2013 Texas Bays and Estuaries Meeting

Wetlands Education Center. Photo courtesy of Wenxian Tan.

Photos courtesy of Mission Aransas NERR "Faces of an Estuary" Contest.

Texas Bays and Estuaries Meeting

TBEM

Marine Science Institute

THE UNIVERSITY OF TEXAS AT AUSTIN

Port Aransas, Texas
April 25-26, 2013

Photo of the Aransas Wildlife Refuge. The Preserve includes mud flats, pothole wetlands, marsh, bay and river habitats. Photo courtesy of Claire Griffin.

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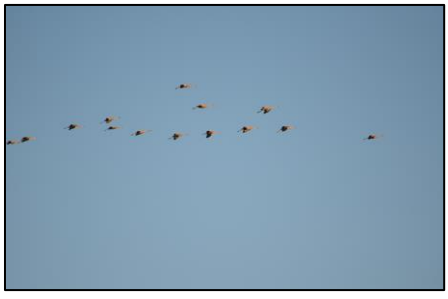


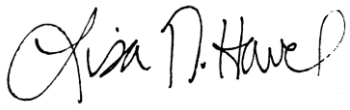
Welcome!

The University of Texas Marine Science Institute is proud to host the 9th annual Texas Bays and Estuaries Meeting. We have a great program of talks and posters this year from all around the state, and we are truly excited for the great turnout.

Please remember that all campus buildings are nonsmoking. Restrooms are located in the Visitor's Center, across from the auditorium. Robert's and Miss K's will cater lunch and dinner, respectively. Beer and wine will be available during the poster session and at dinner. Each registered participant has been provided two complimentary drink tickets with his/her name badge (1 ticket = 1 drink). You must use these tickets for drinks, as the bartender will not accept cash. You may wander freely with your drinks, but please do not leave the campus with them. Authors will be at their posters from 5:00 – 6:00 during the poster session (Thursday, April 25th).

Once again, thank you all for participating and we hope you enjoy the meeting!

See you again next year!



Lisa Havel

TBEM 2013 Convener
Marine Science Institute
The University of Texas at Austin

Schedule:
Thursday April 25, 2013

8:00 AM - Registration, Visitor's Center Lobby, The University of Texas at Austin, Marine Science Institute, Port Aransas, TX

8:30 AM - Welcome and Opening Remarks – Lee Fuiman, Ph.D, Associate Director for Fisheries and Mariculture, The University of Texas at Austin, Marine Science Institute, Port Aransas, TX

-Coastal Environments-

8:45 AM – **Mangroves invading Texas salt marshes: Does it affect microclimate?**
[1]Steven C. Pennings*, [2]Hongyu Guo, [2]Anna R. Armitage, [1]Sayatani Dastidar, [2]Carolyn A. Weaver, and [3]Zoe Hughes; [1]University of Houston, [2]Texas A&M University at Galveston, [3]Boston University. (*Invited Speaker*)

9:15 AM – **Informing conservation planning using sea-level rise and storm surge impact estimates in Texas and Florida coastal bay ecosystems.**
M. Thompson*, B. Gilmer and J. Brenner; The Nature Conservancy.

9:30 AM – **Characterizing the pristine oyster reef community of Sabine Lake Estuary relative to surrounding marsh edge and non-vegetated bottom habitats.**
Jaimie A. Nevins*, Jennifer Beseres Pollack, Gregory W. Stunz; Texas A&M University – Corpus Christi. *(Student Presentation)*

9:45 AM – **Effects of amino acids on the growth and microcystin production of *Microcystis aeruginosa***
[1]Sammy Ray*, [2]Brittany Blomberg, [2]Jennifer Pollack and [2]Rick Kalke; [1]Texas A&M University at Galveston, [2]Harte Research Institute Texas A&M Corpus Christi.

10:00 AM – **BREAK**

-Coastal Environments (continued)-

10:15 AM – **Seagrasses in the western Gulf of Mexico: Statewide monitoring and linkages to regional climatic events.**
Kenneth H. Dunton*, Christopher J. Wilson and S. S. Wilson; The University of Texas at Austin, Marine Science Institute.

10:30 AM – **Seagrass abundance patterns in the Lower Laguna Madre.**
[1] C. J. Gomez, [1]J. McDaniel, [1]J. Garcia, E. Quintero, [1]J. Kowalski, [2]Hudson DeYoe*; [1]The International Baccalaureate Program at Lamar Academy, [2]Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American.

Thursday April 25, 2013 (continued)

10:45 AM – **Genetic variation in a Bermuda population of the seagrass *Halodule wrightii*.**
Sebastian R. Rubiano* and Patrick D. Larkin; Dept. of Physical & Environmental Sciences, Texas A&M University-Corpus Christi. *(Student Presentation)*

11:00 AM – **Effects of nutrient enrichment on turtlegrass reproductive status.**
Kelly M. Darnell* and Kenneth H. Dunton, The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

-Fisheries and Aquaculture-

11:15 AM – **The effect of reopening Cedar Bayou on estuarine-dependent species.**
Jason Williams*, Greg Stunz, Michelle Zapp Sluis, Megan Robillard; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University Corpus Christi.

11:30 AM – **Tracking Atlantic tarpon migration and habitat utilization with chemical signatures in scales: A non-lethal approach.**
Benjamin D. Walther* and Skye H. Woodcock; The University of Texas at Austin, Marine Science Institute.

11:45 AM – **Spatiotemporal variability of dissolved elements in south Texas bays: Implications for using fish otoliths as geochemical environmental proxies.**
John A. Mohan* and Benjamin Walther; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

12:00 PM **- LUNCH** (Catered by Robert's) at picnic tables under the Main Laboratory Building.

-Fisheries and Aquaculture (continued)-

1:00 PM – **Review of coastal fish stock enhancement.**
Robert R. Vega*; Texas Parks & Wildlife Department.

1:15 PM **– Adult diet and larval diet influence survival skills of red drum larvae.**
Kestrel O. Perez* and Lee A. Fuiman; The University of Texas at Austin, Marine Science Institute.

1:30 PM – **Larval red drum (*Sciaenops ocellatus*) respond to dissolved chemicals from the estuarine environment.**
Lisa N. Havel* and Lee A. Fuiman; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

Thursday April 25, 2013 (continued)

1:45 PM – **Carbon dioxide is effective at inducing anesthesia in multiple marine fish species.**
Erik Oberg*, Kestrel O. Perez, and Lee A. Fuiman; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

2:00 PM – **Status of southern flounder (*Paralichthys lethostigma*) along the Texas Coast.**
Mark Fisher*, Texas Parks and Wildlife Department.

2:15 PM – **Southern flounder spawning success is dependent on high sperm motility and abundant membrane progestin receptor-alpha expression on the sperm plasma membrane.**
Wenxian Tan*, Yosi Aizen, and P. Thomas; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

2:30 PM – **BREAK**

-Fisheries and Aquaculture (continued)-

2:45 PM - **Hiding in plain sight: Tracking the red snapper spawning stock in the western Gulf of Mexico.**
[1]Judd M. Curtis*, [1]Gregory W. Stunz, [2]M. W. Johnson, [3]Sandra L. Diamond; [1]Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi, [2]National Park Service, Gulf Islands National Seashore, Ocean Springs, MS, [3]Texas Tech University. *(Student Presentation)*

3:00 PM – **Unique population dynamics of *Pogonias cromis* in the upper Laguna Madre.**
Zachary T. Olsen*; Texas Parks and Wildlife Department - Coastal Fisheries.

3:15 PM – **Sharks in Texas coastal waters: Are we swimming in essential shark habitat?**
Philip Jose*, Gregory W. Stunz, Matt Ajemian; Harte Research Insititute at Texas A&M University - Corpus Christi. *(Student Presentation)*

-Harmful Algal Blooms and Hypoxia-

3:30 PM – **Continuous and automated phytoplankton imaging keeps tabs on HABs.**
Lisa Campbell*; Dept of Oceanography, Texas A&M University – College Station. (*Invited Speaker*)

4:00 PM – **The effects of a red tide, *Karenia brevis* episode on the benthic macroinvertebrate communities of South Padre Island, Texas.**
Liana Lerma* and David W. Hicks; The University of Texas – Brownsville. *(Student Presentation)*

Thursday April 25, 2013 (continued)

4:15 PM – **Identification of a new to science cyanobacterial toxin.**
I-Shuo Huang* and Paul Zimba; Texas A&M University-Corpus Christi, Center for Coastal Studies. *(Student Presentation)*

4:30 PM – **Molecular and physiological responses of Atlantic croaker exposed to hypoxia in the northern Gulf of Mexico: Comparison with laboratory findings.**
M. S. Rahman* and Peter Thomas; The University of Texas at Austin, Marine Science Institute.

5:00 PM – **Poster Session**

6:00 PM – **DINNER** (Catered by Miss K's) at the Marine Science Institute Visitor's Center.

Friday April 26, 2013

-Freshwater Inflow and Drought-

8:30 AM - **Connecting observations and models for Texas bays and estuaries.**
David R. Maidment*; Center for Research in Water Resources, University of Texas at Austin. (*Invited Speaker*)

9:00 AM – **Impacts of droughts and low flows on health and productivity in three Texas estuaries.**
Terence A. Palmer* and Paul A. Montagna; Harte Research Insititute at Texas A&M University - Corpus Christi.

9:15 AM – **Hydrologic pulsing in coastal wetland and saltwater pond ecosystems.**
[1]Niki Ragan*, [1]K. Pearman, [2]E. Smith, [3]Jeffrey Wozniak; [1]Department of Biological Sciences, Sam Houston State University, [2]International Crane Foundation, [3]Texas Research Institute for Environmental Studies, Sam Houston State University. *(Student Presentation)*

9:30 AM – **Nitrogen and organic carbon delivery to the coastal ocean from Texas rivers.**
Claire G. Griffin* and J. W. McClelland; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

9:45 AM – **Suspended sediment dynamics of shallow wind-driven estuaries.**
Anthony Reisinger* and J. C. Gibeaut; Harte Research Insititute at Texas A&M University - Corpus Christi. *(Student Presentation)*

Friday April 26, 2013 (continued)

10:00 AM – **To settle or not to settle? Picky blue crab megalopae may bias efficiency of hog's hair collectors under varying environmental conditions.**
[1]Kimberly Bittler*, [1]Lindsay P. Scheef, [2]Deepak Adhikari, [1]Edward. J. Buskey; [1]The University of Texas at Austin, Marine Science Institute, [2]University of Minnesota, Department of Aerospace Engineering & Mechanics. *(Student Presentation).*

10:15 AM – **BREAK**

-Freshwater Inflow and Drought (continued)-

10:30 AM – **Comparing performance of five nutrient phytoplankton zooplankton (NPZ) models.**
[1]Evan Turner*, [2]Denise A. Bruesewitz, [2]Rae F. Mooney, [1]Paul A. Montagna, [2]James W. McClelland, [1]Alexey Sadovski, [2]Edward J. Buskey; [1]Harte Research Institute at Texas A&M University - Corpus Christi, [2]The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

10:45 AM - **Impact of drying associated with drought on the rapid release of polycyclic aromatic hydrocarbons from salt marsh sediments in South Texas, USA.**
[1]Zhanfei Liu*, [1]Zucheng Wang, [2]Kehui Xu; [1]The University of Texas at Austin, Marine Science Institute, [2]Department of Oceanography and Coastal Sciences, Louisiana State University.

-Oil Spills-

11:00 AM – **Gulf Integrated Spill Consortium (GISR): Petroleum in the water column in the vicinity of the Deepwater Horizon spill.**
Terry L. Wade*, S. T. Sweet, J. L. Sericano, D. Shi, N. L. Guinasso; GERG Texas A&M University.

11:15 AM – **Deep-sea benthic footprint of the Deepwater Horizon blowout.**
[1]Paul A. Montagna, [2]Jeffrey G. Baguley, [3]Cynthia Cooksey, [4]Ian Hartwell, [1]Larry J. Hyde, [3]Jeffrey L. Hyland, [1]Richard D. Kalke, [3]Laura M. Kracker, [1]Michael Reuscher and [1]Adelaide C. E. Rhodes*; [1]Texas A&M University – Corpus Christi, [2]University of Nevada – Reno, [3]National Oceanic and Atmospheric Administration Centers for Coastal Ocean Science, Charleston, SC, [4]National Oceanic and Atmospheric Administration National Centers for Coastal Ocean Science, Silver Spring, MD.

11:30 AM – **DWH blowout effects on the deep sea macrobenthic communities.**
Travis Washburn*, Adelaide Rhodes, and Paul Montagna; Harte Research Institute at Texas A&M University - Corpus Christi. *(Student Presentation)*

Friday April 26, 2013 (continued)

11:45 AM – **Acute toxicity of dispersed oil on blue crab megalopae: Microbial surfactants as potential bioremediators.**
[1]Rachel Fern*, [1]Kim Withers, [2]Tony Wood; [1]Center for Coastal Studies - Texas A&M University – Corpus Christi, [2]National Spill Control School. *(Student Presentation)*

12:00 PM – **LUNCH** (Catered by Robert's) at picnic tables under the Main Laboratory Building.
Student Collaborative Luncheon (Registration required event): This is a Mission-Aransas NERR sponsored working lunch for student attendees who have registered for this event. Please join us in the Estuarine Research Center seminar room for lunch catered by Cancun Mexican Restaurant and chat with other students about your research!

-Conservation and Restoration-

1:00 PM – **Resource management by the Coastal Bend Bays & Estuaries Program.**
Ray Allen*; Coastal Bend Bays & Estuaries Program. (*Invited Speaker*)

1:30 PM – **Progress of a restored oyster reef in South Texas: The first year.**
[1]Brittany N.Blomberg*, [2]Jennifer Beseres Pollack, [1]Paul Montagna; [1]Harte Research Institute at Texas A&M University - Corpus Christi, [2]Department of Life Sciences, Texas A&M University – Corpus Christi. *(Student Presentation)*

1:45 PM – **Comparative habitat functions of alternative substrates used for oyster reef restoration.**
Lindsey M. George*, Jennifer B. Pollack, Delbert L. Smee, Paul A. Montagna; Texas A&M University – Corpus Christi. *(Student Presentation)*

2:00 PM – **Crunching the numbers: The importance of offshore artificial reefs to Texas fisheries.**
Matt J. Ajemian*, J. J. Wetz and Gregory W. Stunz; Harte Research Insititute at Texas A&M University - Corpus Christi.

2:15 PM – **Using real-time GIS modeling and an interactive tabletop to help coastal communities plan for the future.**
J. Jacob, S. Mikulencak, and Heather Wade*; Texas A&M University, Texas Sea Grant.

2:30 PM – BREAK

Friday April 26, 2013 (continued)

-Conservation and Restoration (continued)-

2:45 PM – **Population genetics of eastern oysters (*Crassostrea virginica*) in Texas.**
[1]Joel D. Anderson*, [1]William J. Karel, [1]Christopher E. Mace, [1]Brian L. Bartram, and [2]Matthew P. Hare; [1]Texas Parks and Wildlife, [2]Dept. Natural Resources, Cornell University.

3:00 PM – **Genetic diversity and natal origins of green turtles (*Chelonia mydas*) in Southern Texas.**
[1]Joel D. Anderson*, [2]Donna J. Shaver, and [3]William J. Karel; [1]Texas Parks and Wildlife, [2]National Park Service, Padre Island National Seashore, [3]Texas Parks and Wildlife, Coastal Fisheries.

3:15 PM – **Preliminary observation of fibropapilloma virus in green turtles (*Chelonia mydas*) captures from Texas' Lower Laguna Madre.**
Tasha Metz*; Texas A&M University at Galveston.

-Invertebrate Ecology-

3:30 PM – **Scope for growth of three ecologically important bivalve species native to the Upper Laguna Madre, Texas.**
Lee Schoech*, Kim Withers, Rachel Fern; Center for Costal Studies at Texas A&M University Corpus Christi. *(Student Presentation)*

3:45 PM – **Spatial dynamics of blue crab spawning in Texas bays, estuaries, and offshore waters.**
M. Zachary Darnell*; The University of Texas at Austin, Marine Science Institute.

4:00 PM – **Rapid population growth of *Luidia clathrata* (striped seastar) in Matagorda Bay, Texas.**
Nicole F. Poulson* and J. O. Harper; Texas Parks and Wildlife Department-Coastal Fisheries.

-Special Topic-

4:15 PM – **Spheres of interest: From racing bubbles to sedentary mud balls, some marine constructs emulate the sphere.**
Tony Amos*; The University of Texas at Austin, Marine Science Institute.

4:30 PM – **Award Ceremony for Best Student Oral and Poster Presentations**

-END OF TBEM 2013-

Student Awards

Student presentations are an important aspect of this meeting. The Best Student Presentation awards are one of the ways we have to acknowledge excellence in research. The Coastal Bend Bays and Estuaries Program has continued its support of this award ($200 for 1st Place, $150 for 2nd Place and $100 for 3rd Place).

Previous winners:

2005: **Jason James**, Texas A&M Corpus Christi, 1st Place
Tatum Neeley, Texas A&M University, College Station, 2nd Place
2006: **Harris Mulhstein**, The University of Texas at Austin 1st Place
Lucia B. Carreon Martinez, The University of Texas at Austin, 2nd Place
2007: **Matt Hubner,** Texas A&M Corpus Christi, 1st Place
Megan Fencil, The University of Texas at Austin, 2nd Place
2008: **John Froeschke**, Texas A&M Corpus Christi, 1st Place
Laura Ryckman, The University of Texas at Austin, 2nd Place
Katie Swanson, The University of Texas at Austin, 2nd Place
2009**: Christopher Wilson**, The University of Texas at Austin, 1st Place
Danielle Crossen, University of Houston, Clear Lake, 2nd Place
2011: **Rachel Mills**, The University of Texas at Austin, 1st Place
Kelly Darnell, The University of Texas at Austin, 2nd Place
2012: **Lisa Havel**, The University of Texas at Austin, 1st Place
Huy Vu, University of Houston, 2nd place
Jena Campbell, The University of Texas at Austin, 3rd Place

The Best Student Poster awards are generously sponsored by The Coastal Bend Bays Foundation to acknowledge excellence in research in this format ($150 for 1st Place, $100 for 2nd Place and $50 for 3rd Place).

Abstracts for Oral Presentations

Mangroves invading Texas salt marshes: Does it affect microclimate?
[1]Steven C. Pennings*, [2]Hongyu Guo, [2]Anna R. Armitage, [1]Sayatani Dastidar, [2]Carolyn A. Weaver, and [3]Zoe Hughes; [1]University of Houston, [2]Texas A&M University at Galveston, [3]Boston University.

Black mangroves (*Avicennia germinans*) are expanding into areas historically occupied by salt marsh plants on the Texas coast. Over the coming decades, mangrove distributions are expected to continue expanding due to rising global temperatures and milder winters. Will this matter? To examine the ecological consequences of these vegetation changes, we set up ten large experimental plots on Harbor Island in Port Aransas, TX, in which we manipulated the density of mangroves in the summer of 2012. Results to date show that removal of mangroves has strongly affected microclimate; this effect will be discussed at length in a companion poster. Removal of mangroves has also led to expansion of marsh plants, primarily *Batis maritima* and *Sarcocornia* spp. To investigate how the competitive relationships between mangroves and marsh plants change along a gradient of mangrove density, we have transplanted marsh plants into areas with and without mangroves in each of our plots. Over the coming years, we anticipate also documenting the effects of mangrove density on soil characteristics and accretion, marine macrofauna, soil infauna, nekton, terrestrial arthropods and birds. Our work will provide information on which ecosystem services provided by coastal wetlands are most likely to be affected by the change from salt marsh to mangroves. This information will allow coastal industries such as fisheries and tourism to be adaptively managed in response to ongoing and future changes in the biological environment.

Informing conservation planning using sea-level rise and storm surge impact estimates in Texas and Florida coastal bay ecosystems.
M. Thompson*, B. Gilmer and J. Brenner; The Nature Conservancy.

Coastal communities across the Gulf of Mexico are increasingly vulnerable to coastal hazards including sea level rise (SLR). The Gulf of Mexico contains 20,000 km² of land below 1.5 meters in elevation and is one of the most vulnerable regions to sea level rise (SLR) in the continental U.S. Wetlands are among the Gulf of Mexico's most economically and ecologically important habitats and comprise thirty-one percent (28,372 mi²) of land within the U.S. Gulf coastal watershed. These increasing hazards threaten not only the human-built infrastructure and coastal communities, but also natural habitats and ecosystems. Through a participatory stakeholder process, the project team and regional stakeholders identified ongoing and future conservation planning efforts that were best suited to be informed by SLR and storm surge projections, socioeconomic indicators, and marsh migration scenarios. This study estimates the potential impacts of SLR and storm surge to human communities and natural habitats, with emphasis on coastal marshlands, in both the Galveston Bay region of Texas and the Choctawhatchee/Saint Andres Bay region of Florida. Project results included 1) Marsh Change and Viability Analysis, 2) Community Risk Analysis, 3) Community Resilience Analysis; and 4) Long-term marsh Management Analysis. Our study suggests that SLR impacts should be

incorporated into ongoing conservation planning and management activities, within the Galveston Bay region in Texas and the Choctawhatchee/Saint Andrew Bays region of Florida, in order to allow decision makers to more easily develop adaptation strategies that foster coastal resilience in the face of a changing climate.

Characterizing the pristine oyster reef community of Sabine Lake Estuary relative to surrounding marsh edge and non-vegetated bottom habitats.

Jaimie A. Nevins*, Jennifer Beseres Pollack, Gregory W. Stunz; Texas A&M University – Corpus Christi. *(Student Presentation)*

Sabine Lake is an approximately 360 km^2 estuary on the Texas-Louisiana border formed by the union of the Neches and Sabine Rivers. With nearly 200,000 acres of marshes that surround the estuary, it is one of the largest ecosystems in Texas. This estuary is unique in terms of its large oyster reef complex with no record of commercial harvest as far back as the 1960's. It is likely one of the largest remaining un-fished oyster reefs in the United States. The overarching goal of this research project is to describe the oyster population structure and community composition of finfishes and invertebrates on this naturally functioning reef system. This project will also assess the density and diversity of finfish and macro-invertebrates within two additional microhabitats within Sabine Lake: non-vegetated bottom and marsh edge habitats. Preliminary results show a notable difference in abundance and diversity of nekton among the three microhabitats.

Effects of amino acids on the growth and microcystin production of *Microcystis aeruginosa*

[1]Sammy Ray*, [2]Brittany Blomberg, [2]Jennifer Pollack and [2]Rick Kalke; [1]Texas A&M University at Galveston, [2]Harte Research Institute Texas A&M Corpus Christi.

The severe Texas drought of 2011 continued into 2012 with only slight abatement. The Dermo levels remain high throughout this system. Moreover, the populations of the horse oyster (*Ostera equistres*) greatly increased during 2012. Limited data are available on the status of Dermo disease in other Texas Bays during 2012; such available data will be presented. It is the senior author's opinion, that a massive tropical storm will be required to restore oyster populations in South Texas.

Seagrasses in the western Gulf of Mexico: Statewide monitoring and linkages to regional climatic events.

Kenneth H. Dunton*, Christopher J. Wilson and S. S. Wilson; The University of Texas at Austin, Marine Science Institute.

We provide an update on the first comprehensive survey of seagrasses along the south Texas coast based on visits to 567 individual sample sites during summers of 2011 and 2012. Site locations were chosen from seagrass meadows delineated during the 2004/2007 NOAA Benthic Habitat Assessment and were spatially distributed throughout the Mission-Aransas National Estuarine Research Reserve, Corpus Christi Bay and the Laguna Madre.The 2011 field sampling effort specifically featured Tier-2 protocols, which are intended to provide rapid assessments of hydrography, seagrass areal coverage, species distributions and plant physiological condition.

The Tier-2 sampling program successfully yielded spatial characteristics of seagrass habitat quality, identified several regions indicative of seagrass decline and thoroughly evaluated the validity of seagrass coverage described in the 2004/2007 NOAA Benthic Habitat Assessment. In addition, our long-term estuarine monitoring site in the Laguna Madre, Texas was used to explore the individual contributions of natural and anthropogenic stressors over a 20-year period. El Nino-Southern Oscillation was shown to regulate local precipitation and salinity regimes, which is consistent with previous findings along the Texas coast. We describe a novel relationship between salinity, chlorophyll and light availability at the seagrass canopy. Our results highlight the complex nature of estuarine ecosystems and the importance for discerning natural versus anthropogenic forcing mechanisms when developing effective long-term management and conservation strategies.

Seagrass abundance patterns in the Lower Laguna Madre.

[1] C. J. Gomez, [1]J. McDaniel, [1]J. Garcia, E. Quintero, [1]J. Kowalski, [2]Hudson DeYoe*; [1]The International Baccalaureate Program at Lamar Academy, [2]Department of Biology and the Center for Subtropical Studies, The University of Texas-Pan American.

There has been much change in Lower Laguna Madre seagrass distribution and abundance over the last fifty years. A bay-wide survey of the Lower Laguna Madre (LLM) seagrasses was undertaken during summer 2012 to investigate the premise that the freshwater discharges to the LLM accompanying Hurricanes Dolly (2008) and Alex (2010) have further altered the distribution and abundance of its seagrass communities. This study encompassed 180 stations distributed throughout the lagoon. At each station, seagrass abundance was estimated by recording % cover and species composition. In addition, benthic cores were collected for seagrass biomass and sediment grain size analysis and routine water quality data were recorded. *Halodule wrightii* has once again become the dominant seagrass in the Lower Laguna Madre (present at 51% of stations). Mean total biomass was 146.16 g m-2 (SE = 11.53; N = 297) which comprised 48% of all vegetated stations. Unvegetated sediments accounted for 30% of all stations. *Thalassia testudinum* (11% of all stations), once found as far north as the Arroyo Colorado, was found only in the southernmost part of the LLM, with average biomass of 736 g m-2 (SE = 82.44; N = 50), while *Syringodium filiforme* (2% of all stations) was found only near the Brazos-Santiago Pass (average total biomass = 365 g m-2 (SE = 35.55; N = 25). *Ruppia maritima* (6% of all stations) had a mean total biomass of 59.02 g m-2 (SE = 13.94; N = 17). Shoal grass average total biomass on the west side of the LLM (128.67 g m-2; SE = 21.88) was significantly different from that of the east side (68.67 g m-2; SE = 17.80) (Mann-Whitney U = 822; P = <0.001). The period of hyposaline conditions in the LLM following Hurricane Alex were sufficient to cause significant mortality to limit the areal distribution and abundance of turtle grass and manatee grass and allow shoal grass to expand its distribution.

Genetic variation in a Bermuda population of the seagrass *Halodule wrightii*.
Sebastian R. Rubiano* and Patrick D. Larkin; Dept. of Physical & Environmental Sciences, Texas A&M University-Corpus Christi. *(Student Presentation)*

Seagrasses are marine angiosperms that significantly contribute to coastal food webs and habitats for a number of fauna. Seagrasses are affected by natural and anthropogenic factors that threaten their integrity and stability. Dredging and filling operations, propeller scarring, and eutrophication are examples of factors that can reduce the size of seagrass ecosystems. This can have a negative effect on seagrass genetic variation, which may ultimately hinder the ability of the ecosystems to adapt and recover from disturbance. We used a microsatellite-based DNA marker assay (8 loci) to assess genetic diversity in a population (40 samples) of *Halodule wrightii* from Bermuda. We compared these values to those obtained from 10 populations along the Texas Gulf Coast. Results indicate that clonal diversity (R = 0.256) and heterozygosity (He= 0.490) were relatively low while a measure of inbreeding was relatively high (Fis= 0.166). The mean Fst estimate (0.331) was also high, indicating pronounced levels of genetic differentiation from the Texas populations. Our results suggest that this particular Bermuda population has signs of being genetically poor.

Effects of nutrient enrichment on turtlegrass reproductive status.
Kelly M. Darnell* and K. H. Dunton, The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

Reproductive effort is often spatially and temporally variable, and resource availability frequently contributes to this variability. Consequently, reproductive frequency and output are often related to nutritional status. We examined the influence of nutrient availability on turtlegrass (*Thalassia testudinum*) reproductive status in Lower Laguna Madre, Texas, a region where porewater and water column nutrients are low. Two months before the onset of the 2012 reproductive season, we enriched 50 turtlegrass plots with Osmocote Smart-Release fertilizer (19-6-12) buried at the rhizome layer. Each enriched plot was paired with an unenriched control plot. This procedure resulted in increased porewater ammonium concentrations of 679 ± 188 uM in enriched plots, compared to 204 ± 34 uM in unenriched plots. At the onset of the reproductive season, we examined shoot morphology and reproductive status. Enriched shoots were less reproductive than unenriched shoots ($p = 0.0008$), with a lower proportion of reproductive shoots in enriched (0.07) than unenriched plots (0.20). However, enriched shoots had more leaves that were longer and wider than unenriched shoots. These results suggest that in high nutrient conditions, turtlegrass may rely more on somatic growth than sexual reproduction and that nutrient availability may have an important influence on sexual reproduction in turtlegrass.

The effect of reopening Cedar Bayou on estuarine-dependent species.
Jason Williams*, Greg Stunz, Michelle Zapp Sluis, Megan Robillard; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University Corpus Christi.

Tidal inlets play ecologically important roles by transporting estuarine-dependent planktonic larvae to inshore waters where they settle into crucial nursery habitats. Cedar Bayou is a natural

tidal inlet separating San Jose Island from Matagorda Island. Historically, the inlet connected the Gulf of Mexico waters with Mesquite Bay, which feeds into Aransas and San Antonio Bays. In the past, Cedar Bayou has been opened and closed as a result of both natural and human influences. In 1979, the inlet was manually filled to protect estuarine waters and wetlands from the Ixtoc I oil spill in Campeche, Mexico. In a joint effort to reopen this historic, ecologically important channel, the Coastal Conservation Association and Aransas County have plans to dredge and reopen the inlet in 2014. The overall goal of this project is to assess the impact of opening Cedar Bayou on nekton productivity and sustainability in the adjacent seagrass habitats within the Aransas Bay complex. The study employs a classic before-after-control-impact (BACI) design whereby selected seagrass beds within Cedar Bayou (impact sites) and Aransas Bay (control sites) will be sampled before and after the opening of Cedar Bayou. Preliminary results indicate a strong difference in overall nekton abundance and density of newly settled, estuarine-dependent species between habitats adjacent to Cedar Bayou and Aransas Pass. Similar to our work on the opening of other tidal inlets, we hypothesize an increase in estuarine-dependent nekton found within the Cedar Bayou region after the opening of the inlet that may translate into increased overall estuarine productivity.

Tracking Atlantic tarpon migration and habitat utilization with chemical signatures in scales: A non-lethal approach.

Benjamin D. Walther* and Skye H. Woodcock; The University of Texas at Austin, Marine Science Institute.

Atlantic tarpon are large migratory elopomorph fish that frequent coastal and inshore waters of the tropical and subtropical Atlantic Ocean, and often inhabit brackish lagoons and freshwater tributaries. Despite the intensity of management and the economic importance of tarpon, many aspects of its biology are poorly described including the frequency and duration of movements into low salinity habitats. We aim to develop a non-lethal method to help quantify movements between estuarine and offshore habitats of tarpon and their participation in coastal food webs using natural geochemical signatures in scales. We used (1) laser ablation ICP-MS to quantify Ba and Sr concentrations and (2) isotope ratio mass spectrometry for carbon and nitrogen stable isotope ratios to quantify chemical changes across growth increments in scales to determine if they reflect movement between estuarine and off shore habitats. Isotopic and trace element signatures showed distinct patterns that indicated both movement between estuarine and offshore habitats as well as ontogenetic trophic enrichment with age. Chemical signatures differed among regions, indicating some geographic separation among baseline signatures. Patterns in geochemical signatures also differed among individuals, suggesting that this method may provide a non-lethal alternative to geochemical signatures in otoliths for quantifying individual migration patterns. This approach is preferable for Atlantic tarpon and other highly protected species where traditional lethal techniques are unsuitable.

Spatiotemporal variability of dissolved elements in south Texas bays: Implications for using fish otoliths as geochemical environmental proxies.
John A. Mohan* and Benjamin Walther; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

Otoliths are paired carbonate structures that accrete permanent growth increments on daily to annual timescales. As fish grow, dissolved trace elements (such as strontium and barium) are taken up through the gills from the environment and get deposited into the crystal growth increments, providing a chemical chronology of habitat residence and movement patterns. Interpreting these chronologies requires an understanding of the spatial and temporal variability of dissolved trace elements in the ambient environment, at both small and large spatiotemporal scales. To investigate large-scale spatial variation, water samples were collected from Galveston Bay, Mission-Aransas Bay, and Laguna Madre in July 2012, and analyzed for δ18O, Ba:Ca, Sr:Ca, Mg:Ca, Mn:Ca, and Li:Ca. The multivariate elemental signatures correctly classified the bays with 100% accuracy, with δ18O and Ba:Ca being the primary habitat discriminators. To investigate small-scale spatiotemporal variation, water samples were collected monthly from the Mission-Aransas National Estuarine Research Reserve (MANERR) at five fixed stations throughout 2012. Variation within each site over time was as great as variation between the bays. Multiple linear regression revealed that salinity was able to significantly predict the variation in δ18O and Ba:Ca within the MANERR habitats throughout the year. Thus using relationships between dissolved elements and otolith elements to identify exact spatial habitat origins of fish is confounded by temporal variation. However, consistent relationships of δ18O and Ba:Ca with salinity should allow accurate descriptions of fish movement across salinity gradients in south Texas bays.

Review of coastal fish stock enhancement.
Robert R. Vega*; Texas Parks & Wildlife Department.

Decline of Texas red drum (*Sciaenops ocellatus*) during the 1970s prompted TPWD to implement a recovery plan. Included were (1) fishery-independent monitoring to assess stock status; (2) restrictive regulations to reduce fishing pressure; and, (3) development and implementation of an enhancement program based on the release of hatchery-reared fingerlings. Since 1983, over 638 million hatchery-reared red drum fingerlings have been released into Texas bays.

TPWD fishery managers have used a number of methods to evaluate the success of hatcheries in enhancing red drum populations. Recently, the focus has been on use of natural microsatellite-DNA markers. Analysis of the DNA studies indicates that the contribution from stocked hatchery fish has ranged from 0 to 18%. As would be expected, the efficacy of the stock enhancement program has varied widely, both from year to year and from bay to bay.

Efforts to culture spotted seatrout (*Cynoscion nebulosus*) on a large-scale for stock enhancement has been made by TPWD marine fish hatcheries since 1993. Over 72 million hatchery-reared spotted seatout fingerlings have been released into Texas Bays. In addition, efforts to rear southern flounder (*Paralichthys lethostigma*) fingerlings for stock enhancement has steadily

progressed with large-scale stockings targeted within the next few years.

TPWD's long-term management plan using hatcheries to supplement natural recruitment, in concert with traditional management tools, has played a crucial role in the rebound of the red drum population to near-record highs. Texas fishery managers have taken the often controversial practice of stocking hatchery-produced fish and used it to the apparent benefit of the red drum, and are aiming to supplement spotted seatrout and southern flounder populations.

Now, finally, the technology is at hand to determine not only that stocking works, in the case of red drum in Texas, but also how to make it work better. This purpose of this presentation is describe some of the operations and strategies behind the Texas marine stock enhancement program.

Adult diet and larval diet influence survival skills of red drum larvae.
Kestrel O. Perez* and Lee A. Fuiman; The University of Texas at Austin, Marine Science Institute.

Essential fatty acids, those that must come from either the larval or maternal diet, are required for normal growth and development. Correlations have been reported between concentrations of two egg fatty acids, docosahexaenoic acid (DHA) and arachidonic acid (ARA), and larval escape performance, with the suggestion that some effects may be irreversible. First, to determine the natural range in fatty acid content we collected wild spawned eggs from 2009-2012 in the Aransas Pass tidal inlet in Port Aransas, TX. Then, we produced batches of eggs that varied in ARA and DHA by manipulating adult diet and measured larval routine swimming, escape performance, and survival. To evaluate whether the effect of egg content on larval performance could be reversed by feeding an enriched larval diet, larvae were fed four different diets that varied in fatty acid content. Of the five traits that were related to egg fatty acid content, response latency and routine swimming speed were significantly lower when larvae were fed the medium diet than the poor diet, indicating that for these performance traits the for the effects of poor egg quality were reversible. The other three larval traits did not differ significantly among the enriched diets, indicating that those effects of egg content may be irreversible. Since neither adult fish nor larval fish can manufacture these fatty acids, they originate from the adult diet. These causes of variation in larval performance suggest that adult diet dynamics are important for our understanding of mechanisms behind population recruitment.

Larval red drum (*Sciaenops ocellatus*) respond to dissolved chemicals from the estuarine environment.
Lisa N. Havel* and Lee A. Fuiman; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

The number of larvae that successfully settle into benthic estuarine nursery grounds can impact adult population dynamics. Planktonic larvae require both developed swimming capabilities and functional sensory systems to locate these habitats. Marine fishes commonly use chemical cues for navigation, however the olfactory function for fishes residing in estuaries, including those on

the Texas coast, has received little research attention. To examine the role of water chemistry on red drum (*Sciaenops ocellatus*) settlement, we quantified their behavioral responses in the presence of distinct natural chemical cues. In laboratory trials, we made paired comparisons of pre-settlement larvae exposed to sterilized sea water (as a control) and one of six treatments (sterilized sea water, sea water collected on ebb tide, sea water collected on flood tide, sea water collected from seagrass beds, tannic acid dissolved in sterilized seawater, or lignin dissolved in sterilized seawater). Results showed that larvae exposed to seawater collected from seagrass beds swam faster than those from the other treatments. Additionally, larvae in the water from seagrass beds swam higher in the water column than those in the flood tide water. These differences in behavior among the various water samples demonstrate that red drum larvae can distinguish different water masses and suggest an active response to chemical stimuli, which could aid in orientation and movement to or retention in suitable settlement sites.

Carbon dioxide is effective at inducing anesthesia in multiple marine fish species.
Erik Oberg*, Kestrel O. Perez, and Lee A. Fuiman; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

Marine fisheries research involving surgery requires effective anesthesia, but regulations limit the anesthetic methods that can be used on species considered food fish. Carbon dioxide is one anesthetic that complies with Food and Drug Administration and Institutional Animal Care protocols, but no published work characterizes its effectiveness on marine fishes. We used acetic acid and sodium carbonate to create a carbon dioxide rich seawater bath to induce anesthesia. We measured induction time and recovery time. We found that carbon dioxide effectively anesthetizes various estuarine fishes, including red drum (*Sciaenops ocellatus*), southern flounder (*Paralichthys lethostigma*), common snook (*Centropomus undecimalis*), Florida pompano (*Trachinotus carolinus*), and inland silverside (*Menidia beryllina*) to stage-4 anesthesia, a level acceptable for minor surgery. Average induction times for these species were: 4.26, 9.61, 2.42, 2.12, and 0.85 min, respectively. There was a strong positive relationship between total length and induction time for all species, but no relationship between total length and recovery time. Using red drum, we also examined intraspecific differences among age groups and recent energetic experience (rested vs. fatigued). These results provide needed documentation of carbon dioxide effectiveness on marine fish and are useful for planning field studies on marine food fish that involve minor surgery.

Status of southern flounder (*Paralichthys lethostigma*) along the Texas Coast.
Mark Fisher*, Texas Parks and Wildlife Department.

Southern flounder (*Paralichthys lethostigma*) are an economically important species in Texas, supporting both recreational and commercial fisheries. Landings are seasonal, with a peak during the fall spawning run. Flounder abundance began to decline in the early ‘90s, causing the Texas Parks and Wildlife Department to implement stricter harvest regulations, and the population has rebounded since 2008. Adults are winter spawners and juvenile recruitment is temperature-dependent, with higher recruitment associated with colder winters. The population has rebounded from a combination of harvest regulations and the recent cool winters.

Southern flounder spawning success is dependent on high sperm motility and abundant membrane progestin receptor-alpha expression on the sperm plasma membrane.
Wenxian Tan*, Yosi Aizen, and P. Thomas; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

The southern flounder (*Paralichthys lethostigma*) is a potentially important aquaculture finfish species. However, poor sperm quality (e.g. low milt volume, low sperm motility) and a lack of understanding of the hormonal regulation of male flounder reproduction have hindered the development of commercially viable spawning protocols for this species. We recently showed that the major progestin produced in the southern flounder is 17,20beta,21-trihydroxy-4-pregnen-3-one (20beta-S) and that binding of 20beta-S to the membrane progestin receptor, mPR-alpha, on flounder sperm stimulates sperm swimming velocity. Furthermore, the amount of mPR-alpha present on the plasma membrane of sperm directly correlates with their swimming velocity. In this study, we show that spawning success is dependent on high sperm motility; spawning trials with sperm displaying high motility resulted in higher fertilization rates compared to those with sperm displaying low motility. Consistent with our previous reported findings, sperm displaying higher motility had higher mPR-alpha expression on the plasma membrane compared to that on lower motility sperm. Stimulation of high motility sperm with 100 nM of 20beta-S and the mPR-alpha-specific agonist, Org OD 02-0 significantly increased both sperm motility and fertilization success. Our results indicate that a single injection of a GnRH superactive analog (100 microgram/kg) into males resulted in increased sperm motility 72 hrs post-injection. The increased sperm motility also resulted in higher fertilization success, with no observed adverse effects on the development of the embryo. These findings provide a possible avenue for improving spawning of this potentially important aquaculture species in captivity, which may have both ecological and socio-economical impacts.

Hiding in plain sight: Tracking the red snapper spawning stock in the western Gulf of Mexico.
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Red snapper (*Lutjanus campechanus*) in the Gulf of Mexico have been classified as overfished since 1984. However, despite historically low stock sizes, current recruitment is much higher than historical recruitment levels. One hypothesis to explain this paradox is the existence of a locally recruiting source population of large, highly fecund “sow” snapper not targeted by the directed fishery responsible for maintaining high recruitment. These sow snapper are relatively un-fished because they may be using different habitats that move them away from commonly known structures where fishermen concentrate their effort. The objectives of this study were to: (1) test the hypothesis that older, larger snapper have found spatial refuge from fishing by selecting different habitats than small snapper; (2) investigate large-scale movement of sow snapper; and (3) investigate small-scale habitat preferences and use patterns of sow snapper compared to small snapper. Acoustic returns of sow (>685 mm) snapper tagged and tracked using mobile acoustic telemetry showed 79% (11 of 14) recovery at initial tag sites after three

months and 36% (5 of 14) after one year. Stationary acoustic telemetry showed small and sow snapper tagged at one structured site exhibited similar long-term habitat use patterns. Sampling trips measuring catch-per-unit-effort at three surface platforms and three not visible sites revealed comparative catch rates and total lengths. Sow snapper appear to be showing high site fidelity but using same habitats and exhibiting similar movement patterns as small snapper. These data suggest that high recruitment observed may be originating from other non-targeted sources.

Unique population dynamics of *Pogonias cromis* in the upper Laguna Madre.
Zachary T. Olsen*; Texas Parks and Wildlife Department - Coastal Fisheries.

Black drum (*Pogonias cromis*) are an important commercial and recreational finfish throughout the Gulf of Mexico. Along the Texas coast, commercial catch is highest in the upper Laguna Madre (ULM) system. The ULM black drum population has been shown to differ from those of other Texas bay systems in growth rate and age at reproductive maturity presumably due to the hypersaline conditions which dominate in this particular estuary. As a result, trends in adult populations and recruitment are shown to be different for black drum in the ULM when compared to populations from adjacent bay systems and appear to be closely related to salinity regimes within the estuary. While the population of black drum in the ULM is currently high, recent findings of undersized and emaciated fish in the Baffin Bay system seem to suggest limited resources and that the carrying capacity may have been exceeded. This event may be related to recent peaks in salinity in the Baffin Bay system and the unique dynamics of the ULM black drum population.

Sharks in Texas coastal waters: Are we swimming in essential shark habitat?
Philip Jose*, Gregory W. Stunz, Matt Ajemian; Harte Research Insititute at Texas A&M University - Corpus Christi. *(Student Presentation)*

Sharks are apex predators that play a crucial role in structuring marine ecosystems. However, conservation of these important species requires comprehensive habitat delineation of all life stages, which is often an elusive task for these highly mobile predators. Despite having relatively low shark abundance at inshore locales, the Texas coastal bend maintains a prolific recreational shark fishery along its barrier islands. We assessed the potential for this nearshore region as vital shark habitat using three main criteria: 1) Sharks must be more commonly encountered along barrier islands than adjacent embayments; 2) Sharks must remain resident to these barrier islands; and 3) Sharks exhibit fidelity to these islands. Our approach used both fisheries-dependent and independent data to determine the potential of Texas nearshore waters as essential shark habitat. We addressed the spatiotemporal dynamics of nearshore shark habitat use by developing an angler-based passive tagging program. These data suggested that the nearshore shark assemblage varied seasonally and that sharks generally exhibit a southward migratory pattern along the immediate shoreline. To further compare fine-scale patterns of habitat use between the nearshore region and major tidal inlets, we tracked 25 sharks using acoustic telemetry. Acoustically tagged sharks repeatedly used nearshore waters and Aransas Inlet, remaining in these areas for consecutive days and also returning to these areas throughout the

year. Our findings indicate that Texas barrier islands serve as important habitat for a variety of shark species and life stages.

Continuous and automated phytoplankton imaging keeps tabs on HABs.
Lisa Campbell*; Dept of Oceanography, Texas A&M University – College Station.

Continuous automated imaging-in-flow by the Imaging FlowCytobot (IFCB) has proven to be an effective and successful method for early warning of harmful algal blooms (HABs). Over the past seven years, the IFCB has provided early warning of six HAB events. Since the initial discovery of an unexpected and harmful bloom of *Dinophysis ovum* in 2008, blooms of *Dinophysis* have recurred in 2010, 2011 and 2012, but all were detected early enough so that the shellfishery remained closed and no recalls were necessary. In fall 2009, manual inspection of IFCB images in mid-August provided early warning for a *Karenia brevis* bloom that developed in mid-September. Images from the 2009 bloom were used to develop an automated classifier that was employed in 2011. Successful implementation of automated file downloading, processing and image classification allowed results to be available within 4 h after collection and sent to state agency representatives by email for swift response. Intermittent appearances of HABs (apparently influenced by weather/ rainfall) can be missed or overlooked by routine, less frequent sampling. Archived IFCB data were used to calculate growth rates over the course of a bloom and provide new insights into bloom development. Our work has demonstrated that continuous and automated methods for monitoring coastal waters provide data at sufficient temporal resolution to allow appropriate responses to HABs (and no human illness has resulted from these events). The ability to follow the abundance of individual phytoplankton taxa at relevant temporal scales permits better understanding of plankton community dynamics.

The effects of a red tide, *Karenia brevis* episode on the benthic macroinvertebrate communities of South Padre Island, Texas.
Liana Lerma* and David W. Hicks; The University of Texas – Brownsville. *(Student Presentation)*

In September 2011, a prolonged (four month) red tide event (*Karenia brevis*) occurred on South Padre Island, Texas resulting in significant fish mortality and irritating aerosols. The detrimental effects of *Karenia brevis* on fish, wildlife, and people, are well documented, however, lower trophic level effects are largely unknown. Swash zone macroinvertebrate communities inhabiting sandy beaches are an important linkage between marine and terrestrial food webs and thus may serve as a brevetoxin vector to higher trophic levels. To assess the effects of *Karenia brevis* on this essential lower trophic level community, sampling was conducted from six 400 m stretches of beach prior to and after high red tide cell count concentrations. All species within the samples were identified and enumerated. A one way ANOSIM was used to compare before and after event swash-zone communities. Results indicate that the pre and post bloom abundances and biomass were significantly different (ANOSIM Global R=0.612, p=0.01 and R=0.538, p= 0.01, respectively). During the red tide occurrence, species abundances for *Donax variabilis* and *Ancinus depressus* increased while *Haustorius sp.* and *Scolelepis squamata* decreased. Further analysis of multi-dimensional scaling indicated a clear separation of pre and post bloom

community abundances and biomass. However, when compared with data from a previous study conducted at the same location, the communities shared like similarities suggesting that the differences in both communities appear to be within range of natural variation and therefore unlikely attributable to the red tide effects.

Identification of a new to science cyanobacterial toxin.
I-Shuo Huang* and Paul Zimba; Texas A&M University-Corpus Christi, Center for Coastal Studies. *(Student Presentation)*

Cyanobacterial toxins are best known in freshwater, however there is increasing evidence of marine cyanobacterial toxins that are poor characterized. A marine *Geitlerinema sp.* was isolated from an aquatic animal rearing facility having mysid mortality events. The cyanobacteria possibly originated from the Chesapeake Bay or Gulf of Mexico. Unialgal bulk cultures were used to produce sufficient material to isolate the toxin. Isolation of the unknown toxin was accomplished by bioassay-guided fractionation combined with HPLC/HPLC-MS for separation of toxic fractions. The toxin has a mass of 475.3 AMU, a size not associated with any previously known cyanobacterial toxins. Taxonomic identification will be achieved using PCR, light and electron microscopy, and structure of toxin will be determined using TOF mass spectrometry and NMR. It is likely that other small filamentous cyanobacteria will be found that produce allelopathic secondary metabolites.

Molecular and physiological responses of Atlantic croaker exposed to hypoxia in the northern Gulf of Mexico: Comparison with laboratory findings.
M. S. Rahman* and Peter Thomas; The University of Texas at Austin, Marine Science Institute.

One of the most significant global changes due to human activities in the marine environment over the past thirty years has been the dramatic worldwide increase in the incidence of hypoxia (low dissolved oxygen <2 mg/L) in coastal bottom waters. The exposure of motile animals such as fish to these hypoxic waters and the long-term effects of hypoxia on fisheries are unknown. Therefore, there is an urgent need to develop reliable indicators of environmental hypoxia stress in marine organisms in order to assess the ecological impacts of coastal hypoxia and global warming. A suite of molecular indicators (hypoxia-inducible factor, HIFα, an oxygen-sensitive transcription factor; neuronal nitric oxide synthase, nNOS, an enzyme that catalyzes the production of nitric oxide; and insulin-like growth factor binding protein, IGFBP, a growth inhibitory protein) were measured in Atlantic croaker collected from hypoxic and normoxic sites during summer in the northern Gulf of Mexico. We found that HIF-αs, nNOS and IGFBP-1 mRNA levels were elevated several-fold in brain and liver tissues of croaker collected from hypoxic sites compared to levels in fish collected from normoxic sites. Similarly, HIF-αs, nNOS and IGFBP-1 transcript levels were upregulated in these tissues three- to ten-fold after 3 and 7 days of hypoxia exposure in controlled laboratory experiments and declined to control levels within 24 h of restoration to normoxic conditions. These results suggest that HIF-αs, nNOS and IGFBP-1 transcripts are potentially useful biomarkers of environmental hypoxia exposure.

Connecting observations and models for Texas bays and estuaries.
David R. Maidment*; Center for Research in Water Resources, University of Texas at Austin.

Texas bays and estuaries are extremely complex enviornments where each layer of complexity that is peeled away yields other layers of complexity underneath. Many organizations and individuals make observations of water properties at point locations through time, satellite and aircraft obseravtions describe spatial patterns at fixed points in time, simulation models describe the evolution of properties in both space and time. By using Sensor Web and Model Web to link observations and models a more complete picture can be assembled of current and historical conditions in the bay and estuary system.

Impacts of droughts and low flows on health and productivity in three Texas estuaries.
Terence A. Palmer* and Paul A. Montagna; Harte Research Insititute at Texas A&M University - Corpus Christi.

Most Texas estuaries are vulnerable to changes in freshwater inflow because of growing human populations, climate change, and an already parched climate. This study investigated the effects of historic droughts in three Texas estuaries along a decreasing freshwater inflow gradient; from the Lavaca-Colorado Estuary in the north, the Guadalupe Estuary in the middle, and the Nueces Estuary in the south. Droughts were defined as being months when the mean salinity of the primary bay of each estuary was in the upper quartile of historic salinities of the same bay.

Nitrate plus nitrite, and silicate concentrations were lower in drought conditions in Lavaca-Colorado Estuary, but not in the higher saline Nueces Bay. Relative concentrations of phosphate were inconsistent among different climatic conditions. Macrofauna diversity increased in drought conditions relative to other conditions in Lavaca-Colorado and Guadalupe Estuaries. There were no consistent trends in abundance, diversity or community composition among climate conditions; however indicator species for each estuary were identified. White shrimp and blue crabs decreased in mean abundance during drought periods and also changed their spatial distribution.

Hydrologic pulsing in coastal wetland and saltwater pond ecosystems.
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Hydrologic connectivity is a critical factor in aquatic ecosystems for maintaining overall system integrity and organization, including the regulation of nutrient cycling, species diversity and primary production. Salt marsh ecosystems are often thought to be at or near steady state, but given increasing climate variation (e.g., droughts) a "pulsed steady state" framework may provide an alternative paradigm for understanding how hydrologic pulsing works to regulate these complex systems. Recent and prolonged drought conditions throughout the San Antonio/Guadalupe watershed have led to both decreased local precipitation in coastal settings and diminished freshwater inflows to the greater estuary. Herein we review the spatial and

temporal trends in both salt marsh salinity and Carolina wolfberry (*Lycium carolinianum*) phenology from 2011 - 2013 at three sites at the Aransas National Wildlife Refuge. During peak drought conditions in August of 2011, approximately 30% of saltwater ponds were completely dry and ponds with water had salinities ranging from 40.79ppt to 140.68ppt – considerably higher than the salinity of the adjacent San Antonio Bay (~35ppt). Despite the "freshening" of the system in 2012, the phenology of wolfberry plants continued to be altered with leaf, flower and berry production all displaying a departure from the documented phenology during previous seasons of higher freshwater inflows. Our data illustrate the presence of a hydrologic connectivity gradient between bay water and the marsh surface, which may be an important factor linking how hydrologic pulsing events influence landscape-level variation in salt marsh vegetation dynamics.

Nitrogen and organic carbon delivery to the coastal ocean from Texas rivers.
Claire G. Griffin* and J. W. McClelland; The University of Texas at Austin, Marine Science Institute. *(Student Presentation)*

Recent research in a variety of environments have highlighted the importance of linking discharge across the hydrograph with constituent concentrations and export. High flow events have been historically under-sampled, yet may be responsible for large portions of annual nutrient and organic matter export. This is particularly true for semi-arid river systems, such as in Texas. During the 2012 water year, as much as 2/3 of the annual discharge occurred during storm events in the larger river systems within the state. This study focuses on nitrogen and organic carbon dynamics in four Texas rivers (Nueces, San Antonio, Guadalupe and Colorado), with targeted sampling of high flow events to fully characterize their importance to constituent loading. We found that in three of the rivers, nitrate concentrations were diluted during very high flow, while organic matter concentrations increased. In the Nueces river, however, a reservoir very low in the watershed acts to diminish differences between flow conditions. Even when discharge varies by an order of magnitude, there is very little change in nutrient or dissolved organic matter concentrations. These results highlight that natural storm events are very different in terms of chemistry from regulated flow releases from reservoirs. Thus, storm events may be important not only for their freshwater delivery, but also for the relative nutrient and organic matter supply to estuaries.

Suspended sediment dynamics of shallow wind-driven estuaries.
Anthony Reisinger* and J. C. Gibeaut; Harte Research Insititute at Texas A&M University - Corpus Christi. *(Student Presentation)*

Suspended sediments carried to estuaries by freshwater inflows, ocean exchanges, and resuspension by waves are an integral part of estuarine systems. Major estuaries in Texas (Galveston, Matagorda, and Corpus Christi Bays) are shallow, wind-dominated systems, prone to wave resuspension of sediment. These estuaries exist along a climate gradient, and their average annual freshwater inflow decreases 10 fold from north to south, normalized by bay volume, while marine sediment input is minimal due to their microtidal setting. To understand sediment dynamics of these estuarine systems a comparative analysis was conducted using wave models,

inflow data, and suspended sediment as represented by total suspended solids (TSS) and turbidity collected by state agencies. This analysis shows that inflow and wave resuspension are the primary drivers of estuarine sediment dynamics. The source of the suspended sediment, however, differs among estuaries. TSS concentrations and turbidity in Galveston Bay are influenced by inflow, while concentrations to the south correlate more with wind-wave energy. Therefore, we hypothesize that as dewatering continues, sedimentary processes on the Texas coast will shift from inflow to resuspension dominance.

To settle or not to settle? Picky blue crab megalopae may bias efficiency of hog's hair collectors under varying environmental conditions.

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"Hog's Hair" collectors are simple artificial settlement substrates that have been used in over 30 peer reviewed papers to quantify the settlement of blue crab (*Callinectes sapidus*) megalopae. Despite the broad use of hog's hair collectors, few studies have critically examined the limitations of this method, although issues of underestimation and poor correlations to the plankton have been raised in the literature. The results of a flume experiment and regular field sampling indicate that the settlement rate of blue crab megalopae on hog's hair collectors is incredibly low compared to the encounter rate. The flume experiment also showed that settlement rate varies significantly with the current speed, and that small scale turbulent features may play a role modulating settlement in megalopae. These results suggest that variability in the flow environment could potentially confound comparisons of megalopae abundance between sites and over time, and that current speeds are an important factor to account for in future studies using hog's hair collectors.

Comparing performance of five nutrient phytoplankton zooplankton (NPZ) models.

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Modeling nutrient cycle dynamics in the open ocean based on the well-known interactions among nitrogen, phytoplankton, and zooplankton (NPZ) is well-established. Difficulty arises in applying this methodology to multiple coastal systems because of differences among geography, water chemistry, microbial interactions, weather patterns, and sedimentary nutrient cycling. Current trends in ecological modeling are toward more complex modeling relationships and mathematical functions. Four published NPZ models and a new model are compared based their varying number of equations, mathematical complexity, and required parameters. The new model adapts NPZ interactions to shallow estuary systems by adding a benthic consumption component as a nutrient producer consumer (NPC) system. Each model is calibrated and validated for two bays in the western Gulf of Mexico: San Antonio Bay, Texas, USA, and Copano Bay, Texas, USA. Daily riverine nutrient inputs are used as the model driver while

historical measurements are used for calibration and validation. The five models are compared for their ability to simulate the observed bay response of primary production in both locations. The new model simulates primary production closer to measured observations than other models due the inclusion of benthic consumption dynamics. Additionally, differences of complexity between NPZ models have no relationship to overall goodness of fit. Models produced nearly identical results regardless of different relationships and mathematical formulas. This study shows that adding mathematical complexity only provides marginal gains in practice while decreasing portability, and that NPZ can be extended for coastal zone applications.

Impact of drying associated with drought on the rapid release of polycyclic aromatic hydrocarbons from salt marsh sediments in South Texas, USA.

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Dry-wet cycles occur frequently in wetland sediments and can impact geochemical properties of the sediments. In this study, we examined drying impact on the "rapid" release of polycyclic aromatic hydrocarbons (PAHs) from salt marsh sediments in Nueces Delta, South Texas, where PAHs were sourced mainly from coal or biomass burning based on diagnostic ratios of PAH isomers. Among the 16 EPA priority PAHs examined, phenanthrene, fluoranthene and pyrene were released preferentially into solution within 1-3 days after dried sediments were rewetted with a solid/water slurry ratio of 1/100. The percentages of PAHs released from dried sediments ranged from 0.3-3.9%. We also examined the release of PAHs from different grain size fractions (<32, 32-63, 63-125, 125-300μm). The 125-300-μm fraction released the highest percentage of total PAHs (9.2%), suggesting that PAHs associated with relatively fresh plant debris are released readily. Drying increased the apparent hydrophobicity of sedimentary organic matter (SOM), as more added deuterated phenanthrene was sorbed to dried than to wet sediments. Therefore, the increased release of PAHs from dried sediment may be caused by structural changes of SOM, such as exposing its hydrophobic interior, where the PAHs are concentrated. These results help predict the fate of organic contaminants during drought/flood oscillations and provide information needed to develop remediation strategies.

Gulf Integrated Spill Consortium (GISR): Petroleum in the water column in the vicinity of the Deepwater Horizon spill.

Terry L. Wade*, S. T. Sweet, J. L. Sericano, D. Shi, N. L. Guinasso; GERG Texas A&M University.

Sources of hydrocarbons in the water column include oil spills, natural seepage, oil production activities, ship activities, coastal run-off and atmospheric deposition. Total scanning fluorescence (TSF) is an effective screening tool to detect the presence of aromatic hydrocarbons derived from petroleum in water samples. TSF analyses of over 300 discreet water samples collected at various depths throughout the water column during and soon after the Deepwater Horizon (DWH) Spill detected aromatic hydrocarbons (Wade et.al, 2011 a,b) in some samples. Selected samples analyzed for polycyclic aromatic hydrocarbons (PAH) confirmed the presence of petroleum in samples with elevated TSF. Additional water samples (337) were collected through

out the water column on July 2012 GISR cruise on the R/V Pelican in the vicinity of the DWH and analyzed for TSF and estimation of total petroleum hydrocarbons. Larger water volumes (2 to 4 L) were collected to at selected depths to provide lower detection limit to better characterize low concentrations as it. The presence and spatial extent of petroleum two years following the spill will be compared to results during and just after the spill.

Deep-sea benthic footprint of the Deepwater Horizon blowout.

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Oil from the Deepwater Horizon blowout reached the bottom of the deep-sea in the Gulf of Mexico. As part of the response to the accident, cruises were deployed in fall 2010 to measure potential impacts on macrofauna and meiofauna – the two main soft-bottom benthic invertebrate groups. Sediment was collected using a multicorer so that samples for chemical, physical and biological analyses could be linked together. The footprint of the oil spill was identified by creating a new variable with multivariate analysis and mapping the new variable in a geographic information system. Changes in abundance and diversity of these fauna extend to 3 km from the wellhead in all directions covering an area about 24 km squared; and up to 17 km towards the southwest and 8.5 km towards the northeast, covering an area 148 km squared. Benthic effects were correlated to total petroleum hydrocarbon, polycyclic aromatic hydrocarbons and barium concentrations, and distance to the wellhead; but not distance to hydrocarbon seeps. Thus, benthic effects are more likely due to the oil spill, and not hydrocarbon seepage. Recovery rates in the deep sea are likely to be slow, on the order of decades or longer.

DWH blowout effects on the deep sea macrobenthic communities.

Travis Washburn*, Adelaide Rhodes, and Paul Montagna; Harte Research Institute at Texas A&M University - Corpus Christi. *(Student Presentation)*

In April of 2010, the Deepwater Horizon blowout resulted in the largest accidental oil release in history. The release of oil took place as two incidents: the common surface slick with short residence times and a subsurface deep water plume with relatively unknown persistence times. In the fall of 2010, benthic cores were collected in the in the northern Gulf of Mexico at depths from 76 to 2767 meters. Stations ranged from <1 to approximately 200 kilometers from the DWH wellhead. Macrobenthic infaunal assemblages were analyzed and compared. The major taxa in this study had different feeding strategies (e.g., depost- vs. suspension-feeders) and sensitivity to pollution. Abundances and family diversity were examined as possible spill indicators. Community composition was analyzed at various distances from the spill with non-metric multidimensional scaling. The goal of this study was to find oil effects on the benthos and their geographic extent. This study presents over two years of work performed to assess potential impacts of the blowout to deep sea benthos.

Acute toxicity of dispersed oil on blue crab megalopae: Microbial surfactants as potential bioremediators.

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During the Deepwater Horizon incident in 2010, approximately 1.8 million gallons of Corexit® dispersants were approved for use directly onto the released oil. Blue crab (*Callinectes sapidus*) megalopae are pelagic and are likely to be one of the first organisms exposed to spilled oil and applied dispersants in open-ocean and nearshore waters. The commercial and ecological significance of this species makes establishing toxicity effects of oil and dispersants vital. This study examined acute toxicity of Corexit® 9500, Corexit® 9527, and Microblaze® (a microbial surfactant) alone and in combination with crude oil. In addition, Microblaze® was applied to crude oil dispersed with each Corexit® dispersant to investigate the combined effect of Microblaze® on the toxicity of the Corexit® 9500, 9527and crude oil mixtures. Blue crab megalopae were exposed for 48 hours to varying dosages of each treatment. Preliminary results indicate that oil treated with dispersants was more toxic than either oil or dispersants alone and Microblaze® was essentially non-toxic. Additionally, results indicate a synergistic effect of the microbial surfactant on the dispersed oil, lowering the toxicity after 12-hours. Such research may provide essential baseline data needed to determine the optimal dosing of dispersants. If this technique is found to be a legitimate method of bioremediation, oil spill response protocol may be revolutionized making for a cleaner and substantially less toxic event for the affected ecosystems as well as decrease the intensity and duration of human health concerns.

Resource management by the Coastal Bend Bays & Estuaries Program.

Ray Allen*; Coastal Bend Bays & Estuaries Program.

CBBEP is engaged in a number of hands-on management activities including colonial waterbird rookery island enhancement, marsh restoration in Nueces Bay, and restoring the natural hydrology of wetlands on Matagorda Island. This presentation will provide an overview of these and other projects being implemented by CBBEP.

Progress of a restored oyster reef in South Texas: The first year.

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Oyster reef habitat was restored in the Mission-Aransas Estuary, Texas in summer 2011. The restoration employed a reef complex design, consisting of 8 mounds covering nearly 4 acres in Copano Bay. Sampling trays were deployed on the restored reef and nearby natural reef during early fall 2011. Trays were retrieved from each site during 3 sampling periods in 2012. The restored reef has experienced significant oyster recruitment during the first year post-restoration. By the end of the first year, total oyster numbers and average oyster size were comparable between the natural and restored reef sites. Several oysters on the restored reef have reached harvest size (≥ 76 mm) within the first year. Oyster numbers increased between February and

June, but declined between June and September on both the natural and restored reef sites. We believe this may be due to high salinities evident during the late summer, and increased exposure to disease (*Perkinsus marinus*). Water filtration rates were calculated for both the natural and restored reefs based oyster size, temperature, salinity and total suspended solid concentrations. Results indicate that the restored reef is successful in providing this service at the same magnitude as the natural reef after just one year. Fauna communities on the restored and natural reefs are also compared. Monitoring will continue through 2013.

Comparative habitat functions of alternative substrates used for oyster reef restoration.
Lindsey M. George*, Jennifer B. Pollack, Delbert L. Smee, Paul A. Montagna; Texas A&M University – Corpus Christi. *(Student Presentation)*

Oyster reef habitats have declined from historic levels due to overharvest and degraded water quality. When oysters are harvested, an important component of their habitat is also removed: the oyster shells on which the spat typically settle. Oyster shell is the preferred substrate used in restoration. In Texas, shell must be purchased from wholesalers and is expensive and not readily available. This study incorporated laboratory and field experiments to assess habitat value of lower cost alternative substrates (crushed concrete, porcelain, limestone, and river rock, as well as oyster shell) for reef resident fishes and macro-invertebrates. Field studies utilized replicate trays of each substrate type throughout St. Charles Bay, TX during spring and summer 2012. Trays were retrieved after four months and assessed for oyster spat settlement and faunal diversity and density. Laboratory experiments used these substrates to observe prey mortality and refuge in the presence of a predator (e.g. pinfish, blue crab). Results may enable future restoration plans to be implemented at a lower cost while providing similar habitat functions.

Crunching the numbers: The importance of offshore artificial reefs to Texas fisheries.
Matt J. Ajemian*, J. J. Wetz and Gregory W. Stunz; Harte Research Insititute at Texas A&M University - Corpus Christi.

During the last few decades, artificial reef development has been undertaken to create new habitat for restoration, increase fisheries production, and bolster recreational diving and fishing. While the debate over attraction versus production continues, most scientists agree that artificial reefs have the potential to positively affect demersal marine communities and increase opportunities for natural resource use by forming the base of the food web. The state of Texas has one of the largest reefing programs in the United States, yet there have been few assessments of fish populations inhabiting these artificial structures. We are currently engaged in an intensive offshore monitoring program of 15 artificial reefs along the Texas coastal bend. These sites vary in structure and relief and include toppled rigs, cut-off rigs, concrete culverts, liberty ships, and barges. Our surveys combine the use of remotely operated vehicle (ROV), SCUBA, and vertical longlines to quantify the abundance and diversity of fishes inhabiting these reefs. In our first year of assessment we observed >50 fish species (including invasive lionfish) and confirmed the presence of a variety of commercially and recreationally exploited snappers, groupers, and jacks. Year 1 data also suggest that reef type influences fish community structure and abundance patterns. Future efforts include a comparison of gear selectivity and performance at select sites

and continued reef fish monitoring across the coastal bend region. These studies aim to guide developers on best practices for artificial reefs in the Texas, the Gulf of Mexico, and beyond.

Using real-time GIS modeling and an interactive tabletop to help coastal communities plan for the future.

J. Jacob, S. Mikulencak, and Heather Wade*; Texas A&M University, Texas Sea Grant.

The Cities of Rockport, Fulton, and Aransas County are located on Texas' central Gulf Coast. The city and county have a population of nearly 24,000 residents, and is part of the Corpus Christi metropolitan area, population 416,000. Much of the area is low-lying in coastal surge and flood zones, and is virtually surrounded by the 185,000-acre Mission-Aransas National Estuary Research Reserve (MANERR). It is a community where the economy, quality of life, and its environment is inseparable from its coastal location. Residents move here attracted to the charm of coastal living. But it is also a community with a future tied to climate change. Likely, these communities will directly experience rising sea level, more frequent storms, higher surges, and longer droughts. Public and private resources, facilities, and activities will likely be disrupted or damaged by these events. Educating and working with local officials to identify steps they can take to mitigate these impacts is what this project is about.
Communities that are informed about the consequences of land use decisions in areas of potentially increasing coastal hazards will be in a better position today to plan and prepare for tomorrow. TX SeaGrant will update and provide a participatory GIS tool in partnership with the public and local officials to develop future growth scenarios to evaluate strategies for adapting to coastal change. The question facing communities is not if growth will occur, but where and how it will occur. The CHARM model (Community Health and Resources Management) supported by a weTable setup allows citizens and officials to work in a team setting to propose answers to where and how growth will occur (URL in reference). The public can outline areas of growth and redevelopment in the model, while the model calculates impacts to resiliency in real-time. Leading up to a growth-modeling charrette, TX SeaGrant will host a series of Coastal Resiliency Index assessments, a speaker's fora, and a set of project meetings with local officials to incorporate local knowledge in the model. A final Rockport-Aransas resiliency report will summarize public input outcomes, review growth and resiliency scenarios, and provide local officials with tools to address vulnerabilities.

Population genetics of eastern oysters (*Crassostrea virginica*) in Texas.

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We used genetic cluster analysis and a common geographic interpolation tool, inverse distance weighting (IDW), to project a genetic landscape of eastern oysters (*Crassostrea virginica*) in a transition zone between genetically distinct populations in the western Gulf of Mexico. The genetic landscape was then qualitatively overlaid onto geographic (land) barriers, and quantitatively compared to environmental variables in an effort to develop hypotheses regarding the mechanisms driving population divergence. The data indicate two genetically divergent oyster populations which converge near northern Corpus Christi Bay, and southern Aransas Bay.

At both broad (entire coast) and local (Aransas Bay only) geographic scales, genetic identity was not significantly correlated with any factor other than latitude, suggesting that water features such as annual mean salinity, temperature, dissolved oxygen and turbidity have not significantly influenced the distribution of the two populations. The presence of a secondary hybrid zone between divergent populations, rather than divergent selection in response to heterogeneous hydrological variables, is likely driving the observed pattern of genetic structure. Compared to previous studies, the presence of southern population oysters in Corpus Christi and Aransas Bay suggests a recent expansion of this population into areas previously inhabited only by northern oysters.

Genetic diversity and natal origins of green turtles (*Chelonia mydas*) in Southern Texas.

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We examined the genetic diversity and natal origins of green turtles from a well known foraging area in the western Gulf of Mexico. Bayesian mixed-stock analysis of mitochondrial DNA haplotypes was used to demonstrate that an overwhelming percentage (~ 95%) of individuals in the western Gulf of Mexico foraging group likely originate in other Gulf of Mexico and northern Caribbean rookeries, with smaller contributions coming from the western and southern Caribbean, and potentially the Mediterranean Sea. Management of green turtles in the western Gulf of Mexico will be improved by linking conservation efforts aimed at this foraging group to turtle aggregates occurring in other critical habitats within the recently defined northwest Atlantic green turtle regional management unit.

Preliminary observation of fibropapilloma virus in green turtles (*Chelonia mydas*) captures from Texas' Lower Laguna Madre.

Tasha Metz*; Texas A&M University at Galveston.

Texas waters provide essential habitat to five protected sea turtle species, including the green turtle (*Chelonia mydas*). Entanglement netting surveys deployed by the Sea Turtle and Fisheries Ecology Research Lab (STFERL) since 1991 to assess abundance, distribution, and habitat use of greens within seagrass and jettied habitats of Texas' lower Laguna Madre (LLM) have yielded 311 captures and provided evidence for an exponentially increasing population that likely represents the largest northern Gulf concentration west of Florida. Fibropapillomatosis (FP) is a sea turtle condition likely caused by a herpes virus and is characterized by internal and external tumors that compromise a turtle's ability to swim, see, feed and escape from predators. Although this disease has been extensively documented in Florida and Hawaiian green turtles since the 1930's and 1950's, respectively, it was not recorded in Texas greens prior to May 2010 , when two stranded turtles were found near South Padre Island and Port Aransas. Subsequently, the STFERL's entanglement net capture of 31 greens from the LLM in August 2010 included 11 individuals exhibiting tumors on the eyes and the ventral side near the flippers and cloaca. A potential timeline of introduction of the FP virus to the Texas population and a preliminary infection rate has been developed from these recent and historical STFERL captures. The new

emergence of FP in greens inhabiting LLM raises concern as to the disease's impact on continued population growth and the ability to develop response initiatives to contain the spread of this infectious agent.

Scope for growth of three ecologically important bivalve species native to the Upper Laguna Madre, Texas.

Lee Schoech*, Kim Withers, Rachel Fern; Center for Costal Studies at Texas A&M University Corpus Christi. *(Student Presentation)*

Bivalves are important constituents of the seagrass community in estuarine ecosystems. In order to determine optimal conditions necessary for adequate growth for reproduction, scope for growth (SFG) is frequently used. SFG integrates filtration rate, assimilation efficiency, respiration rate, and ammonia production to estimate metabolic activity (Widdows 1995). SFG is highly sensitive to environmental perturbations, including exposure to harmful algal blooms (HABs), and is especially appealing as a stress response indicator due to the fact that it represents an integration of the whole organism's response to environmental conditions (Gobler & Sundra 2012). This study establishes SFG for, *Argopecten irradians amplicostatus, Chione elevata* and *Mulinia lateralis,* which are key food sources for economically and recreationally important fish species. Various environmental conditions such as extreme salinities (Marsden 2004), temperature (Marsden 2004) high turbidity (Buskey et al.1997), harmful algal blooms (Shumway 1990; Gobler & Sunda 2012) and low preferred food availability (Wong & Cheung 2001) influence SFG. A two-way ANOVA will be used to determine the main and interactive effects of treatment diet and species on SFG and absorption efficiency. Oxygen consumption, ammonia excretion and food consumption will be compared using a two-way analysis with a covariate of either shell length, shell width or animal dry weight, the main effects of treatment diet and species. Results from this study will be used as a baseline in future studies to determine lethal and sub-lethal effects of *Aureoumbra lagunensis* DeYoe et Stockwell, the Texas Brown Tide organism, as well as studies of other stressors on the target bivalve species.

Spatial dynamics of blue crab spawning in Texas bays, estuaries, and offshore waters.

M. Zachary Darnell*; The University of Texas at Austin, Marine Science Institute.

Blue crabs have a migratory life cycle, occupying a variety of estuarine and offshore habitats during different life history stages. One of the most dramatic migrations occurs following mating, when female blue crabs migrate from low-salinity mating areas to high-salinity spawning areas in the lower estuary and coastal ocean. To date, the vast majority of research on the blue crab spawning migration has focused on the Atlantic Coast, where estuarine conditions differ dramatically from conditions in Texas estuaries, where tides are minimal and salinity gradients may be reversed or absent. I investigated spawning locations and seasonality in Texas estuaries and offshore waters using data from fishery-independent trawl surveys conducted by TPWD and the Gulf States Marine Fisheries Commission. Spawning generally occured in areas with salinities > 22 ppt. Spawning took place both inside the estuaries and offshore, with the relative importance of offshore spawning areas related to the salinity regime within the estuary. In low-salinity areas (e.g., Sabine Lake), spawning occurs further offshore while in high-salinity

areas (e.g., Lower Laguna Madre), spawning takes place primarily within the estuary. These differences in spawning locations may have implications for population connectivity, especially under drought conditions, and emphasize the need for place-based management of the blue crab spawning stock.

Rapid population growth of *Luidia clathrata* (striped seastar) in Matagorda Bay, Texas.
Nicole F. Poulson* and J. O. Harper; Texas Parks and Wildlife Department-Coastal Fisheries.

TPWD bay trawl sampling (1980-2012) shows a rapid increase of striped seastar (*Luidia clathrata*) catch rates in Matagorda Bay beginning in 2008. Though other Texas bay systems and nearshore waters show fluctuations in *L. clathrata* catch rates, the increase since 2008 is Matagorda Bay specific. Increased catches of *L. clathrata* are not obviously tied to salinity, temperature, or dissolved oxygen fluctuations, though *L. clathrata* are found in greatest abundance in salinities from ~20 - 40 ppt. Greatest CPUEs are found near the center of Matagorda Bay close to the dredged shipping channels. TPWD biologists are analyzing Matagorda Bay resource monitoring data for other species with similar changes in catch rate. Currently, causes for the population growth of *L.clathrata* in Matagorda Bay remain speculative.

Spheres of interest: From racing bubbles to sedentary mud balls, some marine constructs emulate the sphere.
Tony Amos*; The University of Texas at Austin, Marine Science Institute.

From fish eggs to cabbage heads, the sphere is a common geometric form that marine organism assume. In years of observing the littoral environment in the Coastal Bend I have been intrigued by some spherical and spheroidal marine constructs that are created by physical processes acting on non-living materials. 1) Grass balls in the surf: first reported at the 2003 TBEM (Amos, Bohn and Amos, 2003) the recent drought has reduced the production of these mini-habitats to zero in the 2012 season. 2) Octocoral balls. These more spheroidal constructs are formed from Sea pens (*Virgularia sp*.) and Sea whips (*Leptogorgia sp.*) and often incorporate fishing line and other plastic debris. 3) Mud Balls: These are potato sized and larger, irregular spheres that are the product of dredging operations and incorporate shelly and rocky material. Following dredging they get buried in the beach sand and mat emerge months or years after the dredging has ceased. 4) Wind Tide balls: May or may not exist, they are the product of the drought/flood cycle on the back-island wind-tidal flats. 5) Racing bubbles: completely spherical bubbles a few millimeters in diameter surface tension keeps these racing over the sea surface in the surf zone. Difficult to document, conditions for their formation remains a mystery.

Abstracts for Poster Presentations

Mangroves invading Texas salt marshes: Does it affect microclimate?
Hongyu Guo*, Steven C. Pennings, Anna R. Armitage, Carolyn A. Weaver and Zoe Hughes

Black mangroves (*Avicennia germinans*) are expanding into areas historically occupied by salt marsh plants on the Texas coast. Over the coming decades, mangrove distributions are expected to continue expanding due to rising global temperatures and milder winters. Will this matter? To examine the consequences of these vegetation changes on microclimate, we set up large experimental plots on Harbor Island in Port Aransas, TX, in which we manipulated the density of mangroves. The results so far show that the changes in mangrove cover had significant influences on microclimate. In the fall of 2012, mangrove cover affected wind speed and variation in wind speed. Mangrove cover did not affect average temperature or humidity, but did affect variation in temperature and humidity. We are continuing to monitor how mangrove cover affects microclimate, and hypothesize that the effects may differ among seasons. By altering microclimate, mangrove cover is likely to affect almost every other species that occurs in coastal wetlands, providing conditions that are more favorable for some and less favorable for others.

Restoring coastal thornscrub forests in South Texas using herbivore exclosures, seedling protective tubes, and invasive grass herbicide.
K. N. Dick*, H. D. Alexander, and J. Moczygemba (*Student Presentation*)

The Tamaulipan thornscrub ecosystem consists of multiple species of short-statured, drought-resistant shrubs and is found throughout the semi-arid, sub-tropical regions of northeastern Mexico and southern Texas. As a result of anthropogenic land changes including urbanization, agriculture, and invasion by exotic grasses, this coastal forest ecosystem currently occupies less than 1% (200,000 km2) of its original range. Ecologically, thornscrub species stabilize soils and provide critical habitat for numerous fauna, including the federally endangered ocelot (*Leopardus pardalis*). To restore thornscrub habitat, the U.S. Fish and Wildlife Service has planted thousands of Tamaulipan thornscrub seedlings, of approximately forty species, at Laguna Atascosa National Wildlife Refuge (LANWR) in coastal south Texas. In February 2013, we treated ~ 1,200 of these seedlings with three management techniques (herbivore exclosures, seedling protective tubes, and invasive grass herbicide) used singly and in combination. Basal diameter, seedling height, browse intensity, and invasive grass cover were measured on each seedling immediately following treatment and will be assessed subsequently at 3-mo intervals for a 2-yr period. Findings from this research will be used to develop management protocol to restore coastal thornscrub forests and provide baseline data for assessing future changes in thornscrub habitat.

Coastal thornscrub forest restoration in South Texas: Effectiveness of different management techniques.

Heather D. Alexander*, J. Moczygemba, I. Prado

Coastal thornscrub forests occur throughout south Texas and provide critical habitat for numerous fauna, including the Federally-endangered ocelot and a variety of migratory songbirds. However, <1% of original thornscrub remains due to conversion for agriculture and urbanization. One approach currently underway to restore thornscrub habitat around core ocelot populations in south Texas is the planting of native seedlings and subsequent control of competing invasive grasses through herbicide application. Over the last five years, ~ 150,000 seedlings have been hand-planted across 150 acres in the Laguna Atascosa National Wildlife Refuge (LANWR), location of one of two remaining breeding populations of ocelots in the U.S. Despite the importance of these restoration efforts, the effectiveness of this approach and feasibility of alternative strategies have yet to be established. In February 2012, a pilot study was initiated at LANWR to assess the effects of various management strategies (fire, invasive grass herbicide, acetic acid, and seedling protective tubes) on thornscrub seedling growth and survival. One year post-treatment, we quantified seedling growth characteristics (basal diameter, height) and browse intensity in relation to microenvironmental conditions (soil moisture, temperature, and conductivity). We found that seedlings growing in protective tubes tended to be larger and contain less browse than those that were unprotected. Soils within tubes tended to have higher moisture. This project will fill this knowledge gap by determining the empirical relationships between thornscrub seedlings and their abiotic and biotic environments and using these relationships to predict seedling success under different management strategies.

Modeling controls on the hydrodynamics of tidal freshwater ecosystems to prepare for coastal climate change.

Allan Jones *, Kevan Moffett, James McClelland (*Student Presentation*)

Coastal estuaries are important to society and to our world's bio- and geographic diversity. However, an integral aspect of the estuarine environment that has been largely overlooked by riverine and estuarine science is the riverine tidal freshwater ecosystem (TFE). Riverine science has overlooked the TFE due to its tidal dynamics, while estuarine science has neglected the TFE because of its freshwater chemistry. The TFE receives freshwater from upstream, which is balanced by losses at the head of the estuary through diffusion and mixing. The volume and residence time of freshwater in the TFE control the rate and amount of freshwater and nutrients entering the estuary. Since a standard, quantitative definition of a TFE is lacking, this study first defines a TFE in physically-based terms. We define the upstream boundary as the point where the discharging river's momentum is balanced by the encroaching tidal signal's momentum, i.e., the furthest point upstream experiencing oscillating flow. We define the downstream boundary using a selected freshwater concentration threshold. On either side of these boundaries exist transitional zones: upstream, tidal damping continues while river flow is remains unidirectional; downstream, a brackish mixing zone connects the TFE to the estuary. The ultimate goal of the proposed research is to understand the role of the TFE in estuary ecosystem change. As a first step toward this goal, we have developed a one-dimensional model to assess the sensitivity of the

location, volume and residence time of the TFE to environmental variables (e.g., precipitation frequency, river discharge, tidal amplitude).

Black mangrove (*Avicennia germinans*) leaf litter decomposition as indicator of ecosystem function in estuaries in Lower Laguna Madre, Texas.
Mario Marquez *, Alejandro Fierro-Cabo, Carlos Cintra-Buenrostro (*Student Presentation*)

Estuaries are among the most productive aquatic systems in the world, with important energetic pathways along coastal zones generated within them. Due to their location at the freshwater-ocean interface, they are subject to frequent disturbing events, both anthropogenic and natural. Four estuaries (South Bay, San Martin Lake and two sections of Bahia Grande) along the Brownsville Ship Channel near the southern terminus of the Lower Laguna Madre (LLM) were studied, each with different disturbance histories varying from pollution, land-use change, altered hydrological and salinity regimes. We examined decomposition as one functional process, by measuring decay rates and nitrogen dynamics. The overlying goal of this study is to compare the functional state of one reference and three disturbed estuaries, based on the characterization of decomposition process. Mature leaves of black mangrove (*Avicennia germinans*) were used as the decomposition substrate since the species is endogenous to these systems. We estimated decay constants and half-lives using single and double-exponential models. Stable isotope analysis (δ13C and δ15N) and C/N ratios of the decaying litter were used to compare N immobilization/release among sites. Preliminary results indicate that metrics derived from the decomposition process are useful functional indicators as they discriminate among sites with different disturbances.

Coastal prairie restoration in south Texas using prescribed fire, chemical, and mechanical methods.
Eric M. Verderber*, Heather D. Alexander, and J. Moczygemba (*Student Presentation*)

Coastal prairies are grassland-dominated ecosystems located along the coastal plains of Texas and Louisiana. These coastal grasslands provide habitat for numerous fauna, including the Federally-endangered Northern Aplomado Falcon, and buffer inland areas from storm surges and flood waters. Once covering vast areas in South Texas, coastal prairies now represent < 1% of their original acreage due to conversion for agriculture, rangelands, and urbanization. Remaining remnant patches are often seriously degraded due to the encroachment of woody species, which have been left unchecked for decades due to fire suppression and invasion of non-native grasses. In this study, we compare the effectiveness and financial feasibility of various management strategies used singly and in different combinations (prescribed fire, chemical, and mechanical) at decreasing woody vegetation cover (mesquite and huisache) and restoring coastal prairies within the Laguna Atascosa National Wildlife Refuge Bahia Grande Unit in deep south Texas. Pre-treatment vegetation surveys of understory vegetation cover and woody vegetation composition, size, and density were conducted in March 2013 on 27 research plots distributed across nine treatments (n = 3). Post-treatment surveys and monitoring will be conducted at a minimum of 3-mo intervals for a 2-yr period. Effective control of woody vegetation establishment is paramount in restoring the contiguous coastal prairie habitat required by

imperiled species like the Northern Aplomado Falcon, while minimizing the preferred "thick-brush" habitat utilized by many non-beneficial predators and invasive animal species, including feral hogs and Nilgai antelope.

Saltmarsh pond classification and fish community dynamics at the Aransas National Wildlife Refuge.

Niki Ragan* and Jeffrey Wozniak (*Student Presentation*)

In estuarine systems, inundation regime plays a vital role in shaping the physical and chemical characteristics of saltwater ponds. At the Aransas National Wildlife Refuge (ANWR), these saltwater ponds are scattered across the coastal marsh landscape, each possessing a varying degree of hydrological connectivity to marine water. Previous research in the region identified nekton usage of the greater marsh surface, while here we propose to determine fish presence and persistence in coastal saltwater ponds. In addition we will collect a wide range of physical and biogeochemical data to characterize the ponds in an attempt to determine how these environmental characteristics work to impact the composition of fish assemblages in ponds. These efforts will include verifying pond size and bathymetry, sediment and vegetation types and a wide range of pond water quality parameters (e.g., pH, dissolved oxygen and nutrient concentrations, etc.). Fish assemblages within the ponds will be collected through standard seining techniques with fishes being preserved and identified to the species level. Understanding the marsh pond dynamics at the ANWR, which is wintering grounds for the endangered whooping crane (Grus americana), is an important step in comprehending both food web dynamics and overall coastal management practices in the system.

A synthesis study of historical and spatial dynamics of hypoxia in the East China Sea and northern Gulf of Mexico.

Xinxin Li*, Thomas S. Bianchi, Lisa E. Osterman, Jun Zhao

The number of hypoxic zones in the coastal margin areas is doubling every decade due to the enhanced nutrient input caused by anthropogenic activities. Studies of hypoxia on globally-large river delta-front estuaries (LDEs) are of significant importance because they might affect the carbon cycling in this region and further influence global climate change. This study, for the first time, compared hypoxia in two of the largest LDEs in the world - Mississippi (Gulf of Mexico) and Changjiang (East China Sea) River mouth and adjacent shelf which have experienced frequent eutrophication and summer stratification. The hypoxia history can be tracked back to 1910 indicated by microfossil PEB index (low oxygen species) in sediment cores in the Mississippi LDE, while the occurrence of hypoxic bottom water in the Changjiang LDE began in 1941 based on an increase in low-oxygen tolerant foraminiferal microfossils in sediment cores with a chronology of over 60 years. Spatially, the hypoxia region has rapidly expanded from the Mississippi delta to a large portion of the Gulf of Mexico across the entire Louisiana shelf since last century. However, the hotspot of hypoxia region in the East China Sea is focused on the Changjiang Estuary where has the most anthropogenic nutrients input and the strongest summer stratification. These changes are consistent with the long term trend of nutrient loads and other biogeochemical proxies such as plant pigment biomarkers in the sediment cores sampled in a

wide area. Further work needs to be done considering that studies on hypoxia in East China Sea are sparse compared to the 20-plus years of monitoring in the Gulf of Mexico hypoxic zone.

An experimental test of the effects of disturbance frequency on the diversity of artificial reef fouling communities.

Jonathan Le*, David Hicks, Carlos Cintra-Buenrostro, Dale Shively (*Student Presentation*)

Disturbance magnitude and frequency are recognized as two of the principle factors influencing terrestrial and inter-tidal communities, but disturbance effects have not been comprehensively studied in sub-tidal communities. Biofouling communities consist primarily of shell-bearing and encrusting species that attach directly to substrate increasing the complexity of inhabited structures, associate sessile species that live on or within the primary species, and mobile species that migrate throughout the community. These communities are often the most important secondary producers of sub-tidal reefs along the South Texas coastline. In this study a series of steel plates were affixed on the Texas Clipper reef off the coast of South Padre Island, Texas and used as settlement plates for the recruitment of biofouling species. Equal magnitude disturbance treatments varying in frequency were applied over an experimental period of 140 days, after which the plates were removed from the reef and the biota of each plate were quantified and identified to the lowest possible taxonomic level. It was hypothesized that increasing disturbance frequencies would increase species richness until disturbance reached a critical threshold that inhibited pioneer species survival, in accordance with the Intermediate Disturbance Hypothesis (IDH). Preliminary results indicate a trend of increasing species richness and decreasing species evenness as disturbance frequency increases from a zero disturbance treatment (control) to frequencies of five weeks and ten weeks. More robust multivariate statistical analyses are planned to test for differences in community structure among the disturbance treatments.

Variation in elemental composition of the seagrass *Halodule wrightii* from the Lower Laguna Madre.

E. Triplett *, Claudia Tamez, J. Parsons, J. Kowalski and Hudson DeYoe (*Student Presentation*)

Elemental composition of tissue may be a useful tool to assess the condition of seagrass plants but little synoptic data exists. In conjunction with a seagrass survey in the Lower Laguna Madre during the summer of 2012, seagrass (*Halodule wrightii*) leaf, root and rhizome tissue was collected for elemental analysis from a subset of 160 sites used in the survey. In addition, a comparison of the elemental composition of *Halodule wrightii*, *Syringodium filiforme* and *Thalassia testudinum* collected at one site was completed. Elemental composition of the plant tissue was determined by ICP-MS. Among the 8 LLM sites, there were detectable differences in *Halodule* leaf tissue for the following elements: Ba, Ca, Na, Mg, Mn, Al, and Fe. For 6 of 13 elements (Na, Ca, Ba, Mg, Cd, Cr), there was a detectable difference among the 3 species. There was a significant difference amongst the plant components (leaves, roots, rhizomes) for all elements except Pb with levels decreasing from rhizomes to roots to leaves in all 3 species.

Coastal vegetation line dynamics along Mustang Island and North Padre Island, TX.
Marissa Dotson*, Diana del Angel, James Gibeaut (*Student Presentation*)

The Texas Open Beaches Act allows public access to Gulf-facing beaches landward of the mean high water line to the vegetation line. The legislation incorporates a dynamic rolling easement that allows access to migrate with changing shorelines. This study describes the historical trend of vegetation line position and the effects of shoreline change rates and beach maintenance on the position of the vegetation line along Mustang-North Padre Islands. Anthropogenic activities on the study site include driving on the beach and beach maintenance such as mechanical sargassum removal, beach scraping, and pushup of material against the dune face. Vegetation line movements were analyzed from georeferenced aerial photography from 1979-2010. The 1979-2010 trend shows a seaward movement averaging 36m and an average rate of change, estimated from linear regression, of 1.8m/yr seaward. This can be attributed to the recovery from dune blowouts. The short-term trend of the vegetation line, from 2005-2010, shows an average of 1.88m landward movement and a rate of change average of 0.34m/yr landward. This can be attributed to human activity and the long-term shoreline trend. Some areas of high maintenance correspond with seaward shoreline and vegetation line movement. Beach maintenance creates an artificial addition of sand to the foredune, which becomes vegetated extending the vegetation line seaward. On non-maintained beaches, the shoreline and vegetation line are moving landward, with the exception of Mustang Island State Park where driving is not allowed. Driving is destructive to incipient dunes and vegetation, whereas natural beaches promote dune accretion and vegetation propagation.

Size-at-age vs. size-at-stage: Environmental control of juvenile blue crab growth rates.
Sarah Cunningham*, M. Zachary Darnell, Edward J. Buskey (*Student Presentation*)

Growth rates are influenced by a number of factors including genetics, environment, and nutritional status. Although size-at-age is a commonly used metric for assessing growth rates, size-at-stage may be a more appropriate metric for species undergoing discontinuous growth. Growth rates are often assessed by measuring size-at-age. For organisms undergoing discontinuous growth, however, size-at-stage is a more appropriate measurement. Blue crab size-at-maturity has been the subject of much recent investigation due to declining crab sizes in many areas and spatial and temporal trends of decreased crab size at higher temperatures and higher salinities. We investigated growth rates of juvenile blue crabs *Callinectes sapidus* at different temperature and salinity combinations. Crabs were collected as megalopae, placed into experimental treatments, and monitored daily. Two temperatures (20, 30°C) and three salinities (20, 30, 40 ppt) were tested, for a total of 6 treatments. Twelve crabs were tested in each treatment. The experiment continued until the 6th juvenile instar was reached. Crabs at 30°C exhibited shorter intermolt periods but lower growth-per-molt than crabs at 20°C. Thus, size-at-age was greater for crabs held at 30°C, but size-at-stage was greater for crabs held at 20°C. These results indicate that temperature has a strong, direct effect on growth rates and size in blue crabs. Salinity, however, did not influence growth; spatial patterns of decreasing crab size at higher salinities are likely due to indirect effects mediated through food availability, food quality, or disease.

Conservation prioritization for Whooping Cranes in Aransas, San Antonio, and Matagorda Bay systems, Texas.
E. Smith *, F. Chavez-Ramirez, J. Gibeaut, and L. Lumb\

The last wild population of endangered Whooping Cranes migrates between breeding grounds in Northwest Territory, Canada, and wintering grounds along central Texas Gulf coast, USA. Whereas the breeding area supports an expanding population, the wintering area may be a limiting factor to achieve the downlisting recovery goal of 1000 individuals and 250 nesting pairs. A collaborative approach to achieve conservation acquisition/easement goals of at least 125,000 ac is necessary by using GIS to identify essential habitats adjacent to the core recovery area. Overall objectives involved developing maps that target current needs and evaluating landscape changes under various sea-level rise scenarios. Results and recommendations from the current needs objectives will be presented. Point data from recent Whooping Crane surveys were joined to land cover classes to provide metrics that delineated expansion areas and quantified potential winter territories. In the project study area, overall habitat extent that appears suitable for potential crane winter use will meet the 125,000 ac goal. However, an increasing number of subadults in the population will also require additional habitat that should be quantified. These results will direct conservation strategies to facilitate endangered Whooping Crane recovery under current recovery predictions.

Environmental parameters and eukaryotic plankton dynamics in the Mission-Aransas estuary, Texas from 2011-2012.
Aubrey R. Lashaway* and Deana Erdner (*Student Presentation*)

As the base of the food chain, plankton growth and composition effects the cycling of nutrients and organic matter within ecosystems, and supports production at higher trophic levels. The overall goal of this project was to examine how natural environmental fluctuations, such as changes in nutrients, temperature, and salinity, influence eukaryotic plankton community structure, and if community structure and function are related in situ. To achieve this, we examined environmental parameters as well as the diversity and biomass of phyto- and zooplankton communities in a subtropical estuary located within the Mission-Aransas National Estuarine Research Reserve. Water samples were collected monthly at five sites from September 2011 to August 2012 and analyzed for a suite of abiotic and biotic variables. Plankton diversity and community structure were evaluated by using the terminal restriction fragment length polymorphism (t-RFLP) method and assessment of size fractionated chlorophyll-a, microzooplankton and mesozooplankton biomass concentrations. Results of the hierarchical clustering analysis (including MANOVA) and nonmetric multidimensional scaling analysis used to examine the relationships between community composition and environmental variables will be presented.

Facility Map and Directions

2013 TBEM is located at the <u>main campus</u> (star) of The University of Texas Marine Science Institute.

Map of the University of Texas Marine Science Institute campus.

University of Texas Marine Science Institute Visitor Center

University of Texas Marine Science Institute Main Campus

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