2022 Texas Bays and Estuaries Meeting

The University of Texas Marine Science Institute
Port Aransas, Texas
September 21-22, 2022

Texas Bays and Estuaries Meeting

TBEM

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NATIONAL ESTUARINE RESEARCH RESERVE

The University of Texas at Austin
Marine Science Institute

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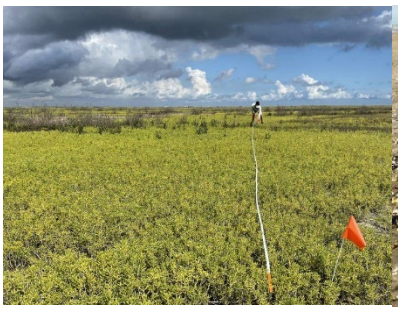

Welcome!

The University of Texas Marine Science Institute is proud to host the 14th annual Texas Bays and Estuaries Meeting. We have a great program of talks and posters this year from all around the state! We are truly excited for the great turnout.

Please remember that all campus buildings, grounds, and outdoor spaces are nonsmoking. Restrooms are located outside the auditorium in the new Patton Marine Science Education Center. Miss K's Kitchen will be providing lunch on both days and La Playa Restaurant is catering Wednesday night's Poster Session. Beer and wine will be available during the poster and Hors d'oeuvre session, and during the social event afterwards. You may wander freely with your drinks, but please do not leave the campus with them. Presenters will be next to their posters from 4:00 to 6:00 p.m. during the poster session on Wednesday evening (September 21st) in the Lyceum.

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

See you again next year!

Jace Tunnell

Texas Bays and Estuaries Meeting Committee

Adriana Reza	Georgia Neblett	Kelley Savage	Tracy Weatherall
Berit Batterton	Joan Garland	Kyle Capistrant-Fossa	Zhanfei Liu
Christina Marconi	Katie Swanson	Simon Brandl	

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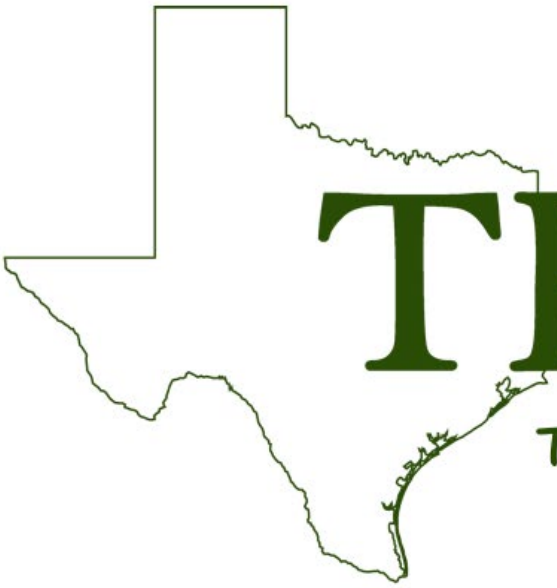

Welcome to

TBEM 2022

Texas Bays and Estuaries Meeting

Thank you to our Sponsors!

Invited Speaker Biography

Mr. Dakus Geeslin, M.S., Deputy Director, Coastal Fisheries Division, Texas Parks and Wildlife Department (TPWD)

As Deputy Director of Coastal Fisheries, Dakus oversees the monitoring and management of recreational and commercial fisheries along the Texas coast which includes the longest running marine resource monitoring program in North America. He also oversees the fisheries enhancement program including two production fish hatcheries and one research hatchery facility. Combined, these hatcheries comprise the largest red drum hatchery operation in the world. Dakus is responsible for leading the development of fisheries policy and regulations for coastal resources within Texas state waters, bays, and estuaries. He also serves on the Gulf of Mexico Fisheries Management Council to represent Texas interests in federal fisheries management challenges in off-shore waters. Dakus received a Master of Science Degree in Aquatic Biology from Stephen F. Austin State University.

In his free time, Dakus enjoys spending time with family, training dogs, fly fishing, volunteering in conservation organizations, attending as many baseball games as possible and cheering on his beloved Chicago Cubs.

Schedule

Wednesday, September 21, 2022

8:00 AM - **Registration,** Marine Science Education Center, The University of Texas Marine Science Institute, 855 East Cotter Avenue, Port Aransas Texas

9:00 AM - **Welcome and Opening Remarks-** Dr. Ed Buskey, Director, The University of Texas Marine Science Institute

HABITATS AND ECOSYSTEMS

9:15 AM - **To tong or not to tong: comparing gear types for measuring oyster density on degraded and restored reefs**
Jacob Harris*, Zachary T. Olsen, Emma Clarkson, and Adam Reimer; Texas Parks and Wildlife Department – Coastal Fisheries Division

9:30 AM - **A Comparison of Hydraulic Patent Tongs and Oyster Dredges for Monitoring Oyster Reefs in the Mission-Aransas Estuary**
[1]Margaret Wheat-Walsh*, [1]Zachary T. Olsen, and [2]Jennifer Beseres-Pollack; [1]Texas Parks and Wildlife Department—Coastal Fisheries Division, Aransas Bay Ecosystem Team, [2]Harte Research Institute, Texas A&M University—Corpus Christi

9:45 AM - **Assessing the Sensitivity of Oyster Sampling Metrics to Reef Structure: Accounting for Ecosystem Services in Oyster Management**
[1]Zachary T. Olsen*, [2]Evan Pettis, and [3]Emma Clarkson; [1]Texas Parks and Wildlife Department—Coastal Fisheries Division, Aransas Bay Ecosystem Team, [2]Texas Parks and Wildlife Department—Coastal Fisheries Division, Habitat Assessment Team, [3]Texas Parks and Wildlife Department—Coastal Fisheries Division, Ecosystem Resources Program

HABITAT AND RESTORATION

10:00 AM - **The Texas Gulf Region CMWA: Eight Years of Lessons and Successes**
[1,2]Katie Swanson*, [3]Adriana Leiva, [4]Ashley Morgan-Olvera, [5]Bill Green, [2]Christina Marconi, [5]Demian Gomez, [6]Kendal Keyes, [7]Leigh Perry, [8]Meagan Jones, [9]Rae Mooney, [7]Rosario Martinez; [1]Mission-Aransas National Estuarine Research Reserve, [2]University of Texas Marine Science Institute, [3]U.S. Fish and Wildlife Service, [4]Texas Invasive Species Institute, Sam Houston State University, [5]Texas A&M Forest Service, [6]Texas Parks & Wildlife Department, [7]Coastal Bend Bays & Estuaries Program, [8]Nueces County Coastal Parks, and [9]City of Port Aransas Nature Preserves

10:15 AM- **BREAK**

Wednesday, September 21, 2022 (continued)

ENVIRONMENTAL AND WATER QUALITY

10:30 AM - **NOx source apportionment in a coastal urban air shed using stable isotope techniques**
[1,2]Kaiya Shealy* and [1,2]J. David Felix; [1]Department of Physical and Environmental Sciences, [2]Center for Water Supply Studies College of Science and Engineering, Texas A&M University – Corpus Christi (*Student Presentation*)

10:45 AM - **Electric currents in the sediment: alkalization of seawater by cable bacteria**
Hang Yin* and Xinping Hu; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University -- Corpus Christi

11:00 AM - **The aggregation of riverine dissolved organic matter exposed to seawater depends on its chemical character and the hardness of the freshwater**
[1]José Ernesto Sampedro-Avila*, [1]Helmut Maske, and [2]Zhanfei Liu; [1]Centro de Investigación Científica y de Educación Superior de Ensenada, Baja California (CICESE), [2]Marine Science Institute, The University of Texas at Austin (*Student Presentation*)

11:15 AM - **Dissolved organic matter concentration and composition of Mission-Aransas National Estuarine Research Reserve**
[1]Kaijun Lu*, [2]Emma Linhares, [1]Ryan Hladyniuk, [2]Laodong Guo, and [1]Zhanfei Liu; [1]Marine Science Institute, The University of Texas at Austin, [2]University of Wisconsin- Milwaukee

11:30 AM - **Effects of drought, pulsed freshwater inflows and nutrients imported from the Gulf of Mexico on primary production and water quality in the Mission-Aransas Estuary**
Edward Buskey*, Cammie Hyatt, and Lindsay Scheef; Marine Science Institute, The University of Texas at Austin

11:45 AM - **LUNCH (Catered by Miss K's Kitchen) in the Lyceum,** located between the Main Lab Building and Administrative Building.

Wednesday, September 21, 2022 (continued)

EXTREME WEATHER IMPACTS (SPECIAL SESSION)

1:00 PM - **Winter Storm Uri impacts and Managing for Recovery of Spotted Seatrout in Texas**
Dakus Geeslin*; Deputy Director, Coastal Fisheries Division, Texas Parks and Wildlife Department (*Invited Speaker*)

1:30 PM - **Community response of benthic macrofauna following Winter Storm Uri in Baffin Bay, Texas**
[1]Jennifer Gilmore*, [2]Benoit Lebreton, [1]Natasha Breaux, [1]Terence Palmer, and [1]Jennifer Beseres Pollack; [1]Harte Research Institute, Texas A&M University-Corpus Christi, [2]UMR Littoral, Environment Et Societies, CNRS - University of La Rochelle, Institut du Littoral Et de L'Environnement (*Student Presentation*)

1:45 PM - **Green Sea Turtle (*Chelonia mydas*) Hypothermic Stunning in Texas**
[1]Donna J. Shaver*, [1]Martha R. Villalba-Guerra, [1]Heather M. Wilson, [1]J. Shelby Walker, [1]Hilary R. Frandsen, [1]Cynthia Rubio, [2]Mary Kay Skoruppa, [3]Christopher D. Marshall, [4]Jace Tunnell, [4]Alicia M. Walker, [5]Jesse Gilbert, [6]Timothy T. Tristan, [6]Amanda K. Terry, [7]Amy N. Bonka, [7]Wendy Knight, and [8]Philippe Tissot; [1]National Park Service, Padre Island National Seashore, Corpus Christi, TX, USA, [2]U.S. Fish and Wildlife Service, Texas Coastal Ecological Services, Corpus Christi, TX, USA, [3]Gulf Center for Sea Turtle Research, Texas A&M University at Galveston, Galveston, TX, USA, [4]Amos Rehabilitation Keep, University of Texas Marine Science Institute, Port Aransas, TX, USA, [5]Texas State Aquarium, Corpus Christi, TX, USA, [6]Texas Sealife Center, Corpus Christi, TX, USA, [7]Sea Turtle, Inc., South Padre Island, TX, USA, [8]Conrad Blucher Institute, Texas A&M University at Corpus Christi, Corpus Christi, TX, USA

2:00 PM - **Drought Effects on a Marine Food Web Revealed by Composition of Fish Eggs**
Lee A. Fuiman*; Fisheries and Mariculture Laboratory, Marine Science Institute, The University of Texas at Austin

2:15 PM - **BREAK**

2:30 PM - **Ensemble estimates of Multivariate Coastal Risk**
Jemerson P. James*, Yurui Fan, and Vijay Panchang; Texas A&M University (*Student Presentation)*

2:45 PM - **Winter storm Uri (Feb. 2021) produced a gradient of impacts to vegetation and sediment in Texas coastal wetlands over a latitudinal gradient from Boca Chica to Port O'Connor**
C. Edward Proffitt* and Donna J. Devlin; Department of Life Sciences, Texas A&M University – Corpus Christi

Wednesday, September 21, 2022 (continued)

3:00 PM - **Effects of Winter Storm Uri on *Avicennia germinans* recruitment along the Texas Coast**
Donna J. Devlin* and C. Edward Proffitt; Department of Life Sciences, Texas A&M University -- Corpus Christi

3:15 PM- **Black Mangrove Seedlings Response to an Extreme Disturbance Event**
[1]Jacob Doty*, [1]C. Edward Proffitt, [1]Donna J. Devlin, and [2]Anna Armitage; [1]Texas A&M University -- Corpus Christi, [2]Texas A&M University – Galveston (*Student Presentation*)

3:30 PM **Black Mangrove Dieback Following an Extreme Freeze Event- February 2021**
Melinda Martinez*; U.S. Geological Survey

3:45 PM **Retention and pathway of pollutants released to Galveston Bay during Hurricane Harvey using Lagrangian particle tracking**
Jiabi Du, Emily Summers and Kyeong Park*; Department of Marine and Coastal Environmental Science, Texas A&M University -- Galveston

4:00 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.

6:00 PM - **Social Event** located in the Marine Science Institute's Lyceum.

Thursday, September 22, 2022

8:00 AM - **Registration,** Marine Science Education Center, The University of Texas Marine Science Institute, 855 East Cotter Avenue, Port Aransas Texas

ENVIRONMENTAL AND WATER QUALITY

8:30 AM - **A Spatio-Temporal Analysis of Polycyclic Aromatic Hydrocarbons in Mission-Aransas NERR and Matagorda Bay Sediments**
Zhanfei Liu, Jack Lloyd*, Kaijun Lu, and Zucheng Wang; Marine Science Institute, The University of Texas at Austin (*Student Presentation*)

HABITAT AND RESTORATION

8:45 AM - **Focused Flows: Environmental Water for Coastal Habitat**
Quinn McColly*; Texas Water Trade

9:00 AM - **Update on Little Bay Restoration Initiative**
Charlie Belaire and Hannah Rudellat*; Anchor QEA

9:15 AM - **Marsh Restoration, Seagrass Protection, and Bird Island Creation Through the Beneficial Use of Dredged Material**
[1]Hayden Smith*, [2]Todd Merendino, [3]Sarah Garza, [3]Harrison McNeil, [3]Yvonne Dives-Gomez, [4]Ray Newby, [1]Renee Robertson, [1]Alex Freddo, and [1]Dan Opdyke; [1]Anchor QEA, [2]Ducks Unlimited, [3]Port of Corpus Christi Authority, [4]Texas Department of Transportation

9:30 AM - **Landscape & Geologic History of Oso Bay Wetlands Preserve**
Randy Bissell*; Texas Master Naturalist

FISH AND FISHERIES

9:45 AM- **Distribution, Density, and Habitat Association of the Dwarf Seahorse (*Hippocampus zosterae*) in Texas**
[1]Jenny Wrast Oakley*, [1,2]Story Lesher, and [1,2]George Guillen; [1]Environmental Institute of Houston, University of Houston, [2]College of Science and Engineering, University of Houston

10:00 AM- **BREAK**

10:30 AM - **Comparing diversity of estuarine-dependent nekton between Aransas Pass and Packery Channel inlets**
[1,2]Joseph Kuntz*, [2]Daniel Coffey, [2]Jeffrey Kaiser, [2]Jason Williams, and [2]Gregory Stunz; [1]Department of Life Sciences, College of Science and Engineering, Texas A&M University – Corpus Christi, [2]Harte Research Institute for Gulf of Mexico Studies, Texas A&M University – Corpus Christi (*Student Presentation*)

Thursday, September 22, 2022 (continued)

10:45 AM - **Role of Calcium Channels in Sperm Motility in Southern Flounder (*Paralichthys lethostigma*)**
Caroline Matkin* and Peter Thomas; Marine Science Institute, The University of Texas at Austin

11:00 AM - **Toxicity of 6PPD-quinone among estuarine fishes through development**
Kerri Lynn Ackerly* Kathleen J. Roark, Andrew J. Esbaugh, and Kristin Nielsen; Marine Science Institute, The University of Texas at Austin

11:15 AM - **The Influence of Depth and Season on the Nearshore Community of the Texas Gulf of Mexico**
Jeremy T. McCulloch* and Ethan T. Getz; Texas Parks and Wildlife Department – Coastal Fisheries Division

11:30 AM - **Characterizing Fish Assemblages and Red Snapper Growth/Movement at Various High- and Low-Profile Artificial Reef Configurations**
Marybeth Weihbrecht* and Richard Kline; University of Texas –Rio Grande Valley (*Student Presentation*)

11:45 AM - **Paired Acoustic and Gillnet Sampling Reveals the Utility of Passive Acoustic Monitoring for Fisheries Monitoring in South Texas Estuaries**
[1]Philip M. Souza, Jr*., [2]Zachary T. Olsen, and [1]Simon J. Brandl; [1]Marine Science Institute, The University of Texas at Austin, [2]Texas Parks and Wildlife Department—Coastal Fisheries Division, Aransas Bay Ecosystem Team (*Student Presentation*)

12:00 PM - **LUNCH (Catered by Miss K's Kitchen) in the Lyceum,** located between the main lab building and administrative building.

HABITATS AND ECOSYSTEMS

1:00 PM- **Surface Elevation Change Dynamics in Texas Coastal Marshes: Assessing the Effects of Rising Sea-Levels and Intensifying Hurricanes**
[1]Laura C. Feher*, [2]Jena A. Moon, [3]William C. Vervaeke, [1]Michael J. Osland, [1,4]Bogdan Chivoiu, [5]David R. Stewart, [1]Darren J. Johnson, [1]James B. Grace, and [6]Nicole M. Rankin; [1]U.S. Geological Survey, Lafayette, Louisiana, [2]U.S. Fish and Wildlife Service, Winnie, Texas, [3]National Park Service, Jacksonville, Florida, [4]Cherokee Nations Systems Solutions, [5]U.S. Fish and Wildlife Service, Albuquerque, New Mexico, [6]U.S. Fish and Wildlife Service, Atlanta, Georgia

1:15 PM - **Sunlight steers seagrass succession in super salty Laguna Madre (TX, USA)**
Kyle Capistrant-Fossa* and Kenneth H. Dunton; Marine Science Institute, The University of Texas at Austin (*Student Presentation*)

Thursday, September 22, 2022 (continued)

1:30 PM - **Long-term monitoring of seagrass meadows using acoustical methods**
[1]Colby W. Cushing*,[1] Megan S. Ballard, [1]Kevin M. Lee, [1]Andrew R. McNeese, [2]Kyle A. Capistrant-Fossa, [1]Prithika Sen, [1]Thomas S. Jerome, [1,3]Preston S. Wilson, [2]Kenneth H. Dunton; [1]Applied Research Laboratories, The University of Texas at Austin, [2]Marine Science Institute, The University of Texas at Austin, [3]Walker Department of Mechanical Engineering, The University of Texas at Austin

1:45 PM - **Patterns of space use and habitat selection of Little Blue Herons wintering in Gulf Coast Wetlands**
[1]Alexander R. Sharp*, [1]Dale E. Gawlik, and [2]Michelle Petersen; [1]Harte Research Institute for Gulf of Mexico Studies, [2]Florida Atlantic University (*Student Presentation*)

2:00 PM - **Identification of diamondback terrapin nesting beaches in two Texas estuaries**
Aaron Baxter*; Center for Coastal Studies, Texas A&M – Corpus Christi

2:15 PM - **Evaluating the use of drones for monitoring waterbird nest abundance and nest survival**
Rostam E. Mirzadi* and Dale E. Gawlik; Conservation and Biodiversity Lab, Harte Research Institute for Gulf of Mexico Studies, Texas A&M University – Corpus Christi (*Student Presentation*)

INVERTEBRATE ECOLOGY

2:30 PM - **Environmental trends of black gill disease (*Hyalophysa lynni*) in penaeid shrimp on the Texas Gulf Coast**
Jillian Swinford* and Joel Anderson; Texas Parks and Wildlife Department

2:45 PM - **Tracing exploitation of egg boons in marine invertebrates using fatty acids and stable isotopes**
Parvathi Nair*, Cambria Miller, and Lee A. Fuiman; Marine Science Institute, The University of Texas at Austin

3:00 PM - **BREAK**

POLICY AND ECONOMICS

3:15 PM - **Science-based assessments for coastal resilience**
Arsum Pathak*; National Wildlife Federation

3:30 PM - **Developing a Texas-Wide Estuarine Survey to Identify Drivers of Hydrography and Water Quality**
Evan L. Turner*, Kevin DeSantiago, Amin Kiaghadi, Mark Lopez, Ram Neupane, and Caimee Schoenbaechler; Texas Water Development Board

Thursday, September 22, 2022 (continued)

3:45 PM - **Water Management in the Coastal Bend Region – A Brief History and Some Thoughts on the Future with Regard to Freshwater Inflows**
James A. Dodson*; GroundswellTX

4:00 PM - **Draft EIS for the Proposed Corpus Christi Ship Channel Deepening Project- Observations Regarding Compliance with NEPA and CWA Section 404(b)(1) Guidelines**
K.G. Teague*; PWS, Senior Certified Ecologist

4:15 PM - **2022 TBEM Closed**

Student Awards

Student presentations and posters are an important aspect of this meeting. Student awards for presentations and posters are just some of the ways to acknowledge excellence in research. The best student presentation awards are generously sponsored by the Coastal Bend Bays & Estuaries Program. Student oral presentations will be awarded with 1st ($200), 2nd ($150), and 3rd ($100) place prizes. Student posters will be awarded with 1st ($150), 2nd ($100), and 3rd ($50) place prizes.

Previous Presentation Winners:

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

2015: **Meredith Evans,** The University of Texas Marine Science Institute, 1st Place
Kathryn Mendenhall, Texas A&M University-Corpus Christi, 2nd Place
Juliet Lamb, Clemson University and Department of Forestry and Environmental Conservation, 3rd Place

2016: **Meredith Evans,** The University of Texas Marine Science Institute, 1st Place
Nick Reyna, The University of Texas Marine Science Institute, 2nd Place
Victoria Congdon, The University of Texas Marine Science Institute, 3rd Place

2017: **Austin Green,** The University of Texas Rio Grande Valley, 1st Place
Alex Tompkins, Texas A&M University-Corpus Christi, Harte Research Institute, 2nd Place
Erin Reed, The University of Texas Marine Science Institute, 3rd Place (tie)
Victoria Congdon, The University of Texas Marine Science Institute, 3rd Place (tie)

Previous Poster Winners:

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

2015: **Ashley Whitt,** Texas A&M University-Galveston, 1st Place
Jason Jenkins, The University of Texas Marine Science Institute, 2nd Place
Eric White, Texas A&M University-Corpus Christi, 3rd Place

2016: **Natasha Breaux,** Texas A&M University-Corpus Christi, Harte Research Institute, 1st Place
Rachel Edwards, Texas A&M University-Corpus Christi, Harte Research Institute, 2nd Place
Jake Loveless, Texas A&M University-Corpus Christi, 3rd Place

2017: **Hailey Boeck,** Texas A&M University-Corpus Christi, 1st Place
Tyler Schact, Texas A&M University-Corpus Christi, 2nd Place
Kesley Gibson, Texas A&M University-Corpus Christi, Harte Research Institute, 3rd Place

Abstracts for Oral Presentations

HABITATS AND ECOSYSTEMS

To tong or not to tong: comparing gear types for measuring oyster density on degraded and restored reefs

Jacob Harris*, Zachary T. Olsen, Emma Clarkson, and Adam Reimer; Texas Parks and Wildlife Department – Coastal Fisheries Division

The quantification of oyster density on reefs has historically been accomplished using diver quadrats, but this process can be labor intensive. Patent tongs are an alternative method for estimating oyster density without requiring diving surveys, but there is limited literature on the sampling efficiency of patent tongs as their use has not been widespread. We compared oyster density estimates from samples collected with patent tongs and diver quadrats with the objective of (1) comparing the efficiency of these two sampling methods and (2) establishing a conversion factor that can be used to compare data from both gear types. Because oyster reef consolidation likely impacts the efficiency of sampling gear, we stratified our sampling efforts by habitat type (e.g., restored versus degraded). A total of ten reef sites were selected in Galveston Bay, five of which were designated "degraded", and five of which were designated "restored". At each reef location, patent tong and diver quadrat samples were collected, and the density of live oysters (>25mm), dead shell, and length of live oysters were recorded. We observed differences in densities between gear types and degradation levels for live oyster and shell, though no significant interaction was detected between gear and degradation level. Catch rates were, on average, 16 oyster/m^2 greater in quadrat versus tong samples. However, high variability among samples may hinder predictive performance of these conversions. Regardless, these findings could aid oyster monitoring and restoration efforts globally by allowing for the comparison of monitoring data collected with these different gears by decreasing personnel risk and labor hours previously associated with quadrat sampling.

A Comparison of Hydraulic Patent Tongs and Oyster Dredges for Monitoring Oyster Reefs in the Mission-Aransas Estuary

[1]Margaret Wheat-Walsh*, [1]Zachary T. Olsen, and [2]Jennifer Beseres-Pollack; [1]Texas Parks and Wildlife Department—Coastal Fisheries Division, Aransas Bay Ecosystem Team, [2]Harte Research Institute, Texas A&M University—Corpus Christi

The Eastern Oyster (*Crassostrea virginica*) is an organism with high economic and ecological importance to the coastal bend of Texas. Oysters are ecosystem engineers, and they also support a valuable fishery along the Texas coast. The Texas Parks and Wildlife Department currently uses dredge sampling to assess the catch rate of legal sized oysters (≥76 mm) and the percent of undersized oysters (51-75 mm) sampled before and throughout the commercial season. Together, these metrics are used to open and close areas to commercial oyster harvest. However, dredges have been shown to underestimate catch rate of smaller oysters and shell. Here we compared the sampling performance of hydraulic tongs with the performance of the dredges. Sampling was conducted in the Mission-Aransas estuary along six reefs that present varying levels of fishing pressure. Results show that oyster tongs tend to be more efficient than dredges at collecting all sizes of oysters and oyster shell. Tongs also allow us to accurately assess catch per unit area as a quantitative measure of oyster density (e.g. per m^2). However, tong samples cover a smaller area than dredges, which could increase variability between samples for some reef areas. This increased variability could have sample size implications for tong versus dredge sampling programs.

Comparing these two gears will allow us to determine if a change in sampling methodology would benefit the way that oysters are monitored, and to better understand the size selectivity and catchability that each of these sampling gears provide to fisheries managers.

Assessing the Sensitivity of Oyster Sampling Metrics to Reef Structure: Accounting for Ecosystem Services in Oyster Management

[1]Zachary T. Olsen*, [2]Evan Pettis, and [3]Emma Clarkson; [1]Texas Parks and Wildlife Department—Coastal Fisheries Division, Aransas Bay Ecosystem Team, [2]Texas Parks and Wildlife Department—Coastal Fisheries Division, Habitat Assessment Team, [3]Texas Parks and Wildlife Department—Coastal Fisheries Division, Ecosystem Resources Program

The Texas commercial oyster fishery is one of the state's most valuable, worth over 30 million dollars in 2020. Oysters and oyster reefs also play a valuable role in estuarine fish habitat, water filtration, and shoreline protection. In Texas estuaries, areas are opened and closed to oyster harvest based on the catch rate of market sized oysters (≥76 mm) calculated from fishery independent samples collected before and during the commercial season. Recent commercial oyster seasons have produced some of the highest fishing effort and landings on record for the coastal bend region. Here we assess the sensitivity of dredge sampling as an indicator of underlying reef structure. The objectives of this study were to (1) examine the relationship between market oyster catch rate (i.e., the current sampling metric) and reef structure and (2) assess the value of other dredge collected reef components (e.g., shell) in formulating sampling metrics sensitive to reef structure. Dredge sampling was paired with acoustic surveys of six reef areas in the Mission-Aransas estuary. Sampling was conducted during both the early- and post-2021-2022 commercial season. Results suggest that market oyster catch rate is related to acoustic metrics of reef structure (e.g., hardness, roughness), though this relationship is imperfect and likely varies among reefs. Large (>50 mm) and small (26-50 mm) shell catch rates were also related to acoustic metrics of reef structure. These results suggest that while current oyster sampling metrics are relevant to reef structure, they may benefit from the inclusion of other reef components.

HABITAT AND RESTORATION

The Texas Gulf Region CMWA: Eight Years of Lessons and Successes

[1,2]Katie Swanson*, [3]Adriana Leiva, [4]Ashley Morgan-Olvera, [5]Bill Green, [2]Christina Marconi, [5]Demian Gomez, [6]Kendal Keyes, [7]Leigh Perry, [8]Meagan Jones, [9]Rae Mooney, [7]Rosario Martinez; [1]Mission-Aransas National Estuarine Research Reserve, [2]University of Texas Marine Science Institute, [3]U.S. Fish and Wildlife Service, [4]Texas Invasive Species Institute, Sam Houston State University, [5]Texas A&M Forest Service, [6]Texas Parks & Wildlife Department, [7]Coastal Bend Bays & Estuaries Program, [8]Nueces County Coastal Parks, and [9]City of Port Aransas Nature Preserves

In 2014, the Texas Gulf Region Cooperative Weed Management Area (CWMA) received a grant to establish the organization and develop a Brazilian peppertree management plan. Since that time, the CWMA has expanded to include 9 partners and over 30 participating members. The CWMA has completed over 15 volunteer work days; hosted 20 outreach events; removed Brazilian peppertree from over 240 acres; and improved management on over 9,370 acres of public and managed lands. They mostly focus their removal and restoration efforts within dune and coastal grassland prairie habitats located in Port Aransas, that have high concentrations of peppertrees and are owned by CWMA partners. Recently removal efforts were also geared towards private landowners. In 2020-2021, the CWMA was able to remove Brazilian peppertrees from over 30 private properties. Education and outreach are also key components of the CWMA. Countless brochures, mailouts, and

informational packets have been provided to the residents within and surrounding the CWMA boundary. Outreach materials and events focus on the identification, treatment, and impacts of Brazilian peppertree, as well as the importance of replanting native plant species. The CWMA is currently undergoing a Management Plan update, expanding its boundaries and partners, and moving forward with multiple funding opportunities. The CWMA has made multiple successes in the past 8 years, and continues to be a great resource to the region.

ENVIRONMENTAL AND WATER QUALITY

NOx source apportionment in a coastal urban air shed using stable isotope techniques
[1,2]Kaiya Shealy* and [1,2]J. David Felix; [1]Department of Physical and Environmental Sciences, [2]Center for Water Supply Studies College of Science and Engineering, Texas A&M University – Corpus Christi
(*Student Presentation*)

NOx (NO + NO2) emission decreases urban air quality and its subsequent deposition can be a significant source of excess nitrogen loading to coastal waters. Photochemical reactions between volatile organic compounds, and NOx in the atmosphere creates ozone (O3). Previous studies suggest that the City of Corpus Christi is in a NOx limited zone, so an increase in NOx would lead to an increase in O3. The first step to NOx emission mitigation is to quantify the contributions of NOx sources. This study uses stable isotope techniques to measure point and nonpoint NOx sources in order to quantify three main NOx sources in the Corpus Christi air shed: vehicular, biogenic, and industrial sources. Each of these sources have unique isotopic compositions or "source signatures", specifically δ15N-NOx values, which are different for each source and allow the use of isotope mixing models to determine source contribution. NOx and NO2 passive air samplers will be deployed at three City of Corpus Christi NOx and ozone monitoring stations each month for one year and the nitrogen and oxygen isotopic composition (δ15N, δ18O) of each sample will be measured. The δ15N-NOx value in ambient air, and the δ15N-NOx values of the NOx sources, will be applied to a Bayesian isotope mixing model to quantify source contributions. Limited preliminary data suggests that vehicular emissions is the main contribution, followed by industrial emissions, then biogenic. Results will help aid in the creation of an ozone action plan for the City of Corpus Christi.

Electric currents in the sediment: alkalization of seawater by cable bacteria
Hang Yin* and Xinping Hu; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University – Corpus Christi

In recent decades, the atmospheric carbon dioxide (CO2) increase rate has reached to an unprecedented level due to anthropogenic activities. As increasing anthropogenic CO2 results in significant global changes including widespread ocean acidification, numerous studies have been conducted to explore both the natural and artificial pathways compensating for seawater pH drop. In this study, we conducted both modelling and experimental exercise to examine the effects of cable bacteria activities on water column carbonate chemistry. The spatial separations of cathodic oxygen reduction at sediment surface and anodic oxidation of sulfide at depth cause the redistribution of sediment pH profiles. Our model simulations showed that electrogenic sulfide oxidation increased overlying water pH by as much as 0.3 and TA by 280 μmol kg-1 in 5 days with a 100 cm overlying water depth. In lab incubation experiments, biogeochemical snorkels made from graphite rods were inserted into the sediment to explore the occurrence of sediment electrogenic reactions by both cable bacteria and artificial conductors. We found that compared with the control, electrogenic reactions increased overlying water pH by as much as 0.12 and TA by 300 μmol kg-1 in 25 days with a 3.5 cm overlying water depth. It was believed that sediment biogeochemical processes as a whole

decrease overlying water pH. However, results from both modelling and sediment incubation experiments highlight that cable bacteria may play an important role in buffering seawater acid-base equilibrium, especially in shallow coastal environments.

The aggregation of riverine dissolved organic matter exposed to seawater depends on its chemical character and the hardness of the freshwater

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Terrestrial run-off transports $400x10^{12}$ g C y^{-1} into the global ocean and more than half of this terrigenous organic matter is in the dissolved phase, contributing to up to 2.4 % of dissolved organic carbon (DOC) in the ocean. Riverine organic matter tends to aggregate more with increasing concentrations of divalent cations (Ca^{2+}, Mg^{2+}) when mixed with seawater. Consumption of particulate organic carbon (POC) by bacteria compared to DOC should be favored and might contribute to the oxygen deficit near river mouths known as coastal hypoxia. In freshwaters, the ratio of organic aggregates to dissolved organic matter is expected to depend on the cations concentration of the freshwater (water hardness), and this ratio would determine the relative additional aggregation at the marine-freshwater interface. The composition of organic aggregates is a strong determinant of their biodegradation state and might be also relevant for the actual aggregation of the dissolved organic matter. We measured the amount of riverine dissolved organic matter aggregated into particles and its composition when mixed with seawater. We used an automated analyzer for total organic carbon and total nitrogen, CHN analysis with infrared mass spectrometry for stable isotopic analysis, and high-performance liquid chromatography for total hydrolyzable amino acids (THAA). Preliminary results from experiments when mixing seawater with water from two Texas rivers with similar water hardness (Mission and Aransas) showed that aggregates were formed from dissolved organic matter because POC, particulate organic nitrogen (PON) and THAA concentrations were higher than expected from a conservative behavior.

Dissolved organic matter concentration and composition of Mission-Aransas National Estuary Research Reserve

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Dissolved organic matter is a key component of element cycling and ecosystem dynamics of estuaries. We analyzed dissolved organic carbon (DOC) concentration and chromophoric dissolved organic matter (CDOM) composition in samples collected at 5 long-term monitoring stations in the Mission-Aransas National Estuary Research Reserve (NERR) over 2016 – 2021. In general, CDOM (UV-absorbance at 254 nm) is significantly correlated with DOC, indicating CDOM can be used as a proxy for bulk DOM. With a base line value of ca. 2.0 ppm to 5.0 ppm, the changes in DOC concentration in the Mission-Aransas NERR region showed a close correlation with hydrological events. High DOC concentrations in all 5 stations coincide with high precipitation in the local regions. Specifically, the highest DOC concentrations were not observed during Hurricane Harvey, but shortly after it. The impact of rainfall on DOM is further confirmed by the CDOM parameters. For instance, the specific UV absorbance at 254 nm (SUVA254), which is a strong indicator of the aromaticity of DOM, reaches the lowest value when the highest DOC concentration is documented, suggesting that the high levels of DOM may not be originated from the adjacent watershed through riverine input. Similarly, the UV-absorbance ratio index of 210 nm and 254 nm (URI) is generally low when the DOC concentrations are high, showing predominance of humic substances during high

DOC period. Overall, these preliminary data show that the dissolved organic matter from rainfall may represent a major contributor to the DOM in the Mission-Aransas NERR waters.

Effects of drought, pulsed freshwater inflows and nutrients imported from the Gulf of Mexico on primary production and water quality in the Mission-Aransas Estuary
Edward Buskey*, Cammie Hyatt, and Lindsay Scheef; Marine Science Institute, The University of Texas at Austin

The Mission-Aransas Estuary is in an arid region of South Texas with limited rainfall. Low freshwater inflows can be replaced with short duration, large freshwater pulses due to storm events. Low freshwater input, small tidal range and a nearly continuous barrier island separating the estuary from the Gulf of Mexico result in a typical water replacement time of about one year. Five monitoring stations collect water quality data at 15-minute intervals, and nutrient and plankton samples have been collected monthly over the past 14 years. These data reveal the impacts of extended periods of drought punctuated by major inflows of freshwater to the estuary on nutrient concentrations, phytoplankton biomass, primary production and net ecosystem metabolism. Short term changes in nutrient concentration and phytoplankton biomass can be seen in response to intense inflow events, but seasonal patterns of primary production are similar during periods of drought and high salinities compared to periods following higher freshwater inflows, nutrient loading and lower salinities. Nutrient concentrations in near shore waters along the Texas Coast are typically higher than those found within the Mission-Aransas Estuary due to high nutrient inputs from the Mississippi River. Sampling at 2-hour intervals in the channel between the Gulf of Mexico and the estuary show that on high tides nutrients are imported from the Gulf into the estuary. The estuary maintains high productivity with efficient nutrient recycling in this shallow, warm water system supplemented by nutrients from near shore Gulf waters and episodic inputs of nutrients from freshwater inflows.

EXTREME WEATHER IMPACTS (SPECIAL SESSION)

Winter Storm Uri impacts and Managing for Recovery of Spotted Seatrout in Texas
Dakus Geeslin*; Deputy Director, Coastal Fisheries Division, Texas Parks and Wildlife Department (Invited Speaker)

The largest freeze related fish kill since the 1980's began as multiple frontal passages moved through Texas beginning February 13, 2021 dropping water temperatures in coastal bay systems to below the thermal tolerances of many fish including Spotted Seatrout. The storm, later named Winter Storm Uri, had significant impacts on marine fish in Texas. An estimated minimum of 3.8 million fish consisting of 61 species were impacted coastwide. Recreationally important game species accounted for 9% of the total fish kill. Spotted seatrout were particularly impacted and comprised 48% of the kill from game species. Both the Upper and Lower Laguna Madre bay systems were hit particularly hard by this event in terms of game fish mortality. The Lower Laguna Madre had the highest mortality of Spotted Seatrout with an estimated 104,000 fish killed. The magnitude of the kill led the Texas Parks and Wildlife commission to take emergency management action in reducing harvest through size and bag limit restrictions for 180 days. Spring gill net catch rates reflected the impact of the kill within impacted bay systems showing reduced catch rates up to 44% below the ten-year mean. San Antonio Bay and Matagorda Bay which did not have the extensive fish kill based on assessments at the time of the storm showed similar reduction in catch rates. Additional regulatory action was taken in the form of harvest restrictions to accelerate recovery efforts. Recovery rates from impacted areas will be shared during the presentation.

Community response of benthic macrofauna following Winter Storm Uri in Baffin Bay, Texas

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In subtropical areas, freezing temperatures are uncommon events that can produce substantial effects on estuarine ecosystems, including large fish kills. In February 2021, Winter Storm Uri brought a prolonged period of freezing air temperatures to Texas—7 days along the southern coast—with associated mortalities of over 82,000 black drum in the Upper Laguna Madre, including Baffin Bay. In Baffin Bay, black drum forage for benthic macrofauna prey on soft sediments and on Serpulid reefs formed by gregarious settlement of tube-building polychaetes. While most of the literature on cold disturbances in a subtropical climate quantify fish mortality, this work will evaluate prey availability and trophic dynamics—specifically of benthic macrofauna and black drum in Baffin Bay—to assess the outlook of recovery. Following Winter Storm Uri, we anticipate decreases in benthic macrofauna abundance, with a shift toward dominance by more opportunistic species. In soft sediments, we expect to see fewer impacts to deeper-burrowing organisms (e.g. bivalves) that may have access to thermal refuges. On Serpulid reefs, we expect relatively faster recovery of benthic macrofauna density, diversity and biomass compared to soft sediments, facilitated by the structural complexity of the habitat. We anticipate that temporary reductions in prey availability across both habitat types will likely result in a narrowed black drum diet. With increasing climate variability, there is a need to understand how estuarine systems in subtropical areas will respond to future freeze events. Results of this work will inform predictions of estuarine response to future freeze events in subtropical areas.

Green Sea Turtle (*Chelonia mydas*) Hypothermic Stunning in Texas

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Texas inshore waters are the epicenter of sea turtle hypothermic stunning in the western Gulf of Mexico (GoM). Hypothermic stunning occurs along the entire Texas coast, with green turtles (*Chelonia mydas*) by far the most frequently documented species. The Sea Turtle Stranding and Salvage Network (STSSN) began in 1980 and documented hypothermic stunning as the stranding cause for 76.0% of all green turtles recorded in Texas 1980–2021. Most of these hypothermic stunned green turtles recorded in Texas (98.7%) were found in inshore waters along bays and estuaries. Recently, these events have increased in frequency and numbers of individuals affected, as both the numbers of juvenile green turtles inhabiting Texas waters has increased and weather events have become more severe. During the winter of 2010–2011, 1,670 hypothermic stunned green turtles were documented, 711 were documented during the winter of 2014–2015, and 3,702 during the winter of 2017–2018. February 2021, the STSSN documented 13,326 hypothermic stunned green turtles in Texas, more than tripling the previous largest event recorded in Texas

(2017–2018). The largest numbers were documented in the Laguna Madre (LM), one of the most important developmental habitats for green turtles in the western GoM. A Water Temperature Prediction System produced warnings of the 2021 event, but duration and severity exceeded expectations. STSSN participants faced many challenges, leading to retooling of procedures. These adjustments and recruiting additional partners will enable more effective responses to massive events such as the 2021 event, allowing more turtles to be saved during similar sized and even larger events expected in the future.

Drought Effects on a Marine Food Web Revealed by Composition of Fish Eggs

Lee A. Fuiman*; Fisheries and Mariculture Laboratory, Marine Science Institute, The University of Texas at Austin

Flow of essential fatty acids through food webs is critical for the health of individual animals, populations, and communities. Planktonic eggs may play a central role in marine systems because they are highly concentrated in essential fatty acids, superabundant, and consumed by a variety of species. Eight years of sampling red drum (*Sciaenops ocellatus*) eggs provided the opportunity to test the hypothesis that extreme climatic events differentially alter abundances of prey populations and, ultimately, egg fatty acid composition. Fatty acid composition of eggs varied significantly among years and three major patterns of interannual variation (principal components) paralleled trends in the Palmer Drought Severity Index. Each of the first three principal components was related to abundance of a particular prey (blue crabs, filter-feeding fishes, or brown shrimp) during the spring and summer. Summer abundances of blue crab and brown shrimp were most strongly correlated with bay salinity 12–14 months earlier. Summer abundances of filter-feeding fishes were most strongly correlated with bay salinity 0–1 month earlier. The analyses revealed changes in trophodynamic flow that were associated with the phases of the climatic event. EFA content of eggs increased during drought years then decreased in the recovery years, indicating the potential for downstream effects on reproductive output, offspring viability, and tissue composition of egg consumers. The analysis also revealed climate-related shifts in the degree of benthic- pelagic coupling and pelagic recycling that were mediated by the egg boons.

Ensemble estimates of Multivariate Coastal Risk

Jemerson P. James*, Yurui Fan, and Vijay Panchang; Texas A&M University (*Student Presentation)*

Atlantic storms penetrating the Gulf of Mexico are the most common extreme weather events experienced by Texas coastline. These storms effect multiple drivers of coastal hazards such as high winds, storm surges, and, at times, heavy precipitation. However, traditional design guidelines include probability estimates of each of these individual drivers taken separately, for e.g. 100-year wind speed or 100-year water level. Recent research has demonstrated the importance of accounting for the multivariate nature of coastal hazards and copulas appear to be the most frequently used statistical tool for estimating the multivariate risk. Usually the procedure involves identifying the best copula model at a location of interest based on the available data. Very recently, some researchers (e.g. Lucey and Gallien 2022) have observed that multiple copulas provide "reasonable" representation (while some do not) and recommend expanding the suite of copulas used. This begs the question: if more than one are plausible, wouldn't an "ensemble" approach be more suitable? We demonstrate an example of this approach, by estimating the ensemble multivariate risk inference for joint occurrence of wind speeds and surge levels in Galveston during storms. The wind-speed and surge measurements provided by Trepanier et al. (2015) based on the HURDAT and SURGEDAT datasets going back to ~1880, will be used for this study. The results consist of ensemble estimates of risks and the "most likely" estimate.

Winter storm Uri (Feb. 2021) produced a gradient of impacts to vegetation and sediment in Texas coastal wetlands over a latitudinal gradient from Boca Chica to Port O'Connor

C. Edward Proffitt* and Donna J. Devlin; Department of Life Sciences, Texas A&M University – Corpus Christi

Mangroves increased in dominance along the Texas Coast after the last two killing freezes in the 1980's and Winter Storm Uri. Uri caused extensive mangrove mortality, as well as significant mortality of salt marsh species and extensive loss of above ground biomass at three Sentinel Sites, Port O'Connor (-9.1C) to Corpus Christi Bay (-6.6 to -7.7C) , and moderate losses of above ground mangrove biomass southward from Padre Island National Seashore (-7.1C) to Laguna Atascosa NWR (-5.6C). At the southernmost site at the Lower Rio Grande NWR (-3.3 to -5C), there was mild damage to leaves and shoots and reduced reproduction the following season. At the other six Sentinel Sites, there was essentially no reproduction the summer following the freeze as any survivors were investing energy in vegetative re-growth. Some recruitment that year was likely by propagules that were already in the water at the time of the freeze and thus were protected from being killed by the higher latent heat of water. The shoreline has retreated at the Port O'Connor Sentinel Site at Boggy Creek where mangrove mortality was very high, and Spartina alterniflora is recruiting into some areas that were previously occupied by mangroves. We did not find substantial subsidence or accretion at SET/MH plots at most sites at 1.5 years post-freeze. However, sediments are noticeably less firm and more anoxic at the sites where mangroves perished, thus, these sites where sediment is no longer held by live roots may be especially vulnerable to erosion during storms.

Effects of Winter Storm Uri on *Avicennia germinans* recruitment along the Texas Coast

Donna J. Devlin* and C. Edward Proffitt; Department of Life Sciences, Texas A&M University -- Corpus Christi

The mortality of mangroves associated with the February 2021 freeze changed the landscape of many estuaries in Texas. Understanding environmental factors that influence propagule and seedling recruitment may benefit managers who wish to control the potential for repopulation of mangroves at specific sites. Freeze damage to foliage was minimal at Boca Chica and most defoliated shrubs at Laguna Atascosa resprouted. At our sites North of Padre Island National Seashore, most trees >0.5m were defoliated and the majority perished, young of the year seedlings that recruited prior to the February freeze also perished. A low number of propagules that were either floating during the freeze or dispersed to sites after the freeze did successfully recruit at the northern sites. The high specific heat capacity of water likely affected survival of both floating propagules that were not subjected to cold air temperatures and roots submerged in cold saturated soils, that remained cold longer than higher elevation, unsaturated soils. As expected, flowering this year north of Laguna Atascosa is restricted to individual protected shrubs at high elevation sites. Surprisingly, flowering is extremely low from Laguna Atascosa south. Prudent use of nutrient amendments by managers may help to ameliorate freeze effects. N+P treatments applied to maternal plants increase abundance of flowers. Both N and N+P treatments increase propagule production by ~39%. Further, seedlings grown from propagules from N and N+P treated plants grow faster and therefore likely will reproduce earlier. High nutrient or amended sites may serve as source populations for degraded mangrove populations.

Black Mangrove Seedlings Response to an Extreme Disturbance Event

[1]Jacob Doty*, [1]C. Edward Proffitt, [1]Donna J. Devlin, and [2]Anna Armitage; [1]Texas A&M University -- Corpus Christi, [2]Texas A&M University -- Galveston (*Student Presentation*)

Avicennia germinans has migrated northward along the Texas coast leading to a shift in species dominance from salt marsh flora to mangrove forest in many locations. However, disturbance events can cause a mass mortality of tropical mangroves and drive shifts in dominance back to salt marsh species. Initial recovery following mass mortality will be largely dependent on the success and growth to reproductive age/size class of mangrove seedlings. Our study assessed the response of Avicennia seedlings (green cotyledons attached), that recruited post-disturbance, to an extreme low temperature disturbance event (Winter Storm Uri, Feb. 2021). In the Lower Laguna Madre (Boca Chica site) freeze effects were minimal and propagules recruiting any time before or after the freeze could survive and grow. At higher latitudes (Corpus Christi Bay & Matagorda Bay) where freeze effects were more severe, rooted seedlings died along with most adult shrubs and new colonization appeared to be by seedlings recruiting from propagules likely floating in the water at the time of the freeze. Thus, recruitment that year occurred only after the Feb. freeze. The survival and growth of seedlings recruited at different sites prior and after Uri were not significantly different. At freeze-disturbed sites 10-53% of new seedlings flowered within 16 months of the freeze event, while 0 % flowered at the non-disturbed southernmost location. These results suggest that reproduction of 1 year old seedlings may be an important aspect of mangrove recovery and over the ensuing years will contribute to the regime shift, barring additional hard freezes.

Black Mangrove Dieback Following an Extreme Freeze Event- February 2021

Melinda Martinez*; U.S. Geological Survey

Climate extremes regulate the northern range limits of many tropical, cold-sensitive species. For example, in the southeastern United States, mangrove range dynamics are controlled by the frequency and intensity of extreme freeze events. There is a pressing need to advance understanding of the effects of extreme winter temperatures on mangroves near their northern range limits to predict future regime shifts. An extreme freeze event that occurred in Texas, U.S.A. in February 2021 produced temperatures as low as -10 °C, which exceeds the estimated threshold for black mangrove (*Avicennia germinans*) damage and mortality. We examined the damage to black mangroves in coastal Texas using remotely sensed data (specifically, vegetation greenness from Sentinel-2 surface reflectance data). We compared results in Texas to unaffected mangroves in coastal Louisiana and Florida. We observed the most extensive damage in areas where minimum temperatures were lowest, though the response was nonlinear. We found a sigmoidal relationship between mangrove freeze damage (i.e., magnitude of vegetation greenness change) and minimum temperature, where lower temperatures led to greater damage. Field data and remotely sensed data both had minimum temperature thresholds near -6.0 °C. The most widespread mangrove damage occurred in coastal wetlands near Port Aransas, TX (~1,651 ha) followed by Port O'Connor, TX (~1,566 ha). Collectively, our results highlight the value of remotely sensed data for quantifying the effects of extreme freeze events on tropical, cold-sensitive plant species, which can be used to better anticipate and prepare for changing range limits due to climate change.

Retention and pathway of pollutants released to Galveston Bay during Hurricane Harvey using Lagrangian particle tracking

Jiabi Du, Emily Summers and Kyeong Park*; Department of Marine and Coastal Environmental Science, Texas A&M University -- Galveston

Increasing frequency of extreme precipitation events under the future warming climate makes the storm-related pollutant release more and more threatening to coastal ecosystems. Hurricane Harvey (2017), a 1000-year extreme precipitation event, introduced massive amounts of pollutants to the Galveston Bay system, with 0.57×106 tons of raw sewage and 22,000 barrels of oil, refined fuels and chemicals reportedly released during Harvey. Using a Lagrangian particle-tracking method coupled with a validated 3D hydrodynamic model, we examined the retention, pathway, and fate of the released pollutants. A new timescale, local exposure time (LET), is introduced to quantitatively evaluate the spatially varying susceptibility inside the bay and over the shelf, with a larger LET indicating the region is more susceptible to the released pollutants. We found LET inside the bay is at least one order of magnitude larger for post-storm release than storm release due to a quick recovery in the system's flushing. More than 90% of pollutants released during the storm exited the bay within two days, while those released after the storm could stay inside the bay for up to three months, implying that post-storm release is potentially more damaging to water quality and ecosystem health. Our results suggest that not only the amount of total pollutant load but also the release timing should be considered when assessing a storm's environmental and ecological influence, because there could be large amounts of pollutants steadily and slowly discharged after storm through groundwater, sewage systems, and reservoirs.

ENVIRONMENTAL AND WATER QUALITY

A Spatio-Temporal Analysis of Polycyclic Aromatic Hydrocarbons in Mission-Aransas NERR and Matagorda Bay Sediments

Zhanfei Liu, Jack Lloyd*, Kaijun Lu, and Zucheng Wang; Marine Science Institute, The University of Texas at Austin (*Student Presentation*)

Polycyclic aromatic hydrocarbons (PAHs) are a major component of petroleum which can accumulate and persist in marine sediments and cause harm to marine organisms due to their mutagenic and carcinogenic properties. The Mission-Aransas National Estuarine Research Reserve (NERR) and Matagorda Bay include around 450,000 acres of wetland, terrestrial, and marine environments. Petrochemical industries are abundant within this system and represent a risk to its productivity and health. Therefore, monitoring PAH concentrations in the region is essential to assessing potential impacts of oil and gas wells on the temporal and spatial distribution of PAHs, as well as providing baseline data critical for developing effective responses to future potential disasters. In this study, we measured 16 U.S. EPA priority PAH in sediment samples taken from the NERR and Matagorda Bay over a twelve year period, from 2011 to 2022. For each station, total PAH, low molecular weight (LMW) PAH, and high molecular weight (HMW) PAH concentrations were calculated, in addition to the percentage of each individual PAH present. Ratios of fluoranthene/(fluoranthene + pyrene) and anthracene/(anthracene + phenanthrene) were used as source indicators. The results indicate that Hurricane Harvey had a significant impact on PAH concentrations in the samples taken following the storm event compared to those taken prior ($p < 0.01$). PAH ratios indicate a dominant pyrogenic source of PAHs, although petrogenic sources are also suggested, albeit less frequently. Overall, these waters continue to be affected by natural and anthropogenic factors, highlighting the need for continued monitoring and research.

HABITAT AND RESTORATION

Focused Flows: Environmental Water for Coastal Habitat
Quinn McColly*; Texas Water Trade

Bays and estuaries are some of the most productive habitats on the planet and freshwater inflows to them provide critical ecological functions. Human activity has greatly diminished the volume of flows over the past decades via extraction and impoundment. This is particularly challenging for the environment under drought conditions when human needs persist. Texas Water Trade has facilitated the purchase of environmental water in multiple locations along the Texas Coast, two of these projects are located around Galveston Bay. This water is deposited onto private land and can be held to create habitat then released to affect salinity levels. While we cannot purchase enough water to affect the entire bay, we are testing the efficacy of using a "focused flows" approach. By buying modest amounts of water then deploying it strategically using "right place, right time" tactics we hope to provide uplift to systems under pressure. To measure the impact of the efforts, we are developing a novel monitoring strategy. We have deployed a network of game cameras that are synchronized to take pictures at ten-minute intervals at both treatment and control sites. These images are being processed using artificial intelligence object detection software to provide accurate bird counts. These counts will provide insight into the land use patterns on wetted versus non-wetted lands resulting from our efforts. In addition, we are capturing bird song recordings which will be processed in a similar fashion. Salinity meters have also been deployed to track the impact of releases on salinity levels.

Update on Little Bay Restoration Initiative
Charlie Belaire and Hannah Rudellat*; Anchor QEA

Little Bay is a small secondary bay within the Aransas Bay, Texas system. This 350-acre embayment lies within the City of Rockport and is the focal point of much of the eco-tourism industry of Aransas County. For decades, Little Bay exhibited water quality sufficient to host seagrass on most of its shallow areas. This water quality and seagrass persisted through the construction of Key Allegro Canal subdivision and Rockport Beach in the early 1960s and thrived until the 2000-2007 timeframe. By 2007, seagrass had disappeared and noxious algal blooms and odors became commonplace. For many years, the local governments invested in studies by universities, agencies and consultants to identify causes and corrective actions to restore water quality and seagrass beds. This presentation discusses how unified community support, combined with efforts of scientists and engineers, can result in significant assistance from the Texas General Land Office to address water quality problems in impaired or threatened coastal bays.

Marsh Restoration, Seagrass Protection, and Bird Island Creation Through the Beneficial Use of Dredged Material
[1]Hayden Smith*, [2]Todd Merendino, [3]Sarah Garza, [3]Harrison McNeil, [3]Yvonne Dives-Gomez, [4]Ray Newby, [1]Renee Robertson, [1]Alex Freddo, and [1]Dan Opdyke; [1]Anchor QEA, [2]Ducks Unlimited, [3]Port of Corpus Christi Authority, [4]Texas Department of Transportation

Navigation channels along the Texas coast are in frequent need of dredging. Historically, most dredged material has been placed in areas that do not provide significant ecological benefits. This results in the loss of valuable sediment that could be used to restore wetlands, rookeries, tidal flats, beaches, and other ecologically and economically important habitats. Using funding from a Texas General Land Office Coastal Management Program Gulf of Mexico Energy Security Act grant to Ducks

Unlimited (DU) as well as Port of Corpus Christi Authority (PCCA) support, the project team worked with stakeholders to select and develop preliminary designs for 20 restoration sites to beneficially use dredged material (BU). Of those sites, the project team developed 30% designs for 11 and is developing 60% designs, cost estimates, and permit application packages for 7. These efforts will aid in preparing several high priority projects for final design and construction using future funding. This presentation highlights the approaches used by DU and the PCCA with the support of Anchor QEA, LLC, Sarosdy Consulting, and the Texas Department of Transportation to develop the 60% designs and cost estimates for the following sites:

- Dagger Island: BU from the Corpus Christi Ship Channel to construct a protective berm, create marsh and seagrass habitat, and protect seagrasses within Redfish Bay
- Little Bird Island North: BU from the Gulf Intracoastal Waterway to create critical rookery habitat and expand oyster habitat within San Antonio Bay

Landscape & Geologic History of Oso Bay Wetlands Preserve
Randy Bissell*; Texas Master Naturalist

The Oso Bay Wetlands Preserve is comprised of three basic geologic components – the Beaumont Uplands, the Wisconsin Unconformity, and the Holocene Bay Fill. Most of the preserve is made up of Beaumont Uplands which are ~450,000 to 125,000-year-old "Beaumont Formation" sandy clays. The uplands host a variety of native trees, brush, and thorny thicket. Prairie grasses and cacti grow well on the slopes here. Songbirds inhabit and nest in dense foliage. The Wisconsinian Unconformity is not a unit, but a surface. It is the gentle slope that fronts the Oso Bay. It is the erosional scar of a sea-level fall that occurred in the last 120,000 years to about 12,000 years ago as the Wisconsin Ice advanced across much of North America. Global sea level fell over 400 ft! Imagine looking into a ravine, perhaps 60-80 ft. deep separating the Preserve from a sandy hill, the present-day Flour Bluff. The beach was 60 miles east of Port Aransas! Sea-level rise in the last 11,000 years has resulted in the Holocene Bay Fill, or the flat sandy and salty wetlands of the intertidal environment. The fine sands and silts drape onto the Wisconsin Unconformity. Present-day sea-level fills the estuary and tides or heavy rains may flood the lowlands. Placing a finger at the contact between the Beaumont Formation and the Holocene intertidal fill represents a time gap of over 100,000 years! Ducks, roseate spoonbills, terns, gulls, and herons all love the natural productivity and diversity of food sources in these estuarine wetlands.

FISH AND FISHERIES

Distribution, Density, and Habitat Association of the Dwarf Seahorse (*Hippocampus zosterae*) in Texas
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Dwarf Seahorses (*Hippocampus zosterae*) are among smallest species of seahorses, averaging about two centimeters in height. Their preferred habitat is seagrass beds. This study represents the first coast-wide survey of Dwarf Seahorse in Texas. Field sampling was divided into two years. Year-1 (2020) was a coast-wide distribution and density assessment using push nets, and year-2 (2021) was a gear comparison study. Seagrass species, percent cover, canopy height and biomass were monitored at each site, and water quality and other physical habitat characteristics were recorded. Seventy-nine Dwarf Seahorses were captured at 30 of the 80 sites that were visited in year-1 with an overall catch per unit effort (CPUE) of 0.017 individuals per meter2. They were caught in all bay systems except for Galveston, with the highest CPUE in Aransas. Dwarf Seahorse CPUE was

positively correlated with an increase in seagrass diversity. The presence and cover of Turtle Grass (*Thalassia testudinum*) were significantly correlated with CPUE and presence of Dwarf Seahorses. The most effective gear type was the Throw Trap (CPUE = 0.222) followed by the push net (CPUE = 0.019). Dwarf Seahorse catch was highest at sites which had a high diversity of seagrass and contained Turtle Grass (a climax species), suggesting they were mature beds. While the throw trap was the most effective gear type, they were also the most labor and time intensive. Continued state-wide monitoring is recommended to examine seasonal trends and track changes in population demographics of Dwarf Seahorses.

Comparing diversity of estuarine-dependent nekton between Aransas Pass and Packery Channel inlets

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Tidal inlets play an essential role in estuarine-dependent nekton recruitment by providing access to nursery habitats (e.g., seagrass meadows) from spawning grounds in the Gulf of Mexico. The Corpus Christi Bay region includes Aransas Pass, a historically large inlet, and Packery Channel, a smaller natural tidal inlet permanently reopened in 2005. The purpose of this study was to (1) determine whether there is a seasonal difference in species diversity between the Aransas Pass (large) and Packery Channel (small) inlets and (2) determine if the distance from the inlet has an effect on species diversity. Shannon diversity indices were calculated from juvenile nekton (fish, shrimp, and crab) species collected using epibenthic sled tows from eight seagrass meadow sites near Aransas Pass and four sites near Packery Channel across three primary recruitment seasons (fall, winter, and spring). There was no significant difference in species diversity between the Aransas Pass and Packery Channel inlet, though there was a significant difference among seasons. Diversity was significantly higher during the winter and spring recruitment seasons at both inlets compared to the fall. In addition, distance (2-10 km) from the inlet had no significant effect on species diversity regardless of the season. These findings demonstrate that despite differences in size and age, Aransas Pass and Packery Channel support equally diverse nursery habitats across a range of distances for estuarine-dependent nekton species.

Role of Calcium Channels in Sperm Motility in Southern Flounder (*Paralichthys lethostigma*)

Caroline Matkin* and Peter Thomas; Marine Science Institute, The University of Texas at Austin

A better understanding of the mechanisms regulating sperm motility in southern flounder (*Paralichthys lethostigma*) would enable the development of new procedures to enhance the reproductive performance of southern flounder male broodstock. A rise in intracellular calcium is essential for the initiation of sperm motility in marine fish, however this process and the role of different calcium channels remain unclear. The function of calcium channels in sperm motility was investigated in southern flounder. The role of voltage-gated L-and T-type calcium channels in sperm motility were examined using L- type calcium channel inhibitors (verapamil, nifedipine, and diltiazem) and T-type calcium channel inhibitors (mibefradil and ML218). Additionally, the presence of a calcium channel in mammalian sperm, CatSper, in southern flounder sperm was investigated using a specific CatSper antibody. Moreover, the function of CatSper in flounder sperm motility was investigated using the CatSper specific inhibitor, HC-056456. To induce sperm motility, the activating solution must have high osmolarity, similar to that of full-strength seawater. Preincubation with verapamil, nifedipine, diltiazem, mibefradil, and ML218 resulted in a significant decrease in sperm motility in all cases, thus confirming the function of L- and T- type calcium

channels in the sperm motility response. Expression of CatSper3 protein was detected on flounder sperm by Western blot, and preincubation with HC-056456 resulted in a significant decrease in sperm motility. These results suggest the presence of a complex mechanism regulating the calcium increase in flounder sperm during initiation of sperm motility involving L-type, T-type, and CatSper calcium channels.

Toxicity of 6PPD-quinone among estuarine fishes through development

Kerri Lynn Ackerly* Kathleen J. Roark, Andrew J. Esbaugh, and Kristin Nielsen; Marine Science Institute, The University of Texas at Austin

Annual large-scale fish kills after storms are a serious issue for salmon populations migrating through highly urbanized watersheds in the Pacific Northwest region of the United States. Recently, these mass die-offs were linked to tire wear particles (TWPs) left on roadways, which are washed into nearby surface waters with stormwater runoff. The lethality of these TWPs have been attributed to 6PPD-quinone (a quinone byproduct of the ubiquitous tire antiozonant 6PPD), which has a median lethal concentration of < 1-µg/L for select species of salmonids. However, there remains a paucity of data describing the differential toxicity of this compound across species and ontogenies, or its sub-lethal effects during early life stages. Additionally, no toxicity values have been developed for estuarine fish species exposed to 6PPD-quinone. Filling this data gap is particularly significant because estuaries receiving inflows from highly urbanized watersheds are especially vulnerable to TWPs. To close these data gaps, we (1) determined the toxicity of 6PPD-quinone to both model (e.g., sheepshead minnow [*Cyprinodon variegatus*]) and non-model (red drum [*Sciaenops ocellatus*], southern flounder [*Paralichthys lethostigma*]) estuarine fishes (2) examines the relative sensitivities of early life stages within a single species, and (3) derived sub-lethal toxicity values for early life stage fish. Results indicate that the toxicity of 6PPD-quinone varies demonstrably across species and ontogeny, with toxicity values spanning several orders of magnitude in some species. These data are a significant contribution towards advancing our knowledge of this newly identified and likely pervasive environmental toxicant.

The Influence of Depth and Season on the Nearshore Community of the Texas Gulf of Mexico

Jeremy T. McCulloch* and Ethan T. Getz; Texas Parks and Wildlife Department – Coastal Fisheries Division

The northern Gulf of Mexico largely consists of unconsolidated or “mud-bottom” habitat which is utilized by a number of ecologically valuable and targeted species. Here, we utilized a long-term fisheries-independent dataset collected by the Texas Parks and Wildlife Department to characterize community composition within the nearshore waters (< 9 miles) of Texas. Multivariate analyses were used to assess communities collected in Gulf trawl samples from five regions between 2010-2019. The relationship between gulf and adjacent estuary communities was also investigated. Results revealed clear gradients in environmental variables including turbidity, salinity and depth along the coast. Community composition also varied seasonally and by region. Diversity measures including evenness, richness and Shannon-Weiner diversity index (H’) were also calculated for each sample and compared across depth and season. Results determined that H’ increased from north to south along the Texas coast. H’ also increased with depth and was highest in the winter and spring. Pulses of richness were also evident in the summer and fall likely due to migration or recruitment events. These results highlight the shifts in community composition along the gulf coast of Texas based on environmental gradients.

Characterizing Fish Assemblages and Red Snapper Growth/Movement at Various High- and Low-Profile Artificial Reef Configurations

Marybeth Weihbrecht* and Richard Kline; University of Texas –Rio Grande Valley (*Student Presentation*)

The Rio Grande Valley Artificial Reef is the largest artificial reef off the Texas coast at 2.5 square miles and is located 12 miles northeast of South Padre Island (26° 16.70' N, 97° 02.99' W). Construction of the reef began in 2015 to provide hard substrate habitat for reef fish at various life stages. This study focuses on the size, abundance, and movement of Red Snapper *(Lutjanus campechanus*) among three different reef patch configurations in the RGV reef: including concrete pyramids, low profile cinder block platforms, and mixed sites containing both cinder block platforms and pyramids. There are multiple replicates of each configuration, totaling 51 sites. Three baited fish traps were deployed for one hour around the center point of each site. All captured fish were identified and measured, while red snapper were weighed, measured, and tagged before release. Location coordinates of recaptured fish were recorded from each tag return. The main objectives of this study were to 1) Compare community structure at the different reef configurations. 2) Compare the lengths and weights of Red Snapper at each reef configuration type. 3) Determine whether Red Snapper were emigrating from the RGV reef.

Paired Acoustic and Gillnet Sampling Reveals the Utility of Passive Acoustic Monitoring for Fisheries Monitoring in South Texas Estuaries

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The Mission-Aransas Estuary (MAE) is home to fish populations that serve as the basis for lucrative recreational fisheries and provide important ecosystem services. To assess the health and diversity of local fishes, the Texas Parks and Wildlife Department (TPWD) employs fisheries-independent sampling methods. These techniques result in reliable population assessments but are labor and resource-intensive, while only providing a snapshot of heterogenous populations on a biannual basis. Passive acoustic monitoring (PAM) has been applied to monitor spawning activity and biodiversity of soniferous organisms, but its utility to estimate abundance and biodiversity of entire fish communities is largely untested, especially in turbid estuaries. Here, we use synchronized acoustic and gill net sampling to better understand the utility of PAM for monitoring local fisheries. We placed acoustic recorders adjacent to TPWD gillnets during deployments for 51 sampling locations over two sampling seasons. We then generated acoustic indices and quantified fish calling activity to test correlations between soundscapes and gillnet catch. Our results indicate that PAM can be used to track relative abundance of fishes, especially soniferous species. However, for the family Sciaenidae, abundances are only reflected by calling activity in the spring when spawning activity is high. Overall, our results suggest that PAM provides valuable complementary information concerning the spawning activity of recreationally important species, the distribution of species typically undersampled by gillnets, and the spatial distribution of fish populations in the MAE. As such, PAM may be used to fill knowledge gaps by providing continuous data at target locations with no impact on resident fish populations.

HABITATS AND ECOSYSTEMS

Surface Elevation Change Dynamics in Texas Coastal Marshes: Assessing the Effects of Rising Sea-Levels and Intensifying Hurricanes

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Accelerated sea-level rise and intensifying hurricanes highlight the need to better understand surface elevation change in coastal wetlands. We used the surface elevation table-marker horizon approach to measure surface elevation change in 14 coastal marshes along the northwestern Gulf of Mexico, within five National Wildlife Refuges in Texas (USA). During the 2014–2019 study period, the mean rate of surface elevation change was 1.96 ± 0.87 mm yr−1 (range: -1.57 to 8.37 mm yr−1). Vertical accretion rates varied due to landscape proximity relative to sediment inputs from Hurricane Harvey. At most sites, vertical accretion offset subsurface losses due to shallow subsidence. However, net elevation gains were often lower than recent relative sea-level rise rates, and much lower than rates expected under future sea-level rise. Because these marshes are not keeping pace with recent sea-level rise, it is unlikely that they will be able to adjust to future accelerations. Climate change threatens these Texas coastal wetlands and the ecological and economic services they provide. By characterizing the status and prospective loss of coastal marshes, our study reinforces the value of identifying local and landscape-level adaptation mechanisms that can enhance the ability of coastal marshes to adapt to threats posed by climate change.

Sunlight steers seagrass succession in super salty Laguna Madre (TX, USA)

Kyle Capistrant-Fossa* and Kenneth H. Dunton; Marine Science Institute, The University of Texas at Austin (*Student Presentation*)

Seagrasses are vital ecosystem integrators where their condition and distribution reflect the local abiotic and biotic environment. Therefore, long-term monitoring of seagrass meadows provides insight into ecosystem dynamics and drivers of environmental change. Here, we report 30 years of monitoring from "LM-151", a fixed station at Padre Island National Seashore within the hypersaline Laguna Madre. At 2 – 4 week intervals we measured water temperature, salinity, chlorophyll a concentration, nutrients (NOx, NH^{4+}), light attenuation, dissolved oxygen, total suspended solids, and water/secchi depth over a period extending more than three decades. Seagrass biomass and density were measured haphazardly every quarter (n=4 samples/quarter/year). Historically, a *Halodule wrightii* meadow dominated the site with a maximum density of 10,851 shoots m^{-2} (5/16/2014, 8/19/2015, and 5/31/2018). Between 2009 – 2013 the mean *Halodule* shoot density significantly decreased compared to the preceding decade (4597 ± 2242 – 1694 ± 2717 shoots m^{-2}; $p < - 10\text{-}8$) but was replaced by *Syringodium filiforme* (8380 shoots m^{-2} on 11/16/2010) following typical successional patterns. This increase and subsequent decrease in *Syringodium* coincides with shallower, less turbid, waters. Continuous measurements of underwater photosynthetically active radiation (PAR) reveal a peak in 2010. *Halodule* recovered as water levels increased but nearly vanished from the site by early summer 2019. Collaborating the recent loss of seagrasses, we found PAR decreased to minimal levels. These results suggest seagrasses in Laguna Madre are living near

their physiological thresholds and may be particularly sensitive to changes caused by human impacts including dredging, eutrophication, sea level rise, and algal blooms.

Long-term monitoring of seagrass meadows using acoustical methods

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Seagrasses are sentinel species whose sensitivity to changes in underwater light transmission and nutrient availability makes them an ideal indicator for sea level rise and climate change. The biological processes and physical characteristics of seagrass are known to affect acoustic propagation due to gas bodies contained within the seagrass tissue as well as photosynthesis-driven bubble production that results in free gas bubbles attached to the plants and in the water. The detachment of gas bubbles from the plants is also a source of ambient sound. To assess the acoustical properties of seagrasses in situ, we deployed a monitoring system in a seagrass meadow located in an area of Corpus Christi Bay known as East Flats, near Port Aransas, Texas. The system includes environmental sensor loggers, a measurement system consisting of an acoustic projector and a set of receiving hydrophones, along with an instrumentation pressure vessel that houses the electronics to control acoustic data acquisition and data storage. Measurements of acoustic propagation and ambient sound were collected every ten minutes for a period of ten months. Supporting environmental measurements including water temperature and salinity, dissolved oxygen, and photosynthetically active radiation were also collected and used to interpret the acoustic data. Ambient sound data were also analyzed to observe variations in acoustic characteristics related to bubble production from seagrass photosynthesis. This talk presents preliminary results from the long-term deployment of the acoustic system in a dense seagrass meadow dominated by *Thalassia testudinum*.

Patterns of space use and habitat selection of Little Blue Herons wintering in Gulf Coast Wetlands

[1]Alexander R. Sharp*, [1]Dale E. Gawlik, and [2]Michelle Petersen; [1]Harte Research Institute for Gulf of Mexico Studies, [2]Florida Atlantic University (*Student Presentation*)

Understanding nonbreeding spatial requirements is critical for the continued conservation of coastal waterbirds, as data suggests that both migratory and residential individuals spend a majority of their lives on their nonbreeding grounds. Patterns in the use of coastal wetlands during this period can be used as indicators of hydrologic conditions in wetland systems of the Gulf of Mexico. When tolerance differences to hydrologic conditions among species are known, waterbirds provide clear and rapid signals of changing environmental conditions. However, in coastal ecosystems, little is known about the degree to which individual birds utilize coastal wetlands, and thus how they could be affected by altered freshwater flows to these areas. In this study, satellite transmitters were deployed on 30 Little Blue Herons (*Egretta cerulea*) in the lower Florida Keys (Great White Heron National Wildlife Refuge) and the Charlotte River Estuary (J.N. "Ding" Darling National Wildlife Refuge) during the nonbreeding season of 2021-2022. The goals of this study are to identify patterns of habitat use and local and long-distance movements of herons wintering in the wetlands bordering the Gulf of Mexico. Data collected from deployed transmitters has identified important space-use patterns, long-distance movements, and roost fidelity in this species, along with sites of biological importance such as roosts, foraging habitat and nesting colonies for individuals utilizing Gulf coast wetlands during the nonbreeding season.

Identification of diamondback terrapin nesting beaches in two Texas estuaries
Aaron Baxter*; Center for Coastal Studies, Texas A&M – Corpus Christi

Diamondback terrapin, North America's only brackish water turtle, are in decline throughout their range. Declines are attributed to several factors including nesting habitat loss, alteration, and fragmentation. For a population to remain stable, there must be recruitment to replace older individuals as they are lost. Terrapins exhibit nest site fidelity and successful nesting is imperative to achieve population stability. The specific location of these nesting sites is largely unknown in Texas, with most information existing as anecdotal reports. To protect these areas as functional nesting habitat, they must first be identified. Several methods were employed during nesting season over the course of two years to identify nesting beaches within the Nueces and Mission-Aransas Estuaries. These methods included passive acoustic telemetry, active radio telemetry, walking surveys, and game cameras. As a result, nesting beaches were identified in both estuaries. Data collected at each nest included distance from water, slope, vegetative cover, nest depth, and sediment grain size. These data were compared to existing data from outside of Texas. The implications of this work are various and include species management, land-owner collaboration, habitat protection, and habitat restoration/enhancement.

Evaluating the use of drones for monitoring waterbird nest abundance and nest survival
Rostam E. Mirzadi* and Dale E. Gawlik; Conservation and Biodiversity Lab, Harte Research Institute for Gulf of Mexico Studies, Texas A&M University – Corpus Christi (*Student Presentation*)

Surveys of colonial waterbirds are used to monitor species' population status and to derive metrics used to assess wetland ecosystem restoration and management activities. Previous studies have found that drone surveys provide accurate estimates of nest abundance and survival for ground-nesting waterbird species such as terns (*Laridae* Spp.), but drones have not been used to estimate survival for waterbirds nesting in a canopied marsh habitat, and potential sources of bias in drone surveys have not been examined in depth. I examined potential visibility biases associated with using a drone to survey colonies of wading birds (*Ciconiiformes* and *Pelecaniformes*) in marsh habitat in Florida in 2020 and 2021. Monthly nest counts and survival were compared between traditional and drone survey methods. Ground-based and drone nest transect surveys were conducted to estimate survival and detection probabilities of each species and plumage color. Generalized linear mixed-effects models were used to quantify the degree to which visual occlusion of nests influenced detectability. Estimates of white-colored waterbird nests were significantly greater for drone surveys than those derived from traditional survey methods but estimates of dark-colored waterbirds from drone surveys were biased low. Overall, there was no difference between survival estimates from either method. However, drone-derived estimates of dark-colored waterbirds had lower accuracy. Our results suggest that drone surveys are a viable method to conduct monthly nest surveys and estimate survival of waterbirds breeding in marsh habitat, but researchers should consider their study area and species because before choosing a survey method.

INVERTEBRATE ECOLOGY

Environmental trends of black gill disease (*Hyalophysa lynni*) in penaeid shrimp on the Texas Gulf Coast
Jillian Swinford* and Joel Anderson; Texas Parks and Wildlife Department

Black Gill (*Hyalophysa lynni*) is an emergent parasite recently identified in penaeid shrimp populations along the southeast Atlantic Coast and the Gulf of Mexico. The "black gill" immune

response, caused by *H. lynni* infection of shrimp gills, has been shown to decrease respiratory ability in penaeid shrimp, making them more vulnerable to predation or changing environmental parameters. These parameters, such as temperature and salinity, may drive seasonal infection levels of this parasitic ciliate in shrimp populations, which are the basis of one of the largest fisheries in the United States. From 2019 to 2021, Texas Parks and Wildlife has implemented a study monitoring two commercially important penaeid shrimp species, *Litopenaeus setiferus and Farfantepenaeus aztecus* with the goal of analyzing trends of disease prevalence along seasonal and temporal scales. *Hyalophysa lynni* was found in all seven bay systems studied throughout the sampling period, was detected in 66% of all shrimp samples collected, and pervasiveness of the ciliate presence peaked during August and September. Low salinity, high temperature, and time of year (late spring through fall) were indicated in boosted regression tree modeling as factors that increased *H. lynni* prevalence in shrimp in this region. These results may imply that annual precipitation events and higher water temperature values may heighten the population morbidity annually within shrimp stocks along the Texas Gulf Coast in the future.

Tracing exploitation of egg boons in marine invertebrates using fatty acids and stable isotopes

Parvathi Nair*, Cambria Miller, and Lee A. Fuiman; Marine Science Institute, The University of Texas at Austin

Coordinated spawning of fishes and other marine animals releases millions of planktonic eggs into the environment, known as egg boons, creating nutritional resource pulses. Eggs are rich in essential fatty acids and may be an important lipid subsidy to egg consumers. Our aim was to validate the application of fatty acid and stable isotope tracers of egg consumption for two potential egg consumers. We fed ctenophores (*Mnemiopsis leidyi*) and crustaceans (*Palaemonetes pugio*) a common diet of Artemia and simulated egg boons for half of them by supplementing the common diet with Red Drum (*Sciaenops ocellatus*) eggs for 3-7 consecutive days every 10 days for 10-90 days. Controls received no eggs. In both species, fatty acid profiles of consumers fed eggs was significantly different from that of controls 24 h after the last feeding of eggs. Consumers took on fatty acid characteristics of eggs. However, their fatty acid profile was similar to that of controls within 2-10 days after the last egg-feeding event. Thus, certain combinations of fatty acids could potentially be used as biomarkers of egg consumption within a short period of time. Additionally, delta-N-15 of consumers fed eggs was significantly higher than controls, indicating that consumption of fish eggs, which have high delta-N-15, led to delta-N-15 enrichment in egg consumers. We conclude that fatty acids and stable isotopes of nitrogen can be used as biomarkers of recent egg consumption in marine invertebrates, validating their use for assessing exploitation of egg boons in nature.

POLICY AND ECONOMICS

Science-based assessments for coastal resilience

Arsum Pathak*; National Wildlife Federation

This presentation aims to highlight the need for science-based assessments to guide community investments and decision-making for tackling climate-induced extreme weather challenges. It presents the case of a vulnerability assessment conducted by the National Wildlife Federation to support coastal planning related to nature-based solutions in the Texas Mid-Coast. The goal of this assessment was to equip decision-makers with the latest climate information about their region and provide funding opportunities and resources to employ equitable nature-based solutions that can mitigate their present and future risks. With multiple new funding options becoming available for

coastal resilience, these timely discussions can ensure that the coastal counties are in a competitive position to leverage these upcoming opportunities. Similar location-specific scientific assessments can fill information and capacity gaps that exist along the Texas Coast. Communicating risks and solutions to county leaders and elected officials can steer conversations on planning and aid decision-making for an equitable and resilient future in the face of changing climate.

Developing a Texas-Wide Estuarine Survey to Identify Drivers of Hydrography and Water Quality

Evan L. Turner*, Kevin DeSantiago, Amin Kiaghadi, Mark Lopez, Ram Neupane, and Caimee Schoenbaechler,; Texas Water Development Board

From November 2021 to January 2022, Texas Water Development Board (TWDB) staff conducted an intensive hydrologic and water quality survey of San Antonio Bay, Texas. The two-month survey included a combination of unattended deployments recording hourly measurements from ten flow meters and eight water quality instruments, and a manned water quality survey with both surface transects and depth profiles from 28 stations over a two-day period. In total, 329,706 qualified observations were recorded, which is 1.4% of the total amount of qualified records that have been collected by the TWDB coastal program since 1986 (all data are publicly available through http://www.waterdatafortexas.org/coastal). Preliminary analysis indicates persistent hydrological stratification in the estuary regardless of strong mixing forces. Our findings showed that diurnal biological activities (algae photosynthesis) led to daytime increased pH and dissolved oxygen (DO) where total depth is < 1.0 m in this bay. Furthermore, we investigated the relationship between surface winds and localized sub-surface water velocities. Data indicates that surface windspeeds are potentially the hydrographical driver of the shallow system, which could inform future monitoring and modeling efforts.

Water Management in the Coastal Bend Region – A Brief History and Some Thoughts on the Future with Regard to Freshwater Inflows

James A. Dodson*; GroundswellTX

Serious efforts to develop and implement a freshwater inflow management program for the Nueces/Corpus Christi Bay System began in 1990 with a lawsuit, filed by environmental interests, that aimed to force the City of Corpus Christi to implement the freshwater inflow provisions of the surface water right they held for the Choke Canyon Reservoir Project. This triggered the creation of the stakeholder-driven Nueces Estuary Advisory Council and the development of the first freshwater inflow management plan. This plan was adapted over the next twelve years, but has remained much the same since 2002. The author suggests that it is time to revisit this plan in light of the significant changes which have occurred over that 20-year period, particularly with respect to the impact of increasingly severe droughts on estuary inflows and the need for better adaptive management measures to assure adequate water is available for both the Nueces Estuary/Corpus Christi Bay system and water users throughout the Coastal Bend Region.

Draft EIS for the Proposed Corpus Christi Ship Channel Deepening Project- Observations Regarding Compliance with NEPA and CWA Section 404(b)(1) Guidelines

K.G. Teague*; PWS, Senior Certified Ecologist

The U.S. Army Corps of Engineers (Corps) published a notice of availability for this DEIS in the Federal Register on June 10, 2022. I submitted comments on August 4, 2022. My observations included:

*Potential failure to meet requirements of NEPA and CWA Section 404(b)(1) Guidelines:

Failure to disclose the quality of dredged material proposed to be disposed of on beaches, dunes, and the nearshore Gulf of Mexico.
*Failure to disclose the quality of dredged material proposed to be disposed of on beaches, dunes, and the nearshore Gulf of Mexico.
*Failure to disclose information regarding the quality of dredged material to be removed adjacent to Harbor Island, a known contaminated site, for disposal at undisclosed locations.
*Failure to disclose potential secondary impacts of proposed dredged material disposal on Harbor Island, to seagrasses, due to increased light attenuation due to suspended solids, and due to sediment transport from the disposal site onto adjacent seagrass beds.
*Failure to consider alternatives to proposed disposal of dredged material adjacent to expansive seagrass beds adjacent to Harbor Island. Failure to defend this proposed action as the Least Environmentally Damaging Practicable Alternative.
*Failure to consistently define the "full and complete project", as per the Corps letter to the POCC, dated February 14, 2019. This is important because it determines the scope of the project to be assessed in this DEIS. Because of this failure, the DEIS may constitute "piece-mealing" under NEPA, a practice that is unacceptable under NEPA.

Abstracts for Poster Presentations

(1) Unintended consequences of coastal infrastructure on morphodynamics of the San Bernard River mouth
John Malito* and David Mohrig; Jackson School of Geosciences, The University of Texas at Austin

Capital works projects, particularly modifications to coastal rivers, are critical to the Texas economy. However, alterations to channel pathways can lead to harmful and costly geomorphic responses that can occur decades after completion of the project. An example of this is the closure of the San Bernard River mouth, located on the central coast of Texas, which was clogged by sediments in the 1990s as a result of two major projects in the area: the diversion of the Brazos River channel (1929) and the construction of the Gulf Intracoastal Waterway (GIWW) (1940s). The objective of this study was to document the delayed geomorphic response to the projects using historical aerial imagery and provide a snapshot of flow pathways in the area using measurements collected in situ. Results showed that the GIWW was the main conduit for river flow as it bisects the San Bernard 2 km inland of its river mouth, reducing discharge in the terminal limb of the river. As a result of reduced flow, the river mouth became clogged with beach sediment transported along shore from the Brazos River which had been diverted to within 6 km of the San Bernard. Dredging operations have been required to re-connect the San Bernard River to the sea, incurring costs of over $10 million since its closure, with additional maintenance projects funded into the future. To optimize the cost-effectiveness of channel modification projects their long-term impact must be considered as managers continue to adapt to ever-changing coastal zones.

(2) Hurricane Harvey changed sediment geochemistry of a south Texas estuary through strong resuspension
Jianhong Xue*, Zucheng Wang, Kaijun Lu, Sarah Douglas, Xianbiao Lin, Amber Hardison, and Zhanfei Liu; Marine Science Institute, The University of Texas at Austin

Major hurricanes can greatly affect biogeochemical processes in the impacted coastal bays and estuaries through strong storm surge and resuspension, yet the impacts on sediment geochemistry

have rarely been evaluated. The 2017 Hurricane Harvey made landfall near Mission-Aransas Estuary (MAE) in South Texas as a Category 4 storm, and the sediment geochemistry of MAE was systematically evaluated before and after the hurricane. The median grain size of the surface sediment in the estuary was significantly increased from 57±31μm before Harvey to 79±32μm five months after Harvey, but the total organic carbon content in surface sediments remained roughly the same. The levels of specific organic chemical classes in the sediment changed in distinctly different degrees, suggesting that the processes affecting these chemicals by Harvey were decoupled. Results from accessory pigments showed that cyanobacteria in surface sediments significantly increased immediately after Harvey, but returned to its usual level three months later. The concentration of pheophorbide and its percentage in chloropigments in surface sediments both decreased significantly after Harvey but recovered three months later, suggesting the resilience of the benthic community. In contrast, polycyclic aromatic hydrocarbons (PAHs), as one group of widespread contaminants in coastal sediments, significantly decreased (~10 fold) after Hurricane Harvey and did not recover one year after. Taken together, the strong storm surge and resuspension of sediment by Harvey presented major disturbance to the geochemistry of surface sediment in MAE, and the impacts on different organic chemical classes depended on their sources, chemical properties, and/or association with fine clay minerals.

(3) Assessing the resilience and recovery of recreational fish species to extreme events in coastal Texas

Ana Silverio* and Easton White; Department of Biological Sciences, University of New Hampshire (*Student Presentation*)

Extreme events disrupt marine ecosystems. For populations to recover from these disruptions, specific management actions are necessary. Yet, little is known about how natural and anthropogenic extreme events affect different fish populations. As climate changes, there is a predicted increase in frequency and severity in these events. Past studies have looked at either one type of extreme event, i.e., freezes or hurricanes onto a system, or only in one location of their known habitable regions. However, it is less common for studies to incorporate several extreme events, both state and non-state controlled, for a long-term study of these patterns. The state of Texas, where recreational fishing brings in billions of dollars each year, has been affected greatly by extreme events, especially on the gulf coast. In this system, it is crucial to understand the economic and ecological ramifications of extreme events. To develop this understanding, we used independent and dependent survey data collected by Texas Parks and Wildlife from 1974 – present, across 10 major bay systems and focused on the top four recreationally sought-after fishes; the red drum, black drum, spotted seatrout and southern flounder. Our preliminary results show how catch and catch per unit effort was altered during recent freeze events, hurricanes, and the COVID-19 pandemic. Additionally, we compare patterns across bay systems and fish species. From these results we plan to apply additional statistical analysis to determine the potential differences in how the populations differ in resilience and recovery, under different extreme events, to better inform management.

(4) Long-term lack of liquids limits leafy life in Lavaca marsh (TX, USA)

Berit E. Batterton* and Kenneth H. Dunton; Marine Science Institute, The University of Texas at Austin (*Student Presentation*)

Coastal marshes are impacted by climate change at broad scales. The Texas coast has some of the highest rates of sea level rise, a well-studied driver of marsh loss, however, impacts from macroclimatic factors, such as droughts, continue to be understudied. In south Texas, air temperatures have increased 0.25-0.47°C per decade, and precipitation is predicted to be more

variable, causing increased drought severity. Reductions in riverine and groundwater inflows induce soil water deficits and hypersalinity, and can alter marsh vegetation community composition, biomass, primary production, and soil carbon sequestration. We aimed to determine how changes in freshwater inflows impact the ecology of marshes on the south Texas coast. We surveyed vegetation community composition at over 400 sites in the Lavaca River Delta to inform and test a species-level classification of aerial imagery. We mapped vegetation from 2010 to 2020 and modeled changes in marsh ecological variables (habitat extent, vegetation community composition) with variations in historical freshwater inflow data. Inflows to the Delta ranged from about 80,000-515,000 acre-ft yr-1 throughout the decade. We found that the extents of all habitats varied significantly over time (marsh vegetation: -10%, non-marsh vegetation: +6%, water: +7%, bare: -3%), with vegetated areas having the most significant shifts with respect to inflows. In addition, species community composition varied significantly with inflows, with *Spartina alterniflora* and *Scirpus maritimus* displaying the greatest range in cover. Increased frequency of hot and dry conditions may cause significant changes in vegetation composition, as shown here, and consequences for marsh health and resilience.

(5) Determination to Detect Recruitment of American Eel (*Anguilla rostrata*) in Texas

[1]Jenny Wrast Oakley*, [3]Stephen Curtis, and [1,2]George Guillen; [1]Environmental Institute of Houston, University of Houston, [2]College of Science and Engineering, University of Houston, [3]Texas Parks and Wildlife Department, River Studies Team, San Marcos, Texas

The American Eel (*Anguilla rostra*) is a facultative catadromous fish. Data are lacking related to juvenile (glass eel and elvers) recruitment along the continental shelf and into the bays and estuaries of the Gulf of Mexico. American Eel are considered a Species of Greatest Conservation Need by the Texas Parks and Wildlife Department (TPWD). The goal of the study is to document recruitment of American Eel in to better understand their recruitment timing, distribution, density and habitat associations in Texas. A two-year field effort using small-mesh fyke nets, specifically designed and deployed to select for small-bodied organisms that display a net upstream movement, were used to sample for juvenile American Eel in 2019-2020. The cumulative effort in total soak time for this effort was 6,851.77 hours. There was a total of 130,860 fishes collected representing 71 fish species from 34 families, but no American Eel were captured. However, other Elopomorphs, [Speckled Worm Eel (*Myrophis punctatus*), and Ladyfish (*Elops saurus*)] were collected. These findings suggest that fyke nets are effective at capturing the early life stages of Elopomorphs as they ingress and settle. It is likely that if American Eel juveniles were present in high abundances during the dates and locations surveyed, we would have been able to detect their ingression. Continued year-round monitoring is underway using a combination of eel ramps, eDNA, and plankton sampling to increase the likelihood of detecting even highly sporadic recruitment events.

(6) Developmental Impacts of Hypersalinity and Per- and Polyfluoroalkyl Substances (PFAS) on Early Life Stage Red Drum

Kathleen Roark*, Kerri Lynn Ackerly, and Kristin Nielsen; Marine Science Institute, The University of Texas at Austin (*Student Presentation*)

Estuaries are important sites for many biological and ecological processes, including acting as a nursery habitat for fishes. Freshwater inflow from terrestrial sources and tidal inflow from the ocean cause salinity fluctuations and gradients that estuarine biota must tolerate. Changes in flow regimes can result from anthropogenic activity in coastal watersheds and rising temperatures related to climate change. Salinities outside of tolerated ranges are known to cause osmotic stress and impact development in fishes, but experimental data are limited among estuarine fishes. Estuaries are also vulnerable to contamination by per- and polyfluoroalkyl substances (PFAS), a

large class of manmade organoflourine compounds that are used in a variety of industrial and commercial applications. These compounds are highly mobile, persistent, and ubiquitously detected in the environment. Due to the broad range of applications for PFAS, these chemicals are in constant production, which contributes to their continuous release into the environment. Despite estuarine habitats along the Gulf of Mexico being particularly vulnerable to PFAS contamination due to their proximity to industrial sites, toxicological studies examining the effects of PFAS on aquatic biota overwhelmingly utilize freshwater models. Therefore, the present study aims to address important data gaps regarding the separate and combined effects of PFAS contamination and hypersalinity in regards to the estuarine fish red drum (*Sciaenops ocellatus*) and Perfluorohexanesulfonic acid (PFHxS). These data have implications for the survival of early life stage larval red drum residing within Gulf of Mexico estuaries, as they have the potential to encounter both hypersaline conditions and PFAS.

(7) Status and Trends of the Striped Mullet (*Mugil cephalus*) along the Texas Coast

[1]Stephen Hale*, [1]Zachary T. Olsen, and [2]Brian Bartram; [1]TPWD Coastal Fisheries – Aransas Bay Ecosystem, [2]TPWD Coastal Fisheries – Corpus Christi Bay Ecosystem

The striped mullet (*Mugil cephalus*) is an important forage fish throughout its range and supports an extensive bait fishery across much of the Texas coast. Texas Parks and Wildlife Department has been collecting fisheries-independent data with its current standardized procedures along the Texas coast as part of the Texas Marine Resource Monitoring Program for over four decades. In this study we will use data from three sampling gears (gill nets, bay trawls, and bag seines) to examine trends in striped mullet populations from 1983 – 2021, with each gear designed to capture fish at different life history stages and in different habitats. In general, coastwide catch rates of adult striped mullet have shown a noticeable decline over the past decade in many Texas bay systems. In contrast, coastwide catch rates of juvenile striped mullet have been generally increasing in bay trawl samples and are relatively stable yet variable in bag seine samples. Given the role striped mullet play in the food web of these bay systems, it is important for managers to take note of population changes and to consider ecological implications of such trends. Understanding the status and trends of forage fishes like striped mullet is key to informing management decisions at an ecosystem level.

(8) Recruitment and distribution patterns of Crevalle Jack in Texas bays

Ethan T. Getz*, Lily Walker, and Charles Downey; Texas Parks and Wildlife Department – Coastal Fisheries Division

Crevalle Jacks are ubiquitous in the Gulf of Mexico but little is known about their population dynamics and life history. Here, a long-term fisheries-independent dataset collected by the Texas Parks and Wildlife Department was used to assess crevalle jack recruitment seasonality and distribution patterns in Texas bays. Juvenile jacks were collected in bag seines and adults were collected in gill net samples from 1983-2021. Bag seine samples were used to assess the timing and spatial patterns of recruitment. Gill net samples were analyzed to determine trends in abundance, distribution, and length frequency. Results from bag seine samples indicated that peak recruitment occurred in June and declined quickly afterwards. Recruitment occurred in each major bay system with occurrence generally associated with ocean passes. Abundance of adult jacks sampled in gill nets trended upwards throughout the timeseries. Mean latitude of occurrence increased from April to June and decreased from September to November, likely coinciding with northward migrations in the spring and southward migrations in the fall along the coast. Length frequency distributions displayed a bimodal peak including a high percentage of large adults >800 mm TL. Bag seine and gill net results suggest that both juvenile and adult Crevalle Jacks utilize Texas bays and life history characteristics presented here could be used as a baseline for future population dynamic studies.

(9) Mapping and Fish Community Characterization of East Bank Ridge, Gulf of Mexico
Marissa Lamb* and Richard Kline; University of Texas – Rio Grande Valley (*Student Presentation*)

East Bank Ridge is a natural reef formation located 18 nautical miles off the coast of South Padre Island. This formation spans an area of over 80 km2 at 40-45m depth. Little is known about the structural composition of the ridge and there is no record on the biological community present. A decade ago, the ridge was well-known in the South Padre Island fishing community as a site for prized fish species (primarily *Serranidae* and *Lutjanidae* sp.). Currently, the area is no longer frequented by fisherman because catch rates have decreased substantially according to their personal observations. In this study, we aim to characterize the current fish populations present at East Bank Ridge. A base map of the structures present will be created using side scan sonar to identify major structures that could provide suitable habitat for reef fish species. From this map, select sites will be visually surveyed using a remotely operated vehicle (ROV) to determine fish species presence and abundance. Split beam sonar will be used to determine fish biomass and total fish abundance on the ridge. The natural reef system in closest proximity to East Bank Ridge will be used as a comparison site to assess differences in fish community composition and abundance.

(10) Larval Fish Ingress and Vertical Distribution in the Aransas Pass Inlet System
Olivia Robson* and Simon Geist; Department of Life Sciences, Texas A&M University – Corpus Christi (*Student Presentation*)

In Corpus Christi Bay there are several ongoing proposals for industrial developments, including four desalination plants. These developments are causing concern about the potential environmental impacts to the area. Many economically important species such as Red Drum and Southern Flounder use the bay as a nursery ground thus making the estuary a critical habitat for their survival. The Aransas Pass inlet and surrounding shipping channels act as the main pathway these larvae enter Corpus Christi Bay and Mission Aransas NERR from their spawning areas in the Gulf of Mexico. Larval fish are extremely sensitive to changes in the water column, like salinity and temperature, as they are still rapidly developing and growing. Larval organisms also participate in daily vertical migration in which larvae move vertically in the water column based on the time of day and has been shown to be relevant even in a shallow inlet like Packery Channel in a previous project. This diel vertical migration is an important factor as salinity, temperature, and current can dramatically vary based on depth, especially in a narrow inlet system like the Aransas Pass inlet. Even though larval stages are a crucial step in an organism's life history few studies have been. My research is focused on the collection and quantification of larval fish at discrete depths in the Aransas Pass Inlet System. This research will not only give us a better understanding of the various species who use the area as nursery grounds and their ingress into the bays, but it will also serve as a baseline for environmental health before any proposed industrial developments commence.

(11) Experimental Cultch Placement Strategies: Informing Future Oyster Restoration in Texas
David Norris*, Morgan Bruce, and Evan T. Pettis; Texas Parks and Wildlife Department

Since 2008 the Texas Parks and Wildlife Department (TPWD) has enhanced approximately 1685 acres of oyster reef in Texas's bays and estuaries. One of the primary means of oyster habitat enhancement is through the supplementation of "cultch" (i.e. shell or rock material) on degraded reef substrate. The costs of coordinating and supplying cultch placement efforts have risen exponentially in recent years. In response, TPWD has begun testing several experimental placement strategies in an effort to identify the most efficient and effective usage of limited materials, meet restoration targets while maintaining maximum ecological benefits, and improve the resiliency of

restored reefs. So far, experimental sites have been established in the Galveston, Matagorda, San Antonio, and Aransas Bay systems. Restoration designs being tested include utilizing different (1) placement configurations ("mounds" vs "flats"), (2) spatial configurations, (3) cultch layer densities, (4) combinations of cultch materials, and (5) degrees of vertical relief. Data from on-going monitoring efforts at the experimental sites will be used compare each of these strategies to better inform the agency's future restoration efforts. Preliminary results indicate that all of the tested approaches have been successful at enhancing previously degraded oyster habitat.

(12) Any way the wind blows: how seasonal inundation affects wind-tidal flat community structure and resource quality

[1]Alyssa A. Outhwaite*, [2]Benoit Lebreton, [1]Jennifer Beseres Pollack; [1]Harte Research Institute for Gulf of Mexico Studies, Texas A&M University – Corpus Christi, [2]UMR Littoral, Environment et Societies, CNRS - University of La Rochelle, Institut du Littoral et de l'Environnement (*Student Presentation*)

Wind-tidal flats are salt marsh-adjacent soft bottom habitats where winds play a major role driving patterns of inundation and exposure. These patterns favor development of cyanobacterial mats that bind the sediments, provide food resources that support colonization by invertebrate communities, and contribute to the role of wind-tidal flats as significant feeding grounds for wintering and migrating birds. Despite the important role of irregular flooding on food web dynamics, long term changes of inundation frequency place tidal flats at risk worldwide. On the global scale, ~16% of tidal flats have been lost in just the past three decades, and local losses are as high as 80%, including estuaries in Texas. The purpose of this study is to determine how seasonal inundation and spatial changes across the marsh-tidal flat complex affect infaunal community composition and flows of organic matter in Matagorda Bay, Texas. The marsh-tidal flat system was sampled along a transect moving from the center of the tidal flat running through the tidal flat-marsh boundary into the marsh. Focusing on spring and summer 2021, increased tides and flooding were observed during the spring season, with greater cyanobacterial mat coverage increasing towards the center of the tidal flat. However, infaunal abundance and biomass were greater during the summer. Preliminary chlorophyll a data show organic matter quality increased moving towards the marsh. Resource quality and differences in trophic structure among seasons likely impact ecological functioning of tidal flats, where changes in infaunal recruitment may have important consequences for foraging organisms, such as shorebirds.

(13) Communicating the health of socio-ecological systems of the Texas coast

Amie West*, Jennifer Beseres-Pollack, and Michael Wetz; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University -- Corpus Christi

With a Gulf of Mexico coastline that supports incredibly diverse habitats and human communities, coastal management in Texas requires a transdisciplinary approach to prioritize conservation and restoration actions. The Texas Coast Ecosystem Health Report Card program is using cooperative methods to synthesize existing social, economic, and ecological knowledge and data to support science-based decision making. With input from user groups, we have developed a set of ecosystem indicators to quantitatively describe the status of coastal habitats, wildlife populations, water quality, and socio-economics. The 2022 Ecosystem Health Report Card will present a current snapshot of these indicators relative to the long-term and communicate them at multiple scales of detail for a variety of audiences. Products will include graphic summaries at the regional and state level, a website, and detailed descriptions of datasets and analysis methods. This biennial assessment aims to integrate social and environmental priorities and serve as a tool for guiding more equitable decision making in development, conservation, and adaptation to promote socio-ecological resilience.

(14) Sediment Disturbances near Cultivated Oyster Mariculture sites

Collin Kerr*, Kirk Cammarata, Austin Hamilton, Fabian Castro, and Jacob Doty; Texas A&M University – Corpus Christi (*Student Presentation*)

Seagrass provides a wide range of services. A concern is that the growth of seagrass worldwide is declining. One factor causing a decline in seagrass is one light attenuation. Light attenuation is a result of large amounts of epiphyte growth on the outer surface of the leaf, the depth of the water, dissolved organic matter content and sediment accretion. In this experiment, light attenuation, imaging of epiphyte composition, and seagrass physical traits were measured as indicators of current seagrass conditions. This research is focused on having a better understanding of how sedimentation levels relevant to oyster mariculture may impact seagrass. There is concern that suspended solids may be generated at COM operations from bottom disturbances or from the feces or pseudofeces excreted from the oysters. To emulate COM operational procedures, timed periods of shuffling through sediment were measured by light loggers and sediment traps deployed at 50, 100, and 200 feet downstream measuring the distance and magnitude of moving sediment. *Halodule wrightii* shoots were gathered in our lab's experiment at these certain sites to help give a better understanding how the seagrass might be affected over time. This project is still ongoing and more analysis is needed to provide a better understanding of how seagrass is affected near COM sites. The data will provide important information to inform resource managers of the impacts of suspended sediment generation on critical seagrass resources.

(15) Exploratory Analysis of Wildlife in a Saltmarsh Mangrove Ecotone

Caleb C. Carr*, C. Edward Proffitt, Donna J. Devlin, Shawn McCracken, and Kim Withers; Department of Life Sciences, Texas A&M University – Corpus Christi (*Student Presentation*)

Estuarine habitats along the Texas Gulf Coast are home to diverse salt marshes providing key habitat for numerous species of birds, mammals, fish, and invertebrates. Nutrient enrichment is occurring and predicted to increase in estuaries having potential impacts on the present habitat, including black mangroves, which are becoming increasingly dominant at the subtropical-tropical interface. An experiment was implemented using 24 fertilized plots with either nitrogen, nitrogen and phosphorus, or unfertilized control plots, to understand the impact of nutrient enrichment on mangrove propagule establishment and survival following a catastrophic freeze in February 2021. However, 12.5% of the plots experienced total loss from herbivory, previously unobserved in the site, within the first week. Camera traps are deployed to identify the culprit to better understand factors influencing mangrove propagule success. A suspected culprit, a wood rat, was photographed on the initial deployment, along with other wildlife present. Presently, racoon, grackle, and fiddler crab have frequently been photographed, in addition to less frequent observations of clapper rail, willet, white ibis, common yellowthroat, and savannah sparrow. The camera traps continue to collect data and will provide an exploratory analysis to catalogue various wildlife in the salt marsh mangrove ecotone. The study aims to serve as a foundation for future experiments to study various aspects of wildlife in the salt marsh mangrove ecotone and identify wildlife plant interactions that may impact mangrove recovery and expansion. The future direction of the experiment includes collecting propagules to bait camera traps and photograph herbivory in action.

(16) Short Term Effects of Sediment Disturbance Over Seagrass Beds

[1]Austin Hamilton*, [1]Kirk Cammarata, [1]Collin Kerr, [1]Hua Zhang, and [2]Patrick Nye; [1]Texas A&M University – Corpus Christi, [2]Nye Exploration & Production, LLC (*Student Presentation*)

As industry along the US coasts increases, the frequency of interactions with local ecosystems rises with it, seagrass meadows being one such system. The purpose of this study was to observe the response of *Thalassia testudinum* dominated seagrass beds to frequent sediment roiling caused by tugboat, tanker, and shrimp boat activity near the Ingleside on the Bay community. The measured disturbance, in this case, was prop wash roiled by three tugboats during tanker docking procedures. During docking periods, sediment roiling increased light attenuation by almost 100% at sites closest to the slip, preventing any usable light from reaching the seagrass for almost 3 hours, with sediment reaching 800 meters away. Light loggers and sediment traps measured sediment travel and deposition, deployed along a distance gradient from the docking slip at seagrass canopy height. Unmanned Aerial Imaging hints at a decreasing trend in seagrass density near the docking slip since 2016. Physical seagrass traits such as leaf length, leaf area, and biomass followed an increasing trend away from the docking slip. June measures of biomass & leaf area exhibited greater between-site variance in 2022 vs 2021. Constantly changing disturbances combated monitoring efforts during the study. Effective monitoring of these operational impacts can help install proper procedures to slow the rate of habitat loss in ecosystems adjacent to areas of high industrial activity.

(17) Differences in Litter Decomposition and Macroinvertebrate Communities in a Texas Saltmarsh-mangrove Ecotone

[1]Molly A. McGuigan*, [2]C. Edward Proffitt, and [2]Donna J. Devlin; [1]Department of Physical and Environmental Sciences, Texas A&M University – Corpus Christi, [2]Department of Life Sciences, Texas A&M University – Corpus Christi (*Student Presentation*)

As a result of climate change induced stressors, such as changing weather patterns and frequency and intensity of disturbance, many ecosystems are experiencing regime shifts. Coastal saltmarshes along the Gulf of Mexico are being encroached upon and associated plant species are outcompeted as populations of *Avicennia germinans*, the black mangrove, expand due to a decrease in freeze events. This study has two main goals: to investigate the differences in macroinvertebrate community composition, diversity, richness, and abundance in litter habitat between two dominant vascular plant species – the marsh forb *Batis maritima* and the mangrove *A. germinans* – across a salinity gradient, and to investigate the effects of macroinvertebrate colonization on litter decomposition rate. I hypothesize community composition, diversity, richness, and abundance will vary among litter type and sites. Additionally, I hypothesize that macroinvertebrate colonization will increase decomposition rates in higher salinity due to detritivore activity accelerating breakdown of litter. I aim to determine individual species or abundances that are key contributors to litter decomposition. My observations of samples indicate *B. maritima* leaves decomposed faster than *A. germinans* leaves, but twigs from both are slow to decompose. The native *B. maritima* litter seems to attract a greater abundance of macroinvertebrates, with most invertebrates being crustaceans. Macroinvertebrates were successfully excluded from the 62 micron mesh. This study demonstrates that different plants have different decomposition rates, which leads to different communities being supported by the detrital food chain.

(18) Long-term Monitoring of Dermo (*Perkinusus marinus*) in Mission-Aransas Estuary

Hannah Bueltel*, Terry Palmer, Natasha Breaux, and Jennifer Beseres Pollack; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University – Corpus Christi

Texas estuaries are home to the eastern oyster, *Crassostrea virginica*, which create reefs that are essential to estuarine health and productivity. Oyster reefs provide many ecosystem services such as shoreline protection, water filtration, and habitat for other fauna. One of many threats to oysters is a protozoan parasite, *Perkinsus marinus*, commonly known as Dermo. Oysters are sensitive to changes in salinity and temperature, and Dermo commonly infects oysters when these two factors reach elevated levels. Dr. Sammy Ray of Texas A&M University at Galveston began monitoring Dermo in Texas bays in the 1950's and developed Ray's fluid thioglycolate medium methodology (RFTM) to monitor Dermo infection rates. The Coastal Conservation and Restoration group has conducted quarterly Dermo monitoring in the Mission-Aransas Estuary since 2014 using RFTM. During each sampling event, oysters are collected from eight reefs along a salinity gradient. Mantle tissue from each oyster is extracted and cultured. The tissue is then dyed and observed under a microscope to rate the intensity of infection. Oyster mortality may occur when Dermo levels are high and environmental conditions are unfavorable. Through this ongoing monitoring, Dermo levels have fluctuated with extreme environmental conditions including freeze, rain, and drought events. Along with abundance and growth measurements, monitoring of Dermo infection on oyster reefs is a useful tool to understand the health of local oyster populations.

(19) Long term oxygen and hydrogen stable isotope composition of water from the Mission-Aransas National Estuarine Research Reserve

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We examined the oxygen ($^{18}O/^{16}O$) and hydrogen ($^{2}H/^{1}H$) stable isotopic composition of water obtained from 5 stations, including Aransas Bay (AB), Copano Bay West and East (CW, CE), Mesquite Bay (MB), and Ship Channel (SC), in the Mission-Aransas NERR, along with local precipitation and the Gulf of Mexico (GOM) to understand the hydrological contribution of these sources to the estuary. Since 2015, the average oxygen and hydrogen isotopic composition, reported relative to VSMOW, of AB was +0.1‰ (n=177) and +6.6‰ (n=87), CW 0.0‰ (n=174) and +8.1‰ (n=86), CE 0.0‰ (n=175) and +6.9‰ (n=87), MB -0.1‰ (n=175) and +4.9‰ (n=84), and SC 0.0‰ (n=174) and +6.4‰ (n=84), respectively. Local precipitation oxygen-isotope composition averages -6.6‰ and the hydrogen-isotope composition averages -39.9‰ (n=2), whereas the GOM, sampled in July 2020, is +1.0‰ and +11.0‰ (n=1), respectively. More interesting are the long term-records and the isotopic changes recorded during Hurricane Harvey and precipitation events. Hurricane Harvey is demarcated by an abrupt, large decrease in the oxygen-isotope composition (to -6.0‰) at AB, CW, CE, and MB. A less pronounced decrease (to -2.0‰) during Hurricane Harvey was observed at the SC. Also noteworthy, from June 2018 to June 2019 the oxygen-isotope record at CW and CE shifts toward lower values, -8.0‰ and -4.5‰, respectively. The absence of a spatial pattern across the estuary during this period may suggest riverine influence on rest of the NERR is limited and hints at precipitation being a greater influence to Copano Bay. Future analysis will focus on samples from the Mission and Aransas rivers to assess these inputs.

(20) Measuring and observing the nitrogen-isotope composition of particulate organic matter from glass fiber filters on consecutive days

[1]Ryan Hladyniuk*, [1]Patricia Garlough, [1]Hengchen Wei, [1]Jim McClelland, [2]Hope Shoemaker, [1]Sarah Douglas; [1]Marine Science Institute, The University of Texas at Austin, [2]Texas A&M University

We measured the nitrogen-isotope composition ($^{15}N/^{14}N$) of particulate organic matter (POM) from 60 glass fiber filters (GF/F) from a single, large aliquot (20 L) of Gulf of Mexico seawater (UTMSI Marina) to assess how daily performance of the elemental-analyzer isotope-ratio mass spectrometer system (EA-IRMS) affects sample isotope results. The nitrogen-isotope composition of POM was analyzed on newly prepared combustion and reduction columns (on Day 1) for three subsequent days (same columns for Day 2 and 3). The ash tube was changed daily to maintain consistent combustion parameters. Noteworthy to mention, the EA was plumbed to a two-column configuration (separate oxidation and reduction columns), after the single column configuration failed to produce reproducible results on GF/F samples. The average nitrogen-isotope composition, reported relative to AIR, on day 1 was +5.9±0.4‰ (n=18), day 2 was +5.6±0.4‰ (n=18) and day 3 was +5.4±0.4‰ (n=14). The data suggests that on consecutive runs, the nitrogen-isotope composition of POM GF/F filters drifted towards more negative values. If we assume identical lab conditions, stability, and linearity of the IRMS, and equal handling of the physical filtering and packing the GF/F in tin capsules then the drift can be potentially attributed to the consumption of the combustion (chromium oxide and silvered cobaltous/cobaltic oxide) and reduction (reduced copper filings) chemicals. This can serve to decrease the oxidation potential and perhaps more importantly, the inability to completely reduce NOx products in the copper reduction column. Interestingly, the standard deviation on consecutive days is similar suggesting that 0.4‰ represents the overall sample error (from sample uptake, filtering, and analysis).

(21) Daily Sampling to Assess Environmental Influences on Coastal Phytoplankton Communities

Felipe Urrutia*, Sankar Manalilkada Sasidharan, Laura Beecraft, Dominic Burch, and Michael S. Wetz; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University – Corpus Christi (*Student Presentation*)

Phytoplankton, including harmful taxa, respond rapidly to environmental variability, requiring relatively high frequency to understand the role of specific environmental drivers of community dynamics. Daily sampling was conducted in Oso Bay, the Padre Island canal system (C2), and at a Gulf Beach over a 12 day period in July 2022. In Oso Bay, a 3-4 fold increase in chlorophyll co-occurred with decreasing salinities, likely due to an influx of nutrients. At the canal and beach sites, salinity varied little, yet chlorophyll increased by ~1.5 fold coinciding with an influx of Saharan dust, which may have provided nutrients to the algal communities at these sites that were otherwise separated from freshwater nutrient sources. This study shows that high frequency sampling is necessary to understand drivers of phytoplankton blooms in shallow coastal waters. Additional results from bioassays will be presented to further elaborate on these drivers.

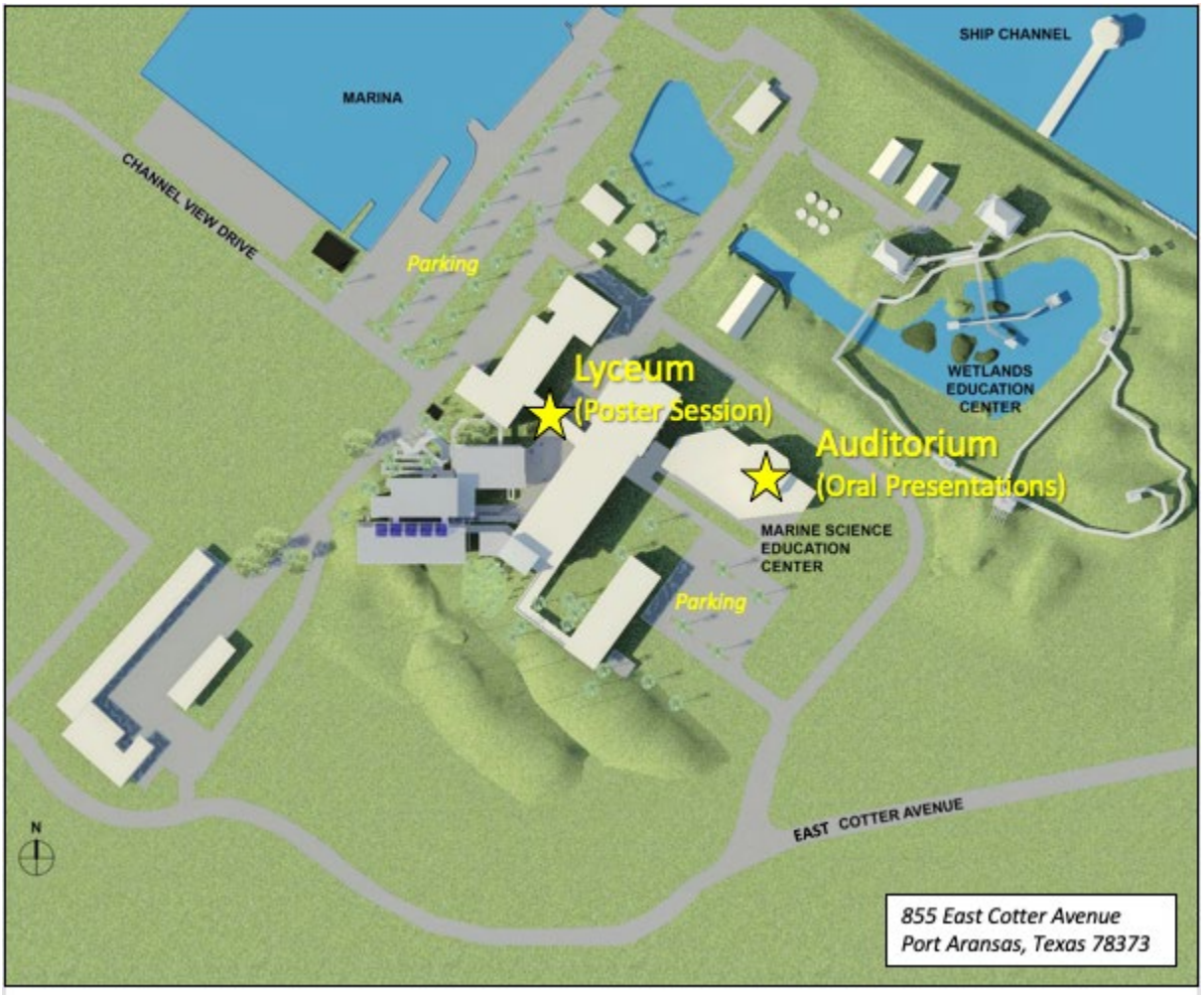
(22) Carbonate Chemistry in the Mission-Aransas Estuary over 4 years including a freeze event

Christian Amos* and Xinping Hu; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University – Corpus Christi (*Student Presentation*)

Estuaries are some of the most important bodies of water on Earth that connect freshwater with seawater. Estuaries are large reservoirs of "blue carbon", including saltmarshes and mangroves, which take up substantial amounts of CO2. The mangrove ecosystems cover 13.8x10^5km^2-

15.2x105km^2 globally. Of this area mangroves make up 60.7km^2 -87km^2 (about the area of Manhattan), respectively. Global warming has further supported the expansion of mangrove habitats to higher latitudes due to rising temperatures. In February 2021, there was a deep freeze that affected most of the Texas coast. The freeze lasted from February 13-18, but the wind chill dropped as low as - 15°C. The mangroves have lost more than 90% of their leaves due to this freeze. Mangrove kill and shedding could supply adjacent estuaries with excess organic carbon, which may lead to the production of excess of CO2, making affected estuaries more net heterotrophic. This study examines the semiarid Mission-Aransas Estuary in the northwestern Gulf of Mexico for spatial and temporal variations in carbonate chemistry parameters (total alkalinity, total dissolved inorganic carbon, pH, and CO2 partial pressure or pCO2) from June 2018-July 2021. The result from the period of a deep freeze that occurred on estuarine carbonate chemistry, when compared with the "normal" years without this extreme event, could shed light on estuarine carbon cycling.

Campus Map



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 2022

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 2022:

- Providing paper coffee mugs (please keep and reuse throughout day if possible)
- Convincing vendors to use Styrofoam alternatives
- Reusable bags for meeting materials
- Reusable nametags
- Using materials with as much recycled content as possible
- Providing electronic copies of meeting materials to registered participants
- Limited paper use through duplex printing where possible
- Email communication with registered participants
- Contracting with local, environmentally responsible vendors whenever possible.

Upcoming Events and Meetings

27-29 October 2022

https://gers.wildapricot.org/2022-meeting

4-8 December 2022

https://raesummit2022.estuaries.org/

4-9 June 2023

https://www.aslo.org/palma-2023/

12-16 November 2023

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