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The Rising Tide: Spring 2007

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Spring 2007 Newsletter



The Nahant Hotel (picture courtesy of the Nahant Historical Society)



The Lodge Estate



The James Estate



The MSC Today



Past MSC Directors Ken Sebens, Doc Riser, Joe Ayers

Celebrating 40 Years of Marine Science 1967 - 2007

The Marine Science Center (MSC) is located a short distance from the former summer cottage and marine laboratory of Harvard Professor Louis Agassiz, the founder of American marine biology in the mid-19th century. Agassiz was a pioneer in marine science education and he promoted the formation of seaside laboratories where students could "Study nature, not books.

From 1823 – 1859, the Nahant Hotel existed on the MSC property. This world–class hotel at the time had 300 rooms and a dining room that held 1000 people. Nahant was a popular summer residence for many Harvard faculty (Agassiz, Longfellow, Felton) many of whom gave public lectures at the Nahant Hotel. The Hotel burned down in 1861. John E. Lodge (married to Anna Cabot) purchased the property and two houses were built for his children Senator Henry Cabot Lodge and Elizabeth Cabot Lodge (wife of George Abbot James).

In 1941 the site was used by the military for the construction of defensive fortifications for Boston Harbor. The fortifications consisted of a 5-inch cannon bunker as well as a larger 16-inch Coastal Defense cannon bunker and associated plotting room and triangulation towers. A Magnetic Loop station to detect submarines was housed in two smaller bunkers near the tip of East Point. In 1954 a Nike missile launcher site was constructed along the southeast rocky coast of the point that is now Lodge Park.

In 1967, Northeastern University acquired the property and Dr. Nathan

"Doc" Riser was appointed the first Director of the Marine Science Institute (now Marine Science Center) in Nahant, a position he held until his retirement in 1985. After his retirement, Doc Riser continued to conduct his research at the MSC until his passing last year. The MSC developed into a world-recognized center of marine organismal research and education following Agassiz's belief in studying nature and not just books.

Today the MSC continues to be a world recognized center of marine science research and education. By the end of this year we will have 6 research labs at the MSC for our resident Biology Department faculty. Our research areas include: Marine Ecosystems, Evolutionary, Physiological, Molecular and Community Ecology, Marine Neurophysiology and Behavior, Genomics. Microbial Ecology, Biological Oceanography, Vertebrate Systematics and Ecology (including fish and marine mammals), Macroalgal Biotechnology and Marine Pollution Remediation.

The Three Seas Program is in its 23rd year of operation and continues a strong reputation of training the next generation of marine scientists. The newly established professional master's program is becoming a highly sought after degree.

The Outreach Program occupies the former generator room of the John. B. Murphy gun battery. Last year over 5000 K-12 students visited the MSC for outreach activities. The RV Mysis had an interior makeover this winter and is in "ship shape" for this upcoming busy season.

We will be holding our annual Open House on Saturday October 6^{th} . Please mark you calendars and join us for our 40^{th} Celebration!

This issue of the MSC Newsletter is an exciting one. This is our first issue with a refreshed layout and with our new name: "The Rising Tide". This issue will highlight the research, education, and outreach activities happening at the MSC.

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Ed Jarroll MSC Director

Director's Report

This year the MSC has seen a number of changes in personnel and facilities. By now most of you know that we lost our first director, Doc Riser, last summer. Steven Vollmer arrived in January, 2007 as our newest Assistant Professor and his laboratory is currently under renovation. Dr. Matt Bracken will join us in fall 2007 and plans already exist for his laboratory renovation. Dr. Sun-Hee Hong, a postdoctoral fellow in Prof. Epstein's group, has joined us here at the MSC.

I have become the full time Director of the MSC after leaving my position as Associate Dean. Dr. Gwil Jones is in the process of moving his entire bird and mammal (including marine) collection to the MSC. Gwil joins us as the Associate Director.

Our new Mysis Captain is James Baginski, who joins us with many years of experience as a ship's captain. He spends much of his time aboard the RV Mysis preparing for our busy spring outreach season.

I wish to acknowledge and congratulate Profs. Joseph Ayers, Slava Epstein and Geoffrey Trussell who received new federal grant support; Dr. Jeremy Long, one of our postdoctoral fellows, received new foundation support to continue his research; and Meredith Doellman received an NSF graduate fellowship to support her doctoral research.

Outreach has had another successful year of interactions with K-12 youngsters, colleges, and other regional institutions. In the past year we have had a whopping 5000 K-12 students use the MSC's educational outreach programs.

Our outreach coordinators, Emily Blume and Tracy Hajduk, deserve congratulation, not only for their hard work with outreach programs, but because they both received a certificate of recognition from the Massachusetts Marine Educators. Additionally, both will receive their M.A.T. (Masters of Arts in Teaching) degrees from Northeastern on May 5th.

Dr. Sal Genovese, the Director of the Three Seas (Program (TSP), informed me that applications are holding steady for the undergraduates and up significantly for our Professional Masters in Marine Biology and new degree program which is completing its second full year.

We here at the MSC wish to thank everyone who has contributed to the Riser Memorial fund. Money from this fund will go toward supporting students in marine biology according to the Riser family's wishes.

Joseph Ayers Lab

During the past year considerable progress has occurred in the Biomimetic Underwater Robot Program. RoboLobster I is now on Exhibition at the Cooper-Hewitt Smithsonian National Design Museum in New York. This summer it will be sent on the National Design Triennial exhibit "Design Life Now" tour to Houston and subsequently to Boston.

The program has received new external funding from the Office of Naval Research to conduct experiments in sensor fusion, the Massachusetts Technology Transfer Center to perform a market assessment for biomimetic robots and a phase II SBIR grant from DARPA/IPTO to construct an electronic nervous system composed of electronic neurons and synapses in collaboration with Information Systems Laboratories (San Diego) and Prof. David Brady of the Department of Electrical and Computer Engineering at Northeastern. This latter grant is aimed at maximizing the adaptability of RoboLamprey by exploring the use of variable chaos at different levels in the nervous system to overcome perturbations while homing on a sonar beacon. Prof. Brady is constructing a short-baseline sonar array for this purpose.

Three students participated in the program this past year. Dan Knudsen completed his honors thesis: "Creating Functional Neural Control Circuits Incorporating Both Discrete Time, Map-Based Neurons And Hindmarsh-Rose Electronic Neurons" and was accepted into the Neuroscience Program at UC San Diego. Daniel Schmidke (University of Hanover) performed his diploma research on neuromodulation of the lobster swimmeret system in the laboratory.

Anthony Westphal (University of Wollongbong), performed a 6-month internship in the laboratory performing a microcode upgrade of RoboLamprey. Anthony and Peter Brannan will be starting as PhD students in the summer and will work on the DARPA SBIR Program. (Cont. on pg. 3)



RoboLobster I

Joseph Ayers Lab (Cont. from pg. 2)

During 2006-2007, Prof Ayers was an invited speaker at three international conferences: (1) the 7th Annual Conference on Technology and The Mine Problem at the Naval Postgraduate School, April (2) International Symposium on Aquabiomechanisms 2006, Ginowan, Okinawa, Japan, July, 2006 and (3) International Conference on Robotics and Automation, Workshop on Biomimetic Robots. Rome, Italy April 2007.

Recent Publications

Ayers, J. and Witting, J. (2007) Biomimetic Approaches to the Control of Underwater Walking Machines. **Philosophical Transactions of the Royal Society, A**, **365**, 273–295

Selverston, A. & Ayers, J. (2006) Oscillations and Oscillatory Behavior in Small Neural Circuits. Biological Cybernetics 95:537–554

Lee, Y., Lee, J., Kim, K., Kim, Y., Ayers, J. (2007) Low Power CMOS Electronic Central Pattern Generator Design for a Biomimetic Underwater Robot. Neurocomputing, *In Press*.

Matthew Bracken Lab



Dr. Matthew Bracken

My current research focuses on understanding the causes and consequences of changes in marine biodiversity. I recently set up a field experiment to quantify the effects of consumers, nutrients, and thermal stress on sea-

weed diversity. Based on the data from this experiment and on surveys of seaweed diversity along tide-height and wave-exposure gradients, I will conduct physiological experiments to evaluate the relationships between realistic diversity changes and important ecosystem functions such as nutrient uptake and photosynthesis rates.

Other current projects include participation in an NCEAS working group evaluating trophic conversion efficiency across ecosystems. My colleagues and I have used meta-analyses to evaluate the effects of consumers and nutrients on producer diversity and biomass and to examine the roles of multiple nutrients (N, P, and both N and P together) in promoting the growth of algae and plants in virtually every ecosystem on Earth. I am also using fisheries data to look at relationships between fish diversity and catch levels. I have found that where fish diversity is higher, catches of both target fish and total fish are higher.

I will arrive at the MSC in August and am finalizing plans for my new research facilities there, which will include both an analytical laboratory for measurement of physiology and seawater nutrients and a space for field preparation and sample processing.

Recent Publications

Bracken, M.E.S., C.A. Gonzalez-Dorantes, and J.J. Stachowicz. *in press*. Whole-community mutualism: associated invertebrates facilitate a dominant habitat-forming seaweed. *Ecology*.

(Cont. on pg. 4)

Matthew Bracken Lab (Cont. from pg. 3)

Bracken, M.E.S. *in press*. Monocultures versus polycultures. *in* S.E. Jørgensen, editor. Encyclopedia of Ecology. Elsevier, Oxford, UK.

Bracken, M.E.S. *in press*. Excretion. *in* M.W. Denny and S.D. Gaines, editors. Encyclopedia of Tidepools and Rocky Shores. University of California Press, Berkeley, California, USA.

Bracken, M.E.S. and J.J. Stachowicz. 2007. Top-down modification of bottom-up processes: selective grazing reduces macroalgal nitrogen uptake. *Marine Ecology Progress Series* 330: 75-82.

Bracken, M.E.S. and J.J. Stachowicz. 2006. Seaweed diversity enhances nitrogen uptake via complementary use of nitrate and ammonium. *Ecology* 87: 2397-2403.

Donald Cheney Lab

This past fall semester, MS graduate student Tim Hogan successfully defended his thesis on the "Palatability and digestibility of a macroalgal-supplemented feed by rainbow trout (Oncorhynchus mykiss)." His research is the first to provide such crucial data for any seaweed, which is necessary before they can be used as a supplemental source of protein and polyunsaturated fatty acids (PUFAs) in fishmeal for fish aquaculture. Developing a seaweed supplement in fishmeal is important because it reduces the dependency on small pelagic fish for fishmeal and increases the sustainability of fish aquaculture. The seaweed tested in this study was *Porphyra vezoensis*, which we had previously shown to have a very high protein level and a fatty acid profile similar to that found in fish typically used for fish oil (eg. herring and anchovy). Overall, the results were very promising and suggest that Porphyra would be a good candidate for use as a fishmeal supplement. Tim presented his work at the World Aquaculture Society Annual Meeting in San Antonio, Texas, in February.

Another graduate student in the Cheney Lab that graduated in the fall semester, and that people will remember, is Phil Colarusso. Phil successfully defended in PhD in December on the "Natural and stress induced changes

in nonstructural carbohydrates in eelgrass (*Zostera marina*)." Phil continues to work at the EPA and oversee their eelgrass-related projects.



Student, Chris McHan

New to Don's lab are MS student Chris McHan, who is studying the reproductive ecology of the invasive green alga Codium fragile ssp. tomentosoides in Massachusetts, and Matt Brudner, a Matz Fellowship undergraduate. Matt and Don are trying to identify native seaweed strains that can be used to remediate marine waters and

sediments of PCBs and PAHs, the two most widespread pollutants in marine sediments. Extremely little is known about the ability of seaweeds to take up PCBs and PAHs, or about the effect these pollutants have on seaweeds. Already they have found a seaweed that rapidly takes up the two pollutants and appears to be able to metabolize at least some PAHs. In addition, it appears that *Littorina littorea* avoids eating plants that have taken up PAH pollutants.

Recent Publications

Cruz-Uribe, O., Cheney, D., and Rorrer, G. 2007. Comparison of TNT removal from seawater by three marine macroalgae. Chemosphere 67: 1469-1476.

Reddy, C.R.K., Dipaklore, S., Kumar, R., Jha, B., Cheney, D. and Fujita, Y. 2006. An improved enzyme preparation for rapid mass production of protoplasts as seed stock for aquaculture of macrophytic marine green algae. Aquaculture 260: 290-297.

Slava Epstein Lab

The principal driving force in Epstein lab is fascination with diversity and complexity of microbial life. Our research program addresses some of the most exciting issues in today's basic and applied microbiology. Current knowledge of microbial diversity is decidedly incomplete. This creates inspiring opportunities, and microbial discovery has become the unifying theme of all the research in my lab. Over the past year, we have focused on several specific projects:

1. Uncultivated microbial majority

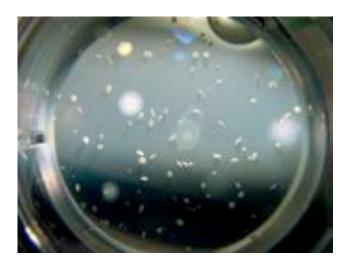
Over 99% of the microorganisms in nature do not grow in the lab. Overwhelming majority of microorganisms have never been cultivated, remain essentially unknown, and represent one of the largest reservoirs of hidden biological and chemical diversity on this planet. We have developed a novel (and recently patented) approach to microbial cultivation that allows access to the uncultivated microbial majority. This approach departs from the idea of microbial cultivation on Petri dish in the laboratory. Instead, it employs nature as a source of growth components, and replaces the traditional Petri dish with a diffusion growth chamber incubated in the natural environment. approach allows us to grow several hundred times more microorganisms than do the traditional techniques, and this opens the door into the previously hidden part of microbial biodiversity. We are presently growing and isolating novel microbial species through our diffusion chamber approach to learn:

- how to domesticate them in the lab;
- what species produce interesting biological activities:
- what role they play in bioremediation;
- how to adapt our methodology for search for extraterrestrial life.

2. Missing kingdoms

The record of global protistan diversity is particularly deficient, even at the kingdom level. We have been at the forefront of discovering large groups of eukaryotes of the highest taxonomic order that until recently were unknown to

science, and remained unexplored. We are using a multitude of cutting edge molecular technique to detect, describe, and characterize novel forms of microbial eukaryotes, paying special attention to extreme environments around the globe. Our recently completed survey of molecular diversity of microbial eukaryotes in the Caribbean is the largest conducted to data, and doubles the amount of relevant information in the entire Genbank. In our research on novel microorganisms in High Arctic, we discovered what appears to be the richest community described so far. Another study that focuses on microbial eukaryotes in the extreme environments in Mediterranean identified large groups of these organisms of the highest taxonomic novelty. Related is our research on the nature of microbial species. We explore a variety of molecular and bioinformatics approach to understand how microbial species evolve, and how to detect and define them in the environment.



Currently, 5 PhD students, 2 exchange students from Germany and Venezuela, 2 undergraduate researchers, 1 Postdoctoral Fellow, and 1 Senior Scientist work on the above projects 24/7/365, with passion and dedication, pushing the limits of today's environmental microbiology and microbial ecology.

Recent Publications

Jeon, S.O., Bunge, J., Stoeck, T., Barger, K. J. A., Hong, S. H., Epstein, S. S. (2006). Sybthetic Statistical Approach Reveals a High Degree of Richness of Microbial Eukaryotes in an Anoxic Water Column. Applied and Environmental Microbiology, Oct. 2006, p. 6578-6583

Stoeck T., Hayward B., Taylor G.T., Varela R., Epstein S.S. (2006). A multiple PCR-primer approach to access the microeukaryotic diversity in environmental samples. Protist, Vol. 157, 31-43, January 2006

Hong S.-H., Bunge J., Jeon, S.-O., and S.S. Epstein. (2006) Predicting microbial species richness. PNAS 103: 117-122

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Gwilym Jones Lab

Presently my primary research focus is an historical and contemporary study of the distribution and status of the mammals of Massachusetts. Coincidental studies include endo- and ectoparasites of the small mammals and carnivores, as well as carnivore food habits. I am particularly interested in the zoogeography and seasonal population of ectoparasites. Graduate students in my laboratory have/are studying insectivore and rodent systematics, insectivore and rodent ectoparasites, carnivore endoparasites, carnivore and fish food habits, biology and insular and urban brown rats, management issues relative to harbor porpoise populations, and behavior of pilot black whales, harbor seals, mute swans and song sparrows.

Currently, my graduate students' projects include studies of anatomical studies of the white-sided dolphin and long-finned pilot whale, and behavioral studies of harbor seals and gray seals.



Humpback Whale Skull

The Jones Lab also has a marine mammal research collection, already housed in the bunker system, that contains 619 specimens (full skeletons), from the small (porpoise) to the largest (blue whale). There are 213 seals, sea lions, and walrus (7 species) and 406 porpoises, dolphins and whales (20 species). In addition, the fish collection being transferred to MSC contains over 300 species and will be incorporated with the MSC fish collection. Overall, the vertebrate research collection contains 465 mammal species

(nearly 40,000 specimens), 345 bird species (including a wide variety of marine species), and 212 reptile/amphibian species.

As for activities at the Jones Lab, I recently made a presentation at the 13th Annual Conference, Ecological Landscape Association in Springfield in March (2007) -

subject: Mammalian depredation; My lab also presented posters at the 63rd Northeast Fish and Wildlife Conference in Mystic in April (2007) – Meghann Murray (M.Sci student) subject: Interspecific haul-out behavior of harbor and grey seals on Cape Cod; Larisa Gokool (undergrad), Sean Kent (Ph.D. student) subject: Frequency of female androgyny in *Martes pennanti*. I am being featured in a book on the history of science at Hanover College (est. 1827), Hanover, Indiana.

Finally, the Jones Lab is in the process of moving to its new location at the Marine Science Center in the upcoming months.

Geoffrey Trussell Lab

Research in our lab continues to focus on a number of important topics in ecology. I have been principally occupying my time with examining the importance of trait-mediated indirect interactions (TMIIs) on rocky shores. This endeavor has involved participating in an NCEAS working group on trait-mediated effects as well as conducting several experiments. In particular, our recent research has focused on how environmental context shapes the strength and sign of TMIIs and identifying how TMIIs may influences ecosystem functions. We will continue to explore latter topic on rocky shores and Catherine Matassa and I will head to old field communities in Connecticut this summer to explore how predation risk influences energy transfer with Os Schmitz (Yale) in his experimental food webs.

Finally, I have developed an NSF proposal with Barney Luttbeg (UC Davis) that combines our respective expertise in experimental ecology and modeling to examine whether models based on short-term empirical data can reliably predict, among other things, the long-term relative importance of TMIIs. We're keeping our fingers crossed! Our lab also attended the 36th annual Benthic Marine Ecology Meeting in Atlanta, Georgia from March 21-25. Postdoc Jeremy Long gave a cool talk on inducible defenses in sequences that are based on an uncoming pener in Ecology.

Postdoc Jeremy Long gave a cool talk on inducible defenses in seaweeds that are based on an upcoming paper in Ecology and Andrew Altieri spoke about his great work on facilitation in cobble beach communities.

PhD students Genevieve Bernatchez and Elizabeth Bryson gave great talks on the non-lethal effects of an invasive predator on mudflat community diversity and geographic variation in rocky shore community succession. Meredith Doellman and Catherine Matassa presented excellent posters on the effects of predation risk on prey functional responses and spatial variation in foraging behavior.

In other news, Meredith Doellman was just awarded an NSF Graduate Fellowship to round out her Honorable Mention last year. Dr. Jeremy Long and I have been asked to move forward with our pre-proposal to a full proposal to

(Cont. on pg. 7)

Geoffrey Trussell Lab (Cont. from pg. 6)



Dr. Geoffrey Trussell

establish a long-term monitoring program of intertidal communities on the Boston Harbor Islands and other National Park areas in the Gulf of Maine. Finally, the lab was also awarded a grant from NSF to examine the effects of flow turbulence on the relative importance of nonconsumptive and consumptive predator effects to trophic cascades on rocky shores. This work is in collaboration with Dr. Lee Smee (Texas A&M, Corpus-Christi).

Finally, our Three Seas postdoc, Andrew Altieri, will be heading to Brown to do a post doc in Mark Bertness' lab. His time here was too short and while we will miss having him around full time, Andrew is planning to continue his work on the impact of striped bass on subtidal communities in Nahant.

Dr. Jeremy Long, Postdoctoral Researcher, Trussell Lab

With Geoff Trussell as a co-PI, I submitted a proposal to develop a program that will monitor plants and animals living within the intertidal zones of Acadia and Boston Harbor Islands National Parks. Our proposal received excellent reviews and it appears that we will receive this grant. This is excellent news because it will allow me to remain at the MSC for an additional two years. A significant part of our efforts will be dedicated to building a volunteer base to help conduct rocky intertidal surveys at both parks.

I recently presented my research at two scientific conferences. In the fall, I attended the annual Western Society of



Dr. Jeremy Long

Naturalists Meeting in Redmond, WA. I was hoping to do a side-trip to go snowboarding but I was a week early before the first big snowfall. In March, I attended the annual Benthic Ecology Meeting at my alma mater (Georgia Tech) in Atlanta, GA. I enjoyed seeing old friends and visiting some of my previous haunts. During this meeting, I met with Swedish and Chilean researchers to design experiments to be conducted in their countries. For example, I am traveling to Sweden for science at the end of May. Additionally, Cal State Long Beach and Chapman University invited me to present seminars on my research.

A manuscript submitted by myself and two undergraduates, Rebecca Hamilton and Northeastern's Jocelyn Mitchell, entitled, "Asymmetric competition via induced resistance: specialist herbivores indirectly suppress generalist preference and populations," is in press at Ecology. Our paper describes a new way by which marine herbivores may compete with each other. This manuscript was recently highlighted in the Bulletin of the Ecological Society of America. I have two papers in revision and two others that I expect to submit for publication soon.

If you are interested in spending some time outdoors in National Parks and joining our team, please contact me via email, j.long@neu.edu.

Recent Publications

Kishida, O., G.C. Trussell, K. Nishimura. 2007. Geographic variation in a predator induced defense and its genetic basis. *Ecology (in press)*..

Long, J.D., G.C. Trussell. 2007. Geographic variation in seaweed induced responses to herbivory. *Marine Ecology Progress Series* 333: 75-80.

Trussell, G.C., P.J. Ewanchuk, C.M. Matassa. 2006a. The fear of being eaten reduces energy transfer in a simple food chain. *Ecology* 87: 2979-2984.

Trussell, G.C., P.J. Ewanchuk, C.M. Mattassa. 2006b. Habitat effects on the relative importance of trait and density mediated indirect interactions. *Ecology Letters* 9: 1245-1252.

Trussell, G.C., M.P. Lesser, M.R. Patterson, S.J. Genovese. 2006. Depth-specific differences in the growth of the sponge *Callyspongia vaginalis*: the role of bottom-up effects. *Marine Ecology Progress Series* 323: 149-158.



I am one of two new faculty hires to Northeastern's Marine Science Center. I arrived on January 1 from the tropical climate of Panama where I was a researcher with the Smithsonian Tropical Research Institution for the past 3 years. I am a molecular geneticist and I study how marine organisms evolve and adapt to their environment.

I work on a variety of marine organisms but my specialty is tropical reef-building corals. My research has focused on coral hybridization and the genetic consequences of inter-species gene exchange. This work allows me to pinpoint the genes that define the differences between corals species and have generated the diversity of corals that we see on tropical reefs. I am also using genetics to solve the mysteries of why corals are declining worldwide. My primary study organism—the Caribbean staghorn corals—have been decimated by an unknown pathogen called White Band Disease (WBD) and recently listed on the US Endangered Species Act. My research is aimed at identifying the WBD pathogen, understanding the factors controlling the spread of the disease, and identifying genetically resistant coral individuals.

Closer to home, I have recently begun collaborative research with the Trussell lab looking at the evolution and adaptation of common inter-tidal snails that occur up and down the coast of New England.

We are currently renovating my laboratory space and installing a state of the art marine genomics laboratory at the MSC. I am happy to report that two new PhD students, David Combosch and Silvia Libro, will be starting in my lab this fall.

Selected Publications

Vollmer, S.V., Palumbi, S.R. 2007. Restricted Gene Flow in the Caribbean Staghorn Coral *Acropora cervicornis*: Implications for the Recovery of Endangered Reefs. J Heredity 98: 40-50.

Willis, B.L., van Oppen, M.J.H, Miller, D.J., Vollmer, S. V., Ayre, D.J. 2006. The Role of Hybridization in the Evolution of Reef Corals. Annual Review of Ecology, Evolution, and Systematics 37: 489-517

Vollmer, S.V., Palumbi, S.R. 2004. Testing the Utility of ITS Sequences in Coral Phylogenetics. Molecular Ecology 13: 2763-2772.

Vollmer, S.V., Palumbi S.R. 2002. Hybridization and the Evolution of Reef Coral Diversity. Science 296: 2023-2025.

Vollmer, SV, Palumbi, S.R. 2002. Unisexual Clones: Lizards and Corals. Science 298: 2130-2131.

Outreach

The Marine Science Center outreach program goes far beyond "show n' tell" science education. Our K-12 Outreach Program is designed to provide a practice-oriented curriculum that supports and enriches K-12 classroom science curricula using authentic marine models and to provide fun, content-rich lessons and activities that significantly expand students' scientific literacy. Some programs we offer include marine biology cruises aboard our research vessel Mysis, guided tide pool excursions focusing on a number of themes including animal and algal diversity, invasive species monitoring and field sampling techniques, and classroom visits to local schools and after-school programs. This May we will also be running oceanographic cruises aboard our research vessel Mysis from the New England Aquarium for one week in May.

Currently the Outreach Program is accepting applicants into the Coastal Ocean Science Academy (COSA). COSA is a two-week marine science summer academy for



students entering 9th or 10th grade in the fall of 2007. Students spend time doing field work in local marine habitats, spend time aboard Northeastern University's research vessel Mysis on oceanographic trips, as well as partake in ongoing Marine Science Center research. Interested students can go to our website www.marinescience.neu.edu/COSA/index.htm

to learn more or to download an application.

This summer we are also running a number of teacher workshops and professional development sessions for local school districts on the North Shore. Programs vary in length and grade level, but all strive to assist teachers with creating inquiry-based marine science curricula and projects to use in their classrooms.

The Outreach Program just held it's final Evening Lecture Series of the 2006-2007 school year. The latest



spring lectures covered such topics as coral diseases, defensive strategies in marine life, and the life and death of horseshoe crabs. Presenters included the MSC's newest faculty member, Dr. Steve Vollmer, Dr. Jeremy Long, a postdoctoral researcher from the MSC, and Dr. Sara P. Grady a ecologist from the North and South Rivers Watershed Association. The lecture series starts again in October and is free and open to the public.

Outreach Program Coordinators, Tracy Hajduk and Emily Blume were recently awarded "Certificates of Appreciation" from the Massachusetts Marine Educators organization. This award is given in recognition of dedicated service and outstanding contributions in the field of marine science. They will receive their awards at the annual Mass Marine Educators conference at Woods Hole on May 5th.



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It's April, and the Three Seas Program has moved to its final location for the year, USC's Wrigley Marine Science Center on Catalina Island, located 25 miles offshore of Los Angeles. Students arrived at Catalina Island on March 30th, following their 2-week break after the winter session at the UC Berkeley's Gump Field Station on the island of Moorea. If you're wondering where exactly Moorea is located, it's in French Polynesia, about 10 miles from Tahiti.

While the majority of EW XXIII students decided to head home to the States for some well-deserved R&R, four women in the group decided to take advantage of Tahiti's relatively close proximity to New Zealand. Students can add a New Zealand RT leg on to their LAX-Tahiti ticket for just a couple hundred bucks. Kat Anderson, Kelsey Reider, and Kellie Spafford tramped (that's the Kiwi term for hiking or backpacking) across the North Island while Abby Dobbs and a friend took on the South Island.

Now comfortably ensconced at the WMSC, students in EW XXIII have just finished the Marine Conservation Biology course led by Dr. Kathy Ann Miller. As a new twist this year, Kathy Ann invited Tim Reed, a GIS specialist working for NOAA (Gulf of the Farallones office in San Francisco) to teach a short module on GIS mapping. Class projects were able to effectively dovetail GPS technology with GIS mapping techniques for a for a cutting-edge curriculum.

Next up at Catalina is the Marine Birds & Mammals course led by Breck Tyler (Long Marine Lab, UC Santa Cruz), followed by Dr. Gretchen Hofmann's (UC Santa Barbara) Physiological & Molecular Marine Ecology course.

We're fond of saying that the mark of our program's success in measured not only by our students' experience while in our company, but by what they are able to accomplish after completing the Three Seas Program. Summer plans are beginning to take shape for several of our students in EW XXIII:

Kat Anderson will be joining Three Seas Faculty member Dr. Rich Aronson at Dauphin Island Sea Laboratory this summer before returning to Bowdoin College this fall, while Katie Kershaw will be headed up to the Darling Center in Maine to work on lobster ecology with Dr. Rick Wahle of Bigelow Laboratories. Katie's work with Rick will continue until November, and will fulfill the internship requirement for the MS in Marine Biology Program.

Other summer research plans not quite finalized at this point include Abby Dobbs returning to the MSC to work in Geoff Trussell's lab, Kellie Spafford remaining on Catalina Island at the Catalina Island Marine Institute, and Bethany Kirpalani heading to Hawaii to assist Jackie Padilla-Gamino (our Biology of Corals TA in Moorea) on coral spawning.

Not soon to be forgotten, EW XXII is still making news. Back on main campus in Boston, a group of students from EW XXII entered Northeastern University's Amazing Husky Hunt last fall intent on showing the rest of campus how the team building skills and strong group dynamics gained in the Three Seas Program were second

to none. The Amazing Husky Hunt is a scavenger hunt taking place throughout Boston. Our group had a strategy meeting prior to the event to ensure they would be able to work as efficiently as possible when the hunt began. Well, their training paid off as their team of 12 took first place in a field of 50 teams. The stakes were high, as they were rewarded with a banquet dinner at Maggiano's restaurant, and a free roundtrip ticket anywhere JetBlue flies. In more science-related pursuits, here's a great illustration of how great training and a tremendous network of Three Seas faculty and alumni paid off with an amazing research opportunity for three students in EW XXII. A few weeks ago, Three Seas Program Director Sal Genovese received an email from Dr. Howie Lasker (SUNY Buffalo) forwarded by Dr. Brian Helmuth, a former Three Seas student/TA, who's currently a faculty member at the University of South Carolina and an instructor in our Ocean & Coastal Processes course in Moorea. Dr. Lasker was looking for a few AAUS certified divers to assist on a research project in the Bahamas during a 2-week cruise on the R/V Walton Smith. This message was subsequently forwarded to the students of EW XXII, and on May 10th, Liz Bentley, Nate Formel, and Jon Onufryk will begin monitoring marked quadrats for gorgonian recruits and assessing population densities at a variety of sites along the southern edge of the Little Bahama Bank. We wish them fair winds and following seas! Looking to the future, student enrollment in next year's Three Seas Program is promising. There are at least 10 undergraduate students slated to join us for the 2007-08 academic year, and we will round off the EW XXIV class of 20 students with graduate students concurrently enrolled in the MS in Marine Biology Program. There has been a program, as we have fielded over 30 qualified applications for approximately 10 available slots. For more information on either the Three Seas Program or the MS in Marine Biology Program, please consult their respective websites at www.threeseas.neu.edu or www.marinebioms.neu.edu.



SUMMER MARINE BIOLOGY PROGRAM 2007 COURSE OFFERINGS

Introduction To Marine Biology

BIO U151 4 SH Credits

Offered evenings: Tuesday, Thursday, 5:30 - 8:30pm; July 3 - Aug 21

Diving Research Methods

BIO U589 or BIO G289 2 SH Credits Offered Fridays, 9:00 am – 5:00 pm; May 11 – June 22.

Marine Birds & Mammals

BIO U509/510 or BIO G209/210 3 SH Credits Offered Fridays, 9:00 am - 4:30 pm; July 6 – Aug 17

Summer Science Institutes for Teachers Surveys of New England Coastal Ecosystems

Graduate Credit: SCI 3613 PDPs/CEUs: SCI 5913
Participants: Science Teachers, grades 5–12
Dates/Times: July 30 - August 3; 9:00 am – 4:00 pm

Global Threats to Marine Biodiversity

Graduate Credit: SCI 3610 PDPs/CEUs: SCI 5910 Participants: Science Teachers, grades 5–12 Dates/Times: July 16 - August 12

For more information call (781) 581-7370 x-311, or check our web site

Flotsam & Jetsam

Northeastern University Marine Science Center (MSC) Outreach Program in Nahant, in partnership with the Lynn Public Schools and the The New England Aquarium (NEAq) was awarded funding from the MA Dept of Education for a Professional Development Institute "On the waterfront" (OTW): Integrating Science Standards Through Classroom and Field Investigations of the Lynn waterfront" for Lynn School teachers in grades 6 - 8. This Institute will take place in August at the MSC.

Emily Blume and Tracy Hajduk each received a certificate of recognition from the Massachusetts Marine Educators for their contributions to Marine Science Education

Meredith Doellman was just awarded a 3-year NSF Graduate Research Fellowship.

Sun Hee Hong has joined us at the MSC and will be working in the Epstein Lab.

Nathan W. Riser Memorial Scholarship Fund

A memorial fund has been established to support students studying marine invertebrate biology at Northeastern University. If you would like to contribute to this please send a check payable to Northeastern University and write Riser Memorial on the memo line.

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Events

Coastweeks Open House Saturday October 6, 2007 10 AM – 3PM

Join us for...

Guided Tidepool and Geology Walks
Tours of the WWII Bunker
Tours of the Solar Observatory
Marine Research Exhibits
Marine Life Exhibits
Children's Activities
Beach Cleanup, and much more!

Evening Lectures Series

Monthly lectures on Tuesday evenings will begin again in October

About the Marine Science Center

The mission of the MSC consists of three principal components representing three interconnected goals:

RESEARCH

The MSC is an internationally recognized research institution that: a) focuses on the ocean environment, marine life and its diversity, ecology, and discovering biotechnological and medical potentials in the sea, and b) attracts scientists of the world to spend varying periods of time doing high quality research that will benefit the university's students and enhance reputation;

EDUCATION

The MSC is a first class teaching laboratory, a center for undergraduate and graduate education where the theory of marine sciences is as close to its practice as the sea to the station's front door;

OUTREACH

the MSC is a learning center with outreach activities to the general public that will enhance the public's awareness and knowledge of the oceans as a potential for scientific discovery and medical advances.

MSC Staff

Ed Jarroll

Director

Ted Maney

Lab Manager Diving Safety Officer

Diving Safety Officer

Sal Genovese

Three Seas Program Director

Carlos Diaz

Administrative Officer

Emily Blume

Outreach Program Coordinator

Tracy Hajduk

Outreach Program Coordinator

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MSC Faculty

Resident Faculty

Joseph Ayers

Neurophysiology and Behavior

Matt Bracken (August 2007)

Marine Ecosystems and Community Ecology

Slava Epstein

Microbial Ecology; Biological

Oceanography

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Vertebrate Systematics and Ecology

Geoff Trussell

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Pollution Remediation William Detrich

Marine Molecular Biology and Biochemistry



The RV Mysis