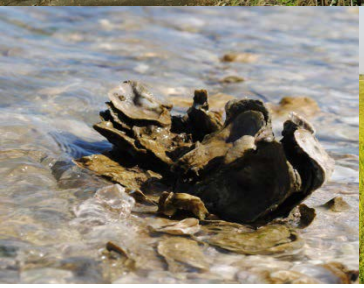
2015 Texas Bays and Estuaries Meeting




The University of Texas Marine Science Institute
Port Aransas, Texas
April 8-9, 2015

Texas Bays and Estuaries Meeting

TBEM

MISSION ★ ARANSAS
NATIONAL ESTUARINE RESEARCH RESERVE

THE UNIVERSITY OF TEXAS AT AUSTIN
Marine Science Institute
College of Natural Sciences

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Welcome!

The University of Texas Marine Science Institute is proud to host the 11th annual Texas Bays and Estuaries Meeting. We have a great program of talks and posters this year from all around the state and beyond! We are truly excited for the great turnout.

Please remember that all campus buildings are nonsmoking. Restrooms are located across from the auditorium in the Visitor's Center. Aunt Sissy's Kitchen will be providing lunch on both days and La Playa Restaurant is catering Wednesday night's dinner. Beer and wine will be available during the poster and Hors d'oeuvre session, and on the sunset cruise. You may wander freely with your drinks, but please do not leave the campus with them (unless on the boat). Authors will be at their posters from 5:00 to 6:30 p.m. during the poster session on Wednesday evening (April 8th).

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

See you again next year!

Texas Bays and Estuaries Meeting Committee

Follow the meeting on social media with #TBEM2015

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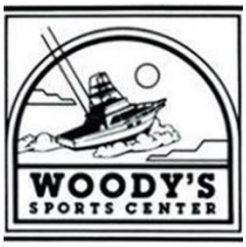

Invited Speakers Biographies

Dr. Becky Allee, Director (Acting), NOAA RESTORE Act Science Program

Dr. Allee is currently serving as the acting director for the National Oceanic and Atmospheric Administration's (NOAA) RESTORE Act Science Program and leads the science plan development team. As the acting director, Dr. Allee is the primary point of accountability for execution of the program and the primary interface to RESTORE Council and congressional staff, academicians, nongovernmental organizations, and other regional stakeholders and partners. Dr. Allee is also Senior Scientist NOAA's Office for Coastal Management – Gulf Coast. As Senior Scientist, Dr. Allee provides guidance and technical support to help identify priority objectives of ecosystem assessment and characterization and provides technical and scientific consultation and guidance on proposed activities for coastal resource management. Dr. Allee received her doctorate in biological sciences from the University of Arkansas. She also holds a Master of Science in biology from Stephen F. Austin State University.

Dr. Greg Stunz, Harte Research Institute for Gulf of Mexico Studies, Endowed Chair, Fisheries and Ocean Health, Director, Center for Sportfish Science and Conservation, and Professor of Marine Biology. Texas A&M University-Corpus Christi

A major focus of Dr. Stunz's research program is to provide scientific data for sustainable management of our marine fisheries and ocean resources to ensure healthy environments. Greg's research program is diverse but currently focuses on migration patterns marine life using a variety of state-of-the-art electronic tracking devices, how marine animals interact with their habitats, and the vital role that estuaries and near-shore waters play in sustaining marine populations. Specifically, his research includes understanding the roles of apex predators in Gulf ecosystems and tracking their movement patterns, dolphin-fish migration patterns and life history, red snapper ecology and management. Dr. Stunz current has several projects dealing with the sustainable management of many estuarine fish, such as spotted sea trout, red drum, and many others.

Dr. John Jacob, Director of the Texas Coastal Watershed Program and Professor and Extension Specialist, Texas A&M Sea Grant Program and the Texas AgriLife Extension Service through the Department of Recreation, Parks, and Tourism Science

Dr. Jocob's current project, Coastal CHARM (Community Health and Resource Management), focuses on enabling coastal communities in Texas to improve quality of life in cities and towns while preserving and enhancing the natural coastal environment. Dr. Jacob holds B.S. and M.S. degrees from Texas Tech University, and a Ph.D. from Texas A&M University, all in soils and natural resources. He is registered as a Professional Geoscientist with the State of Texas and is a Professional Wetland Scientist. Dr. Jacob is a recognized expert on Texas wetlands, having been active in consulting and research aspects of wetlands for more than 20 years. Dr. Jacob is co-author of the Texas Coastal Wetland guidebook, as well as the Texas Sea Grant Resilient Coast series on the built environment and wetlands.

Schedule

Wednesday, April 8, 2015

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

8:45 AM - **Welcome and Opening Remarks-** Dr. Robert Dickey, Director, The University of Texas at Austin, Marine Science Institute, Port Aransas, Texas.

-ECOSYSTEM SCIENCE-

9:00 AM - **National Oceanic and Atmospheric Administration's National Ocean Service: Serving Estuaries in the Gulf of Mexico**
Dr. Rebecca J. Allee; Office for Coastal Management – Gulf Region (*Invited Speaker*)

9:30 AM - **Gulf of Mexico Species Interaction (GoMexSI) project: More than just a database!**
[1]James D. Simons* and [2]Jorrit Poelen; [1]Center for Coastal Studies, Texas A&M University-Corpus Christi; [2]Data Analysis and Visualization Consultant

9:45 AM - **Gulf of Mexico Species Interactions (GoMexSI) database: Beyond the fishes!**
[1]Theresa Mitchell*, [1]James D. Simons and [2]Jorrit Poelen; [1]Center for Coastal Studies, Texas A&M University-Corpus Christi; [2]Data Analysis and Visualization Consultant

10:00 AM - **Spatial analysis of marine species migrations to prioritize opportunities for conservation and restoration in the Gulf of Mexico**
Carly Voight*, Jorge Brenner and David Mehlman; The Nature Conservancy-Texas Chapter

10:15 AM - **Seasonal suspended sediment patterns of Texas Estuaries: insights from a decade of satellite data**
[1]Anthony S. Reisinger*, [2]Philippe Tissot and [1]James C. Gibeaut; [1]Harte Research Institute, Texas A&M University-Corpus Christi; [2]Conrad Blucher Institute, Texas A&M University-Corpus Christi (*Student Presentation*)

10:30 AM - **BREAK**

Wednesday, April 9, 2015 (continued)

-ECOSYSTEM SCIENCE (continued)-

10:45 AM - **The influence of physical forcing on phytoplankton dynamics in Baffin Bay, Texas**
[1]Emily Cira* and [2]Michael Wetz; [1] Texas A & M University–Corpus Christi, Department of Physical and Environmental Sciences; [2] Texas A & M University–Corpus Christi, Department of Life Sciences (*Student Presentation*)

11:00 AM - **High-resolution hydrodynamic modeling of Nueces Delta and Guadalupe Bayou**
Zhi Li*, Richard Carothers, Yuxiang Lin, Paola Passalacqua and Ben R. Hodges; Center for Research in Water Resources, University of Texas at Austin (*Student Presentation*)

11:15 AM - **Comparing peptide hydrolysis along a salinity gradient in the northern Gulf of Mexico Mississippi River plume**
Shuting Liu* and Zhanfei Liu; The University of Texas Marine Science Institute (*Student Presentation*)

11:30 AM - **Alkalinity Dynamics in a South Texas Estuary**
Hongming Yao* and Xinping Hu; Department of Physical and Environmental Sciences, Texas A & M University–Corpus Christi (*Student Presentation*)

11:45 AM - **Effects of salt marsh hydroperiod on trematode parasites**
[1]Julia C. Buck*, [2]Elizabeth M. Morris and [2]Jeffrey R. Wozniak; [1]Texas Research Institute for Environmental Studies, Sam Houston State University; [2]Department of Biological Sciences, Sam Houston State University

12:00 PM - **LUNCH (Catered by Aunt Sissy's Kitchen) in Visitor's Center lobby.**

-CEDAR BAYOU-

1:00 PM - **The role of tidal inlets in maintenance of fishery populations**
Dr. Greg Stunz; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi (*Invited Speaker*)

1:30 PM - **Post-Opening Impacts of Reopening a Natural Tidal Inlet on Fisheries in Mesquite Bay, Texas**
Quentin Hall*, Greg Stunz, Jason Williams and Megan Robillard; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi (*Student Presentation*)

Wednesday, April 9, 2015 (continued)

1:45 PM - **Water circulation in the Mission-Aransas Reserve: the effects of tides, winds, and the opening of Cedar Bayou**
[1]Lindsay P. Scheef*, [2]George H. Ward and [1]Edward J. Buskey; [1]The University of Texas Marine Science Institute; [2]University of Texas at Austin Center for Research in Water Resources

2:00 PM - **2014: A Place Odyssey: A video record of the dredging of Cedar Bayou**
Anthony F. Amos; The University of Texas Marine Science Institute

2:15 PM - **Dredging of the Historical Cedar Bayou Tidal Inlet on the Texas Gulf Coast**
[1]Aaron Horine, PE* and [2]John Blaha; [1]Coast & Harbor Engineering, A Division of Hatch Mott MacDonald; [2]Coastal Conservation Association Texas

2:30 PM - **BREAK**

-RESTORATION-

2:45 PM - **Texas Coastal Habitat Restoration 1983 – 2015**
Charles Belaire; Belaire Environmental, Inc.

3:00 PM - **Nueces Marsh Restoration Master Plan: Successful Implementation of Flexible Design and Funding Strategies**
[1]Cameron Perry*, [2]Leo Trevino and [2]Rosario Martinez; [1]HDR Engineering, Inc.; [2]Coastal Bend Bays & Estuaries Program

3:15 PM - **Diversity pattern of macrobenthos associated with different stages of wetland restoration in the Yellow River Delta**
[1,2]Shanze Li*, [2]Baoshan Cui, [2]Tian Xie and [3]Kejiang Zhang; [1]Department of Biology and Biochemistry, University of Houston; [2]School of Environment, Beijing Normal University; [3]Chengdu K&H Environmental Protection Tec. Co., Ltd., Chengdu, P.R. China (*Student Presentation*)

3:30 PM - **Development of oyster reef communities following the restoration of reef habitat in Matagorda Bay, Texas**
[1]Kevin De Santiago*, [1]Jennifer Pollack and [2]Terry Palmer; [1]Texas A&M University–Corpus Christi; [2]Harte Research Institute, Texas A&M University–Corpus Christi (*Student Presentation*)

Wednesday, April 9, 2015 (continued)

3:45 PM - **Assessing the effect of substrate material on community development of a restored oyster reef**
[1]Patrick Graham*; [1]Jennifer Pollack and [2]Terry Palmer; [1]Texas A&M University–Corpus Christi; [2]Harte Research Institute, Texas A&M University–Corpus Christi (*Student Presentation*)

-OIL SPILL SCIENCE-

4:00 PM - **Oil spill modeling in Galveston Bay**
Dongyu Feng*, Xianlong Hou and Ben R. Hodges; Center for Research in Water Resources, University of Texas at Austin (*Student Presentation*)

4:15 PM - **Evaluation of oil spill toxicity in coastal salt marshes: spatial and temporal trends of petroleum weathering**
[1]Meredith Evans*, [1]Jiqing Liu, [2]Brad Rosenheim and [1]Zhanfei Liu; [1]The University of Texas Marine Science Institute; [2]College of Marine Science, University of South Florida (*Student Presentation*)

4:30 PM - **Effects of crude oil, chemical dispersant, and UV radiation on *Temora turbinata* nauplii from the Gulf of Mexico**
Tracy Harvey*, Tara Connelly, Rodrigo Almeda and Edward J. Buskey; The University of Texas Marine Science Institute (*Student Presentation*)

4:45 PM - **Natural solar radiation shapes crude oil-degrading bacterial community structures in surface water of the northern Gulf of Mexico**
Hernando P. Bacosa*, Deana L. Erdner and Zhanfei Liu; The University of Texas Marine Science Institute

5:00 PM - **Poster Session/ Hors d'oeuvre Hour** (Catered by La Playa) located in the Marine Science Institute's Lyceum, between the Main Lab building and Administrative Building.

6:30 PM - **Poster Session Complete.** Please find your way to the UTMSI boat marina to start loading onto the *Mustang*.

6:45 PM - **Sunset Cruise** aboard the *Mustang.*

8:15 PM - **Return to UTMSI Boat Marina**

Thursday, April 9, 2015

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

9:00 AM - **Resilience and the Nature of Place**
Dr. John Jacob; Texas A&M Sea Grant Program and the Texas AgriLife Extension Service through the Department of Recreation, Parks, and Tourism Science (*Invited Speaker*)

-VEGETATION-

9:30 AM - **Three years of seagrass monitoring in Texas: fascinating shifts and stability in percent cover and species composition**
Sara S. Wilson* and Kenneth H. Dunton; The University of Texas Marine Science Institute (*Student Presentation*)

9:45 AM - **Monitoring Seagrass Distribution and Disturbance with Combined Use of Landsat-8 Imagery and Multi-Frequency Sidescan Sonar Data**
[1]Abdullah F. Rahman* and [2]Maryam Rahnemoonfar; [1]University of Texas Rio Grande Valley, Coastal Studies Lab; [2]Texas A&M University-Corpus Christi, Department of Computing Sciences

10:00 AM - **Decomposition and nitrogen dynamics of Turtle grass (*Thalassia testudinum*) in a subtropical estuarine system**
Monica Delgado*, Carlos E. Cintra Buenrostro and Alejandro Fierro-Cabo; The University of Texas at Brownsville (*Student Presentation*)

10:15 AM - **Macroclimate controls on tidal wetland ecosystems: Variation in plant community structure across climatic gradients in northern Gulf of Mexico estuaries**
[1]Christopher A. Gabler*, [2]Michael J. Osland, [2]James B. Grace, [2]Camille L. Stagg, [2]Richard H. Day, [2]Stephen B. Hartley, [2]Nicholas M. Enwright, [2]Andrew S. From, [3]Meagan L. McLemore and [4]Jennie L. McLeod; [1]University of Houston, Department of Biology and Biochemistry; [2]U.S. Geological Survey, National Wetlands Research Center; [3]McLemore Consulting, U.S. Geological Survey, National Wetlands Research Center; [4]McLeod Consulting, U.S. Geological Survey, National Wetlands Research Center

10:30 AM - **BREAK**

Thursday, April 9, 2015 (continued)

-TURTLES AND BIRDS-

10:45 AM - **Surge of Green Turtle Cold Stunning in Texas**
[1]Donna J. Shaver*, [1]Jennifer Shelby Walker, [1]Cynthia Rubio, [2]Anthony Amos and [3]Jeffrey George; [1]National Park Service, Padre Island National Seashore; [2]Animal Rehabilitation Keep (ARK), University of Texas Marine Science Institute; [3]Sea Turtle, Inc.

11:00 AM - **Current Documentation of Fibropapillomatosis in Green Turtles (*Chelonia Mydas*) Captured from Texas Inshore Waters**
[1,2]Tasha L. Metz*, [2]Mandi L. Gordon, [2]George J. Guillen and [3]Joel D. Anderson; [1]Department of Marine Biology, Texas A&M University at Galveston; [2]Environmental Institute of Houston, University of Houston – Clear Lake; [3]Perry R. Bass Fisheries Research Station, Texas Parks and Wildlife

11:15 AM - **Brown Pelican Fledgling Success and Diet: Potential Drivers of Changing Regional Distribution in the Texas Coast**
[1]Yvan G. Satgé*, [1]Juliet S. Lamb and [2]Patrick G.R. Jodice; [1]Department of Forestry and Environmental Conservation, Clemson University; [2]US Geological Survey South Carolina Cooperative Fish and Wildlife Research Unit

11:30 AM - **Should I Stay or Should I Go? Conservation Implications of Individual Variation in Brown Pelican Migratory Strategies**
[1]Juliet S. Lamb* and [2]Patrick G.R. Jodice; [1]Department of Forestry and Environmental Conservation, Clemson University; [2]U.S. Geological Survey South Carolina Cooperative Fish and Wildlife Research Unit (*Student Presentation*)

11:45 AM - **Bird #19: The remarkable winter site fidelity of a Piping Plover (*Charadrius melodius*) on Mustang Island Gulf beach, South Texas**
Anthony F. Amos; The University of Texas Marine Science Institute

12:00 PM - **LUNCH (Catered by Catered by Aunt Sissy's Kitchen) in Visitor's Center lobby.**

-TURTLES AND BIRDS (continued)-

1:15 PM - **Historical Occurrence and Trends in the Distribution of the Texas Diamond-backed Terrapin, *Malaclemys terrapin littoralis***
[1]George Guillen*, [1]Jenny Oakley, [2]Bryan Alleman and [1]Mandi Gordon; [1]Environmental Institute of Houston; [2]School of Science and Computer Engineering, University of Houston-Clear Lake

Thursday, April 9, 2015 (continued)

1:30 PM - **Assessment of Habitat and Prey Availability Associated with the Distribution of Texas Diamond-backed Terrapin (*Malaclemys terrapin littoralis*)**
[1]Bryan Alleman* and [2]George Guillen; [1]University of Houston-Clear Lake, School of Science and Computer Engineering; [2]University of Houston-Clear Lake /Environmental Institute of Houston (*Student Presentation*)

-INVERTEBREATE ECOLOGY-

1:45 PM - **Impacts of food availability on prey defenses in Eastern oysters *Crassostrea virginica***
Avery E. Scherer* and Delbert L. Smee; Texas A&M University-Corpus Christi (*Student Presentation*)

2:00 PM - **Spatiotemporal analysis of jellyfish abundance for coastal Texas**
[1]Heidi Heim-Ballew* and [2]Zachary Olsen; [1]Texas A&M University-Corpus Christi; [2]Texas Parks and Wildlife Department - Coastal Fisheries Division (*Student Presentation*)

2:15 PM - **BREAK**

-FISH AND FISHERIES-

2:30 PM - **Residence of Anglers Fishing in the MANERR, 1983-2014**
Mark R. Fisher; Texas Parks and Wildlife, Coastal Fisheries Division

2:45 PM - **The importance of a Northern Gulf of Mexico spring transition as inferred from marine fish biochronologies**
[1]Matthew Dzaugis*, [2]Robert Allman and [1]Bryan A. Black; [1]University of Texas Marine Science Institute; [2]NOAA Fisheries Service (*Student Presentation*)

3:00 PM - **Distribution, Abundance, and Habitat Use of the Saltmarsh Topminnow (*Fundulus jenkinsi*)**
[1]Josi Robertson*, [2]Stephen Curtis, [2]Jenny Oakley and [1,2]George Guillen; [1]University of Houston-Clear Lake, School of Science and Computer Engineering; [2]Environmental Institute of Houston (*Student Presentation*)

3:15 PM - **Early maturation of black drum (*Pogonias cromis*) in Baffin Bay, Texas**
[1]Zachary Olsen* and [2]Dusty McDonald; [1]Texas Parks and Wildlife Department - Coastal Fisheries Division; [2]Texas Parks and Wildlife Department - Perry R. Bass Marine Fisheries Research Center

Thursday, April 9, 2015 (continued)

3:30 PM - **Trophic relationships between black drum (*P. cromis*) and benthic food resources in Baffin Bay, TX: an evaluation using multiple approaches**
[1]Kathryn Mendenhall*, [1]Jennifer Pollack, [2]Matthew Ajemian, [2]Terry Palmer and [1,2]Greg Stunz; [1]Department of Life Sciences, Texas A&M University–Corpus Christi; [2]Harte Research Institute for Gulf of Mexico Studies, Texas A&M University–Corpus Christi (*Student Presentation*)

3:45 PM - **BREAK**

-FISH AND FISHERIES (continued)-

4:00 PM - **Reproductive biology of red snapper, *Lutjanus campechanus*, on natural and artificial reefs in the western Gulf of Mexico**
Chas Downey* and Greg Stunz; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University–Corpus Christi (*Student Presentation*)

4:15 PM - **Tolerance of red drum (*Sciaenops ocellatus*) to varying levels of CO_2**
Elizabeth Brown* and Andrew Esbaugh; The University of Texas Marine Science Institute (*Student Presentation*)

4:30 PM - **The influence of mortality on the genetic diversity of red drum in pond culture**
Joel Anderson*, Paul Cason and Ruben Chavez; Texas Parks and Wildlife, Coastal Fisheries

4:45 PM - **Temperature tolerance of red drum (*Sciaenops ocellatus*) is unaffected by hypoxia exposure despite >90% reduction in oxygen supply capacity**
Rasmus Ern* and Andrew J. Esbaugh; The University of Texas Marine Science Institute

5:00 PM - **2015 TBEM Closed**

Student Awards

Student presentations and posters are an important aspect of this meeting. The best student awards for presentations and posters are one of the ways we have to acknowledge excellence in research. The best student presentation awards are generously sponsored by the Coastal Bend Bays and Estuaries Program to acknowledge excellence in research in this format ($200 for 1st Place, $150 for 2nd Place and $100 for 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).

Previous Presentation Winners:

2008: **John Froeschke**, Texas A&M University-Corpus Christi, 1st Place
Laura Ryckman, The University of Texas Marine Science Institute, tie for 2nd Place
Katie Swanson, The University of Texas Marine Science Institute, tie for 2nd Place

2009: **Christopher Wilson**, The University of Texas Marine Science Institute, 1st Place
Danielle Crossen, University of Houston, Clear Lake, 2nd Place

2011: **Rachel Mills**, The University of Texas Marine Science Institute, 1st Place
Kelly Darnell, The University of Texas Marine Science Institute, 2nd Place

2012: **Lisa Havel**, The University of Texas Marine Science Institute, 1st Place
Huy Vu, University of Houston, 2nd Place
Jena Campbell, The University of Texas Marine Science Institute, 3rd Place

2013: **Jud Curtis**, Texas A&M University-Corpus Christi, 1st Place
Kimberly Bittler, The University of Texas Marine Science Institute, 2nd Place
Brittany Bloomberg, Texas A&M University-Corpus Christi, 3rd Place

2014: **Philip Jose,** Texas A&M University-Corpus Christi, 1st Place
Rachel Arney, The University of Texas- Brownsville, 2nd Place
Quentin Hall, Texas A&M University-Corpus Christi, 3rd Place

Previous Poster Winners:

2013: **Xinxin Li**, Texas A&M University, 1st Place
Allan Jones, The University of Texas at Austin, 2nd Place
Aubrey Lashaway, The University of Texas Marine Science Institute, 3rd Place

2014: **Melissa McCutcheon,** Texas A&M University-Corpus Christi, 1st Place
Kevin DeSantiago, Texas A&M University-Corpus Christi, 2nd Place
John Mohan, The University of Texas Marine Science Institute, 3rd Place

COASTAL BEND BAYS & ESTUARIES PROGRAM

COASTAL BEND BAYS FOUNDATION
Dedicated to protecting our bays and estuaries

Abstracts for Oral Presentations

National Oceanic and Atmospheric Administration's National Ocean Service: Serving Estuaries in the Gulf of Mexico

Dr. Rebecca J. Allee; Office for Coastal Management – Gulf Region (*Invited Speaker*)

The National Ocean Service (NOS) within the U.S. National Oceanic and Atmospheric Administration (NOAA) has the mission to "provide science-based solutions through collaborative partnerships to address evolving economic, environmental, and social pressures on our ocean and coasts". We strive to accomplish our mission through our three agency priorities of coastal resilience, coastal intelligence, and place-based conservation. Working with local and regional stakeholders and partners, NOS provides science-based services to inform decision making. NOS services can be grouped into three categories: Navigation, Observation, and Positioning; Coastal Science and Assessment; and Ocean and Coastal Management Services. The data, information, and tools that result from day to day activities carried out in the program offices supporting these services are designed in collaboration with our stakeholders to address their needs with the goal to improve coastal resource management. Within the Gulf region, some of the ongoing activities include Sentinel Site monitoring to understand sea level rise impacts on coastal vegetated habitats, Mission Aransas plankton monitoring for predictions of Harmful Algal Blooms, Bay Watershed Education and Training (B-WET) program workshops for teachers, and marsh restoration to reduce non-point source pollution. This presentation will discuss the types of programs and projects that NOAA, and particularly NOS, supports or is involved with in estuaries of the Gulf of Mexico. Examples of projects within Texas estuaries will be highlighted as well.

Gulf of Mexico Species Interaction (GoMexSI) project: More than just a database!

[1]James D. Simons* and [2]Jorrit Poelen; [1]Center for Coastal Studies, Texas A&M University-Corpus Christi; [2]Data Analysis and Visualization Consultant

As the world collects and needs more data for ever larger, holistic, ecosystem analyses, the value of historic, baseline data becomes ever more obvious. In an effort to locate, access, and serve fish diet data for fishery ecosystem models, food web theory research, teaching food webs in the classroom, or determining the diet of your favorite game fish, the GoMexSI database and webpage project evolved. As GloBI a new, world-wide repository of species interaction data evolved, GoMexSI became an application of the GloBI project. GloBI, which is closely associated with the Encyclopedia of Life project, accepts contributions of species interaction data of all kinds from anywhere in the world. These two projects are based on a Neo4j graph database framework, and project management, and data uploading and editing is accomplished on Github. Data can be queried using R, rglobi, or the Cypher query language. GoMexSI also has three graphical query pages on the GoMexSI webpage. In addition to serving species interaction data for the Gulf, GoMexSI also houses a list of all the references to these data that we have located to date. Recently we held a GoMexSI/GloBI workshop at TAMUCC Center for Coastal Studies where we learned more about Neo4j, Github, rglobi and Cypher. Future plans

include developing webpage sections for analytical tools, educators, fishermen, and species interactions in art and music. Recently we were awarded partial funding for a project that would complete trophic data entry for all taxa in Texas bays, estuaries, and coastal waters.

Gulf of Mexico Species Interactions (GoMexSI) database: Beyond the fishes!

[1]Theresa Mitchell*, [1]James D. Simons and [2]Jorrit Poelen; [1]Center for Coastal Studies, Texas A&M University-Corpus Christi; [2]Data Analysis and Visualization Consultant

Much attention has been devoted to measurement and cataloguing of biodiversity throughout the world and in the Gulf of Mexico over the past 30 to 50 years. However, systematic recording and cataloguing of species interactions, or biostructure, has received far less attention. Nevertheless, it is this biostructure that defines and governs the flow of energy through the ecosystem. The Gulf of Mexico Species Interaction (GoMexSI) database and web application (gomexsi.tamucc.edu), is striving to rectify this situation. Response has been excellent with approximately 215 registered users to the webpage (i.e. those seeking to query the data). Collecting, extracting, and archiving data from published and un-published resources (758) and data contributors (21), we now have trophic interaction data for fishes from 103 sources, with a total of 62,759 interactions from 1,922 unique interactors. Presently we have identified an additional 269 references for diet data from nine taxa other than fishes including sea and shore birds, coastal and marine mammals, reptiles, arthropods, and others. A total of 635 species have been identified, with 378 from the arthropoda being the most speciose. In the process of locating these references, we are beginning to identify which taxa and species have been studied most frequently, and for which taxa further data collection is needed. Another 476 references with more than 500 species have been located representing parasite/host interactions. In the near future, we expect to start adding the information from these references into the database.

Spatial analysis of marine species migrations to prioritize opportunities for conservation and restoration in the Gulf of Mexico

Carly Voight*, Jorge Brenner and David Mehlman; The Nature Conservancy- Texas Chapter

Hundreds of species migrate throughout the Gulf of Mexico each year to reproduce, forage, or reach summering/wintering grounds. Many of these species, such as whooping cranes, Kemp's Ridley sea turtles, and Atlantic tarpon, utilize areas along the Texas coast. These fish, sea turtles, marine mammals, and birds move through overlapping regions of the Gulf while migrating or aggregating. Identifying these common corridors is important in determining conservation opportunities and abating threats. The Nature Conservancy is working with numerous partner institutions and researchers to increase the understanding of marine migratory species in the Gulf of Mexico, corridors, and aggregation areas as well as the barriers that impact their ability to complete their migratory cycles. Data on migration pathways and stepping stones from 26 different migratory species has been gathered, synthesized, and analyzed in GIS. Spatial hotspots for diversity and multi-species migratory corridors were derived to determine which regions of the Gulf are the most critical for the migration of these species. Corridors were analyzed in conjunction with the extent of spatial threats that may represent barriers for completing migratory cycles. This project provides a series of science-based recommendations

to increase the viability of these populations and opportunities for conserving their capacity to migrate throughout the Gulf of Mexico. Results from this study aim at improving our capacity to assess and manage the areas that these species depend on and suggest a series of geographic priorities for restoring the habitats they use as stepping stones while migrating in the Gulf.

Seasonal suspended sediment patterns of Texas Estuaries: insights from a decade of satellite data

[1]Anthony S. Reisinger*, [2]Philippe Tissot and [1]James C. Gibeaut; [1]Harte Research Institute, Texas A&M University-Corpus Christi; [2]Conrad Blucher Institute, Texas A&M University-Corpus Christi (*Student Presentation*)

Suspended sediments are an integral part of estuarine systems; their flux within estuaries is a result of interplay between freshwater inflow, tidal currents, wind-wave resuspension, commercial fishing, and dredging operations. The importance that physical processes play in influencing spatial distributions of suspended sediments varies as a function of time, space, physical attributes of the estuary, and regional climate, while the influence of anthropogenic activities is largely unknown. In Texas, the three largest estuaries, Galveston, Matagorda, and Corpus Christi Bays, are shallow, wind-dominated systems, prone to wind-wave resuspension of sediment. These estuaries exist along a climate gradient, and their average annual freshwater inflow, normalized by bay volume, decreases 10 fold from north to south. To determine how wind-wave resuspension and inflow influence spatial distributions of suspended sediment within each estuary, median and IQR of total suspended solids were computed for a variety of time periods from daily cloud-free satellite data from 2002 to 2014. Wind-wave resuspension patterns were generated for 3 seasonal wind regimes: (1) frontal passages (Nov-Feb); (2) southeasterlies (March- June); and (3) relatively quiet period (July-Oct). Patterns were generated for wet (Nov. - June) and dry (July – Oct.) seasons for Galveston Bay to show the influence of inflow. Results revealed that Matagorda and Corpus Christi Bays seasonal sediment patterns are dominated by wind-wave resuspension. Galveston Bay is dominated by inflow and also influenced by frontal passages, however, the influence of oyster harvesting in Galveston Bay is the most prevalent pattern within the estuary.

The influence of physical forcing on phytoplankton dynamics in Baffin Bay, Texas

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Baffin Bay has been experiencing signs of eutrophication in recent decades, including episodic hypoxia, dense algal blooms, increasing levels of nitrogen and phosphorus, and ephemeral fish kills. While previous studies have focused on the nutritional requirements of specific phytoplankton (e.g., *Aureoumbra lagunensis*) and conditions leading to blooms of this “brown tide” organism, little to no information exists on larger scale physical forcing(s) that may influence phytoplankton bloom dynamics in the system. Here I report results from a field sampling program that was initiated in May 2013. Chlorophyll concentrations decrease towards the mouth of the bay, and also vary considerably on a seasonal basis. For example, during

winter, low light levels and low temperature, perhaps coupled with intense water column mixing, prevent significant phytoplankton growth. In late winter/early spring, physical conditions become conducive to phytoplankton growth and large blooms develop. Finally, during summer, the southeasterly winds facilitate intrusion of low nutrient, low chlorophyll water from Laguna Madre into eastern Baffin Bay, while chlorophyll concentrations remain high in western Baffin Bay. These results point to physical forcing(s) as a significant factor influencing the phytoplankton dynamics of Baffin Bay; this is the first study to document the importance of regional-scale wind forcing for water quality in Baffin Bay, and represents a step forward in our ability to understand bloom dynamics in Baffin Bay.

High-resolution hydrodynamic modeling of Nueces Delta and Guadalupe Bayou

Zhi Li*, Richard Carothers, Yuxiang Lin, Paola Passalacqua and Ben R. Hodges; Center for Research in Water Resources, University of Texas at Austin (*Student Presentation*)

Maintaining healthy ecosystems in Texas estuaries under the stress of ongoing droughts is a challenge. The interface between freshwater, saltwater and the landscape is characterized by a variety of complex flow paths through vegetation and channels. Changes in the timing and distribution of freshwater floods over the last 30+ years has substantially affected both the Nueces River Delta and the bayous of the Guadalupe River. With limited freshwater, there is an open question as to its most efficient use in maintaining healthy ecosystems. Towards understanding the impact of different timing, flow rates, and freshwater volumes, we are using high resolution hydrodynamic models of both the Nueces Delta and Guadalupe Bayous with grid scales on the order of 30 x 30 m. The Nueces Delta Hydrodynamic Model (NDHM) was previously developed under CBBEP and is being used to analyze different pumping scenarios that can be undertaken with the Rincon pipeline. The model is helping us understand the fate of freshwater and the different effects that can be achieve by pumping under different wind and tidal conditions. In the Guadalupe Bayous, we are producing a detailed landscape model based on lidar data and using this to build a new Guadalupe Bayou Hydrodynamic Model (GBHM) as a basis for future studies.

Comparing peptide hydrolysis along a salinity gradient in the northern Gulf of Mexico Mississippi River plume

Shuting Liu* and Zhanfei Liu; The University of Texas Marine Science Institute (*Student Presentation*)

Extracellular enzymatic hydrolysis of peptides, which breaks down proteins or large peptides into small fragments to allow bacterial uptake in marine environments, is a key step in the cycling of labile organic matter and regulates the turnover rate of carbon and nutrients. Peptide hydrolysis rates vary in different marine environments, and salinity is often a key environmental parameter that affects hydrolysis. In this study, we measured hydrolysis rates of tetrapeptide alanine-valine-phenylalanine- alanine (AVFA), a small fragment of RuBisCO, along a salinity gradient in the northern Gulf of Mexico Mississippi River plume, and evaluated the effects of environmental factors on peptide hydrolysis rates. Our data showed that peptide hydrolysis rates were 2-59 times higher in low-salinity (18-27) than high-salinity (35-36) waters in the plume,

and that the hydrolysis rate was correlated strongly to salinity. The low-salinity waters were particularly enriched in dissolved organic nitrogen, nitrate, phytoplankton, bacterial biomass, and certain "opportuni-trophic" bacteria types, such as *Flavobacterium*, *Ruegeria* and *Roseobacter*. High abundance of these bacteria may be key enhancing peptide hydrolysis rates in the low-salinity waters from principal component analysis. This study provides insights into the biological and chemical factors that control patterns of extracellular enzymatic activities in different seawater environments.

Alkalinity Dynamics in a South Texas Estuary

Hongming Yao*and Xinping Hu; Department of Physical and Environmental Sciences, Texas A&M University−Corpus Christi (*Student Presentation*)

According to a recent study, many south Texas estuaries are experiencing a gradual acidification represented by decreases in total alkalinity (TA) and pH. The Mission-Aransas Estuary is among those estuaries experiencing acidification. In order to better understand the acidification process in this estuary, we started measuring TA and other carbonate parameters (total dissolved CO2 or DIC, pH, and Ca2+) at five permanent monitoring stations maintained by the Mission-Aransas National Estuary Research Reserve (MANERR) since mid-2014. Biweekly trips were conducted from May 2014 to October 2014, and monthly trips were conducted since November 2014. Based on our observations, TA in this estuary ranged from 2350 to 2700 μeq•kg-1 during our sampling period. There was spatially heterogeneity in TA with the highest average TA (2638 ± 236 μeq•kg-1) observed at the Copano West (CW) station and the lowest average TA (2398 ± 42 μeq•kg-1) observed at the Port Aransas (PA) station. Overall, TA in this estuary was highest from May through June, and lowest from September through October. Average salinity in this estuary was 35.0 ± 2.7, which was close to open ocean salinity (35). The CW station had the highest salinity with an average salinity of 37.0 ± 2.4. A multiple linear regression model indicated that TA was significantly related to DIC, calcite saturation (ΩCa), and partial pressure of CO2 (pCO2).

Effects of salt marsh hydroperiod on trematode parasites

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In salt marshes of Texas, the frequency and magnitude of hydrological connection events is regulated by seasonal tidal cycles, wind-driven tides, and precipitation. Spatio-temporal variability in hydroperiod may affect biota, including parasites and their hosts. In this system, at least 18 species of trematodes (flukes) from 8 different families utilize the plicated horn snail (*Cerithidea pliculosa*) as a first intermediate host, fish, crabs, or bivalves as second intermediate hosts, and birds or mammals as final hosts. Because these trematodes have one or two free-swimming stages in their life cycle, they are likely to be profoundly influenced by salt marsh hydroperiod. We compared cercarial production of the trematode *Euhaplorchis* sp. A from snails collected from a study site in Galveston in October and January (mean monthly precipitation = 89 and 104mm respectively). We found that snails collected in October shed fewer cercariae

than snails collected in January, suggesting that the pattern may be driven by water availability. A pilot experiment revealed that snails submerged twice daily produced twice as many cercariae as snails submerged every eight days, indicating that trematodes can only partially compensate for infrequent submergence of their snail hosts. Dissecting snails (n=805) collected from salt marshes in Galveston and the Aransas National Wildlife Refuge revealed differences in trematode community structure that may be attributable to hydroperiod. Larval trematodes have previously been used as biological indicators of functional food webs in estuarine ecosystems, and we conclude that they may also be effective indicators of water availability in these systems.

The role of tidal inlets in maintenance of fishery populations

Greg Stunz; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi (*Invited Speaker*)

The majority of nekton occurring in coastal waters share a common estuarine-dependent life history strategy characterized by near-shore spawning in the Gulf of Mexico with larvae migrating through tidal inlets into shallow estuarine “nursery” grounds. Within these inshore areas, juvenile fishes and invertebrates use a variety of habitats such as seagrass beds, marsh, and oyster reefs before later joining adult stocks. Access to high quality habitat and spawning grounds via tidal inlets is essential for reproduction, growth, survival, and maintenance of these populations. Thus, tidal inlets play a direct role in nekton productivity, sustainability, and ecosystem health. Because 75% of commercially or recreationally important species in the Gulf are estuarine-dependent, understanding how nekton use passes that connect Gulf and bay waters is critical. Our research group has been intensively studying tidal inlet dynamics for the past decade, including Cedar Bayou. The focus of this presentation will be to generally highlight patterns we have observed – a net positive benefits of having flowing tidal inlets. This presentation will be followed by several technical presentations detailing these studies. A key to our most recent studies with Packery Channel and Cedar Bayou was having the ability to assess nekton density and community structure prior to dredging to establish a pre-opening benchmark. Having these benchmark studies was critical in assigning cause and effect relationships on the benefits of having an estuary open to the Gulf of Mexico.

Post-Opening Impacts of Reopening a Natural Tidal Inlet on Fisheries in Mesquite Bay, Texas

Quentin Hall*, Greg Stunz, Jason Williams and Megan Robillard; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi (*Student Presentation*)

In April of 2014 a collaborative effort began to physically reopen Cedar Bayou, a natural tidal inlet that historically linked Mesquite Bay, TX, to the Gulf of Mexico. The inlet was intentionally closed in 1979 to prevent contaminants from the Ixtoc I oil spill from reaching fragile nearshore estuarine and wetland ecosystems. Research has shown the importance of tidal inlets for migration and dispersal of juvenile and adult nekton. The main objectives of this study are 1). To quantify changes to densities of juvenile estuarine-dependent species recruiting to seagrass (*Halodule wrightii*) nursery habitats in the Mesquite Bay complex before and after

reopening the inlet and 2). Use acoustic telemetry to determine if adult *Sciaenops ocellatus* use the newly opened inlet to migrate to offshore spawning grounds. Juvenile fish and crustaceans were sampled during the fall, winter, and spring recruitment seasons using an epibenthic sled. Samples have been collected for two years pre-opening and will be collected one year post-opening. The study is a classic before-after control-impact design where selected seagrass beds near Cedar Bayou (impact) and Aransas Bay (control) will be analyzed. The first year of post-opening data show a marked increase in nekton densities within the Cedar Bayou region. Results from the acoustic telemetry portion of this study demonstrate defined movements and directionality through Cedar Bayou during the spawning season. The data from both portions of this study suggest that Cedar Bayou is already fulfilling its role as a fish pass.

Water circulation in the Mission-Aransas Reserve: the effects of tides, winds, and the opening of Cedar Bayou

[1]Lindsay P. Scheef*, [2]George H. Ward and [1]Edward J. Buskey; [1]The University of Texas Marine Science Institute; [2]University of Texas at Austin Center for Research in Water Resources

Mesquite Bay, at the northeast edge of the Mission-Aransas National Estuarine Research Reserve, is isolated from the Gulf of Mexico by two barrier islands and a distance of more than 40 km to the nearest pass. Historically, Cedar Bayou served as a direct connection between Mesquite Bay and the Gulf of Mexico, but it was deliberately filled in 1979 to prevent oil from the IXTOC I spill from entering the estuary. Several attempts to reopen the pass in the following years were unsuccessful as sedimentation continued to slowly refill the opening, finally closing it again completely during the winter of 2007-2008. A dredging project to reopen Cedar Bayou began in May of 2014 and was completed in September 2014. To assess how the reopening of Cedar Bayou would affect circulation patterns in Mesquite Bay, “tilt” current meters were placed at 11 stations throughout the bay. Circulation data have been collected at these stations from March 2014, before dredging work began, to present. These data will help us understand how various factors, such as winds, tides, and the opening of Cedar Bayou, affect circulation in the bay. When combined with water quality and biological monitoring data from other ongoing projects, the data gathered by the tilt current meters may also provide important insights into how water exchange through Cedar Bayou influences the ecology of the system.

2014: A Place Odyssey: A video record of the dredging of Cedar Bayou

Anthony F. Amos; The University of Texas Marine Science Institute

The Cedar Bayou pass, often referred to as an “Ephemeral Pass”, separates San Jose and Matagorda barrier islands near the central Texas Coast. In recent years the pass has been more closed than open and various efforts to keep it open have not succeeded. In 2014 a major dredging project opened the pass and is predicted to keep it open permanently (with annual maintenance). The author has conducted a 20-year survey of San Jose Island done on an 8-day interval. This presentation shows ground-level video clips of the entire dredging process from April to October 2014 when the pass was opened and continues to the present revealing changes after dredging was completed. Also presented is some pre-dredging video when the pass was open naturally and some discussion on the closure during the IXTOC I Oil Spill.

Dredging of the Historical Cedar Bayou Tidal Inlet on the Texas Gulf Coast

[1]Aaron Horine, PE* and [2]John Blaha; [1]Coast & Harbor Engineering, A Division of Hatch Mott MacDonald; [2]Coastal Conservation Association Texas

Historically, the Cedar Bayou channel, which separates San Jose Island and Matagorda Island, allowed passage of fish and other marine life between Mesquite Bay and the Gulf of Mexico and provided food sources to a number of coastal inhabitants, including wintering whooping cranes, a critically endangered species. Over the past decade, the channel was completely closed and required opening in order to restore circulation for wildlife and habitat. Dredging and excavation of 550,000 cubic yards was achieved using an intricate combination of mechanical excavation and hydraulic dredging in order to comply with a 6 month environmental window and other conditions set in the permit. Cedar Bayou is classified as an ephemeral tidal inlet which has historically been open and closed depending on environmental forcing and anthropogenic activities. In order to increase the hydraulic stability of the inlet and reduce the time between maintenance dredging efforts, Coast & Harbor Engineering developed a design template connecting Vinson Slough to Cedar Bayou, and Cedar Bayou to the Gulf of Mexico. To accomplish this work, regulatory agencies and funding partners were involved early on to ensure a stable foundation for the success of the project. To complete this complex project, Aransas County was part of a vital partnership including Texas Parks and Wildlife, Coastal Conservation Association, Texas General Land Office and Save Cedar Bayou, Inc. Despite numerous environmental and logistical challenges, Cedar Bayou finished construction without impact to sensitive habitat and ahead of schedule in early October 2014.

Texas Coastal Habitat Restoration 1983 – 2015

Charles Belaire; Belaire Environmental, Inc.

This presentation will provide an overview of more than 1000 acres of Belaire Environmental, Inc.'s habitat restoration and mitigation projects on the Texas coast from 1983 – 2015. This overview will include a map showing the location of each project and a summary of the types of projects: planting natural shorelines without modification; beneficial use of dredged materials to create marsh; scrape-down of dredge spoil and planting to restore seagrass; placement of fill to create substrate and elevations suitable for seagrass and wetlands; placement of wave barriers to provide calmed waters for wetland and seagrass establishment; oyster habitat and reef creation; etc. Examples of each project type will be shown and success and failures will be discussed.

Nueces Marsh Restoration Master Plan: Successful Implementation of Flexible Design and Funding Strategies

[1]Cameron Perry*, [2]Leo Trevino and [2]Rosario Martinez; [1]HDR Engineering, Inc.; [2]Coastal Bend Bays & Estuaries Program

Prior to the 1940's, 600 acres of intertidal salt marsh was located immediately west of Portland, Texas between Nueces and Corpus Christi Bay. However, construction of a causeway excavated and filled extensive marsh areas that significantly altered the water exchange and system health. Approximately 180 acres of loss can be directly attributed to the road construction and an

additional 160 acres have been lost due to erosion and relative sea level rise. To address some of these habitat losses, Coastal Bend Bays & Estuaries Program (CBBEP) developed a long-term restoration master plan to create 160 acres of marsh complex. The restoration goals targeted low marsh (*Spartina alterniflora*) with additional smaller communities of mixed and/or high marsh. Due to the scale of the project, restoration needed to be completed in phases. Therefore, the master plan included several design feature options and a flexible permit to accommodate varying funding levels. In turn, this allowed CBBEP to pursue varying funding sources and show the ability to quickly execute a project. The project has recently gone from an idea to gaining over $4.5 million for construction, which is now complete. Components of the work included raising the grade of the open water site by creating sidecast terraces and confined cells into which dredged material was placed. To protect the site a 4,200 foot earthen berm was constructed that was later armored. The presentation will discuss the project, flexible design, issues encountered during permitting, funding strategies, as well as lessons learned.

Diversity pattern of macrobenthos associated with different stages of wetland restoration in the Yellow River Delta

[1,2]Shanze Li*, [2]Baoshan Cui, [2]Tian Xie and [3]Kejiang Zhang; [1]Department of Biology and Biochemistry, University of Houston; [2]School of Environment, Beijing Normal University; [3]Chengdu K&H Environmental Protection Tec. Co., Ltd., Chengdu, P.R. China (*Student Presentation*)

Because wetland restoration projects are becoming more common and are expensive, it is important to evaluate their success. Evaluation studies common use measurements of soils, vegetation, hydrology and wildlife to evaluate the success of wetland restoration. In contrast, the diversity of macrobenthos and their relationships with environmental factors are often neglected. To better understand the success of wetland restoration, we examined the abundance and diversity of macrobenthos in different stages of a freshwater wetland restoration project in the Yellow River Delta in China, with reference to environmental factors that might explain macrobenthic patterns. Macrobenthic species richness and density were greater in the oldest restoration area versus the younger and no-treatment areas. Macrobenthic biomass, however, was greatest in the no-treatment area. The oldest restoration area had deeper water levels, lower salinities, softer and wetter soils, and higher soil organic, nitrogen and carbon contents, and these variables largely distinguished the macrobenthic samples in a CCA analysis. A combination of landscape position and recovery time (time since the restoration was implemented) likely explains the abiotic differences among restoration areas. We recommend an adaptive management strategy, guided by long-term monitoring and experiments, to improve the success of this and other wetland restoration projects.

Development of oyster reef communities following the restoration of reef habitat in Matagorda Bay, Texas

[1]Kevin De Santiago*, [1]Jennifer Pollack and [2]Terry Palmer; [1]Texas A&M University–Corpus Christi; [2]Harte Research Institute, Texas A&M University–Corpus Christi (*Student Presentation*)

In addition to supporting an economically important fishery, oyster reefs provide various ecosystem services such as shoreline stabilization, water filtration, and provision of habitat and foraging grounds for reef-associated species. However, overharvesting, disease, and declining water quality have depleted oyster stocks. Today, oyster reefs rank among the most threatened marine habitats in the world. Restoration efforts focus on replacing hard structure to encourage oyster reef development and restore ecosystem services. In 2013, The Nature Conservancy placed over 0.23 km2 of hard structure in Matagorda Bay to restore a portion of the historically productive Half Moon Reef. Oysters, finfish, and macroinvertebrates are sampled seasonally using a variety of methods including SCUBA collection, suction sampling, and epibenthic sled towing. Oyster shell height on the reef has shown significant growth throughout sampling seasons. Faunal communities sampled on the reef are demonstrating strong differences from communities sampled 150 m off the reef including increased species richness and abundance. Determining the proficiency of the recent project in enhancing the production of economically and ecologically important species may encourage future oyster reef conservation and restoration efforts.

Assessing the effect of substrate material on community development of a restored oyster reef

[1]Patrick Graham*; [1]Jennifer Pollack and [2]Terry Palmer; [1]Texas A&M University–Corpus Christi; [2]Harte Research Institute, Texas A&M University–Corpus Christi (*Student Presentation*)

Oyster reefs, formed by the generational settlement of *Crassostrea virginica*, serve as an important ecological habitat within Texas estuaries. The structural complexities of oyster reefs provide important habitat and spawning substrate for fish and mobile crustaceans and biogenic habitat for benthic invertebrates. Oyster populations have declined worldwide in response to factors such as disease and habitat degradation. Reef restoration is an increasingly used tool to combat habitat losses with oyster shell as the preferred substrate. However, with limited oyster shell available for restoration practices, alternative substrates have been used. Substrate type may affect oyster recruitment and growth, leading to the long-term sustainability of the reef. It is not fully understood how substrate type affects faunal assemblages in early stages of reef development, when substrate may have the greatest influence on faunal recruitment and habitat use. We restored 6 acres of oyster reef in the Mission-Aransas Estuary, TX, in July 2013 using concrete, limestone, river rock, and oyster shell substrates. We are sampling the reef for 18 months to compare oyster recruitment and faunal community development associated with each substrate type. Results will provide information on the ability of alternative substrates to promote sustainable management of oyster reef resources via restoration.

Oil spill modeling in Galveston Bay

Dongyu Feng*, Xianlong Hou and Ben R. Hodges; Center for Research in Water Resources, University of Texas at Austin (*Student Presentation*)

As ship traffic continues increasing in Texas bays, ship collisions and oil spills will occur despite our best efforts towards improving traffic management, navigation aids, and collision avoidance systems. To minimize the ecological damage and optimize response, emergency managers need to know where and how fast oil will spread. Predicting oil spill trajectories requires a combination of hydrodynamic models for water currents and oil spill models for advection and dispersion. Recently a new high-resolution hydrodynamic model (SUNTANS) was developed for Galveston Bay as part of the Gulf of Mexico Research Initiative (GoMRI). We are integrating this model with the GNOME oil spill transport model and analyzing how the improved model affects an oil spill transport predictions. Our research focus is on the sensitivity of predicted oil spill fate as a function of various uncertainties, including the initial spill location, effects of bay salinity on water currents, reliability of wind forecasts, and the effective dispersion rates of the oil. Our goal is to identify the critical factors that control the accuracy of oil spill transport prediction so that the next generation of oil spill models operated by the Texas General Land Office and the Texas Water Development Board will make the most effective use of new modeling methods.

Evaluation of oil spill toxicity in coastal salt marshes: spatial and temporal trends of petroleum weathering

[1]Meredith Evans*, [1]Jiqing Liu, [2]Brad Rosenheim and [1]Zhanfei Liu; [1]The University of Texas Marine Science Institute; [2]College of Marine Science, University of South Florida (*Student Presentation*)

Following an oceanic oil spill, natural and man-mediated weathering processes can vastly manipulate the chemical characteristics of petroleum. The resulting chemical composition must be assessed in order to determine the toxicity of weathered oil to marine ecosystems. In this study, we evaluate the chemical transformations of petroleum in oiled salt marshes following the Deepwater Horizon oil spill. Weathering over time (2010-2012) and space (high, medium and low wave-action marshes) shows a decrease in lightweight hydrocarbons with increased time and wave energy. In addition, by quantifying the concentrations of the 16 EPA priority polycyclic aromatic hydrocarbons (PAHs), which are known toxicants to marine ecosystems, we assess the duration and intensity of toxicity in these coastal marshes. To achieve these compound-specific hydrocarbon analyses, we use traditional solvent extraction and fractionation techniques. We also apply ramped pyrolysis – gas chromatography – mass spectrometry (Py-GC-MS) to qualify the degree of weathering in each sample. Overall, the results of this study (1) indicate weathering trends that can be expected in coastal marshes following hydrocarbon pollution and (2) demonstrate the potential for Py-GC-MS to efficiently evaluate petroleum weathering. As such, these results are valuable for toxicity predictions and assessments in any coastal area following future oil spills.

Effects of crude oil, chemical dispersant, and UV radiation on *Temora turbinata* nauplii from the Gulf of Mexico

Tracy Harvey*, Tara Connelly, Rodrigo Almeda and Edward J. Buskey; The University of Texas Marine Science Institute (*Student Presentation*)

Anthropogenic oil spills continue to have devastating effects on the ecosystems in which they occur. Understanding how marine ecosystems are affected by these events is important for future mitigation and the improvement of preventative and restoration methods. The goal of this study was to investigate how copepods, the predominant group of zooplankton and the base of the marine food web, respond to oil spill conditions. *Temora turbinata*, native to the Gulf of Mexico was used as a model species in this study. Two important and novel aspects were considered: (1) exposing copepods at an early life stage when individuals tend to be more vulnerable to contaminant exposure and (2) including UV radiation as a factor in toxicity analysis. To mimic oil spill conditions during the Deep Water Horizon (DWH) oil spill copepod nauplii were exposed to crude oil concentrations (0.5ppm-2ppm), chemical dispersant (20:1, oil:dispersant), and UV radiation. After being exposed for 48 hours to various conditions, mortality, growth, and swimming behavior of the copepod nauplii were examined. At relatively low concentrations of oil (≥1 µL/L) sublethal effects were observed, including changes in swimming behavior. Most notably, crude oil (1 µL/L) + dispersant, and the presences of UV radiation caused a significant increase in mortality by 8X, and crude oil (2 µL/L) and the presence of UV caused a significant increase in mortality by 13X. A crude oil LC50 of 1.95 µL/L was observed without UV and a LC50 of 1.34 µL/L was observed with the presence of UV. These results demonstrate the importance of considering factors such as UV exposure and life stage when evaluating the potential toxicity of an oil spill to marine organisms.

Natural solar radiation shapes crude oil-degrading bacterial community structures in surface water of the northern Gulf of Mexico

Hernando P. Bacosa*, Deana L. Erdner and Zhanfei Liu; The University of Texas Marine Science Institute

The fate and ecological consequences of spilled oil and Corexit dispersant following the Deepwater Horizon (DWH) spill are not yet fully understood. Previous studies focused on the deep-sea plume of oil and dispersants, while the response of bacterial communities in surface waters exposed to natural solar radiation in the presence of oil and Corexit has received limited attention. In this study, we incubated surface water from the DWH site with crude oil, Corexit, or both under natural sunlight in the northern Gulf of Mexico. The bacterial community was analyzed via pyrosequencing. Residual alkanes and polycyclic aromatic hydrocarbons (PAHs) were determined by gas chromatography coupled with mass spectrometry. Our results showed that sunlight is a key driver in PAHs degradation and shifts in bacterial community structure and diversity for treatments with oil and/or Corexit. The *Cyanobacteria Synechococcus* and *Prochloroccus* were greatly reduced in irradiated samples with oil and/or dispersant. In samples containing oil, sunlight enriched *Alteromonas, Marinobacter, Halomonas, Bartonella,* and *Labrenzia*. However, dark samples with oil were represented by members of *Alcanivorax, Pseudomonas, Winogradskyella, Rhodovulum* and *Coxiella*. Solar irradiation of Corexit in seawater resulted in the emergence of radiation-resistant bacteria, *Deinocccus-Thermus*. For the

first time, we observed that sunlight inhibited the biodegradation of pristane and phytane, possibly due to inhibition of branched alkane-degrading bacteria. The predominant taxa may serve as potential microbial indicators of future oil spills considering that the Gulf of Mexico is an active area for oil exploration, drilling, and transportation, and offer support for developing bioremediation strategies.

Resilience and the Nature of Place

Dr. John Jacob; Texas A&M Sea Grant Program and the Texas AgriLife Extension Service through the Department of Recreation, Parks, and Tourism Science (*Invited Speaker*)

No one should build on the coast, much less on a barrier island. But here we are. No one is going to leave hazardous coastal areas--we love them too much. Both commerce and recreation will keep us on the coast, so avoidance cannot be the sum total of our coastal planning.
In coastal zones the intersection of nature and place stand out in bold relief. What kind of a places we build, and how we incorporate natural values and functions into those places, and more importantly perhaps, how we preserve natural values and functions in the urban hinterlands, are questions that are central to resilient coastal planning. Not all places are equally hazardous of course, and we need to choose carefully where we develop--this is Bienville's famous dilemma about where to put New Orleans. Is safety more important than commercial access? It turns out that preserving the most hazardous areas not only keeps us out of the worst of harm's way, these very areas often act as critical buffers that protect us. After we figure out the "where" of development, we have to address the "how" and the "what". How we build is critical--how we build on a barrier island is not necessarily how we need to build farther inland. What we build, however, might have the greatest influence on long term resilience. It is the relationship of the nature of "place" to resilience that I wish to address here. I argue that building a community and a place we love will lead to a more durable and resilient place than simply focusing on safety. It is not a question of disregarding principles of safe coastal planning, it is simply about putting placemaking first, and then accounting for hazards and safety. If we put hazards first, we will likely not build lovable places that we want to defend. Walkability is thus a first principle of resilient and sustainable coastal development.

Three years of seagrass monitoring in Texas: fascinating shifts and stability in percent cover and species composition

Sara S. Wilson* and Kenneth H. Dunton; The University of Texas Marine Science Institute (*Student Presentation*)

In the summer of 2011, researchers at the University of Texas Marine Science Institute began a statewide seagrass monitoring program to assess the status and trends of seagrass communities in Texas estuaries. For this study, 558 permanent sampling stations were divided into three regions, the Coastal Bend (CB), Upper Laguna Madre (ULM) and Lower Laguna Madre (LLM), which we divided into thirteen subregions. Results from the first three summers of monitoring indicate that each of the three regions were characterized by unique seagrass assemblages and environmental conditions. CB seagrass meadows appeared to be stable with no major shifts in cover or species composition from 2011-2013, while pronounced changes

occurred in parts of the ULM and LLM. In the northern subregions of ULM, there was a dramatic decline of *Syringodium filiforme* cover, likely due to sustained high (>50) salinities from late 2012 through early 2013. In southern subregions of LLM, large declines of *Thalassia testudinum* cover occurred from 2011-2013, which may have also been driven by major changes to the regional salinity regime. Percent cover trends which occurred at the regional level were not always present at the subregion level, and vice versa. Ultimately, shifts in seagrass coverage and species composition in Texas were strongly dependent upon location. The variations in seagrass landscapes across south Texas reflect long term change in regional climatic conditions, providing opportunities for effective management and conservation over decadal scales.

Monitoring Seagrass Distribution and Disturbance with Combined Use of Landsat-8 Imagery and Multi-Frequency Sidescan Sonar Data

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Seagrass meadows are highly productive coastal ecosystems. They provide food and shelter for fishes, crustaceans, shellfishes, turtles, manatees, ducks, and may other animals and birds. In addition, they contribute a significant amount of carbon buried annually in the sea, although they occupy only a small percentage of global coastal areas. Unfortunately, seagrass areas around the world are being lost at a rapid rate, largely due to anthropogenic disturbances, such as boat scars and bottom trawling. Mapping the distribution of seagrass areas and the intensities and patterns of disturbances is of utmost importance to protect these valuable coastal ecosystems. In this study we demonstrate a method of combining multispectral imagery from NASA's new Landsat-8 satellite with boat-mounted multi-frequency sidescan sonar data to map the distribution and disturbance of seagrasses in the Laguna Madre bay of Texas. Landsat-8 has 16-bit radiometric resolution, providing high precision data to detect seagrass vs. no-seagrass areas at 30 m pixel scale. Boat-mounted multi-frequency sidescan sonar transducers (262, 455 and 800 kHz) provided transects of bay-floor images at cm-scale resolution. These multi-sensor images were post-processed to filter out noise and to determine the threshold values of optical and acoustic intensity for each band. We used image segmentation and pattern recognition methods to map boat-scars and other disturbance features in the seagrass beds, and validated these maps with underwater video and still photographs of the study area. Our results show that multi-sensor remotely-sensed data can potentially be used for routine and repeated mapping of large-scale seagrass areas.

Decomposition and nitrogen dynamics of Turtle grass (*Thalassia testudinum*) in a subtropical estuarine system

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Seagrasses are major primary producers in estuaries, providing the energy base for a complex ecosystem that cycles nutrients through the routes of detrital pathways and herbivory. Studying litter decomposition and nitrogen (N) content of turtle grass (*Thalassia testudinum*) may

improve the understanding of seagrass ecological functions and add to the scientific basis for coastal resources management. The study site is South Bay, the southernmost bay of the Lower Laguna Madre of Texas. Objectives are: 1) compare decomposition patterns of seagrass leaf blades and rhizomes (determining decay rates, half-lives and recalcitrant pool sizes); and 2) quantifying and comparing N usage during decomposition of seagrass tissues to the N content of live seagrass tissues. Determinations of stable isotope ratios (15N/14N) will include decomposing litter to trace the flow of N from different sources within the estuary; including water column, live seagrass blades and rhizomes; epiphytes attached to seagrass blades, decomposing tissues and sediments primarily to determine if N is being incorporated more into live seagrass tissues or decomposing material from the surrounding media (i.e., water, sediment). Preliminary decomposition data for %Ash-Free Dry Weight (AFDW) remaining suggests that approximately, 30% of seagrass dry mass was lost after 9 d for blades and 60 d for rhizomes. At 77 d, the end of the experiment set up, 15% of dry mass was left for blades and 60% for rhizomes. Work is currently in progress, samples are being processed and prepared for stable isotope analyses.

Macroclimate controls on tidal wetland ecosystems: Variation in plant community structure across climatic gradients in northern Gulf of Mexico estuaries

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The northern Gulf of Mexico coast spans broad temperature and precipitation gradients. However, the effects of macroclimate on coastal wetland ecosystem structure have not been fully quantified. In tidal wetlands, foundation plant species (e.g., mangrove trees or salt marsh grasses) play important functional roles, including creating habitat and supporting entire ecological communities. This study investigates the following questions: (1) How do macroclimatic factors govern, directly or indirectly, the distribution, abundance, and performance of foundation plant species in tidal wetlands?; and (2) What conditions characterize ecological transition points where major shifts occur in wetland community structure or species dominance? To address these questions, we measured coverage by individual species, vegetation height, biomass, and soil and landscape characteristics in 1020 study plots across elevation and salinity gradients in ten northern Gulf of Mexico estuaries that span broad regional temperature and rainfall gradients. Sites ranged from hot and dry (south Texas), to cool and wet (Louisiana, Mississippi, Alabama), and to hot and wet (south Florida). We developed models using climate, elevation, and plant community data for common species and functional groups, and identified critical ecological transition points along key abiotic gradients. We quantified major differences among the estuaries in plant community structure, composition, and zonation that are attributable to macroclimatic drivers. At the local scale (i.e., intra-estuary), we quantified ecological transition points associated with changes in elevation and salinity. At the landscape scale, we quantified transitions associated with variation in temperature and rainfall. Total vegetation cover, biomass and canopy height generally increased

with rainfall. These parameters were lowest in south Texas where algal flats dominated and highest in south Florida where mature mangrove forests dominated. Prevalence of particular foundation species and functional groups also varied predictably with rainfall. Graminoids (e.g., *Spartina alterniflora* and *Juncus roemerianus*) or mangroves (e.g., *Avicennia germinans*) dominated wetter (higher rainfall) estuaries, succulents (e.g., *Batis maritima*) dominated drier estuaries, and algal mats dominated the driest estuaries. Temperature influenced aridity and governed whether graminoids or mangroves were locally dominant, with warmer climates favoring mangroves. Intra-estuary transitions in vegetation relate to transitions in local abiotic conditions, which are greatly influenced by macroclimate, especially rainfall and freshwater availability. Our results highlight the importance of accounting for changing macroclimatic conditions within future-focused management and restoration efforts for coastal wetlands.

Surge of Green Turtle Cold Stunning in Texas

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Since 2010, hypothermic stunning has become a substantial annual threat to sea turtles in Texas. Large hypothermic stunning events occurred during early 2010, early 2011, late 2013 to early 2014, and late 2014 to early 2015, when 464, 1,683, 1,300, and nearly 700 sea turtles were found, respectively. These tallies were far more than documented during any other hypothermic stunning events recorded in Texas since the Sea Turtle Stranding and Salvage Network was established in 1980. The vast majority affected during these events were green turtles (*Chelonia mydas*), although a few loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) turtles were also located. Most were found in inshore areas (bays and passes) and in south Texas, and smaller numbers were found in offshore areas (Gulf of Mexico beaches) and on the upper and middle Texas coast. Approximately two-thirds of the turtles were located alive and taken to rehabilitation facilities. Most survived and were released. Most of the dead turtles were found in areas that were difficult to access. Hypothermic stunning is the most significant source of green turtle strandings in Texas. Most of the green turtles found were juveniles. The numbers of juvenile green turtles inhabiting south Texas waters has been increasing rapidly, so it is expected that the numbers of turtles affected by hypothermic stunning will continue to increase. Organized search efforts and assistance of the public are needed to ensure that turtles are quickly found, brought to rehabilitation, and saved during these events.

Current Documentation of Fibropapillomatosis in Green Turtles (*Chelonia Mydas*) Captured from Texas Inshore Waters

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Texas waters provide essential habitat to five protected sea turtle species, including the green turtle (*Chelonia mydas*). Fibropapillomatosis (FP) was first reported in Texas greens during summer 2010 (Tristan et al. 2010) and is a condition likely caused by a herpesvirus. It is characterized by internal and external tumors that compromise a turtle's ability to swim, see, feed and escape from predators. Directed-capture surveys utilizing large mesh entanglement nets and cast nets were conducted at inshore locations along the Texas coast during 2014 to assess current abundance, distribution, FP occurrence and herpesvirus variant in this population of greens. A total of 41 green turtles were captured, with 33 taken during entanglement netting effort near seagrass beds and 8 turtles acquired via cast-net at jettied passes. Overall, 11 of 41 (26.8%) green turtles exhibited FP tumors, with all afflicted turtles collected in the lower Laguna Madre and all tumors possessing FP herpesvirus variant B (Ene et al. 2005). Tumor scores (TS) were given to all individuals (Work and Balazs 1999), with 12.2% being mildly afflicted (TS 1), 7.3% being moderately afflicted (TS 2), and another 7.3% severely afflicted (TS 3). Tumors were most prevalent in the 40-49.9 cm (60%, n = 10) and 50-59.9 cm (67.7 %, n = 3) SCL size classes. The new emergence of FP in Texas greens provides another opportunity to better understand the etiology of this disease, but also raises concerns as to its impact on continued population growth (Metz and Landry 2013).

Brown Pelican Fledgling Success and Diet: Potential Drivers of Changing Regional Distribution in the Texas Coast

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Following their extirpation from the northwestern Gulf of Mexico, Brown Pelicans have gradually recolonized the Texas coast. In recent years, nesting numbers have grown exponentially in northern Texas colonies (Galveston Bay), while remaining stable or declining elsewhere in the state. Aside from an annual breeding census, little demographic information has been reported for Brown pelicans in this portion of their range. During the summer of 2014, we assessed fledging success and chick condition in subsets of the four largest Texas colonies (Marker 52, North Deer, Sundown and Shamrock islands). We also measured frequency, size, and content of chick meals as potential drivers of differences in demographic rates. Both chick condition and fledging success declined from north to south, with Galveston Bay breeders producing nearly twice as many fledglings per nest (0.93 ± 0.43) as breeders in the southernmost colony in Corpus Christi Bay (0.47 ± 0.33). Notably, while provisioning rates declined from north to south, meal masses increased along the same gradient. Northern nestlings received more Gulf menhaden, particularly in small size classes; however, our energy density analysis suggests that energetic content is similar across main prey species and regions.

We conclude that higher nest productivity at northern colonies may be contributing to their rapid growth and that varying prey availability is a more likely driver than prey quality of observed demographic patterns.

Should I Stay or Should I Go? Conservation Implications of Individual Variation in Brown Pelican Migratory Strategies

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Although Brown Pelicans (*Pelecanus occidentalis*) are resident throughout their range, some individuals regularly undertake postbreeding migrations of up to 3,000 km. Variation in migratory strategies could expose different subsets of the population to differing risk factors and play a substantial role in population dynamics; however, little information exists on the prevalence or distribution of long-distance migrants. To address this information gap, we used GPS loggers to track postbreeding movements in 85 Brown Pelicans breeding in Florida, Louisiana, and Texas colonies. For all individuals for which we obtained a complete migration cycle (n=43), we modeled migratory strategy (resident or migrant) as a function of sex, body size, body condition, breeding location, and recent reproductive success. We found that females were more likely to migrate, while males were more likely to be resident. Body size was a significant predictor for males, with larger males more likely to remain resident, but was not significantly different between resident and migrant females. Likelihood of migration also increased with colony size. Neither body condition nor breeding success influenced migratory strategy. Regionally, Texas and Louisiana breeders were more likely to migrate than Florida breeders, with most individuals wintering along the Mexican coast. Two years of data indicate that migration is relatively consistent within individuals, and we plan to further investigate the role of genetic factors in determining migratory patterns. We conclude that understanding risk factors in non-breeding areas is essential to assessing overall mortality risk for the species, particularly in the Western and Central Gulf.

Bird #19: The remarkable winter site fidelity of a Piping Plover (*Charadrius melodius*) on Mustang Island Gulf beach, South Texas

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The endangered Piping Plover (*Charadrius melodius*) winters over in South Texas and other sites in southern North America. The author has monitored the plover populations on Mustang and San Jose Islands for 37 years. C. melodius breeds along the Atlantic seaboard, the Great Lakes, and the Canadian Great Plains and migrates to winter here as early as July 1, staying until May the following year. A banding program was initiated in 2002. The unique combination of colored bands, and now flags, has allowed tracking of individuals on the wintering grounds. One such bird, the 19th banded Piping Plover observed by the author, defends a territory on Mustang Island beach bordering the Gulf of Mexico in which it forages and feeds and occasionally roosts. Number 19 was banded as a chick in 2003, at Dryboro Lake, Saskatchewan, Canada. Known to the author as “Green on Yellow-Green,” it is now spending

its 12th winter on its Mustang Island territory It has been observed 297 times and the GPS location data exhibits an almost perfect bell curve distribution almost exclusively within +/- 100 m from the mean. This paper discusses the implications of this fidelity, the relation to human disturbance, beach management, and development. Other aspects of the banding program and plover population trends will be presented.

Effectiveness of crab trap bycatch reduction devices (BRDs) in the Nueces and Mission-Aransas Estuaries, Texas

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Diamondback terrapins (*Malaclemys terrapin*) are the only brackish water turtle species in North America. Occurring from Cape Cod, MA to Corpus Christi, TX, this species inhabits coastal habitats including marsh, tidal creeks and rivers, and open bays. These same habitats are often shared with blue crabs (*Callinectes sapidus*) which are recreationally and commercially fished for food. Terrapins are often drawn to the traps used to capture blue crabs and may become entrapped. With no access to air, trapped terrapins often drown. This blue crab fishery is economically important and efforts to reduce incidental terrapin mortality must account for this. This study tested the efficacy of bycatch reduction devices (BRDs) in excluding terrapins from crab traps and also addressed the resultant blue crab catch rates associated with the use of BRDs. Between 2013 and 2014, control (non-BRD) and experimental (BRD) crab traps were fished in a manner consistent with commercial crabbing operations in the Nueces and Mission-Aransas Estuaries. Each estuary was sampled for one year, excluding months when depressed water temperatures caused inactivity in both terrapins and blue crabs. Results of these studies showed that BRDs were highly effective at excluding terrapins from crab traps. Blue crab catch rates were minimally affected by the use of BRDs in both estuaries. These results suggest that BRDs are an inexpensive, and effective, management tool for conserving terrapin populations without negatively affecting the blue crab fishery.

Historical Occurrence and Trends in the Distribution of the Texas Diamond-backed Terrapin, *Malaclemys terrapin littoralis*

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The Texas Diamondback, *Malaclemys terrapin littoralis*, is the only naturally occurring species of turtle found in estuaries ranging from Sabine Lake to Baffin Bay. Terrapin have been identified as a species of concern by state and federal agencies. The primary objectives of our study were to 1) determine distribution and trends in abundance and 2) determine critical factors affecting terrapin in Texas. We conducted a literature review, interviews, and field studies during 2014. Information on location, method captured, habitat, and environmental data were collected to evaluate their possible relationship with terrapin distribution. The first report of terrapin in Texas is 1841. The primary factor causing major declines in terrapin from 1841 to the 1920 was commercial harvest of the species for food. During 1912 through 1975 the shell dredging industry removed large amounts of oyster shell in Texas including shell beaches and

small islands. The largest known populations of Texas terrapin today are found in the Nueces and West Galveston Bay near or on isolated islands with shell beaches. The only reported sightings of nesting terrapin have been on shell beaches located in West Bay and nearby Moses Lake. We conclude that the two primary factors causing major declines in terrapin before the 1970's were overharvesting and loss of nesting habitat. The blue crab fishery and boat collisions are the two present anthropogenic sources of mortality. Due to a small home range (≤ 254 hectares), loss of nesting and marsh foraging habitat, terrapin face an increased risk of extirpation.

Assessment of Habitat and Prey Availability Associated with the Distribution of Texas Diamond-backed Terrapin (*Malaclemys terrapin littoralis*)

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Diamond-backed terrapins (*Malaclemys terrapin*) are an Emydid turtle specialized for living in saltmarshes. The Texas subspecies (M. t. *littoralis*) is found along most of the Texas Gulf coast. The few studies assessing habitat and prey availability have been conducted on Atlantic subspecies of Diamond-backed Terrapin. Previous studies indicate that resource availability may not be the primary factor regulating terrapin distribution. Due to body size sexual dimorphism, studies indicate resource partitioning between males and females may be occurring. There is currently a paucity of data on the ecology of this species along the Gulf of Mexico, especially when considering terrestrial habitat use. This study attempts to characterize the terrestrial habitat used by Texas Diamond-backed Terrapin. Quadrats (1m2) were employed to examine prey numbers and habitat conditions at random and terrapin capture locations. For habitat metrics, random locations were significantly higher in number of plant species and vegetation coverages when compared with capture locations. No significant difference between location types was detected for the dominant plant species *Spartina alterniflora*. Random locations had significantly higher numbers of *Uca* spp. burrows than capture locations. Overall marsh location showed significant differences in habitat and prey metrics. When testing capture locations specifically, multiple significant seasonal vegetation and prey differences were detected. However, no differences for any factor between sexes were detected. These findings support previous studies and extend the basic knowledge and understanding of habitat utilization by this species which will be useful for ongoing conservation and management of M. terrapin, especially the Texas subspecies.

Impacts of food availability on prey defenses in Eastern oysters *Crassostrea virginica*

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Many prey species must balance the benefits of defending against predators with the costs of producing these defenses. As predation risk increases, the benefit to organisms, in terms of increased survival, is assumed to outweigh the cost of sacrificing growth and fecundity. Such relationships have been demonstrated for many model systems under simplified laboratory

conditions. However, predator prey interactions occur against a background of environmental conditions and the cost of defending is like to change as these conditions shift. Sacrificing opportunities for energy acquisition, for example, will become more costly as resources become scarce. Therefore, under these conditions, induced defenses to predation risk are expected to decrease. The role of inducible defenses under conditions of changing food availability were investigated using Eastern oysters *Crassostrea virginica* and the Atlantic mud crab *Panopeus herbstii* as a model system. In this system, defenses seem to be unaffected by food availability despite negative effects of low food availability under control conditions. These results highlight the importance of investigating inducible defenses under naturally relevant conditions to determine the importance of defensive responses and predatory interactions on community structure.

Spatiotemporal analysis of jellyfish abundance for coastal Texas

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In this study we examine abundance of three species of Scyphozoan jellyfish (*Aurelia aurita, Chrysaora quinquecirrha* and *Stomolophus meleagris*) captured in TPWD trawls from 1983-2013 with these specific goals in mind: (1) to analyze trends in abundance for eight Texas bay systems and (2) to determine if abundance trends are constant among bay systems. Few long-term studies have been conducted to determine changes in abundance of these organisms. The Texas coast encompasses eight hydrologically and geographically unique bay systems that are ideal for studying biological-environmental interactions. Texas Parks and Wildlife Department (TPWD) has been conducting fisheries independent monitoring surveys for each bay system since the late 1970's, with uniform standardization occurring in the 1980's, to document changes in abundance of marine organisms. This long-term data provides the opportunity to analyze large (coastwide) and small (bay system specific) scale trends over time. Though highly variable, significant species specific changes in abundance have occurred for some central coast bay systems. Among the bay systems examined, A. *aurita* shows consistent positive trends in abundance, S. *meleagris* shows consistent negative trends in abundance, and C. *quinquecirrha* shows variable trends (both positive and negative) in abundance. However, plots of ranked abundance suggest that these trends are very slight across the timeseries examined. The next step for our analysis will be to quantify environmental drivers of these observed trends.

Residence of Anglers Fishing in the MANERR, 1983-2014

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The Texas Parks and Wildlife Department (TPWD) has been recording the county of residence of anglers interviewed during their creel survey since 1983. Within the Mission-Aransas National Estuarine Research Reserve (MANERR), TPWD annually expends 133 survey-days at 25 boat ramps and marinas and currently interviews about 5,700 anglers per year. The number of anglers interviewed has doubled from 21/day in 1983 to 44/day in 2014, a reflection of the increase in recreational fishing within the MANERR. Anglers from 251 out of the 254 Texas

counties, all 50 states and several countries have been interviewed, with nonlocal anglers outnumbering local anglers (Aransas, Nueces, Refugio and San Patricio counties) 3:1. The most frequently encountered anglers are from Bexar, Aransas, Travis, Harris and Nueces counties. Non-metric multidimensional scaling (NMDS) indicates significant ($p<0.001$) differences in the composition of anglers between high-use season (May 15-November 20) and low-use season (November 21-May 14), and also between private boat anglers and charter boat (guided) anglers. The low-use season has a higher percentage of out-of-state anglers, while guided anglers are less numerous than private boat anglers. These results indicate that the MANERR is an important recreational fishing destination for anglers across the state and the US, and is a significant contribution to the local economy as outside dollars are brought into the area by nonlocal anglers.

The importance of a Northern Gulf of Mexico spring transition as inferred from marine fish biochronologies

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Multidecadal biochronologies were generated from the otolith growth-increment widths of reef-dwelling red snapper (*Lutjanus campechanus*) and gray snapper (*L. griseus*), migratory king mackerel (*Scomberomorous cavalla*), and estuarine black drum (*Pogonia cromis*), all collected from the Gulf of Mexico. Synchronous growth patterns were evident within each species, which facilitated the development of exactly dated biochronologies, the longest of which spanned 46 years. All species significantly ($p < 0.05$) and positively correlated to sea surface temperatures (SST) in the northern Gulf of Mexico, especially between March and June. Red and gray snapper correlated with SST early in the springtime window (March and April), as did mackerel (March through May), while drum correlated from May through June. The leading principal component (PC1fish) of these four fish chronologies captured 68% of the variability in the dataset, underscoring the synchrony among these fish time series. PC1fish also positively correlated to sea level pressure in the Gulf of Mexico and western Atlantic in the area of the Bermuda High. Thus, a strong springtime Bermuda High and associated warm temperatures are favorable for fish growth and may reflect a broader spring transition from a winter to summertime climate pattern in the northern Gulf.

Distribution, Abundance, and Habitat Use of the Saltmarsh Topminnow (*Fundulus jenkinsi*)

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Fundulus jenkinsi has a preference for low to moderate salinities and is primarily found along the edge of saltmarsh habitat surrounding small intertidal creeks. Not much is known about *F. jenkinsi*'s range or abundance within Texas. *Fundulus jenkinsi* is under consideration for federal listing and given this species' restricted range in Texas and recent projections of land development, land subsidence, and sea level rise it is important to document its habitat

requirements and distribution. The objectives of our study was to document the distribution, abundance, and habitat use of *F. jenkinsi* within the Galveston Bay and Sabine Lake watershed. Tidally influenced generally mesohaline sites were chosen to evaluate the influence of salinity gradients on *F. jenkinsi* occurrence. Fish communities were sampled using seines and Breder traps. Water depth, tide stage, water quality, dominant vegetation, and habitat type were recorded during each sampling even. When collected, specimens of *F. jenkinsi* were identified, counted, and measured. For each sampling event, abundance (N), species abundance (N), relative abundance (%), catch-per-unit-effort (CPUE), richness (S), diversity (H′) and evenness (J′) was calculated. In addition, fish community assemblages were analyzed using PRIMER 6 to identify environmental and biological factors relating to spatial and temporal trends in *F. jenkinsi* presence across sites. The results of our monitoring efforts are presented for both estuaries.

Early maturation of black drum (*Pogonias cromis*) in Baffin Bay, Texas

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Black Drum (*Pogonias cromis*) from the upper Laguna Madre (ULM) system have been shown to mature at earlier ages than individuals from other Texas bay systems. However, recent studies have shown differing levels of recruitment in the Baffin Bay complex (BBC; secondary and tertiary bays located within the ULM system) compared to the primary bay of this system (ULM proper). This may suggest differing reproductive biology or larval/juvenile survivorship between these areas. We conducted a study to compare age-at-maturity of black drum in BBC, ULM proper, and Matagorda Bay using gonadosomatic indices and identification of egg maturity stage. Black Drum from BBC were found to be reproductively mature at smaller sizes than individuals from both ULM proper and Matagorda Bay. Additionally, reproductive development occurred earlier in the spawning season for both BBC and ULM proper compared to Matagorda Bay. While otoliths have yet to be processed, preliminary analysis suggests that Black Drum from BBC do mature at a smaller size which may be at least partially responsible for elevated recruitment observed in this system. Other studies have suggested that this early maturation may be an adaptation to deal with differential mortality among systems.

Trophic relationships between black drum (*P. cromis*) and benthic food resources in Baffin Bay, TX: an evaluation using multiple approaches

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Black Drum, *Pogonias cromis*, are large-bodied sciaenid fish that occur throughout warm-temperate to subtropical estuaries in the northwest Atlantic and Gulf of Mexico. Black Drum constitute important commercial and recreational fisheries, with approximately 1.7 million pounds of Black Drum landed in Texas in 2010, earning ~$1.6 million. The ecology of Black Drum remains poorly characterized across the vast majority of its range, particularly along the

Texas coast. The Baffin Bay Complex (BBC) supports the highest catch per unit effort of Black Drum in Texas. However, during 2012 through 2014, large numbers of fish have been observed with abnormal physical characteristics and emaciated morphology. The working hypothesis is that Black Drum exhibit strong fidelity to the BBC and may have been affected by changes in availability and identity of prey resources, which in turn exhibit distribution patterns related to local ecological and water quality conditions. Seasonal benthic surveys are being conducted to determine the distribution and abundance of potential prey items. Black Drum are also being collected from throughout the BBC for visual and stable isotope analysis of gut contents. Acoustic telemetry is being used to quantify Black Drum distribution and habitat use. The results of this study will provide a better understanding of the linkages between water quality, benthic prey, and Black Drum ecology in the BBC.

Reproductive biology of red snapper, *Lutjanus campechanus*, on natural and artificial reefs in the western Gulf of Mexico

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Energy exploration in the Gulf of Mexico (Gulf) has resulted in the addition of numerous oil and gas production platforms that have added structurally complex habitat to an area otherwise comprised of primarily bare (mud or sand) bottom. The impact of these artificial structures on fish populations is largely unknown and there is ongoing debate about their functionality. Red Snapper (*Lutjanus campechanus*) is an ecologically and economically important sportfish that utilizes natural reefs as well as the artificial reefs created by standing and reefed (toppled or cutoff) oil and gas platforms. Little is known about the reproductive characteristics of Red Snapper in the western Gulf, and how they may differ between natural and artificial habitats. Red Snapper (155-855 mm TL) were collected from various habitat types in the western Gulf including standing rigs, reefed rigs, and natural hard-bottom. Physical parameters (sex, total weight, gonad weight, TL) were recorded and ovaries were preserved for histological analysis. Sex ratios, gonadosomatic indices (GSI), reproductive stages, and weight were compared between habitat types. Sex ratios were nearly 1:1 at natural habitats and standing rigs, with reefed rigs having a higher percentage of males (59.8%) than females. Preliminary GSI data between sites suggests a similar spawning season between structure types. These initial results suggest that the functionality of artificial reefs and natural reefs could be similar for Red Snapper reproductive biology in the western Gulf.

Tolerance of red drum (*Sciaenops ocellatus*) to varying levels of CO_2

Elizabeth Brown* and Andrew Esbaugh; The University of Texas Marine Science Institute (*Student Presentation*)

Anthropogenic CO_2 emissions have raised oceanic CO_2 by 40% since the pre-industrial era, which has reduced ocean pH by 0.1 units. This results in acid-base disturbances in marine organisms that are compensated through regulatory pathways. Interestingly, many estuarine fish regularly encounter periods of elevated CO_2, which may impart a level of species resilience to ocean acidification (OA). This study assessed the plasticity of such regulatory pathways in red

drum (*Sciaenops ocellatus*) gills after acclimation to varying CO_2 levels. Red drum were exposed to OA level CO_2 (1,000 μatm) for 24h, 72h, and 14d with concurrent controls. Proof of principle exposures were performed at 5,000 and 20,000 μatm and assessed after 4, 8, 24, and 48 h of exposure. Gills were analyzed for a suite of acid-base relevant genes via qPCR. No significant changes in gene expression were observed in OA and 5,000 μatm treatments, which suggests that red drum have baseline expression sufficient to compensate for these CO_2 exposures. This is supported by whole animal acid flux experiments, which revealed that acid-base disturbances of 5,000 μatm were fully compensated after only 2 h of exposure, with acid flux returning to control levels over the ensuing 4 h. In contrast, 20,000 μatm showed dramatic up-regulation of acid excretion pathways, which demonstrates the capacity for phenotypic plasticity. Overall, these results indicate that red drum are able to fully compensate for environmentally relevant acid-base disturbances using baseline cellular machinery, likely owing to their highly variable estuarine habitat.

The influence of mortality on the genetic diversity of red drum in pond culture

Joel Anderson*, Paul Cason and Ruben Chavez; Texas Parks and Wildlife, Coastal Fisheries

One of the goals of the Texas Parks and Wildlife red drum (*Sciaenops ocellatus*) stock enhancement program is to maximize the genetic diversity of released fish. Historically, strategies seeking to maximize genetic diversity have been focused on the spawning process, and have been based on the idea of maximizing the number of broodfish involved in singular spawning events. A second relatively unexplored point at which genetic diversity may be lost is in the outdoor pond culture phase, where fishes spawned by multiple family groups are grown together prior to release. We monitored the survival rates of all red drum families during the course of pond culture in six different pond trials, to evaluate the null hypothesis that the rate of natural mortality during the culture phase is consistent among family groups. We further estimated the genetic effective size of fishes prior to, and directly after pond culture in an effort to determine whether differential mortality rates among families had deleterious effects on genetic diversity of the population. Variance in mortality rates were observed among families within some trials, although the magnitude of variability differed among trials. In some cases, variance in mortality had a significant influence on genetic diversity of the stocked population. Survival of pond cultured juveniles was significantly linked to faster growth rates among maternal siblings. These data suggest that variance in mortality among family groups during pond culture can negatively influence the genetic diversity of stocked red drum, although this effect is not entirely consistent through time.

Temperature tolerance of red drum (*Sciaenops ocellatus*) is unaffected by hypoxia exposure despite >90% reduction in oxygen supply capacity

Rasmus Ern* and Andrew J. Esbaugh; The University of Texas Marine Science Institute

Insufficient oxygen supply for vital physiological functions has been hypothesized the determinant of upper thermal limits (T_{crit}) in fish. The fish heart is situated after the tissue and cardiac oxygen supply therefore relies on venous PO2. As a result, the exponential increase in tissue oxygen demand with rising temperatures causes a gradual decline in venous PO2 limiting

cardiac oxygen supply, heart performance and oxygen supply capacity of the cardiorespiratory system ($\dot{M}O_2max$). This negative spiral continuous until the T_{crit} where oxygen demand for basic maintenance functions (SMR) exceeds $\dot{M}O_2max$. Several species maintain aerobic scope ($\dot{M}O_2max$ – SMR) few degrees below T_{crit} indicating that insufficient oxygen supply is not the determinant of T_{crit} in all fish. It has, however, been argued that the collapse of the cardiorespiratory system occurs very close to T_{crit} in these species, and that insufficient oxygen supply therefore remains the determinant of T_{crit}; leaving the hypothesis unresolved. Aerobic scope measurements at T_{crit} reveal little because it is difficult to determine if death occurs due to insufficient oxygen supply or if the cardiorespiratory system collapses because the fish is dying. We therefore measured the effects of temperature and hypoxia on T_{crit}, SMR, $\dot{M}O_2max$, and the critical water oxygen tension (P_{crit}) below which the fish cannot maintain sufficient oxygen uptake to sustain SMR; i.e. aerobic scope is zero. We find T_{crit} is unaffected by hypoxia exposure despite >90% reduction of aerobic scope and we therefore reject the hypothesis that insufficient oxygen supply is the determinant of T_{crit} in all fish species.

Abstracts for Poster Presentations

Gulf of Mexico Research Initiative Information and Data Cooperative: Adventures in Large Scale Data Management

Lauren Showalter* and Sandra Ellis; Gulf of Mexico Research Initiative, Harte Research Institute, Texas A&M University-Corpus Christi

Following the 2010 Deepwater Horizon BP Oil Spill in the Gulf of Mexico, BP committed $500 million (USD) for a research program that investigates the impacts of oil, dispersed oil, and dispersant on the environment and to develop strategies for response to future disasters. This research program, the Gulf of Mexico Research Initiative (GoMRI), is mandated to make all the data produced available to the public. To fulfill this goal, GoMRI developed the Gulf of Mexico Research Initiative Information and Data Cooperative (GRIIDC). GRIIDC addresses the data and information needs of this varied community of more than 2,000 scientists. The mission of GRIIDC is to ensure a data and information legacy that promotes continual scientific discovery and public awareness of the Gulf of Mexico Ecosystem. As part of its effort to encourage data sharing among scientists interested in oil-spill related research in the Gulf of Mexico, GRIIDC maintains a catalog of data generated by GoMRI scientists. GRIIDC has developed tools to facilitate submission of data and creation of metadata by scientists; while tools to search the catalog and download data have been developed to cater to both the needs of researchers and the general public. This poster will display current technologies used to build the GRIIDC data management system (e.g., geospatial search tools, and an ISO 19115-2 metadata editor), barriers encountered in the development of this system, interoperability with government and private interests, and achievements associated with building a cooperative network of scientists dedicated to data sharing.

Wading Birds of the Texas Gulf Coast: an Overview of an Earthwatch Research Expedition

[1]Jeffrey R. Wozniak*, [2]Elizabeth Smith, [3]Julia C. Buck and [1]Kelbi Delaune; [1]Department of Biological Sciences, Sam Houston State University; [2]International Crane Foundation; [3]Texas Research Institute for Environmental Studies, Sam Houston State University

In the summer of 2014, ten high school students from Los Angeles County participated in a 2 week Earthwatch Ignite Research Expedition at the Aransas National Wildlife Refuge (ANWR). The over-arching goal of the expedition was to train these young scientists in the field of coastal ecology and through hands-on experimentation and observations to gain a better understanding of how environmental and anthropogenic stressors impact coastal marsh ecosystems. Earthwatch student researchers investigated a wide range of ecological parameters in coastal salt marshes at ANWR. The program focused on four unique, yet connected, ecological research areas: 1) Coastal marsh ecology, 2) Parasite ecology & ecosystem health, 3) Influence of salinity on blue crabs and 4) Wading bird ecology & conservation. This presentation summarizes each of these focal areas and illustrates how Earthwatch students synthesized each to determine potential impacts on wading bird resources and coastal wetland habitat quality.

Observations on the Movement and Distribution of Bottlenose Dolphins (*Tursiops truncatus*) in Upper Galveston Bay

[1]Sherah Loe*, [2]Kristi Fazioli and [2]Dr. George Guillen; [1]University of Houston-Clear Lake, School of Science and Computer Engineering; [2]University of Houston-Clear Lake, Environmental Institute of Houston (*Student Presentation*)

Galveston Bay (GB) is the largest estuary in Texas, rests adjacent to the nation's energy capital, and is located in the most populated region of the state. The Houston Ship Channel (HSC) divides GB and is an avenue for heavy maritime traffic ending at the Port of Houston (POH) in the northwest. Consequently, GB has suffered degraded water quality due to anthropogenic influences. Current concerns include heavy metals, chlorinated organic compounds, and seafood advisories, making GB a high priority for biological monitoring. Bottlenose dolphins (*Tursiops truncatus*) are long lived organisms in GB and are exposed to these anthropogenic stressors. Surveys conducted in 1990 revealed limited dolphin activity in upper GB. Until recently, no other surveys have been conducted in this region. Our objectives are: 1) estimation of dolphin abundance, demographics, and movement; 2) characterization of behavior; and 3) collection of gross measures of health. Based on preliminary data, photo-id surveys (n=11) conducted in 2013-14 resulted in over 300 dolphins sighted, suggesting regular use of upper GB, including the HSC near the POH. Increased occurrences of dolphins may indicate reduced levels of contaminants & other stressors. Additional monitoring should be conducted to determine other factors. We will continue long term photo-id monitoring and, in 2015-16, plan to perform remote biopsy sampling for stable isotope & contaminant concentration analyses. This multidisciplinary approach will provide critical data to better understand habitat use, site fidelity, and foraging ecology of GB dolphins in addition to information on ecological and human risks from contaminant exposure.

Colonization of the Corpus Christi Nearshore Reef: A comparison of underwater video and traditional sampling gears for indexing reef fish presence and abundance

Lily M. Walker*, Matthew K. Streich and Gregory W. Stunz; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi (*Student Presentation*)

Artificial reefs are a popular management tool used to enhance fish stocks and increase habitat availability for reef fishes. However, uncertainty regarding the impacts of artificial reefs on marine fisheries exists due to a lack of fishery independent surveys—specifically those that quantify changes in fish abundance and community structure from the onset of reef establishment. In October 2013, the Corpus Christi Nearshore Reef was constructed providing a unique opportunity to monitor colonization patterns. Vertical lines and small fish traps have been used to monitor changes in fish abundance since the reef was constructed. In March 2014, we added underwater video to the trap deployments as an additional survey method. The goal of this study was to evaluate the ability of these methods to assess the reef fish community. Specifically, we compared species richness, frequency of occurrence, and abundance indices between these survey methods. Species richness derived from vertical lines and traps (4 and 6, respectively) was lower than richness observed from video (21). For 3 of the 4 species that were captured in traps and observed on video, the frequency of occurrence was significantly higher

on video. Frequency of occurrence for Red Snapper and Gray Triggerfish was 166% greater on video than on traps. Relative abundance indices from vertical lines, traps, and video surveys suggested that Red Snapper abundance increased over time. Our results indicate that underwater video can be a useful addition to traditional sampling methods by providing a more comprehensive assessment of the reef fish community.

New Reef, New Refuge: A preliminary study of alternative substrate use by fishes and macroinvertebrates on Half Moon Reef, Matagorda Bay

Taylor Haskins*, Kevin De Santiago and Jennifer Beseres Pollack; Texas A&M University-Corpus Christi (*Student Presentation*)

The availability of hard structure is a fundamental component of oyster reef development, as free swimming oyster larvae require attachment points for growth and recruitment. Oyster reefs across the Gulf of Mexico have been subject to a number of environmental stressors for many years. Recently, disease and several anthropogenic affects such as pollution and overharvesting have led to a sharp decline in oyster populations. Oysters play a large role in ecology of the Gulf Coast bays and estuaries by providing habitat that facilitates predator- prey interactions and also through their water filtration activities. From late 2013 through early 2014, 57 acres of oyster reef were restored using concrete and limestone substrates at historic Half Moon Reef in Matagorda Bay to facilitate settlement of oyster larvae and enhance fish populations. Our study aims to compare oyster recruitment and reef-associated faunal utilization on concrete versus limestone substrates at Half Moon Reef as well as adjacent unstructured bay bottom. Preliminary results indicate higher species abundance and richness on limestone substrates. The results of this study will provide insight into the effects of substrate type on larval oyster recruitment and local species abundance.

Predicting 3 majors shrimp species distribution and abundance across the Gulf of Mexico through different modeling techniques

Xiaopeng Cai; Costal and Marine System Science, Texas A&M University-Corpus Christi (*Student Presentation*)

Farfantepenaeus aztecus (brown shrimp), *F. duorarum* (pink shrimp) and *Litopenaeus setiferus* (white shrimp) are the most common shrimp species across the Gulf of Mexico (GOM). Accurate prediction of the distribution and abundance of these species in the GOM will help governments better manage shrimp resources. To achieve this goal, Generalized Linear Models (GLM), Generalized Additive Models (GAM) and Random Forests (RF) were applied using 43 variables to predict the distribution and abundance of the shrimps. Shrimp abundance data as well as 39 predictors including latitude, longitude, depth, bottom types and different environmental condition parameters for surface, middle and bottom layer of the water column were obtained from the Southeast Monitoring and Assessment Program (SEAMAP), while bottom type data (sand, mud, rock and gravel) were obtained from the National Oceanographic Data Center (NODC) regional climatology database. Shrinkage models using fewer predictors for each method were evaluated by Akaike information criterion (AICc) and R2. Results showed that RF model had the best performance among the 3 methods. RF shrinkage model

with predictors of latitude, longitude, depth and bottom types can reliably capture the areas of high and low abundance of the 3 shrimp species including those areas where abundance data were absent. The methods can be further refined to predict distribution of other species, and help the government manage the fisheries resources more efficiently.

Assessment of mercury and stable isotopes in selected game fish food webs of Texas bays and estuaries

Tracy F. Weatherall*, James Simons and Kim Withers; Center for Coastal Studies, Texas A&M University-Corpus Christi

Abstract: Methylmercury, the most toxic form of mercury, bioaccumulates in terrestrial and aquatic food webs. Humans are exposed mainly through consumption of predatory fishes, with children most at risk. Atmospheric inorganic mercury occurs in precipitation and particulates which is deposited into lakes, rivers, and estuaries where it is converted to methylmercury. There are few data to trace mercury from the environment through food webs to humans. This project will provide information on mercury concentrations in tissues of food web components of red drum, black drum and spotted seatrout. Study areas are Lavaca Bay, San Antonio Bay and Nueces Bay, all popular sport fishing areas. Our objectives are: 1) analyze tissues and food organisms of Texas coastal game fishes to assess methylmercury concentrations in study area food webs; 2) conduct stomach content analysis on game fishes to confirm food choices; 3) conduct stable isotope analysis on predator and prey organisms to confirm food web linkages; and, 4) construct a model of likely pathways of methylmercury bioaccumulation. Game fishes, prey organisms (fishes, crustaceans, polychaetes, molluscs), phytoplankton, zooplankton, and sediments were collected for methylmercury and stable isotope analyses. Preliminary results indicate spotted seatrout had highest mean methylmercury concentration (1011 ng/g dw) with black drum lowest (529 ng/g dw). Mean total mercury for prey items was highest in Lavaca Bay (88.1 ng/g dw) with San Antonio Bay lowest (24.3 ng/g dw). Mean δ15N for all prey and game fish combined was greatest in San Antonio Bay (16.61) and lowest in Lavaca Bay (12.92).

Identification of Regulators of the Membrane Androgen Receptor Induced Apoptotic Pathway in Ovarian Follicle Cells of Atlantic Croaker (*Micropogonias undulatus*) and the Disruption of Apoptosis by Environmental Antiandrogens

Aubrey Converse* and Peter Thomas; The University of Texas Marine Science Institute (*Student Presentation*)

Berg et al. (2014) identified a novel membrane androgen receptor (mAR) in Atlantic croaker ovarian follicle cells that is also a member of the ZIP9 zinc transporter subfamily. The activation of this mAR results in the elevation of internal free zinc and apoptosis, but the mechanism behind this response is still obscure. We examined the apoptotic pathway in croaker follicle cells in order to identify key components of this pathway. In addition, the effect of classical antiandrogens on the pathway was assessed. This study provides evidence for the involvement of BAX and P53 in testosterone induced apoptosis, as well as the ability of classical antiandrogens to act on the mAR. Testosterone treatment of croaker follicle cells resulted in the upregulation of mRNA expression of apoptotic regulators, BAX and P53, as well

as BAX protein. Knockdown of ZIP9 abrogated the effects of testosterone on apoptotic gene upregulation, directly linking this effect to mAR activity. Interestingly, competitive binding assays showed that two nuclear androgen receptor antagonists, the fungicide vinclozolin and its metabolite M2, are capable of binding to the mAR. Vinclozolin and M2 treatment of follicle cells abolished testosterone's effect on apoptosis. These findings support the role of mAR in mediating croaker follicle cell apoptosis by demonstrating known apoptotic regulators respond downstream of receptor activation. We also present evidence that classical antiandrogens can act on membrane associated receptors. This work establishes components of the pathway that regulates croaker ovarian cell apoptosis, as well as potential influences of environmental pollutants on this pathway.

Modulation by hypoxia of the expression and functions of membrane steroid receptors in ovaries of Atlantic croaker, *Micropogonias undulatus*

Kathryn Ondricek* and Peter Thomas; The University of Texas Marine Science Institute (*Student Presentation*)

Hypoxia is an endocrine disruptor, altering estrogen, testosterone, and progestin hormone levels and stunting gonadal growth in Atlantic croaker. Steroids act through specific hormone receptors to alter reproductive functions, and the hormonal response is dependent on the concentrations of these receptors. However, information is currently lacking on the effects of hypoxia on expression and functions of membrane receptors mediating rapid, nongenomic steroid actions such as final oocyte maturation (FOM). Atlantic croaker were exposed to normoxia (7.0 mg DO/L) or hypoxia (1.7 mg DO/L) for 10 weeks during their period of gonadal recrudescence (October-December). Relative gene expression was quantified using qRT-PCR. mRNA expression of the membrane estrogen receptor (GPR30) was increased in hypoxia-exposed fish compared to normoxia-exposed controls, whereas mRNA expression of the membrane androgen receptor (ZIP9) and membrane progestin receptor (mPRα) was decreased in hypoxia-exposed fish compared to normoxia-exposed controls. Oocytes from both hypoxia-exposed and normoxia-exposed fish were tested in an in vitro FOM assay to examine possible alterations in receptor functions. When oocyte maturation was stimulated with progestin, which acts through mPRα, significantly fewer oocytes of hypoxia-exposed fish underwent FOM compared to oocytes of normoxia-exposed controls. When maturation was inhibited with estrogen, which acts through GPR30, significantly more oocytes of hypoxia-exposed fish maintained meiotic arrest compared to oocytes of normoxia-exposed controls. These results suggest that alterations in the expression of the receptors mPRα and GPR30 caused by hypoxia exposure affect the responsiveness of oocytes to progestin and estrogen, resulting in disruption of FOM.

Monitoring seagrass distribution and quantifying anthropogenically-disturbed seagrass ecosystems with Sidescan Sonar

Linda Jordan*, Abdullah F. Rahman and Richard Kline; The University of Texas at Brownsville *(Student Presentation)*

Seagrass is an important indicator of coastal health. Therefore, understanding and quantifying the anthropogenic impact on seagrass distribution is essential for monitoring the health of a coastal ecosystem. Advances in acoustic remote sensing, specifically with sidescan sonar, have allowed scientist to map the distribution of seagrass however there is no established method for identifying and recording anthropogenic disturbance pattern. This leaves no way for scientist or government agencies to monitor the recovery of seagrass. This research aims to use sidescan sonar to measure the width, depth, and length of anthropogenic disturbance patterns. Then employ this tool to identify and map disturbance patterns in the northern, central and southern portion of the Lower Laguna Madre in South Texas. Importantly, this will be a valuable tool that can be utilized for future management of seagrass.

Short-Term Wetland Sediment Accretion Rates on Mustang Island, TX

Melinda Martinez* and James C. Gibeaut; Harte Research Institute, Texas A&M University–Corpus Christi (*Student Presentation*)

Studies of wetlands on barrier islands along the central Texas coast show that marshes have transitioned as a result of relative sea level rise. Sediment accretion rates are commonly measured to assess the ability of marshes to keep pace with the rate of sea level rise. For this study, the marker horizon methodology was used to measure vertical accretion (VA) annually, along with sediment plates and erosion pins to measure deposition and erosion biweekly. Water level loggers were also distributed across the study in order to determine the influence of flooding frequency and duration on sediment accretion. The complex relationship between elevation, vegetation, and tidal inundation causes accretion and deposition to vary for each wetland type on the bay margin of Mustang Island. Aeolian transport is a major contributor for high marsh (HM) and tidal flat (TF) environments, while bioturbation and inundation are the major contributors for low marsh (LM) environments. Average VA measurements from marker horizons measured over a two-and-a half-year period are 5.66mm/yr for HM, 3.17mm/yr for LM, and 2.88mm/yr for TF environments, which are much higher than a previous study on Mustang Island that measured vertical accretion rates over a 50-year period using radioisotope Cs-137. Examining sedimentation rates over a range of time scales provides insight into the factors and interactions that control marsh elevation and sedimentation processes.

Monitoring Community Development in Restored Saltmarsh (Spartina alterniflora) Habitat

Eric White*, Ryan Rezek and Jennifer Beseres Pollack; Texas A&M University-Corpus Christi (*Student Presentation*)

Saltmarsh habitat plays a crucial role in Gulf of Mexico coastal systems by providing nursery habitat and foraging ground for ecologically and economically important finfish and crustaceans. However, saltmarsh habitats have experienced severe degradation due to impacts

associated with coastal development. In 2011 a saltmarsh restoration project in Nueces Bay was undertaken by the Coastal Bend Bays and Estuaries Program (CBBEP) to compensate for habitat loss during the construction of the U.S. Highway 181 Causeway in the late 1940's. The restoration included the creation of ~150 acres of marsh habitat and planting of 31,000 *Spartina alterniflora* plants. The nekton community in the restored saltmarsh and adjacent natural saltmarsh habitats were sampled using a modified epibenthic sled in May and August of 2014. Stem counts of *Spartina alterniflora* were also performed in each sample site to assess habitat recovery. Total nekton abundance was compared between restored and natural sites and sampling dates with 2-way mixed effects ANOVA. The restored saltmarsh habitat was found to support similar nekton abundance as the natural saltmarsh during the May sampling period and significantly greater nekton abundance during the August. Reduced nekton abundance observed in the natural marsh in August was attributed to wrack disturbance, while the physical design of the restored saltmarsh protected the sample sites from inundation. These findings demonstrate the proficiency of this restored saltmarsh habitat in supporting nekton communities and highlights how constructed habitats can resist physical disturbances that may impact adjacent communities.

Comparing community structure of phytoplankton and microzooplankton between Surfside Jetty County Park and Port Aransas, TX using Imaging Flow Cytometry

Jennifer Genzer*, Lisa Campbell, Laura Brooke Harred, Darren Henrichs and Silvia Angles; Texas A&M University (*Student Presentation*)

Microplankton community structure was examined at two sites along the Texas gulf coast using an Imaging FlowCytobot (IFCB) to determine similarity. Six field samples that were taken over the course of nine months at Surfside Jetty County Park (and returned to the Campbell Lab at Texas A&M University for IFCB analysis) were compared to the automated sampling data from the IFCB deployed on the UTMSI pier in Port Aransas. The images of the plankton from both locations were identified using automated classification and then manually corrected into sixty-six categories to identify as many plankton species as possible. Kendall's Tau non-parametric correlation coefficient and Jaccard's coefficient tests were used to compare community structure on all sample dates. Similarities between locations were significant but had a weak correlation, ranging from 0.250 to 0.490. Comparisons of the samples taken on either side of the jetty in Surfside had corresponding results of low correlation, ranging from 0.2 to 0.467, and could indicate that differences in physical factors, such as wave action, could impact the community structure even in the same location. The Kendall's Tau test was also performed on categories grouped into major classes, e.g. diatoms, dinoflagellates, flagellates, and the results were not significant. The sample that was the most different was in March 2014, when blooms of Dinophysis ovum and Prorocentrum texanum appeared in both locations. This was an unexpected result and could invite a discussion for more monitoring of the Texas shoreline.

Texas Coastal Wetlands: Synthesis and Analysis

Diana C. Del Angel* and James C. Gibeaut; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi

This poster will provide a synthesis of available data and reports on the pattern of wetland change and the causes of wetland loss in Texas coastal counties. Additionally, a discussion of challenges and opportunities in wetland management will be presented. Data from the NOAA Coastal Change Analysis Program estimate a total of 1,651,782 acres of wetlands in the 17 coastal counties in 2010 and 37,293 acres lost since 1996. According to the Status and Trends of Wetlands and Aquatic Habitats reports (2002-2011), historically, major causes of wetland change have been the occurrence of drought, relative sea level rise, and most recently increasing coastal development. Fast growing counties like Harris, Jefferson, and Cameron have experienced the largest amount of wetland loss. Challenges to wetland management have risen after Clean Water Act jurisdictional changes over isolated wetlands. On the other hand, opportunities have occurred and priority wetlands enhancement and acquisition through state and federal programs like the Coastal Management Program, the Coastal Impact Assistance Program, and the Gulf Environmental Benefit Fund, among others. Increased knowledge of wetland processes may improve management and restoration of coastal wetlands in Texas.

eBird's eye view of a changing marsh-mangrove ecotone in coastal Texas

[1]Ashley A. Whitt*, [2]Wesley E. Highfield, [3]Steven C. Pennings and [1]Anna. R. Armitage; [1]Department of Marine Biology, Texas A&M University at Galveston; [2]Department of Marine Sciences, Texas A&M University at Galveston; [3]Department of Biology and Biochemistry, University of Houston (*Student Presentation*)

Bird community composition in coastal Texas may be impacted by woody encroachment of black mangroves (*Avicennia germinans*) into graminoid-dominated salt marshes. As part of the Central Flyway, Texas serves as a critical stop-over habitat for migratory birds and as valuable foraging, roosting, breeding and wintering grounds for migrants and resident birds. A shift in vegetation structure between grass-dominated salt marshes to more structurally complex mangrove stands could affect the multidimensional habitat space that many bird communities rely on. Our objective is to understand whether bird community composition differs between mangrove and marsh dominated habitats. To gain a large spatial and temporal perspective, we investigated this question using observations from Cornell's Lab of Ornithology's eBird citizen science database overlaid on vegetation maps in ArcGIS. Using spatial analysis tools we calculated the amount of marsh or mangrove area within a 100m buffer zone around each reported bird observation GPS location. Analysis of Similarity suggested that total bird species abundances of buffer zones containing mangroves were dissimilar to sites with high marsh areas. Bird community composition in areas with a heterogeneous mix of mangrove and marsh vegetation tended to be different from homogenous vegetation areas.

Characterization of annual ambient water quality trends in natural and created wetlands of the Texas coast

[1]Natasha Zarnstoff* and [2]George Guillen; [1]University of Houston-Clear Lake/School of Science and Computer Engineering; [2]University of Houston-Clear Lake /Environmental Institute of Houston (*Student Presentation*)

The United States Environmental Protection Agency (EPA) has expressed interest in creating specific water quality standards for coastal and inland wetlands. When established these standards would be incorporated into various agency's decision making processes. Environmental agencies and professionals have long recognized the fundamental difference in ambient water quality between open water systems and wetlands and the need to develop specific standards for each type of system. Saltwater wetlands provide a variety of ecosystem services, but little research has been published on water quality of these marshes. Besides not knowing the annual trends in saltmarsh water quality, there have been no studies looking at the differences in water quality differences between created and natural coastal marshes. The preliminary results of our study focus on the annual trend of coastal wetlands in Texas. During our study we measured surface water quality of an open water site, a natural marsh, and a created marsh within three bays of the Galveston Bay system. Surface water quality was measured every other month with a YSI sonde and collection of grab samples. Deployable water quality monitoring devices were also used to show dissolved oxygen, temperature, and conductivity for three days prior to water sample collection. We will present preliminary results on annual water quality trends and comparisons of these trends between natural and created saltmarshes.

Effects of Freshwater Inflow and Tides on Water Quality of the Brazos River Estuary

Stephen Curtis*, Jenny Oakley, Mandi Gordon and George Guillen; Environmental Institute of Houston, University of Houston-Clear Lake

The State of Texas is currently in the process of validating environmental flow recommendations in an effort to maintain sound ecological environments in rivers and estuaries. It is assumed that the primary mechanism regulating production in estuaries is the discharge of freshwater which creates an optimal salinity gradient. Within a riverine system, this salinity gradient operates on a dynamic linear scale influenced by freshwater inflow and tidal forces. The objectives of this study were to 1) characterize the flow regime and 2) assess the influence of freshwater inflow and tidal movement on salinity gradients in the lower Brazos River. Continuous and opportunistic water quality samples were collected from November 2014 to February 2015. Five sampling events were distributed across the hydrograph during dry (cubic feet per second = 1,050 and 1,160), average (2,070) and wet (4,210 and 5,710) base flows with two events occurring on the falling end of the hydrograph following high flow pulses. Broad-scale patterns in salinity gradients and pulse delay depended upon the timing, magnitude and duration of freshwater inflow events. Salinity levels were inversely related to freshwater inflow and predictable trends in the tidal wedge location relative to the size of the inflow event were defined. Continued monitoring of water quality and flow along with the integration of biological community data will help resource managers better understand the influence of freshwater inflow on biota and plan for the freshwater needs of the Brazos River estuary.

Using Sediment Grain Size Analysis in Conjunction with Foraminiferal Assemblage Patterns as Proxies to Discern Past Climate and Water Balance Issues in Nueces Bay, South Texas

Chasidy Palmer*, Mark C. McKay and Mark Besonen; Earth System Science Laboratory, Texas A&M University-Corpus Christi (*Student Presentation*)

Sediment cores collected from Nueces Bay, an incised bay/estuary system located in South Texas, were used to examine the relationship between sediment particle size patterns and the distribution of foraminiferal assemblages, as an indicator of environmental change. Foraminifera are typically abundant in marine and estuarine environments. At the genus and species levels, assemblage patterns are indicative of climatic and environmental conditions present at the time of their deposition. Therefore, they make excellent indicators for assessing past changes in environmental conditions. The sediment grain size distributions, and the foraminiferal assemblages in surface samples are reflective of current and recent events in the estuary and bay. However, down core analyses of the same parameters are variable, and indicative of past environmental changes in the system. This work documents some of the natural variability that has affected the Nueces Bay system resulting from climatic events such as periods of drought, high precipitation, and resulting runoff. It also helps to explain the results of changes in freshwater inflows, due both to drought, and also to the anthropogenic diversion of freshwater inflows from the Nueces River and delta areas. This work will also show that grain size and composition of foraminiferal assemblages can be effective proxies for establishing both spatial and temporal indicators of past and present bay and estuary health.

Spatial-Temporal Distribution, and Partitioning of Organic Matter in a Eutrophic Estuary (Baffin Bay, Corpus Christi, TX)

Kenneth C. Hayes* and Michael S. Wetz; College of Science & Engineering, Texas A&M University-Corpus Christi

Baffin Bay is a shallow (~1-2 m), long-residence time (>1 year) estuary that is experiencing symptoms of eutrophication, including high chlorophyll a levels and episodic hypoxia. At present, the sources of organic matter contributing to hypoxia formation are largely unknown, as are the physical dynamics that facilitate hypoxic events. Here we present results from the first two years of a volunteer water quality monitoring study that demonstrate the spatial-temporal distribution and dominant forms of organic matter in Baffin Bay. Exceptionally high organic carbon concentrations have been observed in Baffin Bay, with dissolved organic carbon as the dominant form of organic carbon in the system. The dissolved organic carbon concentrations are much higher than those observed in other estuarine systems of the Texas coast and display a sharp concentration gradient from the upper Baffin Bay to the mouth. Dissolved organic nitrogen concentrations are also very high year round, and typically exceed inorganic nitrogen concentrations. The relationships between environmental conditions, organic matter and hypoxia will be discussed further in the presentation.

Impact of Drought on Biogeochemical Processes in the Mission-Aransas NERR: A Preliminary Analysis

Nicolas Reyna; The University of Texas Marine Science Institute (*Student Presentation*)

The Mission-Aransas National Estuarine Research Reserve (MANERR) is characterized by drought and infrequent flooding events that impact the water quality and nutrient dynamics of the system, and these changes in turn alter the metabolism and biogeochemistry of the system. The reserve implements a system-wide monitoring program (SWMP) that continuously records water quality data and collects monthly nutrient samples at five stations within the estuary. To evaluate the impact of drought and flood on biogeochemical processes in the MANERR, a six year time series (2009-2015) using all available SWMP parameters was constructed and compared to U.S. Geological Survey (USGS) stream flow data from the rivers and creeks that discharge into the bays. Beginning in late 2009 the system began experiencing high rates of river discharge due to a series of recurring storm events which lasted until early 2011. This resulted in 2010 being a "wet" year with a much lower mean annual salinity (~8 ppt at Copano Bay West) than that of a "dry" year, such as 2013 (~36 ppt at Copano Bay West). Concentrations of phosphate (PO43-) and dissolved inorganic nitrogen (DIN) also responded to changes in river discharge. PO43- and DIN concentrations were 2-4 times greater in wet years than in dry years. These conditions also altered the N:P nutrient ratio, favoring an N-limited system in wet years versus a P-limited system in dry years. These results point to two drastically different biogeochemical regimes based on freshwater input.

How do drying-rewetting events affect nutrient releases from subtropical salt marsh sediments?

Jason Jenkins* and Zhanfei Liu; The University of Texas Marine Science Institute (*Student Presentation*)

Drying and rewetting events strongly influence nutrient releases from sediments to overlying waters in coastal estuarine systems. In this study, marsh sediment samples were dried, rewetted and compared to un-dried sediment in an incubation experiment under anoxic conditions. Biogeochemical parameters, including pH, DOC, TDN, NH4, PO4 and bacterial community, were monitored over a three-week period. Overlying water in dried sediment showed a consistently lower pH throughout the experiment and much higher levels of NH4 and PO4. Phosphate levels correlate well to bacterial abundance suggesting that phosphate release was a combination of sediment organic matter decomposition and bacterial cell lysing. Both TDN and DOC for the dried sediment showed a greater release rate than the un-dried sediments, supporting our hypothesis that the dried sediment would release more nutrients into the water due to the drying event. Bacterial community structure highly differed between the two sediments. The structure in the wet sediment was more diverse and dominated mainly by *Alphaproteobacteria* early in the experiment but latter shifting to an *Epsilonproteobacteria* dominated community. Dried sediment however showed a much different structure, less diverse and dominated mainly by *Bacilli*. Early in the experiment there was a lower diversity in the dried sediment bacterial community which was dominated by only a few classes, however the community became much more diverse as the experiment proceeded. This suggests that

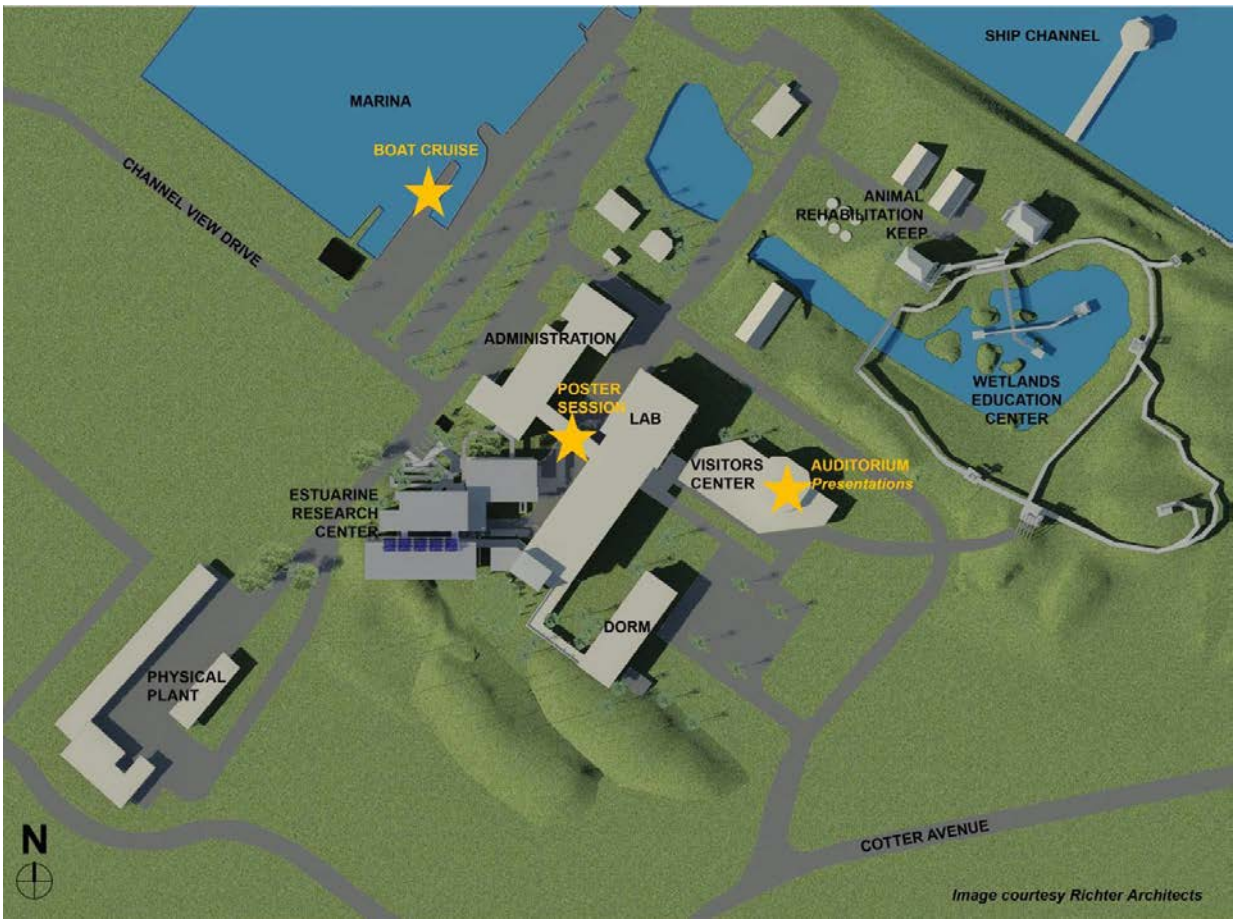
bacterial strains that survived the drying event are largely responsible for the initial cycling of nutrients into the water column.

Robust sampling along the Arroyo Colorado in support of flow modeling and bacterial source tracking efforts

Guadalupe Garcia III*, Monica Delgado, Rachelle Maldonado and Jude A. Benavides, Ph.D; The University of Texas at Brownsville

Researchers from The University of Texas at Brownsville environmental department conducted over two years of water quality sampling on the Arroyo Colorado (the Arroyo). Sampling activities were externally funded and were in support of two major efforts to better understand the hydraulic and bacterial characteristics of the Arroyo. The first effort involved the development of a CE-QUAL-W2 2-D hydraulic flow model and the second, a Bacterial Source Tracking (BST) effort aimed toward identifying principal sources of bacterial pollution in the Arroyo. Flow measurements, water quality samples, and real time water quality vertical profile measurements were taken for both projects. Calibration efforts for the hydraulic model using collected data are on-going; however, initial data analysis reveals the presence of a strong anoxic and salt-wedge underlying the tidal segment of the Arroyo. Additionally, initial E.coli and Enterococcus values vary significantly in range and time throughout the Arroyo, ranging from 17 - 2419 MPN/100 mls. The Arroyo Colorado is located in the Lower Rio Grande Valley of South Texas and is part of the Lower Laguna Madre Watershed. The tidally influenced portion of the Arroyo Colorado has been on the Clean Water Act Section 303d watch list since 2006 for high bacterial levels and low dissolved oxygen. These and other funded efforts are ongoing and will continue to play an important role in understanding how watershed management activities are improving water quality in the tidal segment of the Arroyo Colorado and the Lower Laguna Madre.

Campus Map



Map of the main campus of The University of Texas Marine Science Institute.

The University of Texas Marine Science Institute is dedicated to the three central functions of a major university (research, education, and outreach) as they apply to the Texas coastal zone and other marine environments. As an organized research unit of The University of Texas at Austin, the main goal of the Marine Science Institute is to improve our understanding of the marine environment through rigorous scientific investigations.

Greening the TBEM 2015

Bringing people together for a large meeting like Texas Bays and Estuaries can create significant environmental impacts. As professionals in our field, it is important for the Mission-Aransas Reserve and the University of Texas Marine Science Institute to lead by example. The following list highlights the steps we've taken to reduce the impact of TBEM 2015:

- Providing paper coffee mugs (please keep and reuse throughout day if possible)
- Convincing vendors to use Styrofoam alternatives
- Reusable bags for meeting materials
- Reusable nametag wallets
- Recycling bins provided by the UTMSI Green Team
- Limited paper use through duplex printing where possible
- Using materials with as much recycled content as possible
- Providing electronic copies of meeting materials to registered participants
- Contracting with local vendors whenever possible

To learn more about the Mission-Aransas Reserve and UTMSI efforts to reduce their environmental impact, check out the UTMSI Green Team (www.utmsi.utexas.edu/greenteam)!

Upcoming Events and Meetings

EARTH DAY BAY DAY

April 11th 10:00 AM – 5:00 PM
HERITAGE PARK, CORPUS CHRISTI, TX

Master of Ceremonies – Maclovio Perez
Honorary Chair – Mayor Nelda Martinez

Gladys Porter Zoo

Texas Coastal Expo
By Texas Park & Wildlife

Catch & Release Fishing Tank
Sponsored by Kiwanis Downtown Club

Raptor Flying Demonstrations
By Sky Kings Falconry

Rock Wall Climbing
By Youth Odyssey

Cuddles & Critters Petting Zoo

Not So Creepy Critters

Corpus Christi Police Department K9 Unit
K9 Unit Demonstrations

E-Waste Recycle
By Malkan Interactive Communication (Hot Z95/92.7 Kbay/ESPN 1440)

Pop-Up Dog Park
Adopt and register at the park!

Bike Give-Away
Corpus Christi Regional Transportation Authority

FREE ADMISSION!!

OUR GRACIOUS INVESTORS

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