College of Charleston
Graduate Program in Marine Biology

20th ANNUAL
STUDENT RESEARCH COLLOQUIUM


Fort Johnson Marine Resources Center
Marine Resources Research Institute Auditorium

PROGRAM & ABSTRACTS
PURPOSE AND HISTORY

The Student Research Colloquium of the Graduate Program in Marine Biology (GPMB) was established in 1998, to increase awareness of research activities by students and faculty affiliated with GPMB; to provide graduate students with experience in making scientific presentations; and to promote interactions among faculty and students conducting research in marine biology. The Colloquium Committee looks forward to your comments regarding ways to improve and enhance this annual event, and thanks all the sponsors for their support.

Previous Keynote Speakers

1999  Dr. Ken Tenore, Chesapeake Biological Laboratory, University of Maryland
2000  Dr. John Pearse, Institute of Marine Science, Univ. of California, Santa Cruz
2001  Dr. Lauren Mullineaux, Woods Hole Oceanographic Institute
2002  Dr. Larry Crowder, Duke Marine Laboratory, Duke University
2003  Dr. Walter Boynton, Chesapeake Biological Laboratory, Univ. of Maryland
2004  Dr. Malcolm Shick, School of Marine Sciences, University of Maine
2005  Dr. Margaret McFall-Ngai, University of Wisconsin-Madison Medical School
2006  Dr. Jeffrey Levinton, State University of New York at Stony Brook
2007  Dr. Peter Wainwright, University of California, Davis
2008  Dr. James T. Carlton, Williams College & Williams-Mystic Program
2009  Dr. Steve Palumbi, Hopkins Marine Station & Stanford University
2009  Dr. Erik Sotka, CoC & Dr. Geoff Scott, Hollings Marine Laboratory
2010  Dr. Win Watson, University of New Hampshire
2011  Dr. John Bruno, University of North Carolina
2012  Dr. Thomas Near, Yale University
2013  Dr. Felicia Coleman, Florida State University & Coastal Marine Laboratory
2014  Dr. Dean Grubbs, Florida State University & Coastal Marine Laboratory
2015  Dr. Daniel Huber, University of Tampa

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SC Department of Natural Resources, Marine Resources Division
STUDENT RESEARCH COLLOQUIUM 2016
PROGRAM

Oral presentations will be held at the Marine Resources Research Institute, at Fort Johnson. The Friday evening poster session and social and the Lowcountry Boil on Saturday will take place adjacent to the Marshlands House at the outdoor classroom.

Posters will be on display prior to the poster session in the hallways of MRRI, beginning Wednesday, 9/28, and will be moved to the outdoor classroom by 3:00 p.m. on Friday, 9/30. Poster presenters will attend their posters in two shifts, from 5:15 to 7:15 p.m. on Friday.

FRIDAY, 30 SEPTEMBER

Noon – 3:00  Students hang posters; should be completed by 3:00.

4:00  Opening Remarks
   Dr. Mike Auerbach
   Dean of the School of Sciences and Mathematics, College of Charleston

4:05  Introduction of Keynote Speaker
   Dr. Mike Denson, Director
   S.C. Department of Natural Resources, Marine Resources Research Institute

4:10  Keynote Address
   SIX YEARS AFTER THE DEEPWATER HORIZON OIL SPILL: IMPACTS ON MARINE
   SEDIMENTS AND FISH
   Dr. David Hastings, Eckerd College

5:15 – 7:15 Poster Session & Social. Presenters at odd-numbered posters from 5:15-6:15, and
   at even-numbered posters from 6:15-7:15.

SATURDAY, 1 OCTOBER

9:30  Introduction
   Dr. Tracey Smart, Chair of the Colloquium Committee
   South Carolina Department of Natural Resources

ORAL PRESENTATIONS

SESSION 1

9:45  1.1 AGE AND GROWTH OF ATLANTIC AND SHORTNOSE STURGEON IN THE COOPER
   RIVER USING THE MINIMALLY INVASIVE PECTORAL FIN Ray. Ruddle, V (GPMB, The
   Graduate School at the University of Charleston, SC), Bubley, W (College of Charleston;
SCDNR), Holbrook, C (College of Charleston; SCDNR), Sancho, G (College of Charleston), Shervette, V (USC Aiken), and Post, B (SCDNR).

10:00 1.2 RAPID EVOLUTION OF THERMAL TOLERANCE AND HEAT-SHOCK PROTEIN EXPRESSION IN AN INTRODUCED RED SEAWEED. Flanagan, BA (GPMB, The Graduate School at the University of Charleston, SC), Krueger-Hadfield, SA (University of Alabama at Birmingham), and Sotka, EE (College of Charleston)

10:15 1.3 LETHAL AND SUBLETHAL EFFECTS OF EXPOSURE TO EXTREME COLD IN THE INVASIVE GREEN PORCELAIN CRAB PETROLISTHES ARMATUS. Mack, K (GPMB, The Graduate School at the University of Charleston, SC); Podolsky, B (GPMB, The Graduate School at the University of Charleston, SC); Fowler, A (University of Charleston, SC; Department of Environmental Science and Policy, George Mason University, Fairfax, VA); Shervette, V (Department of Biology and Geology, University of South Carolina) and Wilber, D (GPMB, The Graduate School at the University of Charleston, SC)

10:30 – 11:00 Break

SESSION 2

11:00 2.1 FORAGE FISH GUILD STRUCTURE OF THE SOUTH ATLANTIC BIGHT. Michael, C (GPMB, The Graduate School and the University of Charleston, SC) and Smart, T (SCDNR)

11:15 2.2 ZOOPLANKTON EXPOSURE TO MICROPLASTIC AT ESTUARINE TIDAL FRONTS IN CHARLESTON HARBOR, SC. Payton, T (GPMB, The Graduate School at the University of Charleston, SC), Beckingham, B (College of Charleston), and Dustan, P (College of Charleston)

11:30 2.3 ACOUSTIC TRACKING OF SOUTHERN FLOUNDER IN THE CHARLESTON HARBOR SYSTEM. Hart, MP (GPMB, The Graduate School at the University of Charleston, SC), Denson, MR (South Carolina Department of Natural Resources), Scharf, FS (University of North Carolina Wilmington), Sancho, G (College of Charleston), and Arnott, SA (South Carolina Department of Natural Resources)

11:45 – 1:15 Lunch

SESSION 3

1:15 3.1 A COMPARISON OF SERUM FGF21 CONCENTRATIONS BETWEEN MANAGED AND FREE-RANGING BOTTLENOSE DOLPHINS, TURSIOPS TRUNCATUS. Harrell, T (GPMB, The Graduate School at the University of Charleston, SC) and Janech, M (Medical University of South Carolina)

1:30 3.2 THE IMPACT OF VITAMIN B₁₂ AND NITRATE ON DIMETHYSULFINIOPROPIONATE PRODUCTION IN MARINE EUKARYOTIC PHYTOPLANKTON. Pound, HL (GPMB, The Graduate School at the University of Charleston, SC) and Lee, PA (College of Charleston)

1:45 3.3 EXPLORING THE SPATIAL AND TEMPORAL TRENDS OF BLACK SEA BASS AND WHITE GRUNT ALONG THE SOUTH ATLANTIC BIGHT FROM 1990-2015. Walker, MF (GPMB, The Graduate School at the University of Charleston, SC), Ballenger, JC (SCDNR),
Reichert, MJM (SCDNR), McGlinn, D (College of Charleston), and Bacheler, N (NOAA-SEFIS)

2:00 – 2:30 Break

SESSION 4

2:30  **4.1 EVALUATING THE EFFECTIVENESS OF COMMUNITY-BASED MANAGEMENT OF THE CROWN-OF-THORNS SEASTAR (ACANTHASTER PLANCI) IN THE PHILIPPINES.** Byce, SJ (MES, The Graduate School at the University of Charleston, SC)

2:45  **4.2 A GEOMETRIC MORPHOMETRIC APPROACH TO IDENTIFY ELASMOBRANCH FISHES FROM THE LATE EOCENE OF SOUTH CAROLINA.** Taylor, J (GPMB, The Graduate School at the University of Charleston, SC) and Naylor, G (College of Charleston)

3:00 - 3:30 Break

3:30 Closing Address

**TIPS AND TALES FROM A NON-LINEAR CAREER IN MARINE SCIENCE: 3 WAYS TO SUCCEED AS A GRADUATE STUDENT AND BEYOND**

Dr. David Hastings, Eckerd College

4:30 Closing remarks and award presentation

Dr. Craig Plante, Grice Marine Laboratory, College of Charleston

5:00 **Lowcountry Boil and introduction of new students**, Outdoor Classroom
POSTER PRESENTATIONS

1. CRYPTIC AND INVASIVE LINEAGES WITHIN THE COSMOPOLITAN AMPHIPOD AMPITHOE VALIDA. Harper, K (GPMB, The Graduate School at the College of Charleston, SC); Scheinberg, L (San Francisco State University, CA); Boyer, K (San Francisco State University, CA); Sotka, E (College of Charleston)

2. THE ECOLOGY OF THE RIBBED MUSSEL, GEUKENSI A DEMISSA, IN SOUTH CAROLINA SALT MARSHES: DISTRIBUTION, RESPONSE TO HARVEST, AND ROLE IN FACILITATING THE TRANSIENT NEKT ON COMMUNITY. Julien, A (GPMB, The Graduate School at the University of Charleston, SC), A Tweel (South Carolina Department of Natural Resources), N Hadley (South Carolina Department of Natural Resources), D McGlinn (College of Charleston), and P Kingsley-Smith (South Carolina Department of Natural Resources)

3. INVESTIGATION OF THE POPULATION GENETIC STRUCTURE AND THE FREQUENCY OF THE RAT LUNGWORM PARASITE IN THE INVASIVE ISLAND APPLE SNAIL IN SOUTH CAROLINA. Underwood, EB (GPMB, The Graduate School at the University of Charleston, SC), Darden, TL (South Carolina Department of Natural Resources), Plante, CJ (College of Charleston), Fowler, AE (George Mason University), Knott, DM (Poseidon Taxonomic Services, LLC), and Kingsley-Smith, PR (South Carolina Department of Natural Resources)

4. CHARACTERIZATION OF GROWTH ANOMALIES IN PORITES COMPRESSA USING ELEMENTAL ANALYSIS AND METABOLOMICS. Andersson, E (GPMB, The Graduate School at the University of Charleston, SC), Day, R (National Institute of Standards and Technology), Schock, T (National Institute of Standards and Technology), Woodley, C (National Oceanic and Atmospheric Administration) and Anderson, P (College of Charleston)

5. COMPARISON OF SERUM VANIN-1 CONCENTRATIONS IN DIVING MARINE MAMMALS AND TERRESTRIAL MAMMALS USING MASS SPECTROMETRY. Boxall, BK (GPMB, The Graduate School at the University of Charleston, SC) and Janech, MG (Nephrology, MUSC)

6. A VICARIANCE MODEL FOR BIOGEOGRAPHY AND SPECIATION IN ELASMOBRANCHS USING MOLECULAR CLOCKS. Enright, NM (GPMB, The Graduate School at the University of Charleston, SC) and Naylor, G (College of Charleston)

7. EFFICACY OF JUVENILE ABUNDANCE INDICES IN STOCK ASSESSMENTS OF SOUTH ATLANTIC FISHERIES. Reynolds, J (GPMB, The Graduate School at the University of Charleston, SC) and Smart, T (SCDNR)

8. AGE AND SIZE DEPENDENCY OF SPAWNING FREQUENCY AND DURATION IN THREE FISH SPECIES OFF THE SOUTHEASTERN UNITED STATES: GAG (MYCTERO PERCA MICROLEPIS), SCAMP (MYCTERO PERCA PHENAX), AND GREATER AMBERJACK (SERIO LA DUMERI LI). Gamboa-Salazar, KR (GPMB, The Graduate School at the University of Charleston, SC),
TEMPORAL CHANGES IN SOUTH ATLANTIC OCEAN FISH BIODIVERSITY. Baker, N (GPMB, the Graduate School at the University of Charleston, SC) and McGlinn, D (College of Charleston)

USING THE ‘TURTLE’ BARNACLE, CHELONIBIA TESTUDINARIA, AS A PROXY FOR BREVETOXIN EXPOSURE IN LOGGERHEAD SEA TURTLES. Lane, Z (GPMB, The Graduate School at the University of Charleston, SC), DiTullio, J (College of Charleston), Fair, P (NOAA, National Ocean Service), Van Dolah, F (NOAA, National Ocean Service), and Zardus, J (The Citadel)

IDENTIFYING SOURCES OF MICROPLASTIC DEBRIS IN CHARLESTON HARBOR, SC. Leads, R (GPMB, The Graduate School at the University of Charleston, SC) and Weinstein, J (The Citadel)

QUANTIFYING MICROPLASTICS IN THE GUT OF STRANDED BOTTLENOSE DOLPHINS (TURSIOPS TRUNCATUS) FROM SOUTH CAROLINA, USA. Battaglia, FM (GPMB, The Graduate School at the University of Charleston, SC), Beckingham, B (College of Charleston), McFee, W (NOAA, National Ocean Service, Center for Coastal Environmental Health and Biomolecular Research), Hart, L (College of Charleston), and Kucklick, J (National Institute of Standards and Technology)

INFLUENCE OF COBALAMIN (VITAMIN B₁₂) ON THE MICROBIAL DEGRADATION OF DIMETHYSULFONIOPROPIONATE AND RELATED COMPOUNDS. Burnham, A (GPMB, The Graduate School at the University of Charleston, SC)
Keynote Speaker

David Hastings, Ph.D.
Eckerd College, Florida

Dr. David Hastings is a Professor of Marine Science and Chemistry at Eckerd College, where he specializes in paleoclimatology and marine geochemistry. He has investigated a broad range of topics and actively engages the public in policy conversations regarding climate change. In recent studies, Dr. Hastings has examined how rapid climate changes during the deglacial period (20,000 to 10,000 years ago) impacted the Gulf of Mexico and how the 2010 BP oil spill changed sediment redox conditions in the same area.

Dr. Hastings completed a B.S. degree at Princeton University (1979), his Ph.D. at the University of Washington (1995), and a postdoc at the University of British Columbia in Vancouver. He teaches several courses, including Chemical and Physical Oceanography, Global Environmental Change, Introduction to Marine Science, and General Chemistry. Dr. Hastings has received several awards including the Lloyd W. Chapin Award for Excellence in Scholarship and the Arts (2015), the Robert A. Staub Distinguished Teacher Award (2012), and selection as a “Science Champion” by the Union of Concerned Scientists for “speaking (scientific) truth to power.”
PRESENTATION AWARDS

Awards are given to two graduate students for the best oral presentation and the best poster presentation. Presentations will be judged on 1) scientific content based on the articulation of the problem, soundness of hypothesis testing, methodologies, and analyses; 2) oral and visual quality of the delivery; and 3) demonstration of confidence and depth of understanding of the material.

A panel of awards judges will be appointed before the Colloquium. For each presentation, the judges will complete a narrative evaluation form; these evaluation forms will be given to presenters after the Colloquium. Following the final presentation, judges will meet to discuss their evaluations and select the award recipient. Additional narrative evaluation forms will be made available to audience members during the sessions so that presenters will be provided with additional feedback, but this feedback will not be considered in selecting the award recipient.

Following the colloquium, the award for best oral presentation will be presented by Dr. Rob Dillon and the winner will receive a personalized certificate of recognition and a cash award sponsored by Sigma Xi, The Scientific Research Society. The award for best poster presentation will be presented by Dr. Paul Nolan and the winner will receive a personalized certificate of recognition and a cash award sponsored by The Charleston Natural History Society.

Past Oral Presentation Award Winners:

2015 Robin Frede
2014 Alyssa Demko
2013 David Coles
2012 Tim O’Donnell
2011 Kristin Stover
2010 David Shiffmann
2009 (Sep.) Melanie Hedgespeth
2009 (Feb.): Megan Kent
2008: Tom Baird
2007: Courtney Arthur
2006: Deb Zdankiewicz
2005: Eric Pante
2004: Stephanie Brunelle
2003: David Couillard
2002: Bob Grant

Past Poster Presentation Award Winners

2015 Victoria Ruddle
2014 Mark Lehtonen
2013 Liz Duerrmit
2012 Amanda Kelly
2011 Tim O’Donnell

Past Proposal Poster Award Winners

2010 Cameron Doll
2009 Ryan Joyce & Tessa Bricker
2008 Lindsey Parent & Joy Gerhard
ABSTRACTS

POSTERS

1 CRYPTIC AND INVASIVE LINEAGES WITHIN THE COSMOPOLITAN AMPHIPOD AMPITHOE VALIDA. Harper, K (GPMB, The Graduate School at the College of Charleston, SC); Scheinberg, L (San Francisco State University, CA); Boyer, K (San Francisco State University, CA); Sotka, E (College of Charleston)

Marine biological invasions are accelerating in number and impacts. To understand and manage such invasions, it is important to both accurately identify invasive species and identify their introduction sources and pathways. However, identification of marine invasive species is often problematic, particularly among small invertebrate taxa that are difficult or impossible to differentiate morphologically. Inaccurate species identification can then lead to wrongly assumed sources and routes of introduction events. Molecular data can serve as a powerful tool to reveal cryptic species complexes and thus, improve our ability to make inferences regarding invasion histories. We used molecular tools to understand cryptic and invasive lineages within the common estuarine amphipod *Ampithoe valida*, which is found in Japan, on the east and west coasts of the United States and in Argentina. Using mitochondrial DNA sequencing, we found three divergent lineages across *A valida’s* range; one that dominates the north Atlantic Ocean, a second that occurs in southern Japan, and a third lineage that occurs in northern Japan and along most of the western United States. These native clades likely reflect divergence that occurred at least 3 million years ago. Genetic data also indicate three relatively recent introduction events: the Atlantic lineage into Argentina and a single estuary in California, and southern Japanese introduction into San Francisco Bay. Ongoing work, using genomic SNP data, will confirm whether or not hybridization among these lineages has occurred, and provide further insight into the accurate directions of invasion events.

2 THE ECOLOGY OF THE RIBBED MUSSEL, GEUKENSIA DEMISSA, IN SOUTH CAROLINA SALT MARSHES: DISTRIBUTION, RESPONSE TO HARVEST, AND ROLE IN FACILITATING THE TRANSIENT NEKTON COMMUNITY. Julien, A (GPMB, The Graduate School at the University of Charleston, SC), A Tweel (South Carolina Department of Natural Resources), N Hadley (South Carolina Department of Natural Resources), D McGlinn (College of Charleston), and P Kingsley-Smith (South Carolina Department of Natural Resources)

The ribbed mussel (*Geukensia demissa*) is a secondary foundation species that promotes ecosystem functioning through its interaction with the dominant salt marsh vegetation, *Spartina alterniflora*. Over the past 5 years, commercial landings of *G. demissa* in South Carolina have increased markedly, yet there are no species-specific regulations for the ribbed mussel in support of sustainable harvesting. Rather, harvesting practices and seasons fall under more general molluscan shellfish regulations. The goals of this project are: 1) to characterize the habitat (elevation and salinity) and demographics (density and size-frequency) of *G. demissa* populations in the high marsh; 2) to gain a better understanding of the role that *G. demissa*
plays in facilitating the transient nekton community by comparing community composition diversity metrics across different treatments using small-scale drop net sampling; and 3) to investigate how harvesting practices affect juvenile recruitment of *G. demissa* and *Spartina* productivity. The tidal position of *G. demissa* will be established by conducting elevation surveys at multiple sites and across a salinity gradient along the Ashley River, and monthly size frequencies will be determined by randomly sampling mussel aggregations. Juvenile recruitment of *G. demissa* and parameters of *Spartina* productivity (e.g., biomass) will be measured in plots subject to varying degrees of mussel harvest. The results of this project will support management of this emerging fishery by providing more information on the distribution of *G. demissa*, its role as a foundation species, its ability to recover following harvest, and the potential impacts of its removal on salt marsh productivity.

3  **INVESTIGATION OF THE POPULATION GENETIC STRUCTURE AND THE FREQUENCY OF THE RAT LUNGWORM PARASITE IN THE INVASIVE ISLAND APPLE SNAIL IN SOUTH CAROLINA.**

Underwood, EB (GPMB, The Graduate School of the University of Charleston, SC), Darden, TL (South Carolina Department of Natural Resources), Plante, CJ (College of Charleston), Fowler, AE (George Mason University), Knott, DM (Poseidon Taxonomic Services, LLC), and Kingsley-Smith, PR (South Carolina Department of Natural Resources)

Freshwater gastropods in the genus *Pomacea* have proven to be successful invaders in the United States and in other regions around the world. The Island apple snail (*Pomacea maculata*), native to South America, is currently established in several southeastern states, including South Carolina. *Pomacea maculata* is considered invasive due to the negative impacts associated with intense grazing, high fecundity, an ability to out-compete native species, and the potential to serve as a host for the rat lungworm nematode parasite (*Angiostrongylus cantonensis*), which can cause eosinophilic meningitis in humans. Despite these impacts, knowledge of *P. maculata* specific to South Carolina is limited. The primary aim of this study is to determine the population genetic structure of this species in South Carolina and Georgia using a suite of microsatellite markers. Thus far, 16 microsatellite markers have been successfully optimized. Molecular diversity indices will be calculated to determine the likelihood of secondary introductions, predict the success of these populations, and estimate gene flow. A secondary aim of this study is to determine the frequency of the rat lungworm parasite in *P. maculata* using a quantitative real-time PCR assay. This technique will be used to test 100 individuals collected from each of three sites (West Ashley, Myrtle Beach, and Mount Pleasant). Preliminary results (West Ashley, n=39, and Myrtle Beach, n=39) have resulted in no positive *A. cantonensis* detections. This study will also investigate the physiological tolerances (temperature and salinity) of *P. maculata* to help predict its capacity for future spread.

4  **CHARACTERIZATION OF GROWTH ANOMALIES IN *PORITES COMPRESSA* USING ELEMENTAL ANALYSIS AND METABOLOMICS.**

Andersson, E (GPMB, The Graduate School at the University of Charleston, SC), Day, R (National Institute of Standards and Technology), Schock, T (National Institute of Standards and Technology), Woodley, C (National Oceanic and Atmospheric Administration) and Anderson, P (College of Charleston)
Skeletal growth anomalies are a tumor-like coral disease, generally characterized by localized increased skeletal growth resulting in an abnormal protuberant mass on a coral colony. The coral tissue associated with these anomalies is characterized by having fewer polyps and fewer zooxanthellae than healthy tissue. Growth anomalies are a prevalent disease in the Indo-Pacific that are thought to be contributing to the decline of coral reefs in the region. Although growth anomalies have been characterized in multiple coral species using field surveys and histological techniques, the etiology of this disease remains unknown. The current study will use a combination of 1H-NMR and mass spectrometry-based metabolomics and ICP-mass spectrometry to characterize soft tissue and skeleton from diseased and healthy Porites compressa from Coconut Island (Oahu, Hawaii), where the frequency of growth anomalies is high. 1H-NMR metabolomics of stony corals is a recently explored area of research which lacks established and refined procedures. The current study aims to further optimize metabolomics protocols for stony corals. Beginning this method development, three different metabolite extraction techniques were compared using coral from the NOAA culture facility to help determine which extraction technique is most appropriate for the growth anomaly samples. This effort will be complemented by other –omic analyses that are a part of a larger effort to develop multiplex methods for assessing coral and environmental condition. This multi-faceted approach will be used to elucidate possible mechanisms behind the etiology of growth anomalies, and to develop the next generation of diagnostic techniques for assessing the health of corals and other marine organisms.

5 COMPARISON OF SERUM VANIN-1 CONCENTRATIONS IN DIVING MARINE MAMMALS AND TERRESTRIAL MAMMALS USING MASS SPECTROMETRY. Boxall, BK (GPMB, The Graduate School at the University of Charleston, SC) and Janech, MG (Nephrology, MUSC)

The dive response of marine mammals induces oxidative stress through peripheral vasoconstriction of the large arteries and subsequent reperfusion of the organs. Damage due to oxidative stress is mitigated by an increase in well-characterized antioxidant proteins in the blood and tissues. Few studies have been conducted to discover whether protein characteristics of the blood exist that are unique to marine mammals for alleviating oxidative stress. A proteomic study of Tursiops truncatus serum revealed that the protein, Vanin-1, is greatly elevated compared to published values for humans. Serum Vanin-1 concentrations in dolphins ranged from 31-106 μg/mL, about 20-1000 times higher than estimates previously reported for humans. Vanin-1 is known to produce the free thiol, cysteamine, from the vitamin B5 precursor, pantetheine. Cysteamine has antioxidant properties; thus, a high Vanin-1 phenotype may be an adaptation to counter oxidative stress. This project will test the hypothesis that elevated levels of circulating Vanin-1 is a shared state amongst all diving marine mammals. To test this hypothesis, serum will be assayed for Vanin-1 concentration using mass spectrometry from 10 terrestrial species belonging to five different mammalian orders: Rodentia (Muridae), Primates (Hominidae), Cetartiodactyla (Suidae and Bovidae), Perissodactyla (Equidae), and Carnivora (Canidae and Felidae), and 9 marine mammal species representing either the toothed whales (Cetartiodactyla, Odontoceti) or seals and sea lions (Carnivora, clade Pinnipedia). If serum Vanin-1 is higher in all diving marine mammals compared
to all terrestrial mammals, this would suggest that elevated Vanin-1 abundance in the blood is an important adaptation for diving.

6 A VICARIANCE MODEL FOR BIOGEOGRAPHY AND SPECIATION IN ELASMOBRANCHS USING MOLECULAR CLOCKS. Enright, NM (GPMB, The Graduate School at the University of Charleston, SC) and Naylor, G (College of Charleston)

Understanding rates of molecular evolution and dates of divergence in different species can provide useful insights into phenomena such as adaptation and speciation, and may allow one to make inferences about population structure and biogeography. A barrier such as the Isthmus of Panama is a relatively new vicariant barrier separating two bodies of water inhabited by elasmobranchs, where no gene flow can occur between the separated populations. Such structures provide opportunities to calibrate rates of molecular evolution across a diversity of marine taxa and to explore the influence of different life history parameters on estimated rates of molecular evolution. Elasmobranchs are well suited for such studies as they exhibit both a wide range of life history attributes and include several taxa whose populations have been separated by such vicariant events. In this study, rates of molecular evolution are contrasted for mitochondrial markers across a suite of elasmobranch sister taxa found on either side of vicariant barriers. Patterns of molecular evolution are examined for potential influence on different life history parameters including but not limited to ovipary versus vivipary, generation time, and effective population size.

7 EFFICACY OF JUVENILE ABUNDANCE INDICES IN STOCK ASSESSMENTS OF SOUTH ATLANTIC FISHERIES. Reynolds, J (GPMB, The Graduate School at the University of Charleston, SC) and Smart, T (SCDNR)

The use of fisheries management tools has become increasingly proactive as growing human populations are putting an ever increasing demand on ocean resources. The capabilities of some of these tools however, such as predictive models, depend primarily on the quality of input data. Secondarily, it is necessary to have a good understanding of the factors in these models and their relationships with one another for models to be accurate and realistic. Stock assessments for South Atlantic king mackerel, Scomberomorus cavalla, use inputs such as abundance indices, growth parameters, and fisheries landings to produce estimates of spawning stock biomass and population size, which are then used to set management regulations. There are assumptions, however, that are made with the use of this modeling system, in particular that there are measurable connections among life stages. A juvenile index of abundance from the SEAMAP-SA Coastal Trawl Survey is presumed to represent ecological recruitment and therefore be coupled (positively correlated) to recruitment to the fishery or landings. This index also is presumed to be coupled with reproductive output of the adults (or spawning biomass). Preliminary results display very weak correlations among life stages and indicate inputs are decoupled at some point or points in the system. This research will further investigate this decoupling to determine what other factors or elements need to be taken into consideration, such as environmental or oceanographic factors. Understanding the
relationships among these different elements will result in more informed stock assessments and ultimately more proactive management.

8 **AGE AND SIZE DEPENDENCY OF SPAWNING FREQUENCY AND DURATION IN THREE FISH SPECIES OFF THE SOUTHEASTERN UNITED STATES: GAG (**MYCTEROPERCA MICROLEPIS**), SCAMP (**MYCTEROPERCA PHENAX**), AND GREATER AMBERJACK (**SERIOLA DUMERILI**).**

Gamboa-Salazar, KR (GPMB, The Graduate School at the University of Charleston, SC), Wyanski, DM (SCDNR), Bubley, WJ (SCDNR), Klibansky, N (NOAA), and Sancho, G (College of Charleston)

The productivity of a fish stock is typically measured by the relationship between reproductive output and subsequent recruitment into the stock, via a spawner-recruit model. Spawning stock biomass (SSB), the total weight of mature females, is the most widely used measure to calculate reproductive output, but it relies on the assumption of a consistent relationship between number of oocytes and fish weight throughout the stock. Non-linear increases in fecundity, spawning frequency, and spawning duration with size have been shown to occur in marine fishes, rendering this assumption invalid. Because of this, the SSB parameters calculated from the assessments can lead to over or underestimations of stock productivity and to ineffective management regulations. Recently, assessments have begun to quantify reproductive output as total egg production (TEP), which can remove some of these assumptions. The purpose of this study is to analyze the age and size dependency of spawning frequency and duration in two closely related congeneric species in the Southeastern United States: Gag (**Mycteroperca microlepis**) and Scamp (**Mycteroperca phenax**), as well as Greater Amberjack (**Seriola dumerili**), for comparison with a different family. We are currently histologically analyzing the reproductive phase and spawning indicators of approximately 5,400 fishery-dependent samples collected since 1994, and will subsequently determine the spawning frequency in each age and size class to provide more accurate, age and size based models of reproductive output. Incorporating these models into TEP estimates could lead to more accurate assessments, thus providing better estimates of harvest rates to ensure the resilience of these stocks.

9 **TEMPORAL CHANGES IN SOUTH ATLANTIC OCEAN FISH BIODIVERSITY.** Baker, N (GPMB, the Graduate School at the University of Charleston, SC) and McGlinn, D (College of Charleston)

It has recently been documented that communities are becoming more homogenous due to global changes. This is a concern because it lowers regional biodiversity. In fish communities, increasing ocean temperature, ocean acidification, and fishing pressures could be causing such changes. Monitoring changes in fish communities is important for trying to understand how these factors are affecting biodiversity. We would like to determine how the biodiversity of fish communities in the South Atlantic Ocean has changed over the recent decades when scale-dependent effects have been taken into account. We hypothesize that the total number of individuals and species in communities has decreased, and that communities have become more similar over temporal and latitudinal scales. Depending on the effort (size of sampling area, length of study, number of samples), the observed patterns between fish communities can vary. Therefore we will be taking scale-dependent effects into account. We will be analyzing
data provided by the SCDNR’s SEAMAP group to parse out different aspects of fish biodiversity. The data are obtained from trawl samples conducted by SEAMAP from Cape Hatteras, NC to Cape Canaveral, FL, from 1989 to 2014. We will use the number of species and number of individuals to create curves for the change in number of individuals, species abundance distribution, and aggregation of species. These curves will provide information on specific components of biodiversity, and give clearer insight into the changes. This approach can then be applied to further studies on biodiversity, or to potentially assist in fisheries management.

10 USING THE ‘TURTLE’ BARNACLE, *CHELONIBIA TESTUDINARIA*, AS A PROXY FOR BREVETOXIN EXPOSURE IN LOGGERHEAD SEA TURTLES. Lane, Z (GPMB, The Graduate School at the University of Charleston, SC), DiTullio, J (College of Charleston), Fair, P (NOAA, National Ocean Service), Van Dolah, F (NOAA, National Ocean Service), and Zardus, J (The Citadel)

The barnacle, *Chelonia testudinaria*, is a commensal species that has been reported living on horseshoe crabs, manatees, and every known species of sea turtle. One benefit it gains from its host is exposure to consistent feeding currents afforded by attachment to a larger, mobile organism. This life strategy, however, exposes *C. testudinaria* to various biological/chemical stressors in the environment where its host resides. Harmful algal blooms often occur in areas where *C. testudinaria* hosts are native, and are known to have adverse effects on host health. A common alga linked to HAB production is the dinoflagellate, *Karenia brevis*, which releases a suite of potent neurotoxins known as brevetoxins that have been implicated in many marine mammal and turtle strandings and large fish kills. These toxins are also the cause of neurotoxic shellfish poisoning in humans, acquired indirectly by eating bloom-exposed bivalves. This study aims to connect brevetoxin concentrations in *C. testudinaria* tissues with environmental brevetoxin concentrations via biomagnification to determine if this commensal barnacle could act as a proxy for host exposure. Barnacles will be raised to maturity in a laboratory setting, and *C. testudinaria* will be exposed to biologically relevant concentrations of *K. brevis* in order to test if environmental brevetoxin concentration is positively correlated with brevetoxin concentration in *C. testudinaria* tissue. Successful laboratory rearing of *C. testudinaria* has yet to be reported, and this study aims to be the first to do so through use of a novel technique involving specialized tanks designed to promote the settlement and growth of this particular species. Along with laboratory trials, *C. testudinaria* and host blood samples will be taken from loggerhead sea turtles, *Caretta caretta*, found in active *K. brevis* blooms off the coast of Florida in order to examine the potential ecological correlation between host and *C. testudinaria* tissue brevetoxin levels.

11 IDENTIFYING SOURCES OF MICROPLASTIC DEBRIS IN CHARLESTON HARBOR, SC. Leads, R (GPMB, The Graduate School at the University of Charleston, SC) and Weinstein, J (The Citadel)

Microplastics (<5 mm diameter) are ubiquitous in the environment, and abundances as high as thousands of particles/m²² have been reported on shorelines worldwide. A previous survey of Charleston Harbor reported an average of 591 ± 103 microplastic particles/m² in intertidal sediments, with polyamide (nylon) fragments being the most abundant type of particle. The high concentration of nylon fragments in Charleston Harbor is unique; microplastic debris in
other marine systems is mostly composed of polyethylene, polypropylene, and polystyrene. The present study aims to identify sources of microplastic debris in Charleston Harbor, focusing on the potential source of these nylon fragments. As rivers are thought to be a significant contributor of non-point source (litter and runoff) and point source (municipal and industrial discharges) marine microplastics, sediment and sea surface samples were collected from the Ashley River (n=3), Wando River (n=3), Cooper River (n=8), and Daniel Island (n=1), and were analyzed for microplastics (63-500 µm). Preliminary results indicate that total microplastics and nylon fragments were most abundant in the Ashley River (560 particles/m²), followed by the Cooper River (251 particles/m²), and the Wando River (204 particles/m²). Because the Ashley River contains few point source discharges, these results support the notion that non-point sources are a significant contributor to microplastic pollution in Charleston Harbor. Additionally, in all three rivers, greater microplastic abundance was observed at upstream sites, suggesting that the headwaters of coastal watersheds may be a significant contributor to microplastics in coastal waters. This research is funded by the SC Sea Grant Consortium.

12 QUANTIFYING MICROPLASTICS IN THE GUT OF STRANDED BOTTLENOSE DOLPHINS (TURSIOPS TRUNCATUS) FROM SOUTH CAROLINA, USA. Battaglia, FM (GPMB, The Graduate School at the University of Charleston, SC), Beckingham, B (College of Charleston), McFee, W (NOAA, National Ocean Service, Center for Coastal Environmental Health and Biomolecular Research), Hart, L (College of Charleston), and Kucklick, J (National Institute of Standards and Technology)

Microplastic pollution is a ubiquitous problem affecting marine ecosystems. Microplastics are capable of concentrating contaminants and providing habitat for microorganisms, thus presenting a mechanism for toxin transfer to marine biota. Ingestion of microplastics has been reported for a variety of lower trophic level organisms in field and laboratory studies, including zooplankton, polychaetes, bivalves, crustaceans, and fish. Conversely, ingestion by higher trophic levels remains largely unexplored. The bottlenose dolphin (Tursiops truncatus) is a long-lived resident and apex predator in coastal and estuarine ecosystems along the southeastern United States and as such, can be a sensitive gauge for environmental quality within its range. The present study will investigate microplastic exposure in stranded T. truncatus from South Carolina, USA. Objectives are to 1) refine a method for quantifying microplastics in marine mammals, 2) provide the first measure for exposure in T. truncatus and 3) compare levels to findings in the recent literature. The gastrointestinal tract will be removed post mortem and its contents washed into containers. Organic material will be reduced via wet digestion, and samples will be separated into four size fractions (75-125µm, 125-355µm, 355µm-1mm, and 1-5mm) and dried. Microplastics will be visually enumerated under a stereomicroscope. The identity of ambiguous particles will be confirmed by comparing their melting point to reference ranges for common polymers. Data from this initial investigation will aid future studies examining the routes of exposure and possible transfer of microplastic-associated pollutants and microbial pathogens to marine apex predators like T. truncatus.

13 INFLUENCE OF COBALAMIN (VITAMIN B₁₂) ON THE MICROBIAL DEGRADATION OF DIMETHYLSULFONIOPROPIONATE AND RELATED COMPOUNDS. Burnham, A (GPMB, The Graduate School at the University of Charleston, SC)
The production of dimethylsuloniopropionate (DMSP) by phytoplankton and its subsequent microbial degradation are important biogenic contributors to the global sulfur cycle. The degradation of DMSP contributes to the sulfur requirements of marine microbes and is a source of sulfur for global climate processes in two ways. First, DMSP can be demethylated/demethiolated into methane, an important greenhouse gas, and methanethiol, a major source of sulfur for the biosynthesis of methionine (Met) by many marine bacterioplankton. Second, DMSP can be cleavage into dimethylsulfide (DMS), a key source of cloud condensing nuclei (CCN). Despite this biological and climatic importance, the factors controlling the ratio of these pathways relative to one another are most likely numerous and still not well understood. Vitamin B_{12} is a known cofactor for the B_{12}-dependent methionine synthase (MetH), a significant source of methionine, and therefore represents a potential limiting factor for Met production and microbial-mediated demethylation/demethiolation of DMSP. Utilizing a series of controlled incubations with open ocean microbial communities and Proton Transfer Reaction (PTR)-Mass Spectrometry, the proposed research will attempt to elucidate the importance of Vitamin B_{12} in controlling the metabolically preferred DMSP degradation pathway and consequently, the relative abundance of cleavage and demethylation products.

**ORAL PRESENTATIONS**

1.1 **AGE AND GROWTH OF ATLANTIC AND SHORTNOSE STURGEON IN THE COOPER RIVER USING THE MINIMALLY INVASIVE PECTORAL FIN RAY.** Ruddle, V (GPMB, The Graduate School at the University of Charleston, SC), Bubley, W (College of Charleston; SCDNR), Holbrook, C (College of Charleston; SCDNR), Sancho, G (College of Charleston), Shervette, V (USC Aiken), and Post, B (SCDNR).

The Cooper River in South Carolina is home to Atlantic Sturgeon, *Acipenser oxyrinchus*, and Shortnose Sturgeon, *Acipenser brevirostrum*, endangered anadromous fishes. Understanding the status of these populations is especially significant given recent approval for extensive dredging of the Charleston Harbor and a portion of the Cooper River to deepen shipping channels. The age structure of the population in the Cooper River is unknown, yet important to understand due to potential effects of the dredging on the current population. It also plays a role in identifying the current health of these populations and inform on recruitment into the system. Fish were caught between (03/2015-09/2016) in the Cooper River and within Charleston Harbor following SCDNR anadromous fish protocol. In an attempt to improve upon age estimates obtained from the more commonly used but more destructive to remove fin spine, second marginal pectoral fin ray samples were removed from both species. Average percent error (APE) between readers and coefficient of variation (CV) results suggest that the second marginal fin ray is a precise method of ageing both species, and may be preferable to the first fin spine. Age estimates from the second marginal fin rays suggest that recruitment to both populations is limited.

1.2 **RAPID EVOLUTION OF THERMAL TOLERANCE AND HEAT-SHOCK PROTEIN EXPRESSION IN AN INTRODUCED RED SEAWEED.** Flanagan, BA (GPMB, The Graduate School at the University of
Rapid evolution of introduced species facilitates successful invasions, yet the extent to which evolution operates in natural populations occupying novel habitats remains largely untested. Here, we used the widely introduced red seaweed *Gracilaria vermiculophylla* to observe rapid evolution of high temperature tolerance and induced expression of two heat-shock proteins, *HSP70* and *HSP90*. Field-collected and common garden *G. vermiculophylla* thalli from forty-one native Japanese and introduced North American and European sites were exposed to 40°C for 1, 2, or 4 hours. After exposure, rates of survivorship and *HSP70* and *HSP90* expression were quantified. Introduced thalli survived high temperature stress at greater rates than native thalli. We found the recapitulation of a latitudinal cline in survivorship along the eastern coast of the United States, mirroring the same cline observed in the native range. This suggests local adaptation following the successful establishment of thalli along the eastern seaboard. Additionally, introduced thalli induced *HSP70* and *HSP90* to higher levels than their native counterparts. The increased induction of *HSPs* supports the increased rate of survival after heat stress and ties the survival phenotype to a molecular mechanism. The survival and expression rates were the same even after thalli were reared in a common garden for 4 months. In conclusion, our evidence indicates that rapid evolution plays a role in the facilitating this and likely other invasions. Genetic adaptation should thus be seen alongside propagule pressure, biotic interactions and ecosystem dynamics as characteristics influencing marine invasion success.

1.3 LETHAL AND SUBLETHAL EFFECTS OF EXPOSURE TO EXTREME COLD IN THE INVASIVE GREEN PORCELAIN CRAB *PETROLISTHES ARMATUS*. Mack, K (GPMB, The Graduate School at the University of Charleston, SC); Podolsky, B (GPMB, The Graduate School at the University of Charleston, SC); Fowler, A (University of Charleston, SC; Department of Environmental Science and Policy, George Mason University, Fairfax, VA); Shervette, V (Department of Biology and Geology, University of South Carolina) and Wilber, D (GPMB, The Graduate School at the University of Charleston, SC)

The green porcelain crab, *Petrolisthes armatus*, is an intertidal anomuran with a native range extending from the Indian River, FL south through the Caribbean to Brazil. Facilitated by warming ocean waters, the species has invaded northward and established populations on intertidal oyster reefs, first appearing in Charleston, SC in the 1990s and later expanding north to Wilmington, NC. *Petrolisthes armatus* may be limited in its poleward range expansion by its intolerance of cold winter temperatures. Using crabs collected from five locations between Savannah, GA and Wilmington, NC, I conducted laboratory incubation trials to determine cold temperature thresholds that induce sublethal (loss of righting response) and lethal effects, testing for differences among populations, sexes, and sizes. Following an acclimation period (20°C – 12 °C), crabs were exposed to a chronic cold temperature trial modeled after water temperatures recorded during the January 2014 cold snap in Charleston Harbor, SC (12°C - 3°C). Collections and laboratory incubation trials were conducted seasonally from June 2015 to June 2016. In the summer and fall incubations, crabs from the two more northern locations survived
significantly longer. In the summer and spring incubations, during spawning, females survived and maintained their righting response significantly longer than males. Survival was inversely related to size, but is likely autorecorrelated with sex. Crabs from northern locations appear better adapted to withstand cold water temperatures, and this adaptive difference is only apparent when seasonally appropriate. Energy stores associated with egg production may improve tolerance to cold, but this advantage would be largely irrelevant as spawning does not occur in winter.

2.1 FORAGE FISH GUILD STRUCTURE OF THE SOUTH ATLANTIC BIGHT. Michael, C (GPMB, The Graduate School and the University of Charleston, SC) and Smart, T (SCDNR)

Ecosystem-based fisheries management (EBFM) is area of intense study that uses multiple species, usually from interacting trophic levels, to gain an in-depth understanding of how a targeted species is affected not only by fishing, but also by its competitors, predators, and prey. The South Carolina Department of Natural Resources (SCDNR) has been conducting fisheries-independent surveys of regional stocks using chevron traps through the Marine Resources Monitoring, Assessment, and Prediction (MARMAP) Program since 1990 and shrimp trawls through the Southeast Area Monitoring and Assessment Program (SEAMAP) since 1987. The objective of this study is to determine basic life history and diet composition of small forage fish species that are common prey of the fishes in the snapper-grouper complex. These forage fish species include Sand Perch (Diplectrum formosum), Spottail Pinfish (Diplodus holbrooki), Pinfish (Lagodon rhomboides), Tomtate (Haemulon aurolineaturn), and Stenotomus spp. Modified sampling methods to eliminate bait gorging were used to improve the stomach content analysis. Diet overlap was calculated using prey weights and counts to determine whether forage fish species are part of the same trophic group, or guild. Several species in one guild can be monitored using an indicator species, such as small Black Sea Bass (Centropristis striata) (≤200mm total length) in this study, to expand management to a multispecies approach. The Schoener Index of resource overlap indicates all species pairs have significant diet overlap and are members of the same guild. Trophic guilds can simplify the stock assessment process so that EBFM can be achieved the future.

2.2 ZOOPLANKTON EXPOSURE TO MICROPLASTIC AT ESTUARINE TIDAL FRONTS IN CHARLESTON HARBOR, SC. Payton, T (GPMB, The Graduate School at the University of Charleston, SC), Beckingham, B (College of Charleston), and Dustan, P (College of Charleston)

The Charleston Harbor in Charleston, SC receives input from three main river systems and the Atlantic Ocean, generating tidally-driven frontal aggregation zones for semi-buoyant particulates. Microplastics are found in Charleston Harbor and have entered the estuarine trophic system as evidenced by fragments and fibers found in the guts of shrimp, the feces of local birds, and the gills of Eastern oysters, Crassostrea virginica. The present study examined whether aggregation zones at flood tidal fronts in the Ashley and Cooper River present a pathway of increased exposure for microplastics to enter the estuarine trophic system via ingestion by zooplankton. Fluorescence and bright-field microscopy were used to enumerate
microplastics in filtered surface water samples and melting point analysis confirmed the identification. The increased relative abundance of microplastics in flood tidal fronts compared to the surrounding water suggests these systems concentrate microplastics similarly to phytoplankton and thus may be an important conduit for microplastic to enter the food web. Additionally, each front and associated river system may be characterized by different relative abundances of microplastic fibers verses fragments. Future analysis will examine zooplankton populations collected at tidal fronts to provide a better understanding of the movement of microplastics into the lower trophic feeding guilds in a dynamic estuarine environment.

2.3 ACOUSTIC TRACKING OF SOUTHERN FLOUNDER IN THE CHARLESTON HARBOR SYSTEM. Hart, MP (GPMB, The Graduate School at the University of Charleston, SC), Denson, MR (South Carolina Department of Natural Resources), Scharf, FS (University of North Carolina Wilmington), Sancho, G (College of Charleston), and Arnott, SA (South Carolina Department of Natural Resources)

Southern flounder is an economically important fish in the southern U.S. Atlantic and Gulf of Mexico coastal regions, but population numbers are declining. Genetic and morphometric studies have shown that the Atlantic population is distinct from the Gulf of Mexico, but there is little evidence of stock structure along the Atlantic coast due to extensive mixing (North Carolina to eastern Florida). At present, fisheries within the Atlantic are managed separately by individual states, but there is increasing pressure for an integrated single stock approach. There is, however, a lack of basic information on regional fish movement and mortality patterns. The aim of this study was to address these research requirements by tracking the movement and fate of individual southern flounder using acoustic telemetry. We first tested several methods of acoustic tag attachment to optimize fish survival and tag retention. We found that most fish (95%) survived tagging at water temperatures below 25°C, but survival was poor (40-85%) at higher temperatures. Also, fish with surgically implanted tags had better tagging recovery and tag retention than those with externally attached tags. After optimizing tag attachment, we released 119 acoustically tagged southern flounder (>275 mm total length) into the Ashley River (Charleston, South Carolina) and are currently tracking fish movement using a combination of fixed receivers and active tracking. Preliminary movement results show that 96% of the fish have been detected, 88% fish stayed within the river of release, and 12% moved into the Atlantic Ocean in the fall months.

3.1 A COMPARISON OF SERUM FGF21 CONCENTRATIONS BETWEEN MANAGED AND FREE-RANGING BOTTLENOSE DOLPHINS, TURSIOPS TRUNCATUS. Harrell, T (GPMB, The Graduate School at the University of Charleston, SC) and Janech, M (Medical University of South Carolina)

No abstract.

3.2 THE IMPACT OF VITAMIN B12 AND NITRATE ON DIMETHYLSULFONIOPROPIONATE PRODUCTION IN MARINE EUKARYOTIC PHYTOPLANKTON. Pound, HL (GPMB, The Graduate School at the University of Charleston, SC) and Lee, PA (College of Charleston)
Phytoplankton play countless roles in the support and regulation of marine ecosystems, as well as in global biogeochemical processes. One such process in the global sulfur cycle is the pathway that begins with the production of dimethylsulfonylpropionate (DMSP) by marine eukaryotic phytoplankton and results in the formation of sulfate-based cloud condensation nuclei that contribute to the Earth’s albedo. While this concept is widely accepted as the CLAW hypothesis, many of the intermediate steps, including DMSP production, are poorly understood. Nutrient limitation is thought to play a major role in the amount of DMSP produced by controlling the metabolic pathways. Vitamin B\textsubscript{12} and nitrate are of particular interest due to their involvement in the synthesis of methionine, the precursor for DMSP, as a co-factor and nitrogen source, respectively. Laboratory culture experiments have been performed on several phytoplankton species with differing requirements for B\textsubscript{12} and capacity to produce DMSP under various nutrient conditions. Based on classic techniques, B\textsubscript{12} limitation had little impact on cell growth, whereas nitrate limitation had a significant effect on both culture growth and intracellular DMSP concentration of *Thalassiosira pseudonana* and *Phaeodactylum tricornutum*. These experiments will verify the role of B\textsubscript{12} in DMSP production and help link the underlying metabolic pathways that drive the cellular portion of the sulfur cycle to ecosystem and global scale processes.

### 3.3 EXPLORING THE SPATIAL AND TEMPORAL TRENDS OF BLACK SEA BASS AND WHITE GRUNT ALONG THE SOUTH ATLANTIC BIGHT FROM 1990-2015

Walker, MF (GPMB, The Graduate School at the University of Charleston, SC), Ballenger, JC (SCDNR), Reichert, MJM (SCDNR), McGlinn, D (College of Charleston), and Bacheler, N (NOAA-SEFIS)

With roots dating to 1972 and the formation of the Marine Resources Monitoring, Assessment, and Prediction (MARMAP) program, the Southeast Reef Fish Survey (SERFS) is a long-term fishery-independent monitoring program designed to examine changes in relative abundance and life history of economically important fish species found on live-bottom habitats of the South Atlantic Bight. Since 1990 the SERFS program has used baited chevron traps as the primary gear due to its ability to capture a wide range of species and sizes of fish. Using this data, the purpose of this project is to examine the distribution of Black Sea Bass (*Centropristis striata*) and White Grunt (*Haemulon plumieri*), which are economically important reef fish species that have been subject to varying levels of fishing intensity and management regulations. Species distribution modeling (SDM) has become a common strategy for examining terrestrial species distributions, but has rarely been used in the marine realm. Furthermore, biotic interactions are an important aspect of a species’ habitat, but are rarely included in SDM. In this study, a generalized linear model framework, including k-fold cross validation, was used to examine the distribution of both species. Depth and latitude were the most important variables for describing the *C. striata* and *H. plumieri* distributions respectively. Positive relationships were found between occurrence and predator/prey species. Furthermore, model accuracy was higher for White Grunt (86.0%) than for Black Sea Bass (82.5%). This study will provide insight into how the distribution of these species has changed through time with fluctuating environmental conditions and fishing regulations.
4.1 EVALUATING THE EFFECTIVENESS OF COMMUNITY-BASED MANAGEMENT OF THE CROWN-OF-THORNS SEASTAR (*ACANTHASTER PLANCI*) IN THE PHILIPPINES. Byce, SJ (MES, The Graduate School at the University of Charleston, SC)

Crown-of-thorns (COT) seastars, *Acanthaster planci*, are corallivores, which have consumed mass quantities of coral throughout the Indo-Pacific thereby posing serious threat to the coral reef ecosystem. The Philippines is a nation of island communities, who depend on the sea for both livelihood and food. There is no current, consolidated database documenting the extent of COT abundance in the Philippines and no former research has assessed COT management in local government units of the Philippines to determine best practice guidelines. This study used participant surveys with local government officials, informal interviews with local fisher folk, and snorkel surveys in the small island province of Romblon, Philippines to evaluate the existing state of COT populations and management. Data collected across eleven different municipalities and 31 coastal barangays (towns) revealed a lack of awareness of COT ecology and gaps in communication between local government officials and fisher folk. Pre-existing management of COTs was found to be non-existent. Secondly, this study implemented and evaluated bounty programs for COT removal by hand in eight municipalities. No removal event completely eradicated COTs and all sites required additional follow up action. The findings of this study suggest that successful COT management in Romblon, Philippines will require improved awareness by government officials of COT ecology and threats, increased communication between government officials and fisher folk, and a small task force of individuals dedicated to multiple consistent COT removals along key reefs.

4.2 A GEOMETRIC MORPHOMETRIC APPROACH TO IDENTIFY ELASMOMBRANCH FISHES FROM THE LATE EOCENE OF SOUTH CAROLINA. Taylor, J (GPMB, The Graduate School at the University of Charleston, SC) and Naylor, G (College of Charleston)

Isolated chondrichthyan teeth are the most abundant vertebrate fossil represented in the fossil record, and are widely distributed along the southeastern United States. The coastal plain in South Carolina contains an abundance of chondrichthyan remains from the Eocene epoch, which is distinguishable from other epochs by the presence of distinct, calcareous nanofossil assemblages and levels of dissolved carbon. The Eocene lasted from 55.8 to 33.9 million years ago and is characterized by accelerated global cooling, changes in ocean circulation, and a drop in global temperature of about 2°C. Fauna diversity has been observed in the calcareous nanofossil assemblage from the Eocene, but has yet to be observed in vertebrate macrofauna, specifically elasmobranchs. The present study aims to identify the diversity of the elasmobranch fauna using isolated teeth found in the Parkers Ferry formation (33.239068° N, -80.425665°W), Late Eocene, which represents a period of cooling in South Carolina. Many extant sharks can be identified on the basis of tooth morphology, which has been typically qualitative in nature. This sorting “technique” has led to taxonomic problems in the reporting of the fossil record, because there are several complicated patterns of heterodonty that influence tooth shape. A geometric morphometric technique was applied to extant and fossil teeth as a quantitative approach to identify the elasmobranch taxa from the Late Eocene. Extant dentitions were used in order to observe tooth shape morphology and trends seen
between species from complete associated tooth sets; fossil teeth were then analyzed and sorted into species/ classes based on trends observed from the extant individuals. The results of the present study will provide a reliable and unbiased method to identifying fossil sharks’ teeth; this may be utilized for documenting transitions in the elasmobranch fauna from the Early to Middle, a time period when global marine and terrestrial extinctions occurred.