

NC State University Center/Institute Annual Report 2015

Center/Institute: **Center for Marine Sciences and Technology**
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Mission and Vision Statement

CMAST MISSION STATEMENT: The principal mission of the Center for Marine Sciences and Technology (CMAST), located in Morehead City, NC, is to discover innovative solutions to questions and problems in marine systems and provide effective communication of these discoveries. Examples of questions and communication of discoveries are archived in CMAST Newsletters (CMAST Communicator), found on our website, www.cmast.ncsu.edu.

CMAST VISION STATEMENT: CMAST facilitates multidisciplinary studies among research scientists, educators and extension specialists from the participating NC State colleges, as well as with other educational institutions and agencies concerned with marine sciences and coastal natural resources, and provides a focal point for citizen contact. The strategic plan for CMAST aligns with that of (1) NC State University, (2) Strategic Planning for Marine Laboratories as recommended by the National Association of Marine Laboratories, and (3) core strengths of CMAST Faculty.

Research Impact

Please see list of Significant Activities in Appendix

Current Funding Sources

Federal:	\$8,019,918.99
State:	\$989,584
Other :	\$302,768
File Uploaded:	2015 Current Funding

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Grant Title	Granting Agency	Grant Number	Start Date	End Date	Amount Funded
Quantifying the Impact of an Invasive Species on Ecosystem Service Provision:.....	NC Sea Grant Program	559864	4/1/2015	2/28/2016	\$9,999.00
Metapopulation Dynamics Guides Oyster Restoration and Shell Budgets in NC	NC Sea Grant Program	5555071 5555072 5555073	2/1/2012	8/31/2015	\$132,546.00
Metapopulation Dynamics Guides Oyster Restoration and Habitat Protection in NC	NC Sea Grant Program	558075	2/1/2014	01/31/2016	\$139,562
Can You Hear Me Now? Estuarine Soundscapes and Their Role in Larval Settlement	NSF	555501	9/1/2012	8/30/2015	\$456,414
Collaborative: Interacting Effects of Local Demography and Larval Connectivity on Estuarine Metapopulation Dynamics	NSF	554937	3/15/2012	2/29/2016	\$555,804
Southeast Climate Science Center	US Geological Survey (USGS)		9/23/2010	9/22/2015	\$1,527,123
Collaborative Research: Connectivity in Western Atlantic Seep Populations:.....	NSF	552825	10/1/2010	09/30/2015	\$473,346
Dissertation Research: Underwater Soundscapes and	NSF	555506	7/1/2012	12/31/2014	\$14,999
Identifying Sustainable Substrates for Oyster Restoration and Artificial Reefs	NC Sea Grant Program	554085	5/15/2011	12/31/2014	\$60,000
Estuarine Soundscapes: Spatiotemporal Patterns of Biological.....	NC Sea Grant Program	557742	3/3/2014	4/30/2015	\$9,999.00
Development of In-Vivo Marine Magnetic Spectral Resonance Imaging (MMSRI) Capabilities	NSF	555801	8/1/2012	3/31/2014	\$332,590
Use of a biophysicl modeling framework to develop a recruitment index....	NOAA/NMFS	Funded (5-account pending)	6/1/2015	5/31/2016	\$53,769
Acquisition of an Unmanned Surface vehicle for High-Resolution Mapping of the Shallow Seabed and Water Column	NSF	Funded (5-account pending)	6/1/2015	5/31/2016	\$349.99
Marine Fisheries Fellowship Program: A cooperative agreement between North Carolina Division of Marine Fisheries and North Carolina Sea Grant.	NC DENR		7/2015	6/2020	\$272,204
Marine Fisheries Management Fellowship Program: A cooperative agreement between North Carolina Division of Marine Fisheries and North Carolina Sea Grant.	NC Sea Grant		2/2014	1/2018	\$85,140

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Grant Title	Granting Agency	Grant Number	Start Date	End Date	Amount Funded
Evaluation of changes in available spawning and nursery habitats for river herring in North Carolina.	NC DENR		9/2015	8/2017	\$91,361
Demographics of American Eels (<i>Anguilla rostrata</i>) Inhabiting Tidal Creeks of Coastal North Carolina	NC Sea Grant		3/2015	2/2016	\$39,997
Estimating discard mortality of shallow and deep water reef fishes using conventional and telemetry tags	NOAA		9/2014	8/2016	\$254,122
Estimating mortality for southern flounder using a combined telemetry and conventional tagging approach. NC CRFL. Lead-PI: Dr. Frederick S. Scharf ; Co-PI: Dr. Jeffrey A. Buckel & Joseph E. Hightower. \$456,059	NC DENR/UNCW		7/2014	6/2018	\$456,059 (\$39,452 to NCSU)
Stock structure of spotted seatrout: assessing genetic connectivity at northern latitudinal limits	NC DENR		7/2014	6/2016	\$225,567
Enabling linkages to climate change and ecosystem management: facilitating collaboration and access to long-term fishery and environmental data.	NERRS/Rutgers		9/2013	8/2014	\$473,025 (\$97,000 to NCSU)
Sources of mortality and movements of weakfish tagged in North Carolina.	NC DENR		7/2013	6/2017	\$399,827
Diet composition and ecosystem modeling of predatory fishes captured in North Carolina of Marine Fisheries. Coastal Recreational Fisheries	NC DENR		8/2011	9/2016	\$269,776
Crude oil and dispersant impacts on hatchling loggerhead sea turtles (<i>Caretta caretta</i>)	Oiled Wildlife Care Network/UC Davis/CA Dept Fish Wildl		10/1/2014	9/30/2016	\$10,720
Aquarium Health Management	NC DENR		10/1/2014	11/30/2015	\$130,010
Veterinary Medical Services to NC Museum of Natural Sciences	NC DENR		7/1/2014	6/30/2017	\$60,000
Pharmacokinetics of enrofloxacin in sea urchins	American Assoc Zoo Veterinarians		3/1/2015	2/28/2016	\$3,700
Aquarium Health Management	NC DENR		ct 2014	Aug. 2015	\$130,000
Aquarium Health Management	NC DENR		ct 2013	Aug. 2014	\$305,000
Crude Oil Sea Turtle Hatchlings	OWCN		2014-2015	2014-2015	\$107,000
Sea Turtle Cold Stun	Barbour Foundation		ct 2014		\$18,000
USGS Southeastern Climate Science Center	USGS		ct 2014		\$1,500,000

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Grant Title	Granting Agency	Grant Number	Start Date	End Date	Amount Funded
Coastal Connections	Math And Science Partnership	58304	7/1/2014	9/30/2016	\$109,168
Coastal Inquirers	Borroughs Wellcome SSEP Grant	62032	3/1/2015	5/31/2018	\$175,600
Building a Stronger Bridge in Acidified Food Products	US DHHS Food and Drug Administration	558897	9/1/2014	09/31/2015	\$439,493

Budget

Is the Center/Institute budget sufficient to continue operations for the the next five years?

Response: No

Need an additional 0.25 FTE for the director of the Science House at CMAST

Personnel

David Eggleston

Jeff Buckel

Craig Harms

David Green

Suzanne Kennedy-Stoskopf

Michael Stoskopf

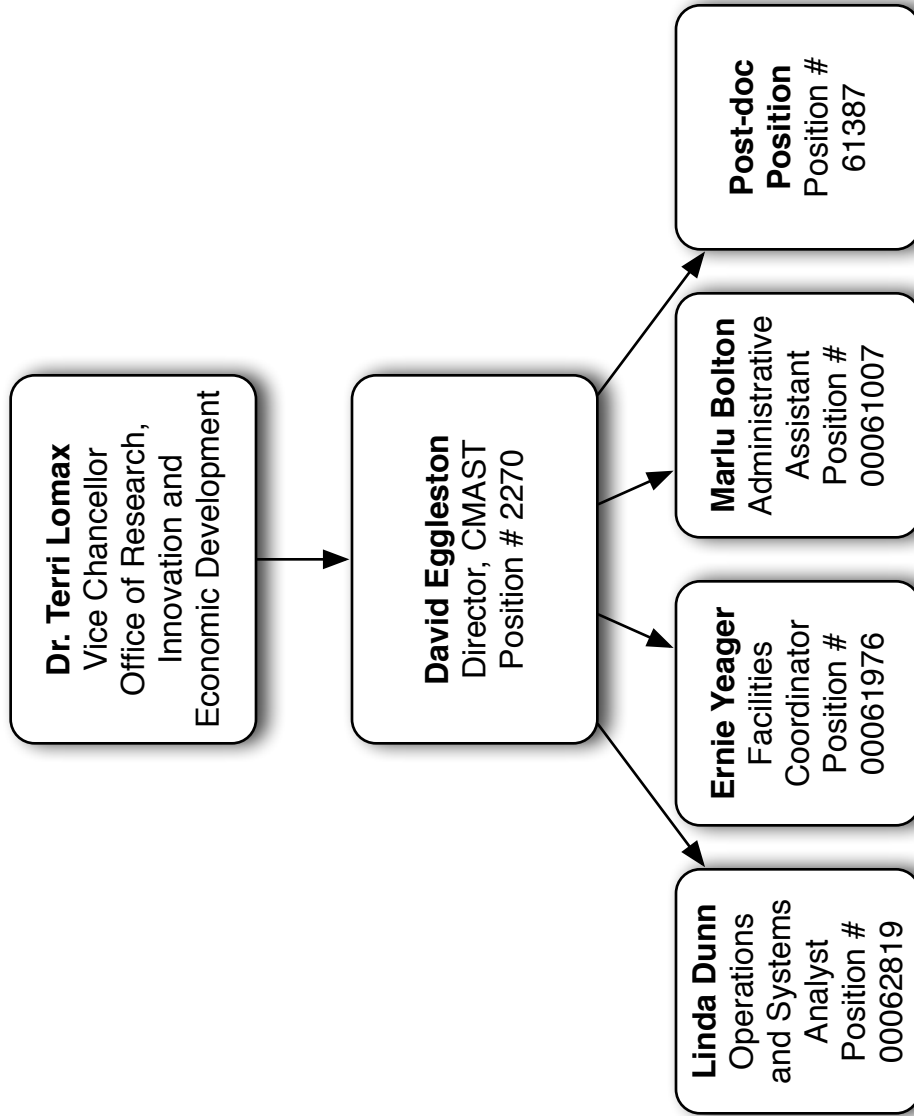
How many people are supported by State funds?

Response: 6

Organizational chart:

File uploaded: [CMAST Organizational Chart](#)

Center for Marine Sciences and Technology (CMAST) Organizational Chart



Publications

How many papers were published during the reporting period?

Response: 33 Peer-Reviewed

1. Gjeltema, Jenessa L., De Voe, R.S., Phillips, B.E. and Stoskopf, M.K. (2015) Casqueinfection, resolution, and subsequent repneumatization in a trumpeter hornbill (*bucanistes buccinators*). *Veterinary Quarterly*.
2. Hurley-Sanders, J.L., Stoskopf, M.K., Nelson, S.A.C., Showers, W., Law, J.M., Levine, J.F. (submitted 2014) Variable Impact of Diet on Carbohydrate and Polyamine Metabolites in *Elliptio Complanata* as Assessed Using Proton Nuclear Magnetic Resonance Spectroscopy. *Journal of Experimental Biology - prima-mentor metabolomics*.
3. Parsons, Arielle, Simons, Theodore R., O'Connell Jr., Allan F., Pollock, Kenneth H. and Stoskopf, Michael K. Jessica Stocking (submitted 2014) Using Ancillary Data to Evaluate Sources of bias in Mark-Resight Camera Trapping Studies. *Journal of Wildlife Management*. Mentor on writing and design.
4. Gese, Eric M., Knowlton, Frederick F., Adams, Jennifer, Beck, Karen, Fuller, Todd, Murray, Dennis, Steury, Todd, Stoskopf, Michael K., Waddell, William, Waits, Lisette. (submitted 2014) Addressing Challenges from Hybridization in Endangered Species Recovery: the Red Wolf as a Case Study. *Current Zoology* (Authorship alphabetical after first two positions) – joint collaborative
5. Hurley-Sanders, J., Levine, J., Nelson, S., Law, M., Showers, W., Stoskopf, M.K. (accepted 2015) Key metabolites in tissue extracts of *Elliptio complanata* identified using ¹H Nuclear Magnetic Resonance (NMR) spectroscopy. *Conservation Physiology* Primary mentor on metabolomics.
6. Hurley-Sanders, J.L., Stoskopf, M.K., Nelson, S.A.C., Showers, W., Law, J.M., Gracz, H.S. Levine, J.F. (Accepted 2015) Tissue extraction methods for metabolic profiling of a freshwater bivalve, *Elliptio complanata* (Lightfoot, 1786). *American Malacological Bulletin*. Primary mentor on metabolomics
7. Niemuth, J.N., Harms, C.A., Stoskopf, M.K. (accepted 2014) Effects of Processing Time on Whole Blood and Plasma Samples from Loggerhead Sea Turtles (*Caretta caretta*) for ¹H-NMR-Based Metabolomics. *Herpetological Conservation Biology*.
8. Gjeltema, Jenessa and Stoskopf, Michael (2014) Evaluation of Alphaxalone, as a Single agent and in Combination with Ketamine, Xylazine, and Morphine for Anesthesia of the Chilean Rose Tarantula, *Grammastola rosea*. *Journal of Zoo and Wildlife Medicine* 45(4): 792-801. Doi 10.1638/2013-0223.1 – Primary Mentor
9. Niemuth, J.,N., Stoskopf, M.K. (2014) Hepatic Metabolomic Investigation of the North American Black Bear (*Ursus americanus*) Using ¹H-NMR Spectroscopy. *Wildlife Biology in Practice*. 10(1): 14-23. doi:10.2461/wbp.2014.10.3 Primary Mentor
10. Tikunov, Andrey P., Stoskopf, Michael K. Macdonald, Jeffrey M. (2014) Fluxomics of the Eastern Oyster for Environmental Stress Studies. *Metabolites* 4: 53-70. DOI 10.3390/metabo4010053 Primary oyster biology/physiology.
11. Niemuth, Jennifer N. , Sanders, Charles, Mooney, Charles B., Deperno, Christopher, Stoskopf, Michael K. (2014) Nephrolithiasis in Free-Ranging *Lontra canadensis* in North Carolina, USA. *Journal of Zoo and Wildlife Medicine* 45(1):110-117. Doi 10.1638/2013-0135R2.1 Primary Mentor of 1st author
12. Minter, L.J., Dombrowski, D.S., Stoskopf, M.K., Purnell, C. A., Loomis, M.R., De Voe, R.S. (2013) Hematology and Plasma Biochemical Values for Free Ranging Cottonmouths (*Agkistrodon piscivorus*) in Central North Carolina. *Herpetological Conservation and Biology* 8(2):321-334. Primary Mentor of first author in design and writing.
13. Turner, M.M., DePerno, C.S., Conner, M.C., Stoskopf, M.K., Eyler, T. Brian, Lancia, R.A. (2013) Habitat, Wildlife and One Health: *Arcanobacterium pyogenes* in Maryland and Upper Eastern Shore White-tailed Deer Populations. *Infection Ecology & Epidemiology* 3: 19175 – <http://dx.doi.org/10.3402/iee.v3i0.19175> primary

mentor in writing and design.

14. Bacheler, N.M., Whitfield, P.E., Muñoz, R.C., Harrison, B.B., Harms, C.A., Buckel, C.A. 2015. Movement of invasive adult lionfish *Pterois volitans* using telemetry: importance of controls to estimate and explain variable detection probabilities. *Mar Ecol Prog Ser* 527: 205-220. doi:10.3354/meps11241

15. Kelly, T., McNeill, J.B., Avens, L., Hall, A.G., Goshe, L.R., Hohn, A.A., Godfrey, M.H., Mihnovets, A.N., Cluse, W.M., Harms, C.A. 2015. Clinical pathology reference intervals for an in-water population of juvenile loggerhead sea turtles (*Caretta caretta*) in Core Sound, North Carolina, USA. *PLOS ONE* 10(3): e0115739. doi:10.1371/journal.pone.0115739

16. Christiansen, E.F., Cray, C., Lewbart, G.A., Harms, C.A. 2015. Plasma protein electrophoresis and acute phase proteins in koi carp (*Cyprinus carpio*) following exploratory celiotomy. *J Exotic Pet Med*: 24: 76-83.

17. Bailey, K.M., Minter, L.J., Lewbart, G.A., Harms, C.A., Griffith, E.H., Posner, L.P. 2014. Alfaxalone as an intramuscular injectable anesthetic in koi carp *Cyprinus carpio*. *J Zoo Wildl Med* 45: 852-858. <http://dx.doi.org/10.1638/2014-0056.1>

18. Chinnadurai, S.K., Messenger, K., Papich, M.G., Harms, C.A. 2014. Meloxicam pharmacokinetics using non-linear mixed effects modeling in ferrets after single subcutaneous administration. *J Vet Pharm Ther* 37: 382-387. doi: 10.1111/jvp.12099

19. Minter, L.J., Bailey, K.M., Harms, C.A., Lewbart, G.A., Posner, L.P. 2014. The efficacy of alfaxalone for immersion anesthesia in koi carp (*Cyprinus carpio*). *Vet Anaesth Analg* 41: 398-405. doi:10.1111/vaa.12113

20. Christiansen, E.F., Mitchell, J.M., Harms, C.A., Stoskopf, M.K. 2014. Sedation of red porgy (*Pagrus pagrus*) and black sea bass (*Centropristis striata*) using ketamine, dexmedetomidine and midazolam delivered via intramuscular injection. *J Zoo Aquarium Res* 2: 62-68. <http://www.jzar.org/jzar/article/download/41/34> (cover photo)

21. Butler, C.M., Hanrahan, B., Buckel, J.A., Rudershausen, P.J., Juanes, F. and Smith, J. 2014. Size-selective feeding in captive and free-ranging Atlantic bluefin tuna (*Thunnus thynnus*). *Mar. Coast. Fish.* 6:81-88.

22. Buckel, J.A. 2014. Book Review: "Billion-dollar fish: the untold story of Alaska Pollock, by Kevin M. Bailey". *Fisheries* 39(5):221.

23. Callihan, J., Godwin, C.H., Buckel, J.A. 2014. Effect of demography on spatial distribution: movement patterns of Albemarle Sound-Roanoke River striped bass (*Morone saxatilis*) in relation to their stock recovery. *Fish. Bull.* 112:131-143.

24. Callihan, J., Godwin, C.H., Dockendorf, K. and Buckel, J.A. 2014. Growth and mortality of hatchery-reared striped bass stocked into non-natal systems. *N. Am. J. Fish. Mgmt.* 34:1131-1139.

25. Morley, J.W. and Buckel, J.A. 2014. Effects of temperature and prey size on predator-prey interactions between bluefish and bay anchovy. *J. Exp. Mar. Biol. Ecol.* 461:449-457.

26. Dunn, R., D. Eggleston, N. Lindquist. (2014). Substrate effects on demographic rates of Eastern oyster (*Crassostrea virginica*). *Journal of Shellfisheries Research.* 33:177-185.

27. Puckett, B.J., Eggleston, D.B., Kerr, P.C. Luettich, R. (2014). Larval dispersal and population connectivity among a network of marine reserves. *Fisheries Oceanography* 23(4):342-361.

28. Lillis, A., Eggleston, D., Bohnenstiehl, D. (2014). Habitat-associated estuarine soundscapes: Distinct acoustic characteristics of sub-tidal oyster reefs compared to surrounding soft-bottom habitats. *Marine Ecology Progress Series.* 505:1-17.

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29. Lillis, A., Eggleston, D., Bohnenstiehl, D. (2014). Soundscape variation from a larval perspective: the case for ambient habitat sound as a settlement cue for weakly swimming larvae. *Marine Ecology Progress Series* 509: 57-70.

30. Dunn, R., Eggleston, D., Lindquist, N. (2014). Oyster-sponge interactions and bioerosion of reef-building substrate materials: implications for oyster restoration. *Journal of Shellfisheries Research*. 33(3): 1-12.

31. Qian, H., Li, Y., He, R. Eggleston, D.B. (2014). Connectivity in the Intra-American Seas and implications for potential larval transport. *Coral Reefs*. doi:10.1007/s00338-014-1244-0.

32. Eggleston, D., Millstein, E. and Plaia, G. (in press). Timing and route of migration of mature female blue crabs in a tidal estuary. *Biology Letters*.

33. Lillis, A., Eggleston, D. and Bohnenstiehl, D. (in press). Can you hear me now? Soundscape manipulation enhances natural settlement of a reef-building mollusk in a temperate estuarine system. *PeerJ*

The papers by Lillis et al, on underwater soundscapes were picked-up by the Raleigh News & Observer, NPR, and newspapers/social media in the US and abroad. The journal article in *MEPS* in 2014 was the featured article of that issue, and this work was featured on NSF's web-site for Biological Oceanography.

Other examples of noteworthy articles can be found in the Appendix of Significant Accomplishments.

Activities Supported by the Center/Institute

Courses:

FW 314 Coastal Ecology and Management, Spring semester

FW 895 – Dissertation Research

MEA695 -- MS Research

MEA895 -- Dissertation Research

MEA449/549 Biological Oceanography, Fall semester

MEA469 Ecology of Coastal Resources, Spring semester

MEA591 Marine Science for K-12 Teachers

VMC 991 Marine Mammal Selective, Spring semester

FW730 Ethics for Fisheries Wildlife and Conservation Biology Professionals, Fall & Spring semesters

VMC 923 Research in Zoological Health Fall and Spring semesters

CBS 817 Advanced Topics in Zoological Medicine, Fall semester

CBS 818 Advanced Topics in Zoological Medicine, Spring semester

FW720 Epidemiology of Wildlife Diseases, Fall semester

Seafood Technology Program:

- Offer Basic Seafood Hazard and Critical Control Point workshops - required by the US Food and Drug Administration for members of the seafood processing and importing industry, and regulatory officials nationwide.

- Take part in the Entrepreneurial Initiative for Food (ei4f) with the Department of Food, Bioprocessing and Nutrition Sciences, assisting existing and start-up seafood businesses with product safety, process validations and product testing.

- Collaborate with members of the scientific research community in creating Stewards of the Future: Research for Ocean Health and Community Sustainability, a Regional Exchange Group sponsored by the NC Biotechnology Center.

CMAST Seminar Series brings in speakers on a wide variety of marine science-related topics.

The Science House at CMAST offers a wide range of K-12 STEM activities at CMATS, ranging from the 4H SeaWolves Program, to Coastal Inquirers Program for middle school, students, to Marine Science for Teachers

graduate course.

Educational Impact

How many students were taught/trained by the Center/Institute during the reporting period?

NC State: Undergraduate students:	339
NC State: Master's students:	68
NC State: PhD students:	34
Non-NC State: K-12 students:	1243
Non-NC State: Undergraduate students:	6
Non-NC State Master's students:	0
Non-NC State PhD students:	0
Other (Postdocs, industry professionals, etc.):	121

Does this Center/Institute confer degrees?

Response: No

File uploaded: [Graduate Student List](#)

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First Name	Last Name	Graduated?	Continuing?	Notes
Jason	Peters	Yes		
Beatriz	Perez	Yes		
Ashlee	Lillis	Yes		
Shannon	Brown	No	Yes	
Katelyn	Jenkins	No	Yes	
Seth	Theurekauf	No	Yes	
Doreen	McVeigh	No	Yes	
Paul	Rudershausen	No	Yes	
Samantha	Binion	No	Yes	
Jacob	Krause	No	Yes	
Brendan	Runde	No	Yes	
Steven	Lombardo	No	Yes	Steve starts Aug 2015 so not sure if should be included here?
Jennifer	Niemuth		Yes	PhD, Committee member
Tiffany	Keenan-Bateman	No		UNC-W, MSc, Committee member
Emily	Christiansen	No		Zoological Medicine Resident, Committee Member
Jeness	Gjeltema		Yes	Zoological Medicine Resident, Committee Member
Brianne	Phillips		Yes	Zoological Medicine Resident, Committee Member
Sarah	Cannizzo		Yes	Zoological Medicine Resident, Committee Member
Jennifer	Niemuth	PhD	Yes	
Stasia	Bembenek-Bailey	PhD	Yes	
Rattapan	Pattanarangsang	PhD	Yes	
Yiwen	Thor	No	Yes	MS degree
Kelly	O'Neil	Yes		PhD
Lauren	Charles-Smith	Yes		

Appendix

File Uploaded: [Final 2015 Appendix](#)

Key Accomplishments for CMAST faculty (2014-15)

I. Some key accomplishments for David Eggleston during FY 2014-15 include:

- (i) Planning and funding of a CMAST *Semester-At-The-Coast Program* for undergraduates for Spring 2016,
- (ii) Delivery of a report to the Chancellors of NCSU and UNC CH entitled: *Report and Recommendations of Joint Task Force on UNC/NCSU Coastal Marine Stations in Morehead City*,
- (iii) Development of a *Semester-At-The-Coast Program* for the UNC-System,
- (iv) Service on College of Sciences Dean Search Committee,
- (v) Service on Search Committee for Physical Oceanographer faculty (NCSU/MEAS);
- (vi) Graduating 3 students (2 MS and 1 PhD);
- (vii) Completion of the CMAST Marine Magnetic Resonance Facility and establishment of purchasing contract with the NC Marine Biotechnologies Center of Innovation to serve as broker for industry contracts,
- (viii) Submission of NCSU Faculty Cluster Hire proposal (lead);
- (ix) Submission of UNC GA ROI proposal (w D. DeMaster),
- (x) Participation in 20-d research cruise aboard the *RV Atlantis* in the Gulf of Mexico, and completed three *DSV Alvin* dives to over 6,000ft,
- (xi) Participation in international working group of essential habitat for exploited marine species, Lisbon, Portugal,
- (xii) Co-hosted a statistical workshop on improving the accuracy of fishery-independent survey methods at VIMS for an international group of scientists, and
- (xiii) Maintaining a productive research and graduate training program (6 publications, 3 papers in press).

Over the past 5 years, I have served as PI or co-PI on ~ \$12 million in grants. Of this \$12 million, I have served as PI for ~ \$3 million that has been funded directly to NC State for research. Moreover, my graduate students consistently win awards for their oral and poster presentations (e.g., Benthic Ecology Meeting), as well as highly competitive graduate fellowships (NSF Graduate Fellowship, DoD fellowship, NOAA/Sea Grant/NC NERR Fellowships).

II. Some key accomplishments for Jeff Buckel during FY 2014-15 include:

CMAST Fisheries Ecology – significant impacts

Effect of demography on spatial distribution: movement patterns of Albemarle Sound-Roanoke River striped bass (*Morone saxatilis*) in relation to their stock recovery.

The Albemarle Sound-Roanoke River (AR) population of striped bass has recovered to high levels of abundance and there are now older fish in the population. Tagging data show that these large striped bass are joining the coastal migratory group of striped bass and are caught in northern Atlantic waters. The catch of these larger fish was not accounted for in the 2010 stock assessment; that is, current management assumes that all North Carolina AR striped bass are resident. A measure of migration out of North Carolina estuaries is needed for accurate assessment of the stock. We found that recapture locations of tagged striped bass were related to both fish size and total annual stock abundance. Emigration of larger striped bass outside of the

AR system has increased during the past two decades (1991-2008) as population size increased. In the 2010 striped bass assessment, landings outside the Albemarle Sound estuary were not included in the AR stock assessment; thus, the assessment underestimated fishing mortality. The most recent assessment of AR striped bass used our migration by time and age probabilities to account for fishing mortality on striped bass caught outside of the Albemarle Sound-Roanoke River system. This estimate of fishing mortality is more accurate and will lead to improved management of AR striped bass.

Callihan, J., C.H. Godwin, J. A. Buckel. 2014. Effect of demography on spatial distribution: movement patterns of Albemarle Sound-Roanoke River striped bass (*Morone saxatilis*) in relation to their stock recovery. Fish. Bull. 112:131-143.

Movement and mortality of spotted seatrout at its northern latitudinal limits

Spotted seatrout are the number one recreationally landed species in the US southeast and in North Carolina. The recent stock assessment for this species found the population to be overfished and that fishing levels had been too high for the past decade. However, the assessment assumed that mortality from natural causes was relatively low and constant throughout this time period. Periodic fish kills during harsh winters may violate that assumption. Through tagging, laboratory experiments and analysis of historical monitoring data, we found that natural mortality is the dominant source of mortality in the North Carolina/Virginia stock of spotted seatrout. Annual estimates of natural mortality were highly variable with extremely high values during relatively cold winters and lower estimates during mild winters. In previous assessments, the disappearance of spotted seatrout was assumed to result from fishing-related mortality. This was an incorrect assessment. The high mortality rates observed in this population are a result of natural causes and not overfishing. Our findings have an impact on how the North Carolina/Virginia stock of spotted seatrout will be assessed and managed.

Ellis, T.A. 2014. Movement and mortality of spotted seatrout at its northern latitudinal limits. Ph.D. dissertation. North Carolina State University. 241 p.

III. Some key accomplishments for Craig Harms during FY 2014-15 include:

- (i) Presented results of investigation into clinical pathology effects of crude oil and dispersant exposure to sea turtles, at international meeting in Australia.
- (ii) Represented fish and marine mammal perspectives at AVMA Animal Welfare Symposium: Humane Endings.
- (iii) Program committee and session chair for Regional Aquatics Meeting and for Southeast Regional Sea Turtle Meeting.
- (iv) National Oceanic and Atmospheric Administration, Southeast United States Marine Mammal Stranding Network award in recognition of North Carolina State University, College of Veterinary Medicine, Center for Marine Sciences and Technology, for excellence in responding to stranded marine mammals during the 2013-2014 mid-Atlantic bottlenose dolphin Unusual Mortality Event.

IV. Some key accomplishments for Michael Stoskopf during FY 2014-15 include:

- (i) Key note Elasmobranch Symposium, Monterey, California, Symposium held once a decade
- (ii) Improved method for collecting metabolomic samples from clinical patients
- (iii) On Editorial Boards of Marine Drugs, International Veterinary Medicine and Lab Animal
- (iv) Direct NCSU Fisheries and Aquaculture Health Scholars Program Serve on Executive Committee of NCSU Fisheries, Wildlife and Conservation Biology Program DGP for CVM for NCSU Fisheries, Wildlife and Conservation Biology Graduate Program
- (v) Major advisor for three Ph.D. students
- (vi) Committee member for two Ph.D. students
- (vii) Mentor three undergrad Fisheries Health Scholar Students
- (viii) Seven original research articles accepted by or published in peer-reviewed journals

V. Key Accomplishments for Patrick Curley during FY 2014-15 include:

- (i) Conducted K12 Outreach Programs- Planned and implemented 12 professional development workshops for teachers that were held at CMAST or at a local school district. Hosted school leadership retreats at CMAST and provided classroom assistance and programs to hundreds of students in area schools.
- (ii) Represented CMAST at community events such as Rotary Club, meetings and displays at the NC Aquarium at Pine Knoll Shores and the NC Seafood Festival.
- (iii) Service to professional organizations-served on steering committee for the development of the NC Environmental Literacy Plan, served as eastern section chair of the Environmental Educators of North Carolina and chaired the NC Marine Science and Education Partnership's annual Coastal Marine Science Competition.
- (iv) Presented five presentations on making coastal connections to the K12 curriculum standards using place based education at professional educator conferences
- (v) Service as Co-PI and Director for the Coastal Connections Math and Science Partnership program that provided professional development and Sustained STEM Support (S³) to 15 participating teachers.
- (vi) Service as Co-PI and Director of the Coastal Inquirers Borroughs-Wellcome Student Science Enrichment Program which serves low income, At-Risk middle school students by providing STEM clubs in four middle schools.
- (vii) Developed and implemented MEA 591-601, Coastal Marine Science for Educators
- (viii) Served as Advisor for the Sea Wolf Program for High School Students which serves a leadership development and career exploration program that serves as a recruitment tool for NCSU. During the year the Sea Wolves have attended marine mammal stranding training, won first place for the region in the NC Envirothon and have hosted three Teen Coastal Science Café's.
- (ix) During the past year, collaborated in the development and submittal of five grants for a total of \$1,901,000.00 of which \$564,000 has been awarded, and \$1,337,000.00 is pending. In addition to grants, service contracts with Onslow County Schools and The Bridge DownEast 21st Schools have been secured for a total of \$38,500.00