

Making Waves

At the Darling Marine Center



Dr. Sara Lindsay identifying polychaete worms collected in Lowe's Cove at the DMC's lower campus.

Dr. Sara Lindsay studies chemoreception in deposit feeding marine invertebrates. Chemoreception is how many marine organisms "sense" their surroundings. It plays an ecologically significant role in feeding, habitat selection, mate selection, and predator detection for many animals. Sara's current research focuses on how the molecular and physiological mechanisms of chemoreception act to coordinate responses by marine organisms, specifically polychaete worms, to changing environmental conditions.

As a relative newcomer to the Northeast, Sara is enjoying "mucking in the mud" around the Center and learning the animals which comprise our local fauna. This spring and summer, Sara will be at the DMC collecting polychaete worms to use in her research on chemoreceptors. A high school student will be helping her collect specimens and conduct behavioral experiments.

More information about Sara's research interests can be found on the internet at:
<http://www.ume.maine.edu/~marine/lindsay.htm>

Orono-based Faculty Make Good Use of the DMC

A majority of the faculty of the School of Marine Sciences are based in Orono, but many conduct research and teach classes at the Darling Marine Center on a part-time or seasonal basis. These faculty, and often, their graduate students are a vital part of the DMC's broad research mission and a part of the DMC community. Featured in this issue are Dr. Sara Lindsay (left), Dr. Paul Rawson, Dr. Cindy Pilskan, Dr. Bruce Barber, and Dr. Malcom Schick's PhD student, Nikki Adams. Turn to page 6-7 for more of these profiles.

Summer Seminar Series

The DMC's busy summer schedule includes two seminar series. The popular Thursday afternoon seminars have once again been arranged by a team of graduate students. These weekly scientific talks will be presented by visiting scientists from the Smithsonian Institution, the Virginia Institute of Marine Science, Pontificia Universidad Catolica de Chile, and a few DMC faculty. The complete schedule is on listed on page 8.

The Gulf of Maine Foundation's evening seminars are held on Wednesdays in July and August. The topics cover a wide range of historical and regional maritime issues making them popular with many in the local community and with summer visitors. Turn to page 9 for details.

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The Darling Conference Center...it's almost done!

As summer approaches, the Darling Conference Center nears completion. The dormitory wing is in the final stages; doors are going up, floors are going down and the exterior walls and decks are being stained. The final push will be to complete the dining/conference area by mid-July. Currently the large stone fireplace is being laid as the dining hall walls go up around it.

Though it's primary purpose will be the housing of undergraduate students and interns, we are increasingly aware of it's multiuse potential. With meeting space, overnight accommodations, and catered meals available, the DMC will now be able to host scientific meetings and conferences for 80-120 people. We invite interested organizations to consider using the space for meetings, courses and retreats. For more information, call our conference coordinator at 207-563-3146, ext 200 or by email at lhealy@maine.edu.



The Darling of the 90's

Recently, Director Kevin Eckelbarger had to gather some information about the Darling Marine Center. We were so surprised and tickled by the results, we just had to share them.

◆ Since 1991, \$5.5 million dollars have been invested in DMC facilities. Ninety-four percent of this funding has come from non-University sources, including \$1 million from the National Science Foundation.

◆ With the completion of the Darling Conference Center and Marine Culture Facility, currently in the design phase, the floor space at the DMC will have doubled from 1991 levels — from approximately 50,000 square feet to approximately 98,000 square feet.

◆ Over the last five years, the eight SMS faculty in residence at the Center have been awarded 104 grants from 43 state and federal agencies totaling more than \$7 million.

◆ Over the last five years, the eight SMS faculty in residence have published 160 papers in peer-reviewed journals/books.

55% organismal biology
24% geochemical oceanography
19% microbiology
2% marine archaeology/aquaculture

◆ Over the last five years, 467 visiting scientists have worked at the DMC — met with faculty, gave seminars, conducted research, took classes, etc. They came from 341 institutions, 32 states and 22 foreign countries.

◆ Over the last five years the DMC has employed 140 interns from 59 universities, 29 states and 6 foreign countries.

◆ Over the last five years nearly 1100 undergraduates have studied and worked the DMC.

◆ In 1998, twenty-five visiting colleges and universities used the DMC for teaching field-oriented marine science courses. They come from as far away as Alabama, Georgia and Nebraska, and as close as Connecticut, Rhode Island, New York and Maine.



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Tim Miller, Laboratory Manager • Linda Healy, Admin. Assistant

New Faces at the Darling Marine Center

New Grad Students & Postdocs



Dr. Sussanne Meidel joined the staff of the DMC in February as a postdoc working for Dr. Phil Yund and Dr. Bob Steneck. She received her PhD from Dalhousie University, Halifax, Nova Scotia having studied the reproductive ecology of the sea urchin *Strongylocentrotus droebachiensis*. Her work culminated in a fertilization model which predicted how sea urchin subpopulations in habitats with different food supplies may contribute to future populations and may influence general population dynamics. Sussanne is now busy in the Flowing Seawater Lab studying fertilization rates and population dynamics in our local sea urchin population, to see whether the establishment of conservation zones may help populations to recover.



Anne Simpson has come to the DMC to pursue a MS in Oceanography. Working with Dr. Les Watling, the focus of her research is two-fold: she plans to study the effects of shrimp trawling on sediment structure in muddy areas of the sea bottom and to examine what effect any alterations to the sediment structure from trawling have on the resident infaunal communities. Anne's undergraduate degree is a BS in Biology from Mary Washington College in Fredericksburg, Virginia.

Anruit "Lek" Limtrakool comes to the Darling Marine Center from Thailand with a scholarship to study microbiology. He is a graduate student in the department of Biochemistry, Microbiology & Molecular Biology pursuing his Masters degree with Dr. Gary King. Lek is currently working on the responses of methanotropic isolates to ionic strength and pH, but hopes to focus on bacterial physiology.



Danielle Toole is working in the Steneck lab on a Hawaiian lobster project. The focus of her work will be to determine what kind of management decisions are and are not working for the Northwestern Hawaiian Island lobster fishery which includes spiny and slipper lobsters. Danielle is a graduate of the University of North Carolina, Willmington.

Jessica Stevens is also working in the Steneck lab. In the coming months, she'll be doing lots of sea sampling and tagging broodstock lobsters to determine where the primary source for lobster larvae is located along the coast of Maine. Jessica is a graduate of Wheaton College in Massachusetts.



Heidi Ryder is the newest addition to the Watling Lab. Processing samples, sorting organisms by taxonomic groups and bringing order and organization to the lab will be her primary responsibilities. Heidi is a graduate of Eckerd College in Florida and hopes to enroll in a graduate program soon.



New Tech's

DMC Scientists

Coral Class Studies Reefs In the Yucatan

Dr. Bob Steneck and ten students from his Coral Reef Ecology class traveled to Mexico's Yucatan coast for a teaching and research trip in March. Using Atlantic and Gulf Rapid Reef Assessment (AGRRA) protocols, students spent many hours underwater studying the overall health of reefs in two regions: Akumal (near Cancun) and Xcalak (near Belize) 200km to the south. They surveyed the reef, quantifying the species, size and abundance of large reef building corals, and the extent of coral bleaching, as well as the abundance of coralline and macroalgae, herbivorous urchins, and fishes.

The group revisited sites a previous class had surveyed in 1997. Using that data as a base line, the students were able to quantify the impacts of hurricane Mitch and a severe bleaching episode associated with La Niña in September 1998. They found alarmingly high rates of mortality on four of the six most important reef building corals, especially in the upper 10 meters of the reef. The students also found that the Akumal reefs were at risk due to excessive macroalgal growth which had increased significantly since 1997.

Eric Annis, a student in the course, describes the course as "...really cool. Not just because we went to Mexico, but because of the mix of people in the class." Students from all three School of Marine Sciences (SMS) programs, Oceanography, Marine Biology and Marine Policy, as well as two professors from the Wildlife Biology Department took part in this highly interdisciplinary study.

Dr. Steneck describes the course as a "win-win-win situation". Students learn to apply classroom knowledge to hands-on research, science gains invaluable information about reef ecology, and local stake holders and lawmakers gain the information necessary to

the prudent biological and economical policies concerning coral reefs.



The coral crowd in Yucatan. Pictured in the back row from left to right: Eric Annis, Carl Wilson, Mac Hunter, John Vavrinec and Matt Gordon. Kristen Eickhorst, Deidre Gilbert, Aram Calhoun and Louanna Martin are in the front row.



Eric Annis, Deidre Gilbert, Matt Gordon, John Vavrinec, Carl Wilson, "el capitan", Mac Hunter, Kristen Eickhorst and Bob Steneck.

What is coral bleaching?

Healthy reef forming corals are colorful — red, orange, yellow, and green. White corals indicate an unhealthy environment. Corals bleach cotton white by expelling their life giving zooxanthelli, the microscopic, symbiotic algae that live in their tissues, when stressed by extreme or prolonged changes in temperature or salinity, reduced sunlight due to turbulent conditions, or excessive fishing or recreational diving. Corals ultimately die from bleaching episodes if conditions do not improve.

The project was co-funded with a grant from the AGRRA and the School of Marine Sciences. Additional logistical support was generously provided by an Akumal dive shop owner, a local ecology center and Aventuras Chinchorro. Dr. Steneck reported these results to the International Conference on Scientific Aspects of Coral Reef Assessment, Monitoring and Restoration, Fort Lauderdale, FL, in April.

Noteworthy

Dr. Kevin Eckelbarger
Received the 1999 Distinguished Alumnus Award of the College of Natural Sciences, California State University, Long Beach.

Dr. Gary King
Elected to a Fellowship by members of the American Academy for Microbiology in recognition of his scientific excellence and creative achievement.

Sarah Gerken
Awarded the DuPlessis Scholarship. A \$10,000 grant awarded to support a female PhD student in the writing phase of her doctoral dissertation.

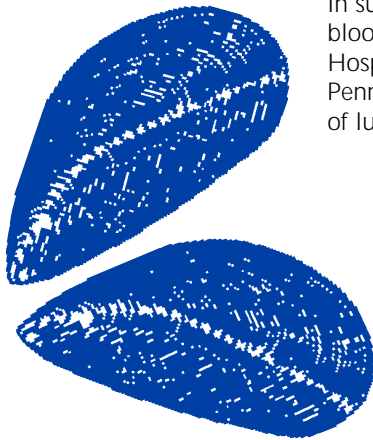
Dr. Warren Riess
Appointed Vice President of the North American Society of Oceanic History, a professional society with members from the US, Canada and Mexico.

New DMC Researcher

Dr. Betty Twarog came to the Darling Marine Center in December 1998 as an Adjunct Scientist. Betty is a physiologist whose research has centered on how the nervous system controls muscle in invertebrate animals and mammals. She is delighted to find that her new colleagues, faculty and students alike, "are enthusiastic marine scientists who are willing to share their interests with a newcomer."

For her PhD thesis at Radcliffe, in 1952, Betty studied "catch" in the blue mussel, *Mytilus edulis*. Catch is a long lasting, low energy muscle contraction which enables clams and oysters to resist being opened by hungry predators. Continuing this work at Harvard, she found that a newly characterized compound, serotonin, is released from nerves in *Mytilus* to relax the catch contraction. Serotonin appeared to be a major neurotransmitter in mollusks. In 1953, she showed that serotonin is present in the brain of mammals, a discovery which laid the groundwork for studies by others in the 1960s, identifying serotonin as an important neurotransmitter in the human brain.

In succeeding years, Betty became interested in responses of blood vessels in the mammalian lung. Then, at Graduate Hospital, as an adjunct Professor with the University of Pennsylvania, she studied the physiology and biochemistry of lung arteries for some years.



Betty retired from biomedical research in 1991 and moved to Maine. She spent several years at the Bigelow Laboratory for Ocean Sciences. While there, she and fellow researcher Yojiro Muneoka of Hiroshima, Japan, discovered that GABA, a crucial neurotransmitter in humans and suspected inducer of larval settlement in marine molluscs, could be isolated from two strains of Paralytic Shellfish Toxin (PST)-producing algae.

Betty's current research is a collaborative effort with Dr. Monica Bricelj of the Institute for Marine Biosciences in Halifax, Nova Scotia. They are examining the varying resistances of the steamer clam, *Mya arenaria*, populations to PST's. Betty is studying nerve responses in these populations to determine whether the nerves are resistant to PST while her collaborators study biochemical and behavioral mechanisms of resistance.



Science Down Under

PhD candidate **Sarah Gerken** recently returned from a six week tour of Australia's natural history museums. She visited these museums to become familiar with the cumaceans of the southern hemisphere. Sarah explains that "her thesis is a monograph of members of the family Gynodiastylidae, and in order to do a proper monograph and good phylogenetic analysis, it is necessary to examine the type specimens for as many species as possible."

Sarah spent lots of time at the South Australian Museum in Adelaide where the majority of type specimens for this family are deposited. She also traveled to the Museum of Victoria in Melbourne and the Australian Museum in Sydney, which also have extensive collections of cumaceans in their holdings. She was excited to find 5-10 previously undescribed species in these collections.

Sarah says the trip, funded by DuPlessis scholarship, made "100 times better" and believe considerably to our knowledge of biodiversity, in terms of the cumacean fauna of Australia". In the coming months Sarah's collaborating with her colleagues in Australia as she has been invited to write a chapter on euphausiids for a book on pelagic invertebrates from the waters of the U.S. west coast.



Dr. Les Watling traveled to New Zealand for the last of his PEET project expeditions (Partnerships for Enhancing Expertise in Taxonomy). With great help from his New Zealand colleagues who provided boat access in various field sites, Les collected cumaceans from the waters around both North and South Islands. And, he adds with a chuckle, "I collected amphipods from the forest floor near Kaikoura. Can't do that in Maine, unfortunately!"

Orono Faculty & Students at the DMC



Cindy Pilskan (back row, second from the right) and participants from Camp Kieve's Science Camp for Girls

Dr. Cindy Pilskan

Dr. Cindy Pilskan uses the Darling Marine Center primarily for teaching purposes. In addition to teaching a graduate level course at the Center each fall, Cindy teaches/leads two local science camp programs: Camp Kieve's Summer Science Camp for Girls and Camp Norumbega's Summer Discovery Camp. She encourages young women to pursue their interests in science while telling them about her research in the open oceans, observing "marine snow" through the bubbles of a deep sea submersible. Then she takes the girls out on the Damariscotta River for some hands on marine research.

Cindy's research work is primarily open-ocean/deep-water oriented. However, recent collaboration on a project studying particulate organic concentrations in the water column above mussel beds and the filtration rates of mussels, has brought some of her research closer to shore. This summers, she plans to expand these studies to include oysters in the Damariscotta River. To learn more, visit her web site at <http://www.ume.maine.edu/~marine/pilskaln.htm>.

Dr. Paul Rawson

Dr. Paul Rawson uses a combination of population, quantitative and molecular approaches to study the evolution of physiological traits in marine invertebrates, the genetics of oysters and mussels, and the biogeography of invertebrates.

It has long been assumed that the only blue mussel species present in the Gulf of Maine was *Mytilus edulis*. However, Paul has recently confirmed the presence of a morphologically similar species, *M. trossulus* in many locations in the northeastern portion of the Gulf. Paul plans to conduct comparative physiology studies of these two species at the DMC, using controlled environmental chambers that mimic the conditions blue mussels experience along the coast of Maine. In addition, he will use molecular techniques to examine the species composition and rates of species-specific survival for the species.

Paul will also be conducting genetic research at the DMC in hopes of exploiting hybrid vigor to improve growth rates of cultured oysters. The relative performance of these parental and hybrid lines will be tested under a variety of environmental conditions along the coast of Maine, where oyster culture is practical.

Visit Paul's website at <http://www.ume.maine.edu/~marine/rawson.htm> to learn more about his shellfish research.



Semester by the Sea '99

Students interested in marine biology and oceanography can enhance their undergraduate experience by enrolling in the School of Marine Science's *Semester by the Sea* program.

Participants will reside at the Darling Marine Center and take classes designed to provide in depth study and hands-on research experience in a variety of marine ecosystems. *Semester by the Sea* meets SMS degree requirements. The program is open to students from any UMaine campus or any other academic institution.

**Space is still available for the fall semester!
Contact Dr. Jim McCleave at the School of Marine Science at 207-581-4392.**

Orono Faculty & Students at the DMC

Nikki Adams

Nikki Adams is a doctoral candidate in Zoology working with Dr. Malcolm Schick. She is interested in how ultraviolet radiation (UVR) affects the biochemistry and development of marine invertebrates, specifically sea urchins and corals. In recent years she has used UV sensors to determine the penetration of UVR in local coastal waters, and conducted feeding experiments to determine if sea urchins receive protection against UVR by accumulating putative sunscreen molecules from their diet of macroalgae.

As a master's student, Nikki documented that these "sunscreen molecules" partially defend embryos of the green sea urchin, *Strongylocentrotus droebachiensis*, against UV-induced delays during cell division. Her doctoral research involves a closer examination of the effects of UVR on the development of urchin embryos and larvae, and the sunscreen protection gleaned from their diet. Using the environmental chambers in the Flowing Seawater Lab, Nikki reared adult urchins with and without UV exposure on controlled diets of macroalgae with and without the sunscreen molecules. These urchins subsequently produced eggs with respective concentrations of "sunscreen" in their eggs thereby allowing Nikki to determine whether UVR affected gametogenesis or the accumulation of the sunscreen molecules in the ovaries.



Above: Nikki Adams sets up an environmental chamber for her sea urchin experiments.



Students in the Shellfish Mariculture class examine floating oyster trays in the Damariscotta River.

Dr. Bruce Barber

Dr. Bruce Barber describes the facilities at the Center as "invaluable to his research on bivalve physiology, pathology and culture." Though based at the Orono campus, he and his graduate students, Ryan Carnegie, Maya Crosby and Carolina Garrido, and postdoc Dr. Kathy Boettcher are frequent visitors to DMC and can most often be found in the Flowing Seawater Laboratory.

Much of Bruce's research focuses on the selective breeding of oysters. Over the years UMaine researchers have developed fast growing, disease resistant oysters that form the basis of the hatchery based oyster culture industry in Maine. He uses the Flowing Seawater Lab to maintain, condition, and spawn the broodstock, and DMC boats are used to deploy, monitor, and maintain the various genetic lines.

Each May, Bruce and graduate student Chris Davis teach an intensive Shellfish Mariculture Techniques class at the DMC. The course teaches the theory and practice of marine bivalve aquaculture techniques practiced in the Northeastern US and includes field trips to commercial sites on the Damariscotta River and the outer coast

More information about Bruce's research program can be found on the internet at <http://www.ume.maine.edu/~marine/barber.htm>.

Graduate Students

Congratulations are in order!



Carl Wilson was awarded a MS in Oceanography this spring for his work with Dr. Bob Steneck. His thesis was entitled *Bathymetric and spatial patterns of settlement in American lobster, Homarus americanus, in the Gulf of Maine*. Carl is now working for the Island Institute, in Rockland, as the Marine Resources Outreach Coordinator. In his new capacity, Carl will collaborate with

Bob Steneck on the Penobscot Bay lobster project and organize outreach activities associated with it.

MS done, PhD to go! In March, **Ian Voparil** completed the requirements for Masters degree in Oceanography with the presentation of his thesis entitled *PAH Solubility in the Lugworm's (Arenicola marina) Digestive Fluids*. He plans to continue studying contaminant availability to deposit feeders and worm guts in the DMC biogeochem lab with Dr. Larry Mayer.



Maya Crosby successfully defended her thesis titled *A bacteriological study of Crassostrea virginica and Ostrea edulis in the Damariscotta River, ME*, and was awarded a MS in Marine Bioresources. Her advisor was Dr. Bruce Barber. Maya is now working in the hatchery of the Pemaquid Oyster Company in Bremen, ME. This summer she will also be coordinating volunteers for the Gulf of Maine Foundation.



Thursday Afternoon Seminar Series

Graduate students Sara Gerkin, Anne Simpson and Exequiel Gonzalez have been busy putting together a star studded summer seminar series. This weekly event is held every Thursday afternoon in the Kresge classroom at 4pm.

June 3 • Bottom up and Pushing up

When the Ephemeral Becomes Eternal, the Consumers are Consumed and the Lizards go to the Beach. Jose Miguel Farina, Pontificia Universidad Catolica de Chile.

June 10 • Bioavailability

Linking chemistry and organismal biology in the study of nutrition and toxicology. Dr. Larry Mayer, DMC, UMaine.

June 17 • Maine Coastal Oceanography from Space.

Dr. Andy Thomas, University of Maine.

June 24 • Looking for Sex In All the Wrong Places

Where do reproductive lobsters live and why might that be VERY important. Dr. Robert Steneck, DMC, UMaine.

July 1 • Fishing for the Right Gear

A continuum of research to reduce bycatch in small mesh fisheries in the Gulf of Maine. Dan Schick, Maine Department of Marine Resources.

July 8 • The Secret Life of Shrimps

Ecology and evolution of social organization in sponge dwelling Synalpheus. Dr. J. Emmet Duffy, Virginia Institute of Marine Sciences.

July 9 • Summer Special Seminar • Friday 4:00 PM

Microbial Ecology of the Earthworm Gut and the In situ Emission of Nitrous Oxide (N₂O). Dr. Harold L. Drake, University of Bayreuth, Germany.

July 15 • Crafty Crustaceans:

Vision, bioluminescence and camouflage in the deep sea. Dr. Sara Lindsay, UMaine.

July 22 Mythical Monsters of the Neoproterozoic

Paleontological and developmental approaches to the Metazoan Radiation. Dr. Doug Erwin, Smithsonian Institution.

July 29 The Blue Crab Fishery in Virginia.

Dr. Paul Gerdes, Virginia Institute of Marine Sciences

August 5 • TBA

August 12 • The Early Worm

Evolution of the ancestral stock of flatworms. Dr. Seth Tyler, UMaine.

August 19 • Mussels' Muscles

Finding a new neurotransmitter — serotonin. Dr. Betty Twarog, DMC, UMaine.

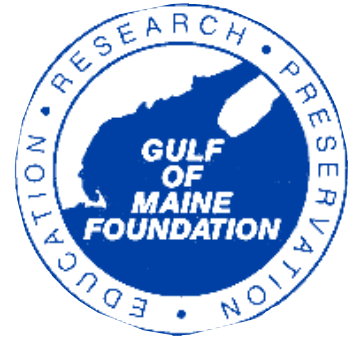
August 26 • TBA



Gulf of Maine Foundation

Gulf of Maine Foundation

The Gulf of Maine Foundation (GMF) is a non-profit corporation founded in 1986 to foster the growth and development of marine studies at the Darling Marine Center. They provide funds for facilities, equipment and undergraduate research scholarships. GMF is also developing a program to enrich the exposure of the area's young people to science and the marine environment. Membership material may be obtained by writing: The Gulf of Maine Foundation, P.O. Box 185, Damariscotta, ME 04543



GMF's Summer Lecture Series

Each summer the Gulf of Maine Foundation hosts a Wednesday evening lecture series at the Darling Marine Center. The weekly event draws on the expertise of scientists, historians, novelists and photographers and covers a wide variety of marine and maritime issues and events.

Lectures are held at 7:30pm in the Kresge classroom (except when noted) and are open to the public. Lectures are free to GMF members. A \$4 donation is requested for non-members.

July 7 • Red Tides in the Gulf of Maine

Why are they getting worse? Dr. David Townsend, Professor of Oceanography, UMaine.

July 14 • Bottoming Out

Can marine species survive modern dragging techniques? Dr. Les Watling, Professor of Oceanography, UMaine.

July 21 • Captain Kidd and Dixie Bull

Pirates, treasures and famous folks on the Maine coast. George Dow, Historian, Nobelboro, ME.

July 28 • Antarctic Adventure

Discoveries on a Chinese research vessel in the Southern Indian Ocean. Dr. Cindy Pilskan, Associate Professor of Oceanography, UMaine.

August 4* • Bunglers, Blusters & Boneheads

The dubious history of naval action in Maine during the American Revolution. James L. Nelson, Harpswell. Author of *The Biddlecomb Series*, novels of maritime history.

* This lecture will be held at the Round Top Center for the Arts, Damariscotta, ME.

August 11 • An Eye for the Coast

Fascinating Monhegan in 1900. William Bunting, Whitefield, maritime historian and Earle Shettleworth, JR., Rockport, photographer. Authors of *An Eye for the Coast: The Maritime & Monhegan Photographs of Eric Hudson*.

August 18 • A Dynamic DMC Advances Toward 2000

Open house for GMF members. Tour the campus, talk to the experts.

GMF Docents Give Tours of the Darling Marine Center in July and August

Wednesdays at 1:30pm & Fridays at 10:30am

GMF Volunteers Build Walking Trails

Are you looking for a new place to walk? Beginning in late June or early July, GMF board member Elsie Morse and a team of volunteers will open the first of several walking trails at the Darling Marine Center. When complete, visitors will be able to take hikes ranging from 1-6 miles.

Apart from enjoying the peace provided by a woodland or shoreline walk, those wishing to enrich their understanding of nature will find interpretive material that will change throughout the year. Maps and trail guides will be in a box under the Gulf of Maine Foundation sign at the DMC Administration Building. Dog owners are welcome to bring their canine friends but the latter must be on a leash.

Persons wishing to help with trail construction or the interpretive material should contact the GMF at 207-563-3146, ext 252. Leave a message if no one answers!

GMF Board of Directors

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Visiting Scientists



Dr. Leland Johnson, Visiting Investigator from South Dakota

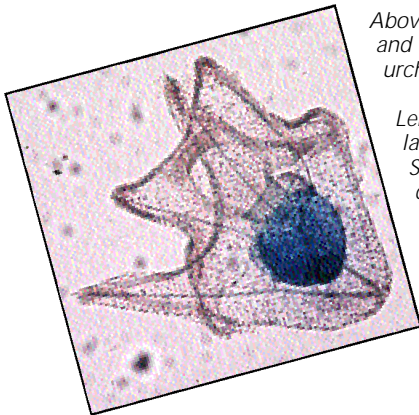
Dr. Leland Johnson, Professor of Biology at Augustana College in Sioux Falls, South Dakota spent three weeks at DMC this winter studying the larvae of the sea urchin *Strongylocentrotus droebachiensis*. His experiments were designed to test the effects of temperature on larval development. Dr. Johnson hopes the results of his work will expand our knowledge of the relationship between temperature and the development of marine animals, and contribute to our general understanding of the interaction of organisms and their marine environment.

Since Maine sea urchins support a commercial fishery, such research is of particular practical importance. It is necessary to understand the many aspects of their biology so that management decisions can be as sound as possible. Further, as with some other commercially important species, there is some interest in sea urchin aquaculture. A clear understanding of factors that affect larval development will provide the necessary foundation for aquaculture research and Dr. Johnson's investigations contribute to that understanding.

Dr. Johnson frequently returns to the Darling Marine Center for both research and teaching on a regular basis. His Developmental Biology workshop is a perennial favorite of the Center's summer course program drawing college and university professors from across the US and Canada.

Above: Dr. Johnson waiting and watching for sea urchins to spawn.

Left: a four-arm pluteus larva of the sea urchin *Strongylocentrotus droebachiensis*. The larva is approximately 150 μ m in length from apex to arm tip.



Left: Drs. Les Watling, Jon Norenburg and Nathan Riser

Far Left: "Doc" Riser and Kevin Eckelbarger

Back Together Again

It was old home week in the Flowing Seawater Lab as **Dr. Kevin Eckelbarger** hosted colleagues **Dr. Nathan Riser** and **Dr. Jon Norenburg** and **Dr. Mats Envall**. "Doc" Riser was Kevin's and Jon's PhD advisor and is Emeritus, Director of Northeastern's marine lab. Dr. Jon Norenburg, is Curator, Division of Invertebrate Zoology, at the Smithsonian in Washington, DC. Dr. Mats Envall is a postdoc working with Dr. Norenburg. They were here to search the beaches and coves of midcoast Maine in search of marine worms and other meiofauna. At the same time, **Dr. David Doe**, another student in the Riser lab, was here as with a visiting college group from Westfield State University.

Visiting Scientists

More Visitors...

Graduate student **Exequiel Gonzalez** had two visitors from the Universidad Catolica del Norte, Coquimbo, Chile this spring. **Miguel Rivera**, General Manager of the Abalone Production Center and **Cesar Galleguillos**, Research Assistant in the Aquaculture Department visited the U.S. (Louisiana, Alabama, Florida, Mississippi, Rhode Island, New Hampshire and Maine) looking for aquaculture facilities, comparing technologies, marketing strategies, and packing techniques for improving their projects.

Don Perkins, President of the Gulf of Maine Aquarium, and a five member design team visited the Center to get a close look at the design and workings of our Flowing Seawater Lab. The Gulf of Maine Aquarium is an organization in the Portland area dedicated to establishing an aquarium and private research facility in southern Maine.

Greg Teegarden (DMC alum) and **Bob Campbell**, visiting investigators from URI, have been coming to the DMC on a weekly basis this spring. They are studying zooplankton predation on *Alexandria spp.*, one of the dinoflagellates responsible for red tide. Their work here involves sampling coastal and near coastal waters for zooplankton aboard the R/V Nucella and conducting controlled experiments in the Flowing Seawater Lab.



Visiting from Poland

Graduate student Magdalena Blazewicz worked in the Watling Lab this spring. Having finished writing her dissertation, Maggie is in the United States for several months, mostly in Mississippi, studying cumaceans and other small crustaceans "just for fun". Maggie hails from the Laboratory of Polar Biology and Oceanobiology, University of Lodz, Lodz, Poland. Upon returning to Poland she will be defending her dissertation. Pictured above is Dr. Les Watling, Magdalena Blazewicz, Sarah Gerken and Heidi Ryder



Science Club Visits Center

Debbie Holmes (center) and the 3rd Grade Science Club from the Miles Lane Elementary School, Bucksport, ME, visited the DMC during their spring break. The group raised bus money by growing and selling perennials in their school's green house. While in the area they also explored the Rachel Carson Preserve in New Harbor.

Visit the Darling Marine Center

..... in person or on the web

<http://server.dmc.maine.edu>

SCUBA



What Is Scientific Diving?

Scientific diving is an official term used by institutions and organizations that engage in underwater research activities to express exemption from the OSHA regulations that govern commercial diving. To qualify for these exemptions, the University of Maine maintains high safety and certification standards, and assures OSHA that the divers are scientists or scientists-in-training (students, interns, etc) and that the work is non-proprietary.

The University of Maine's certification standards are based on those established by the American Academy of Underwater Sciences (AAUS); a non-profit, self-regulating corporation of scientists dedicated to the safety and welfare of underwater researchers. AAUS standards for scientific diving are recognized by over fifty AAUS member organizations. Divers benefit from AAUS certification reciprocity that makes collaboration on research projects with other member organizations easy. The University of Maine fully supports this reciprocity. To learn more about AAUS, visit their website: <http://www.erols.com/aaus/aaus.htm>.



Diver Certification

Most of our divers come to the Center with recreational diving certification. After obtaining a physical exam and demonstrating competency as a diver, one becomes a scientific diver in training. Divers attain scientific diver status upon the completion of 100 hours of training which includes boat handling and data gathering techniques, as well as a minimum of 12 dives beyond the diver in training level. They must also obtain diving first aid, CPR, O₂, and dive rescue training/certifications.

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Darling Marine Center

University of Maine
193 Clark's Cove Road
Walpole, ME 04573

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Dive Stats

Over the past three years our divers have spent 1954 hours underwater, logging over 4600 dives in the chilly Maine waters. In comparison to other AAUS member organizations, most of which are located in warmer climes, the Darling Marine Center ranked 13th out of 39 for total dives*. That's not too shabby considering it

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