

MAKING WAVES

at the University of Maine Darling Marine Center



New Research Faculty at the Darling Marine Center

The University of Maine School of Marine Sciences (SMS) is proud to welcome two new research faculty: Dr. Damian Brady and Dr. Rhian Waller. For the past year, SMS has been on the lookout for talented researchers with proven interest in interdisciplinary collaboration among its core areas of aquaculture, marine biology, marine policy and oceanography, and with other fields of science or engineering. Damian and Rhian fit the bill and their arrival doubles the number of assistant research professors in the SMS. Damian and Rhian will both be based at the Darling Marine Center, bringing the total number of full-time faculty in residence to ten; the highest number in over a decade. DMC director, Dr. Kevin Eckelbarger says "We are very pleased to have Rhian and Damian join our resident faculty because they will significantly diversify and enrich our research capabilities."

**"I AM ALREADY ENJOYING
THEIR FRESH PERSPECTIVES."**

~ Dr. Pete Jumars,
Professor & Director of the
School of Marine Sciences



Dr. Damian Brady

Dr. Damian Brady moved into his office at the DMC in early September. A relatively simple move as he was already living in Maine and telecommuting to complete a Post-doctoral Fellowship at the University of Delaware, where he also received his Ph.D.

Damian studies the relationship between water quality and living resources. He designs numerical models to predict the extent, duration, and severity of "dead zones," areas of low dissolved oxygen resulting from nutrient loading or eutrophication. Additionally, he is interested in the behavior of juvenile fish in relation to dead zones as they are often very susceptible to the effects of low dissolved oxygen. Incorporating fish behavior into numerical models of dead zones gives a more integrated picture of how dead zones impact essential fish habitat. Damian believes end-to-end models that connect the watershed to water quality to fish and shellfish will be valuable tools for fisheries and environmental managers.

Damian is already exploring collaborations with UMaine faculty. Possible projects include watershed modeling on Lake Sebago with Dr. Jean MacRae, phosphorus cycling in sediments with Dr. Aria Amirbahman, and modeling the three local estuaries (Penobscot, Damariscotta, and Kennebec) with Dr. Larry Mayer at the DMC.

Dr. Rhian Waller is due to arrive at the DMC in late December; relocating from the University of Hawaii, Manoa, in the middle of a Maine winter!

Rhian received her Ph.D. from National Oceanographic Center, Southampton (UK) where she studied the reproduction of deep-sea scleractinian corals. Her ultimate research goal is to understand reproductive processes in cold-water ecosystems. To do so, Rhian regularly travels from pole to pole with additional stops in Alaska and Chile, relying on geographic databases and photographic data to find the animals. On site and back in her lab, she studies their reproductive ecology and larval development to understand how deep water corals may have evolved and how they disperse. Genetics, another useful tool to Rhian, helps her directly track larval dispersal and examine species diversity within the ecosystem.

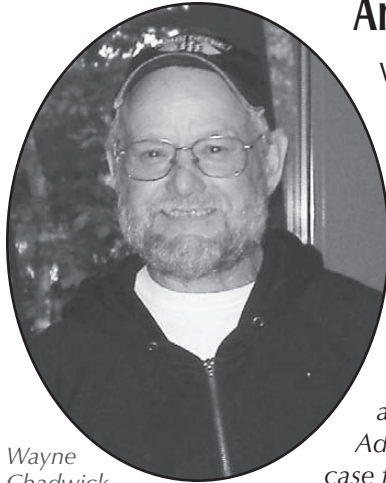
Ready access to flowing seawater at the DMC "is an exciting aspect to this move to Maine," says Rhian. With it she can expand her studies of reproductive biology and ecology to species found within the Gulf of Maine and explore new avenues of larval ecology research on fauna that are impossible to observe in the field.



*Dr. Rhian Waller aboard the
ARV Nathaniel Palmer in the
Drake Passage, Antarctica*

Photo credit - Dann Blackwood, USCS

An Outstanding Employee!



Wayne
Chadwick

Wayne Chadwick was named University of Maine Outstanding Classified Employee of the Year for the 2009-2010 academic year. For those of you who know Wayne and are familiar with his incredible work ethic, it comes to no surprise that he was the unanimous 1st pick for the award. For those who have yet to meet Wayne, here is an excerpt of one of the many nomination letters written by coworkers on his behalf:

Wayne has been a pillar of service and stability and beloved member of the Darling Marine Center community for over 23 years. In his position as grounds keeper, Wayne has played a vital role in maintaining the image of the University and the Darling Center as one of the preeminent small marine laboratories in the nation. Through years of growth and change, Wayne has committed himself to meticulously grooming our coastal campus. With over 170 acres of forest, fields, roads, walkways, and 25 buildings, looking after this facility is no small task. Additionally, consider that for most of his tenure Wayne has been the sole grounds keeper, and the case for exemplary performance and dedication becomes clear. As an individual Wayne is quiet, caring, and personable. He is most often the first employee to arrive in the morning, and the last to leave; if the flag is flying on campus, you know Wayne is here.

CONGRATULATIONS WAYNE!

Recent Publications

- Arnold, S.N.** 2010. "Coral survivorship in the gardens of good and evil" in Building Capacity in Coral Reef Science: An anthology of CRTR scholars' research 2010. D. Cleland (ed.) pp 2-7. www.gefcoral.org/publications.aspx.
- Arnold, S.N., R.S. Steneck & P.J. Mumby.** 2010. Running the gauntlet: Inhibitory effects of algal turfs on the process of coral recruitment. *Mar. Ecol. Prog. Ser.* 414:91-105.
- Auster, P. J. & **L. Watling.** 2009. Beaked whale foraging areas inferred by gouges in the seafloor. *Marine Mammal Science* 26:226-233.
- Book, J.W., **H. Perkins** & M. Wimbush. 2009. North Adriatic tides: observations, variational data assimilation modeling, and linear tide dynamics. *Geofizika* 26(2):115-143.
- Brady, D.C.** & T.E. Targett. 2010. Characterizing the escape response of juvenile summer flounder *Paralichthys dentatus* to diel-cycling hypoxia. *J. Fish Biol.* 77(1):137-152.
- Brady, D.C.,** D.M. Tuzzolino & T.E. Targett. 2009. Behavioral responses of juvenile weakfish, *Cynoscion regalis*, to diel-cycling hypoxia: swimming speed, angular correlation, expected displacement and effects of hypoxia acclimation. *Can. J. Fish. Aquat. Sci.* 66(3):415-424.
- Breitburg, D.L., J.K. Craig, R.S. Fulford, K.A. Rose, W.R. Boynton, **D.C. Brady**, B.J. Ciotti, R.J. Diaz, K.D. Friedland, J.D. Hagy III, D.R. Hart, A.H. Hines, E.D. Houde, S.E. Kolesar, S.W. Nixon, J.A. Rice, D.H. Secor & T.E. Targett. 2009. Nutrient enrichment and fisheries exploitation: interactive effects on estuarine living resources and their management. *Hydrobiologia.* 629(1):31-47.
- Estes, J.A., C.H. Peterson, & **R.S. Steneck.** 2010. "Some effects of apex predators in higher-latitude coastal oceans" in: Trophic Cascades: predators, prey, and the changing dynamics of nature. Terborgh, J. and Estes, J.S. (eds). pp. 37-53. Island Press, Washington, DC.
- Fennel, K., **D.C. Brady**, D.M. Di Toro, R. Fulweiler, W.S. Gardner, A. Giblin, M.J. McCarthy, A. Rao, S. Seitzinger, M. Thouvenot-Korppoo, & C. Tobias. 2009. Modeling denitrification in aquatic sediments. *Biogeochemistry.* 93(1-2):159-178.
- Foley, M., B.S. Halpern, F. Micheli, M.H. Armsby, M.R. Caldwell, E. Prahler, D. Silvas, C.M. Crain, Rohr, M.W. Beck, M.H. Carr, L.B. Crowder, E. Duffy, S. Hacker, S., K. McLeod, C.H. Peterson, H.M. Regan, P.A. Sandifer, **R.S. Steneck.** 2010. Guiding scientific principles for marine spatial planning. *Marine Policy* 34(5): 955-966.
- Gelcich, S., T.P. Hughes, P. Olsson, C. Folke, O. Defeo, M. Fernandez, S. Foa, L.H. Gunderson, C. Rodriguez-Sickert, M. Scheffer, **R.S. Steneck,** and J.C. Castilla. 2010. Navigating transformations in governance of Chilean marine coastal resources. *Proc. Of Nat. Acad. Sciences* 107(39): 16794-16799
- Hovel, K. & **R.A. Wahle.** 2010. Consistent effects of habitat fragmentation on American lobster movement across a gradient of predation risk and shelter competition. *Ecology.* 91:1993-2002.
- Hughes, T., N. Graham, J. Jackson, P. Mumby, **R.S. Steneck.** 2010. Rising to the challenge of sustaining coral reef resilience. *Trends Ecol Evol.* 25(11):633-642.

Continued on page 3.



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Questions and complaints about discrimination in any area of the University should be directed to the Director of Equal Opportunity, The University of Maine, 5754 North Stevens Hall, Room 101, Orono, ME 04469-5754, Telephone (207)581-1226, TTY (207)581-9484.

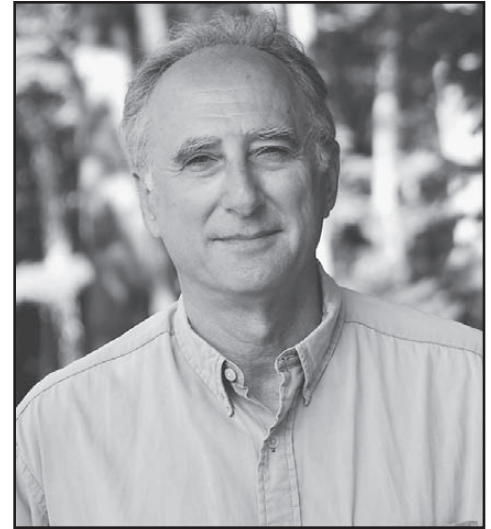
World Trade Center Shipwreck

Dr. Warren Riess, UM Maritime Historian and Archeologist based at the DMC, was called to New York City in July to help identify and conserve a shipwreck found at the World Trade Center site. Though all that remained of the ship was approximately 32' of the stern, Warren and his colleagues believe it was likely a 60-70' two-masted ship, built in the late-1700's or early-1800's, and used for coastal trade.

The wreck was riddled with shipworm burrows and shells, so the archaeologists called on DMC director, Dr. Kevin Eckelbarger to identify the organism. The shipworm was *Lyrodus pedicellatus*, a warmer water species that tells us the ship likely made at least one trip to the Caribbean.

The wreck also offered archaeologists several curiosities to ponder. The ship was constructed mostly of oak with a hickory keel; an uncommon, though not unreasonable, combination of North American hardwoods. It was assembled with square iron nails rather than wooden pegs; pricey materials for a trading vessel. Also at the wreck site were round logs, suggesting the ship was rolled to its resting place. Maps and charts of the day, however, suggest the site was then 13' underwater.

The ship was disassembled and trucked to Maryland for conservation. Images of the shipwreck can be found at www.drewfulton.com/panos/wtc-ship/wtc-ship.html.



Dr. Warren, Riess

Recent Publications con't from page 2

Incze, L., H. Xue, N. Wolff, D. Xu, C. Wilson, **R. Steneck**, **R. Wahle**, P. Lawton, N. Pettigrew, and Y. Chen. 2010. Connectivity of lobster (*Homarus americanus*) populations in the coastal Gulf of Maine: part II. Coupled biophysical dynamics. Fisheries Oceanogr. 19:1-20.

Jumars, P.A., E. Boss, J.H. Trowbridge & L. Karp-Boss. 2009. Turbulence-plankton interactions: A new cartoon. Marine Ecology: An Evolutionary Approach. 30:133-150.

Lorenzen, K., **R.S. Steneck**, R.P. Warner, A.M. Parma, F.C. Coleman, & K.M. Leber. 2010. The spatial dimensions of fisheries: putting it all in place. An introduction to the proceedings of the seventh William R. and Lenore Mote Symposium in Fisheries Ecology. Bull. Mar. Sci. 86(2):169-177.

McCauley, D.J., F. Micheli, H.S. Young, D.P. Tittensor, D.R. Brumbaugh, E.M.P. Madin, K.E. Holmes, J.E. Smith, H.K. Lotze, P.A. DeSalles, **S.N. Arnold** & B. Worm. 2010. Acute effects of removing large fish from a near-pristine coral reef. Marine Biology 175(12):2739-2750.

Mosher, C.V. & **L. Watling**. 2009. Partners for life: a brittle star and its octocoral host. Mar. Ecol. Prog. Ser. 397:81-88.

Musiak, M.M., L. Karp-Boss, **P.A. Jumars** & L.J. Fauci. 2009. Nutrient transport and acquisition by diatom chains in a moving fluid. J. Fluid Mech. 638:401-421.

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.

Pardo, L.M., C.S. Cardyn, P. Mora & **R.A. Wahle**. 2010. A new passive collector to assess settlement rates, substrate selection and predation pressure in decapod crustacean larvae. J. Expt. Mar. Biol. Ecol. 393:100-105

Ritson-Williams, R., V.J. Paul, S.N. **Arnold** & **R.S. Steneck**. 2010. Larval settlement preferences and post-settlement survival of the threatened Caribbean corals *Acropora palmata* and *A. cervicornis*. Coral Reefs 29:71-81.

Steneck R.S., and J.A. Wilson. 2010. A fisheries play in an ecosystem theater: challenges of managing ecological and social drivers of marine fisheries at nested spatial scales. Bull. Mar. Sci. 86(2):387-411.

Tyler, R.M., **D.C. Brady** & T.E. Targett. 2009. Temporal and spatial dynamics of diel-cycling dissolved oxygen in estuarine tributaries. Estuaries and Coasts. 32(1):123-145.

Watling, L. 2009. Biogeographic provinces in the Atlantic deep sea determined from cumacean distribution patterns. Deep-Sea Research Part II, 56:1747-1753.

Wells, R.J.D., **R.S. Steneck**, A.T. Palma. 2010. Three-dimensional resource partitioning between American lobster (*Homarus americanus*) and rock crab (*Cancer irroratus*) in a subtidal kelp forest, J. Exp. Mar. Biol. Ecol.384(1):1-6.

Williams, B., J. Halfar, **R.S. Steneck**, U.G. Wortmann, S. Hetzinger, W. Adey, P. Lebednik, & M. Joachimski. 2010. Twentieth century $\delta^{13}C$ variability in surface water dissolved inorganic carbon recorded by coralline algae in the northern North Pacific Ocean and the Bering Sea, Biogeosciences Discuss. 7:5801-5828.



Above: US and Chilean researchers on Robinson Crusoe Island.
 Right: Charlene Bergeron with *Janus frontalis*.



Rapid Response Rescues Research Project

Dr. Rick Wahle received a Rapid Response Grant from the National Science Foundation to resurrect a benthic ecology project ruined by the tsunami that devastated the Chilean coast on February 27, 2010.

In 2008, an extensive field research project was established around Robinson Crusoe Island, which lies 600 kilometers west of Chile in the southeast Pacific Ocean, by a group of Chilean marine biologist including Dr. Alvaro Palma of Pontificia Universidad Católica de Chile who received his Ph.D. from UMaine. The study aimed to understand the links between nearshore oceanographic conditions, benthic communities, and the Robinson Crusoe lobster, *Janus frontalis*. The tsunami destroyed the island's waterfront village, the Chilean marine laboratory, and the research project.

Rick and his lab are currently in Chile on their second of four trips to the area. The rapid response collaboration between US and Chilean researchers not only hastened the recovery of the project, but also yielded a unique opportunity to compare the benthic community, before and after a tsunami.

Wind Energy & the Benthos

In July 2012, an experimental wind turbine will be moored three miles off Monhegan Island to evaluate and monitor environmental impacts, as well as turbine design, stability, and placement, that would characterize a full-scale deepwater wind farm.

Dr. Bob Steneck, graduate student Jenn McHenry, and summer interns surveyed the test sites to establish base-line data on the benthic communities lying at 100m depth. They found key benthic organisms to be much less abundant off Monhegan than at a coastal control site near Pemaquid Point and consequently do not think the proposed wind project will

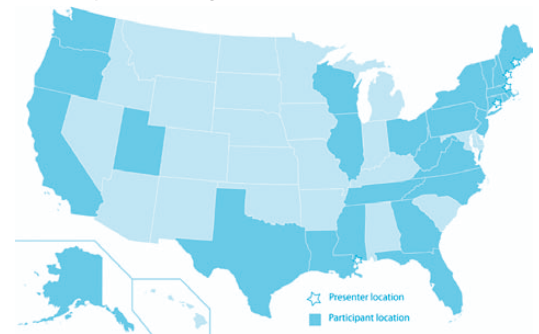


Ben Gutzler, Elizabeth Ford, Jenn McHenry, Owen Lui & Dr. Bob Steneck

negatively impact the benthos to a great degree. The group will continue seasonal monitoring until the turbines are deployed at which point the monitoring will focus on the impacts of deployment and chronic disturbances due to the operation of the wind generators. Learn more at www.deepcwind.org.

“ROLE” Model Webinars Newest Initiative for COSEE-OS

COSEE-Ocean Systems (OS) successfully extended its National Science Foundation (NSF) funding for an additional three years with fresh ideas for improving ocean literacy. Among COSEE-OS' new initiatives is the recently launched “ROLE (Research-based Online Learning Event) Model” Webinar Series. Each one-hour webinar includes three presentations: an ocean research scientist, an educator discussing ways that concept mapping can be used in education contexts, and a demonstration of multimedia software by COSEE-OS staff. Participants can interact with presenters by submitting questions and comments either verbally or through a text-based “chat box.”



The “ROLE Model” webinars have attracted interest on a national scale – the first webinars included 96 participants from 25 states (colored dark blue in map above.) A webinar series for 2011 is being planned and will include researchers from the NSF-funded “Autonomous measurements of carbon fluxes in the North Atlantic Bloom” project whose UMaine Principal Investigator is Dr. Mary Jane Perry.

Learn more about COSEE-OS webinars at <http://cosee.umaine.edu/programs/webinars/upcomingwebinar>.

UMAINE INVASIVE RESEARCH!

Invasive species are non-native organisms whose establishment in an area can potentially cause ecological or economic harm. Several invasive species are found in the Gulf of Maine. UM researchers are working to identify marine invasives and their impact on native species and communities. The three projects below focus on invasive tunicates

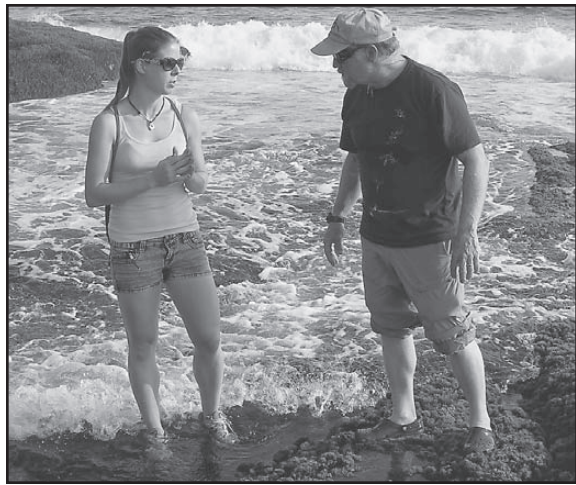
Optical Detection of *Didemnum*

Dr. Emmanuel Boss and students in the **Maine In-situ Sound and Color Lab** (MISC Lab) are employing optical sensors to quantify the ever expanding range of *Didemnum vexillum*, an invasive colonial tunicate that covers hard rocky substrates as well as docks, lines, ship hulls, and fishing/aquaculture gear in the Gulf of Maine and Georges Bank.

In this, the first of a two year study, MISC Lab researchers used two kinds of optical sensors, different light sources, and video cameras to measure the reflective light spectra of several organisms common to the waters around the DMC. Preliminary analysis of the data shows *Didemnum* mats have a higher reflectance than surrounding substrates and possibly a unique fluorescence signature, too. Future work will include adapting the optical sensors for use on autonomous vehicles (AUV's) so large scale surveys of the benthos can be made.



Mike Sauer, Dr. Emmanuel Boss, Thomas Leeuw & Wayne Slade



Sabrina Petri & Dr. Bob Steneck

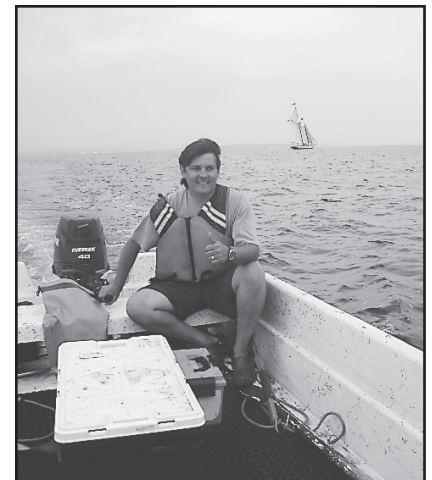
Preying on Invasives... or Not

Sabrina Petri, undergraduate student in the School of Marine Sciences, spent the summer in residence at the DMC working on her Capstone Project with Dr. Bob Steneck. Working under the premise that invasive tunicates are successful in the Damariscotta estuary because there are no predators to control them, Sabrina tried to identify predators of invasive tunicates.

Sabrina tested periwinkles, whelks and nudibranchs as possible predators of the colonial tunicates, and rock crabs and green crabs as predators of solitary tunicates, like sea squirts. Only rock crabs proved to be interested in any sort of tunicate. So it sounds like Sabrina might be onto something — limited predation on invasive tunicates enables them to thrive in the Damariscotta River Estuary.

Invasive Fouling Communities

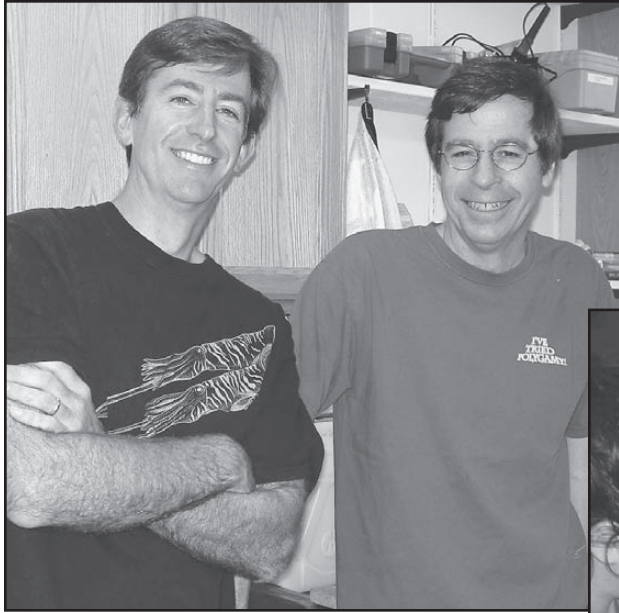
Felipe Paredes, Ph.D. student in the School of Marine Sciences, is studying invasive tunicate species in fouling communities; specifically native vs. non-native species abundances along estuarine gradients. In 2009, he compared fouling communities in the Kennebec, Sheepscot and Damariscotta estuaries. He found relatively light fouling, dominated by native species in the Sheepscot and Kennebec estuaries. Conversely, he found high degrees of fouling dominated by non-native tunicates in the Damariscotta estuary. In 2010, Felipe expanded his project to investigate possible differences in latitudinal and seasonal patterns along the coast of Maine. Using the DMC as the center of operations, he deployed over 300 settlement plates at 26 stations in seven estuaries from the NH border to Cobscook Bay and photographed the development of the fouling communities on the plates throughout the summer. Next year, Felipe plans to test the effects of currents and estuarine productivity on the native and non-native fouling communities.



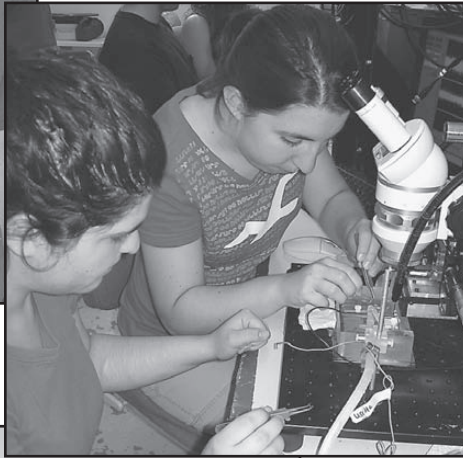
Felipe Paredes

Squid Squad Summer Research

Dr. Joe Thompson and his students from Franklin and Marshall College made their annual summer migration to the DMC to continue researching the musculoskeletal systems of squid. This year they were joined by Dr. Bill Keir and his students from the University of North Carolina, Chapel Hill. With a newly funded grant from the National Science Foundation, the researchers are testing a mathematical model, developed by Joe a couple of years ago, that challenges the dominant paradigm of muscle contraction.



Visiting Investigators: Dr. Joe Thompson & Dr. Bill Keir
Right: Miriam Rich (UNC) and Kari Taylor (F&M)



The long held view is that fibers within an individual muscle contract at the same rate, but this may not be the case in hollow cylindrical muscles like those of the squid mantle. By sewing small ultrasonic transmitters into the mantle muscle of hatchling, juvenile and adult squid, they measure gradients of strain and strain rates of the muscle fibers on the inside and outside of the mantle. A better understanding how these muscles work and how they change ontogenically, may provide clues to how they evolved.

A Renal Curiosity

Molgula is a genus of solitary tunicate with great diversity in high latitudes. Curiously, *Molgula* has a ductless, kidney-like sac. Since it's renal sac has no openings, it has no way to get rid of it's excrement. However, as *Molgula* develops from juvenile to adult and begins feeding, it consumes *Nephromyces* - a fungus with intracellular bacteria, which ends up in the renal sac of all adults. Dr. Mary Beth Saffo is an adjunct scientist at the Marine Biological Laboratory in Woods Hole and researcher at Harvard University working to unravel this curious relationship.



Visiting investigators: Dr. Mary Beth Saffo & Brandon Seah, Harvard University.

Research to date shows that all sexually active adults of *Molgula manhattanensis* are infected with *Nephromyces*. Mary Beth believes the tunicate needs the fungus to process excrement and the fungus needs the tunicate to complete it's life cycle. Harvard University student Brandon Seah is researching the bacteria's role in this 3-way relationship. They came to the DMC to collect as many species of *Molgula* as possible to confirm that adults of all species were infected with *Nephromyces*. Further genetic work at Harvard may help explain the evolutionary and physiological foundation for this mènage à trois.

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.

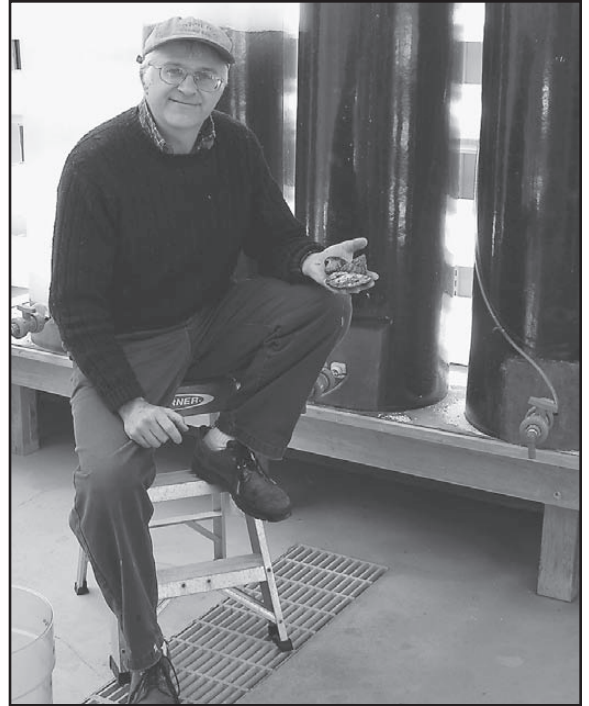
Welcome!

Mick Devin is the new Hatchery Manager in the DMC's Marine Culture Laboratory. Working for Dr. Paul Rawson in the School of Marine Sciences, Mick primarily supports the University of Maine Cooperative Oyster Broodstock Program; a partnership with Maine oyster growers and trade associations that uses selective breeding and cross-breeding to develop oyster lines with enhance production. With the recent outbreak of MSX in the Damariscotta River, the oyster breeding program will focus on developing a disease-resistant strain of the American oyster, *Crassostrea virginica*. MSX is an oyster disease caused by the protozoan parasite *Haplosporidium nelsoni* that kills oysters but is not known to harm human health.

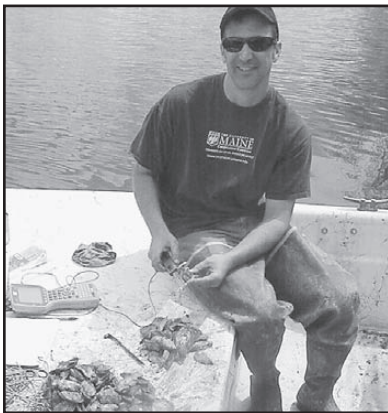
Mick is also involved with many other collaborative aquaculture projects. Working with Dana Morse, Maine Sea Grant, to develop a protocol to control the mud blister worm, *Polydora sp.* (see article below), Mick and several Semester by the Sea (SBS) students are studying mud blister worm mortality at low temperatures. It may be possible to kill the worms and not the oysters by holding oysters at cold temperatures for an extended period of time.

Additional projects address the increasing demand for whelks and razor clams for the gourmet food markets of Asia and Europe. With funding from the Maine Technology Institute and working in collaboration with Phinney Enterprises, a private company in Trescot, Maine, Mick is studying the reproductive biology and developing culture techniques for the waved whelk, *Buccinum undatum*. A similar project involving the razor clam is contingent on funding from the Northeast Regional Aquaculture.

In addition to supporting the educational and research needs of UMaine faculty and students, Mick hopes to make the DMC aquaculture facility more welcoming, available and user-friendly for visiting researchers.



Mick Devin



Dana Morse, Maine Sea Grant



Jesse Leach, Bagaduce River Oyster Company

Helping the Oyster Industry Control Mud Blister Worms

With funding from the Northeast Sustainable Agriculture Research and Education (SARE) program, Sea Grant Extension agent Dana Morse is working with oyster farmers Jesse Leach and Eric Moran, of the Bagaduce River Oyster company, to find ways of countering infestations of mud blister worms, *Polydora sp.* in farm raised oysters.

Though the larval distributions and developmental stages of the annelid worm

were studied by Dr. James Blake at the DMC back in the 1970's, control measures are still not clear and *Polydora* remains a problem for shellfish growers from Maine to the Gulf of Mexico. *Polydora* is not harmful to the bivalve, but it's presence stimulates the growth of pockets in the oyster shell, which fill with mud and worm waste. If the pocket is broken when shucking the oyster, it's an unappetizing prospect!

Jesse and Dana have been testing the effects of air drying, brine dipping, and equipment type on infestations of *Polydora sp.* for the past two years with hopes toward providing oyster producers with tips to minimize the problem. The project has also stimulated further research with Dr. Paul Rawson, and the DMC Hatchery Manager, Mick Devin who are working on effects of low temperatures on the survival of blister worms and oysters, when the oysters are held in moist air storage.



Nathan Briggs

MS Awarded to Nathan Briggs

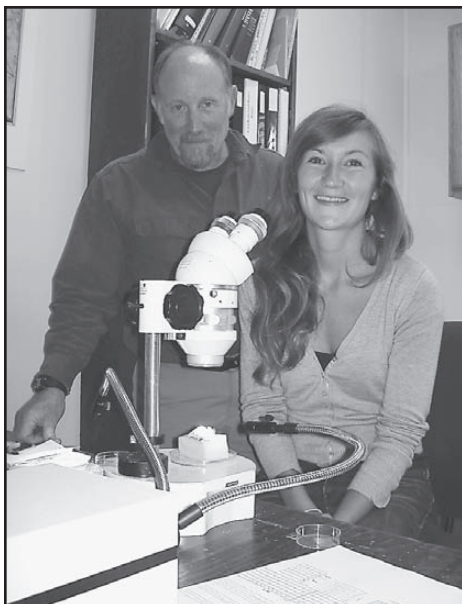
Nathan Briggs was awarded and M.S. in Oceanography for his thesis titled: Analysis of Optical Spikes Reveals Dynamics of Aggregates in the Twilight Zone; work he did under the tutelage of Dr. Mary Jane Perry. The “biological pump,” whereby phytoplankton grow in the surface ocean, aggregate, and sink, is a critical process contributing to global atmospheric CO₂ drawdown and provides the vast majority of food for deep ocean and benthic ecosystems. The phytoplankton aggregates, also called “marine snow,” are fragile and notoriously difficult to sample. In his thesis, Nathan presented a method for detecting these sinking clumps of phytoplankton and estimating their sinking speed using small optical instruments aboard automated underwater vehicles. The method revealed a large pulse of phytoplankton sinking at 75 meters per day following the North Atlantic spring phytoplankton bloom in 2008. His results confirm the value of autonomous platforms in studying biological processes in the ocean. Nathan is staying on in the Perry lab and pursuing a Ph.D.

Centuries Old Shells Hold Climate Clues

Erin Beirne and Shelly Griffin, graduate students under the advisement of Dr. Alan Wanamaker Jr. at Iowa State University, are trying to back-calculate oceanic conditions in the Gulf of Maine using the shells of ocean quahog, *Arctica islandica*. Since the quahog can live to be over 200 years old, their shells hold a recorded history of ocean temperature and salinity spanning centuries. Using ancient shells, Shelly is matching annual growth bands (much like tree rings) to construct a chronology of changes in the ocean environment. Erin is studying living quahogs to learn how seawater chemistry is recorded within their shells. She maintained populations of juvenile and adult quahogs at the DMC while tracking water chemistry in the hopes of correlating the dissolved inorganic carbon content of the water with the carbon in the animals shell material and tissues. The team hopes that accurately interpreting the physical and geochemical signatures in quahog shells may aid in hindcasting oceanographic conditions in the Gulf of Maine.



Erin Beirne & Shelly Griffin



Dr. Bob Steneck & Gaëlle Quere

Crustose Coralline Algae Taxonomy

Gaëlle Quere is a Ph.D. student at Leibniz Center for Marine Tropical Ecology, Bremen, Germany, studying the diseases that affect crustose coralline algae. Crustose coralline algae play a crucial role in the ecology of coral reefs by acting as cues for coral settlement and by contributing to reef calcification and cementation. However, in an era of rapid climate change and unprecedented human pressure, these algae show increased signs of mortality through diseases. Gaëlle’s thesis research focuses on the Coralline Lethal Disease (CLD) in Curaçao and her key objectives are to characterize the disease, understand the spatial-temporal dynamics of the disease, identify the environmental factors and evaluate the effects on reef recovery processes. Gaëlle spent a month at the DMC working with Bob Steneck with one important objective: learn the taxonomy of coralline algae. Coralline taxonomy is a difficult discipline always under revision and Bob is one of the only specialists in the world. Gaëlle considers herself “really lucky to have this opportunity” and will now be able to conduct her research at the species level.

Hydractinia Like It “Just Right”

Lareen Smith is a 1st year Master’s student at California State University, Northridge. Working with Dr. Steve Dudgeon, she is studying the physiological regulation of *Hydractinia symbiolongicarpus* morphology (body form.) *Hydractinia* are colonial hydrozoans often found on the backs of hermit crab shewlls. Laboratory studies in the California Dudgeon lab showed that *Hydractinia spp.* colonies have different morphologies when grown in hypoxic (low oxygen) conditions. Lareen received the DMC’s Addison E. Verrill Award for Marine Biology to conduct a complementary field study.

After propagating colonies of *Hydractinia* on glass slides in the Flowing Seawater Laboratory, Lareen placed the genotypic replicates at various sites in Lowes Cove and surrounding areas that represented a range of key environmental variables. For 15 days, the specimens grew and data loggers monitored flow speed, salinity, temperature, dissolved oxygen and pH. Preliminary results suggest that colonies in the most extreme environment experienced little to no growth while colonies in the mid-range environmental variables experienced the most growth. In other words, *Hydractinia symbiolongicarpus* like their environment to be “just right”; not too warm or salty, and with plenty of oxygen.



Lareen Smith

VISITING GRADUATE STUDENT AWARDS

The DMC has been awarding facility grants to visiting graduate students for five years. The [Addison E. Verrill Award for Marine Biology](#) and the [Henry Bryant Bigelow Award for Oceanography](#) are bestowed to graduate students who need access to a marine laboratory to carry out their thesis research. Each award provides up to \$3400 annually for 1-4 years of facility use: housing, laboratory space, aquaria, SCUBA support and boat rentals. Eligible students must be currently enrolled in a recognized graduate program. Preference will be given to students who conduct field-oriented studies, but who have had limited marine lab or field station experience. Application deadline is February 15.

WWW.DMC.MAINE.EDU/GRADAWARDS.HTML

Whelks and Waves

Building on work undertaken nearly century ago by Harold Colton, Katie Vazques spent the summer collecting and measuring whelks. *Nucella lapullis*, the dog whelk, is one of the most common intertidal snails in the Gulf of Maine and its shell shape and coloration vary considerable throughout it’s range. Colton noted that these differences varied with wave exposure. More recent research has reported chromosomal polymorphism in *Nucella* from the Western Atlantic – different populations have different numbers of chromosomes.

I have added my name to the long list of ecologists and evolutionary biologists fascinated by the apparently inexhaustible variation in this remarkable intertidal snail.

~ Katie Vazques

Katie, a Ph.D. student at University of Pennsylvania in the laboratory of Dr. Peter Petraitis, is studying *Nucella* populations in Maine to access the possible correlation between shell morphology, chromosome number and wave exposure. The DMC’s Addison E. Verrill Award allowed Katie to use the lab as home base; to collect *Nucella* along the Maine coast from Acadia National Park to Orrs Island, measure their morphology and freeze samples for DNA analysis back at UPenn.

Like Coulton, Katie is finding morphological differences between *Nucella* populations from exposed and protected shorelines. The lighter color morph is much more common on protected shores and, morphologically, these snails have larger shells (greater shell length) are more likely to have teeth along their apertures.



Katie Vazques

BEACONS on the Maine Coast

BEACONS (Biosafety for Environmental CONTaminants using Novel Sensors) is a collaborative project to develop strategies for the isolation and detection of harmful microbes from both seawater (*Alexandrium*) and freshwater (*Microcystis*) as well as their associated toxins. *Alexandrium*, commonly called red tide, is responsible for extensive closures of shellfish harvests. Paralytic shellfish poisoning (PSP) caused by consumption of shellfish that have fed on the toxic alga *Alexandrium* is a major health concern. *Microcystis* contains toxins that are increasingly found in reservoirs and lakes used for drinking water.

Dr. Laurie Connell and graduate students from the School of Marine Sciences welcomed colleagues from Northern Ireland and the Republic of Ireland to midcoast Maine for a BEACONS meeting at the DMC. The group of 15 researchers have complementary expertise in marine and fresh water environmental research, assay development, and sensor technology. They are developing an innovative sample collection/concentration protocol and a sensor-based detection system that will have positive, world-wide implications for human health and aquatic related industries.



BEACONS at the Pemaquid Point Light House



Students in SMS491-Introduction to Research Diving class

Giant Stride for Divers

It was an exciting year for the UMaine Scientific Diving Program! In order to reduce the financial burden on student divers, the School of Marine Sciences generously funded the acquisition of four sets of basic scuba gear. Purchased in cooperation with Halcyon Manufacturing, Inc. and Aqua Diving Academy, the high quality BCDs, regulators, dive computers, and weight systems were immediately put to use by UMaine students enrolled in SMS491-Introduction to Research Diving.

The Scientific Diving Program also collaborated with the Office of University Development to establish a Scientific Diving Gift Account and now has a repository for charitable contributions made on behalf of UMaine divers. Any funds donated by alumni or friends of the program will be used exclusively to acquire scuba equipment to assist UMaine students and scientists who wish to conduct underwater research. If you are interested in contributing to the UMaine Scientific Diving Program, please contact Diving Safety Officer, Chris Rigaud at crigaud@maine.edu or Assistant VP for Development, Kendra McCrate at kendra.mccrate@maine.edu.



2011 AAUS Diving for Science Symposium

Underwater scientists and diving professionals from around the world will descend upon Maine to continue the tradition of scientific diving excellence at the 2011 AAUS Diving for Science Symposium, hosted by the University of Maine. Pre-symposium workshops, dives and meetings will be held at the DMC October 10-13. Science seminars and other events will be held in Portland October 14-16.

More information at www.aaus.org

Nor'Easter Bowl Sportsmanship Award

Each winter regional National Ocean Science Bowl (NOSB) competitions take place across the country. High school students from Maine, New Hampshire and Vermont compete in the Nor'easter Bowl; showing their knowledge of the marine sciences, including biology, chemistry, physics and geology. Coached by marine science teacher, Beth Marass, the Sanford High School team has received honorable mention for their great sportsmanship for two years running. Their prize—an overnight field trip to the DMC!

Beth has been coaching the Sanford team for six years. They meet once a week, right after school, to discuss Ocean Bowl homework assignments and answer practice questions. The team also takes field trips to the ocean and goes whale watching to build team spirit. We've thoroughly enjoyed our visits from the Sanford High team. The students are keenly interested in marine science and a lot of fun to be around. We wish them the best of luck at the 2011 Nor'Easter Bowl!



Sanford High School Ocean Bowl team aboard the R/V Ira C.



David Wheeler, Instructor of Natural Science Illustration, with UMaine undergrads Sonja Allen (UM marine science major) and Christina Pappas (UM art major) at the art show.

Art & Science Converge at the DMC

An intensive course in natural science illustration was a first-time offering at the DMC this summer. The old saying “a picture paints a thousand words” is especially true of natural science illustration. Though the discipline emphasizes proper proportions, it relies on close, careful observation to capture and portray an organism's form, function and place in the ecosystem. Instructor David Wheeler, Empire State College/SUNY, introduced students to the materials, methods, tools and techniques of scientific illustration, while strongly encouraging them to hone their observational skills. They worked with live specimens, shells, fossils and archaeological artifacts. The results were outstanding and culminated in the first art show at the DMC

David also opened doors for two talented UMaine students, Sonja Allen and Christina Pappas. As part of their undergraduate Capstone Project, they will be meeting with and interviewing with Patricia Kernan, head science illustrator at the New York State Museum. Additionally, Sonja will exhibit her work at the Empire State College Teaching Gallery in March 2011.



Dr. Leland Johnson, DBTW Instructor

DBTW Adds Amphibian Component in 2011

Dr. Leland Johnson, Augustana College, SD, and Dr. Eric Cole, St. Olaf's College, MN, are happy to announce the expansion of the Developmental Biology Teaching Workshop (DBTW.) In 2011, DBTW will be extended to four and one-half days to include a section on amphibian development taught by guest instructor, Dr. Steven Black, Reed College, OR. The new amphibian component will include basic methods for work with amphibian gametes and early embryos. There will be teachable lab experiences with modern techniques for imaging new membrane delivery at cleavage and classical surgical twinning of embryos. Professor Black also will instruct participants in methods for making surgical tools in the historical tradition of Hans Spemann. Additional course information and registration materials are available on at www.dmc.maine.edu.



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DIVE IN

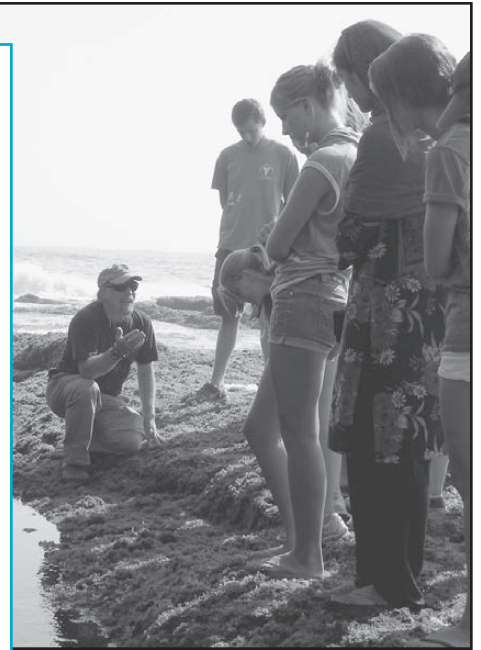
In August, the DMC offered a new program for high school students interested in marine science. **Dive In** was designed to give college-bound students a taste of one of the most popular scientific majors: to expand their view of marine science, to make them aware of different marine science careers, and to discuss relevant coursework for their final year in high school and what to expect as an undergraduate. Participants in this year's program spent three days in residence at the DMC. They explored marine biology, ecology, oceanography, scientific diving, remote ocean sensing, and aquaculture on foot, by kayak, and aboard the R/V Ira C. with UMaine faculty and staff. Watch the DMC website for Dive In 2011 application materials.

TO MARINE SCIENCE



Dive In exposed me to many interesting and exciting fields in marine biology that I never even knew about!

~ Dive In 2010 participant



I attended Semester by the Sea and it was by far my favorite experience with the marine science program.

~ Shawn Villar, SBS 2009

SEMESTER BY THE SEA

A perennial favorite among University of Maine students in the School of Marine Sciences, the Semester by the Sea (SBS) program offers a unique learning experience for undergraduates. SBS'ers study the organisms and habitats of the Gulf of Maine while spending the fall semester in residence at the DMC. Motivated upperclassmen keenly interested in the marine realm and considering graduate school or a professional career in the marine sciences will find SBS invaluable. SBS is open to students from UMaine and outside institutions. Field-oriented courses include:

- Marine Ecology • Design of Marine Organisms
- Biology of Marine Invertebrates • Zooplankton & Ichthyoplankton
- Introduction to Research Diving • Human Impacts on the Ocean
- SBS Undergraduate Seminar

More information at: WWW.DMC.MAINE.EDU/SBS.HTML



I would recommend SBS whole-heartedly to anyone. It really improved me as a person and a scientist.

*~ Matthew Louis
SBS 2008, B.S. UMaine 2009*