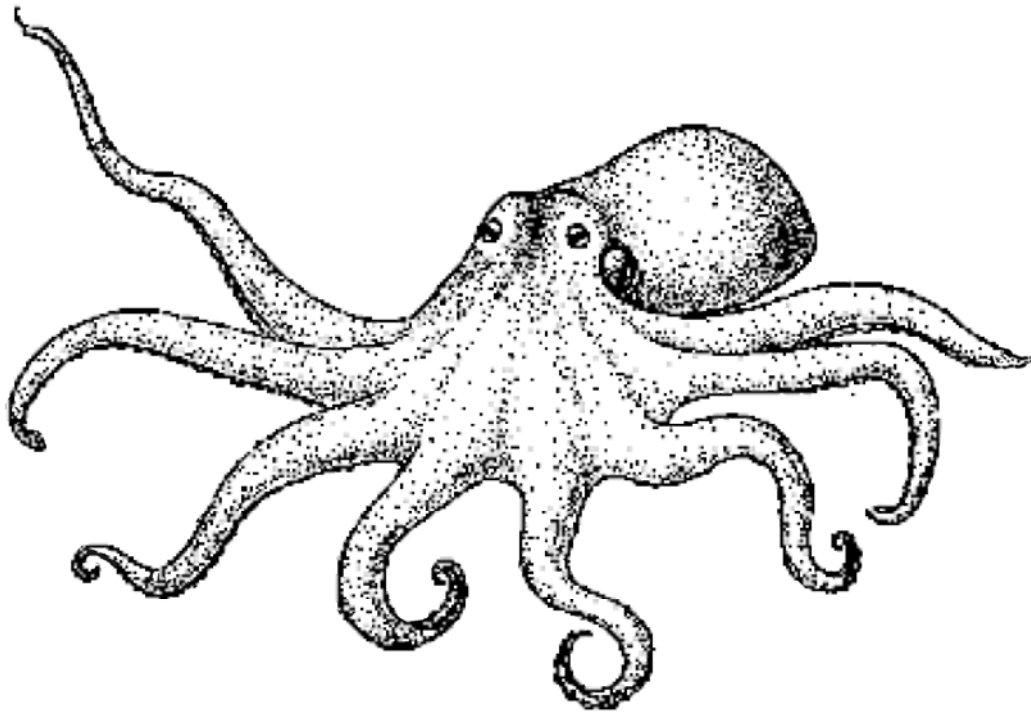


College of Charleston
Graduate Program in Marine Biology

**13th ANNUAL
STUDENT RESEARCH COLLOQUIUM**

25 - 26 September 2009

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 (Feb.) **Dr. Steve Palumbi**, Hopkins Marine Station & Stanford University

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CofC Master of Environmental Sciences Program	SC Dept. of Natural Resources Marine Resources Division
Hollings Marine Lab	South Carolina Sea Grant Consortium
George Grice Foundation	NOAA/NOS Center for Coastal Environmental Health and Biomolecular Research
Medical University of South Carolina	

STUDENT RESEARCH COLLOQUIUM FALL 2009
PROGRAM

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

Posters will be on display by 3:00 p.m. on Friday. Poster presenters will attend their posters from 5:15 to 6:15 p.m. on Friday. Posters will remain on display throughout the Colloquium.

FRIDAY, 25 SEPTEMBER 2009

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

4:00 Opening Remarks

Dr. Jaap Hillenius, Chair
Department of Biology, College of Charleston

4:05 Introduction of Keynote Speaker

Dr. Allan Strand
Department of Biology, College of Charleston

4:10 Keynote Address: The Emerging Role For Pharmacology In Understanding Marine Plant-Herbivore Interactions.

Dr. Erik Sotka
Assistant Professor of Biology
College of Charleston

5:00 – 7:00 Poster Session & Social

SATURDAY, 26 SEPTEMBER 2009

9:15 Introduction

Dr. Melissa Hughes
Department of Biology, College of Charleston

ORAL PRESENTATIONS

SESSION 1 Moderator: Rob Dillon

9:30 Effects Of Seawater Acidification On Shell Formation In Intracapsular Larvae Of The Intertidal Snail *Nassarius obsoletus*.
Fernandes, D.A.O. and Podolsky, R.D.

9:45 Stress Responses in the Coral Symbiont *Symbiodinium adriaticum*: a Role for Spliced Leader Silencing.

Feltman, P. and Van Dolah, F.

10:00 The Role Of Crab Traps In Oyster Restoration.

Kreutzer, A., Hadley, N. and Shervette, V.

10:15 Preliminary Evidence of Genetic Bottleneck in a South Florida Coral Population.

Wham, D.

10:30 – 10:45 **Break**

SESSION 2 Moderator: Rob Dillon

10:45 Temporal Characterization Of The Surf Zone Macrofauna At Folly Beach, South Carolina.

Wilkie, J.

11:00 Serum Cytokines As Predictors Of Domoic Acid Exposure In California Sea Lions, *Zalophus californianus*.

Ferrante, J.A., Arthur, J.M., Gulland, F.M.D., Hill, B., Almeida, J. and Janech, M.G.

11:15 Do Patterns Of Organohalogen Contamination In The Blood Of Adult Male Loggerhead Sea Turtles (*Caretta caretta*) Vary Based On Migration Patterns?

Ragland, J.M., Arendt, M.D. and Keller, J.M.

11:30 Assessment Of Hydroxylated Organic Contaminants And Thyroid Hormones In Shark Blood Plasma From Estuaries Along The Southeast Coast Of The US.

Reiss, K.L., Kucklick, J.R., Keller, J.M., Strand, A.L. and Gelschlechter, J.

11:45 – 1:30 **Lunch**

SESSION 3 Moderator: Rob Dillon

1:30 Circulating Plasma Corticosterone Levels And Injuries In Loggerhead Sea Turtles (*Caretta caretta*).

Alderson, J.E. and Owens D.W.

1:45 Synergistic Effects Of Increased Temperature And CO₂ On Dimethylsulfoniopropionate Concentration In *Symbiodinium microadriaticum* And Associated Changes In Methionine Synthase Activity.

McLenon, A.L. and DiTullio, J.

2:00 Partitioning The Genetic And Environmental Influences On Gene Expression In The Robust Eastern Oyster, *Crassostrea virginica*, From Three Locations In Mississippi.

Johns, C.

2:15 – 2:30 Break

SESSION 4 Moderator: Rob Dillon

2:30 An Assessment Of The Presence And Fate Of Pharmaceuticals And Personal Care Products (PPCPs) Found In Treated Wastewater Discharges Into Charleston Harbor, South Carolina.

Hedgespeth, M., Sapozhnikova, Y. and Wirth, E.

2:45 Population Structure Of *Megabalanus coccopoma* Over Its Introduced Range Of Southeastern U.S.

Williamson, T.J. and Zardus, J.D.

3:00 The Effects Of Iron And Irradiance On The Growth And Physiology Of A Polar Diatom, *Fragilariopsis cylindrus*.

Stavovy, J., DiTullio, J. and Sedwick, P.

3:15 Bottlenose Dolphins And The Atlantic Blue Crab Fishery: A Study Of Coincidence And Interaction In Charleston Harbor, South Carolina.

Sturgeon, N., Powel, J., Pate, M., Speakman, T., Coomer, K. and McFee, W.

3:30 – 4:00 Break

4:00 **Closing address:** Additive Effects of Coastal Development and Global Warming: A Recipe For Disaster For Coastal Ecosystem Health.

Dr. Geoff Scott

Director, Center for Coastal Environmental Health and Biomolecular Research and Acting Director, Hollings Marine Laboratory

5:00 **Closing remarks and award presentation:**

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

5:30 **Lowcountry Boil, Marshlands House**

POSTER PRESENTATIONS

The Effect Of Shell Hash On The Burrowing Rate And Abundance Of *Donax variabilis*.
Bricker, T.

Diamondback Terrapins (*Malaclemys terrapin*) Of The Ashley River: Estimated Population Size, Sex Ratio, And Distribution. **Broyles, E.**

A Coevolutionary Arms-Race Between Coral Reef Herbivores And Their Seaweed Prey: Are Tropical Urchins More Resistant To Lipophilic Secondary Metabolites Than Temperate Urchins? **Craft, J.**

A Quantitative Assessment Of Bottlenose Dolphin, *Tursiops truncatus*, Interactions With Crab Pots as Means Of Understanding Methods Of Entanglement With Fishing Gear.
Duquette, A.

Recruitment Of Stocked Juvenile Red Drum To The Adult Population In South Carolina.
Gerhard, J.

Transgenerational Plasticity And Habitat Heterogeneity In *Mimulus guttatus*: An Analysis Of Maternal And Paternal Effects In Association With Edaphic Variation. **Henson, C.**

Characterization Of The Bacterial Properties That Impair Respiration In The Atlantic Blue Crab, *Callinectes sapidus*. **Johnson, N.**

Nekton Use Of An Intertidal Restored Oyster Reef. **Joyce, R.**

Baseline Data On Vitality, Substrate Composition, And Fish Diversity On Sagarughombe Reef, Solomon Islands Between 2000 And 2008. **Olds, M.K.**

The Effects Of A Synthetic Pyrethroid Pesticide On Two Estuarine Fish Species. **Parent, L.M., DeLorenzo, M. and Fulton, M.**

Using Anisakids As Markers To Identify Potential Pygmy Sperm (*Kogia breviceps*) And Dwarf Sperm Whale (*Kogia sima*) Stocks In The Western Atlantic And Gulf Of Mexico. **Rein, R.**

Stable Isotope Analysis Of The Sandbar Shark (*Carcharinus plumbeus*): A Non-Invasive Method For Comparison Of Diet And Trophic Relationships Between Genders, Locations, And Age Classes. **Shiffman, D.**

Systematic Study Of The *Bregmaceros* sp.5 Complex. **Simpson, R.G.**

An Analysis Of Habitat Movement And Survival Rates For American Oystercatchers In South Carolina. **Snipes, K.**

Determination Of The Amount Of Oyster Shell Available For Recycling Across The State Of South Carolina Through The Use Of Surveys. **Stone, B.**

Community And Trophic Structure Analysis Of The Snapper Grouper Complex Off The Southeastern U.S. Atlantic Coast. **Stratton, M.**

Spawning By The Southern And Gulf Flounders (*Paralichthys lethostigma* And *P. albigutta*) Off The South Carolina Coast. **Tucker, C.R.**

PRESENTATION AWARD(S)

Oral 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 official judges will complete both a numerical and a narrative evaluation form. Following the final presentation, all official judges will meet to discuss their evaluations and select the award recipient. Additional narrative evaluation forms will be made available to selected audience members during the Oral Presentation Sessions so that presenters will be provided with additional feedback, but this feedback will not be considered in selecting the award recipient.

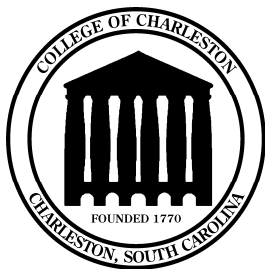
Following the colloquium, the award winner will receive a personalized certificate of recognition and a cash award (sponsored by Sigma Xi, The Scientific Research Society), which will be presented by Dr. Rob Dillon, advisor of Sigma Xi.

This year, for the first time, we will be experimenting with providing feedback to the poster presenters as well. If funding is available, we also hope to give an award for the best poster.

Previous Award Winners:

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



ABSTRACTS

ORAL PRESENTATION

Circulating Plasma Corticosterone Levels And Injuries In Loggerhead Sea Turtles (*Caretta caretta*).

Alderson, J.E. (GPMB, College of Charleston) and Owens, D.W. (GPMB, College of Charleston)

In many vertebrates, exposure to stress can trigger increased secretion of the steroid hormone corticosterone. Previous studies indicate exposure to stressors such as handling and captivity, extreme heat, and disease increase levels of circulating plasma corticosterone in sea turtles. This study investigates the effect of stress caused by physical injury on the corticosterone stress response in loggerhead sea turtles. Loggerheads were captured during trawling activities conducted by the SC-DNR since 2000. Observed injuries were separated into four recency categories: healed injuries, partially healed injuries, fresh injuries, and instant response injuries (injured by stingrays during capture). Blood was collected and centrifuged immediately, and plasma was frozen for later corticosterone measurement using radioimmunoassay. Levels of circulating corticosterone at various points in time were not significantly different between injured loggerheads and corresponding control (uninjured) loggerheads, regardless of injury category ($p=0.061-0.686$). Average initial levels of corticosterone were significantly different between loggerheads with partially healed injuries and healed injuries only ($p=0.042$); however, the corticosterone response over time differed significantly between loggerheads with partially healed injuries and those with healed injuries ($p=0.033$), fresh injuries ($p=0.022$) and instant response injuries ($p=0.048$). These results suggest that the characteristics of the corticosterone stress response in loggerheads may differ depending on the stage of injury healing. Future studies can further increase our understanding of the effect of injuries on the corticosterone stress response in loggerhead sea turtles.

POSTER PRESENTATION

The Effect Of Shell Hash On The Burrowing Rate And Abundance Of *Donax variabilis*.

Bricker, T. (GPMB, College of Charleston) and Bergquist, D. (SCDNR, College of Charleston)

Beach nourishment projects have the potential to change the physical properties such as grain size and sediment composition of the affected shoreface. These changes to the sediment can affect the ability of infauna to penetrate the sediment. Infauna of the swash zone, such as *Donax variabilis*, have adapted burrowing behavior to avoid predation and exclusion by waves. Grain size has been shown to affect the burrowing rates of *Donax* species, but the effects of shell content remain unknown. This project examines the change in burrowing rate of *D. variabilis* in response to changes in shell content across a range of grain sizes. Laboratory and field trials will be carried out in a full factorial design; testing four different grain sizes (very coarse, coarse, medium, fine) against four different percentages of shell (0, 25, 50, 100%). Beaker experiments containing a known grain size of sieved play sand and percentage of crushed shell will

show how burrowing rates change with varying shell content and grain size. Similar experiments will be carried out at Folly Beach, SC. In addition to burrowing rate, abundance of *D. variabilis* in varying shell content will also be examined through historical data mining of past nourishment projects and through sampling of small test plots of the various grain and shell sizes on the beach. The beach ecosystem is ecologically and economically important. Studies on the impacts of nourishment on infauna can be used to evaluate the sustainability of current nourishment practices.

POSTER PRESENTATION

Diamondback Terrapins (*Malaclemys terrapin*) Of The Ashley River:
Estimated Population Size, Sex Ratio, And Distribution.

**Broyles, E. (GPMB, College of Charleston), Owens, D. (College of Charleston),
Roumillat, W. (SCDNR) and Levesque, E. (SCDNR)**

We examined the structure of the diamondback terrapin (*Malaclemys terrapin centrata*) populations in the Ashley River near Charleston, South Carolina. This is an area of high boat use including the trapping of blue crabs, sport fishing, recreational boating, and industrial shipping. Little is known about current terrapin population status or distribution in this heavily used estuarine area. In conjunction with an extensive trammel netting study of estuarine fishes, mark and recapture methods were used to estimate terrapin population parameters. Terrapins were marked using passive integrated transponder (PIT) tags during 17 sampling days over 15 months that resulted in 732 terrapins tagged and 50 recaptures. Mark and recapture data were statistically analyzed using the program MARK to determine population estimates, and sex ratios were determined to be significantly male biased at 1:1.71 ($p < .0001$). The distribution of terrapins over a thirteen year period (1995-2008) was analyzed using the SCDNR trammel netting data in which terrapins were counted as a bycatch species. Catch per unit effort of terrapins at each of the 26 sampling sites along the Ashley have been recorded since 1995. Movements of localized terrapin densities were evaluated using ArcGIS. This information on population size, sex ratios, and distributional changes will be used to determine if regulation on habitat degradation, as well as possible protection, is needed for this species.

POSTER PRESENTATION

A Coevolutionary Arms-Race Between Coral Reef Herbivores And Their
Seaweed Prey: Are Tropical Urchins More Resistant To Lipophilic
Secondary Metabolites Than Temperate Urchins?

**Craft, J. (GPMB, College of Charleston), Paul, V. (Smithsonian Marine Station) and
Sotka, E. (College of Charleston)**

In contrast to temperate seaweeds, tropical seaweeds produce a greater diversity and higher concentrations of lipophilic secondary metabolites. This geographic variation in plant chemical defenses is likely due to a higher intensity of herbivory in tropical regions relative to temperate regions, a greater feeding tolerance by tropical herbivores relative to temperate herbivores, or both. However, few studies have tested the notion that

tropical marine herbivores evolved greater feeding tolerance for tropical plant defenses. Here, we test this coevolutionary prediction by assessing feeding tolerance for ecologically-important urchins from tropical versus temperate regions. Lipophilic extracts were prepared from nine species of taxonomically diverse, chemically-rich tropical seaweed. In a series of pairwise feeding choice assays, extract-coated and control artificial-foods were offered to four tropical (*Arbacia punctulata*, *Diadema antillarum*, *Echinometra lucunter*, *E. viridis*) and two temperate (*Strongylocentrotus droebachiensis* and *S. purpuratus*) echinoid species. If there is a coevolutionary arms-race between tropical algae and these urchins, then tropical urchins should feed on extract-coated algae more readily than temperate urchins. Tropical urchins consumed greater amounts of extract-laden foods than did their temperate counterparts (ANOVA p -value < 0.001), suggesting they are more resistant to lipophilic chemical defenses produced by tropical seaweeds. This study provides support for the coevolutionary arms-race among coral reef herbivores and their seaweed prey and will help guide examinations into the biochemical adaptations urchins utilize to tolerate secondary metabolites of tropical seaweeds.

POSTER PRESENTATION

A Quantitative Assessment Of Bottlenose Dolphin, *Tursiops Truncatus*, Interactions With Crab Pots As Means Of Understanding Methods Of Entanglement With Fishing Gear.

Duquette, A. (GPMB, College of Charleston), Kracker, L. (NOAA/NOS), McFee, W. (NOAA/NOS – Coastal Marine Mammal Stranding Assessments Project), Powell, J. (NOAA/NOS – Coastal Marine Mammal Stranding Assessments Project), Roth, S. (NOAA/NOS)

Entanglement in commercial fishery equipment is the number one anthropogenic cause of marine mammal death worldwide. Scientists turned to acoustic methods for monitoring and deterring marine mammals from fishing gear. However, effective avoidance solutions have not been discovered. One set back is the lack of knowledge about the methods of entanglement. Until those methods are understood, sufficient management is near impossible. The Atlantic blue crab fishery is the number one cause of fishery related incidents for bottlenose dolphins (*Tursiops truncatus*) in South Carolina. It is hypothesized that the dolphins are attracted to the pots by the bait and possibly the other marine life drawn to the pots. Hydrophones deployed in baited and unbaited crab pots will record dolphin sounds and allow for a quantification of the interaction. If dolphins are attracted by the bait, then they will approach and spend more time around the baited pots than the unbaited pots. Visual land observations will ground truth the acoustic data and provide insight into the behaviors bottlenose dolphins exhibit around crab pots. Any significant differences between time spent around baited pots versus unbaited pots will be determined using an ANOVA test in R statistical software. External factors that may be affecting dolphin behavior such as tide or time of day will be tested for significance via ANCOVA tests in R. Results of this research will provide

more information on the dolphin behaviors and time spent at or around crab pots. With this new information, more effective avoidance measures can prevent entanglement.

ORAL PRESENTATION

Stress Responses in the Coral Symbiont *Symbiodinium adriaticum*: a Role for Spliced Leader Silencing.

Feltman, P. (GPMB - College of Charleston, NOAA) and Van Dolah, F. (NOAA, Center for Coastal Environmental Health and Biomolecular Research, Charleston, SC)

The symbiotic relationship between corals and dinoflagellates of the genus *Symbiodinium* provides the basis for a diverse marine ecosystem in the otherwise oligotrophic tropical waters of the world. Coral bleaching, characterized by the impairment or loss of symbionts, is a phenomenon that can lead to large-scale coral mortality. This project seeks to characterize stress responses in *Symbiodinium* that may be important precursors to bleaching events. The stress response in another dinoflagellate, *Karenia brevis*, consists of constitutively expressed stress gene transcripts becoming actively translated to produce stress proteins (Lidie, 2007). Translational control of gene expression in dinoflagellates appears to be mediated by spliced-leader (SL) trans-splicing of mRNAs. An analysis of 15 dinoflagellate species, including *Symbiodinium*, found the identical SL on diverse mRNAs. This suggests that *Symbiodinium* may also use post-transcriptional control in its stress response. Furthermore, a phenomenon of “spliced-leader silencing” described in *Trypanosoma*, may simultaneously suppress translation of non-stress genes by leading to an increase of polycistronic messages unable to enter the translated pool. The goal of this project is to characterize heat-shock response mechanisms in *Symbiodinium*. Three specific objectives are (1) to define a heat-shock response by stress protein expression, (2) demonstrate if stress gene transcripts are controlled translationally, and (3) determine if the SL transcript decreases in abundance and results in polycistronic messages for non-stress genes. Results to date will be presented that establish the response of a *Symbiodinium* clade B isolate from *Monastrea* to 5°C heat shock over an acute timecourse of 0.5, 1, and 4 h.

ORAL PRESENTATION

Effects Of Seawater Acidification On Shell Formation In Intracapsular Larvae Of The Intertidal Snail *Nassarius obsoletus*.

Fernandes, D. A. O. (GPMB, College of Charleston) and Podolsky, R. D. (College of Charleston)

A striking consequence of rising levels of atmospheric carbon dioxide concentration is the increase in of dissolved CO₂ in the world’s oceans. High levels of dissolved carbon dioxide lowers seawater pH and represent a threat to organisms that produce calcified structures, such as corals, molluscs and crustaceans. Early development represents the most vulnerable time in the life history of marine organisms and can be particularly susceptible to small changes in seawater properties. I examined CO₂-related changes

in shell deposition of the intracapsular stages of the intertidal snail *Nassarius obsoletus*. Egg capsules were raised in seawater under conditions that simulated three scenarios of atmospheric CO₂ concentrations: current CO₂ levels, 2x current CO₂ levels and 4x current CO₂ levels. Newly hatched veligers were used to measure larval shell length and the amount of inorganic content deposited per larvae throughout development. Data are still undergoing analysis and results will be presented. Future directions of this study are to address how changes in calcium carbonate shell formation due to seawater acidification affects larval vulnerability to predation.

ORAL PRESENTATION

Serum Cytokines As Predictors Of Domoic Acid Exposure In California Sea Lions, *Zalophus californianus*.

Ferrante, J.A. (GPMB, College of Charleston), Arthur, J.M. (MUSC; Ralph H. Johnson Veterans Affairs Medical Center), Gulland, F.M.D. (The Marine Mammal Center), Hill, B. (MUSC), Almeida, J. (MD Anderson Cancer Center, University of Texas) and Janech, M.G. (MUSC; Ralph H Johnson Veterans Affairs Medical Center)

Domoic acid toxicosis (DAT) is a health issue for the California sea lion (CSL). The diagnosis of DAT by detection of domoic acid (DA) in body fluids remains difficult due to the rapid clearance of DA from the body. We investigated whether serum cytokines could be utilized as biomarkers of DA exposure. CSL serum samples were acquired from The Marine Mammal Center and divided into three groups; CSL's with acute DA (N=25), CSL's with leptospirosis (Lepto) (N=23), and CSL's recovering from another ailment not DA or leptospirosis (NDL) (N=25). We attempted to measure 27 cytokines using a human cytokine multiplex bead assay (Bio-Rad). Three of the cytokines showed a significant change between DA and non-DA animals ($p < 0.05$). Receiver operator characteristic (ROC) curves were calculated for each cytokine. Area under the curve (AUC) values did not exceed 0.552 for each of the 27 cytokines. Nearest related neighbor (NRN – a non-parametric support vector machine) and artificial neural network (ANN) models were utilized to classify CSLs into DA or non-DA categories based on all 27 cytokine levels as a group. For the NRN, the AUC for the ROC was 0.886. This model had a high degree of predictability using cytokines IL-7, IL-10, MIP-1 α , Basic-FGF, MIP-1 β , IL-2, GM-CSF, IL-15, and IL-1b. The AUC of the ANN was 0.878. In conclusion, individual cytokines were not shown to adequately discriminate CSL's with DAT. The NRN and ANN models used several cytokines and better classified CA sea lions with domoic acid toxicosis.

POSTER PRESENTATION

Recruitment Of Stocked Juvenile Red Drum To The Adult Population In South Carolina.

Gerhard, J. (GPMB, College of Charleston) and Denson, M. (SC DNR)

Red drum (*Sciaenops ocellatus*) is one of the most significant recreational fishery species along the southeast U.S. and Gulf of Mexico coasts. Red drum stock

enhancement research has been conducted in Texas, Florida, and South Carolina, and the contribution of stocked fish to the wild population in South Carolina has been measured immediately following stocking through age two. Contribution of stocked fish recruitment to the adult population has not yet been examined and was the focus of this research. Small juveniles (~ 30 mm TL) were stocked in the Ashley and Wando Rivers of Charleston Harbor in 1999 - 2002. Five years after initial stocking (2005 - 2008), adults were sampled offshore of four major South Carolina estuaries via targeted and random stratified longline sampling, and tissue samples were collected for genetic analysis to determine if stocked fish contribute to the adult population. Microsatellite-deduced genotypes of sampled fish were compared to those of broodstock to determine that some small stocked juveniles become part of the adult stock of South Carolina. The contribution of these stocked fish was calculated via several different methods. The overall contribution statewide was calculated, as well as that from each sampled estuary and each year of sampling. Age and length information gathered from 102 sacrificed adults further narrowed down these contributions by evaluating the contribution to specific age classes when fish were stocked. The overall percentage of the adult population identified as stocked fish from three stocked year classes ranged from 2.61% to 54.12%.

ORAL PRESENTATION

An Assessment Of The Presence And Fate Of Pharmaceuticals And Personal Care Products (PPCPs) Found In Treated Wastewater Discharges Into Charleston Harbor, South Carolina.

Hedgespeth, M. (GPMB, College of Charleston), Sapozhnikova, Y. (NOAA/CCEHBR, CHHR) and Wirth, E. (NOAA/CCEHBR, CHHR)

PPCPs include commonly used over-the-counter, prescription, and veterinary drugs, as well as chemicals found in cosmetics and common household products. These chemicals may be introduced into aquatic environments by both non-point and point sources including domestic wastewater treatment plant effluents. Relatively little is known about the effectiveness of such facilities in the United States to remove PPCPs during wastewater treatment and the fate and distribution of PPCPs or their metabolites once released into marine environments. Beginning in March 2009, we examined monthly chemical concentrations of 21 PPCPs in influent and effluent collected from two local wastewater treatment facilities, as well as six surface water samples collected near treated effluent discharges in the Charleston Harbor. The presence of PPCPs in aquatic environments creates possible risks for health impacts on marine organisms; thus, a select number of compounds in this study were used in an acute exposure screen for potential effects on gill tissue respiration of the Eastern oyster (*Crassostrea virginica*). Preliminary results suggest clear differences in PPCP concentrations among sewage influent and effluent samples. Sixteen compounds were detected in the influent samples, thirteen in effluent samples, and nine in harbor samples. The concentrations of most PPCPs were reduced in effluents in comparison to influents, although this trend was not universal. Sampling and analysis will continue through February of 2010. Upon completion, this study will be critical in understanding the efficacy of wastewater treatment on PPCPs, the local distribution of PPCPs in estuarine waters, and will help to

shed light on important environmental questions concerning PPCP distribution in the marine environment.

POSTER PRESENTATION

Transgenerational Plasticity And Habitat Heterogeneity In *Mimulus guttatus*: An Analysis Of Maternal And Paternal Effects In Association With Edaphic Variation.

Henson, C. (MES, College of Charleston)

Habitat heterogeneity occurs at different spatial scales and affects landscapes, within and among populations; the ability to persist in the face of a variable landscape is of particular importance to sessile organisms. Phenotypic plasticity, environmentally dependent phenotypic expression, is one of the major mechanisms which allows for response to microhabitat heterogeneity in plant systems (Bradshaw 1965; Schlichting 1986; Schlichting and Pigliucci 1998). In this study, I am assessing whether transgenerational plasticity, a subset of phenotypic plasticity, in the form of maternal and paternal effects impacts four populations of *Mimulus guttatus* in their response to variable edaphic conditions. Three generations are being utilized in this experiment to establish a total of eight different edaphic pathways across the three generations. A full sibling crossing design was utilized to produce 28 maternal lines which were grown in both serpentine and nonserpentine soil environments. Dams from each line in each environment were crossed with sires from both environments to allow for the assessment of maternal and paternal effects in the offspring generation. Currently, the first two populations have been completed, and the third generation will be planted in the fall of 2009.

ORAL PRESENTATION

Partitioning The Genetic And Environmental Influences On Gene Expression In The Robust Eastern Oyster, *Crassostrea virginica*, From Three Locations In Mississippi.

Johns, C. (GPMB, College of Charleston)

Since the merger of genetics and genomics was proposed in 2001 by Jansen and Nap, expression genetics, as the field is now called, has received an increasing amount of attention. For many years gene expression has been thought to be the driving force of evolution and in order for evolution to occur there must be a genotype-phenotype relationship. Phenotypes can be determined genetically and/or by environmental factors. If expression levels are treated as quantitative phenotypes, then the question becomes what kind of role do genetics and the environment play in determining the phenotype of organisms? This study will attempt to examine the amount of genetic variation and differential expression between the eastern oyster, *Crassostrea virginica*, from three locations in Mississippi. Nine previously described polymorphic microsatellites with di- and trinucleotide repeats will be used to determine the amount of oyster genetic variation., and a cRNA microarray designed from an *Crassostrea virginica* EST library at marinegenomics.org will be used to assess differential gene

expression between oysters. The presence or lack of a relationship between expression and genetic variation will be examined in an effort to partition environmentally and genetically controlled gene expression. The expression and genetic data will be examined using cluster analyses.

POSTER PRESENTATION

Characterization Of The Bacterial Properties That Impair Respiration In The Atlantic Blue Crab, *Callinectes sapidus*.

Johnson, N. (GPMB, College of Charleston), Burnett, L. (College of Charleston) and Burnett, K. (College of Charleston)

In the blue crab *Callinectes sapidus*, injection with the bacterial pathogen *Vibrio campbellii* causes a decrease in oxygen consumption. Histological and physiological evidence suggests that the physical obstruction of hemolymph flow through the gills, caused by aggregations of bacteria and hemocytes in the gill vasculature, may underlie the decrease in aerobic function associated with bacterial infection. Alternatively, the observed decline in oxygen uptake could be a reflection of hormonal changes known to be induced by bacterial lipopolysaccharide (LPS), a major constituent of the Gram-negative bacterial cell wall. To determine whether generic particles of various sizes and surface charges are sufficient to stimulate immune and metabolic responses in *C. sapidus*, the effects of different inert microspheres on circulating hemocytes, hemolymph glucose, and hemolymph lactate were evaluated. None of the microspheres resulted in the dramatic, prolonged (up to 4 h) decrease in circulating hemocytes seen with injection of *V. campbellii*. Hemolymph glucose and lactate levels did not change in response to injected bacteria or microspheres. In future studies, *C. sapidus* will be injected with a variety of other bacteria and purified LPS to further elucidate the microbial elements necessary and/or sufficient to elicit changes in circulating hemocytes, hemolymph glucose, hemolymph lactate, and oxygen uptake. In exploring the range of particles capable of inducing changes in these variables, we hope to gain further understanding of the mechanisms that are responsible for inducing this decrease in aerobic metabolism, and reveal the extent to which this phenomenon may affect naturally infected crabs.

POSTER PRESENTATION

Nekton Use Of An Intertidal Restored Oyster Reef.

Joyce, R. (GPMB, College of Charleston)

Over the past few decades, oyster reef restoration has become increasingly popular. The majority of restoration projects have focused on fisheries enhancement of the eastern oyster, *Crassostrea virginica*. However, within the past few years, restoration projects have begun to include ecosystem health as well. Currently, little is known about how the nekton community changes through time on newly formed restored oyster reefs. Also, since many of the reefs are intertidal, how nekton utilize these habitats on successive tides is not well understood. This project aims to answer two main questions. First, how will the community structure change through time on a newly restored oyster reef? Second, do organisms show site fidelity, or do they constantly move between sites? These questions will be tested by sampling on restored oyster

reefs that were created by placing cement oyster “castles” in a row even with the mean low water line in a South Carolina estuary during the summer. Sampling using stop nets will begin the following spring and continue through late fall. These stop nets will be set during high tide. After most of the water has receded, nekton will be collected, identified, counted, and released. Some species will be tagged using a colored elastomer to determine site fidelity. It is expected that there will be greater species diversity and abundance on the restored reefs compared to sand or mud bottom habitat. Also, site fidelity may be present for some species, while others may be opportunistic or transient.

ORAL PRESENTATION

The Role Of Crab Traps In Oyster Restoration.

Kreutzer, A. (GPMB, College of Charleston), Hadley, N. (SC DNR) and Shervette, V. (University of South Carolina)

Abandoned crab traps are a problem in many coastal areas; when left in the water and marshes they continue fishing, needlessly killing crabs, turtles, and other animals. The goal of this project was to test the utility of these crab traps as a base for artificial oyster reefs. Oyster shell, the media traditionally used for oyster restoration, is expensive to buy and can be ineffective in muddy areas. To start, treatments of crab traps and standard oyster-shell-based restoration techniques were placed at three intertidal locations around Charleston, South Carolina. After nine months, crab traps that had been coated in cement recruited an average of 2,438 oysters per square meter, the highest recruitment of the crab trap treatments. The oyster-shell-based restoration techniques did, however, recruit significantly more oysters (p value = 0.001) than the cement coated traps with an average of 12,435 oysters per square meter. To evaluate the potential of crab traps for use in soft sediment areas, crab traps filled with recycled oyster shells already laden with live oyster spat were deployed in firm and muddy substrates for nine months. These crab traps showed no significant sediment accretion in even the soft substrate. Furthermore, the oyster spat in crab traps on both the hard and soft substrate attained mean sizes of 25.69mm and 30.89mm respectively, with survival rates of 38.5% and 34.6%. Recycled crab traps show good potential as oyster reef building blocks, particularly if coated with cement, and could allow oyster restoration in many areas which are not amenable to existing restoration techniques using oyster shell alone.

ORAL PRESENTATION

Synergistic Effects Of Increased Temperature And CO_2 On Dimethylsulfoniopropionate Concentration In *Symbiodinium microadriaticum* And Associated Changes In Methionine Synthase Activity.
McLenon, A.L. (GPMB, College of Charleston) and DiTullio, J. (College of Charleston)

It is apparent the effects of climate change variables such as increasing sea surface temperature and CO_2 levels on algal communities are complex. In addition, the interactive effects of these variables have not been adequately addressed. For algae

that live within hosts, as do many *Symbiodinium spp.*, these effects can dictate survival of entire ecosystems such as coral reefs. The production of the compound dimethylsulfoniopropionate (DMSP) may be responsible for differences in survival between algal species, and its link to the release of the climatically active gas, dimethylsulfide, imparts a potential global importance. DMSP has many proposed physiological functions in the algal species which produce it. This study examines the potential of DMSP to serve as an antioxidant in the zooxanthellae, *Symbiodinium microadriaticum* (CCMP1633) isolated from a cnidarian host. Specifically, the study investigates the synergistic effects of increased temperature and CO₂ on the production of this compound in algal cultures. Preliminary data support an antioxidant role of DMSP in these algae, with significant changes in the concentration of DMSP at higher temperature. Activity of the enzyme methionine synthase will be monitored to determine whether production of methionine, a direct precursor to DMSP, is a point of regulation in an oxidative stress response. The findings of this study will provide mechanistic insight into the differential survival of cnidarian species and their algal symbionts under oxidative stress.

POSTER PRESENTATION

Baseline Data On Vitality, Substrate Composition, And Fish Diversity On Sagharughombe Reef, Solomon Islands Between 2000 And 2008.

Olds, M.K. (College of Charleston), Dustan, P. (College of Charleston) and Alling, A. (Planetary Coral Reef Foundation)

Coral reef ecosystems have persisted on Earth for millions of years through mass extinctions and ice ages. They are considered to be among the most valuable planetary resources providing millions of people with direct and indirect environmental and economic services. In recent decades live coral coverage and coral vitality has significantly declined. Each reef faces a unique suite of threats depending on several environmental and anthropogenic factors. Understanding present threats depends on the collection of concrete baseline data of substrate composition, coral vitality, and reef fish diversity, enabling observations in changes over time. This study is an analysis of a long-term monitoring project that took place on Sagharughombe Reef, near Ghizo Island in the Western Province of the Solomon Islands (S 08.117° E 156.912°). This reef was visited in 2000, 2002, 2006, and 2008. This timeline includes the severe bleaching event of the great barrier reef in 2002 and the 01 April 2007 magnitude 8.1 earthquake that occurred 45 kilometers SSE from the town of Gizo, Solomon Islands (S 8.418° E 156.978°) and resulted in a series of tsunami waves. The study aims to document the state of Sagharughombe Reef between 2000 and 2008 and to assess the effects of the earthquake and tsunami.

POSTER PRESENTATION

The Effects Of A Synthetic Pyrethroid Pesticide On Two Estuarine Fish Species.

Parent, L.M. (GPMB, College of Charleston)

Pesticides can enter into coastal waters via surface water runoff and aerial drift, posing a risk to non-target aquatic species. Permethrin is a synthetic pyrethroid insecticide used in agricultural, turf grass, commercial, and residential settings to control a wide range of insect pests. Permethrin application in the United States is increasing as it is being used to replace other insecticides such as organophosphates and carbamates. This study examined the effects of permethrin on two species of fish found abundantly in South Carolina estuaries, the mummichog (*Fundulus heteroclitus*), and the red drum (*Sciaenops ocellatus*). The 96h median lethal concentration of permethrin was determined to be 22 µg/L for juvenile *S. ocellatus* and 54 µg/L for adult *F. heteroclitus*. Sublethal cellular stress effects of permethrin were also assessed. Permethrin exposure did not result in significantly lower liver somatic index values. Lipid peroxidation activity of the liver, however, was significantly higher in permethrin-treated fish compared to control animals after 24h. The effects of permethrin on fish cellular stress enzymes and survival occurred at levels greater than those typically measured in the environment. Based on previous testing, the two fish species were less sensitive to permethrin than invertebrates such as shrimp. This study will further understanding of the effects of permethrin on estuarine organisms and may prove useful to the future management and regulation of pyrethroid insecticide application near estuarine habitats.

ORAL PRESENTATION

Do Patterns Of Organohalogen Contamination In The Blood Of Adult Male Loggerhead Sea Turtles (*Caretta caretta*) Vary Based On Migration Patterns?

Ragland, J.M. (GPMB, College of Charleston), Arendt, M.D. (SC DNR) and Keller, J.M. (NIST)

Threats represented by organohalogen (OH) contaminants remain largely a mystery for threatened loggerhead sea turtles (*Caretta caretta*). This study examines regional-scale differences in OH concentrations and patterns in the blood plasma of adult male *C. caretta*. Turtles selected were tracked for an average of 140 days; one group ($n=9$) remained in the capture vicinity near Cape Canaveral, FL while another group ($n=10$) migrated northward along the eastern US coast becoming localized at numerous locations between South Carolina and New Jersey. Samples were analyzed for organochlorine pesticides, polychlorinated biphenyls (PCBs), and polybrominated diphenyl ethers (PBDEs) using gas chromatography mass spectrometry. While concentration variability and non-detect percentages were high, blood plasma concentrations from north-bound migratory adult male *C. caretta* were elevated compared with those remaining near Cape Canaveral for Σ PCBs ($p=0.07$), 4,4'-DDE ($p=0.02$), and Σ PBDEs ($p=0.02$). PBDEs were routinely detected only in migratory adults with PBDE 154 as the dominant congener. Typically, PBDE 47 is the dominant congener reported in wildlife. Atypical PBDE patterns have, however, been observed previously in reptiles captured 35-40°N in the U.S. Interestingly, migratory males swimming northward settled largely in this latitudinal range. This study lends support to the idea that foraging location can have a dramatic effect on exposure to OH contaminants in highly mobile species such as *C. caretta*. Understanding contamination

patterns will inform managers about possible health risks to certain subpopulations. In addition, this particular study is to our knowledge the first to couple satellite tagging with measurements of OH contaminants in the rarely studied adult male *C.caretta*.

POSTER PRESENTATION

Using Anisakids As Markers To Identify Potential Pygmy Sperm (*Kogia breviceps*) And Dwarf Sperm Whale (*Kogia sima*) Stocks In The Western Atlantic And Gulf Of Mexico.

Rein, R. (GPMB, College of Charleston), de Buron, I. (College of Charleston), McFee, W. (NOAA/NOS), Greig, T. (NOAA/NOS) and Arnott, S. (DNR)

Misidentification of pygmy (*Kogia breviceps*) and dwarf (*K. sima*) sperm whales is common, and although they are some of the most commonly stranded mammals on US coasts, their population structures are not well understood. It is currently thought that there are two stocks of *K. breviceps* and one of *K. sima*, however, genetic studies currently being undertaken in another laboratory are not yet conclusive. Parasites have been used to determine stock structure of their hosts species, and we will be using this approach to complement the dwarf and pygmy sperm whale genetic studies. Common parasites found in these whales include anisakids, a type of nematode, which have been successfully used as a biological tag. Anisakid specimens will be obtained from the stomachs of freshly stranded pygmy and dwarf sperm whales from the Gulf of Mexico and the northern Atlantic as well as from laboratory collections. The anterior and posterior ends of the worms will be clipped and fixed in 10% buffered formalin for morphological studies, and the middle part will be frozen at -20°C for molecular studies. Anisakids will be identified at the lowest taxon possible using scanning electron microscopy. Genetic variability of each of the anisakid species' populations will be determined via gene sequencing and examined for the population structure among host and between regions. Results will be used to examine whether these two sperm whale species host different communities of anisakids and if their populations are composed of separate stocks in the area studied.

ORAL PRESENTATION

Assessment Of Hydroxylated Organic Contaminants And Thyroid Hormones In Shark Blood Plasma From Estuaries Along The Southeast Coast Of The US.

Reiss, K.L. (GPMB, College of Charleston, NIST), Kucklick, J.R. (NIST), Keller, J.M. (NIST), Strand, A.E. (College of Charleston) and Gelsleichter, J. (UNF)

Bonnethead (*Sphyrna tiburo*) and finetooth (*Carcharhinus isodon*) sharks use estuaries in South Carolina and Georgia as nurseries and may become exposed to polybrominated diphenyl ethers (PBDEs) and polychlorinated biphenyls (PCBs). These contaminants are bioaccumulative, persistent, and ubiquitous in the environment particularly in association with developed areas. Due to their lipophilic nature, they are usually accumulated in organs such as the liver or fat tissue. The liver can metabolize the contaminants into hydroxylated compounds using the cytochrome P450 enzyme

system. Previous studies have shown that hydroxylated PBDEs and PCBs can bind to transport proteins such as transthyretin or albumin while in the blood. These transport proteins are responsible for carrying thyroid hormones and other signals to their specific targets. Hydroxylated metabolites bind to carrier proteins more strongly than thyroid hormones and may cause thyroid gland disruption which could alter growth, development, or metabolism. Approximately eighty sharks have been sampled from four estuaries in South Carolina and two estuaries in Georgia through each state's Department of Natural Resources (DNR). Samples will be brought back to the National Institute of Standards and Technology (NIST) Organic lab located inside the Hollings Marine Lab in Charleston, SC to quantify the parent PCBs and PBDEs as well as hydroxylated metabolites. A subsample of plasma will be sent to a collaborator at UNF to look at the thyroid hormone concentrations by using an ELISA assay. This study will assess the parent PBDE and PCB concentrations, their hydroxylated metabolite concentrations, and examine possible effects on the thyroid gland.

POSTER PRESENTATION

Stable Isotope Analysis Of The Sandbar Shark (*Carcharinus plumbeus*): A Non-Invasive Method For Comparison Of Diet And Trophic Relationships Between Genders, Locations, And Age Classes.

Shiffman, D. (GPMB, College of Charleston)

Sharks, because of their role as apex predators, are ecologically and economically important animals. However, many species of sharks are declining in population at alarming rates. Federal management plans exist for many U.S. shark species, including the sandbar shark, but a management plan is only as good as the data it is based on. A recent National Marine Fisheries Service SEDAR (Southeast Data Assessment and Review) for sandbar sharks called for increased data on diet and trophic dynamics. The traditional method of stomach content analysis involves cutting open captured sharks' stomachs to analyze the contents. This technique only shows what a shark has eaten recently, and also involves sacrificing the very animals we are trying to conserve. The use of stable isotope analysis ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) can answer the same trophic questions as stomach content analysis, and does not require sacrificing the animal. Sandbar sharks in Virginia and South Carolina waters were captured, measured, tagged, sampled for stable isotope analysis, and released. Stable isotope analysis will be performed to determine the diet and trophic level of sandbar sharks, and to see if there are any changes in the diet or trophic level based on age class, gender, or location. We expect to find ontogenetic and location-based changes, and to contribute to non-invasive scientific sampling for threatened and endangered species.

POSTER PRESENTATION

Systematic Study Of The *Bregmaceros sp.5* Complex.

Simpson, R.G. (GPMB, College of Charleston) and Harold, A.S. (College of Charleston)

The gadiform fishes of the genus *Bregmaceros* are small, mesopelagic planktivores that are commonly caught as bycatch in midwater trawls. Currently, taxonomists recognize 13 valid species, with several more undescribed forms. This study focuses on the more phylogenetically basal group of *Bregmaceros*, including *B. sp.5*. This undescribed form incorporates a potential complex of species found throughout the Atlantic, Pacific, and Indian Oceans. Another closely related species pair, *B. sp.9* and *10*, is distributed in the Indian Ocean. Using a combination of meristic values, multivariate techniques, pigmentation pattern, and various internal/external characters, these undescribed species are diagnosed and described.

POSTER PRESENTATION

An Analysis Of Habitat Movement And Survival Rates For American Oystercatchers In South Carolina.

Snipes, K. (MES, College of Charleston)

The American Oystercatcher has been identified as an “extremely high priority” shorebird by the working group for the Southeastern Coastal Plain as part of the U.S. Shorebird Conservation Plan. This shorebird is especially important in South Carolina because a large proportion of oystercatchers winter here, approximately 1/3 of the overall population. This state also has one of the largest breeding populations of oystercatchers, second only to Virginia. Understanding habitat use as well as population dynamics are two very important tools in the conservation of a species. The banding and resighting of oystercatchers has been an ongoing research method that conservation agencies have been participating in all along the Atlantic coast. Incorporating banding and resighting data of oystercatchers aids in the calculation of their space use and survival rates. Although overall population estimates have been completed for the eastern race of the American Oystercatcher, individual’s habitat dispersal and movement have not been evaluated. Survival rates for oystercatchers in South Carolina have not been determined at this time either. Calculating oystercatcher survival rates can result in a better estimation of population status and trends. The results from my analysis can assist biologists in understanding this species’ behavior as well as contribute to a more accurate oystercatcher census for South Carolina.

ORAL PRESENTATION

The Effects Of Iron And Irradiance On The Growth And Physiology Of A Polar Diatom, *Fragilariopsis cylindrus*.

Stavovy, J. (GPMB, College of Charleston), DiTullio, J. (College of Charleston) and Sedwick, P. (Old Dominion University)

The Ross Sea is the single most productive region in the Southern Ocean. Many oceanic-atmospheric interactions that dictate climate processes are mediated by phytoplankton here. Due to the projected increase in atmospheric CO₂ during this century, associated increases in precipitation, sea ice melt, and ocean stratification are foreseen. How these increases will affect carbon sequestration in the Southern Ocean remain unclear. An associated decrease in nutrient flux across the pycnocline may

reduce the downward flux of carbon by causing a shift in phytoplankton community structure; currently, *Phaeocystis antarctica* and several species of diatoms dominate the Ross Sea. Algal blooms vary in time and space, with *P. antarctica* typically blooming early in the austral spring, and diatoms tending to dominate during the summer. The source of this temporal and spatial variation may be iron (Fe), since it is often limiting in these waters during the growing season. Historically, phytoplankton Fe requirements for growth have been assigned a fixed value. However, *P. antarctica*'s Fe requirement for growth has recently been shown to change as a function of irradiance. This study aims to determine the effects of irradiance on the Fe requirements of a sea-ice diatom, *Fragilariopsis cylindrus*. The half-saturation constant for growth with respect to Fe (K_u) will be determined at sub-optimal, optimal, and supra-optimal irradiance conditions for this species. In addition, certain physiological parameters such as photosynthetic efficiency, pigment composition, and intracellular dimethylsulfoniopropionate (DMSP) concentrations will be measured. These values are important in generating numerical biogeochemical models in the Southern Ocean.

POSTER PRESENTATION

Determination Of The Amount Of Oyster Shell Available For Recycling Across The State Of South Carolina Through The Use Of Surveys.

Stone, B. (MES, College of Charleston)

Oyster reefs create habitat for numerous fish and invertebrate species as well as provide an important commercially harvested renewable resource. Recycled oyster shell can be used to restore and enhance current oyster reefs off the coast of South Carolina. In recent years it has become harder to acquire enough oyster shell for oyster habitat restoration. Most of the shell is believed to end up as landscaping, driveways, or placed in a landfill. Although data exists for oysters harvested commercially within the state, it has been unknown what quantities of oysters are being imported into South Carolina. Although the South Carolina Department of Natural Resources (SCDNR) shell recycling program has achieved an increase in recycled shell, the quantity available still falls far short of the management needs and the state may purchase as much as 60,000 bushels of shell annually. SCDNR is interested in reducing the amount of shell purchased for restoration projects, but currently lacks the information to implement a sound expansion plan. A survey was created and conducted over the phone, by mail, and in person to determine how many oysters were being imported into the state and where the large sources of shell stock might be located across the state. This information was used to determine how much shell should be available for recycling programs. Current calculations reveal that there are about 6,718,600 pounds or 121,977 bushels of Gulf oysters being sold in South Carolina each year. It was also found that more than 50% of all the oysters sold in the state of South Carolina are sold to restaurants where they most likely end up in the trash. Targeting restaurants for their shell would make it possible for oyster restoration projects to continue without the need to purchase shell from out-of-state.

POSTER PRESENTATION

Community And Trophic Structure Analysis Of The Snapper Grouper Complex Off The Southeastern U.S. Atlantic Coast.

Stratton, M. (GPMB, College of Charleston)

Community/trophodynamic metrics have been utilized to detect temporal changes in the community/trophic structure of fish communities in response to environmental and fishing effects. Six community/trophodynamic metrics will be used to characterize changes in the community/trophic structure of the snapper grouper complex, a group of 73 reef-associated fish species managed by the South Atlantic Fishery Management Council: mean length, mean maximum length, mean weight, mean maximum weight, the slope of the biomass spectra, and mean trophic level. Metrics will be calculated from species-size-abundance data compiled during 1990-2009 from an annual fishery-independent sampling program (Marine Resources Monitoring, Assessment and Prediction, MARMAP) using the chevron trap as an abundance index. Stable nitrogen isotope analysis of fish white muscle tissue will be used as an index of mean trophic level (size-structure incorporated). Two isotope methods will be employed: bulk isotope analysis (BIA) and compound-specific isotope analysis (CSIA) of specific amino acids. Both methods provide trophic level estimations of fish specimens, while CSIA can also provide trophic information about basal food web organisms from consumer tissue samples. The accuracy of using CSIA to calculate trophic level in fish specimens will be evaluated in experimental feeding trials to ensure its proper use in the trophodynamic aspect of the proposed study. In addition to characterizing past trends, the ability to use the MARMAP chevron trap survey to detect future trends in the six community/trophodynamic metrics will be investigated. Strong predictive metrics would provide potential decision-making tools for fishery managers and support the implementation of ecosystem-based fishery management.

ORAL PRESENTATION

Bottlenose Dolphins And The Atlantic Blue Crab Fishery: A Study Of Coincidence And Interaction In Charleston Harbor, South Carolina.

Sturgeon, N. (GPMB, College of Charleston), Powel, J. (NOAA, NOS), Pate, M. (NOAA, NOS), Speakman, T. (NOAA, NOS), Coomer, K. (NOAA, NOS) and McFee, W. (NOAA, NOS)

The Atlantic blue crab (*Callinectes sapidus*) fishery has been implicated in a significant number of entanglements, and the gear used is known to have caused injury and death to bottlenose dolphins (*Tursiops truncatus*) throughout the southeastern United States. In order to study this fishery interaction, boat-based surveys were carried out in Charleston Harbor, SC from April through October 2008. Observations were conducted for 313h over 3604.8km along an established transect. During these surveys 2696 dolphins were sighted, 9425 buoys were observed and mapped, and dolphins were observed within 5m of 104 buoys. Dolphins were observed participating in a number of hypothesized behaviors believed to increase the risk of entanglement, including a

behavior in which the crab pot buoy is fully submerged by direct interaction with the pot or buoy line. This behavior appears to be spatially and temporally clustered. GIS mapping was used to evaluate location and density of pots, location of historical entanglements, and location of observed interactions. Photo-identification is currently being conducted to investigate the identity and demographics of individual animals observed in the vicinity of, or interacting with, crab pots. Interviews of local crab fishers are being conducted to determine whether behaviors, such as pot tipping, implicated in other regions are occurring near Charleston, and to collect data regarding dolphin behaviors around the fishery's pots and boats to additionally assess the impact of dolphins on pots and catch. Results of this study will be used to formulate recommendations for managing dolphin interactions with the blue crab fishery.

POSTER PRESENTATION

Spawning By The Southern And Gulf Flounders (*Paralichthys lethostigma* And *P. albigutta*) Off The South Carolina Coast.

Tucker, C. R. (GPMB, College of Charleston)

The southern flounder (*Paralichthys lethostigma*) and the gulf flounder (*P. albigutta*) support an important recreational and commercial fishery in South Carolina (Wenner and Archambault 2005). Much of the life history for these species has been well documented (e.g. Gilbert 1986; Wenner and Archambault 2005; Schreiber 2006). During fall months as the temperature drops, the adults leave the estuaries to spawn in offshore waters (Gilbert 1986). This study seeks to fill in gaps in the life history of southern flounder and gulf flounder during the winter spawning months. SCUBA dives are made during the spawning season (October – March) in areas flounder are expected to spawn. At each site, the habitat is characterized and specimens are collected for histological gonad analysis and aging. To investigate transport of eggs and larvae by currents after spawning, drift bottles will be released from spawning sites (or potential spawning sites) during the 2009/10 spawning season. Since 2007, 85 flounder have been collected by the South Carolina Department of Natural Resources. In addition, 188 racks consisting of flounder carcasses turned in by recreational divers to the South Carolina Department of Natural Resources Flounder Research Project have also been examined. Histologically determined spawning stage indicates gulf flounder spawn at the same reefs they inhabit year round. Southern flounder spawning sites remain elusive, and sampling will include deeper locations further from shore during the 2009/10 season.

ORAL PRESENTATION

Preliminary Evidence Of Genetic Bottleneck In A South Florida Coral Population.

Wham, D. (GPMB, College of Charleston)

Coral reef ecosystems are undergoing global decline due to multiple stressors at local to global scales. Furthermore, it is clear that reefs in close proximity to humans are experiencing the most deleterious effects. The reef systems off of South Florida's coast

are near densely populated centers of human activity and it has been demonstrated that land-based sources of pollution are negatively affecting their vitality. While there has been more than an 80% coral cover loss across the Caribbean, the losses in South Florida have far surpassed these basin-wide estimates. Presently, living coral cover is between 1 and 3 percent, a mere remnant of earlier days. The effects of this loss at the population genetic level were explored using two microsatellites to investigate genetic diversity in *Porites astreoides* Lamarck, commonly called the mustard hill star coral. A comparison of populations from South Florida and the Bahamas revealed that while the two populations shared a large percentage of alleles, the Bahamian population possessed a greater number of alleles at both loci. Additionally, allelic diversity was reduced in the Florida population suggesting that the reduction in coral cover may also be accompanied by genetic bottlenecks.

ORAL PRESENTATION

Temporal characterization of the surf zone macrofauna at Folly Beach, South Carolina.

Wilkie, J. (GPMB, College of Charleston)

The fish assemblage within the surf zone is widely variable consisting of a large number of individuals which represent a small number of species. Although a few species in the surf zone in the South Atlantic Bight have been well studied, data are lacking for most species, especially fishes. Many studies conducted within the surf zone have depicted snapshots of this dynamic community. Data from these short time spans are inadequate for describing long term trends. A study was conducted on Folly Beach, South Carolina from July 2007 to March 2009. In order to evaluate long term changes to the macrofauna in the surf zone, the findings were compared to a historic study conducted in the same location from 1969 to 1971. Data collected were analyzed to compare species richness and abundance between studies as well as between seasons. Over 21 months, 83 hauls were pulled and 1757 specimens were collected consisting of 109 swimming invertebrates and 1648 fishes. These organisms represented 40 species (10 invertebrate, 30 fishes), 30 genera (7 invertebrate, 23 fish) and 19 families (3 invertebrate, 16 fish). Species richness and abundance was significantly higher during the summer of 2007 than all other seasons sampled in this study. The species richness was significantly lower than found in the historic study. The abundance caught was also significantly lower than in the previous study for every season except spring. Additional analyses will examine any correlations between abundance or biomass and any of the physical measurements collected.

ORAL PRESENTATION

Population Structure Of *Megabalanus coccopoma* Over Its Introduced Range Of Southeastern U.S.

Williamson, T.J. (GMBP, College of Charleston) and Zardus, J.D. (The Citadel)

Invasion ecology is emerging as an increasingly important field as the impacts of human activities on the environment are realized by the world. The effects of dispersal on

introduced species globally may be studied through the use of advanced molecular tools. The recent arrival of *Megabalanus coccopoma*, a Pacific tropical barnacle, to the southeastern coast of the United States provides an opportunity to use these molecular tools to study its establishment and subsequent expansion northward. Analysis of nuclear and mitochondrial DNA was used to characterize the genetic variation of populations of *M. coccopoma* along the southeastern coast of the US. Analysis yielded high genetic diversity with low nucleotide diversity. The near absence of genetic structure suggests a panmictic population with high larval dispersal; however, six individuals from a single population in Florida were genetically distinct, suggesting the possibility of multiple invasions. By coupling the molecular data of the metapopulation structure and heat-shock protein expression with thermal oceanographic data, this study will also make conjectures on the likelihood for further range expansion of *M. coccopoma* along the eastern coast of the United States.