TEXAS A&M UNIVERSITY AT GALVESTON

NSF—REU Research Symposium

Ocean and Coastal Studies Building

July 27, 2011

SCHEDULE

9:15 – 9:30	Welcome – Dr. Timothy Dellapenna	(OCSB Lobby)
9:30 – 10:30	Poster Presentations	(OCSB Lobby)
11:30 – 12:30	Lunch	(OCSB Lobby)
1:00 – 2:45	Oral Presentations – Session 1	(OCSB Auditorium)
3:00 – 4:45	Oral Presentations – Session 2	(OCSB Auditorium)

REU Support Team

Dr. William Seitz
Dr. Tammy Holliday
Rachel Farias
Dr. Timothy Dellapenna
Peggy Rutkowski
Carolyn Herman
Andrew McInnes

REU Intern Advisors

Jaime Alvarado-Bremer (MARB)
Anna Armitage (MARB)
Sam Brody (MARS)
Timothy Dellapenna (MARS)
Wes Highfield (MARS)
Patrick Louchouarn (MARS)
Chris Marshall (MARB)
Antonietta Quigg (MARB)
Gil Rowe (MARB)
Peter Santschi (MARS)
Anja Schulze (MARB)
Kathy Schwehr (MARS)

Presentation Schedule

9:30 – 10:30	**POSTER SESSION**
11:30 – 12:30	**LUNCH**
1:00 – 1:15	**Joseph Lemanski** The Effects of the 2010 BP Oil Spill/Deepwater Horizon Incident on Deep-Sea Macrofauna Communities
1:15 – 1:30	**Jacquelin Hipes** Identification of Sipunculan Larvae using Genetic and Morphological Markers
1:30 – 1:45	**Brynn Perales** Genetic Identification of Tuna Species via High-Resolution Melting Analysis
1:45 – 2:00	**Marcella Nunez** The Effects of Si and Ni Concentrations on the Growth and Biochemical Compositions of the *Nitzchia sp.*
2:00 – 2:15	**Mikaela Weisse** Identifying Limiting Nutrients in Galveston Bay Seagrass Communities
2:15 – 2:30	**Brittney Davis** Infaunal Abundance in Restored and Reference Marshes in the Northwestern Gulf of Mexico
2:30 – 2:45	**Logan Harrell** Descriptive Analysis of Section 404 Wetland Permitting Along Texas Coast: 1999-2009
2:45 – 3:00	**BREAK**
3:00 – 3:15	**Fabiola Rivera Irizarry** Characterization of the Gastrointestinal Tract and Inking in Pygmy Sperm Whales (*Kogia breviceps*)
3:15 – 3:30	**Timothy Eyerdom** Evolution and Geomorphology of a Sub-Aqueous Wave Influenced Delta: an Investigation of the Brazos River Delta
3:30 – 3:45	**Rishi Sugla** Nearshore Sediment Dynamics in Galveston, TX, Over a Five Year Period: 2006-2011
3:45 – 4:00	**Jennifer Welch** Surficial Sediment Analysis of West Galveston Bay: Spatial and Temporal Changes in the Distribution of Sand
4:00 – 4:15	**Kandice Williams** Structural Identification of Water Soluble Black Carbon Derived from Biomass Combustion
4:15 – 4:30	**Danielle Creeley** Extracellular Polymeric Substances (EPS): Potential Detoxification Agents to Ameliorate the Toxicity of Engineered Nanoparticles (EN) to Marine Phytoplankton (*Thalassiosira pseudonana)*
4:30 – 4:45	**Geddy Hamblen** Geochronology of Estuarine Sediments by Plutonium Dating

ABSTRACTS

Joseph Lemanski
Siena Heights University
Faculty Advisor: Gil Rowe

Title: The Effects of the 2010 BP Oil Spill/Deepwater Horizon Incident on Deep-Sea Macrofauna Communities

Abstract:

Following the destruction of the British Petroleum owned Deepwater Horizon oilrig that allowed approximately 200 million gallons of crude oil to enter the deep Gulf of Mexico, nine box core samples were taken near the spill site to evaluate the possible damage caused to deep-sea macrofauna communities in the Gulf of Mexico. Three sites that were sampled were N, NE, and SW in relation to the destroyed Mocando wellhead, between six and ten kilometers away from the wellhead. Samples taken were sorted for macrofauna retained on a 300-micron sieve and identified to the higher levels of taxa. The numbers of animals of each taxa identified were recorded and compared to the 2000-2002 Deep Gulf of Mexico Benthos (DGoMB) study. Several classes of animals showed significant changes in abundance and percent composition of population; crustaceans and polychaetes in particular showing a decrease in both categories while Aplacophorans showed a significant increase in both categories. PAH analysis confirms the presence of crude oil, assumed to be from the same source as tar balls found on the coast of Florida following the spill, 15cm deep within the sediments on the seafloor.

Jacquelin Hipes
Louisiana State University
Faculty Advisor: Anja Schulze

Title: Identification of Sipunculan Larvae using Genetic and Morphological Markers

Abstract:

Larval forms of *Sipuncula* often cannot be identified down to the species level using morphological identifiers exclusively. Imaging using light and scanning electron microscopy identified each larva to a type. Genetic analysis of the larvae through sequencing of the mitochondrial cytochrome *c* oxidase subunit I (COI) and nuclear histone protein H3 genes enabled them to be matched to known adult sequences. Of the 19 individual larvae included in this study, 17 were identified to species level and all larvae were successfully identified to genus level. Several larval types are associated with *Xenosiphon branchiatus*, which could be the result of phenotypic plasticity in the larvae or sampling of different stages; this problem presented itself in several of the clades. This study supports the emerging hypothesis that *Apionsoma misakianum* has cryptic species. A larger sample size, of both the number of larval samples and the number of genes sequenced, would help in further resolving relationships in each clade. However, the results gained from this study will have useful applications in future work with Sipunculids, including field identification and population mapping.

Brynn Perales
California State University at Monterey Bay
Faculty Advisor: Jaime Alvarado-Bremer
Title: Genetic Identification of Tuna Species via High-Resolution Melting Analysis
Abstract:

Tunas of the genus Thunnus include some of the most economically and ecologically important fish species in the world, because of this it is important that they can be identified in the larval and juvenile stages. However, tuna larvae are difficult to identify by morphological characteristics. Previous genetic methods of identifying tuna larvae have been unsuccessful in identifying every species of Thunnus and are expensive and time consuming. High-resolution melting analysis (HRMA) is a highly sensitive, low cost, fast genotyping method amenable to high throughput that could be used to identify tuna species. In this study we develop a genetic tuna species identification assay using HRMA of single nucleotide polymorphisms (SNPs) in the mitochondrial nitrogen dehydrogenase subunit 4 gene (ND4). Short amplicon HRMA primers generate diagnostic species specific melting curves. Northern bluefin tuna (T. thynnus), southern bluefin tuna (T. maccoyii), albacore tuna (T. alalunga), blackfin tuna (T. atlanticus), yellowfin tuna (T. albacares), and bigeye tuna (T. obesus) are easily identified using this newly developed genetic assay.

Marcella Nunez
Texas A&M University at Galveston
Faculty Advisor: Antonietta Quigg
Title: The Effects of Si and Ni Concentrations on the Growth and Biochemical Compositions of the *Nitzchia sp.*
Abstract:

The interest in the production of microalgae as a biofuel is increasing due to their high oil content rapid biomass production. Urea is known as an excellent nitrogen source for phototrophic growth of marine algae in both culture and natural environments. The synthesis and activity of urease in certain microalgae depends on a nickel ion requirement. Further, diatoms require silicate in order to grow; this is used to make a frustule or shell that surrounds diatoms. In this study, we used two marine diatoms of *Nitschia sp.* to investigate the role of Ni and Si using urea as N source. They were grown in a modified culture medium at various silicate concentrations and two specific concentrations of nickel, 0.025 and 0.278 µM Ni. In general, *Nitschia sp.* showed higher growth rates with the addition of 0.025 µM Ni regardless the concentration of Si. After the stationary phase when high biomass was achieved, the cultures were transferred to Si-free medium by 1:1 dilution to stimulate the lipid production process. Lipid content increased in diatoms growing with less Si. Proteins and other cellular components were also measured in response to varied Ni and Si concentrations.

Mikaela Weisse
University of Wisconsin
Faculty Advisor: Anna Armitage
Title: Identifying Limiting Nutrients in Galveston Bay Seagrass Communities
Abstract:

Seagrasses, an ecologically important group of marine plants, have declined in worldwide areal extent by 29% since 1879, in part due to nutrient enrichment. To reduce this decline, it is important to discover the limiting nutrient of a system and regulate its input. We examined the effects of nutrient addition on Galveston Bay seagrass communities by fertilizing with nitrogen (N) and phosphorus (P). We utilized 12 - 1 m^2 plots, which we monitored for 20 days after fertilization. Benthic microalgal biomass was significantly higher in plots that had both N and P addition, suggesting co-limitation. P fertilization increased P levels of *Halodule wrightii* only on day 11, while N levels were unaltered by any treatment. Neither seagrass nor macroalgae cover changed in response to nutrients. Given the changes observed in this study, it is possible that the seagrass and microalgae in the bay system are limited by different nutrients. We believe there were stronger nutrient responses in microalgae relative to seagrass because algae are faster growing plants that could quickly adjust to the new nutrient levels. Alternatively, the seagrass community may be nitrogen and phosphorus saturated, but limited instead by another factor, such as space or light availability.

Brittney Davis
Texas A&M University at Galveston
Faculty Advisor: Anna Armitage
Title: Infaunal Abundance in Restored and Reference Marshes in the Northwestern Gulf of Mexico
Abstract:

The extent to which a restored marsh resembles a reference marsh in terms of morphology (i.e. slope, elevation, etc.) and sediment characteristics strongly influences the infaunal community. The objective of this study was to evaluate the influence of four structural designs that incorporate a variety of shapes and sediment type(s) on the infaunal community in a restored brackish marsh in east Texas. Samples were collected in October 2010 from the marsh edge and in July 2011 from the marsh edge, mudflat zone, and Spartina zone. The infaunal community was assessed by comparing mean densities and species richness in a restored and reference marsh. Soil organic carbon was also measured to explain potential differences in mean infaunal densities. A one-way ANOVA for October 2010 data showed no significant differences among the structural designs for either mean density (P= 0.654) or species richness (P = 0.748). Additionally, no significant relationships were found for mean density and soil organic carbon. Similar patterns occurred in July 2011 but densities were much lower which indicates strong seasonal variations. Low infaunal densities in the reference marsh likely facilitated a more rapid recovery than what has previously been reported for restored marshes.

Logan Harrell
Texas A&M University at Galveston
Faculty Advisor: Sam Brody/Wesley Highfield
Title: Descriptive Analysis of Section 404 Wetland Permitting Along Texas Coast: 1999-2009
Abstract:

Wetland areas are developed each year despite the environmental and economic importance they have in communities. Section 404 of the Clean Water Act is used to regulate and minimize the amount of development in wetlands with the requirement that any project must have a permit if it has an impact on the surrounding environment. A descriptive analysis of Section 404 permitting was conducted to better understand the spatial and statistical pattern of this regulatory activity. Permit data was obtained by the USACE for 41 Texas coastal counties. These permits were used as indicators of wetland areas impacted over a ten year period from 1999-2009. The three categories of observation were: temporal trends of permits issued each year, location of permits in rural or urban areas, and relationship to population growth patterns from 2000-2010. Results show a modest decline of permits issued each year, there are statistically more rural permits, and concentration of permits reflects a similar pattern to areas with population change. The results can be used for better wetland management policies in areas with a larger number of permits issued and future research of the effects of permits in these areas.

Fabiola Rivera Irizarry
University of Puerto Rico at Humacao
Faculty Advisor: Chris Marshall
Title: Characterization of the Gastrointestinal Tract and Inking in Pygmy Sperm Whales (*Kogia breviceps*)
Abstract:

Pygmy sperm whales (PSWs) are unusual in that they produce ink. This ink is thought to be generated endogenously. It is known that melanin is a primary component of ink and presumptive melanocytes have been found in the PSW gastrointestinal (GI) tract. However, the distribution and density of melanin is unknown. Therefore, we characterized the microanatomy of nine GI tract segments using histocytochemistry to map the distribution and density of melanin pigments. We hypothesized that PSWs possess a divergent GI anatomy and that the jejunum/ileum has the highest density of melanin pigment. This would suggest that it is center of ink production. Tissue samples from six individuals were processed for histology, sectioned and stained with Masson's Trichrome, Schmorl's and Fontanna-Masson Silver stains. Using a Mann-Whitney U test we found that the highest densities of melanin were in the jejunum, ileum and upper colon, along with presumptive melanocytes. We concluded that although ink is present from the jejunum to the colon, the jejunum and ileum are likely the center of ink production. These data support prior data for the presence of presumptive melanocytes in epithelial tissue and the lamina propria and that ink is indeed generated endogenously, not from the diet.

Timothy Eyerdom
Kent State University
Faculty Advisor: Timothy Dellapenna

Title: Evolution and Geomorphology of a Sub-Aqueous Wave Influenced Delta: an Investigation of the Brazos River Delta

Abstract:

The Brazos River, located in the northern Gulf of Mexico, was rerouted ~10 km in 1929 by the Army Corps of Engineers initiating the formation of a new delta. The purpose of this study was to understand the evolution and morphology of the new delta. A sub-bottom survey was conducted and surface sediment samples were collected from the sub-aqueous delta. This data was combined with side scan sonar and bathymetric data from previous surveys. Sub-bottom results showed a deltaic sequence overlying a sequence of shelf sedimentation. Results from the sediment analysis presented an area of increased coarse-grained sediment extending from the river mouth across the delta to the west corresponding with low side scan sonar back scatter and increased thickness of the delta sequence. We concluded that this area is the primary depocenter of the new delta. Therefore, the new delta has been prograding obliquely to the west of the river at a rate of ~2 cm/yr. To the east of the river, erosion of the old delta dominates with erosional rates as high as 5 cm/yr. The erosional area has been characterized by increased water depths, scour features and decreased thickness of the delta sequence.

Rishi Sugla
University of Maryland
Faculty Advisor: Timothy Dellapenna

Title: Nearshore Sediment Dynamics in Galveston, TX, Over a Five Year Period: 2006-2011

Abstract:

Since 1996, beach nourishment projects have been conducted in Galveston, TX in order to mitigate the considerable amounts of erosion which occur on a year-to-year basis. To understand the long term effects of this erosion, we completed a large scale study to find volume change over time on Galveston Island in order to gain greater insights on how small and large scale processes interact with sediment in the near shore environment. Using traditional profiling methods in addition to computational interpolation software, we have determined the overall change in sediment flux throughout a five year period from 2006-2011. Our analysis has provided us with a report of net negative volume change over time. The data showed a cumulative landward movement of the nearshore profiles. These profiles have allowed us to extrapolate how catastrophic events such as Hurricane Ike may affect bathymetric profiles.

Jennifer Welch
Texas A&M University at Galveston
Faculty Advisor: Timothy Dellapenna

Title: Surficial Sediment Analysis of West Galveston Bay: Spatial and Temporal Changes in the Distribution of Sand

Abstract:

Sediments in West Galveston Bay are comprised of sand, silt, clay, and shell fragments in various proportions depending on the morphology of the depositional environment within the estuary. Primary sources of sediment include erosion of inland and nearshore areas. Subsequently, these sediments are distributed by tides, waves, and run-off, which all vary spatially and temporally within the system. Natural and anthropogenic alterations such as shoreface erosion, subsidence, construction of dams, dredging, marsh restoration, etc. have impacted sediment transportation and distribution in the bay. In 1985 the Bureau of Economic Geology published a surficial sediment map showing the mean sand grain-size fraction plotted in 20% intervals. Our research utilizes the BEG map, 19 vibracores, and 78 grab samples to create an updated, higher resolution surficial sediment map of West Galveston Bay. A comparison of the spatial extent of each sand fraction was performed to determine the net gain/loss in area (km^2). This research found that sand within the 80-100% fraction increased by 15.5 km^2 within the bay. We conclude that the differences are a result of increased transport of sand through San Luis Pass, storm washover events (Hurricane Ike), and an increase in data resolution.

Kandice Williams
Jackson State University
Faculty Advisor: Patrick Louchouarn

Title: Structural Identification of Water Soluble Black Carbon Derived from Biomass Combustion

Abstract:

Combustion processes, whether natural or anthropogenic, are major sources of particulate matter (PM), black carbon (BC), and volatile organic carbon to the atmosphere as well as soils and aquatic environments. The increased emissions of combustion-derived PM and BC to the atmosphere has led to environmental impacts at local, regional, and global levels. The ubiquitous presence of biomass combustion by-products in atmospheric particles could potentially lead to a large transfer of thermally altered TOM to the surface of watersheds and aquatic systems through deposition. Only a handful of studies have used such tracers in sediments; even fewer have characterized these in dissolved organic matter (DOM). While the total amount of DOC from biochars did decrease, as an inverse function of temperature of combustion, the proportion of condensed BC to DOC did not increase with the increasing temperature of combustion. The structure of biochar-derived water-soluble OM reflects the selective solubility of certain functional groups. For example, despite the predominance of aromatic units and soot structures in particulate biochar OM formed at high temperatures, such functionalities are predominant in biochar-derived DOM. The high proportion of O-containing functionalities suggests that water-soluble OM is more biodegradable than the particulate residues of biomass combustion.

Danielle Creeley
Texas A&M University at Galveston
Faculty Advisor: Peter Santschi/Kathy Schwehr

Title: Extracellular Polymeric Substances (EPS): Potential Detoxification Agents to Ameliorate the Toxicity of Engineered Nanoparticles (EN) to Marine Phytoplankton (*Thalassiosira pseudonana)*

Abstract:

With the rapid growth of nanotechnology, there is a concern that ENs will find their way into aquatic systems and possibly cause some negative effects. Dissolution of ENs has been widely recognized to play an important role in their toxicity to marine organisms. However, to what extent dissolution is involved remains largely unknown. Exopolymeric substances excreted from phytoplankton and bacteria are important for the formation of marine gels and marine snow, as well as for the scavenging of trace elements. In the study, QDs toxicity (amine-functionalized and carboxyl-functionalized) were examined by exposing them to different nutrient-conditioned marine algae, *Thalassiosira pseudonana* for 5 days. The dissolution of QDs and the production and characterization of EPS in terms of carbohydrates and proteins were analyzed to enhance the understanding of the interactions between QDs and the cells. No significant toxicity of QDs was observed in this study. Under both nutrient conditions, carboxyl-functionalized QDs started dissolution after one day's incubation, while amine-functionalized QDs started dissolution later with lower rates. In addition, nitrogen-limited cultures had higher dissolution rates for both QDs. A good correlation between proteins and dissolution of QDs suggests the involvement of EPS in the dissolution of QDs and thus detoxification of QDs

Geddy Hamblen
Texas A&M University at Galveston
Faculty Advisor: Peter Santschi/Kathy Schwehr

Title: Geochronology of Estuarine Sediments by Plutonium Dating

Abstract:

The Pembscott River system has been contaminated with mercury from Paper mills and chemical industries. Mercury, especially methyl-Hg, is a powerful neurotoxin in all forms to aquatic life and humans. The rate that all mercury will be buried and absorbed by the environment and neutralized into non toxic chelated forms is largely dependent on the sedimentation rate. Radioisotopes in the environment such as Plutonium that are derived from bomb fallout that peaked in 1963 allow the estimation of the time soils and sediments have been deposited. While ^{137}Cs can also be used for the same purpose, Pu has the advantage that it is not mobile in the sediments, contrary to ^{137}Cs in estuarine systems, which can get remobilized by K^+ from seawater. This study showed a similar rate of deposition previously established by ^{137}Cs and Pb210 but with a much more accurate peak corresponding to the 1963 bomb fallout of Pu. The Plutonium provides accuracy to geochronology, but is best supported by other chemical geochronology methods because Pu will only be found in a very narrow range of a sediment core, where Cs can be found throughout most depths in a core.