NC STATE UNIVERSITY

CMAST
COMMUNICATOR
THE CENTER FOR MARINE SCIENCES AND TECHNOLOGY
discovering coastal solutions

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Food Science and the Sea

Spotlight on NCSU Department of Food Science, Bioprocessing and Nutrition Sciences

Among the many university departments represented at NC State's CMAST is the Department of Food, Bioprocessing and Nutrition Sciences (renamed in 2007 from Food Science). Although popularly known for the ice cream and dairy products sold at the NC State Fair each year, this department covers a wide area in food research including dairy, red meats, poultry and eggs, fruit and vegetables and fishery products. The department is made up of educators, research scientists and extension professionals who are committed to undergraduate and graduate education, conducting cutting edge research, and providing extension and outreach services to North Carolina businesses and the general public.

Perhaps most significant is that this department investigates critical issues related to the safety and quality of food intended for human consumption. This includes post-harvest handling, nutrition, functional components, manufacturing processes and value-added products. Many faculty work in partnership with industry to improve the safety, variety, and quality of food and biological products. The department is well known in the scientific and business community for significant accomplishments including the development of sweet acidophilus milk; research on chemical sterilization of packaging films leading to development of aseptic processing technology; and restructured fish products made of surimi (a functional protein) - to name a few.

In this issue of the *CMAST Communicator*, we spotlight the research of two food scientists - applied research conducted at the NCSU Seafood Laboratory with Dr. David Green, Professor and Extension Seafood Specialist, at CMAST in Morehead City, and the basic seafood research being performed by campus-based faculty, Dr. Tyre Lanier, Professor and Protein Biochemist. These two have teamed up to work together on a number of seafood projects to solve industry issues or open new business opportunities for North Carolina companies.

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CURRENT EVENTS

CMAST SEMINARS • 2008
ROOM 205 • 11:00 AM - 12:00 PM

Note: This semester the CMAST Seminars planners have asked a variety of speakers to address the following common theme:

How will fisheries ecology and management evolve over the next 20 years - with a focus on (1) Key Questions & Why, (2) New Methods, and (3) Wild Speculation.

Seminars titled "The Future of Fisheries Management and Ecology" with an asterisk (*) are part of this series.

Friday, January 25
Hidden Process Models for Animal Population Dynamics
Dr. Paul Conn, NOAA Beaufort

Friday, February 8
The Future of Fisheries Management and Ecology*
Dr. Joseph Hightower, USGS, NC Cooperative Fisheries and Wildlife Research Unit, NCSU

Friday, February 15
The Future of Fisheries Management and Ecology*
Dr. Louis Daniel, Director, NC Division of Marine Fisheries

Friday, February 22
The Future of Fisheries Management and Ecology*
Dr. Michael Prager, NOAA Beaufort

Friday, February 29
CarteretCatch™: Promoting Local Seafood Through Community and Business Partnerships
Barry Nash, NC Sea Grant Seafood Technology and Marketing Specialist

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From the Director

Welcome to the *CMAST Communicator*. In this issue, we move from our previous issue on applied fisheries research in the field to the collaborative nature of research on seafood technology conducted in the laboratory between resident CMAST faculty and their counterparts on NC State University's main campus in Raleigh. Thus, we are very unique among marine science institutions in that we are one of the few that conduct research on fisheries anywhere in the chain from the sea to the dinner plate.

Seafood continues to make headlines, ranging from the health benefits of omega-3 fatty acids found in fish, to the safety concerns of imported seafood, to the decline in wild-caught fisheries and rapid rise in aquaculture products. For example, a majority of the seafood consumed in the US is imported from other countries, of which a large percentage of that is farmed. Concerns of the safety of imported seafood, the ability to use biotechnology to add value to seafood products, and the increasing need for farmed seafood to meet market demands will continue to fuel seafood technology research. Drs. David Green and Tyre Lanier, along with their graduate students and industry partners, are applying biotechnology to add value to seafood products. Their studies provide excellent examples of how university-based biotechnology research can be used to promote economic growth, which is the focus of a recently funded project planning grant from the NC Biotechnology Center for developing a business plan for a NC Center of Innovation in Marine Biotechnology, which is described further in this issue.

As always, I invite you to visit our web site (www.cmast.ncsu.edu), our beautiful facility located on Bogue Sound in Morehead City, or contact any of our faculty, staff or students with questions.

Best wishes, Dave Eggleston

SPOTLIGHT ON CMAST FACULTY AND NCSU DEPARTMENTS

Seafood Laboratory Assists Local Fish Farming Industry

Applied research is conducted at the NCSU Seafood Laboratory in Morehead City when solutions to industry needs are not readily available in commercial practice or from the literature. Development of year-round markets for North Carolina farmed-raised hybrid striped bass using a total quality system is the latest applied research project currently underway at the laboratory.

Hybrid striped bass.

Hybrid striped bass is a popular farmed fish in the US and has long been a success story with fish farmers in North Carolina. The fish is recognized for its white meat, mild odor and flavor, juicy texture and long shelf life. But the North Carolina industry is hard pressed to supply year round markets for its fish due to biological and seasonal variations in fish quality. Research performed by visiting Danish scientists

Harvesting fish.

Ted Davis of White Rock Fish Farm.

Durita Nielsen and Arni Petersen in 2005-06 developed a novel way of grading striped bass based on their sensory attributes that could enhance their marketability and reduce off-flavors encountered during the summer months. Fish are first graded according to their appearance, odor, and texture characteristics and then tagged for full-chain traceability from point of harvest through consumption. The new marketing strategy may provide NC farmers an increase in market share due to consistency in quality and sustainability of supply to fish buyers.

Working with White Rock Fish Farm in Vanceboro, NC, Seafood Lab staff are utilizing a trained sensory panel to obtain objective measures in flavor profiles of cooked hybrid striped bass due to seasonal and special differences at harvest. The fish farm is evaluating a commercial purging technique prior to fish harvest to improve the consistency in flavor profiles, and is working with a private company to develop a computer-based traceability program to help better market these locally-produced fish.

Grading of fresh hybrid striped bass is based on a quality

Sensory panel evaluates product.

index that quantifies multiple fish attributes as a function of time on ice. This Quality Index (QI) Method is correlated to the sensory qualities of cooked fish in order to predict the remaining shelf life based on the grade given to whole fish in ice.

The project is funded through the North Carolina Fishery Resource Grant Program to White Rock Fish Farm, Inc. and the NCSU Seafood Laboratory. For more information on the study, contact Dr. David Green at 919.222.6304 or e-mail dpg@ncsu.edu.

Dr. David Green is Professor, Extension Seafood Specialist and Director of the Seafood Laboratory located at CMAST.

Dr. Lanier at work in gelation lab.

Food Science Research Improves Market Value of North Carolina Seafood

Protein biochemist Tyre Lanier knows that fish offer some unique functional properties that can be used to improve the value and profitability of locally caught seafood.

His research laboratory has worked in the area of understanding the functionality of fish proteins and in the development of restructured fish products made from surimi, a washed minced fish protein. Surimi may not be manufactured along the North Carolina coast, but its finished end product, formed crab meat and shrimp, are frequently found on North Carolina restaurant menus and in grocery store fish counters across the state. Thanks to Dr. Lanier's efforts, many North Carolina businesses have utilized this unique fish product in value-added seafood products like dips, salads, and cakes - meeting price points and volume sales not achievable with more seasonal fishery products.

Surimi product

Scallop Medallions™

Lanier's group has further applied the unique properties of fish proteins to include the binding of small sea scallops into what has been marketed as Scallop Medallions™ by a local seafood business. Wanchese Fish Company worked with Lanier's group in Raleigh and the NCSU Seafood Laboratory to formulate and develop a commercial process to produce "reformed" sea scallops. The marketing success of this innovative process revolutionized the scallop industry and greatly expanded the horizons for one local seafood business.

Penny Amato, Research Analyst in Lanier's lab, works on a titration calorimeter.

Lakendra Shepard at the DSC.

Now, the sky is the limit as Lanier is exploring new ways to apply the functional properties of these fish proteins through solubilization and injection into whole intact fillets. The concept is to recover natural proteins from fish and reinject them into whole fillets, increasing the yield and water retention (binding) properties. The new process is being tested at a number of seafood and other business applications and has received much attention from knowledgeable seafood processors.

For more information on improving the value and profitability of locally-caught seafood, contact Dr. Tyre Lanier at 919.513.2094 or e-mail tyre@ncsu.edu.

NC Biotechnology Center Awards Planning Grant

The North Carolina Biotechnology Center (NCBC) has awarded one of its first $100,000 Phase I planning grants, designed to help create biotechnology focused centers of innovation in North Carolina, to the NC Marine Biotechnology Center of Innovation Development Consortium. The Consortium is coordinated by North Carolina's Eastern Region Development Commission, a publicly chartered municipal corporation. The Consortium (initially consisting of public and private institutions of higher learning engaged in marine science research, education, and training; economic development organizations; and private sector interests) cooperated and collaborated in the development of the successful proposal.

"Key to the success of the Consortium in putting forth this proposal has been the willingness among major universities, including, NC State, UNC Wilmington, UNC Chapel Hill, ECU and Duke to share information and leadership responsibilities in moving this proposal forward," said Al Delia, President of North Carolina's Eastern Region. "That same level of cooperation and collaboration is what will make the planning phase successful, and ultimately will make the creation of the Marine Biotech Center of Innovation a tremendous asset for all of North Carolina."

The $100,000 Phase I funds from the NCBC will be used to plan the development of the North Carolina Marine Biotechnology Center of Innovation. North Carolina's Eastern Region will be the recipient and administrator of Phase I funds. Funds will be expended over a period of 6-12 months from the date of the award. Leadership will be provided by a diverse and widely representative consensus-driven Project Management Team. Working with a Project Director to be hired, the Project Management Team will communicate regularly with an even broader Project Information Contact Group to assure that the process is inclusive and successful.

At the conclusion of this planning period, the NC Marine Biotechnology Center of Innovation Consortium will have developed a detailed implementation plan which will include the establishment of a legal entity that will function as the NC Marine Biotechnology Center of Innovation and be the vehicle that (if invited to do so) will apply for Phase II funds from the NC Biotechnology Center. Phase II funds are designed to establish the Marine Biotechnology Center of Innovation and its initial operations.

David Eggleston, Director of CMAST, is a member of the Executive Committee of Marine Science Directors which will oversee the Program Management of the NC Marine Biotechnology Center for Innovation. CMAST is a key partner in the development of the center as a supporter of marine research which can ultimately provide benefit to local industry with the potential to affect job growth and economic development in coastal areas.

McClellan-Green attends London nanomaterials meeting

Toxicologist Dr. Pat McClellan-Green of CMAST was invited in November 2007 to attend "NANONET WORKSHOP," a meeting of scientists spanning from the European Union, Australia and the US who are currently working with manufactured nanomaterials in the aquatic environment. The meeting was organized by Dr. Jamie Lead (University of Birmingham, England) and funded by the UK Natural Environment Research Council under a program to facilitate knowledge transfer between relevant bodies and people (academia, industry, government).

The workshop was held at the University of Birmingham to discuss the links and overlaps between ecotoxicology and physico-chemistry of nanoparticles (NPs) in natural waters (including soils and sediments). There were approximately 25 participants by invitation only and several talks were given on select topics in this area.

The majority of the two days were set aside for high level research discussion related to what is known about the behavior and effects of nanoparticles in the aquatic environment and most importantly what is *not* known, and recommendations for future research. The scientists who attended this workshop are currently writing several review/discussion papers as an immediate outcome of the workshop. These papers will be published in a special issue of the journal *Environmental Toxicology and Chemistry*.

CMAST and Collaborators Represented at National Estuarine Research Federation Meeting

In November 2007, CMAST research staff member Warren Mitchell attended the Estuarine Research Federation's national meeting in Providence, Rhode Island. Speaking for collaborators Jeff Buckel, Chris Taylor, Gretchen Bath Martin (NOAA) and Kyle Shertzer (NOAA), Warren presented research results at a symposium entitled "Long-term Shifts in Faunal Assemblages in Eastern North America." By analyzing data collected over two decades on the migration of larval fish into Beaufort Inlet, the team described a recent (ca. 2000) and substantial shift in many species' patterns. Interestingly, species which contributed most to this change were more typical of habitats to our south.

Following the symposium, the implications of these and related observations were heartily discussed by scientists hailing from Tampa Bay to the Gulf of St. Lawrence.

CMAST NOTES

CVM Client Honored as 'Hero of the Year'

Dr. Craig Harms, CVM at CMAST, reports that Jean Beasley, Director of the Karen Beasley Sea Turtle Rescue and Rehabilitation Center in Topsail Beach, NC has been named the **Animal Planet Hero of the Year.** Jean is a frequent client of the NCSU CVM VTH (Veterinary Teaching Hospital) and Field Services (based out of CMAST).

Excerpt from the Animal Planet web site report:

Meet Jean Beasley, 2007 Hero of the Year Winner. Animal Planet and the makers of Fresh Step® Litter would like to congratulate Topsail Beach, North Carolina resident Jean Beasley as the 2007 Hero of the Year! Jean was nominated by Martha Eggleston for her work as founder and director of The Karen Beasley Sea Turtle Rescue & Rehabilitation Center.

As the 2007 Hero of the Year, Jean receives a trip for two to Hawaii. In addition, the animal welfare organization of her choice will receive a $10,000 donation provided by the makers of Fresh Step® Litter.

The search for the Hero of the Year is an eight-month process, beginning with online and public nominations, followed by a review of a panel of judges who determine ten finalists. Finally, the voting returns to a public forum as Animal Planet viewers visit animalplanet.com to vote on their favorite finalist.

For more information visit: http://animal.discovery.com/convergence/hero_of_the_year/nominees/2007/winner.html

Fifth Grade Students Visit CMAST

White Oak Elementary 5th grade classes had field trips to CMAST on November 1 & 2, 2007 which included more than 100 students. The trip was coordinated with Ms. Amy Riley, 5th grade teacher and Dr. Jeff Buckel's laboratory at CMAST.

Activities were coordinated to complement the curriculum the students were learning about - latitude and longitude as well as marine habitats.

Activities included a PowerPoint presentation on latitude and longitude in the marine environment, geocaching (modern day "treasure hunts" using handheld GPS units), and beach seining. Prizes for the treasure hunt were provided by the North Carolina Maritime Museum in Beaufort, NC. Members of the Buckel lab - Kyle Adamski, Warren Mitchell, Nate Bacheler, Jim Morley, Tim Ellis, Amy Waggener, and Chris Butler (CVM lab) assisted with the activities.

Sea Grant Hosts Bluefin Tuna and 'Clean Marina' Workshops

Sea Grant, along with other state agencies, hosted three **Clean Marina Workshops** in December. The focus was on marine pressure washing and pollution prevention from toxic bottom paint. Several types of eco-friendly systems were highlighted. The workshops are intended for coastal marina owners and managers.

In addition, Sea Grant, in partnership with the US Coast Guard, NC DMF, and NOAA enforcement, also hosted a Bluefin Tuna Safety Requirements and Handling Workshop in mid-December. This workshop is presented to help those targeting giant, bluefin tuna commercially decipher some of the complex regulations in this fishery and to learn and understand safe handling techniques.

For more information contact Brian Efland, Sea Grant Marine Conservation and Enterprise Development Specialist, at 252-222-6314 or e-mail: brian_efland@ncsu.edu

NCSU DEPARTMENT NEWS

Where are they now?

Dr. Pamela Govett, one of the first zoological medicine residents (2001 - 2004) at CMAST, recently passed the board certification examination of the American College of Zoological Medicine (ACZM) and is currently Assistant Professor at the Western University of Health Sciences, College of Veterinary Medicine, Pomona, CA.

CMAST EVENTS/COURSES con't. from p.1

Friday, March 14
The Future of Fisheries Management and Ecology*
Dr. Rom Lipcius, Virginia Institute of Marine Science

Friday, March 28
Philometrid Parasites of Southern Flounder: Genetics, Pathology, and Life Cycles
Dr. Isaure De Buron, College of Charleston

Friday, April 11
The Effects of an Ecosystem Engineer on a Rare Species
Becky Bartel, CMAST NCSU Zoology

Friday, April 18 • TBA

Course Offering

ST 592: Design and Analysis of Ecological Field Studies
Dr. Ken Pollock, offered at CMAST via videoconference beginning Tuesday, January 15. Visit the site below for detailed information.

http://www4.stat.ncsu.edu/~pollock/ST592New.html