FALL 2010 MEETING

12 p.m. Thursday, October 28 to ~12 p.m. Saturday, October 30

Provincetown Center for Coastal Studies
Provincetown, Massachusetts

The Thursday catered lunch is included in the registration fee.
A Saturday box lunch is available for an extra fee.
Post-meeting field trips will be offered Saturday afternoon.

Important Due Dates:

15 Jun 2010 - express interest in presenting during the special symposium
10 Sep 2010 - abstracts due
22 Sep 2010- student travel award application due
01 Oct 2010 - last day for conference rate at the Cape Inn Resort
13 Oct 2010 - online meeting registration due
20 Oct 2010 - pre-registration payment due to Treasurer

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Provincetown Center for Coastal Studies
Coastal Resource Specialists
Cape Cod National Seashore

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Meeting Site - meeting venue and local attractions

Special Symposium - Cape Cod Bay. Those interested in presenting papers for the symposium please contact Sandy Macfarlane.

Call For Papers - Abstract submission form (due Sep 10) and presentation guidelines.

Students - Presentation prizes and student travel awards.

Registration - The pre-registration deadline is October 13, 2010. After this date, please register on-site.

Meals and Social Events

Business Meeting - The NEERS Business Meeting will be held after the last presentation on Friday afternoon. All meeting participants are encouraged to attend and participate in the discussion. This is an election meeting...

> Nominations from the floor will be welcomed. Current candidates:
> President - John Brawley
> Secretary - Sara Grady
> Treasurer - Cindy Delpapa

Field Trips

Accommodations - Register by October 1, 2010 for the conference rate.

Directions

Program - .pdf of the current program (*updated Oct. 20*).

Abstracts - On-line access to abstracts for this meeting.

contacts

General Information - Sandy Macfarlane, 508-255-5618.

Abstracts or Other Program Concerns - program chair , phone number.

Registration, Student Travel Awards - treasurer , phone number.

Website Issues - webmaster , phone number.

Provincetown Center for Coastal Studies

30 Years of Discovery & Commitment

SIGN UP!

Your Support Is Vital To The Center's Work

- Membership
- Make a donation
- Volunteer
- Donate a car, boat or truck

Newsletter Sign-Up Here
Email:

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Whale Rescue

- Latest Disentanglement
- FAQ

Whale Research

- Right Whale Field Notes
- Humpback Sightings

Marine Education

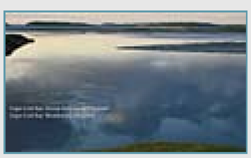
- Calendar of Events
- Field Walks

Marine Fisheries Initiative

- PCCSMFI
- Research Projects

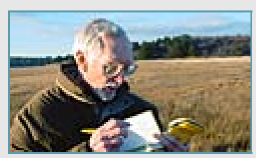
Holiday Homeport Banquet

- Get Details Here



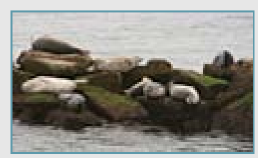
Marine Policy Initiative

- State of the Bay 2009
- Monitoring Program



Land Sea Interaction

- Nearshore Mapping
- Marindin Survey Sites



Seal Studies

- Seal Studies Program
- Research

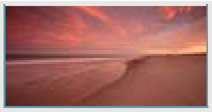
WHALE WATCH • $5 off on tickets! • Visit the Dolphin Fleet

PCCS NEWS AND EVENTS CALENDAR

Click Here for the Entire Calendar

Benefit For Women Pursuing Studies In Science - The Provincetown Center for Coastal Studies will host its Annual Holiday Homeport Banquet on **December 9, 2010, 6 p.m.** at the Jailhouse Tavern in Orleans. **...more**

Volunteers Remove 2000 Pieces of Trash from Long Point - Volunteers led by the PCCS collected over 300 pounds of trash, about 2000 individual items from Long Point Beach in Provincetown, on September 25th as part of COASTSWEEP, a statewide beach cleanup. **...more**



COASTSWEEP Cleaning Up Long Point - PCCS, a leader in marine and coastal research and education for thirty-five years, invites volunteers to participate in a beach cleanup of Long Point in Provincetown at 10 a.m. on Saturday, September 25th. **...more**

The 2010 Boater's Guide Is Now Available - The 2010 Boater's Guide to Nantucket Sound and Cape Cod Bay is now available. A collaboration of PCCS, Nantucket Soundkeeper and the Pleasant Bay Alliance, the guide has comprehensive tide schedules for Cape & Islands and tips on boating safety and recreational fishing regulations. **...more**

PCCS Partners with Local Bike Shop - The Provincetown Center for Coastal Studies (PCCS) and Gale Force Bikes would like you to know about a new activity in Provincetown. Join us for a PCCS naturalist led bicycle tour through the outer dunes of Cape Cod. **...more**

Right Whales in the News

- **Right Whales Flocking to Cape Waters** - *Cape Cod Times*
- **A Whale-Watch of Vital Significance** - *Boston Globe Online, Boston.com*
- **Endangered Whales Feeding off Cape Cod** - *WBZ News, 38 Boston*
- **Right Whales Return in Droves** - *Provincetown Banner*
- **Right Whale Assessment in Cape Cod Bay** - *WCAI FM*

Right whale images taken under NOAA Fisheries permit 633-1763, under the authority of the U.S. Endangered Species and Marine Mammal Protection Acts - please request PCCS permission for use.

Photographs were taken under the authority of NMFS Permit No. 932-1489 issued under the authority of the Marine Mammal Protection Act and the Endangered Species Act. This statement must accompany the image(s) in all subsequent uses.

Provincetown Center for Coastal Studies. Taken under NOAA permit 932-1905, with authority of the ESA.

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MEETING VENUE

The Spring 2010 meeting of the New England Estuarine Research Society (NEERS) will be held at the Provincetown Center for Coastal Studies, Hiebert Marine Lab in Provincetown, MA.

The Provincetown Center for Coastal Studies was established several decades ago and is now one of the premier research centers for whale biology and behavior and coastal geology processes as well as fisheries and other coastal issues. We are delighted to partner with PCCS and hold the NEERS meeting at their new facility in the heart of Provincetown.

The meeting site is 1.3 miles from the Cape Town Inn. Parking is available in city lots near the lab.

directions

LOCAL ATTRACTIONS

Local Events

Halloween in P-Town

Gardens and Historical Sites

50 site historic walking tour - pick up a brochure at the Tourism Office (330 Commercial Street)

Environmental Interpretive Centers

Nature Expeditions

Google Search

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SPECIAL SYMPOSIUM - Cape Cod Bay

Thursday, 12 p.m. to 5 p.m.

The Thursday symposium will focus on Cape Cod Bay and the Gulf of Maine. We are looking for synthesizing papers dealing with large systems within the Bay and Gulf as well as historical examinations of biological or physical parameters and interactions within these systems.

Location - main meeting venue

To Submit a Paper

Please contact Sandy Macfarlane if you are interested in submitting an abstract. We have heard from several folks already so please get in touch with her as soon as possible so we can plan for this session.

Current Program

See the full program for details on presenters.

1:00 Welcome – Sandy Macfarlane, Coastal Resource Specialists; Sarah Peake, Lower Cape State Representative

1:15 NEARSHORE SEAFLOOR MAPPING IN CAPE COD BAY, MASSACHUSETTS

1:35 SEAFLOOR HABITATS IN NORTHERN CAPE COD BAY

1:55 BILLINGSGATE SHOAL, SEA LEVEL RISE AND DEVELOPMENT OF THE EASTERN SHORE OF CAPE COD BAY

2:15 AT THE NEXUS: RIGHT WHALES AND THE ZOOPLANKTON RESOURCES OF CAPE COD BAY

2:45 CHANGES IN THE DISPERSION OF RELATIVE ABUNDANCE OF SIX SPECIES IN CAPE COD AND MASSACHUSETTS BAYS IN THE SPRING BOTTOM TRAWL SURVEY, 1979-2007

3:05 BREAK

3:25 SHELLFISH IN CAPE COD BAY: CENTURIES OF HARVESTING BOUNTIFUL BIVALVES

3:50 EXPERIMENTAL OYSTER REEF RESTORATION IN WELLFLEET: LESSONS FROM YEAR ONE

4:10 TESTING THE WATERS: HOW HEALTHY IS CAPE COD BAY?

4:30 DIAMONDBACK TERRAPINS OF CAPE COD:POPULATION STRUCTURE AND CONSERVATION STRATEGIES

4:50 NUMERICAL MODELING OF FLOW CONTROL STRUCTURES IN CAPE COD BAY’S ESTUARIES

5:10 Closing remarks – Sandy Macfarlane

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CALL FOR PAPERS
abstracts due Friday, September 10, 2010

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Submission Form Is Inactive

The deadline for submitting abstracts has passed. Contact the program chair with questions.

Abstract submissions for contributed oral and poster presentations are invited on any subject related to estuaries or coastal environments. Reports of work in progress as well as work in advanced stages and reviews of relevant topics are encouraged. Contributed oral and poster presentations will be scheduled for Friday morning and afternoon and Saturday morning, October 29-30.

Oral presentations will be limited to 15 minutes with an additional 5 minutes for discussion. Poster presentations will be displayed throughout the meeting, and highlighted during a poster session. Students can compete for the Ketchum and Rankin Prizes for oral presentations or the Dean and Warren Prizes for posters (prize information).

Contributed presentations to the special Thursday symposium on Cape Cod Bay are welcome.

Abstracts must be submitted online (link above) by FRIDAY, SEPTEMBER 10.

All presenters must be or become a NEERS member. Information on becoming a member is included on the pre-registration form, or at JOIN NEERS.

Instructions for Preparing Abstracts

All abstracts have a 1750-character limit (about 250 words) including spaces. The character limit applies to the body of the abstract only, the authors and titles are excluded from the limit. All words in the title should be CAPITALIZED. Author(s), address(es), and presentation title must appear in the proper format. Use footnotes to minimize the space for addresses when multiple authors are from more than one institution. Include full name, e-mail address, and telephone number of presenting author. Even if you would prefer an oral presentation, please consider checking the "oral preferred but poster okay" option if you are willing to present a poster instead. This greatly facilitates final scheduling.

Please indicate on the web submission form if you are submitting your abstract for presentation in the special symposium.

All submissions will be confirmed (although this is not automatic) and the lead author will be notified of his/her scheduled time. Contact the program chair with questions.

PowerPoint Presentations

The conference computer (PC) will use PowerPoint 2007. Please be sure to check your presentation for compatability with this version.

We will load all PowerPoint presentations onto an IBM-compatible laptop well before each session. Please bring your PowerPoint presentation on a USB thumb drive to the projection desk at the NEERS meeting. We will load your presentations the evening before your talk. Please make sure your file can be read by another computer before you hand it in. Speakers should not plan to use their own computers for their presentations.

For presentations that include graphics or media other than standard PowerPoint slides (e.g., complicated animations or embedded video clips; photographic slides or overheads), authors will need to make additional arrangements (Please contact Mark Adams , Cape Cod National Seashore, 508-487-3262 x0501).

Poster Guidelines

Presenters are expected to be present during the dedicated poster viewing session on Friday.

The maximum poster size is 40" x 60". Posters will be taped to the walls at the conference site, tape will be provided.

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STUDENTS AWARDS

Travel Awards

Three $100 travel-awards will be awarded by NEERS, plus additional awards have been donated by our sponsors (some covering full travel costs). Graduate and undergraduate students who are giving presentations at this meeting and are members of NEERS (by the meeting date) may apply. Selection will be made by lottery and will not affect eligibility for student presentation prizes.

To apply for a travel award, send an email with your abstract attached to NEERS treasurer Ed Dettmann by **SEPTEMBER 22**. Provide your name, address, college or university, email, and telephone number. In addition, please have your faculty advisor send Ed an email certifying that you are a student in good standing.

As always, NEERS greatly appreciates donations to the Bill Niering Student Travel Endowment fund (student endowment contributions can be made when you pre-register). Travel awards may be offered to non-presenting students if sufficient funds are available; students are welcome to contact the NEERS Treasurer about availability of such support for general student travel.

Presentation Prizes

Prizes will be awarded to students chosen by the judging panel in four categories: graduate student oral presentation (Buck Ketchum Prize, $100), undergraduate student oral presentations (Stubby Rankin Prize, $100), graduate student poster presentation (David Dean Prize, $100) and undergraduate student poster presentation (Scott Warren Prize, $100). All eligible students will be automatically entered into the appropriate presentation prize competition.

Papers and posters are judged by a committee in terms of overall effectiveness, scientific content, and quality of the presentation. Students are stongly encouraged to review the scoring criteria in advance.

Students who have won an award are not eligible for that award again, but can compete for a different award. NEERS appreciates contributions towards the endowment fund for these prizes, so give generously when you pre-register. One free Banquet ticket is provided for the lead author of each student presentation.

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Registration

Pre-registration closes on Wednesday, October 10, 2010.

Pre-registration Form Is Inactive

The deadline for pre-registration has passed.

You may register on-site. Banquet tickets may not be available. Contact the treasurer with questions.

Payment accepted by check or money order. NEERS cannot accept credit cards.

Registration Fee Schedule - Fall 2010

	pre-registration rate	walk-in rate
student	$25.00	$40.00
member	$50.00	$70.00
non-member	$70.00	$90.00
one-day student	$15.00	$25.00
one-day member	$20.00	$30.00
one-day non-member	$25.00	$35.00

Registration includes catered lunches (Thursday & Friday) and an assortment of baked goods and fruit for the coffee breaks.

Additional Fees - Fall 2010

NEERS membership - student*	$5.00
NEERS membership - regular*	$20.00
Banquet Ticket**	$35.00
Saturday Box Lunch	$10.00
Herring Marsh Field Trip	free
Birding Field Trip	free
Whale Watch Trip	TBA

* The registration form includes the option to join NEERS (membership details).

** Students who are lead presenters recieve a complimentary banquet ticket. Pre-registration is highly recommended, tickets are limited.

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MEALS AND SOCIAL EVENTS

NEERS Welcoming Social

Location: Cape Inn Resort (conference hotel)

Time: Thursday, 6 p.m. to 8 p.m.

The welcoming social will have an added treat: Chris Deascutis and our own NEERS "Hot Toddies" will provide musical accompaniment for an extra night of pre-Halloween social shenanigans. Bring your dancing shoes, an instrument, and a smile to join in the fun. After the social, you can find dinner on your own at a rather large selection of restaurants, something to suit just about any palate– at least a bunch of them should still be open! The final tally of restaurants will be available at the registration desk.

Awards Banquet

Location: Cape Inn Resort (conference hotel)

Time: Friday, 7 p.m. to ??? p.m.

We are very pleased that NEERSians Ed and Kathy Rhodes have volunteered to provide a traditional clambake for us. Those of you who attended the Boothbay meeting will remember the wonderful spread provided by Ed and Kathy, and since the hotel is across the street from Cape Cod Bay, what could be better for estuarine researchers than a clambake? Start with steaming bowls of New England clam chowder. Enjoy lobster,clams, mussels, salmon, onions, potatoes, corn on the cob, sausage and eggs steamed in a bed of seaweed over a cozy wood fire built on the intimate sandy beach at the Cape Inn Resort. The "bake" also includes clam broth, melted butter and coleslaw, and finishes with a berry shortcake on homemade biscuits. For non-seafood eaters we also offer herb-roasted chicken as an alternative, and for the veggie purists in addition to the veggies in the "bake" and the to-die-for dessert you can select a delicious "chili sin carne" that will be served with an assortment of spicy sauces and home-grown jalapenos and habanero peppers to help you "kick it up a notch".

PRE-REGISTRATION IS ESSENTIAL FOR THE BANQUET, please indicate whether you will attend on the meeting registration form. Ed and Kathy are aware of dietary restrictions – just make sure to include them in your registration. If you don't find what you need on the registration form, contact Sandy Macfarlane.

The student awards for best oral and poster presentations will be awarded at the close of the banquet. After the banquet we will be heading to the infamous “A” House or another similar venue for dancing.

Cost of the banquet is $35.00 per person. Students delivering an oral or poster presentation (as lead presenter) attend for free.

Other Meals

Catered lunches will be provided at the Center for Thursday and Friday. These are included in the registration fee. We will also have an assortment of baked goods and fruit for the coffee breaks.

A Saturday box-lunch (for field trips or travelers) is available for $10.00. Please pre-register for a box-lunch when completing the registration form.

A continental breakfast will be served at the hotel. A list of restaurants serving a full breakfast will also be available at the registration desk.

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FIELD TRIPS
Saturday afternoon

Please indicate your interest in one of the following on the pre-registration form, for scheduling purposes. This is nonbinding, but a general head count is helpful to the field trip leaders.

Herring River Restoration Project / Salt Marsh Dieback

One of, if not THE largest proposed restoration projects in New England. Meet at 1pm in the parking lot of Provincetown Center for Coastal Studies. We will caravan to salt marshes experience dieback and the Herring River tidal restoration site. Participants should bring knee boots for walking out into the marsh.

Cost: $0

Birding Field Trip

The Provincetown area is one of the premier locations in eastern North America for seabirds. It is also a great place for migrating hawks and other birds. We will determine the exact destinations of this field trip based on the weather and what birds have been reported that week from birding hotspots like Race Point and Herring Cove. Bring binoculars if you have them, wear decent shoes, and dress for cool, windy conditions. Meet at 1pm in the parking lot of Provincetown Center for Coastal Studies, we'll caravan to the site.

Cost: $0

Whale Watch

http://www.whalewatch.com/

The Dolphin Fleet is the longest-running whale watch company in New England. Actually, whale watching began in Provincetown because Al Avellar, who ran a head-boat for fishing trips, noticed that every time they spotted whales, the passengers flocked to the side of the boat where the whales were sighted, leaving their fishing posts. Al outfitted a boat and whale watching was born. He partnered with the Provincetown Center for Coastal Studies and for years, naturalists from the Center on board have provided the commentary while conducting crucial studies on whale behavior and cataloging whales in the bay pictorially. The proximity of

Provincetown to Stellwagen Bank and whale feeding grounds makes whale watching out of Provincetown a must-do event for thousands of people each year.

Cost: $35 - $39 depending on number of participants; money will be collected at the meeting.

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ACCOMMODATIONS

Cape Inn Resort
www.capeinn.com
phone: (508) 487-1711
for reservations: (800) 422-4224
A block of rooms is reserved for the meeting (mention NEERS) until **October 1, 2010**. Prices vary, depending on room type ($62 - $75). We recommend making hotel reservations early as there are limited options at this time of year.

Other Options

Many hotels and B&Bs are located in P-Town. Check the web, but be sure to register early as this is a holiday weekend.

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NEERS FALL 2010 MEETING

October 28 – 30, 2010

Provincetown Center for Coastal Studies, Provincetown, MA

Co-hosted By

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NEERS FALL 2010 MEETING
October 28 – 30, 2010
Provincetown Center for Coastal Studies, Provincetown, MA

Program at-a-Glance
All events at the Provincetown Center for Coastal Studies unless noted otherwise

Thursday, October 28th

11:00 am – 12:00 pm	Meeting registration
12:00 – 1:00 pm	Lunch
1:00 – 5:15 pm	Cape Cod Bay Symposium
5:45 – 6:45 pm	Meeting Registration (Cape Inn Resort)
6:00 – 8:00 pm	Welcoming Social with musical entertainment by NEERS's own dynamic duo, Mike Larkin and Chris Deacutis: "The 2 Left Standing" (Cape Inn Resort)

Friday, October 29th

7:00 – 8:00 am	Meeting registration
8:00 – 10:10 am	Oral presentations: Estuarine Fauna I
10:30 am – 12:10 pm	Oral presentations: Estuarine Fluxes
12:10 – 1:15 pm	Lunch
12:10 – 1:15 pm	Executive Committee Meeting (PCCS library)
1:20 – 3:00 pm	Oral presentations: Macrophyte Systems
3:00 – 4:00 pm	Poster presentations
4:00 – 5:20 pm	Oral presentations: Nearshore Ecosystems
5:30 – 6:30 pm	NEERS Business Meeting
6:30 – 9:00 pm	Social and NEERS Awards Banquet (Cape Inn Resort)
9:00 pm - ??	Music and dancing at the "A-House" off Commercial Street

Saturday, October 30th

8:20 – 10:10 am	Oral presentations: Estuarine Fauna II
10:30 am – 12:20 pm	Oral presentations: Marsh Ecology and Management
12:20 pm	Pre-ordered box lunches available
1:00 pm	Optional salt marsh or birding field trips – meet in parking lot of PCCS
1:30 pm	Optional whale watch – departs from MacMillan Pier

Thursday, October 28th

12:00 – 1:00 Lunch

SPECIAL SYMPOSIUM: CAPE COD BAY

Chair: Sandy Macfarlane
* Presenter

1:00 Welcome – Sandy Macfarlane, Coastal Resource Specialists
Sarah Peake, Lower Cape State Representative

1:15 Borrelli*, Mark[1], A. R. Norton[2], and T. L. B. Brown[3]
[1]Provincetown Center for Coastal Studies, Provincetown, MA
[2]Dept. of Geological Sciences, Univ. of Delaware, Newark, DE
[3]Dept. of Environ., Earth and Ocean Sciences, Univ. of Massachusetts at Boston, MA
NEARSHORE SEAFLOOR MAPPING IN CAPE COD BAY, MASSACHUSETTS

1:35 Ford*, Kathryn H.[1], M. Rousseau[2], S. Voss[1], R. Boeri[3], D. Sampson[3], and T. Callaghan[3]
[1]Mass. Division of Marine Fisheries, 1213 Purchase St. 3rd Floor, New Bedford, MA
[2]Mass. Division of Marine Fisheries,30 Emerson Ave., Gloucester, MA
[3]Mass. Office of Coastal Zone Management, 251 Causeway St., Suite 800 Boston, MA
SEAFLOOR HABITATS IN NORTHERN CAPE COD BAY

1:55 Giese*, Graham S.
Provincetown Center for Coastal Studies, Provincetown, MA
BILLINGSGATE SHOAL, SEA LEVEL RISE AND DEVELOPMENT OF THE EASTERN SHORE OF CAPE COD BAY

2:15 Mayo*, C. "Stormy" A. and K. Stamieszkin
Provincetown Center for Coastal Studies Provincetown, MA
AT THE NEXUS: RIGHT WHALES AND THE ZOOPLANKTON RESOURCES OF CAPE COD BAY

2:45 Correia*, Steven J., J. King, M. Camisa, and V. Manfredi
Mass. Division of Marine Fisheries, 1213 Purchase St., New Bedford, MA
CHANGES IN THE DISPERSION OF RELATIVE ABUNDANCE OF SIX SPECIES IN CAPE COD AND MASSACHUSETTS BAYS IN THE SPRING BOTTOM TRAWL SURVEY, 1979-2007

3:05 BREAK

3:25 Macfarlane, Sandy L.
Coastal Resource Specialists, Orleans, MA
SHELLFISH IN CAPE COD BAY: CENTURIES OF HARVESTING BOUNTIFUL BIVALVES

3:50 Faherty, Mark
Mass Audubon Wellfleet Bay Wildlife Sanctuary, South Wellfleet, MA
EXPERIMENTAL OYSTER REEF RESTORATION IN WELLFLEET: LESSONS FROM YEAR ONE

4:10 Costa, Amy S.
Provincetown Center for Coastal Studies, Provincetown, MA
TESTING THE WATERS: HOW HEALTHY IS CAPE COD BAY?

4:30 Brennessel*, Barbara A.[1], S. McCafferty[1], J. Simindza[1], A. Shorette[1], and T. Spoon[2]
[1]Wheaton College, Norton, MA
[2]Mystic Aquarium, Mystic, CT
DIAMONDBACK TERRAPINS OF CAPE COD:POPULATION STRUCTURE AND CONSERVATION STRATEGIES

4:50 Dill*, Nathan L. and K. F. Bosma
Woods Hole Group Inc., East Falmouth, MA
NUMERICAL MODELING OF FLOW CONTROL STRUCTURES IN CAPE COD BAY'S ESTUARIES

5:10 Closing remarks – Sandy Macfarlane

6:00 – 8:00 NEERS Welcoming Social – Cape Inn Resort

8:00 Dinner on your own in Provincetown

Friday, October 29th

8:00 Welcome and Introductory Remarks – Pam Morgan, NEERS President

Estuarine Fauna I

Chair: Pam Morgan
* Presenter; **(K)** Ketchum Prize candidate for best graduate student presentation; **(R)** Rankin Prize candidate for best undergraduate student presentation

8:10 **(K)** Brown*, D. Steven and R. Zajac
Dept. of Biol. and Environ. Science, University of New Haven, West Haven, CT
EFFECTS OF HABITAT COMPLEXITY AND COMPOSITION ON BENTHIC ASSEMBLAGES IN NEW HAVEN HARBOR, LONG ISLAND SOUND

8:30 **(K)** Schaller*, Susanne Y.[1], C. C. Chabot[2], and W. H. Watson, III[1]
[1]Department of Biological Sciences, University of New Hampshire, Durham, NH
[2]Department of Biology, Plymouth State University, Plymouth, NH
SEASONAL MOVEMENTS OF HORSESHOE CRABS, LIMULUS POLYPHEMUS, IN THE GREAT BAY ESTUARY, NEW HAMPSHIRE (USA)

8:50 **(K)** Luk*, Yi-Chuan and R. Zajac
Dept. of Biol. and Environ. Science, University of New Haven, West Haven, CT
FIDDLER IN THE MARSH- SPATIAL DISTRIBUTION AND ABUNDANCE OF *UCA SPP.* IN SALT MARSHES OF CENTRAL LONG ISLAND SOUND

9:10 **(K)** Bayley*, Holly K. and S. E. Fox
National Park Service, Cape Cod National Seashore, Wellfleet, MA
RECOVERY OF AN ESTUARINE NEKTON COMMUNITY FOLLOWING PARTIAL RESTORATION OF TIDAL FLOW

9:30 **(R)** Ares*, Nichole L. and D. L. Taylor
Department of Marine Biology Roger Williams University, Bristol RI
MERCURY AND SELENIUM RELATIONSHIPS IN FISH

9:50 **(R)** Gifford*, Samantha J. and R. W. Fulweiler
Earth Science Department, Boston University, Boston, MA
BOSTONIAN PENGUINS AND THE FATE OF NITROGEN - USING STABLE ISOTOPE ANALYSIS TO ASSESS ANTHROPOGENIC INFLUENCES ON WILD AND CAPTIVE PENGUIN COLONIES

10:10 **BREAK**

Estuarine Fluxes

Chair: Pam Morgan
* Presenter; **(K)** Ketchum Prize candidate for best graduate student presentation; **(R)** Rankin Prize candidate for best undergraduate student presentation

10:30 **(R)** Vieillard*, Amanda M.[1], R. W. Fulweiler[1], L. Deegan[2], S. Fagherazzi[1], and D. FitzGerald[1]
[1]Department of Earth Sciences, Boston University Boston, MA
[2]Marine Biological Laboratory Woods Hole, MA
EFFECTS OF FERTILIZATION ON BENTHIC AND PELAGIC SILICA FLUXES IN A NEW ENGLAND SALT MARSH

10:50 **(K)** Heiss*, Elise M. and R. W. Fulweiler
Department of Earth Sciences, Boston University, Boston, MA
SEDIMENT N_2 FLUXES FROM ESTUARY TO OFFSHORE ALONG AN ANTHROPOGENIC N-LOADING GRADIENT

11:10 **(K)** Rempala*, Erin C. and A. Frankic
Dept. of Environ., Earth, and Ocean Sciences, Univ. of Massachusetts, Boston, MA
PRELIMINARY ASSESSMENT OF SALT MARSH–EELGRASS CONNECTIVITY WITH IMPLICATIONS FOR HABITAT RESTORATION

11:30 Sokoloff*, Paul D.[1] and F. T. Short[2]
[1]Mass. Division of Marine Fisheries, Gloucester, MA
[2]University of New Hampshire, Durham, NH
ESTUARINE WATER COLUMN FILTRATION BY *ZOSTERA MARINA* L. (EELGRASS) AND *CRASSOSTREA VIRGINICA* EASTERN OYSTER)MEASURE USING MESOCOSMS

11:50 **(K)** Fields*, Lindsey, S.W. Nixon, and S. Granger
URI Graduate School of Oceanography, Narragansett, RI
BENTHIC METABOLIC RESPONSES TO LOW OXYGEN CONCENTRATIONS IN COASTAL ECOSYSTEMS

12:10 – 1:15 LUNCH

Ecology and Biogeochemistry of Macrophyte Systems

Chair: Robert Buchsbaum
* Presenter; **(K)** Ketchum Prize candidate for best graduate student presentation; **(R)** Rankin Prize candidate for best undergraduate student presentation

1:20 **(K)** Heffner*, Leanna R.[1], A. Giblin[2], R. Marino[2,3], and S. Nixon[1]
[1]Graduate School of Oceanography, University of Rhode Island, Narragansett, RI
[2]The Ecosystems Center, Marine Biological Laboratory, Woods Hole, RI
[3]Dept of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY
NITROGEN FIXATION AND DENITRIFICATION IN NARRAGANSETT BAY SALT MARSHES

1:40 **(K)** Carey*, Joanna and R. W. Fulweiler
Earth Sciences Department, Boston University, Boston, MA
DISSOLVED SILICA IN SALT MARSH POREWATER PROFILES - DO CONCENTRATIONS VARY ALONG A NUTRIENT GRADIENT?

2:00 **(K)** Mitchell*, Elizabeth E.[1] and K. A. Wilson[2]
[1]University of Southern Maine Department of Biology, ME
[2]University of Southern Maine Department of Environmental Science and Policy
VEGETATION RESPONSE TO PREDICTED INCREASED TIDAL MARSH INUNDATION IN NORTHERN NEW ENGLAND BRACKISH MARSHES: PRELIMINARY RESULTS

2:20 **(K)** Novak*, Alyssa B. and F. T. Short
Dept. of Natural Resources and the Environment, Univ. of New Hampshire, Durham, NH
WHY ARE *THALASSIA TESTUDINUM* LEAVES TURNING RED IN SOME AREAS OF THE LOWER FLORIDA KEYS?

2:40 Short*, Fred T.[1], A. S. Klein[2], D. M. Burdick[1], G. Moore[2], S. Granger[3], C. Pickerell[4], J. Vaudrey[5], H. Bayley[6], and N. T. Evans[7]
[1]Dept. of Nat. Resources and the Environ., UNH, Jackson Estuarine Lab., Durham, NH
[2]Department of Biological Sciences, UNH; [3]University of Rhode Island, RI
[4]Cornell Cooperative Extension, NY; [5]University of Connecticut, CT
[6]Cape Cod National Seashore, MA; [7]Massachusetts Division of Fisheries, MA
EELGRASS GENETICS AND RESILIENCE IN SOUTHERN NEW ENGLAND AND NEW YORK TO SUPPORT MANAGEMENT AND RESTORATION SUCCESS

3:00 **BREAK AND POSTER SESSION**
Poster titles are listed at the end of the program

Nearshore Ecosystems: Models for Decision Making and Watershed Influences

Chair: Robert Buchsbaum
* Presenter; **(K)** Ketchum Prize candidate for best graduate student presentation

4:00 **(K)** Byron*, Carrie[1], D. Bengtson[1], B. Costa-Pierce[1,2], J. Link[3], R. Rheault[4], D. Beutel[5], and D. Alves[6]
[1]Dept. of Fisheries, Animal and Vet. Sciences, University of Rhode Island, Kingston, RI
[2]Rhode Island Sea Grant College Program, University of Rhode Island, Narragansett, RI
[3]Nat. Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA
[4]41121 Moorsefield Rd., Wakefield, RI; [5]Cstl. Res. Manage. Council, Wakefield, RI;
[6]NOAA Aquaculture Program, Nat. Marine Fisheries Serv., Gloucester, MA
WORKING TOWARD CONSENSUS: APPLICATION OF SHELLFISH CARRYING CAPACITY IN MANAGEMENT OF RHODE ISLAND AQUACULTURE

4:20 Vaudrey*, Jamie M. P.[1], M. J. Brush[2], D. S. Ullman[3] and J. N. Kremer[1]
[1]Department of Marine Sciences, University of Connecticut
[2]Virginia Institute of Marine Science, The College of William & Mary
[3]Graduate School of Oceanography, University of Rhode Island
DEVELOPMENT AND VALIDATION OF A HYBRID PHYSICAL-ECOLOGICAL MODEL OF NARRAGANSETT BAY, RI, USA.

4:40 Taylor, Dave I.
Environmental Quality Dept., Massachusetts Water Resources Authority, Boston MA
NON-LINEAR RESPONSES OF BOSTON HARBOR TO LARGE DECREASES IN NUTRIENT AND ORGANIC MATTER INPUTS

5:00 Kinney*, Erin L. and I. Valiela
The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA
δ^{15}N PROFILES IN SALT MARSH SEDIMENT CORES: EVIDENCE OF CHANGING LAND USE AND EXPERIMENTAL FERTILIZATION

5:30 **NEERS BUSINESS MEETING**

6:30 **SOCIAL AND NEERS AWARDS BANQUET – Clam Bake at the Cape Inn Resort**
Presentation of Awards for Best Student Papers

9:00 Music and dancing at the A-House, 4-6 Masonic Place, P-town (off Commercial St.)

Saturday, October 30th

Estuarine Fauna II

Chair: Steve Hale
* Presenter

8:20 Gather for session

8:30 Beekey*, Mark B., C. Ryan, H. Potter, and J. H. Mattei
Department of Biology, Sacred Heart University, Fairfield, CT
MOVEMENT PATTERNS OF HORSESHOE CRABS IN LONG ISLAND SOUND: IMPLICATIONS FOR MANAGEMENT STRATEGIES

8:50 Bartholomew, K. A., J. M. Kasinak, M. A. Beekey, and Jennifer H. Mattei*
Department of Biology, Sacred Heart University, Fairfield, CT
MOVEMENT PATTERNS AND POPULATION GENETICS OF THE AMERICAN HORSESHOE CRAB IN RELATION TO LONG ISLAND SOUND CONSERVATION STRATEGIES

9:10 James-Pirri, M.-J.
Graduate School of Oceanography, University of Rhode Island, Narragansett, RI
SEASONAL MOVEMENT OF THE AMERICAN HORSESHOE CRAB *LIMULUS POLYPHEMUS* IN A SEMI-ENCLOSED BAY ON CAPE COD, MASSACHUSETTS (USA) AS DETERMINED BY ACOUSTIC TELEMETRY

9:30 Grear*, Jason S., R. Gutjahr-Gobell, and D. Borsay Horowitz
Atlantic Ecology Division, US Environmental Protection Agency, Narragansett, RI
EFFECTS OF SEAWATER ACIDIFICATION ON THE LIFE CYCLE AND FITNESS OF OPOSSUM SHRIMP POPULATIONS

9:50 Armstrong*, Michael P.[1], J. Sheppard[2], P. Brady[2], and G. Nelson[1]
[1]Massachusetts Division of Marine Fisheries, 30 Emerson Ave, Gloucester, MA
[2]Massachusetts Division of Marine Fisheries, 1213 Purchase St, New Bedford, MA
EVIDENCE FOR POOR YEAR CLASS STRENGTH AS THE CAUSE OF ALEWIFE (*ALOSA PSEUDOHARENGUS*) SPAWNING POPULATION DECLINES IN SOUTHERN NEW ENGLAND

10:10 BREAK

Marsh Ecology and Management

Chair: Steve Hale
* Presenter

10:30 Fox*, Sophia E.[1,2], Y. S. Olsen[1,3], and I. Valiela[1]
[1]The Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA
[2]Present address: National Park Service, Cape Cod National Seashore, Wellfleet, MA
[3]IMEDEA, Mallorca, Spain
THE EFFECTS OF WARMER TEMPERATURES ON *SPARTINA ALTERNIFLORA* AND SEDIMENT CHARACTERISTICS

10:50 Yando*, Erik, Ariella Cohen*, C. Haight, and R. S. Warren
Connecticut College, New London, CT
QUANTIFYING AND DETERMINING A POSSIBLE MECHANISM FOR THE COLLAPSE OF ARTIFICIALLY FERTILIZED PLUM ISLAND SOUND SALT MARSH CREEK BANKS

11:10 Donnelly, Grace M.
BIOSPEC, Inc., 147 Sixth St., Providence, RI
MEIOTIC CHROMOSOME BEHAVIOR IN *SPARTINA ALTERNIFLORA*: IMPLICATIONS FOR MANAGEMENT,GENOMICS,AND ECOLOGY

11:30 Weishar, Lee
Woods Hole Group, East Falmouth, MA
SUCCESSFULLY DESIGNING WETLANDS RESTORATION PROJECT: CAN IT BE DONE?

11:50 Smith*, Stephen M. and M. C. Tyrrell
National Park Service, Cape Cod National Seashore, Wellfleet, MA
THE POTENTIAL FOR VEGETATION RESTORATION IN SALT MARSH DIEBACK AREAS USING EROSION CONTROL FABRIC (CAPE COD, MASSACHUSETTS)

12:10 Closing Remarks – Steve Hale, NEERS President

12:20 Pre-ordered box lunch – pick up at Provincetown Center for Coastal Studies

1:00 Salt marsh field trip departs from Provincetown Center for Coastal Studies parking lot

1:00 Birding field trip departs from Provincetown Center for Coastal Studies parking lot

1:30 Whale watch departs from MacMillan Pier, Provincetown

POSTER PRESENTATIONS

* Presenter; **(D)** Dean Prize candidate for best graduate student poster; **(W)** Warren Prize candidate for best undergraduate student poster

(D) Barrett*, Diana T. and T. K. Rajaniemi
Department of Biology, University of Massachusetts at Dartmouth, Dartmouth, MA
EFFECT OF ENVIRONMENTAL FACTORS ON THE GERMINATION OF SEVERAL SPECIES OF COASTAL DUNE PLANTS

Costa*, Amy S., M. S. Costa, and K. Stamieszkin
Provincetown Center for Coastal Studies. Provincetown, MA
EELGRASS HABITAT MONITORING IN CAPE COD BAY AND THE CHALLENGES OF RESTORATION

Curran*, Patrick B.[1], C. D. Hunt[1], D. M. Michelin[1], and P. S. Libby[2]
[1]Battelle Memorial Institute, Duxbury, MA
[2]Battelle, Brunswick, ME
In situ CHARACTERIZATION OF PHYTOPLANKTON COMMUNITIES USING A NOVEL SUBMERSIBLE IMAGING FLOW CYTOMETER

Evans*, Tay[1], J. Baker[2], A. Costa[3], and B. Warren[4]
[1]Annisquam River Marine Fisheries Station, Mass. Div. of Marine Fisheries, Gloucester, MA
[2]Massachusetts Bays Program, Boston, MA
[3]Provincetown Center for Coastal Studies, Provincetown, MA
[4]Salem Sound Coastwatch, Salem, MA
USE OF "CONSERVATION MOORINGS" AS A COMPONENT OF EELGRASS RESTORATION AND REHABILITATION IN TWO MASSACHUSETTS HARBORS

(W) Gervasi*, Carissa G. and D. L. Taylor
Department of Marine Biology, Roger Williams University, Bristol, RI
ABUNDANCE, GROWTH, AND DIET OF JUVENILE SUMMER FLOUNDER (*PARALICHTHYS DENTATUS*) AND WINTER FLOUNDER (*PSEUDOPLEURONECTES AMERICANUS*) IN NARRAGANSETT BAY RI/MA

Kirtley*, Stacey L.[1] and E. H. Dettmann[2]
[1]Contractor to U.S. EPA, ORD-NHEERL, Atlantic Ecology Division, Narragansett, RI
Current address: New England Aquarium, Boston, MA
[2]U.S. EPA, ORD-NHEERL, Atlantic Ecology Division, Narragansett, RI
NUTRIENT-CHLOROPHYLL RELATIONSHIPS IN THE INDIAN RIVER LAGOON, FLORIDA

Sharif*, Rahat, V. M. Berounsky , L. Maranda, and D. Borkman
University of Rhode Island, Narragansett, RI
CHLOROPHYLL THIN LAYERS OF THE NORTHERN BASIN OF THE PETTAQUAMSCUTT RIVER ESTUARY: A PRELIMINARY STUDY

NEERS MEETING ABSTRACTS - ALL

Ares*, N. L. and D. L. Taylor. Department of Marine Biology Roger Williams University, Bristol RI.

MERCURY AND SELENIUM RELATIONSHIPS IN FISH

Mercury (Hg) is a toxic environmental containment that negatively affects human health, and exposure occurs through the consumption of finfish. Selenium (Se) has a strong relationship with mercury, and is believed to have a mitigating effect on Hg toxicity. Hg levels have been previously investigated in the edible filets of fish, including target species, like the summer flounder (*Paralichythys dentatus*) black sea bass (*Centropristis striata*), tautog (*Tautoga onitis*), and bluefish (*Pomatomus saltatrix*), but the Hg in other tissues, like the brain and liver are lacking. The brain is of particular concern since Hg is a neurotoxin, and the liver due to its role in detoxification. The relationship of Hg and Se has been investigated in some species, however overall, there has been little done. This study concentrates on the differences seen between the four target species. The objectives of this study were to: (1) examine Hg and Se bioaccumulation within the three target tissues, (2) examine the molar ratios of Se:Hg within the tissues, and (3) compare the differences between species, and attribute them to life-history characteristics. From June to August 2007-2010, target fish were collected from Narragansett Bay (RI, USA). Length (cm) was recorded for each fish, and the total Hg was determined using a DMA-80 (direct mercury analyzer) which utilizes automated atomic absorption spectroscopy, and total Se using ICP-MS (inductively coupled plasma mass spectroscopy). Molar ratios of Se:Hg were calculated to determine the protective quality of Se over Hg toxicity, with a ratio =1 showing a protective quality of Se over Hg.

Armstrong*, M. P.[1], J. Sheppard[2], P. Brady[2], AND G. Nelson[1]. [1]Massachusetts Division of Marine Fisheries, 30 Emerson Ave, Gloucester, MA. [2]Massachusetts Division of Marine Fisheries, 1213 Purchase St, New Bedford, MA.

EVIDENCE FOR POOR YEAR CLASS STRENGTH AS THE CAUSE OF ALEWIFE (*ALOSA PSEUDOHARENGUS*) SPAWNING POPULATION DECLINES IN SOUTHERN NEW ENGLAND

Alewife (*Alosa pseudoharengus*) spawning populations began a precipitous decline in southern New England beginning in the early 2000's and reached a low point in 2005-2006. In response to this decline several states banned the harvest of river herring and the Atlantic States Marine Fisheries Commission initiated a management plan to help recover the populations. The cause of this decline has not been demonstrated and this makes formulating an effective recovery plan extremely difficult. However, there has been much speculation that the decline was caused by by-catch of alewives in the offshore pelagic fisheries for Atlantic herring and Atlantic mackerel and predation by high populations of predators such as striped bass, seals, and cormorants. Examination of the age structure of three alewife spawning runs in southeastern Massachusetts indicated that poor year class strength in 2000 through 2003 was the primary cause of the decline of alewife populations. Indices of age-0 and age-1 abundance for these year classes demonstrated that the poor year class strength was established in the early life history, likely in the headwater spawning grounds, discounting the effect of by-catch in offshore fisheries or coastal predation as the primary cause of the decline.

Barrett*, D. T. and T. K. Rajaniemi. Department of Biology, University of Massachusetts at Dartmouth, Dartmouth, MA.

EFFECT OF ENVIRONMENTAL FACTORS ON THE GERMINATION OF SEVERAL SPECIES OF COASTAL DUNE PLANTS

The percentage of germination of eight species of dune plants common to coastal Massachusetts was calculated to determine the effects of variations in temperature, light, soil ionic concentration, as well as the presence of conspecifics on germination. All species displayed statistically significant differences in effects of ionic concentration of the soil, with most germination occurring in soil treated with fresh water, and the least in soil treated with full seawater. Also, light preferences were evident since one species, Chrysops falcata, only germinated in the absence of light, while Solidago sempervirens and Oenothera parviflora germinated only in lighted conditions. Finally, temperature had less of an influence on germination with no statistical difference between high and low temperature conditions. These preliminary findings provide valuable information on the likelihood of germination from seed banks in coastal dunes. Increased likelihood of germination by greater understanding of germination conditions could lead to the use of seed banks to improve plant diversity on coastal dunes, possibly resulting in greater dune stability, as well as to contribute to the management of protected and migratory animal species.

Bartholomew, K.A., J.M. Kasinak, M.A. Beekey, and J.H. Mattei* Department of Biology, Sacred Heart University, Fairfield, CT

MOVEMENT PATTERNS AND POPULATION GENETICS OF THE AMERICAN HORSESHOE CRAB IN RELATION TO LONG ISLAND SOUND CONSERVATION STRATEGIES.

The Connecticut Department of Environmental Protection established three no-harvest zones for the horseshoe crab (*Limulus polyphemus*) population as part of a conservation plan for the species. Data from a long-term mark/recapture study of horseshoe crabs in conjunction with a microsatellite-based genetic survey of the population were analyzed to determine if this plan was appropriate to conserve genetic diversity and broaden our knowledge of movement patterns of *Limulus* in Long Island Sound (LIS). To date, ~53,000 crabs have been tagged over a 10 year period through the Project *Limulus* program with an annual average recapture rate of 12 to 15%. In addition to the ongoing tagging study, 186 horseshoe crabs collected from 5 distinct sites spanning the geographic extent of Long Island Sound (Rye and Mt. Sinai, NY; Milford, New Haven, and Groton, CT) were genotyped for 12 microsatellite loci to determine the overall genetic health of the LIS population and determine if regional genetic differentiation was sufficient to identify sub-populations within this region. The genetic data indicates that the LIS *Limulus* population is genetically homogenous with no signs of inbreeding and substantially similar to other Mid-Atlantic populations. Data from the mark-recapture study indicate significant migration east and west along the north shore of LIS relative to the original tag site and in addition cross LIS migrations have also been observed. Therefore, the locations of the established no-harvest zones are appropriate to conserve genetic diversity. However, based on their tri-state migration patterns a multi-state management strategy is needed for the LIS horseshoe crab population.

Bayley*, H. K. and S. E. Fox. National Park Service, Cape Cod National Seashore, Wellfleet, MA.

RECOVERY OF AN ESTUARINE NEKTON COMMUNITY FOLLOWING PARTIAL RESTORATION OF TIDAL FLOW

East Harbor, a 700-acre back barrier salt marsh and coastal lagoon in Truro, MA was artificially cut off from the sea for almost 140 years. The lack of tidal flushing had created a stagnant freshwater system with several ecological problems, including midge outbreaks, fish kills, and colonization by invasive species. In 2002, tidal flow was partially restored to East Harbor. Estuarine nekton can be used as indicators of ecosystem recovery following tidal restoration. Due to their high degree of mobility, nekton respond rapidly to changes in environmental conditions caused by anthropogenic and natural disturbances such as changes in hydrology, water quality, and storms. To assess the nekton community, we used throw traps to measure nekton species composition, abundance, and density for eight consecutive summers following the restoration of tidal flow to the previously impounded system. Before the re-introduction of tidal flow to East Harbor, there were few nekton species present, and the species found in the system, such as *Cyprinus carpio* and *Alosa pseudoharengus*, tended to be associated with freshwater environments. Overall, the number of nekton species has increased since the restoration. The common estuarine inhabitants *Fundulus heteroclitus*,

Menidia menidia, and *Palaemonetes* spp. have dominated the nekton assemblages. In more recent years, fish species that are closely associated with marine waters were found in the estuarine system. The presence of these fishes with stenohaline tolerances suggests that conditions in East Harbor are converging on those of natural coastal systems where tidal restrictions do not impair seawater exchange.

Beekey*, M. B., C. Ryan, H. Potter, and J. H. Mattei. Department of Biology, Sacred Heart University, Fairfield, CT.

MOVEMENT PATTERNS OF HORSESHOE CRABS IN LONG ISLAND SOUND: IMPLICATIONS FOR MANAGEMENT STRATEGIES

Knowledge of the movement patterns of horseshoe crabs (*Limulus polyphemus*) is a key component in the development of management strategies. Localized management may be advantageous if horseshoe crabs remain year round in or around small embayments. Regional management becomes critical if horseshoe crabs move between embayments, estuaries, and cross state boundaries. Data from a ten year mark/recapture study were analyzed to determine movement patterns of horseshoe crabs in Long Island Sound. Over 53,000 crabs have been tagged with more than 7500 recaptures. The data indicate that within breeding seasons, horseshoe crabs exhibit moderate site fidelity. Males remain at spawning beaches longer than females. Between seasons, the majority of recaptured crabs remained within well defined home ranges. These movement patterns are different from what has been observed in Delaware Bay where crabs undertake extensive migrations. Mark/recapture data from Long Island Sound are more similar to other New England horseshoe crab populations where crabs undertake less extensive migrations. The limited movement of horseshoe crabs in Long Island Sound increases the likelyhood of discrete populations within local areas that may be sensitive to overexploitation. The data support the localized management strategies Connecticut has taken along its coast by establishing no-harvest areas. However, the genetic homogeneity of LIS horseshoe crabs and evidence for regional and cross sound movement highlight the need for cooperative management strategies between Connecticut, Rhode Island, and New York.

Borrelli*, M.[1], A. R. Norton[2], and T. L. B. Brown[3]. [1]Provincetown Center for Coastal Studies, Provincetown, MA; [2]Department of Geological Sciences, University of Delaware, Newark, DE; [3]Department of Environmental, Earth and Ocean Sciences, University of Massachusetts at Boston, MA

NEARSHORE SEAFLOOR MAPPING IN CAPE COD BAY, MASSACHUSETTS

The Provincetown Center for Coastal Studies is conducting a 3-year, state-funded pilot project to develop 'nearshore seafloor resource characterization maps' of Cape Cod Bay, Massachusetts. The agreement also 'acknowledges the need to develop effective mapping strategies for nearshore environments'. In 2010, the first full field season, the project has mapped the seafloor in portions of Cape Cod Bay from the 10 m isobath to the shoreline. These areas have typically been avoided in past mapping studies due to the labor intensive nature of work in shallow waters as a result of the technical limitations of the then existing sonar systems. The Center acquired a state-of-the-art sonar system that allows these areas to be mapped in a third of the time compared with the previous generation of sonar equipment. This system provides seafloor bathymetry and coincident sidescan sonar imagery. Initial results from the first full field season document, for example, eelgrass beds in significant portions of the study area with bedform spacings of 15 – 20 cm. In addition to the mapping of the composition, distribution and condition of epibenthic flora, these data will provide investigators with information regarding coastal erosion/deposition, seafloor rugosity, bottom types and grain size. Future work will include determining the feasibility of using these remote sensing data to ascertain eelgrass biomass. During the 2011 field season we will collect eelgrass samples from selected area within the Bay to ground-truth the remote sensing data.

Brennessel*, B. A.[1], S. McCafferty[1], J. Simindza[1], A. Shorette[1], and T. Spoon[2]. [1]Wheaton College, Norton, MA; [2]Mystic Aquarium, Mystic, CT.

DIAMONDBACK TERRAPINS OF CAPE COD:POPULATION STRUCTURE AND CONSERVATION STRATEGIES

The diamondback terrapin, *Malaclemys terrapin* is classified as a “threatened” species in Massachusetts. It is the only brackish water turtle in North America and can be found in several bays and estuaries on Cape Cod, most notably, Wellfleet Harbor, Eastham, near first Encounter Beach, Barnstable, at Sandy Neck, and on the SouthCoast in Buzzards Bay. A remnant population resides in Pleasant Bay, Orleans. Mark/recapture studies indicate that female terrapins remain in their population clusters but movement of males between clusters cannot be ruled out. Genetic analysis, using microsatellite markers, points toward population structuring among the Cape Cod clusters although not to a degree in which individual terrapins can be assigned to a particular cluster. Tracking studies point to the importance of salt marshes as nurseries for yearling and juvenile terrapins. The main threat to terrapins on Cape Cod is loss of habitat, particularly nesting habitat. In collaboration with Wellfleet Bay Wildlife Sanctuary, our nest protection efforts and turtle gardening programs are producing significant increases in the number of diamondback terrapin nests and the number of hatchlings emerging each year. With the ability to identify nesting females and retrieve their hatchlings, we have conducted a paternity study using terrapins from Wellfleet Harbor. Similar to other species of turtles, diamondback terrapins exhibit multiple paternity. In approximately 30-50% of Wellfleet nests that we examined, the hatchlings have been sired by more than one male.

Brown*, D. S., and R. Zajac. Department of Biology and Environmental Science, University of New Haven, 300 Boston Post Road West Haven, Connecticut

EFFECTS OF HABITAT COMPLEXITY AND COMPOSITION ON BENTHIC ASSEMBLAGES IN NEW HAVEN HARBOR, LONG ISLAND SOUND

The physical structure of a habitat affects communities and diversity over varying temporal and spatial scales. However, how habitat structural components interact across spatial scales to shape the ecology of the marine benthos is poorly understood. The variation in habitat physiognomy (complexity) and variation in habitat composition (heterogeneity) was examined in New Haven Harbor. Underwater video surveys and associated sediment sampling were carried out in 2009. Abiotic and biotic features relative to habitat structure were defined and evaluated. Quantitative measures of complexity, such as shell particulate length and cover, were considered in relation to macrofauna composition and diversity. In this system, shell contributed the most to habitat complexity, although this finding may be mitigated by a seasonal influx in macroalgae. Our preliminary findings highlight the need for coastal and marine studies to take habitat complexity and heterogeneity into account.

Byron*, C.[1], D. Bengtson[1], B. Costa-Pierce[1,2], J. Link[3], R. Rheault[4], D. Beutel[5], D. Alves[6]. [1]Department of Fisheries, Animal and Veterinary Sciences,University of Rhode Island, Kingston, RI; [2]Rhode Island Sea Grant College Program, University of Rhode Island, Narragansett, RI; [3]National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA; [4]41121 Moorsefield Rd, Wakefield, RI; [5]Coastal Resources Management Council, Stedman Government Center, Wakefield, RI; [5]NOAA Aquaculture Program, National Marine Fisheries Service, Northeast Regional Office, Gloucester, MA.

WORKING TOWARD CONSENSUS: APPLICATION OF SHELLFISH CARRYING CAPACITY IN MANAGEMENT OF RHODE ISLAND AQUACULTURE

We present a framework for determining carrying capacity through mass-balance ecosystem modeling and stakeholder

involvement that can be used to guide management of bivalve aquaculture. Two Ecopath models were constructed for Narragansett Bay (NB) and temperate lagoons (TL)in RI where aquaculture has doubled in six years and user conflict is high. Stakeholders informed the modeling process at four critical steps; conceptualization of models, evaluation of data sources for parameterization, mass-balancing of the model, and calculation of carrying capacity. Cultured oysters were not a significant part of NB or TL, despite rapid increase in the industry. Cultured oyster biomass in NB is currently at 0.5t/km/y and could be increased 625 times without exceeding the ecological carrying capacity of 297t/km/y. Production carrying capacity was calculated to be 3,481t/km/y which could exist over only 9% of NB surface area without exceeding the ecological carrying capacity. Cultured oyster biomass in TL is currently at 12t/km/y and could increase 62 times this value without exceeding the ecological carrying capacity of 722y/km/y. Production carrying capacity was calculated to be 1,561t/km/y. TL could support this high level of biomass production across 46% of surface area before exceeding the ecological carrying capacity. Harvest was 40% of biomass. Both NB and TL were more productive and had higher carrying capacity than oligotrophic and heavily cultured New Zealand bays. Involving the stakeholders in the modeling process increased understanding and acceptance of the science thereby making the results more likely to be incorporated into future management and policy formulation.

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DISSOLVED SILICA IN SALT MARSH POREWATER PROFILES - DO CONCENTRATIONS VARY ALONG A NUTRIENT GRADIENT?

In coastal waters, excess nitrogen and phosphorus in relation to silica (Si) can result in Si-limitation. Salt marsh vegetation, particularly *S. alterniflora* and *S. patens* , are active Si accumulators, which allows salt marshes to act as both a source and a sink of Si. The emerging threat of estuarine Si-limitation and recent recognition of salt marshes as relatively large Si pools makes quantifying the rates and controls of Si accumulation and fluxes from salt marshes a crucial next step in coastal ecosystem management. For the first time, high resolution (~3 cm) depth profiles of dissolved silica in salt marsh porewater will be examined and compared spatially across three salt marshes in New England – two relatively low nutrient sites (Acadia National Park, ME and Narragansett Bay National Estuarine Research Reserve, RI) and one nutrient impaired site (Greenwich Bay, RI). Throughout the first 30 cm of sediment, porewater Si concentrations range from 15 to 283 uM, in most cases over an order of magnitude greater than Si concentrations in the adjacent tidal creek. In addition to a spatial comparison, the seasonality of porewater concentrations and the effect of vegetation type at each site will be addressed. These results will be tied into the context of a larger effort to create the first salt marsh Si budget in the Northeast US, an important next step in understanding how Si fluxes and pools change spatially and temporally in marshes exposed to varying levels of nutrients.

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CHANGES IN THE DISPERSION OF RELATIVE ABUNDANCE OF SIX SPECIES IN CAPE COD AND MASSACHUSETTS BAYS IN THE SPRING BOTTOM TRAWL SURVEY, 1979-2007.

We examined changes in dispersion of spring survey relative abundance (1979-2007) among survey strata covering Cape Cod and Massachusetts Bays for 25 species commonly caught in the survey using Gini index. Runs tests above and below the time series median indicated that six species had non-random patterns of runs ($P<0.05$) in the Gini indices. We describe trends in relative abundance by strata for these species. Gini indices declined for four species (winter flounder, little skate, four spot flounder, and American lobster), indicating a trend toward more uniform distribution across strata. In contrast, the Gini index increased for yellowtail flounder indicating more concentration. The Gini index for rainbow smelt increased through the mid 1980’s, declined through the mid 1990’s before increasing again. In general, relative abundance for these winter flounder and American lobster declined in shallow water strata and increased in deeper strata. Relative abundance for yellowtail flounder and four spot flounder declined in all strata

in Cape Cod Bay, but increased or remained stable in Massachusetts Bay. Relative abundance of little skate increased in deeper strata in Cape Cod Bay and increased in all strata in Mass Bay. Smelt relative abundance increased in 9-18m strata in Mass Bay. We also describe survey bottom temperature trends by strata during 1979-2007.

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EELGRASS HABITAT MONITORING IN CAPE COD BAY AND THE CHALLENGES OF RESTORATION

The subtidal flats in Cape Cod Bay off of Eastham have historically been colonized by productive eelgrass beds. However, since 1995, this area has lost over 140 acres of eelgrass habitat. At present there is only one small remnant bed that has persisted. The Provincetown Center for Coastal Studies (PCCS) has been monitoring this area since 2007, collecting both aerial imagery and environmental data (water quality, light attenuation, sediment type, depth, relative exposure, physical disturbance). Based on previous research which has identified ideal conditions for eelgrass restoration (Short et al. 2002) these data suggested that the site in question would be a suitable candidate for an eelgrass restoration study. Therefore, working with the Town of Eastham, PCCS tested several different planting methods to restore eelgrass habitat in this area. Monitoring of these test areas is on-going, but preliminary results indicate low survival success. Although not the anticipated outcome of this project based on the site selection criteria, this study gives valuable insight for future restoration efforts in areas where loss of eelgrass habitat may be more directly related to natural processes rather than anthropogenic disturbance.

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TESTING THE WATERS: HOW HEALTHY IS CAPE COD BAY?

In the spring of 2006, the Provincetown Center for Coastal Studies (PCCS) began a long-term monitoring program to study the health of Cape Cod Bay, focusing on water quality and related indicators of ecosystem health. The foundation for this program was work done by PCCS from 2000-2004 to address the impacts of the Boston Outfall on Cape Cod Bay. Although no direct effects were found from the Boston Outfall from this early work, it was recommended that PCCS continue to research the potential long-term impacts of “upstream polluters” on the marine environment. This and the additional goal to understand the impact from “local polluters” gave rise to the Cape Cod Bay Monitoring Program in 2006. Although water quality was the original focus of this program, the realization of the interdependence of many other facets of the Cape Cod Bay ecosystem has expanded the scope of study. We are now regularly monitoring eelgrass habitat, marine invasive species, and in 2010 are beginning to look at the occurrence of organic wastewater contaminants (pharmaceuticals, personal care products) in the Cape Cod Bay ecosystem.

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In situ CHARACTERIZATION OF PHYTOPLANKTON COMMUNITIES USING A NOVEL SUBMERSIBLE IMAGING FLOW CYTOMETER

Battelle Memorial Institute and Fluid Imaging Technologies Inc. (FIT) have collaborated to develop a submersible application of FIT’s FlowCAM® technology. FlowCAM® is an integrated system for rapidly analyzing particles in a fluid by combining the capabilities of flow cytometry, microscopy, digital imaging, and fluorescence. The new analytical instrument, Submersible FlowCAM® , acquires digital images of particles between 3-3000 µm that pass through a flow cell within the water tight housing . A software program, VisualSpreadsheet®, makes up to 26 different measurements on each particle and allows for automated analysis of the images. Additionally, statistical pattern

matching techniques enable automatic classification of taxonomic groups from libraries of known particle images. The instrument was first deployed in February 2010, in Plymouth Bay, Massachusetts. During a 45minute profiling deployment, the Submersible FlowCAM® imaged 3,315 particles between a user set size range of 30-2000 µm, and automatically identified 8 different genera of phytoplankton. Profile results showed that *Thallasiosira* spp. and *Rhizosolenia* spp. were dominant and present throughout the shallow water column (11.4 m), while other genera were only detected at certain depths. Currently, the Submersible FlowCAM® is undergoing a series of long term test deployments in Duxbury Bay, Massachusetts to examine mooring capabilities. Results from the profile and mooring deployments are presented to illustrate the instruments versatility and capabilities.

Dill*, N. L. and K. F. Bosma. Woods Hole Group Inc., East Falmouth, MA.

NUMERICAL MODELING OF FLOW CONTROL STRUCTURES IN CAPE COD BAY'S ESTUARIES

Numerical modeling provides an efficient tool for simulating hydrodynamics in estuarine environments. It is particularly useful when extensive field data collection is impractical, or when impacts of proposed restoration alternatives must be evaluated. In many cases the interaction between an estuary and the sea is often limited by anthropogenic structures such as: culverts, flap gates, weirs, sluice gates, and self-regulated tide gates. This makes numerical modeling difficult as many existing hydrodynamic models used for simulation of tidal flows do not have provisions for simulating flow control structures. To remedy this, Woods Hole Group has enhanced the multi-dimensional model, the Environmental Fluid Dynamics Code (EFDC), with ability to simulate flow control structures in estuarine environments, as well as developed a one-dimensional model for simulating flow control structures in less complex estuarine systems. Here we present the methods employed within the models to simulate flow control structures and the application of these models to estuaries in Massachusetts, including: the Herring River in Wellfleet, Stony Brook in Brewster, Mayo Creek in Wellfleet, and Town Creek in Salisbury. Model results are validated with field observations to demonstrate the accuracy of the models.

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MEIOTIC CHROMOSOME BEHAVIOR IN *SPARTINA ALTERNIFLORA*: IMPLICATIONS FOR MANAGEMENT,GENOMICS,AND ECOLOGY

Irregular meiotic chromosome behavior is common in many species of grasses. Microscope slides prepared from several different populations of *Spartina alterniflora*, the salt marsh and coastal smooth cordgrass, native to eastern North America and the Gulf of Mexico, show that it, too, exhibits a highly irregular meiosis, and has a variable mitotic number. Meiotic metaphase, within any single floret, displayed an array of bivalents ranging from 28 to 32. Later meiotic phases showed laggards and extra-nuclear chromatin material. This pattern was similar within and between florets on the same plant, and from plant to plant within and between populations in Narragansett Bay and coastal Rhode Island. Since the *S. alterniflora* genome is a hexaploid alloploid, potential haploid permutations are huge. Thus, the reported values of near 50% pollen viability and seed set;and variabilities in DNA fragment analyses are most likely related to outcomes of meiotic chromosome behavior. Recently, *S. alterniflora* has become a serious world-wide invasive. Along Pacific and European coasts it has hybridized with local counterpart species which, in turn, are wiping out the local parental species. Accordingly, ecologists must recognize that no local population of *S. alterniflora* is a clone unless it is small and very new; and that the potential for the appearance of a reciprocal invasion in eastern North America is quite real.

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USE OF "CONSERVATION MOORINGS" AS A COMPONENT OF EELGRASS RESTORATION AND REHABILITATION IN TWO MASSACHUSETTS HARBORS

Eelgrass is declining at an alarming rate in Massachusetts due to a variety of anthropogenic stressors. Water quality impairment is the most commonly cited cause of this decline. However, physical loss from boating impacts, including damage from mooring systems, also plays a major role in the loss of eelgrass extent. To better understand this problem and possible solutions, the Massachusetts Bays Program (MBP) has partnered with state and federal agencies as well as several private institutions to replace traditional moorings with a “conservation mooring” design in Provincetown and Manchester Harbors. The conservation mooring is engineered to eliminate scour and associated damage to the eelgrass bed and other benthic habitats by employing a helical anchor and a floating flexible rode rather than traditional chain and block. Our project is intended to be both a demonstration project and an eelgrass restoration effort. After installation of the new mooring systems, some of the scars will be transplanted with eelgrass. We will compare the response of eelgrass to the conservation moorings in scars with and without transplants as well as reference scars where traditional block and chain mooring systems remain. Volunteers will assist with monitoring eelgrass extent and water quality. Results will have direct management implications by adding more field data on the use and success of conservation moorings in protecting eelgrass. Work on this project began in the Spring of 2010 with initial monitoring, aerial photo-documentation, and site selection. Mooring replacement and eelgrass transplanting is scheduled for this fall.

Faherty, M. Science Coordinator, Mass Audubon Wellfleet Bay Wildlife Sanctuary, South Wellfleet, MA

EXPERIMENTAL OYSTER REEF RESTORATION IN WELLFLEET: LESSONS FROM YEAR ONE

The eastern oyster (*Crassostrea virginica*) is an economically and ecologically important component of Wellfleet Bay. While commercially raised oysters dominate Wellfleet today, wild oyster reefs were historically more prevalent in the area, and a 1972 report indicated a reef containing 1000 bushels of oysters existed off Lieutenant Island. Natural reefs provide a number of ecological services, with important economic impacts: they improve water quality, their three dimensional structure provides habitat for a wide range of invertebrates and fish, they protect coastlines from the erosional effects of storms, they provide a source of spat that benefits the commercial fishery, and they provide an essential trophic link between the benthic (sediment) and pelagic (water column) systems. Mass Audubon is working with The Nature Conservancy, NOAA, the Mass Environmental Trust, and the Town of Wellfleet to restore an oyster reef on flats owned by Mass Audubon off Lieutenant Island. We are testing three reef building materials: shell culch, reef balls, and oyster castles. Preliminary results indicate a high density of oysters set on the three experimental materials in July of 2009, and that the diversity of other organisms increased quickly when materials were placed on the restoration site. Winter freeze-thaw cycles, sedimentation, predation, and disease have all impacted the reef to varying degrees in the last year, and these challenges will be discussed, along with the goals and measures of success for the project, the experimental methods being used, preliminary results, and future directions of the restoration.

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BENTHIC METABOLIC RESPONSES TO LOW OXYGEN CONCENTRATIONS IN COASTAL ECOSYSTEMS

Incubations of sediment cores from stations along the Rhode Island coast show linear deceases of oxygen in near-bottom waters until hypoxic conditions (~3 mg/L) are reached. Once dissolved oxygen concentrations drop below this threshold, some sites show reduced benthic metabolism. In the late 1970’s, sediment core incubations in mid-Narragansett Bay, Rhode Island revealed a decrease in metabolic rate as oxygen concentrations in the overlying water dropped below hypoxic conditions. Similar experiments in the Providence River estuary, a site that routinely experiences hypoxia, showed the opposite, with the rate of benthic metabolism remaining constant in oxygen concentrations as low as 1 mg/L. We recently incubated sediment cores from Block Island and Rhode Island Sounds, two inner-shelf systems that connect Narragansett Bay to the coastal ocean and do not experience hypoxia. Temperature and sediment composition were similar to the past studies. The benthos of both Sounds behaved similarly to those of mid-Narragansett Bay, and decreased their rate of metabolism at oxygen concentrations below 2 mg/L. These findings suggest that benthos in areas where hypoxia occurs frequently respond to decreases in oxygen differently than those in areas with infrequent or no hypoxic events. Models of oxygen concentrations in near bottom coastal waters may need to account for previous oxygen exposure history.

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SEAFLOOR HABITATS IN NORTHERN CAPE COD BAY

The Commonwealth of Massachusetts has been conducting geologic seafloor mapping research for several years in conjunction with the USGS. The need for a better understanding of the links between the geologic mapping and biological (habitat) mapping were recently prioritized under the Science Framework in the Massachusetts Ocean Plan. In order to examine these linkages, a dedicated multi-agency research effort was conducted in June 2010 on the EPA survey vessel Bold. The area of study included Massachusetts territorial waters off of Hull, Duxbury, and Plymouth that were previously imaged by the USGS with interferometric sonar methods. Sample locations were selected using an optimal sampling strategy to examine the seafloor community types associated with the USGS analysis of geophysiographic regions. At 200 stations, video and grab samples were analyzed for grain size and infaunal community. This presentation will focus on the video data collected with a DeepSea Multi-SeaCam wide angle lens camera mounted on a steel frame that was provided courtesy of University of Massachusetts, School for Marine Science and Technology (SMAST).

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THE EFFECTS OF WARMER TEMPERATURES ON *SPARTINA ALTERNIFLORA* AND SEDIMENT CHARACTERISTICS

Salt marshes are critical coastal ecosystems threatened by global atmospheric changes, including sea level rise and warming. To assess impacts of warming on salt marshes, we examined some short-term and long-term effects of increased temperature on salt marsh cordgrass, *Spartina alterniflora*, and below ground biogeochemistry. We used clear plastic enclosures to raise the temperature of the salt marsh surface, and measured responses of *S. alterniflora* and sediment porewater characteristics. Temperatures in enclosure treatments were approximately 7°C above those temperatures measured in control treatments and the adjacent marsh, a reasonable increase in temperature forecasted for the coming decades. Photosynthesis and evapotranspiration of *S. alterniflora* did not show a clear pattern of responses to higher temperatures over the short-term from hours to days, nor over weeks in the longer-term. There were however, clear decreases in porewater salinity with increasing air temperature. This response occurred over short time scales of hours and did not show any longer-term effects over days and weeks. The freshening of porewaters in enclosures with higher air temperatures were most likely the result of a combination of changes in photosynthetically active radiation, photosynthesis, evapotranspiration, and increased temperature. Sea level rise and warming may work synergistically or antagonistically to threaten salt marsh habitats. For example, fresher porewaters may increase *S. alterniflora*'s inundation tolerance or may increase suitable habitat area for the highly invasive species *Phragmites* *australis*. Understanding the nature of this interaction is essential to mitigating salt marsh losses.

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ABUNDANCE, GROWTH, AND DIET OF JUVENILE SUMMER FLOUNDER (*PARALICHTHYS DENTATUS*) AND WINTER FLOUNDER (*PSEUDOPLEURONECTES AMERICANUS*) IN NARRAGANSETT BAY RI/MA

Summer flounder, *Paralichthys dentatus*, and winter flounder, *Pseudopleuronectes americanus* utilize estuaries as nursery habitat during early life stages. In southern New England estuaries, however, little is known regarding the spatiotemporal overlap and potential biotic interactions between the flounder species. The purpose of this research was to assess the abundance, growth, and dietary habits of age-0 summer and winter flounder to determine if predator-prey and/or competitive relationships exist. During the summers of 2009 and 2010, flounder in the Seekonk and Taunton Rivers (RI/MA) were sampled fortnightly using beach seines. Captured flounder were enumerated, measured for total length, and a sub-sample was preserved for stomach content analysis. Flatfish abundance was higher in the Seekonk River than the Taunton River for both summer and winter flounder in 2009 and 2010, and summer flounder were completely absent from the Taunton River in 2010. Summer flounder grew faster than winter flounder, which may be attributed to differences in dietary habits. Decapods and amphipods comprised the majority of the summer flounder diet, while amphipods, nematodes and copepods were favored by winter flounder. Calculation of the Schoener's Index showed that there was no biologically significant competition between summer and winter flounder. Among the identifiable fish prey in summer flounder stomachs, however, there was evidence of predation on winter flounder, albeit to a limited extent. In order to achieve a better understanding of the diets and trophic positioning of the summer and winter flounder, future work will analyze nitrogen stable isotope signatures of the two species.

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BILLINGSGATE SHOAL, SEA LEVEL RISE AND DEVELOPMENT OF THE EASTERN SHORE OF CAPE COD BAY

The late glacial construction of Billingsgate Shoal laid the foundation for the development of the present western coast of outer Cape Cod. Later players in this short history include glacio-fluvial deltaic deposits derived from an eastern ice lobe, rising sea level, submergence of Georges Bank, ocean swell from the southeast and construction of Provincetown Hook. Results of an ongoing study of the sediment budget of outer Cape Cod's eastern coast elucidate the mechanisms by which these factors contribute to recent shoreline changes along the cape's western coast. The 20th Century submergence of Billingsgate Island and ongoing erosion of the remaining tombolo provide examples of such Cape Cod Bay coastal change.

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BOSTONIAN PENGUINS AND THE FATE OF NITROGEN - USING STABLE ISOTOPE ANALYSIS TO ASSESS ANTHROPOGENIC INFLUENCES ON WILD AND CAPTIVE PENGUIN COLONIES.

The purpose of this study is two fold: first, we collected samples of food, guano, and feathers from the New England Aquarium (NEAq) penguin exhibit for ^{15}N and ^{13}C isotope analysis. These data were compared to wild Adelie and Gentoo penguin guano samples, taken from Antarctica, to assess how variations from their natural opportunistic diet are reflected in the guano isotopic composition. A comparison of the two groups' average $d^{15}N$ values shows that captive penguin guano on average (mean $d^{15}N = 11.3$) is more enriched in ^{15}N than the average wild penguin guano (mean $d^{15}N = 8.8$). Second, we wanted to assess the possible impact of wastewater discharge from the NSF funded

long-term research site at Palmer Station (Antarctica) on a local penguin colony. Samples of wild Adelie and Gentoo penguin guano were taken from two separate Antarctic colonies located at Palmer station and Petermann Island. The Petermann island colony, located 45 miles southwest of Palmer Station, is not exposed to human wastewater discharge. Through isotopic analysis of these guano samples, we were able to distinguish between the site impacted by human nitrogen and the site from a more pristine environment. We found the average $d^{15}N$ value for Palmer Station guano to be 19.9, suggestive of anthropogenic N input via wastewater, which typically has $d^{15}N$ values >10 and as high as 24. Petermann Island guano, from a colony not exposed to human wastewater, had a $d^{15}N$ of 6.0.

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EFFECTS OF SEAWATER ACIDIFICATION ON THE LIFE CYCLE AND FITNESS OF OPOSSUM SHRIMP POPULATIONS

Much of the current concern about ecological effects of ocean acidification focuses on molluscs and coccolithophores because of their importance in the global calcium cycle. However, many other marine organisms are likely to be affected by acidification because of their known sensitivity to changes in cellular acid-base balance. Predicting effects of this sensitivity on whole marine populations would be improved by study systems that possess population-level attributes such as age structure and competition. Thus, there is a need to integrate formal methods of experimental population ecology into studies of ocean acidification. To that end, we developed an observational scheme for *Americamysis bahia* which allows estimation of vital rates for specific life stages, but within the context of functioning populations. Initial experiments focused on food limitation and revealed demographic effects not detectable in standard cohort-based methods. We are currently using this system to examine demographic effects of reduced seawater pH, which we manipulate using gaseous carbon dioxide. Future work will include laboratory and field studies of acidification effects on *Neomysis americana*, an important mysid in New England’s coastal waters.

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NITROGEN FIXATION AND DENITRIFICATION IN NARRAGANSETT BAY SALT MARSHES

Throughout the last half-century, there has been a considerable effort to characterize nutrient fluxes within salt marsh ecosystems. Although the exchange of nutrients between the marsh and tidal waters is now reasonably well-understood, the exchange of nitrogen between the marshes and the atmosphere has been much more difficult to quantify. Nitrogen (N)-fixation in marshes has received more attention in past years, with many measurements using the rate of reduction of added acetylene (ARA) as a proxy for N-fixation rates. In recent years many of these research efforts have focused on denitrification, often with the goal of understanding the potential for marshes to remove terrestrial anthropogenic nitrogen before it reaches estuarine waters. A variety of techniques have been used to measure denitrification in marshes, often with varying results. Each method also has its own set of advantages and limitations. The salt marshes of Narragansett Bay, which are located along a gradient of long-term anthropogenic nutrient inputs, are excellent for studying nitrogen cycling in marshes and how these processes are affected by eutrophication. So far there has been some effort to examine the responses of denitrification potential and N2 fluxes to eutrophication and fertilization in Narragansett Bay salt marshes, with widely varying results. The data presented in this talk are the result of preliminary work we have done to measure N-fixation and denitrification in Narragansett Bay marshes located along the nutrient input gradient, including some measurements using the methods we have been developing to more accurately measure these processes using intact sediment cores incubated *in vitro*.

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SEDIMENT N_2 FLUXES FROM ESTUARY TO OFFSHORE ALONG AN ANTHROPOGENIC N-LOADING GRADIENT

This study reports direct measurements of net sediment N_2 fluxes along an anthropogenic N-loading gradient from estuary to offshore using the N_2/Ar method. Field sites include 4 offshore locations where we directly measured the first fluxes of net N_2. Located 25km off the coast of southern RI, Rhode Island Sound has low primary production and summer stratification. Nearby Block Island Sound is tidally mixed with higher chlorophyll levels and contains the Mud Hole, an organic-rich and muddy sediment site. The Mud Patch lies 100km offshore and has possible recalcitrant carbon deposition and homogenous mud-sand sediment. Despite these differences, all 4 of the offshore sites exhibited similar rates of sediment net N_2 fluxes with a mean of 44 µmol N_2-N $m^{-2}hr^{-1}$. Sediment organic matter deposition may not be a main factor controlling offshore rates of net sediment N_2 fluxes. Two estuary sites were also studied. Providence River Estuary (PRE) receives high levels of anthropogenic N-loading and has high rates of primary production; net denitrification rates were highest here with a mean of 132 µmol N_2-N $m^{-2}hr^{-1}$. Mid-Narragansett Bay has recently become increasingly oligotrophic; net N_2 fluxes in mid-Narragansett Bay sediments exhibited a 2-fold decrease from the mean offshore values (mean of 19.5 µmol N_2-N $m^{-2}hr^{-1}$). Both PRE and mid-Narragansett Bay sediment N_2 fluxes decreased from May to August and were negatively correlated with temperature; PRE net N_2 fluxes was also positively correlated with sediment O_2 consumption.

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SEASONAL MOVEMENT OF THE AMERICAN HORSESHOE CRAB *LIMULUS POLYPHEMUS* IN A SEMI-ENCLOSED BAY ON CAPE COD, MASSACHUSETTS (USA) AS DETERMINED BY ACOUSTIC TELEMETRY

American horseshoe crabs *Limulus polyphemus* were tracked using acoustic telemetry and traditional tagging in a semi-enclosed bay on Cape Cod, Massachusetts, USA, to determine seasonal movement patterns. Fifty-five actively spawning females were fitted with transmitters in 2008 and 2009 and were tracked using acoustic telemetry from May 2008 through July 2010. Fifteen crabs with transmitters also had archive depth-temperature tags attached. In addition, over 2000 spawning crabs (males and females) were tagged with US Fish and Wildlife (USFWS) button tags over the same period. Ninety-one percent of the crabs with transmitters were detected during this study. In the spring, crabs were primarily located in the northern section of the bay near spawning beaches, whereas in the fall crabs moved towards the deeper portions of the bay, and some may have overwintered in the bay. There was evidence that a majority (58-71%) of the females with transmitters spawned in two sequential seasons. One archive tag was recovered resulting in a year-long continuous record of depth and temperature data that, when integrated with telemetry data, indicated that the crab overwintered in the bay. The live recapture rate of crabs with USFWS button tags was 11%, with all re-sighted crabs except one observed inside the Pleasant Bay. Eighty-three percent of recaptures were found within 2.5km of the tagging location, and 51% were observed at the same beach where they were tagged. This study provides further evidence that horseshoe crabs in Pleasant Bay may be philopatric to this embayment.

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d^{15}N PROFILES IN SALT MARSH SEDIMENT CORES: EVIDENCE OF CHANGING LAND USE AND EXPERIMENTAL FERTILIZATION

Nitrogen stable isotopes have been use as indicators in estuarine organisms to identify land-derived nitrogen sources. Changes in $d^{15}N$ of salt marsh sediment with depth could be related to changes in estuarine nitrogen sources over time, and to changes in land use on the contributing watershed. To determine whether decadal-scale changes in nitrogen loading and sources are recorded in $d^{15}N$ of salt marsh sediments, we collected and analyzed cores from salt marshes receiving different nitrogen loads and sources. Cores were taken from experimental plots that were fertilized, and from salt marshes receiving different watershed-derived nitrogen loads. In salt marshes exposed to different watershed nitrogen inputs, sediment $d^{15}N$ became heavier as nitrogen loads increased and wastewater sources became more dominant. $d^{15}N$ values in experimentally fertilized plots were higher than control plots and increased over time, becoming heavier than the source fertilizer. The increase in sediment $d^{15}N$ values in fertilized plots over the fertilizer $d^{15}N$ value suggests that denitrifying bacteria responded to the increased nitrogen load and fractionated available nitrogen. Denitrification could have lead to a loss of 33 – 75% of experimentally added nitrogen, a much larger proportion than the fraction buried in sediment.

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NUTRIENT-CHLOROPHYLL RELATIONSHIPS IN THE INDIAN RIVER LAGOON, FLORIDA

The Indian River Lagoon is a highly diverse estuary located along Florida’s Atlantic coast. The system is made up of the main stem and two side-lagoons: the Banana River and Mosquito Lagoon. We segmented the main stem into three sections based on spatial trends in water quality and locations of inlets from the ocean or side-lagoons. Total nitrogen (TN), total phosphorus (TP), and chlorophyll-a concentrations from 31 stations were averaged for wet (June through October) and dry (November through May) seasons. The data were analyzed by season for individual years, as well as for long term responses from 1997 to 2008. TN concentrations decreased, while TP concentrations increased, from north to south. Molar TN:TP ratios suggested phosphorus limitation in the northern and central segments and co-limitation by nitrogen and phosphorus in the southern segment. Regressions by season between TN or TP and chlorophyll-a showed significant year-to-year variability. Correlations between long-term average concentrations of chlorophyll-a and nutrients were strong for TN, TP or both, with some variability between seasons and among segments. In summary, TP appears to be limiting in the northern and central segments of the lagoon, and co-limiting (with TN) in the southern segment. The regressions between chlorophyll-a and nutrients provide a basis for relating nutrient concentrations to long-term average phytoplankton abundance in lagoon segments. An outstanding question is why there is such a significant amount of year-to-year variability in these relationships.

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FIDDLER IN THE MARSH- SPATIAL DISTRIBUTION AND ABUNDANCE OF *UCA SPP*. IN SALT MARSHES OF CENTRAL LONG ISLAND SOUND

As sea level rise (SLR) becomes a greater concern to the management and conservation of our coastlines, salt marshes are starting to experience significant changes in their character and ecology. Recent studies have documented changes in vegetation distribution and pattern in salt marshes due to SLR in the Northeast. However, there has been little examination of potential changes in marsh fauna. Fiddler crabs, *Uca spp.*, are ubiquitous members of salt marsh communities and their burrowing activity is intimately tied to salt marsh dynamics. As such, fiddler crabs may be good sentinel species to illuminate the effects of SLR on salt marsh ecology. Three marsh systems along the central Connecticut coast were studied using a landscape approach in order to determine the spatial distribution and abundance of fiddler crabs in relation to vegetation patch structure and tidal zonation. Data on the abundance of burrows and

presence/ absence of live fiddler crabs were analyzed over multiple spatial scales. Patch type is the most significant factor that determines the variability of burrow abundance. Burrows of fiddler crabs are concentrated in patch types associated with the low marsh habitat (i.e. bare ground, tall *S. alterniflora*) as commonly known, except in highly eroded low marsh. However, we also found live fiddler crabs in the high marsh, especially in patches of short *S. alterniflora* and *D. spicata*. In addition, burrows are found in hummocky *S. patens* and *D. spicata/ S. patens* mixed patches on the high marsh. These results suggest an expansion of the area that is occupied by fiddler crabs.

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SHELLFISH IN CAPE COD BAY: CENTURIES OF HARVESTING BOUNTIFUL BIVALVES

Shellfish harvesting has a long history in Cape Cod Bay. Native Americans harvested shellfish leaving shell middens as testimony to the value of shellfish collected and early European settlers survived on fish and shellfish from the bay. Later there were fishermen bullraking for quahaugs (*Mercenaria mercenaria*) with forty-foot poles while balancing on the decks of beamy catboats; harvesting oysters (*Crassostrea virginica*) from the flats and waters of Wellfleet Harbor with hand rakes and dredges; hydraulic harvesting of seaclams (*Spissula solidissima*) off Billingsgate Shoals; dragging for scallops (*Argopecten irradians*); the more recent explosion of aquaculture entrepreneurs – all of these activities maintained shellfishing as a maritime industry tied to the region and emblematic of an evolving seascape and changing resident attitudes. Fishermen have had to find other ways to stay on the water, many turning to part-time or full time aquaculture, since shellfish harvest has not been immune to the general trend of fisheries decline. The change from hunter-gatherer to farmer has been dramatic. Water quality is generally favorable for shellfish growth, survival and harvest, due, in part, to the tidal amplitude and exchange of water within the bay.

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AT THE NEXUS: RIGHT WHALES AND THE ZOOPLANKTON RESOURCES OF CAPE COD BAY

The Cape Cod Bay ecosystem has been host to right whales since Native Americans harvested whale carcasses along its shores, long before Europeans arrived. Though the number of whales has sharply declined over the intervening millennia, they continue to forage in the eastern bay each year, arriving in January and departing in May, exploiting the seasonal peak in zooplankton productivity. Because of the historic dependency of these nearly extinct whales upon the resources of the bay we have been investigating the characteristics of the zooplankton-whale relationship and assessing the impact that changes in productivity of the bay or alterations in the structure of the plankton community might have on their health and habitat use patterns. The close association between the whales and their zooplanktonic prey fundamentally controls the patterns of movement and behavior of the whales and reflects cyclical changes in the quality of the three taxa of copepod prey: *Centropages* spp.,*Pseudocalanus* spp,and *Calanus finmarchicus*. Based upon estimates of the rate of caloric capture, the zooplankton resource of the bay presently appears to be supportive of the right whales, however preliminary models of the characteristics and filterability of the resource and changes due to alterations in the coastal system could eliminate the bay as a critical habitat for the last right whales. Our data demonstrate the tight interrelationship between the proximal influences of the zooplankton resource and the less well defined impacts of noise pollution and inter-annual fluctuations in prey availability on health, reproduction, and habitat use of the species.

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VEGETATION RESPONSE TO PREDICTED INCREASED TIDAL MARSH INUNDATION IN NORTHERN NEW

ENGLAND BRACKISH MARSHES: PRELIMINARY RESULTS

Brackish marsh vegetation distribution is strongly controlled by its hydraulic regime, and is likely to be impacted by climate change and sea level rise due to changes in the periodicity and magnitude of freshwater and salt water inputs. With increases in sea level, shifts in dominant marsh species would be expected, altering typical brackish marsh plant diversity and moving these systems towards saltier marsh vegetation. Yet little is known about the effects of these hydraulic regimes on brackish marsh floral communities in northern New England. This summer, experimental transplant plots were set up within the high and low marsh of contrasting salinity sites along the Marsh River in Newcastle, Maine. Four species, one common from each extreme, were paired and pairs replicated with each plot to determine plant response to changed environmental variables. Response variables measured included shoot growth, and initial and final aboveground biomass. Preliminary findings will be discussed. The results from this study should allow the construction of a model as a guide for predicting vegetation response to inundation and salinity along a brackish gradient using this season's experimentally obtained information on plant responses to these different regimes.

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WHY ARE *THALASSIA TESTUDINUM* LEAVES TURNING RED IN SOME AREAS OF THE LOWER FLORIDA KEYS?

Leaf reddening occurs in numerous seagrass species growing in shallow waters around the world, but the cause, functional role, and the factor(s) responsible for the induction of leaf reddening in seagrasses have been poorly understood. To develop an understanding of the reddening process in seagrass leaves we compared the physiological and morphological attributes of *T. testudinum* with red leaves to *T. testudinum* with green leaves and investigated the responses of green *T. testudinum* to four light conditions: 1) filters excluding UVB radiation; 2) filters excluding both UVB and UVA radiation; 3) shades reducing ambient solar radiation (including UVB and UVA) by 50%; and 4) ambient solar radiation. We documented higher effective quantum yields ($\Delta F/Fm'$) in red *T. testudinum* compared to green *T. testudinum* plants at high irradiances. In addition, we found that *T. testudinum* plants growing under ambient solar radiation had high concentrations of anthocyanins and were red while *T. testudinum* growing under conditions that excluded UVB or UVB + UVA had low concentrations of anthocyanins and were green. Our results demonstrate that leaf reddening in *T. testudinum* is caused by high concentrations of anthocyanins, may serve a protective role in this species by acting as a sunscreen and enabling plants to maintain high levels of photosynthetic efficiency during periods of high light, and is induced by UVB.

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PRELIMINARY ASSESSMENT OF SALT MARSH–EELGRASS CONNECTIVITY WITH IMPLICATIONS FOR HABITAT RESTORATION

Salt marsh and eelgrass habitats provide important ecological services, many of which are overlooked in urban settings leading to degradation and destruction of these habitats. We wish to discover whether spatial relationships between eelgrass beds and salt marshes affect water purification, biodiversity and health of each habitat. We will attempt to quantify water purification within each habitat and discern whether water purification is more efficient when eelgrass beds and salt marshes work in concert with one another. Additionally, if a spatial relationship exists, what type of spatial relationship would benefit biodiversity and overall health of each habitat? In an attempt to select model study sites, eelgrass beds in proximity to salt marshes are currently being surveyed in Nantucket, Boston Harbor, and Cape Cod. We hope that the findings from this research will not only further the understanding of the relationship between salt marshes and eelgrass beds, but also assist with future restoration projects, particularly those related to the Green Boston Harbor Project. Should spatial relationships be considered in salt marsh and eelgrass restoration projects?

Would restoration be more successful if eelgrass beds are placed in the vicinity of salt marshes, and if so, what is the optimal spatial relationship for restoration of these two habitats?

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SEASONAL MOVEMENTS OF HORSESHOE CRABS, LIMULUS POLYPHEMUS, IN THE GREAT BAY ESTUARY, NEW HAMPSHIRE (USA).

The goal of this study was to determine the year round movement patterns of horseshoe crabs, Limulus polyphemus, in New Hampshire's Great Bay Estuary (USA). Ultrasonic telemetry was used to obtain movement data from 37 Limulus for periods ranging from 2 to 31 months. During the winter (December-March) horseshoe crabs moved very little. In the spring, when water temperatures exceeded 11o C, most tagged animals moved at least 1 km further up into the estuary. The exception was a group of animals (n=4) that overwintered further up in the estuary and moved slightly downstream to their spawning locations. During these up-estuary spring movements, most also appeared to move to shallower subtidal flats about a month prior to spawning. The mean distance traveled by all animals during spring migrations was 2.29 + 0.28 kms upstream. Mating occurred in May and June and during this time animals ranged most widely away from the deeper channels, spending a great deal more time in shallow subtidal areas adjacent to mating beaches. After spawning, in July and August, there was a net downstream movement of 2.03 + 0.42 kms, and during this time of year horseshoe crabs ranged quite widely, using extensive portions of the estuary. In the fall (Sept-Nov) animals moved 0.64 + 0.40 kms down the estuary and settled into wintering locations, where they remained until the following spring (mean movement Dec-Mar was 0.13 + 0.28 km down estuary). The maximum dispersion distance, or annual linear range averaged 4.59 + 1.89 km. The maximum distance traveled by any individual in one direction was 7.92 km and there was no evidence of any Limulus leaving the estuary.

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CHLOROPHYLL THIN LAYERS OF THE NORTHERN BASIN OF THE PETTAQUAMSCUTT RIVER ESTUARY: A PRELIMINARY STUDY

The Pettaquamscutt River Estuary (Narrow River) is a shallow estuary in southern Rhode Island with two deep (12 and 15 m) basins containing almost permanently anoxic bottom waters overlaid with 3-4 m of well-oxygenated waters. In October, 2007 an overturn (ventilation) occurred in the northern basin following an unusually dry summer and early fall which limited the freshwater input to the estuary. While the overturn occurred for only six weeks, this event attracted researchers to a different phenomenon: a chlorophyll thin layer (TL) in both basins. It has been observed consistently for three years with intensities ranging between 20-600 µg/l. Over 50 profiles of the northern basin have been taken and examined. In order to ascertain the characteristics, composition, and general behavior of TL over time, parameters such as dissolved oxygen, salinity, temperature, fluorescence, chlorophyll, secchi depth, and quantum efficiency of phytoplankton photosynthesis were measured weekly. Whole water samples were taken monthly for phytoplankton counts and identification. While the general pattern of the TL intensity declining from summer to winter has been observed, differences have emerged in comparing years. *Prorocentrum minimum* dominated immediately after the overturn, while *Euglena proxima* dominated each summer through 2009, but was markedly reduced during summer 2010. This presentation will offer the characteristics and possible relationships of the depth and intensity of the TL with salinity, secchi depth, phytoplankton species, and season.

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EELGRASS GENETICS AND RESILIENCE IN SOUTHERN NEW ENGLAND AND NEW YORK TO SUPPORT MANAGEMENT AND RESTORATION SUCCESS

We are engaged in a project, funded by The Nature Conservancy, to create a nexus of genetic and other eelgrass (*Zostera marina* L.) information to advance both management and restoration science in southern New England and New York coastal waters. Our approach assesses the genetic diversity and population structure of eelgrass across the region and tests specific genotypes using an experimental factorial design of potential stress parameters to yield maps of eelgrass distribution and resilience. Genetic testing will determine the number of genetically different populations to understand the genetic resilience of eelgrass in the region. Genetic differentiation will identify the genetic makeup of distinct eelgrass populations to allow sampling of eelgrass clones across the region for the stressor studies. We combine: 1) evaluation of the genetic differentiation of eelgrass populations in southern New England and New York, 2) detailed geographic studies of eelgrass genetic diversity and resilience and, 3) experimental testing of plant tolerances which includes multiple stressor spatial data based on field studies and mesocosm experiments. The results of our study will provide information on environmental parameters and stressors to eelgrass, needed to improve site selection for restoration and to identify genetically resilient populations of eelgrass with adequate genetic diversity for restoration success.

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THE POTENTIAL FOR VEGETATION RESTORATION IN SALT MARSH DIEBACK AREAS USING EROSION CONTROL FABRIC (CAPE COD, MASSACHUSETTS)

Salt marsh vegetation dieback from crab (*Sesarma reticulatum*) herbivory is a serious problem on Cape Cod. Continuous grazing by large populations of these crabs eventually cause plant mortality. This, in turn, has created large, barren areas of marsh that are highly susceptible to sediment loss through erosion. In fact, the deterioration of peat platforms and broader geomorphic changes have become widespread and quite severe over the last few decades. In 2010, studies were undertaken to assess whether erosion control fabric could be used to limit or prevent such losses. The basic premise was that permeable fabric with relatively small mesh size laid on top of denuded (bare sediment) areas would prevent the majority of Sesarma crabs from accessing the surface of the marsh and consuming the aboveground foliage of either transplants or new ramets spreading from adjacent stands. Initial results show that erosion control fabric permits normal plant growth to occur, while suppressing or completely preventing herbivory - thus allowing vegetation to thrive in dieback areas where grazing pressure is high. Variability in the results is mostly related to heterogeneity in grazing pressure among sites and the integrity of the exclusion walls surrounding the experimental plots. Notwithstanding, this method has the potential to aid in the preservation and eventual recovery of sizeable areas of denuded marsh.

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ESTUARINE WATER COLUMN FILTRATION BY *ZOSTERA MARINA* L. (EELGRASS) AND *CRASSOSTREA VIRGINICA* EASTERN OYSTER)MEASURE USING MESOCOSMS

An important role of eelgrass and oysters in the ecosystem is their ability to filter the water column. *Zostera marina* L., eelgrass, and *Crassostrea virginica*, eastern oyster, alone or in combination, contribute significantly to the clarity of estuarine waters. A mesocosm study was utilized to investigate the filtration capabilities *Z. marina* and *C. virginica*

using clay, silt, mud and mud + phytoplankton. Seston additions were made to twelve mesocosm tanks with the four habitat types of eelgrass alone, oysters alone, eelgrass + oysters and no eelgrass or oysters (control) to determine the rate of water column filtration. The results demonstrated differences in the capacity of eelgrass and oysters to remove the various fractions of seston. Our findings demonstrate that eelgrass is the most effective filter of the water column regardless of seston grain size. Oysters significantly increased the removal rate of mud + phytoplankton, but not of mud alone. For clay, eelgrass + oysters was an even more effective filter than eelgrass alone. An estuary functions with greatest filtration capacity when a healthy eelgrass habitat and extensive oyster populations are present.

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NON-LINEAR RESPONSES OF BOSTON HARBOR TO LARGE DECREASES IN NUTRIENT AND ORGANIC MATTER INPUTS

Inherent in management actions to reduce nutrient and organic matter loadings is the assumption that coastal aquatic ecosystems respond in a linear manner to the decreases. Recent evidence from Boston Harbor suggests that this assumption may not be valid, at least for highly-enriched, well-flushed systems in the northeast USA. Between 1991 and 2000, the external non-oceanic loadings of total N (TN), total P and particulate organic C (PC) to the harbor were decreased by between 80% and 90%. The N and P concentrations in the harbor water-column, the benthic invertebrate diversity, and the benthic sediment oxygen uptake, all changed in linear proportion to the loadings of TN. For phytoplankton biomass (measured as chl a), water-column PC and bottom-water DO, the changes were curvilinear relative to loadings, with the changes larger at low than high loadings. For this highly-enriched, well-flushed system, the decreases in loadings had quite different effects depending on the base-loadings to the system.

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DEVELOPMENT AND VALIDATION OF A HYBRID PHYSICAL-ECOLOGICAL MODEL OF NARRAGANSETT BAY, RI, USA.

Ecosystem level models are becoming a common tool for informing decisions regarding coastal waters and land-use in the surrounding watersheds. Many of these models are complex, containing numerous parameters that are hard to constrain. Some also require long run times to model a relatively short time span. As part of the NOAA Coastal Hypoxia Research Program (CHRP), we have developed a hybrid model of Narragansett Bay, RI which couples mixing results from the fine-grid Regional Ocean Model System (ROMS) with a coarse-grid, simplified ecological model. The model can be run on a desktop computer, generating a year of output in under one minute. This hybrid model estimates water column chlorophyll, dissolved inorganic nitrogen, dissolved inorganic phosphorous, dissolved oxygen, and labile sediment organic carbon. Physical mixing coefficients have been developed for 2006 and skill assessments comparing output from the hybrid model to field data from this time frame indicate the model adequately replicates the field data. Validation and sensitivity analysis of the model are ongoing, with the ultimate goal of using the model to evaluate management scenarios and their effect on the severity and areal extent of hypoxia in Narragansett Bay.

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EFFECTS OF FERTILIZATION ON BENTHIC AND PELAGIC SILICA FLUXES IN A NEW ENGLAND SALT MARSH

Silica is an important nutrient for many ecosystems; it is especially crucial in coastal systems where it contributes to the structure of marsh grasses as well as that of phytoplankton, specifically, the frustules of benthic and pelagic diatoms. Though silica is not classically thought of as an anthropogenically influenced nutrient, it is indirectly affected by increasing concentrations of nitrogen and phosphorous. As these two nutrients increase in concentration, dissolved silica can become a limiting nutrient in the water column. This study seeks to understand the effect of such nutrient loading on both benthic and pelagic silica fluxes in salt marsh tidal creeks. Three feeder creeks to Plum Island Sound (one reference, one fertilized for two years, and one fertilized for seven years), were analyzed over three full tidal cycles in mid July 2010. Each was enriched with a liquid fertilizer with a 5:1 nitrate to phosphate ratio. During each of the three tidal cycles the two enriched creeks received a new concentration of fertilizer, first seventy, then zero, and finally one hundred and forty micromoles per liter continually for twenty-four hours. Preliminary results of this study show dissolved silica concentrations ranging from six to one hundred and fifteen micromoles per liter with a strong inverse relationship between dissolved silica and tidal level. This research will add to our understanding of the implications of silica limitation in nitrogen-enriched systems, how it influences larger-scale silica fluxes, and what that may mean for higher trophic level organisms.

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SUCCESSFULLY DESIGNING WETLANDS RESTORATION PROJECT: CAN IT BE DONE?

Creating and restoring wetlands has become a national initiative over the past 5 years. The number of restoration projects has increased dramatically. Unfortunately, the number of failures and/or projects that have not fully met their design goals has also increased. Most scientists and engineers that design wetlands restoration projects realize that the design of wetland restoration and creation projects is a complicated process. The basic steps remain the same for both types of projects. However, if the design steps are well known, why have so many projects failed to obtain success? Perhaps this is because wetlands restoration is presently in vogue? More likely failure has occurred because wetlands restoration projects are being designed by engineers and scientist that lack the background and/or the experience to complete a wetlands restoration that will be successful. In general, unsuccessfully designed projects have often omitted one or more of the critical design steps that provide feedback to the design team. Over the past 1½ years the Woods Hole Group has been examining various design documents that are available to engineers, biologists, and ecologists. We have found that all of the documents identified are lacking in some aspect of correctly designing wetlands restoration projects. This paper will discuss the results of our work and present recommended steps for successfully designing a wetlands restoration project by using an example of a successfully designed large-scale wetlands restoration project.

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QUANTIFYING AND DETERMINING A POSSIBLE MECHANISM FOR THE COLLAPSE OF ARTIFICIALLY FERTILIZED PLUM ISLAND SOUND SALT MARSH CREEK BANKS

Effects of nutrient enrichment in salt marshes have recently become an area of heightened interest. Salt marshes are commonly believed to be nearly limitless sinks for nutrients, thus providing a buffer for estuarine waters. The TIDE project (Trophic Cascades and Interacting Control Processes in a Detritus-based Aquatic Ecosystem) attempts to test one hypothesis implied by this idea: that nutrient enrichment does not have a negative impact on salt marshes. TIDE has been artificially eutrifying two salt marsh creeks (50 – 70 µM NO_3, ca. 10X background) since 2004. Intertidal creek banks, dominated by *Spartina alterniflora*, appear to be deteriorating structurally in fertilized creeks relative to the control creeks. The objectives of our work were to quantify the observed deterioration and to test the hypothesis that fertilization weakens peat structure. In fertilized creeks there was a significantly greater quantity of cracks in creek bank *Spartina patens* peat and bare mud in *S. alterniflora* low marsh compared to controls. Twenty peat cores each were analyzed from fertilized and control creeks. Factors compared were live and dead belowground biomass, bulk density and water content. Live biomass was significantly greater in control sites. There were no differences in dead biomass. Peat water content was significantly greater in cores from fertilized creeks and bulk density was greater in the cores from control creeks. We conclude that fertilization has decreased peat structural integrity by decreasing live roots and rhizomes and increasing water content. We argue that the combination of these factors contributes to the deterioration of the intertidal creek bank.

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