

MAKING WAVES

at the University of Maine Darling Marine Center

Happy 45th Anniversary Darling Marine Center!

“Paradise”

On February 1, 1969, Dr. David Dean assumed the duties as the first Director of the Ira C. Darling Center for Research, Teaching and Service. Three weeks later, Mr. Darling sent Dr. Dean a congratulatory letter from his home in Kenilworth, Illinois, in which he expressed his fondness for the seaside farm he had recently donated to The University of Maine: *“As you know I spent the best part of twenty years on the farm, and it was as near Paradise as I ever wish to be.”*

Ira C. Darling was an astute businessman and successful investor who purchased the 148.6-acre property in 1939 for a mere \$12,500 – it is currently valued at \$25 million. Although his summers were spent in “Paradise” on the shores of the Damariscotta River estuary, he was also a practical man and a visionary. When he and his wife could no longer travel from the Chicago area to their beloved farm he donated it to the University of Maine in 1965 so

they could establish an oceanography program. To help them maintain and improve the property, he then established the largest trust in University history in 1968. Mr. Darling’s generosity helped launch the University of Maine’s first oceanography program in 1969. Today the Center supports a broad spectrum of marine science programs through the School of Marine Sciences. Ira Darling’s legacy provided opportunities for thousands of individuals to explore marine science in the Gulf of Maine – from K-12 students and the general public, to college undergraduates, graduate students, postdoctoral fellows, faculty, science conference attendees, and visiting investigators from around the world.

Within days of assuming the Directorship of the Center in 1991, I stood on the Center’s pier and watched an eagle circling the property for nearly 20 minutes. Soon after, I read a letter Mr. Darling wrote to Dr. Dean on June 4, 1969 that stated: *“I used to say to the boys, that if in the years to come they saw a great big bird with large wings soaring around they would know that was me coming down from heaven to look the place over...”* I have no idea if this was an omen but I have reason to believe that forty-five years later Mr. Darling would be pleased that his beloved farm had become near Paradise for new generations of marine scientists.



45 Years
1966 - 2011
pages 6-9



Kevin J. Eckelbarger, Professor and Director

Scientific Diving Scholarship Established in Memory of Dr. John Dearborn

The University of Maine Scientific Diving Program received a \$5,000 donation from J.F. White Contracting Company in memory of Dr. John Dearborn. Mr. Jim Clark of J.F. White noted that, "Dr. John Dearborn was a respected scientist, beloved teacher, and perhaps more importantly, a man who confronted every adversity with determination and wry humor!" The gift establishes the John Dearborn Scientific Diving Scholarship Fund which will be directed towards UMaine marine science students enrolled in the Scientific Diving Program. Dr. Rhian Waller, SMS/DMC faculty accepted the check at the AAUS meeting in Portland while UMaine Dive Safety Officer, Chris Rigaud, looks on.



Recent Publications

Bayer, S.M., L.S. Mullineaux, **R.G. Waller** & A.R. Solow. 2011. Reproductive traits of pioneer gastropod species colonizing a deep-sea hydrothermal vent after an eruption. *Marine Biology* DOI: 10.1007/s00227-010-1550-1.

Estapa, M.L. & L.M. Mayer. 2010. Photooxidation of particulate organic matter, carbon/oxygen stoichiometry, and related photoreactions. *Marine Chemistry* 122:138-147.

Hetzinger, S., J. Halfar, T. Zack, D. Jacob, B. Kunz, G. Gamboa, A. Kronz, W. Adey, P. Lebednik & **R. Steneck.** 2011. High-resolution analysis of trace elements from the North Atlantic and North Pacific in encrusting coralline algae by laser ablation ICP-MS. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 302, 81-94. 004.

Johnson, B.D., M. Barry, B.P. Boudreau, **P.A. Jumars** & K.M. Dorgan. 2011. Profiling fracture toughness in cohesive sediments. *Geo-Marine Letters* DOI 10.1007/s00367-011-0243.

Mayer, L.M., K.H. Thornton, & L.L. Schick. 2011. Bioavailability of organic matter photodissolved from coastal sediments. *Aquatic Microbial Ecology* 64:275-284.

Morrison, C.L.; S.W. Ross, M.S. Nizinski, S. Brooke, J. Jarnegren, **R.G. Waller,** R.L. Johnson & T.L. King. 2011. Genetic discontinuity among regional populations of *Lophelia pertusa* in the North Atlantic Ocean. *Conservation Genetics* 12:713-729.

Mumby, P. J. & **R.S. Steneck.** 2011. The resilience of coral reefs and its implications for reef management. Chapter 29 Pages 509 -519 in: Dubinsky, Z. and N. Stambler (eds.) *Coral Reefs: An Ecosystem in Transition*. Springer Press DOI 10.1007/978-94-007-0114-4_29.

Nguyen, H., L. Karp-Boss, **P.A. Jumars** & L.J. Fauci. 2011. Hydrodynamic effects of spines: a different spin. *Limnology and Oceanography: Fluids and Environments* 1: 110-119.

Padilla-Gamino, J.L.; T.M. Weatherby, **R.G. Waller** & R.D. Gates. 2011. Formation and structural organization of the egg-sperm bundle of the scleractinian coral *Montipora capitata*. *Coral Reefs* 30:371-380.

Steneck, R.S., T.P. Hughes, N. Adger, **S. Arnold,** S. Boudreau, K. Brown, F. Berkes, J. Cinner, C. Folke, L. Gunderson, P. Olsson, M. Scheffer, E. Stephenson, B. Walker, J. Wilson & B. Worm. 2011. Creation of a gilded trap by the high economic value of the Maine lobster fishery. *Conservation Biology* DOI: 10.1111/j.1523-1739.2011.01717.

Wagai, R., **L.M. Mayer,** K. Kitayama & Y. Shirato. 2011. Association of organic matter with iron and aluminum across a range of soils determined via selective dissolution techniques coupled with dissolved nitrogen analysis, *Biogeochemistry* DOI 10.1007/s10533-011-9652-5.

Wagner, D; **R.G. Waller** & R. Toonen. 2011. Sexual reproduction of Hawaiian black corals, with a review of reproductive processes within the order Antipatharia (Cnidaria: Anthozoa: Hexacorallia). *Invertebrate Biology* 130(3): 211-225.

Waller, R.G., K. Scanlon & L. Robinson. 2011. Cold-water coral distributions in the Drake Passage from towed camera observations. *PLoS ONE* 6(1) e16153. doi:10.1371/journal.pone.0016153.

Waller, R.G. & P.A. Tyler. 2011. Reproductive patterns in two deep-water solitary corals from the Northeast Atlantic - *Flabellum alabastrum* and *F. angulare* (Cnidaria: Anthozoa: Scleractinia). *Journal of the Marine Biological Association, UK* 91(3): 669-675.



MAKING WAVES

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One of Maine's public universities

The DMC Library is interested in acquiring past or current research work conducted from the Darling Marine Center that is not accessible online and that is not currently in the DMC Library holdings. Especially prized are theses, dissertations, reports, grey literature, or any material not readily available to DMC Library patrons. If you have an item you care to donate, please contact Randy Lackovic at randy.lackovic@umit.maine.edu.

In complying with the letter and spirit of applicable laws and pursuing its own goals of diversity, the University of Maine shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, including transgender status or gender expression, national origin, citizenship status, age, disability, genetic information or veteran's status in employment, education, and all other areas of the University of Maine. The University provides reasonable accommodations to qualified individuals with disabilities upon request.

Questions and complaints about discrimination in any area of the University should be directed to Karen Kemble, Esq., Director of Equal Opportunity, ADA Coordinator, Title IX Coordinator, Rehabilitation Act Section 504 Coordinator, The University of Maine, 5754 North Stevens Hall, Room 101, Orono, ME 04469-5754, telephone (207) 581-1226, TTY (207) 581-9484.



Obituaries

Dr. John Dearborn passed away on November 24, 2010, just as the last edition of Making Waves was getting printed. Though more than a year has gone by, we want to highlight his research and his dedication to marine biology students at the University of Maine.

John's primary research interests were cold water marine invertebrates, particularly echinoderms. His research took him to the Antarctic, the Arctic, the cold, deep waters off the Chilean coast, and the Gulf of Maine.

John began his career at UMaine in 1966 and retired in 1999. During those years he advised nine Master's students, nine Ph.D. students, and thousands of undergraduate students.

John's dedication to UMaine students continues through the John H. and Bethel B. Dearborn Trusts he endowed to the School of Marine Sciences and the Darling Marine Center.

The DMC plans to use its Dearborn Trust to support undergraduate capstone research and other educational opportunities.

Christina "Tina" Tabarini passed away on July 29, 2011. Tina received a Masters degree in Oceanography from the University of Maine in 1983. Her thesis advisor was Dr. Herb Hidu and her thesis research focused on inducing triploidy in the bay scallop, *Argopecten irradians*.

Think.Maine

Think.Maine is the University of Maine System's new advertising campaign. Launched in September, it highlights the educational and research opportunities available throughout the State's public university system. Dr. Bob Steneck, graduate students Jenn McHenry and Caitlin Cleaver, and undergraduate student Sara Prendergast are featured in a 2.5 minute video clip focusing on the School of Marine Science's Dual Degree Program. Join the crew online as they depart the DMC aboard the R/V *Ira C.* to survey the waters off Monhegan Island at

<http://think.maine.edu/stories/robert-steneck>.



UMaine Marine Sciences on YouTube

Visit the UMaine YouTube site, www.youtube.com/theuniversityofmaine, and you will see several new videos produced by University of Maine Creative Services for 2011 highlighting marine research and education. Of specific interest to fans of the Darling Marine Center and the School of Marine Sciences are videos featuring scallop research, scientific diving, copepods in the Gulf of Maine, tidal power and much more.



Trade Adjustment Assistance to Lobstermen

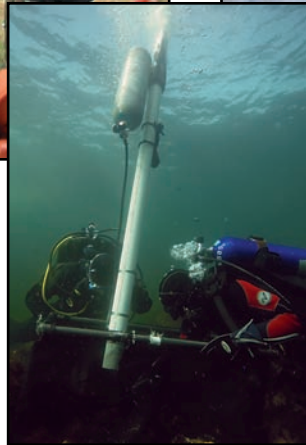
The USDA's Trade Adjustment Assistance (TAA) program for lobstermen in New England is in full swing. Maine lobster is a top-quality item in the seafood market and the four-year TAA program provides business and technical training to lobstermen for strengthening fishing and non-fishing businesses, and adding value to their product. The training is matched with modest financial support, so that participants who develop a new business plan can get their idea off the ground.

Since 2009, Maine Sea Grant has partnered with the Maine Lobstermen's Association and the Maine Farm Service Agency to administer the program and this effort has kept Sea Grant Extension Agent, Dana Morse, very busy! Over 2,700 people are participating from Maine alone, and over 4,000 in the northeast region. Dana is currently hosting workshops on Business Planning, Marketing, and Product Handling and Quality across the state. Workshop material can be viewed and downloaded at, www.taaforfarmers.org/Courses.aspx. More information on the TAA program can be found on the Maine Sea Grant website, www.seagrant.umaine.edu/extension/taa.



Diving for Science

The American Academy of Underwater Sciences held its annual Diving for Science Symposium in Maine in mid-October. UMaine's Dive Safety Officer Chris Rigaud was the host.



Algal Culturing Techniques Class

A unique algal culture techniques class was held at the DMC in June. Offered by the Bigelow Laboratory for Oceans Sciences Center for Culture of Marine Phytoplankton (CCMP), the course covered basic and advanced techniques for isolating, growing, cryopreserving, identifying, and harvesting marine phytoplankton. The course was designed for graduate

students, faculty, aquaculturalists and biofuels/biotech personnel, and drew participants from all corners of the United States as well as from Saudia Arabia, Canada, Spain and the Netherlands. The workshop will be offered again in June 2012. For more information, contact Brynne at bkristan@bigelow.org.

Over 80 Dive Safety Officers, scientists, and students from universities, marine laboratories, and state agencies convened at the DMC for three days of business meetings, training workshops, recreational dives, and a traditional Maine lobster bake before moving to Portland, ME for scientific meetings.

UM faculty, Dr. Bob Steneck and Dr. Rick Wahle, lead workshops on suction sampling and lobster ecology. They were assisted by grads and undergrads in the UM scientific diving program.



Ocean Optics - the Next Gen

The next generation of optical oceanographers met at the DMC in July for a 3-week intensive course on "Calibration and validation for ocean color remote sensing" taught by UM professors Emmanuel Boss and Mary Jane Perry, and their colleagues Curtis Mobley, Collin Roesler, Ken Voss, and Jeremy Werdell. First offered at the Friday Harbor Lab almost 25 years ago, the course has been taught at the DMC since 2001 and has evolved to keep pace with technology and current research directives. The major theme of this year's course is vicarious calibration of satellite-based ocean color radiometers using Earth-based measurements and in-situ optical sensors for validation of data derived from ocean color remote sensing. The course was sponsored by NASA and the University of Maine.



Aomori Aquaculturists Visit the DMC

A delegation of aquaculture professionals from Aomori, Japan, toured coastal Maine in early September. While at the DMC, they met with local shellfish growers to discuss the specialized netting and machinery they use to grow and process scallops and oysters in Mutsu Bay. The delegation also met with DMC faculty and students to discuss research projects underway at the Research Center for Marine Biology, a field station for Tohoku University located on Mutsu Bay. They eagerly invited graduate students and researchers to the marine lab and encouraged collaborative research.

Aomori and Maine have been sister-states since 1994, encouraging educational, cultural, and industry exchanges between their people. The long standing friendship goes back to 1889, when the sailing vessel *Cheseborough*, built in Bath, Maine, wrecked off the shores of Shariki, Aomori Prefecture, Japan. Villagers rescued and cared for the survivors until they could travel home to Maine.



Developmental Biology Teaching Workshop

The Society of Developmental Biology (SDB) awarded Dr. Eric Cole and Dr. Leland Johnson \$8,000 (over 2 years) to expand the Developmental Biology Teaching Workshop (DBTW) that has been offered at the DMC since 1992. The grant provides travel support for guest lecturers, as well as funds for equipment upgrades. As a result, the 2011 workshop was extended to 4.5 days and included a special section on amphibian development taught by Dr. Steven Black, Reed College.

Carleton College professor Dr. Jennifer Wolfe, who specializes in the development of the round worm *C. elegans*, is the guest lecturer for the 2012 workshop which will run June 19-23. Additional information and registration materials are available at the DMC website www.dmc.maine.edu/coursesprofdev.html.

Volunteers Receive Training in 2011

The Maine Department of Marine Resources (DMR) relies on an army of volunteers to help monitor the state's coastal waters for red tide. They collect weekly water samples during the spring and summer months and alert DMR Biotoxin Program staff if *Alexandrium*, the phytoplankton responsible for paralytic shellfish poisoning, are present.

The Maine Phytoplankton Monitoring Program began in 1997 and has held biannual training workshops at the DMC for fourteen years. This year DMR's Alison Sirois lead the two-day training during which volunteers reviewed sampling protocols, sharpened phytoplankton identification skills, and learned about emerging issues. In 2011, twenty-three phytoplankton volunteers covered 17 stations from Machias to Cape Porpoise, Maine.



45th Anniversary

1966-1991

On February 1, 1966, Dr. David Dean took the helm. As the first director of the Ira C. Darling Center for Research, Teaching & Service, David was responsible for securing faculty positions, establishing courses, and physically transforming a farm into a marine lab.

By 1970, resident faculty included: David Dean, Hugh DeWitt, Ken Fink, Herb Hidu, Mike Mazurkiewicz, Bernie McAlice, and Detmar Schnitker. Keith Leeman, caretaker of the Darling property stayed on with the University and proved invaluable during the transition. Early renovations included the Horse Barn where the old stalls became offices, the hayloft a conference room, and the basement became laboratories.

In 1971 funding was secured from the Kresge Foundation for a new classroom. The Flowing Seawater Laboratory was built at the waterfront the same year and quickly became the hub oyster aquaculture research under Herb's auspices. A team of researchers worked on the Maine Yankee Project, monitoring the effect of the nuclear power plant's thermal effluent.

During the remainder of the 70's, the Center continued to expand. George Willett conveyed his property on McGuire Point to UMaine, Vernon Westcott supplied the Center with a scanning electron microscope, and Larry Mayer and Les Watling joined the faculty. Research efforts included Bernie's thorough study of the Damariscotta River estuary.

Dr. Les Watling was appointed Director of the Center in 1985. At that time, the year round population at the lab included 9 faculty, 20 graduate students, 6 technicians and 12 staff. Bob Steneck is hired in 1986. With funding and support from the Gulf of Maine Foundation, Les oversaw the expansion of the Flowing Seawater Laboratory.

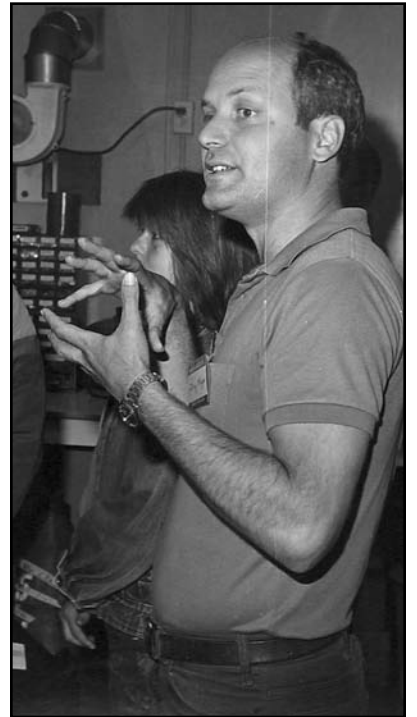
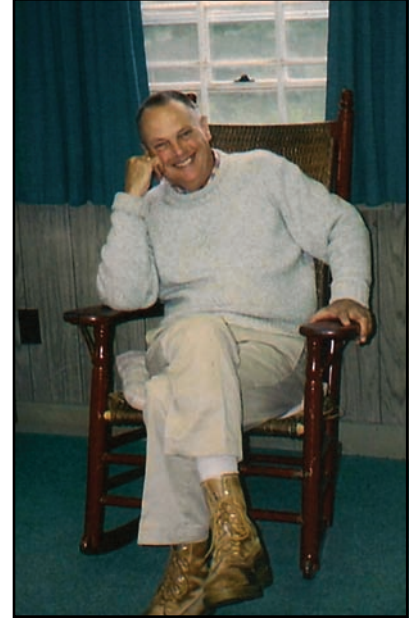
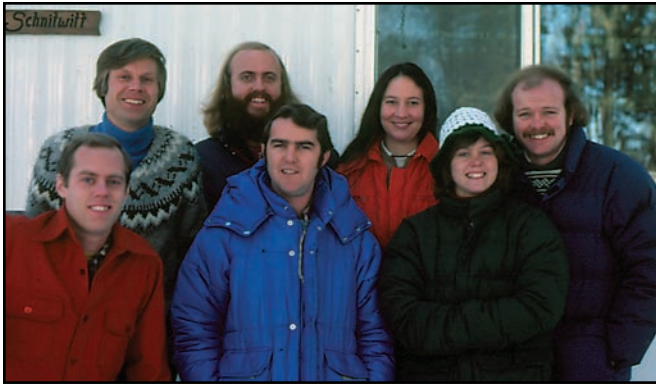


1966

- Dr. David Dean appointed Director.
- The schooner Drake donated to UM and becomes the Center's first research vessel.
- Library established; Louise Dean first librarian.

1968

- Dr. McAlice & Dr. Dean awarded a five-year grant from Maine Yankee Atomic Power Company to study thermal pollution in Montsweag Bay.
- Dr. Dean, Dr. Dearborn, and two graduate students go to the Arctic aboard the R/V Hero.
- 28 people worked at the Center in the summer, 12 year round.



1969

• Bates College is the first visiting college group.

1970

• UMaine establishes Graduate School of Oceanography.

1971

• The research vessel Cypris launched.

• Kresge Foundation funds first classroom building.

• Flowing Seawater Laboratory built.

1974

• Sea Grant Award establishes aquaculture research program.

1976

• George Willett donates home and 22-acre parcel on McGuire point.

1978

• Dr. Larry Mayer & Dr. Les Watling

1985

• Vernon Wescott donates scanning electron microscope to the Center.

• Dr. Les Watling appointed Director.

45th Anniversary

1991-2011

In 1991, Dr. Kevin Eckelbarger took charge and the following two decades brought much change to the DMC property. With funding from the National Science Foundation's Marine Lab and Field Station program, the DMC facilities grew to include: two more classrooms, a dive building, a vessel operations building, a dormitory/dining hall, a coastal research vessel, a second seawater laboratory, a library expansion, and updated laboratory instrumentation and oceanographic sampling gear.

During this time many of the original DMC faculty and staff retired and new faculty were hired including Pete Jumars, Mary Jane Perry, Annette deCharon, Rick Wahle, Rhian Waller, Damian Brady, and Lewis Incze.

The number of academic offerings for UMaine students at the DMC also increased over the last two decades. In 1993, the Semester By the Sea was established, initiating a new tradition of undergraduate teaching at the DMC. UMaine's School of Marine Sciences was formed in 1996 and now offers undergraduate and graduate degrees in marine biology, oceanography and marine policy.

Today the DMC property encompasses 170 acres and has 25 buildings valued at over \$25 million. The facility is widely respected in marine circles and well know an a user-friendly laboratory and field station. Annually, the Center welcomes over 2,200 visitors — students, researchers, course participants and conference goers.



- 1986** • Dr. Bob Steneck hired.
- 1989** • Dr. Warren Riess hired.
- 1991** • Flowing Seater Lab expanded.
- Dr. Kevin Eckelbarger appointed Director.
- 1993** • NSF funds waterfront Dive Building.
- First Semester By the Sea class.
- NSF funds Scanning Electron Microscope.
- NSF funds Geology Core Building.
- 1996** • NSF funds Mitchell classroom.
- UMaine establishes the School of Marine Sciences.
- 1998** • NSF funds R/V Nuclella and research instrumentation.
- 1999** • NSF funds Brooke Hall.
- Dr. Pete Jumars & Dr. Mary Jane Perry hired.



2000

• R/V Ira C. launched.

2001

• NSF funds Marine Culture Laboratory & Classroom.

2005

• NSF funds new library.

2006

• Annette deCharon hired.

2009

• Dr. Rick Wahle hired.

• NSF funds dock crane, winch and CTD.

2010

• Dr. Damian Brady & Dr. Rhian Waller hired.

2011

• Dr. Lewis Incze hired.

The Darling Marine Center archive continues to grow. The library collects a wide array of historical material regarding the DMC: memos, correspondence, meeting notes, education and research records, photos and videos, newsletters and news articles, etc. Please consider donating any DMC historical material you might possess to the DMC Library.

Contact Randy Lackovic at randy.lackovic@umit.maine.edu for more information.



K-12 Education Program Changes Hands

Jan Faulkner retired from her position as K-12 Education Coordinator at the end of the spring semester. She was hired in 2000 by the Gulf of Maine Foundation to develop marine programs that would bring primary and secondary school students to the DMC. Jan worked with local teachers to enhance their marine science curricula, ensuring field trips to the DMC dovetailed with classroom lessons. During her ten years of service, Jan hosted hundreds of student visits to the DMC each year, visited classrooms for follow-up sessions, and coordinated touch tanks at area festivals.

Taking the reins of the K-12 program is Anneliesa “Lili” Pugh. Lili was a graduate student in UM’s School of Marine Sciences. She completed her M.S. in Oceanography at the DMC in 1999. Lili brings to the position years of experience in outreach education and “citizen science” having worked for Mass Audubon and the Sheepscot Valley Conservation Association. Recently, Lili has found herself volunteering in area classrooms and jumped at the opportunity to return to the DMC.



Testing Burrowing Efficiency

Harmful algal blooms and their affect on bivalve shellfish are themes in Dr. Laurie Connell’s research laboratory. Harmful algal blooms, or red tides, contain species of dinoflagellates known to contain paralytic shellfish toxins (PST) that impinge nerve function. The Connell lab discovered a gene mutation that greatly increased the resistance of softshell clams to PSTs. Interestingly, populations with this mutation are found in areas often exposed to red tides.

This work was published in *Nature* and was read by Herb Weiss, a science teacher from Long Island, NY. Intrigued by the research, he contacted Laurie and for the past three years his students have studied PST in the classroom and some students have conducted summer research on the ecological costs of being resistant to PSTs at various sites in Maine.

This summer South Side High’s Emily Passarelli and Lauren Joyce joined Laurie and SMS graduate student Jenny Phillips at the DMC for eight days to study burrowing effectiveness of PST resistant and non-resistant softshell clams. Previous research has shown that non-resistant clams are faster growing. Emily and Lauren were testing the hypothesis: non-resistant clams are also more efficient burrowers.

DIVE IN...



TO MARINE SCIENCE

Marine science captures the imagination of many students. But what does one really study as a marine science major and what are the career options? To find out, you have to **Dive In**. Dive In is a three-day program for college-bound seniors interested in marine science. At the DMC, students explore the fields of marine biology, ecology, oceanography, scientific diving, remote ocean sensing, computer modeling, and aquaculture on foot, by kayak, and aboard the R/V *Ira C*. with faculty and staff of UMaine’s School of Marine Sciences.

Dive In 2012 is scheduled for July 23-25
www.dmc.maine.edu/divein.html

Undergraduate Opportunities at the DMC Expand!

The Semester By the Sea program, offered each fall, is now complimented by short and intensive May Term courses. All classes are open to UMaine students as well as students from other academic institutions. If you're looking for a marine lab experience to cap off your undergraduate career - you'll find it right here!

www.dmc.maine.edu/coursesUM.html



May Term Courses

An energetic group of undergraduates enrolled in the new May term courses. They spent several spring days aboard the R/V *Ira C.* collecting invertebrates and sampling the chemical and physical properties of the Damariscotta River estuary. Back in the lab, they entered and analyzed data, and dissected animals.



In **Estuarine Oceanography**, a problem-oriented field course taught by Dr. Larry Mayer and Dr. Emmanuel Boss, students were charged with quantifying the ability of the Damariscotta River estuary to produce phytoplankton for oyster aquaculture. Students had to learn about and measure circulation patterns, nutrient supply, light fields in the water, and plankton production, and compare them with the demand for food by hungry oysters.

Life Histories & Functional Morphology of Commercially Important Marine Invertebrates of Maine was taught by Dr. Kevin Eckelbarger. Students collected commercially important and ecologically significant invertebrates and examined their reproductive, digestive, and nervous system morphology through dissections. They also learned basic histological techniques and enjoyed guest lectures provided by industry representatives on the commercially important species.

Dr. Damian Brady's **MATLAB for Marine Sciences** course drew interest from both undergraduate and graduate students. MATLAB software is used to analyze and visualize data. The course consisted of lectures and individual projects based on real data, either collected by the student or downloaded from the web, to pre-process, analyze, and visualize their data.



Semester By the Sea

Semester by the Sea is a different kind of learning experience that draws adventurous students to the DMC for the fall semester. Each day a single intensive and hands-on course is offered. Lectures, labs, and field trips revolve around the tides. Motivated juniors and seniors keenly interested in the marine realm and considering graduate school or a professional career in the marine sciences will find Semester by the Sea invaluable.

SBS courses include:

- SMS 352: Marine Ecology
- SMS 480: Biology of Marine Invertebrates
- SMS 482: Human Impacts on the Ocean
- SMS 491: Special Topics
 - Zooplankton & Ichthyoplankton
 - Introduction to Research Diving

Capstone Research Projects

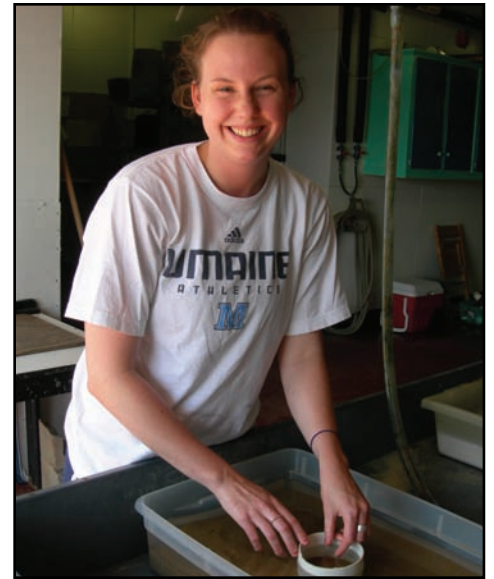
Every undergraduate student at the University of Maine is required to complete a Capstone project in their senior year. Many School of Marine Science undergraduates, like Erik, Sara and Katelyn pictured below, fulfill this requirement at the DMC.



Erik Belmer surveyed copper concentrations in the Damariscotta River over a 24-hour tide cycle in early May and in late October to test two hypotheses: 1) that copper concentrations are higher in May than in October because of higher river runoff due to snowmelt, and 2) that copper concentrations will be higher on the outgoing tide which carries more sediment and nutrients. Erik's Capstone advisor is Dr. Mark Wells. Research Specialist Kathleen Thornton provided technical support at the DMC.



Working under the tutelage of Dr. Bob Steneck, Sara Prendergast looked at the effects of current speed on the growth rates of three invasive colonial tunicates. She cultured samples of *Didemnum*, *Botrylloides* and *Botryllus* on PVC plates, deployed the plates in the low flow environment of Lowes Cove and in the faster moving waters of the Damariscotta River, and monitored growth. Preliminary results reveal all three species have higher vertical growth in the low flow environment.



With guidance from Dr. Sara Lindsay, Katelyn Hunt explored the sensory world of polychaetes. The worms have a nuchal organ on their foreheads; the function of which is not completely understood, but believed to be sensory. To determine if the nuchal organ of *Nereis virens* plays a role in finding food, Katelyn covered the organs with superglue and starved the worms. She put the hungry worms in a tray of sand, impregnated one corner with an annelid favorite – clam slurry – and monitored their movement.

POLAR MARINE ECOLOGY • JUNE 11 - JULY 14, 2012

UMaine marine science students first traveled to the Arctic in 1968 aboard the R/V *Hero* with Dr. David Dean and Dr. John Dearborn. Since then faculty and students have traveled to both poles to study these unique ecosystems. UMaine's long tradition of polar research and academic opportunities continues with **Polar Marine Ecology**, a new 3-credit field course offered by Dr. Rhian Waller. Taught at the DMC and at the Churchill Northern Studies Centre, Polar Marine Ecology will focus on the benthic and pelagic ecosystems of the Antarctic and Arctic, as well as the history of polar exploration and scientific discoveries, and current threats to these unique regions. On site in the Canadian arctic, students will compare temperate Maine to Hudson Bay through group research projects. Field trips to sites of arctic natural history and historical interest are also planned.

More course information and registration instructions are available at the DMC website www.dmc.maine.edu/coursesUM.html. Rhian's website for the course is <https://sites.google.com/a/maine.edu/polarecology>.





Spatial & Temporal Scales of Coral Recruitment & Key Ecological Processes

by Suzanne Arnold, Ph.D. Marine Biology

Susie's thesis research was grand in scope, focusing on the process of successful coral recruitment along the Mesoamerican barrier reef in the Caribbean Sea. On a scale of hundreds of miles, she surveyed the reef finding hotbeds of coral recruitment and regions of low recruitment. She then examined these regions more closely, on a scale of millimeters, to better understand the process of coral recruitment and survivorship in relation to other benthic organisms. She also examined the ecological role of parrotfish and herbivorous fish within the reef. Susie's thesis advisor was Dr. Bob Steneck.



Internannual Variability in American Lobster Settlement: Correlations with Sea Surface Temperature, Wind Strees and River Discharge

by Mahima Jaini, M.S. Marine Biology

Mahima examined the spatial correlation of lobster settlement with environmental variables in the Gulf of Maine and neighboring North Atlantic shelf waters. She compared 20 years of lobster settlement data with satellite derived data on sea surface temperature, wind stress and river discharge of three oceanographically distinct areas of the Gulf of Maine. The analysis revealed patterns of sea surface temperatures in the shelf waters that may be predictive of inshore lobster settlement. Mahima capped off her graduate work in June with the Best Student Paper Award at the International Conference and Workshop on Lobsters in Bergen, Norway. Her thesis advisor was Dr. Rick Wahle.

Developing Region-specific Growth Models for the American Lobster

by Charlene Bergeron, M.S. Marine Biology

Charlene's thesis research focused on creating computerized growth models based on size-age relationships that will enhance lobster population studies and fishery management techniques. Following crustacean cohorts is complicated. The animals have no morphological features such as growth rings, so there is no way to tell the age of an individual. Charlene successfully combined size frequency distribution data from various sources and compared it with data from long-term monitoring and tagging programs to parameterize growth models for three regions in the Gulf of Maine. Charlene's thesis advisor was Dr. Rick Wahle.

Green is the Gulf of Maine: How Have the Dynamics of CDOM and Phytoplankton Influenced Remotely-Sensed Estimates of Chlorophyll A.

by Michael Sauer, Ph.D. Oceanography

Satellite measurements of ocean color are proxies for estimating primary production and have been used with great success in the open ocean. Quantifying primary production in coastal waters from satellite data is more problematic. These waters contain colored dissolved organic material (CDOM) whose optical signals are indistinguishable from chlorophyll in the satellite data. Mike Sauer's research focus was to tease apart these two signals and develop algorithms that, when applied to satellite data, provide a better estimation of coastal primary production. Dr. Collin Roesler, Bowdoin College, and Dr. Mary Jane Perry were Mike's thesis advisors.



Photochemical Reactions of Particulate Organic Matter

by Margaret Estapa, Ph.D. Oceanography

Meg's research explored the role of sunlight in causing organic matter to dissolve from particles with the goal of predicting the "photodissolution" of particulate organic carbon (POC) in the coastal waters of Louisiana. She built a model that calculated dissolution rates from satellite data and laboratory experiments, worked out the seasonality of this reaction, and calculated its contribution to carbon cycling in the region. Her results show that photodissolution of POC has similar importance to already established photochemical reactions of dissolved organic matter. Meg's thesis advisors were Dr. Larry Mayer and Dr. Emmanuel Boss.



CONGRATULATIONS EVERYONE!!



Polychaete Survey

It's not uncommon to see Nancy Prentis scraping the dock or scouring the mudflats of Lowes Cove. She's been doing it since her days as a grad student at the DMC. Now an instructor of biology and marine biology at the University of Maine in Farmington, she often has a student in tow; this time it's Nate Durant, senior biology major at UMF.

Nancy was recently awarded an NSF EPSCoR grant to develop a database of the marine worms living in the waters off St. John, U.S.V.I. As some marine worms are used as bio-indicators of environmental stress, the database will not only provide information on species richness and diversity, but the health of the ocean floor around the island. Nate is one of the students working on the project with Nancy and this trip to the DMC was his introduction to polychaete taxonomy, biology, and ecology.

Copepods, Food for Larval Fish

Vanessa Paradis joined the zooplankton ecology lab of Dr. Jeff Runge for the month of May. As a Master's student in the department of Fundamental Sciences at the University of Quebec at Chicoutimi (UQAC), Vanessa is required to take an internship at another institution. Her academic advisors Pascal Sirois (UQAC) and Martin Castonguay (Department of Fisheries and Oceans, Maurice-Lamontagne Institute in Mont-Joli, Quebec) put her in touch with Jeff as their research interests are complementary.

Vanessa is quantifying *Calanus finmarchicus* and *Pseudocalanus spp.* populations in the southern Gulf of St. Lawrence and in the gut contents of larval Atlantic mackerel to assess their relative importance as prey items to this commercially important fish species. With increasing fishing pressure on the Atlantic mackerel, Canada's Department of Fisheries and Oceans is honing a recruitment model of Atlantic mackerel in the St. Lawrence River. An important factor is the availability of food to the larval fish. Vanessa's results will play a major role in strengthening the model's predictions.

Delivered by Wormweed

Researchers from the Marine Invasions Research Lab at the Smithsonian Environmental Research Center (SERC) in Edgewater, Maryland visited the DMC this summer and fall to study species diversity in "worm weed." Wormweed, so called because it is used as packing material in shipments of bait worms (primarily bloodworms, *Glycera sp.*), is harvested in New England (especially Maine) and shipped around the country, including to the mid-Atlantic region where the study focuses. Wormweed is a free floating mass of knotted wrack, *Ascophyllum nodosum*, detached from its intertidal holdfast and able to survive and grow in this different morphological form, or "ecad." It also serves as habitat for a host of organisms including *Littorina sp.*, amphipods, isopods, and oligochaete and polychaete worms. When employed as packing material, it can be a delivery mechanism for non-native and potentially invasive species, as has been shown on the west coast of the US.

Scientists working on the project include SERC postdocs, Amy Fowler, Joao Canning-Clode; SERC Research Associate, April Blakeslee; and SERC undergraduate interns, Anne Phillip (Portland State University) and Michelle Repetto (University of South Carolina).



VISITING INVESTIGATORS

The DMC is a user-friendly field station for marine researchers. Competitive rates and easy access to diverse intertidal habitats and the Gulf of Maine have drawn hundreds of scientists to the DMC in the last decade. Our professional support staff can provide assistance with specimen collection, equipment use, laboratory set up and housing. For more information, contact Tim Miller, Laboratory Manager, at temiller@maine.edu.

VISITING SCHOLARS

The DMC invites senior-level faculty and researchers to work in residence during the academic year, September to May. Selected Scholars will receive free furnished housing and office space. Preference will be given to applicants who will collaborate or interact with resident faculty and students in a way that will be mutually beneficial. Interested applicants should submit a letter of interest to Dr. Kevin Eckelbarger, DMC Director, at kevine@maine.edu.

VISITING GRADUATE STUDENTS

The Addison E. Verrill Award for Marine Biology and the Henry Bryant Bigelow Award for Oceanography are for graduate students who need access to a marine laboratory to carry out their thesis research. Each award provides up to \$3,400 annually for 1-4 years of facility use: housing, laboratory space, aquaria, SCUBA support and boat rentals. Application materials are available at the DMC website. The application deadline is February 15.

Environmental Adaptation

Carolyn Tepolt is a Ph.D. candidate in Dr. Steve Palumbi's lab at Stanford University studying how different populations of the same species, specifically the globally invasive European green crab, adapt and survive across broad temperature ranges. The DMC was the second stop on a three-leg research trip along the eastern seaboard where she conducted controlled experiments on local crabs to test their temperature tolerance and gathered samples for genetic assays to be completed back at Stanford. By comparing thermal physiology, gene expression, and gene sequence variation between these populations, Carolyn hopes to better understand the mechanisms by which species adapt to rapid environmental change.



Visiting Investigators from South Africa

Prof. Alan Hodgson and his wife Valerie from Rhodes University in Grahamstown, South Africa, spent 10 weeks this fall working with Kevin Eckelbarger on collaborative research projects involving the reproductive biology of shallow water and deep-sea invertebrates.

Valerie was on leave as Laboratory Manager for the Head of Microbiology and Alan was taking a sabbatical after recently stepping down as Head of the Department of Zoology & Entomology. Alan also serves as Director of the Electron Microscopy Center at Rhodes and is editor of the research journal *Invertebrate Reproduction & Development*. The Hodgsons have worked at the DMC on three previous occasions beginning in the late 1990's and have made full use of the Center's marine library and upgraded Electron Microscope Center and Histology Laboratory.





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COLLEGE ENRICHMENT

High school students planning to make the marine sciences part of their future are encouraged to **Dive In!** Spend three science-packed days at the DMC exploring the academic program offered by UMaine's School of Marine Sciences and career opportunities. July 23-25. Information and application materials are available at www.dmc.maine.edu/divein.html.

UMAINE ACCREDITED COURSES

May Term & Summer

SMS 491: Special Topics

- Life Histories & Functional Morphology of Commercially Important Invertebrates of Maine, May 9-25.
- Estuarine Oceanography, May 9-25.
- MATLAB, May 26 - June 8
- Polar Marine Ecology, June 11 - July 14

SMS 303: Techniques of Shellfish Aquaculture, May 21-25.

Semester By the Sea Program

SMS 352: Marine Ecology

SMS 480: Biology of Marine Invertebrates

SMS 482: Human Impacts on the Ocean

SMS 491: Special Topics

- Zooplankton & Ichthyoplankton
- Introduction to Research Diving

UMaine accredited courses offered at the DMC are open to students from UMaine and away. Course descriptions and registration information are posted at www.dmc.maine.edu/coursesUM.html.

DMC WORKSHOPS

The **Developmental Biology Teaching Workshop** is for new and seasoned instructors of undergraduate developmental biology laboratories. It provides basic hands-on experience with some organisms commonly studied in teaching laboratories. June 19-23.

The **Natural Science Illustration Workshop** appeals to students, teachers and professionals interested in drawing the natural world — as realistically as possible. Participants hone their observational skills while using the materials, tools and techniques of the trade. July 16-20.

Registration materials for these workshops are available at www.dmc.maine.edu/coursesprofdev.html.

