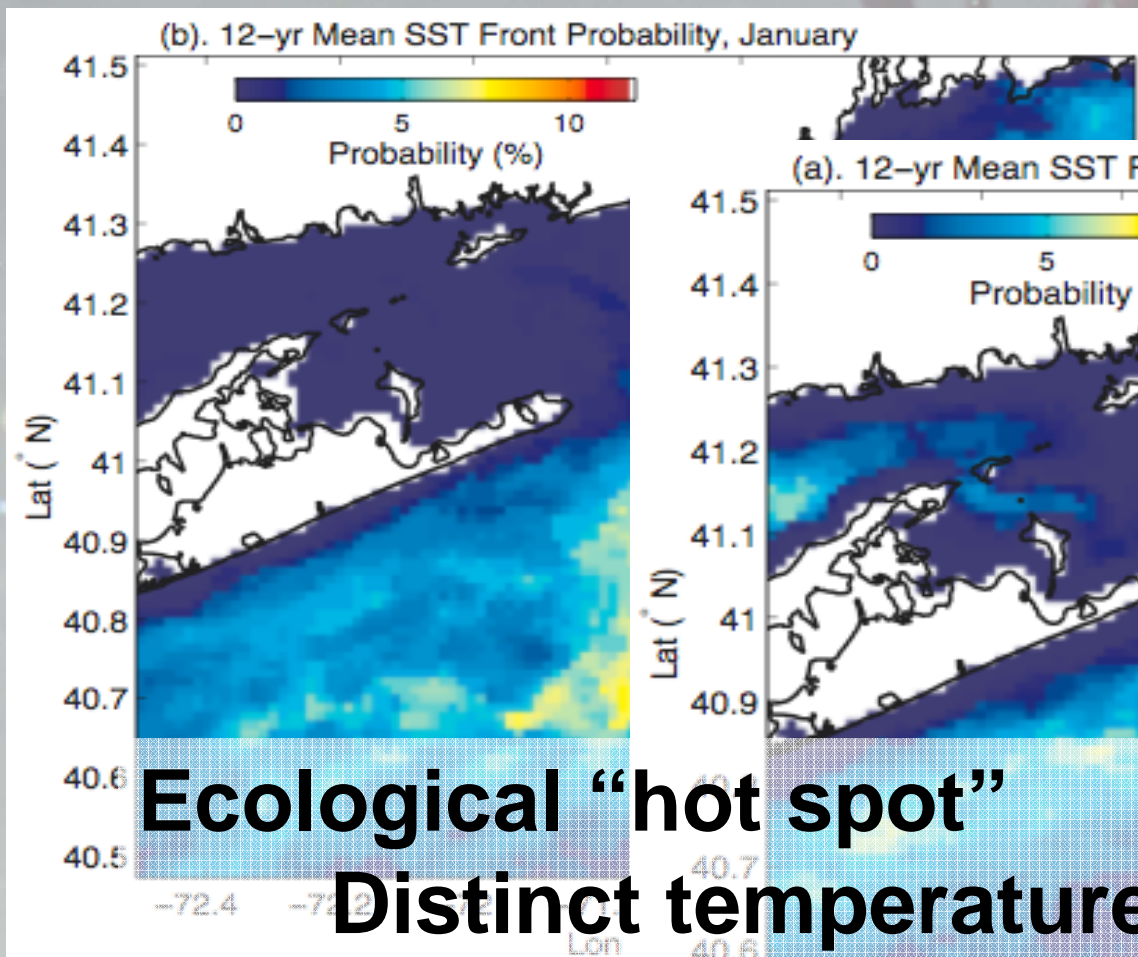
# Rhode Island Sound less dynamic, less well mixed More prone to stratification

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January

# Seasonal "front"

July



**Ecological "hot spot"**

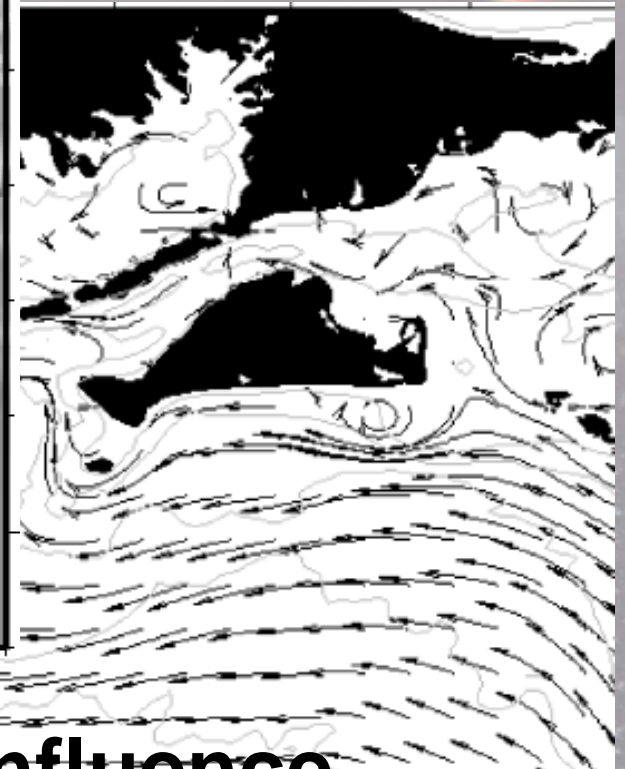
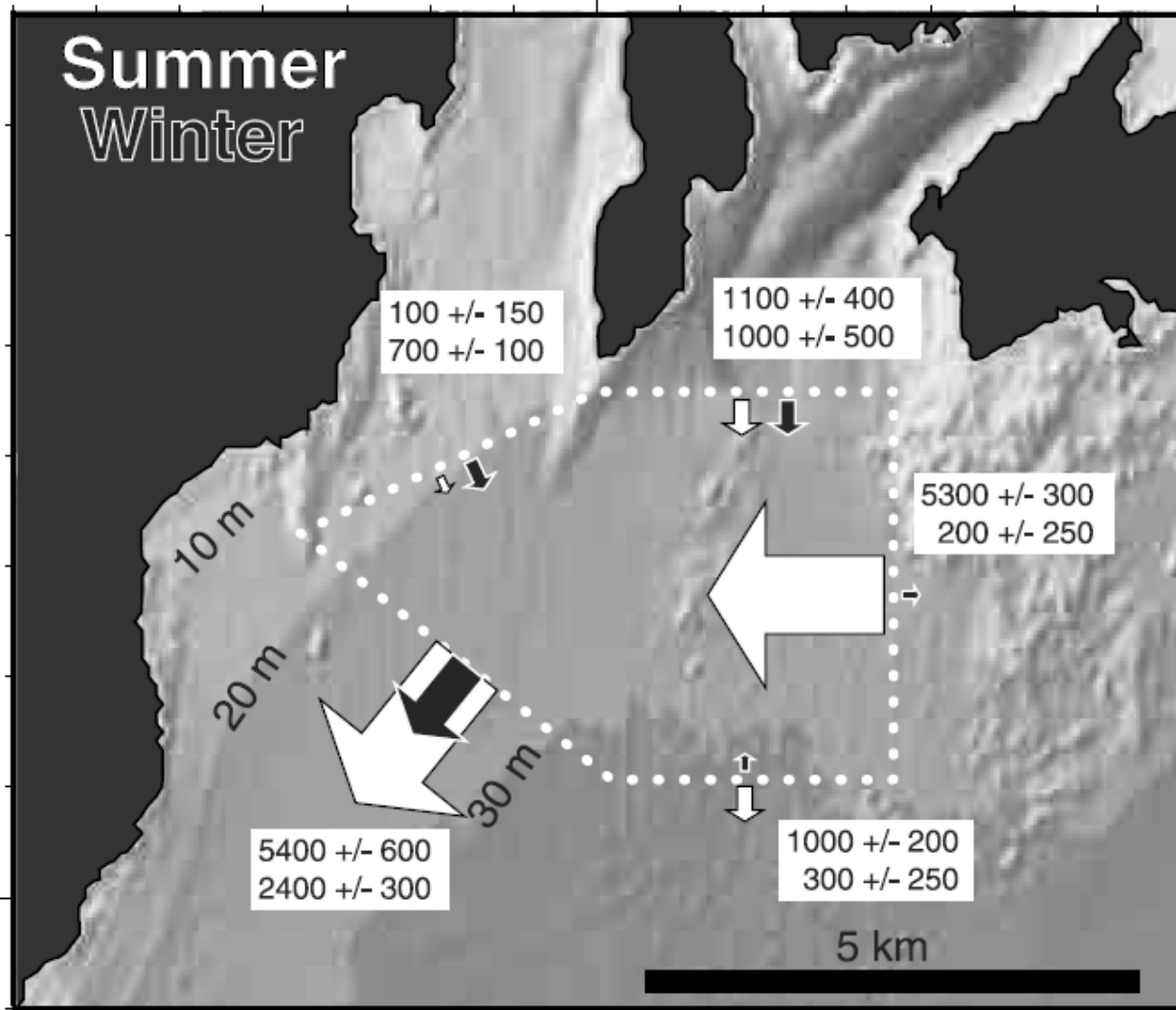
**Distinct temperature discontinuity**

**Fish congregation area**

Weak during winter

**Strong during summer**

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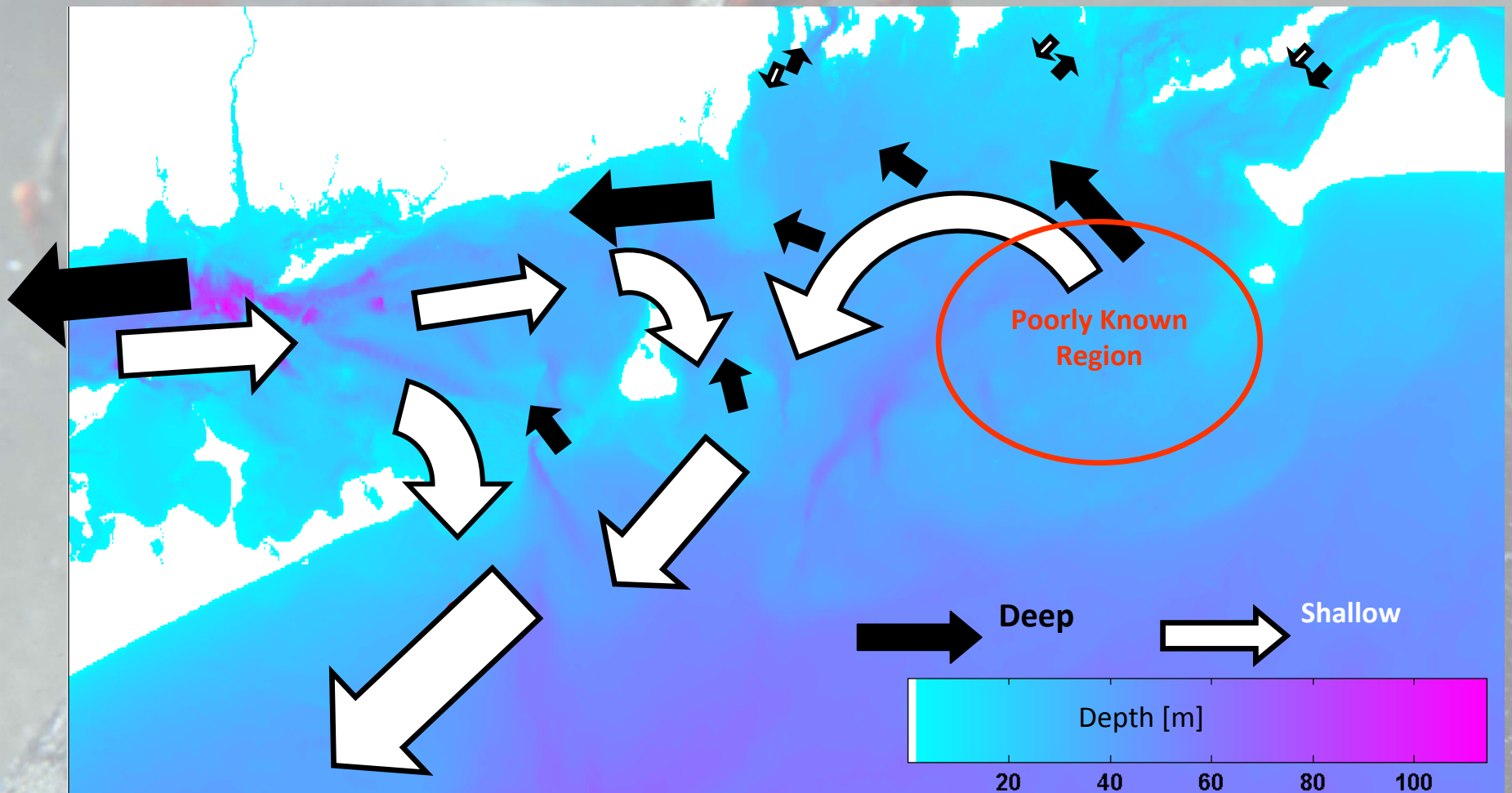
**Narragansett Bay has small influence**  
**Nantucket Shoals, etc. influence not well known**

*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

*Kincaid et al. 2003; He & Wilkin 2006*



# Major circulatory flows in the Ocean SAMP area



*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

Codiga & Ullman 2010



# Chemical Oceanography

## Nutrients:

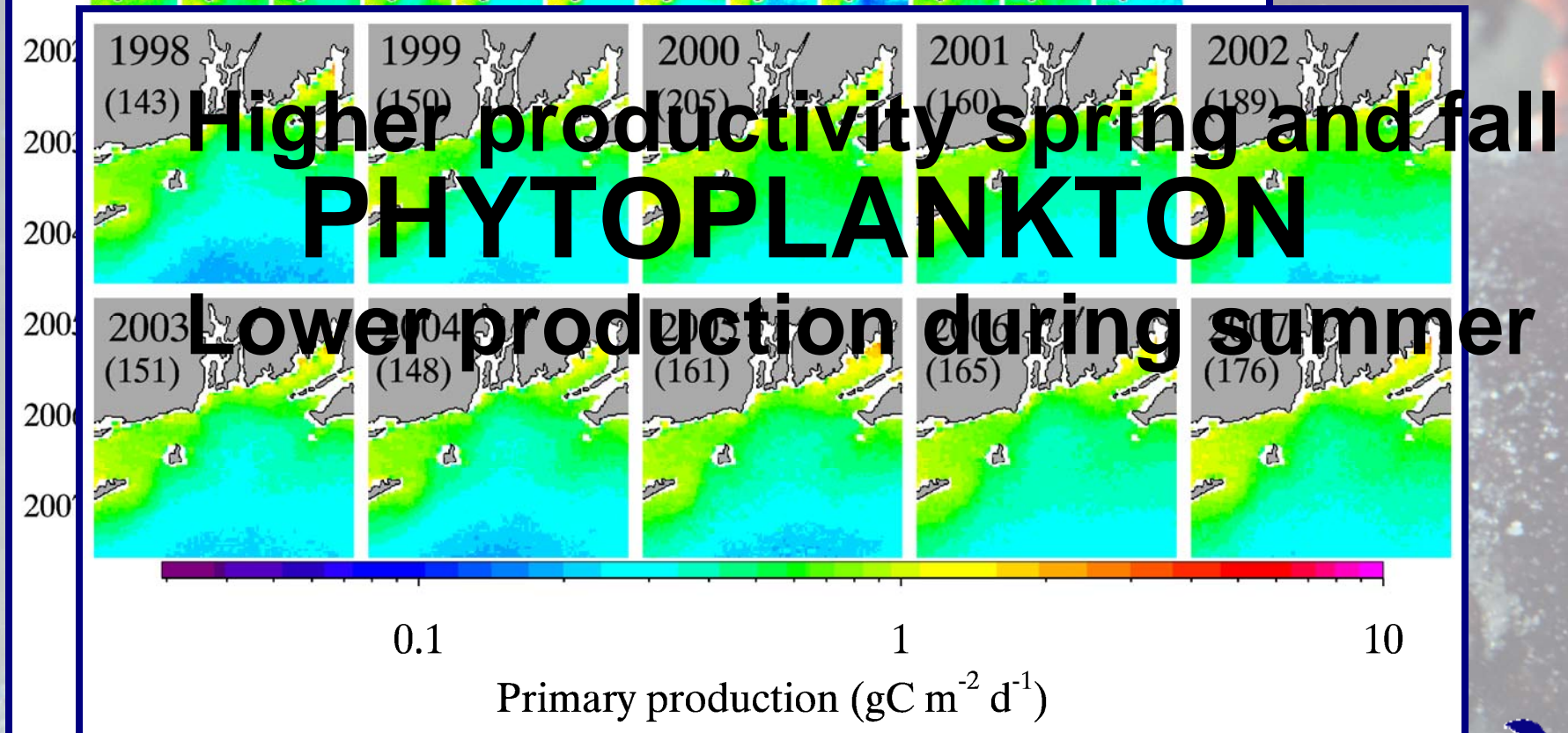
- Sparse data from late 1970s; verifying units
- Gulf Stream input suspected to be important (Gawarkiewicz 2008)

## Toxins:

- Dredge disposal sites: No biological toxicity reported for Brenton Reef (Battelle 2002) or RI Sound site (USACE 2002)
- *North Cape* spill: Minor toxicity/mortality 9 mos. post spill (Ho et al. 1999), current status not known

Higher production inshore

Trend of decreasing production with distance south of shelf edge



K.Hyde, J.O'Reilly, T.Ducas

NOAA / NMFS, Narragansett, RI

*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*



# Zooplankton

Mix of oceanic (beyond the shelf), neretic (shelf), littoral (sheltered bays) and estuarine (widely varying salinities) areas--- a “Mixing Basin”

Seasonal progression of native species (littoral species and larval forms) January through July, then an influx of non-native offshore species August through December (Deevey 1952)

## NMFS MARMAP data undergoing analysis

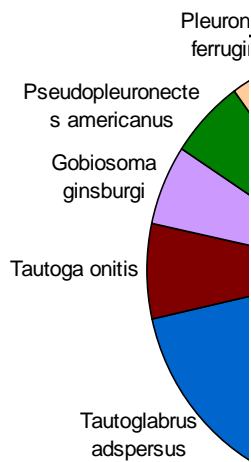
Zooplankton species dominant was salinity influenced

Riley (1952) found zooplankton grazing NOT a control over phytoplankton in Block Island Sound

Martin (1965) found zooplankton grazing WAS a control over phytoplankton in Rhode Island Sound (at mouth of Narragansett Bay)

Kane (2007) notes, for the overall Northeast Atlantic region, recent species shifts, with small-bodied taxa becoming more prevalent, with some species reaching seasonal maxima earlier.

*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*



Appearance shifts

Unclear fish species

Needs before

Month	Eggs	Larvae	
January	Cod	Herring, Long-horn sculpin	13
February	Cod	Cod, Long-horn sculpin	Tautoglabrus adspersus
March	Cod	Cod, Long-horn sculpin	
April	Mackerel	Lumpfish, Wrymouth, Cod, Long-horn sculpin, Brassy sculpin, Hake, Yellowtail flounder	
May	Mackerel, Butterfish	Lumpfish, Cod, Hake, Yellowtail flounder, Brassy sculpin, Mackerel, Butterfish	
June	Weakfish, Cunner, Butterfish, Mackerel, Weakfish	Hake, Mackerel, Cunner, Butterfish, Yellowtail flounder, Windowpane flounder	Tautoglabrus adspersus
July	Cunner, Butterfish, Weakfish	Sea horse, Pipefish, Hake, Windowpane flounder, Yellowtail flounder, Scup, Tautog, Whiting, Weakfish, Butterfish, Cunner	
August	Cunner, Butterfish, Weakfish	Hake, Yellowtail flounder, Butterfish, Cunner, Whiting, Weakfish	
September	Butterfish, Weakfish	Herring, Hake, Butterfish, Whiting, Weakfish	Tautoga onitis
October	Weakfish	Herring, Hake, Butterfish, Whiting, Weakfish	18
November	Cod	Herring, Hake, Whiting, Fluke	
December	Cod	Herring, Fluke	

# ICHTHYOPLANKTON

The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf

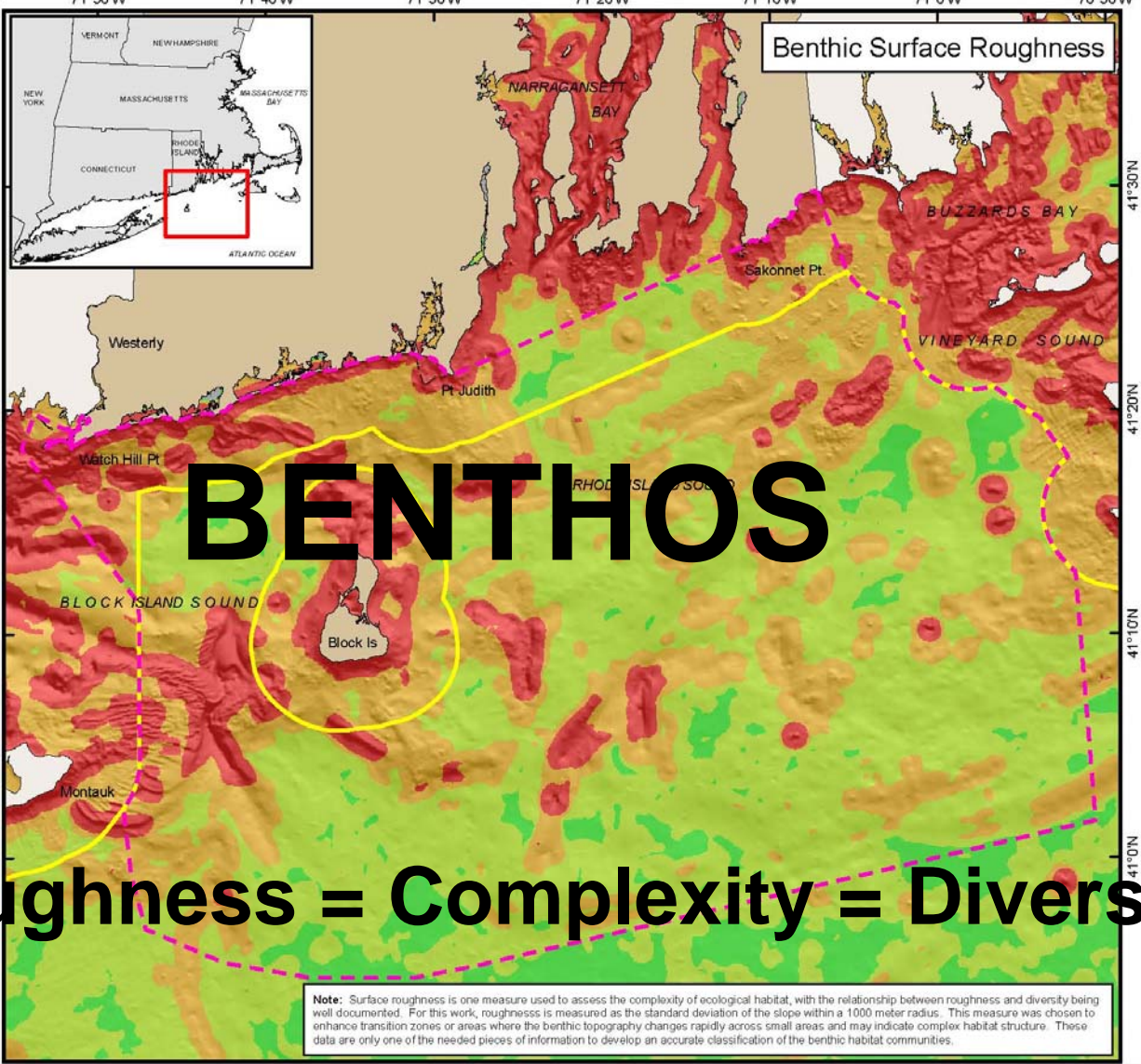
Pfeiffer-Herbert 2008; Merriman & Sclar 1952



# Rhode Island Ocean Special Area Management Plan (SAMP)

**Map Key**

- OceanSAMP Study Area
- State/Federal Waters Separation
- Surface Roughness**
  - Lowest Quartile
  - Second Quartile
  - Third Quartile
  - Highest Quartile



Coordinate System:  
 Projection: RI Stateplane  
 Units: Feet  
 FIPS Zone: 3800  
 Datum: NAD83

For Project Background Information:  
<http://seagrant.gso.un.edu/oceansamp>

For Project Map and Data Products:  
[http://www.narrbay.org/d\\_projects/oceansamp](http://www.narrbay.org/d_projects/oceansamp)

**Ocean SAMP** **CRMC**

**Roughness = Complexity = Diversity**

**Note:** Surface roughness is one measure used to assess the complexity of ecological habitat, with the relationship between roughness and diversity being well documented. For this work, roughness is measured as the standard deviation of the slope within a 1000 meter radius. This measure was chosen to enhance transition zones or areas where the benthic topography changes rapidly across small areas and may indicate complex habitat structure. These data are only one of the needed pieces of information to develop an accurate classification of the benthic habitat communities.

*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

Boothroyd 2008; Zajac 2008; King & Collie 2010 (?)



Species	Percent of Tows
Winter flounder	89.0
Little skate	83.8
American lobster	77.1
Windowpane flounder	72.2
Silver hake	65.0
Winter skate	53.1
Longhorn sculpin	52.8

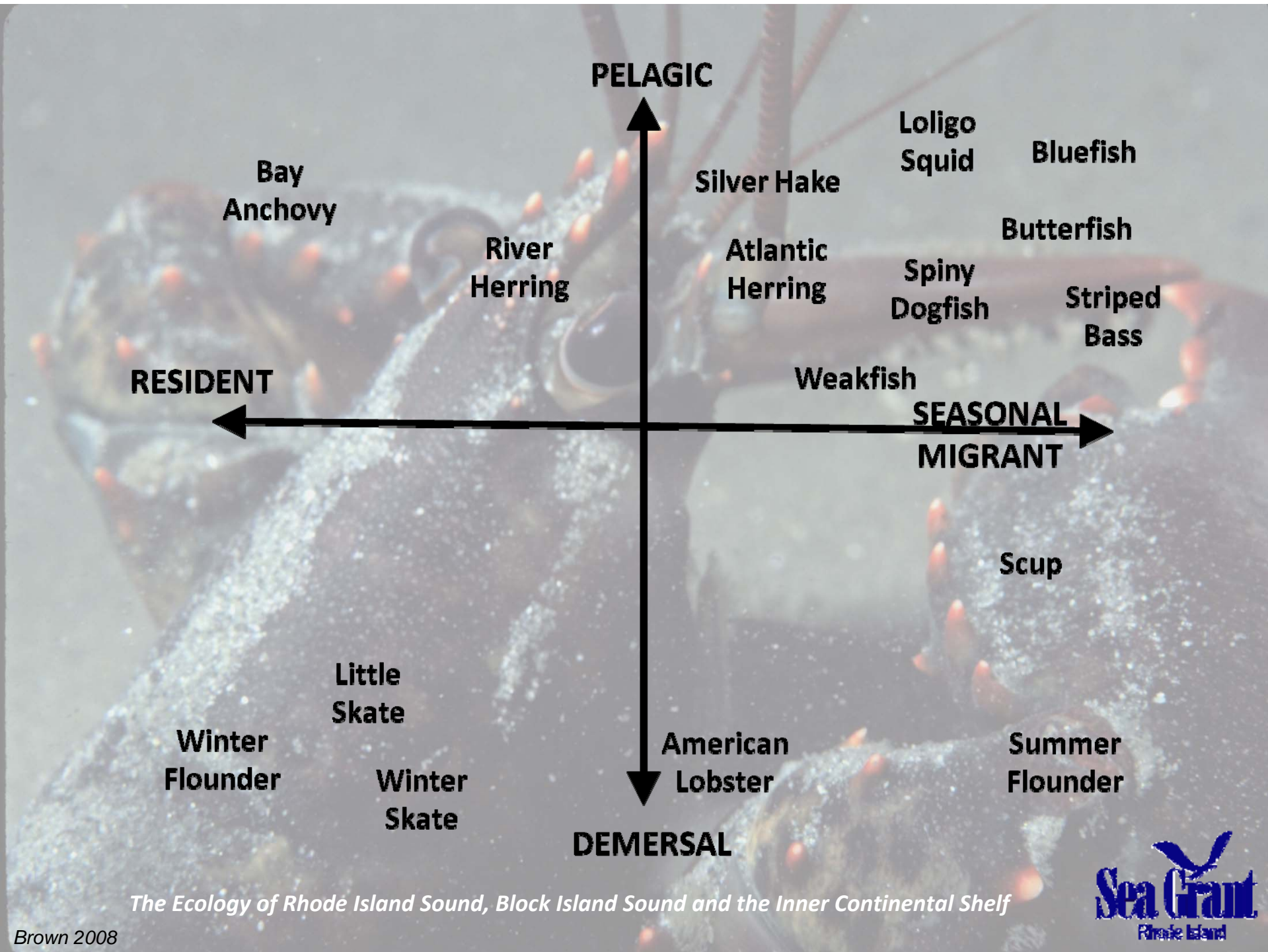
Winter  
Dogfish  
flounder  
not  
widely  
dispersed

# FISH

Species	Percent Biomass
Spiny dogfish	41.0
Little skate	14.3
Winter skate	8.4
Ocean pout	5.0
Scup	3.9
Winter flounder	3.2
Loligo squid	2.3

(sort of)

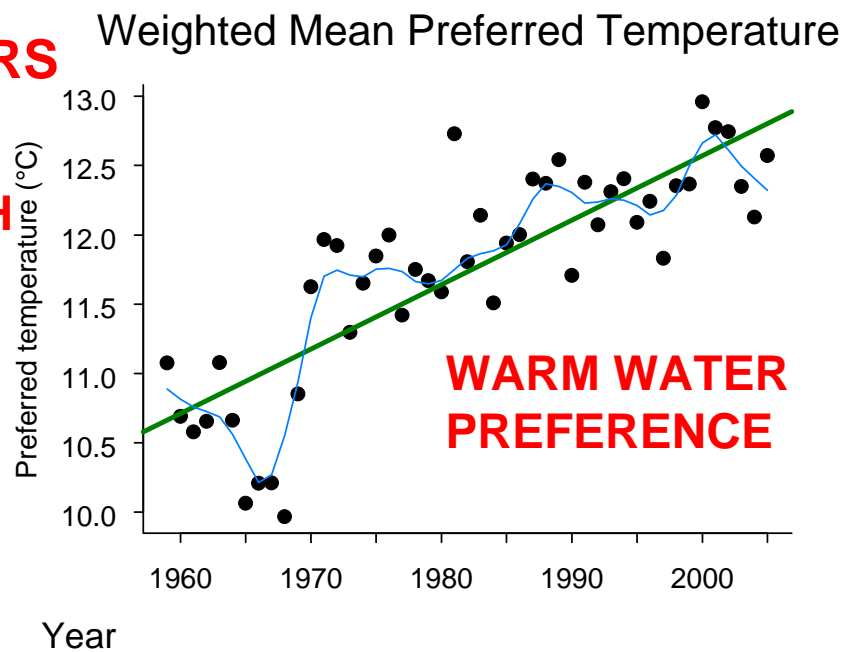
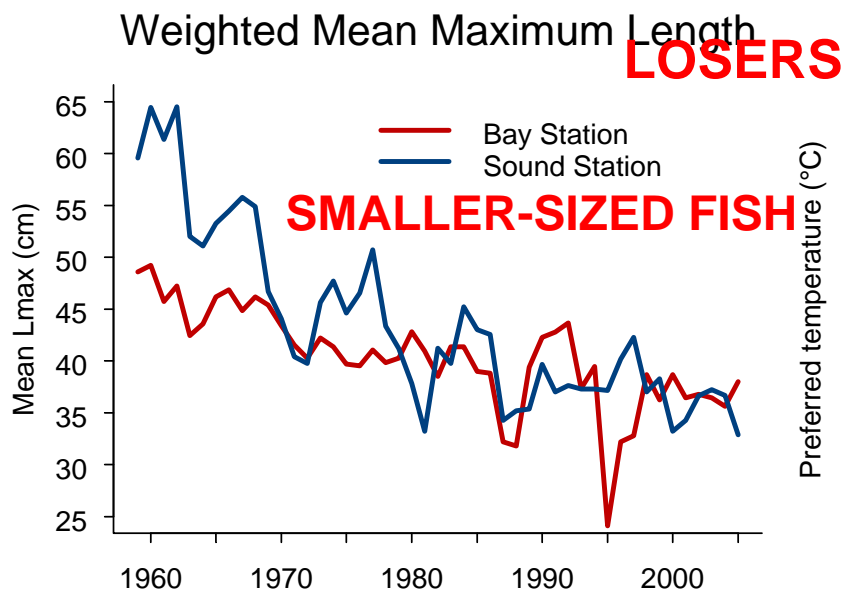
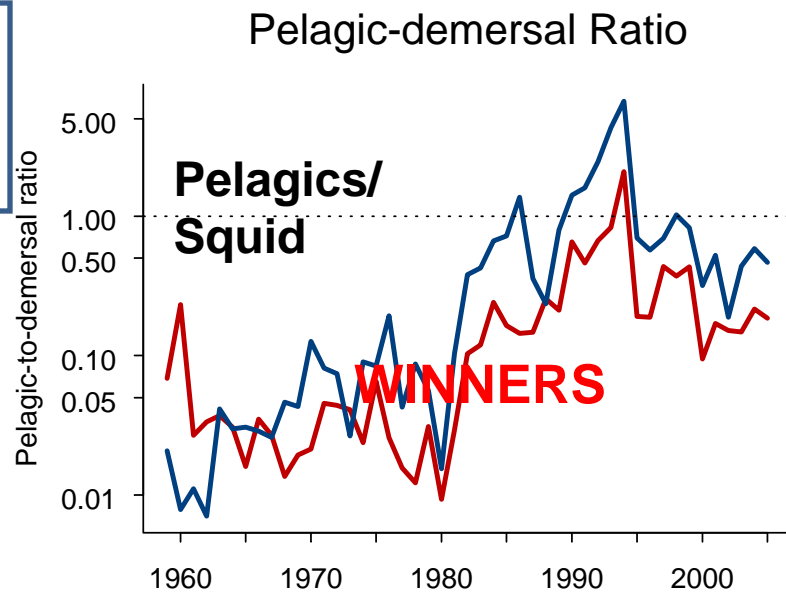
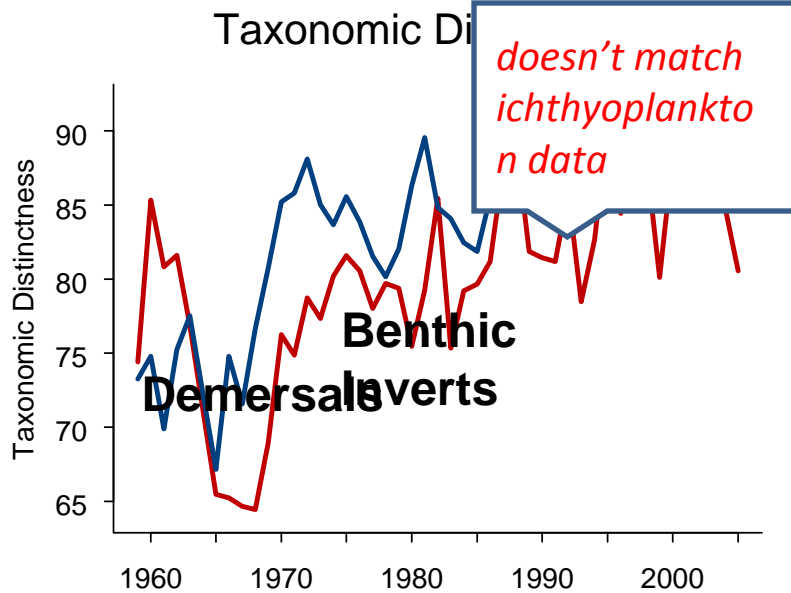
But not  
But very  
very  
plentiful

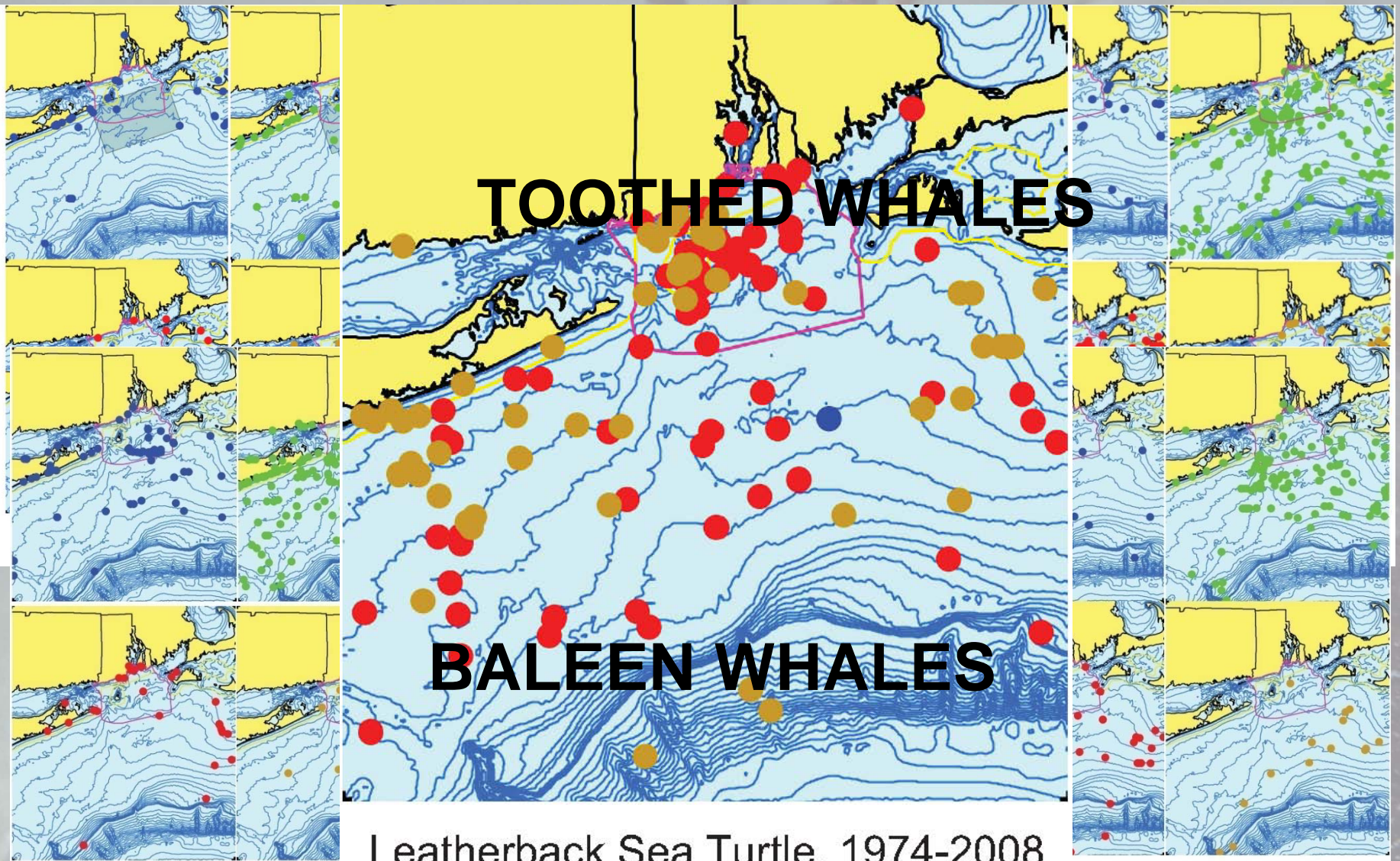


*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

Brown 2008







Leatherback Sea Turtle, 1974-2008

Harbor Porpoise, 1850-2007

Common Dolphin, 1882-2007





White-sided Dolphin, 1973-2006

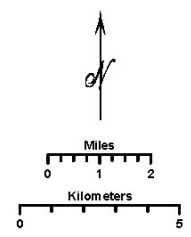
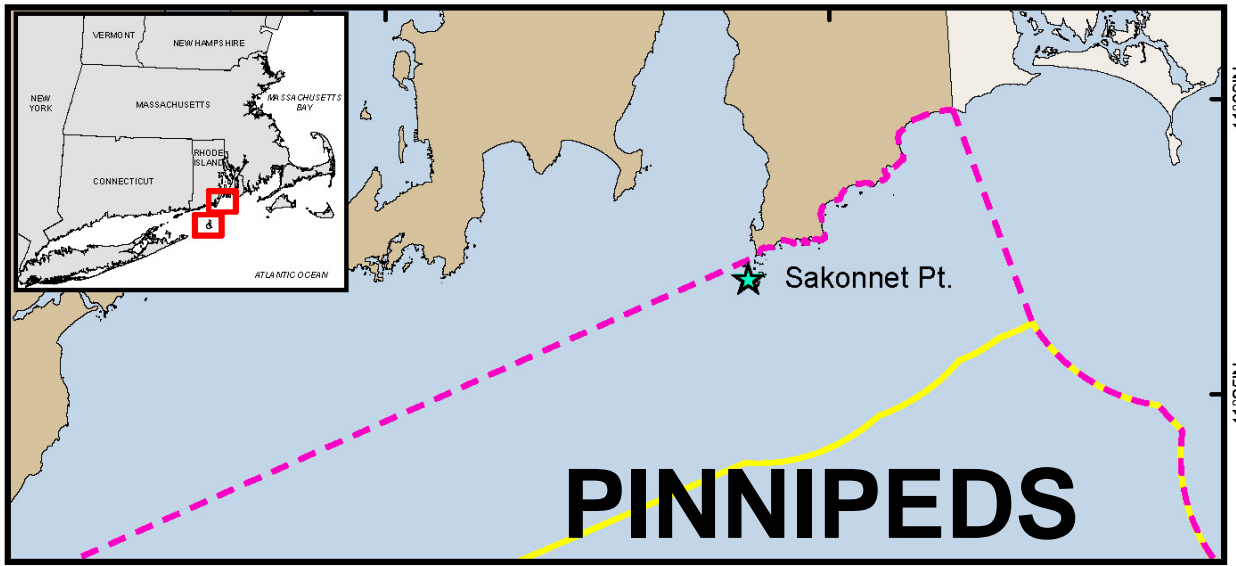
*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

*Kenney & Vigness-Raposa 2009*



# Rhode Island Ocean Special Area Management Plan (SAMP)

- Map Key**
-  OceanSAMP Study Area
  -  State Waters
  -  Seal Haul-Outs
  -  Seal Haul-Out at Cormorant Cove

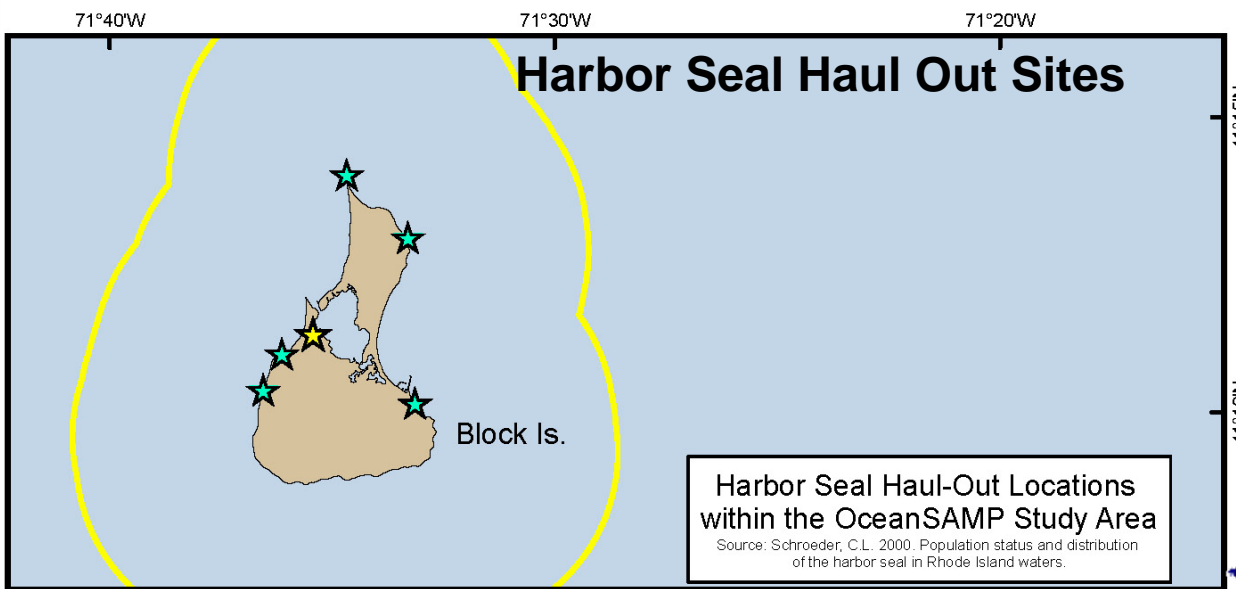


Coordinate System:  
 Projection: RI Stateplane  
 Units: Feet  
 FIPS Zone: 3800  
 Datum: NAD83

Map Base Data:  
 State Borders: RIGIS; MAGIS; CTGIS  
 SAMP Study Area: RI SAMP Database  
 State Waters: MMS SLA Boundary  
 Bathymetry: Interpolated from NOS Soundings

For Project Background Information:  
<http://seagrant.gso.uri.edu/oceansamp>

For Project Map and Data Products:  
[http://www.narrbay.org/d\\_projects/oceansamp](http://www.narrbay.org/d_projects/oceansamp)



*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

Kenney & Vigness-Raposa 2009





# Waterbirds

Common Name	Scientific Name	Seasonal Use
Eider, Common	<i>Somateria mollissima dresseri</i>	Nov–Apr
Gannet, Northern	<i>Morus bassanus</i>	
Gull, Bonaparte's	<i>Chroicocephalus philadelphia</i>	
Gull, Great Black-backed	<i>Larus marinus</i>	Mar–Jul
Gull, Herring	<i>Larus argentatus</i>	All Year
Gull, Laughing	<i>Leucophaeus atricilla</i>	Aug–Sep
Gull, Ring-		
Loon, Com		
Loon, Red-		
Scoter, Bla		
Scoter, Sul		
Scoter, Wi		
Petrel, Wil		
Shearwater		
Shearwater		
Shearwater, Sooty	<i>Puffinus griseus</i>	
Tern, Black	<i>Chlidonias niger</i>	
Tern, Common	<i>Sterna hirundo</i>	Apr–Sep
Tern, Forster's	<i>Sterna forsteri</i>	
Tern, Least	<i>Sternula antillarum</i>	May–Aug
Tern, Roseate	<i>Sterna dougallii</i>	Jul–Aug

## Passerines

# AVIFAUNA

### % of Total Capture (Spring/Fall)

Species	Scientific Name	% of Total Capture (Spring/Fall)
Gray catbird	<i>Dumetella carolinensis</i>	17.1 / 13.2
Common yellowthroat	<i>Geothlypis trichas</i>	13.7 / 0
Yellow-rumped warbler	<i>Dendroica coronate</i>	10.7 / 35.1
White-throated sparrow	<i>Zonotrichia albicollis</i>	6.6 / 0
Golden-crowned kinglet	<i>Regulus satrapa</i>	0 / 4.5
Red-eyed vireo	<i>Vireo olivaceus</i>	0 / 4.1




The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf

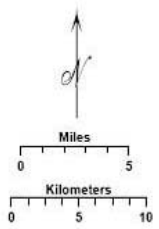
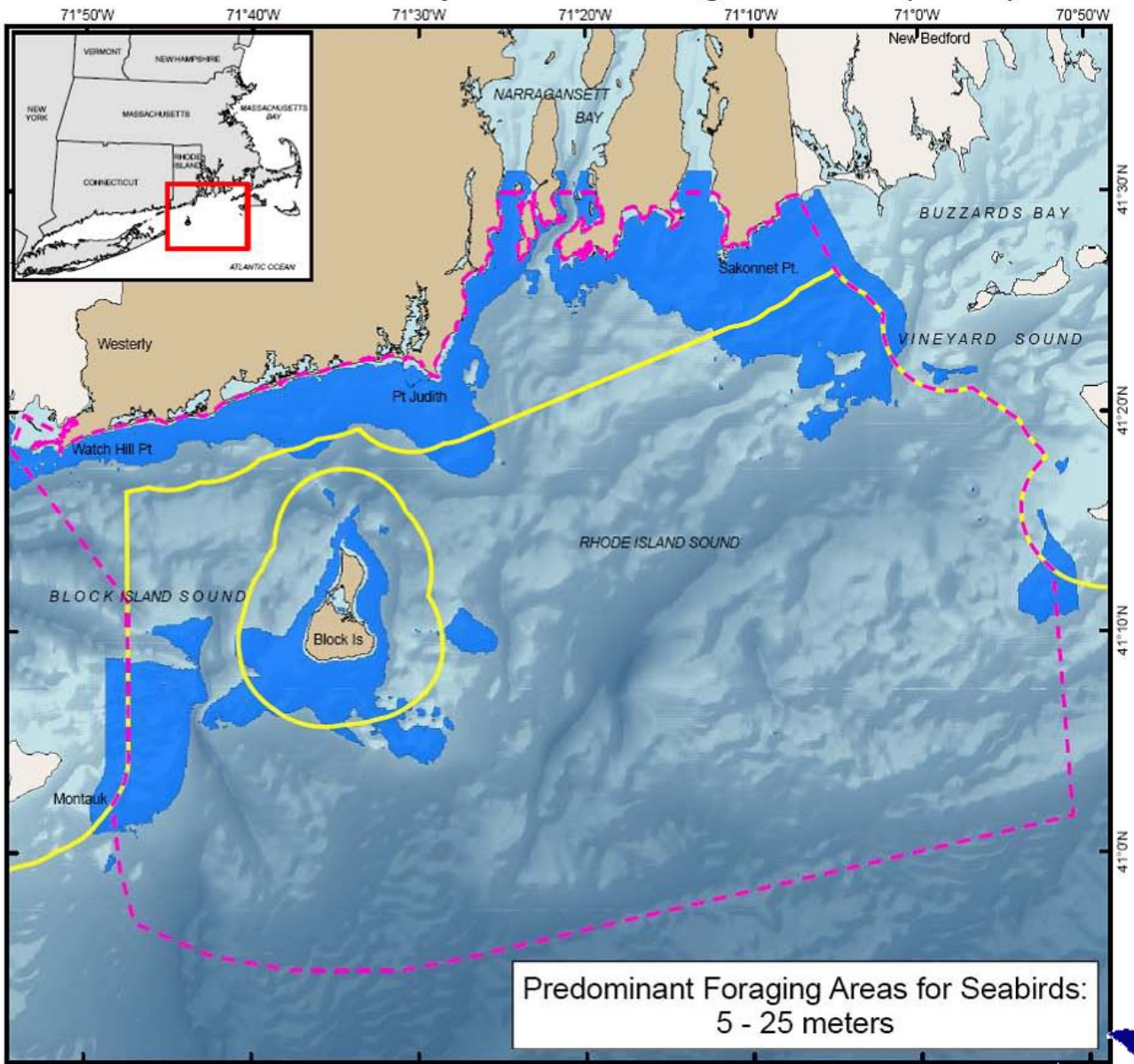
Winiarski et al. 2009; Reinert et al. 2002



# Rhode Island Ocean Special Area Management Plan (SAMP)

**Map Key**

-  Proposed Ocean Study Area
-  State/Federal Waters Separation
-  25 Meter Max Depth



Coordinate System:  
 Projection: RI Stateplane  
 Units: Feet  
 FIPS Zone: 3800  
 Datum: NAD83

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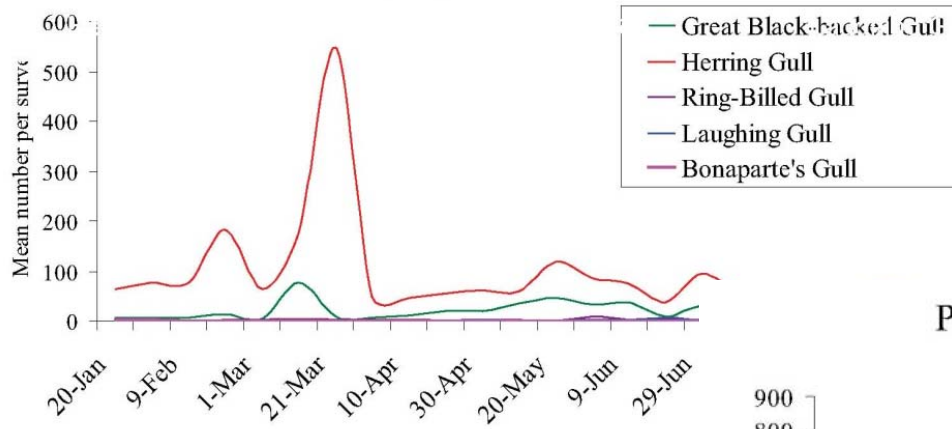


Predominant Foraging Areas for Seabirds:  
5 - 25 meters

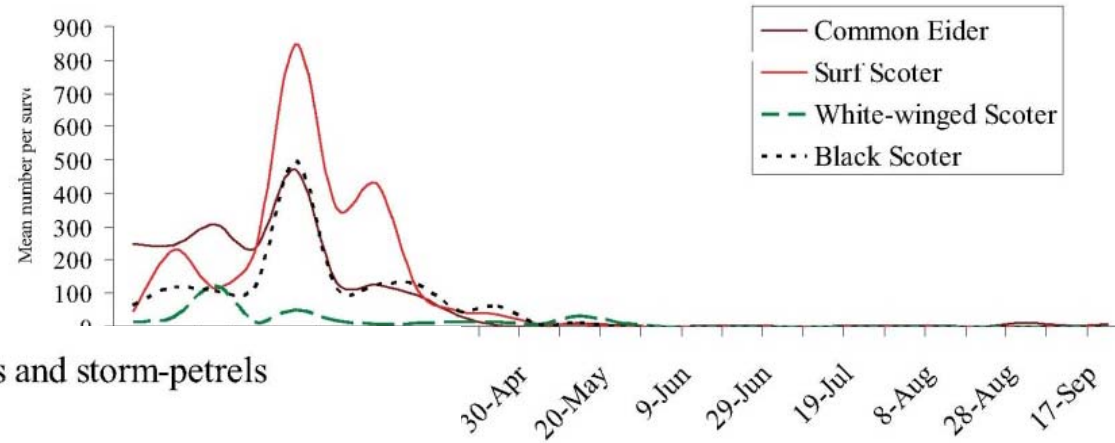
*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*



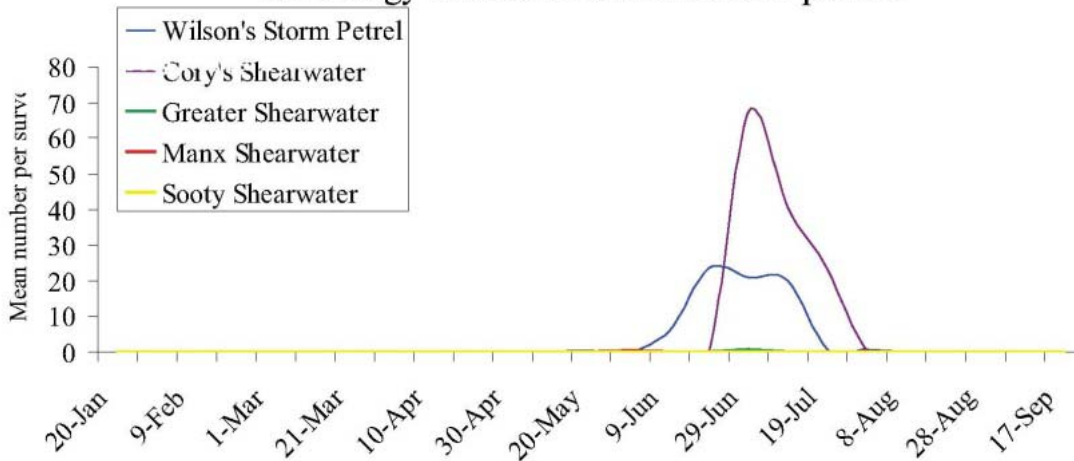
Phenology of gull use of Ocean SAMP area



Phenology of seaduck use of Ocean Samp Area



Phenology of shearwaters and storm-petrels



The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf

# Invasive Species

## Native Species Explosions: EMERGING ISSUES

- ctenophore *Mnemiopsis leidyi* (comb jelly)
- Lion's mane jellyfish (*Cyanea s/l*)

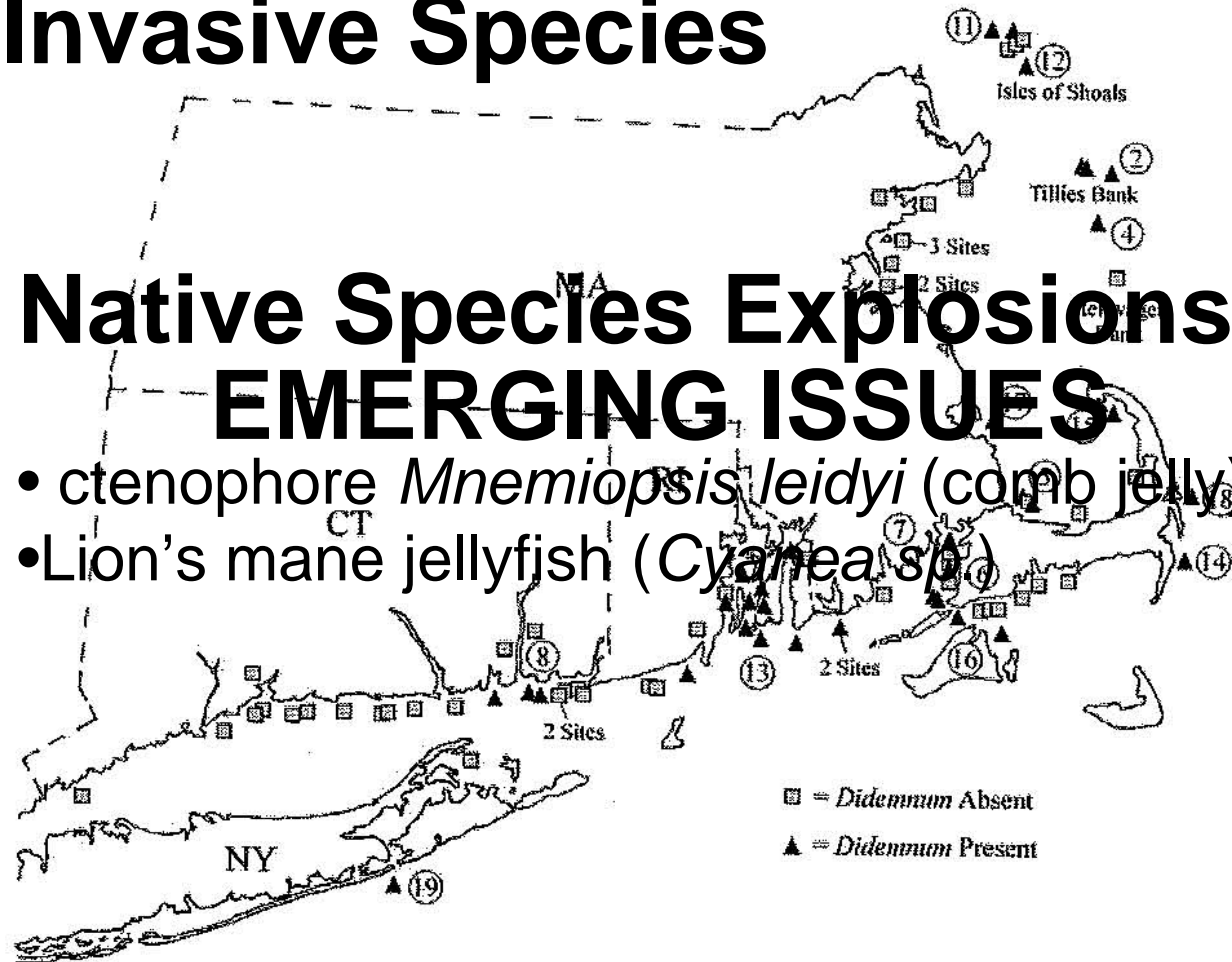


Fig. 2. *Didemnum* sp. A distribution in southern New England, USA. The circled numbers indicate site locations as described in Table 1. Stellwagen Bank=Stellwagen Bank National Marine Sanctuary.

An underwater photograph showing several lobsters on a rocky seabed. The lobsters are dark brown with prominent orange-red spines on their legs. The water is slightly turbid, and the lighting is soft, highlighting the texture of the rocks and the details of the lobsters.

***Thank  
You!***

*The Ecology of Rhode Island Sound, Block Island Sound and the Inner Continental Shelf*

