Port Aransas Community Theater, Port Aransas, Tx

Welcome!

The University of Texas Marine Science Institute, Mission-Aransas National Estuarine Research Reserve, Texas Sea Grant, Coastal Bend Bays & Estuaries Program, NOAA Marine Debris Program, and Texas Coastal Bend Surfrider Foundation are proud to host the 4th Annual Texas Plastic Pollution Symposium. We have a great program of talks and posters this year from presenters all around the state of Texas. Thanks to the Nurdle Patrol, through a grant from the Matagorda Bay Mitigation Trust, for funding the symposium so that all registration is free, including venue, food, student stipends, swag, and virtual programming access.

For a second year in a row, the symposium is a hybrid meeting, with both in-person and virtual presentations. For those attending in person, meals will be catered by two fantastic, Ocean Friendly Restaurants- Miss K's Bistro and Catering (lunch) and La Playa Mexican Grill (heavy hors d'oeuvres at the poster session). There will be over an hour for lunch, followed by a great presentation by world renowned researcher, Dr. Jenna Jambeck, about her research on plastics in our environment.

Student presenters are an important aspect of this symposium. This year, we are pleased to honor best student awards for both oral and posters presentations, acknowledging excellence in student research. The best student oral and poster presentation awards are generously sponsored by the Coastal Bend Bays & Estuaries Program.

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

Texas Plastic Pollution Symposium Planning Committee:
Jace Tunnell, Sara Carney, Kasia Dinkeloo, Minerva Flores, Joan Garland, Adriana Leiva, Christina Marconi, Neil McQueen, Horacio Pérez-España, Pamela Plotkin, Adriana Reza, Katie Swanson, Kathryn Tunnell, Tracy Weatherall, and Caitlin Wessel.

A special thank you goes to all volunteers and moderators.

Follow the meeting on social media with #TxPPS2022

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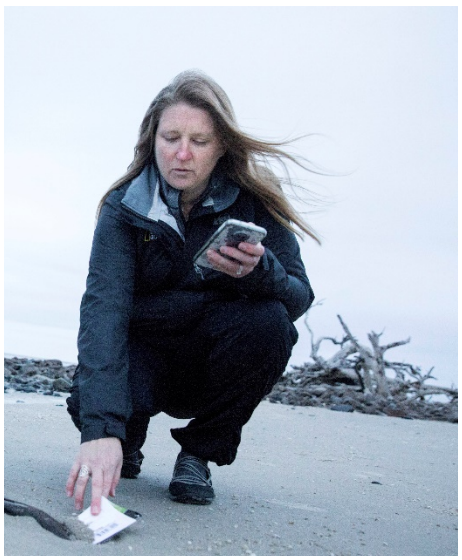
Invited Speaker Biography

Dr. Jenna Jambeck

Georgia Athletic Association Distinguished Professor in Environmental Engineering, Morgan Stanley Plastic Waste Resolution Senior Researcher; University of Georgia, New Materials Institute, Circular Materials Management, Circularity Informatics Lab



Dr. Jenna Jambeck is the Georgia Athletic Association Distinguished Professor in Environmental Engineering in the College of Engineering at the University of Georgia (UGA) and Lead of the Circular Informatics Lab in the New Materials Institute at UGA. From 2018 – 2021 she was a National Geographic Fellow and co-Lead of the Sea to Source Expedition: Ganges. She has been conducting research on solid waste issues for over 25 years with related projects on marine debris and plastic pollution since 2001. Her work on plastic waste inputs into the ocean has been recognized by the global community and translated into policy discussions by the High-Level Panel for the Ocean, in testimony to U.S. Congress, in G7 and G20 Declarations, and the United Nations Environment Programme. She conducts public environmental diplomacy as an International Informational Speaker for the US Department of State. This has included multiple global programs of speaking events, meetings, presentations to governmental bodies, and media outreach around the world in 13 different countries. She has won awards for her teaching and research in the College of Engineering and the UGA Creative Research Medal, as well as a Public Service and Outreach Fellowship. In 2014 she sailed across the Atlantic Ocean with 13 other women in eXXpedition to sample land and open ocean plastic and encourage women to enter STEM disciplines. She is co-developer of the mobile app Marine Debris Tracker, a tool that continues to facilitate a growing global citizen science initiative. The app and citizen science program has documented the location of over five million litter and marine debris items removed from our environment throughout the world.

Follow her work on Twitter @JambeckResearch, @DebrisTracker.

Image credit: Dorothy Kozlowski/UGA

Symposium Schedule
March 31st, 2022

8:00 AM - **In-Person Registration,** Port Aransas Community Theater, Port Aransas, Texas
Virtual Log-In, Zoom link provided in email

9:00 AM - **Welcome,** Jace Tunnell, Mission-Aransas National Estuarine Research Reserve, UT Marine Science Institute

MONITORING

9:15 AM - **Introduction to the Texas Litter Database**
Sara Nichols*

9:30 AM - **Partners in Litter Prevention: the Galveston Bay Watershed Aquatic Action Plan and the Texas Litter Database**
Erin Kinney* and Stephanie Glenn

9:45 AM - **Born on the Bayou: Marine Debris Distribution and Composition in the Galveston Bay Watershed**
Amanda Hackney*, Erin Kinney, Stephanie Glenn

10:00 AM - **Plastic Pellets on Texas Railroads, Beaches, and Rivers**
Jace Tunnell*

10:15 AM - **Microplastics in sediments of Veracruz, southwest Gulf of Mexico**
Minerva Flores-Vargas*, Horacio Pérez-España, Lorena Rios-Mendoza (*Student presentation*)

10:30 AM - **BREAK**

CHEMISTRY OF PLASTIC POLLUTION

10:45 AM - **State-of-the-Science on Microplastic, Heavy Metal and Organic Contaminant interactions in Texas Aquatic Ecosystems: Trends, Analytical Techniques, and Research Needs.**
Oluniyi O. Fadare* and Jeremy L. Conkle

11:00 AM - **Photodegradation patterns differ among different types of plastics after long-term UV exposure**
Xiangtao Jiang*, Scott Gallager, Rut Pedrosa Pàmies, Emil Ruff, Zhanfei Liu (*Student presentation)*

11:15 AM - **Enzymatic Depolymerization of Polyethylene Terephthalate Waste**
Hongyuan Lu, Daniel J. Diaz, Natalie J. Czarnecki, Congzhi Zhu, Wantae Kim, Raghav Shroff, Daniel J. Acosta*, Brad Alexander, Hannah O. Cole, Yan Jessie Zhang, Nathaniel A. Lynd, Andrew D. Ellington, Hal S. Alper (*Student presentation*)

* Indicates presenter

IMPACTS TO FISH AND WILDLIFE

11:30 AM - **Environmental Effects and Toxicological Mechanisms of Microplastics in Aqueous Systems**
Christie Sayes*

11:45 AM - **Investigating the Relationship Between Microplastics and Beach Invertebrate Community Abundance**
Maureen Hayden* (*Student presentation)*

12:00 PM - **LUNCH**

INVITED SPEAKER

1:15 PM - **Sea to Source: Preventing Plastics in our Environment**
Jenna Jambeck*

SOLUTIONS

1:45 PM - **Bioprospecting Plastic Pollution Solutions: Nurdles and Beyond**
Kasia Dinkeloo*

2:00 PM - **Tackling Galveston Bay Marine Debris from All Angles**
Sasha Francis* and Charlotte Cisneros

2:15 PM - **Surfrider Foundation's Local and National Efforts to Reduce Plastic Pollution**
Neil McQueen*

2:30 PM - **BREAK**

2:45 PM - **3D Printing with Shredded Plastic Waste!**
Samantha Snabes

3:00 PM - **Hold On To Your Butt...please**
Rob Glover *

3:15 PM - **The Billy Sandifer Big Shell Beach Cleanup: Making a Positive Impact for 27 Years**
Aaron Baxter*

3:30 PM - **Evaluating biodegradable alternatives to plastic mesh for oyster reef restoration**
Devin Comba, Terence A. Palmer, Natasha J. Breaux*, Jennifer Beseres Pollack

3:45 PM - **Collaborating on Marine Debris Issues across the Gulf**
Caitlin Wessel, Adriana Leiva*

4:00 PM - **Wrap-Up and Closing Remarks**
Jace Tunnell

4:15 PM - **POSTER SESSION** (In-Person ONLY), Lyceum, UTMSI Campus

5:30 PM - **PROGRAM END** (Head to UTMSI Marina for sunset cruise boat ride)

Poster Titles & Presenters

The poster session for this symposium is scheduled from 4:15- 5:30pm on Thursday, March 31st, 2022 in the Lyceum on the UT Marine Science Institute campus. The address to the UT campus is 855 East Cotter Ave., Port Aransas, Texas. Happy hour will begin at 4:15pm as well, so grab your beverage of choice and check out some cool science.

For those attending the meeting virtually: You will receive an email following the meeting containing PDF copies of each of the posters. Check them out, and feel free to reach out to the authors with any questions or comments you may have.

Nurdle Patrol at Saint Stanislaus
Gus Breisacher*, Dylan McShane, Gage Rabby, Omar Tayara, Colin Wood *(Student Poster)*

Superworms - Worms That Aid in the Degradation of Plastics
Rigoberto Carmona*, Gloribel Carmona*, Isaiah Mitchell*, Kasia Dinkeloo *(Student Poster)*

Assessment of microplastics in Crassostrea virginica in Galveston Bay, Texas
Melissa Ciesielski*, Marc H. Hanke, Antonietta Quigg, Laura J. Jurgens

Estimating abundance of microplastics in surface waters and sediments of the Galveston Bay watershed
Emily Cox*, George Guillen, Joanie Steinhaus, Kimber De Salvo Anderson *(Student Poster)*

Microplastic in the Rhizosphere
Katherine V Del Cairo*, N'Kya McDonald *(Student Poster)*

Development of a standardized environmental collection and sorting methods of tire wear particles
Nigel Lascelles*, Jeremy Conkle *(Student Poster)*

Selective quantification of nanoplastics in environmental matrices by asymmetric flow field-flow fractionation with total organic carbon detection
Marfua Mowla*, Sheyda Shakiba, and Stacey M. Louie; Department of Civil and Environmental Engineering, University of Houston (*Student poster*)

Total Mercury (THg) Concentrationss within southern flounder (Paralichthys lethostigma) tissues, livers and consumed plastics in Matagorda Bay, Texas.
Jessica Myers*, Jacob Oster, Keisha Bahr, Benjamin Walther, Jessica Dutton, Jeremy Conkle *(Student presentation)*

Bioprospecting with Nurdles: the search for plastic-degrading microbes
Lauren Ohler* *(Student Poster)*

Comparison of Galveston Bay oysters versus household beverage microplastic exposure for human consumers
Christopher Oxley*, Melissa Ciesielski, Laura Jurgens *(Student Poster)*

Nurdle Patrol Mexico: our monitoring at Southwest Gulf of Mexico
Horacio Pérez-España*, Minerva Flores-Vargas

Abundance and Distribution of Nurdles in Front of Saint Stanislaus Over Time
Jackson Reid* *(Student Poster)*

Solutions to Pollution: Utilizing Beach Clean Ups to Better Inform the Public and Policy
Eleanor TenBrink*, Maryssa Gates*, Morgan Bruce *(Student Poster)*

Is bioplastic an environmental pollutant?
Lee J Pinnell, Andrea Di Cesare , Jeremy Conkle, Jeffrey W Turner*

Abstracts for Oral Presentations

MONITORING

Introduction to the Texas Litter Database

Sara Nichols*; Keep Texas Beautiful

This presentation will introduce the audience to the basic concept of the Texas Litter Database, a recently launched initiative that aims to provide a comprehensive look at what and how much litter is cleaned up across Texas. These data are publicly available and can be used to inform policy, educational, and programmatic solutions to address the litter issue in the state. The presentation will cover the origin of the database, how to access and use the database, and why this is important for everyone working to eliminate litter in Texas.

Partners in Litter Prevention: the Galveston Bay Watershed Aquatic Action Plan and the Texas Litter Database

Erin Kinney* and Stephanie Glenn; Houston Advanced Research Center (HARC)

Litter collection in the Houston-Galveston region is a monumental task that is shared by dozens of organizations and hundreds of volunteers each year. Unfortunately, data on litter collections are often unique to the organization and difficult to obtain. The Partners in Litter Prevention identified the need for more uniform collection methods, metrics, and metadata in the Houston-Galveston region. Other groups recognized this need on a state-wide scale and the idea for the Texas Litter Database was born. Working with partners Keep Texas Beautiful and Black Cat GIS and funded by the Garver Hilyard Black Family Foundation, the Houston Advanced Research Center (HARC) developed a mobile and web-friendly database, with over 70 types of litter in nine categories listed. The data can be searched, graphed, mapped and downloaded, facilitating research, education, and advocacy efforts across the State. Five data partner organizations around the state have pledged to contribute their data, but the Texas Litter Database is free and available for any organization or individual to upload and download data. In addition, HARC and Black Cat GIS developed two methods for little collection: STOP (Study, Track, Remove and Prevent) Texas Litter Survey and Take 2 for Texas, a two-minute plastic bottle survey that anyone can complete quickly and easily.

Born on the Bayou: Marine Debris Distribution and Composition in the Galveston Bay Watershed

[1]Amanda Hackney*, [2]Erin Kinney, [2]Stephanie Glenn; [1]Black Cat GIS & Biological, [2] Houston Advanced Research Center (HARC)

The Partners in Litter Prevention (PLP) identified the need for more uniform collection methods, metrics, and metadata in the Houston-Galveston region. In early 2020, a regional effort was launched to develop a survey procedure that was easy for the public to perform and standardized such that litter trends could be discerned from the resulting data. The Garver, Hilyard, Black

Family Foundation, Black Cat GIS, and the Houston Advanced Research Center developed a rapid assessment technique estimating plastic bottles along Galveston Bay waterways and a transect survey to determine litter composition. Initial attempts testing a visual count method were poor indicators of actual accumulation due to heavy vegetation and murky water at many sample sites. This was replaced by a two-minute count of bottles by one individual. Two-minute counts are satisfactory estimates for most locations, however areas with heavy debris often are undercounted. Longer, detailed 100 ft transect surveys were conducted along shorelines of beaches, bays, bayous, and drainage structures. Every piece of litter the size of a cigarette butt or larger is collected and counted. Surveys have 63 litter type categories, largely based on NOAA Marine Debris categories with a few additions of common local items (example: shotgun shell casings). Over 75 surveys have been conducted at 60+ sites in six counties. Preliminary data shows that in the average 100 ft transect, we found a total of 308 pieces of trash, 123 of these being hard plastic material like bottles, caps, fishing line, etc. The average transect holds 15.8 plastic bottles, 24.72 bottle caps, 12.22 pieces of fishing line or lures, and 17.5 food wrappers. We are currently expanding this program across the state of Texas and are providing training on survey data collection to encourage citizen scientists to participate. This data will be used to inform local stakeholders and the PLP about types of litter to form litter prevention strategies.

Plastic Pellets on Texas Railroads, Beaches, and Rivers

Jace Tunnell*; Mission-Aransas National Estuarine Research Reserve

A citizen science program called Nurdle Patrol has recorded plastic pellet concentrations along beaches, lake shorelines, riverbanks, and railroads from volunteers conducting 10-minute surveys. Over 5,000 volunteers have collected over 11,000 surveys at over 4,500 sites across the United States, Mexico, and 16 other countries to help identify possible sources of the plastic pellets (nurdles). Railroads are used to transport nurdles across the country. In the United States, 78 railroad surveys were conducted, with 75 having nurdles recorded. Of the 78 surveys in the United States, 51 were conducted along railroads in Texas, including as far west as Alpine, Texas. This presentation will focus on Nurdle Patrol efforts by citizen scientists, what the data is showing, and future direction of the program in changing policy about plastics reaching the ocean.

Microplastics in sediments of Veracruz, southwest Gulf of Mexico

[1]Minerva Flores-Vargas*, [1]Horacio Pérez-España, [2]Lorena Rios-Mendoza; [1]Universidad Veracruzana, Instituto de Ciencias Marinas y Pesquerías, [2]University of Wisconsin-Superior, Department of Natural Sciences (*Student presentation*)

In daily life plastic is a widely used material so it is not unusual that it is one of the most common waste. Once this plastic is discarded outdoors it can be fragmented and be more complicated to identify. These smaller pieces are named according to their size as megaplastic, mesoplastic and microplastic (MP), the latter of our special interest. Microplastic are those particles smaller than 5 mm in diameter. As contaminants, it has been documented that MP can be ingested by both terrestrial and marine organisms, becoming harmful to them. To know the magnitude of the problem it is necessary to know where they are found and in what forms and proportions. For the case of the beaches of Veracruz in the southwest Gulf of Mexico this information is necessary, for this reason we analyzed sediment samples from beaches and reefs to have an overview of the microplastics found in the area, and also analyzed whether the number of microplastics analyzed was related to the number of inhabitants in the area. In order to be sure that what was found were MP, the particles found were analyzed by a Fourier Transform Infrared Spectroscopy, confirming the presence of MP in all sampled areas. A higher proportion of polyester fibers was found, which was not related to the number of inhabitants of the nearest population.

CHEMISTRY OF PLASTIC POLLUTION

State-of-the-Science on Microplastic, Heavy Metal and Organic Contaminant interactions in Texas Aquatic Ecosystems: Trends, Analytical Techniques, and Research Needs

Oluniyi O. Fadare* and Jeremy L. Conkle; Department of Physical & Environmental Sciences, Texas A&M University-Corpus Christi

Plastic pollution is one of the most pressing global environmental challenges today, given the potential risks from organismal through ecosystem scales. A growing body of evidence has documented microplastics' (MP, <5 mm) presence in various water bodies. However, data specific to Texas' aquatic ecosystems that examine microplastic interactions with other contaminants are still needed. This information is vital for accurate risk assessments to drive policy decisions. We conducted a systematic literature review on 32 studies from 24 peer-reviewed articles, theses, and reports from 1995 – 2021 on the occurrence and distribution of microplastics and their associated contaminants in Texas' aquatic systems and organisms. These studies examined aquatic animals>sediment>water>plants with proportions being 37.5%, 31.3%, 28.1% and 3.1%, respectively. Except for two of these studies, microplastics were found at varying concentrations in 8.2 – 100% of all sampled matrices. Polyethylene, polypropylene, and polystyrene are the most frequently reported polymer types, although only 52.9% of studies chemically identified materials, mostly through Fourier transform infrared spectrometry (FTIR). Persistent organic pollutants extracted from microplastics, including PAHs (Fluoranthene and Pyrene) and PCBs (153 and 209), were the most detected EPA priority chemicals. The only heavy metal reported in a single study on microplastics in Texas so far is mercury. Major gaps in data, as well as experimental design reporting in the existing literature, may result in over or underestimation of the current microplastics levels in Texas. Research priorities and potential solutions to address microplastic pollution in Texas' water bodies will be discussed.

Photodegradation patterns differ among different types of plastics after long-term UV exposure

[1]Xiangtao Jiang*, [2]Scott Gallager, [2]Rut Pedrosa Pàmies, [2]Emil Ruff, [1]Zhanfei Liu; [1]The University of Texas at Austin – Marine Science Institute; Port Aransas, Texas; [2]The Ecosystems Center, Marine Biological Laboratory; Woods Hole, Massachusetts, Coastal Ocean Vision; North Falmouth, Massachusetts *(Student presentation)*

Plastic debris is broken down into smaller pieces in the marine environment under chemical and physical processes. Plastic-derived weathering products threaten marine organisms and ecosystems. It is critical to understand the environmental fate of plastics under different environmental processes, such as UV irradiation. Here we compared photodegradation of different types of plastics in seawater under 1-3 months of UV irradiation in a laboratory setup, which equals approximately 30-100 years of natural sunlight exposure in the ocean. Two major types of plastic were studied, including semi-crystalline plastics (high- and low-density polyethylene (HDPE, LDPE), polypropylene (PP)), and amorphous plastics (polystyrene (PS), and polycarbonate (PC)). Fourier Transform Infrared (FTIR) spectroscopy results indicated the generation of oxygen-containing functional groups on the surface of all types of plastics by photooxidation. Thermogravimetric analysis (TGA) results revealed that the thermal stability of semi-crystalline plastic HDPE, LDPE, and PP was enhanced slightly after UV exposure likely due to the preferential decomposition of their amorphous regions, and this result was consistent with the increase of plastic crystallinity. In contrast, the thermal stability of amorphous plastics PC and PS decreased after UV exposure. The molecular weights of PS and PC plastics increased after

the irradiation, suggesting cross-linking of the polymer chains. However, the molecular weight of HDPE, LDPE and PP decreased dramatically after the irradiation, suggesting that their main photodegradation pathway was chain scission. This study showed different photodegradation mechanisms of two widespread found groups of plastic found in marine ecosystems, which were dominated by either cross-linking or chain scission.

Enzymatic Depolymerization of Polyethylene Terephthalate Waste
[1]Hongyuan Lu, [2]Daniel J. Diaz, [1]Natalie J. Czarnecki, [1]Congzhi Zhu, [1]Wantae Kim, [3,4]Raghav Shroff, [1,3]Daniel J. Acosta*, [3]Brad Alexander, [1,3]Hannah O. Cole, [3]Yan Jessie Zhang, [1]Nathaniel A. Lynd, [3]Andrew D. Ellington, [1]Hal S. Alper; [1]McKetta Department of Chemical Engineering, The University of Texas at Austin, [2]Department of Chemistry, The University of Texas at Austin, [3]Department of Molecular Biosciences, The University of Texas at Austin, [4]DEVCOM ARL-South, Austin, Texas 78712, United States (*Student presentation*)

The ability of microbes to metabolize a variety of petroleum derived plastics is a rapidly developing area of research that may ultimately provide a mechanism for the remediation of plastic pollution and the recycling of plastic waste. Polyethylene terephthalate (PET) accounts for twelve percent of global solid waste and we have discovered a variety of PET hydrolases capable of depolymerizing this common plastic. Unfortunately, naturally occurring PET hydrolases have been unable to facilitate effective enzymatic PET recycling or remediation due to a lack of robustness and slow reaction rates. Enzyme engineering provides a possibility of ameliorating these issues by improving enzyme activity and stability. We use a structure-based machine learning algorithm to engineer a highly active and robust polyethylene terephthalate hydrolase variant (FAST-PETase: Functional, Active, Stable, and Tolerant PETase) and demonstrate its ability to depolymerize a wide variety of post-consumer plastic substrates with no or minimal pre-treatment. In addition to depolymerizing a wide variety of PET substrates we demonstrate the ability to re-synthesize virgin PET using the monomers recovered from FAST-PETase treatment in a closed-loop PET recycling process. These results constitute a substantial advance in enzymatic depolymerization of PET and the viability of enzymatic PET recycling

IMPACT ON WILDLIFE AND HABITATS

Environmental Effects and Toxicological Mechanisms of Microplastics in Aqueous Systems
Christie Sayes*; Baylor University

Nanoparticle interactions are central to the understanding of a wide spectrum of chemical and physical properties as well as environmental and biological effects. Studies are mostly limited to single particle species - agglomeration in a homogeneous suspension. However, a nanoparticle of one composition can interact with a nanoparticle of another composition. The same is true for nanoplastics. Nanoplastics are a complex mixture of polymers and additives (plasticizers, pigments, lubricants) and are likely to influence real-life environmental fate and effects, which are expected to be different from those of types of nanoparticles. The linkages between nanoplastic properties and effects are largely missing. Because nanoplastics have been shown to enter into different environmental compartments (including humans), the presence of these anthropogenic particles in the aquatic environment has been hypothesized as inducing adverse effects on health. We show that the potential health effects of nanoplastics depends heavily on the surrounding matrix: aggregation in the presence of organic matter or degradation in the presence of ultraviolet light. We compared the properties of three different plastics (polyacryonitrile, polyethylene terephthalate, polystyrene) with those of other nanoparticles (silver, copper, and titania). Results

show that light exposures, organic matter incubation, and increases in salinity resulted in differential toxicological responses in human gut cells as well as increased bacterial inhibition. Surface functional groups (nitrile, ester, aromatic) were monitored for shifts in infrared analyses. The goal of this research is to gain critical information on the environmental effects and toxicological mechanisms of nanoplastics in an effort to enhance strategies in achieving water sustainability globally.

Investigating the Relationship Between Microplastics and Beach Invertebrate Community Abundance

Maureen Hayden*; Self *(Student presentation)*

The goal of this study is to determine if there is a relationship between beach invertebrate communities and plastic pollution and to identify if marine invertebrates ingest microplastics. Galveston Island State Park, Mustang Island State Park, and Sea Rim State Park were sampled. Collections took place twice per sampling period throughout the year; summer (May-August), fall (September-December), and spring (January-April) from June 2021 through August 2022. Sediment cores were taken to collect invertebrates and sediment samples. Five nearshore transects, each 10 meters apart, were taken from the swash zone using a sediment corer (10 cm diameter, 10 cm h). Invertebrate samples were sorted for each nearshore transect and station. Methods development is underway to determine the best protocol for extracting microplastics from sediment using the Sediment Microplastic Isolation Unit (SMI Unit) and corresponding protocol from Coppock et al 2017. Once the invertebrates are sorted, groups of 10 invertebrates from each taxa (if available) will undergo a tissue digestion assay in 10% potassium hydroxide and be examined for presence/absence of naturally ingested microplastics. Presence/absence data of naturally ingested microplastics from invertebrate specimens and invertebrate community diversity/richness will be compared to microplastics found in sediment core samples from each sample site.

SOLUTIONS

Bioprospecting Plastic Pollution Solutions: Nurdles and Beyond

Kasia Dinkeloo*; University of Texas at Austin

Bioprospecting is the search for useful product from natural sources. By studying plants, animals, and microbes, scientists have discovered new materials, medicines, and enzymes that have changed the world. At the University of Texas at Austin, undergraduate researchers in the Freshman Research Initiative's Bioprospecting Stream are working to make such discoveries. Their eyes are on the prize: plastic-degrading enzymes, biomarkers, and remediation tools. It is clear we are approaching a waste crisis with regards to plastics, and it is also clear that solutions may be on the horizon (or in the ocean, or under our feet!). Using bioprospecting and plastic degradation as educational themes in chemistry and biology lab courses, students are working on projects in three main areas: bioprospecting from nurdles, exploring the gut microbiome of plastic-eating superworms, and understanding the impact of plastics on rhizosphere interactions.

Tackling Galveston Bay Marine Debris from All Angles

Sasha Francis* and Charlotte Cisneros; Galveston Bay Foundation

Preventing and removing marine debris around Galveston Bay takes teamwork and tangible actions. Galveston Bay Foundation's Community Programs Team conducts monthly marine debris and nurdle surveys around the Bay, hosts shoreline cleanups, provides presentations, and creates online outreach to tackle marine debris from all angles. Programs go beyond trash cleanups to address the life cycle of pollution, especially plastics. All events and outreach incorporate citizen science, discussions about industry and individual impacts, as well as sustainability ideas. This approach empowers the community while also helping GBF and its partners identify and share resources.

Surfrider Foundation's Local and National Efforts to Reduce Plastic Pollution.

Neil McQueen*; Texas Coastal Bend Chapter - Surfrider Foundation

Plastic pollution is suffocating our oceans and the many animals that call them home. Researchers estimate there are more than 5 trillion pieces of plastic in the ocean with the number continuing to grow every day. This pollution is impacting our marine ecosystems, and many species, from the smallest to largest, that live there. Neil will provide an update on the Texas Coastal Bend Chapter's Skip the Plastic Program, the Texas Nurdle Bill, the bill in Congress for the Break Free From Plastic Pollution Act and Surfrider's Ocean Friendly Restaurants Program.

3D Printing with Shredded Plastic Waste!

Samantha Snabes ; re:3D Inc

Although Fused Filament Fabrication (FFF) 3D printing breaks down manufacturing barriers for complex geometries, low production runs, and rapid prototyping, FFF printing is still dependent on plastic filament-- usually virgin-- and its associated costs, limitations, and environmental impact. These problems can be addressed by 3D printing directly from polymer pellets, flakes, or recycled regrind. Commercial plastic pellets are on average 10x cheaper than filament, making 3D printing more affordable and accessible, especially for large-scale prints. Pellets are available in a wider range of materials, and allow for easy material mixing. Printing from recycled regrind offers even more cost savings and creates a circular economy that revives plastic waste into useful products. This sustainability is vital in environments with limited resources- isolated island populations, natural disaster locations, and remote operations- where plastic products are continuously brought in and end up as waste, and manufactured tools are difficult to source. A pellet printer like Gigabot X tackles both problems at once, closing the loop on plastic manufacturing and expanding the 3D printing industry into both waste disposal and new production applications.

Hold On To Your Butt...please.

Rob Glover*; Galveston Surfrider

Cigarette butts are up to 98% plastic and can actually be recycled! They are the most commonly found litter on beaches and streets. The Galveston Chapter of the Surfrider Foundation began a program two years ago to help reduce the cigarette butt litter on Galveston island. Rob Glover, of Galveston Surfrider, will speak about the truly grassroots beginning of the program and how it is growing and making a difference in Galveston and beyond.

The Billy Sandifer Big Shell Beach Cleanup: Making a Positive Impact for 27 Years

Aaron Baxter*; Friends of Padre

Founded in 2008 by Capt. Billy Sandifer, Friends of Padre (FoP), Inc. is a non-profit organization based in Corpus Christi, TX. Among other things, FoP is responsible for organizing the annual

Billy Sandifer Big Shell Beach Cleanup. This volunteer effort occurs each year on the last Saturday in February, at the Padre Island National Seashore. The Big Shell portion of the Padre Island National Seashore is located 18-30 miles down the beach and is named for the shell fragments that wash ashore there. The shells, and large amounts of marine debris, are deposited along this section of beach due to the convergence of strong currents. The Big Shell is only accessed by 4-wheel drive vehicles and consists of soft sand, narrow beach, and high tides. This debris originates in several different countries, the majority of which are plastics. The Big Shell Beach Cleanup has grown over the past 27 years in terms of volunteers, miles cleaned, and overall tonnage and is currently the largest single day, barrier island beach cleanup in the world. To date, over 3 million pounds of trash has been removed during the Billy Sandifer Big Shell Beach Cleanup and Friends of Padre looks forward to increasing the positive impact made to Padre Island.

Evaluating biodegradable alternatives to plastic mesh for oyster reef restoration.

Devin Comba, Terence A. Palmer, Natasha J. Breaux*, Jennifer Beseres Pollack; Harte Research Institute for Gulf of Mexico Studies, Texas A&M University-Corpus Christi

Plastic aquaculture mesh is commonly used for containing oyster shells in small-scale oyster reef restoration, but environmental and public health concerns have prompted investigations of biodegradable alternatives. Experimental oyster reefs were constructed in the Mission-Aransas Estuary, Texas, U.S.A., in March 2020 using recycled oyster shells placed into four mesh bag types: polyethylene plastic and three biodegradable alternatives (cellulose, cotton, and jute). Oysters, reef-associated fauna, and bag conditions were quantified for seven months. Biodegradable alternatives (cellulose, cotton, and jute) completely degraded within two months of deployment, leaving piles of loose shell, while polyethylene bags remained intact. Despite rapid degradation, the biodegradable treatment successfully recruited oysters and fauna, although at lower densities than the polyethylene treatment. The material cost of using polyethylene bags was lower than for using biodegradable bags, but an accurate environmental cost of plastic pollution needs to be quantified and factored into these calculations. Despite higher initial costs, biodegradable alternatives can be successful for use in small-scale oyster restoration events without introducing plastics into the marine environment.

Collaborating on Marine Debris Issues across the Gulf

[1]Adriana Leiva & [2]Caitlin Wessel; [1]US Fish and Wildlife Service, [2]NOAA Marine Debris Program

The Gulf of Mexico is impacted by marine debris that litters its waters and shorelines and harms ecosystems, marine life, navigation, and the economy. It is generated from multiple sources, including land-based debris from inland and densely populated coastal areas, and ocean-based debris from commercial and recreational activities in the Gulf. To effectively address the marine debris problem in the Gulf of Mexico, it is important to develop coordinated responses and activities among stakeholders and organizations. The Gulf of Mexico Alliance Marine Debris Cross-Team Initiative is dedicated to working to address the issue of marine debris in the Gulf through prevention, research, and removal efforts. Specific actions include education and stewardship, assessing the impacts of marine debris, and supporting volunteer-led efforts to remove marine debris and litter. Learn more about the Gulf of Mexico Alliance Marine Debris Cross-Team Initiative, our goals, our current actions, and how to get involved.

Abstracts for Poster Presentations

Nurdle Patrol at Saint Stanislaus

Gus Breisacher*, Dylan McShane, Gage Rabby, Omar Tayara, Colin Wood; Saint Stanislaus Marine Science *(Student Poster)*

In 2019, the Marine Science program at Saint Stanislaus learned about nurdles and how they affect the environment. These microplastics are the raw material for all plastic products used in our world today. They become an issue when they escape from transportation containers and become free in our environment. They float on water so marine life can mistake nurdles for food. Plastics, including nurdles, have been found to absorb toxins in the environment. Therefore, nurdles and the toxins they carry can bioaccumulate in the food chain. Nurdles are also an issue because they are washing up on coastlines all around the world. In our portion of the Gulf of Mexico, right in front of Saint Stanislaus, we have collected over 52,388 nurdles since 2019. At least once a month, our Marine Science classes conduct nurdle surveys on our beach front in Bay Saint Louis, Mississippi. In 2019 we collected 30,727 nurdles. In 2020 we collected 8,471 nurdles. In 2021 we collected 10,855 nurdles. So far, we have collected 2,335 nurdles in 2022. All data is reported to Nurdle Patrol. This data is used to map where nurdles are being found and hopefully can be used to find out where the nurdles are coming from. This information can also be used to hold companies accountable for releasing them into the environment. Our role is to continue collecting and reporting data in this citizen science-based research project and to communicate our results to the community.

Superworms - Worms That Aid in the Degradation of Plastics

Rigoberto Carmona*, Gloribel Carmona*, Isaiah Mitchell*, Kasia Dinkeloo; The University of Texas at Austin, College of Natural Sciences, The Freshman Research Initiative *(Student Poster)*

The plastic crisis is a global issue that is negatively impacting biospheres and wildlife across the world. It is estimated that around 6.3 billion tons of plastic waste was generated between 1950 and 2015 (Rhodes). The characteristic that makes plastic so useful to us is the very characteristic that makes plastic so threatening; its durability and inability to degrade. There does seem to be plausible solutions that could help alleviate the harmful effects of plastic buildup; however, many of these solutions often produce secondary pollution issues, (Lee et. al 2020) but one solution that would eliminate this problem is the usage of (1) plastic-digesting worms to aid in mineralizing plastic waste, or (2) the use of enzymes found in the worms to degrade plastic waste. Zophobas morio, commonly called Superworms, are able to digest polystyrene with the help of their gut-dwelling bacteria with enzymes capable of degrading polystyrene. It has been observed that around 36.7% of polystyrene ingested by Superworms can be converted into carbon dioxide within a 16-day period (Yang). It is evident that these creatures possess biodegrading abilities that could help alleviate the plastic crisis. Here, researchers are extracting and culturing gut microbes in order to isolate and identify the species responsible for the degradation of polystyrene. Once said microbe is isolated and identified, the researchers will work to identify and validate the enzyme(s) in hopes of providing a tool for the degradation of plastic waste to combat our growing plastic pollution crisis.

Assessment of microplastics in Crassostrea virginica in Galveston Bay, Texas

Melissa Ciesielski*, Marc H. Hanke, Antonietta Quigg, Laura J. Jurgens; Texas A&M University, Galveston, University of Houston

Microplastics (< 5000 microns) are ubiquitous in coastal environments, and can have direct impacts on marine organisms, which can ingest them either directly from the water column, or through the food web. The consumption of microplastics can have impacts on the health of marine organisms, and possibly on humans through the seafood consumption. Bivalves like oysters have the potential to concentrate microplastics through filter-feeding and their consumption may pose additional risk to human health since the entire animal including gut contents is typically consumed. Our study focuses on the ecologically and commercially important bivalve, the eastern oyster (Crassostrea virginica), within Galveston Bay, Texas. Galveston Bay is a highly urbanized estuary that drains the Dallas-Fort Worth metroplex and Houston area watersheds. We present data showing the presence of microplastics down to 55 microns in oysters from three regions of Galveston Bay. The mean number of microplastics per individual oyster was 34.08 +/- 36.99, and 1.87 +/- 2.24 microplastics per gram of wet tissue weight. Microfibers were the most dominant form, followed by fragments. The majority of microplastics were between 500-2000 microns in length. These data provide a first look at microplastic loadings in oysters in the region and support further study on the effects of microplastics. This research will aid in developing management decisions and policy around plastic pollution.

Estimating abundance of microplastics in surface waters and sediments of the Galveston Bay watershed

Emily Cox*, George Guillen, Joanie Steinhaus, Kimber De Salvo Anderson; UHCL College of Science & Engineering / Environmental Institute of Houston *(Student Poster)*

Marine debris is a global issue, and research on plastic and microplastic pollution has greatly expanded recently as the negative impacts become better understood. Demand has driven plastic production to exceed 300 million metric tons annually, and will continue to increase. Plastics never fully degrade, but environmental conditions weaken larger plastics, which are fragmented into progressively smaller pieces, including microplastics (< 5mm diameter). Microplastics are ubiquitous in the environment, and pose many ecotoxicological risks. Heavily urbanized estuarine ecosystems are particularly vulnerable to microplastic pollution, although research of plastic pollutants in such ecosystems is sparse. While studies have been conducted in areas of the Gulf of Mexico, the distribution and concentration of microplastics in Galveston Bay is not fully understood. Here we will estimate the concentration of microplastics found in surface waters and sediments within the lower portion of the Galveston Bay watershed. Microplastics floating in surface waters will be collected from five shoreline sites and five open bay sites in Galveston Bay using replicate water grabs. Floating microplastics will also be collected using replicate neuston net tows. Replicate sediment samples will also be collected using an Ekman dredge in open bay waters, and quadrats at subtidal regions along the shoreline. Samples will be processed using vacuum filtration and a density separator before enumerating the microplastics per sample under a microscope. This research will provide the first comprehensive baseline for the microplastic pollution levels in Galveston Bay, and facilitate future research on topics such as toxin adherence and biota interactions.

Microplastic in the Rhizosphere

Katherine V Del Cairo*, N'Kya McDonald; University of Texas – Austin *(Student Poster)*

It is no secret that there is an increasing abundance of plastic waste found in our environment. Beyond the bottles and bags we see floating in our oceans or blowing across our highways, there

are “hidden” plastics in every corner of the earth: microplastics (measured between 1nm - 5mm) and nanoplastics (<1nm) (1). Much of the current research focuses on microplastic incidence and impact on marine environments, whereas interactions between microplastics and soil environments are less studied and understood (1). Here, we are interested in understanding how the rhizosphere (plant roots and their associated microbiome) interacts with and is impacted by plastics. This project has been initiated by collecting plant/soil samples from field research stations affiliated with the University of Texas and analyzing them in the laboratory. From this, we aim to understand: how much and what kinds of plastics are present in Central Texas soils, how these plastics change soil structure and microbe content, and what impact their presence has on plant and microbe growth and abundance in the rhizosphere.

Development of a standardized environmental collection and sorting methods of tire wear particles

Nigel Lascelles*, Jeremy Conkle; Harte Research Institute, Texas A&M University-Corpus Christi *(Student Poster)*

Microplastics are ubiquitous in environments globally. Tire wear particles (TWPs) are a subclass of microplastics. ~177 million tires were produced in 2020, a >4% increase since 2015. TWPs will increasingly contaminate our environment. TWPs shed from tires during everyday use and are deposited on nearby driving surfaces. They are transported into environmental systems, whether by wind-generated from passing vehicles or rainwater runoff. Seven trillion-plus tiny plastic pieces wash from city streets into San Francisco Bay each year, half of which are black rubbery fragments from worn tires. One challenge to studying TWPs is isolating them from heterogeneous environmental matrices. A simple method for extracting TWPs will expand necessary baseline research and increase the understanding of their environmental impacts. Density separation using a salt solution is a long-standing technique used to remove microplastics from the background material. The salt chosen must produce a denser solution than the target material (1.1-1.2 g cm-3). Additionally, human health and environmental impacts must be considered. A method was developed, tested, and validated using density separation to extract TWPs various matrices, including a sandy-clay beach, stormwater drainage sediment, and parking lot dust and sand. The method was developed using crumb rubber from athletic fields & tire wear shaved from a used tire. Both ZnCl2 and CaCl2 produced 100% recovery; however, CaCl2 is the preferred salt because it is less toxic than ZnCl2.

Selective quantification of nanoplastics in environmental matrices by asymmetric flow field-flow fractionation with total organic carbon detection

Marfua Mowla*, Sheyda Shakiba, and Stacey M. Louie; Department of Civil and Environmental Engineering, University of Houston (*Student poster*)

Fragments of plastics, especially micro- and nano-sized plastics, are a class of emerging environmental pollutants. Over the past decade, a wide range of studies have confirmed the presence of these fragments in the natural environment. There is a need for new analytical methods to be developed to detect and quantify nanoplastics in complex environmental matrices. This research demonstrates a novel technique which separates nanoplastics based on size and distinguishes them from other colloidal particles by their total organic carbon (TOC) content. In this study, asymmetric flow - field flow fractionation (AF4) method separates polystyrene (PS) plastics from a mixture (50 nm, 100 nm, 200nm and 500 nm) that also has inorganic clay and dissolved humic acid as a representation of natural water. We also explore coupling AF4 with other selective detection approaches, such as dying the PS with a fluorescently active dye, Nile Red. The AF4-TOC method was more robust when compared with other detection modes (UVvis, fluorescence, light scattering, and refractive index) to not only selectively detect the PS but also quantify the mass concentration of the nanoplastics regardless of their size. This method development aims to contribute to better understanding nanoplastics pollution by enabling more accurate measurements of their presence and concentration.

Total Mercury (THg) Concentrations within southern flounder (*Paralichthys lethostigma*) tissues, livers and consumed plastics in Matagorda Bay, Texas.

[1]Jessica Myers*, [1]Jacob Oster, [1]Keisha Bahr, [1]Benjamin Walther, [2]Jessica Dutton, [1]Jeremy Conkle; [1]Department of Physical and Environmental Sciences, Texas A&M University-Corpus Christi; [2]Department of Biology, Texas State University *(Student poster)*

The southern flounder, *Paralichthys lethostigma*, is sought after in both commercial and recreational coastal Texas fisheries, including Matagorda Bay. Despite regulations from Texas Parks and Wildlife, there has been an ongoing decrease in population since the 1980s. Elevated levels of industrial influences, a mercury Superfund Site and localized plastic pollution, within the Matagorda Bay system may result in more harm to the population and to those consuming the fish. The hydrophobic nature of plastic makes debris more susceptible to mercury sorption, acting as a potential additional vector for this contaminant in the food web. This study will assess and compare total mercury (THg) concentrations of *P. lethostigma* muscle and liver tissue as well as consumed plastic samples. Fish (n =47) were opportunistically collected from cleaning stations in Port O' Connor, Texas from July to August of 2021. Stomachs will be visually inspected for plastic; any found will be analyzed with Fourier Transform Infrared (FTIR) spectroscopy to determine material type. Muscle, livers, and plastic THg concentrations will be determined using a Direct Mercury Analyzer (DMA). Results from this study and trends on the potential transfer of mercury from consumed plastic debris to southern flounder tissues are pending.

Bioprospecting with Nurdles: the search for plastic-degrading microbes

Lauren Ohler*; Bioprospecting Research Stream at University of Texas *(Student Poster)*

Since its development in 1908, plastic has severely impacted both industry and environment, convenient due to the flexible, durable, yet "disposable" structure. However, plastic is difficult to truly dispose of and degrade due to the structurally sound carbon polymer chain. Many plastic products begin in the form of a small, pelleted concentrate, called a nurdle. Nurdles frequently pollute aquatic ecosystems and wash up on shorelines, contaminating water sources and interfering with flora and fauna. Utilizing nurdles collected from Texas shorelines by The Nurdle Patrol, we are working to isolate and identify microbes capable of plastic degradation. Here, we present our attempts to culture microbes from nurdles. Continuing, we hope to identify isolated microorganisms, and determine if they contain degradation mechanisms that are capable of fixing carbon from the structurally sound chain back into an environmentally useful compound. Optimally, degradation pathways within the microorganisms would be identified, revealing enzyme products that can aid in conversion of plastic waste to reusable compounds.

Comparison of Galveston Bay oysters versus household beverage microplastic exposure for human consumers

Christopher Oxley*, Melissa Ciesielski, Laura Jurgens; Texas A&M at Galveston *(Student Poster)*

Microplastics, plastic particles <5mm in size are ubiquitous marine pollutants. Microplastics originate from the breakdown of larger plastics and synthetic fibers, the release of industrial pellets, and the use of plastic abrasives. Marine organisms such as oysters consume microplastics from their environment, accumulating them in their tissues and potentially passing them on when eaten. Humans who eat oysters are increasingly concerned about microplastics as a health risk, though we still do not fully understand the actual risk. We evaluated the potential of ingesting microplastics (>50 microns in size) from consuming oysters from Galveston Bay, TX, USA, versus household beverages. We collected oysters from a region available for commercial harvesting, digested their tissues, filtered them, and counted the microplastics manually. We then sampled bottled water, tea, fresh tap water, and tap water exposed to airborne contaminants for 24 hours using the same protocols. The air-exposed glasses of water and oysters had the greatest plastic content. Comparatively, plastic content was significantly lower in bottled water and fresh tap water, suggesting that individuals seeking to reduce microplastic exposure should be particularly wary of exposing beverages to airborne household particulates. Results also suggest that oysters, at least from this region of Galveston Bay, could be an important source of ingested plastics.

Nurdle Patrol Mexico: our monitoring at Southwest Gulf of Mexico

Horacio Pérez-España*, Minerva Flores-Vargas; Universidad Veracruzana, Instituto de Ciencias Marinas y Pesquerías

Veracruz is the largest coastal city on the Mexican side of the Gulf of Mexico, with a strong industrial and commercial shipping activity. It is located in the southwest of the gulf and several rivers, which have medium-sized cities in their watersheds, flow nearby. Since January 2019 and until February 2022, 21 beaches near this city have been monitored. A total of 465 transects of 10 min were conducted. Despite the urban centers and the industrialization of the area, the average number of nurdles found in the study period was 47.6 nurdles/10 min. The maximum number was 292 nurdles/10 min, in the city of Alvarado, near the mouth of the Papaloapan River, the second largest in the region. Although further studies are needed, these values are lower than those found in the northern part of the United States, and so far nowhere in Mexico, both in the Gulf and in the Caribbean, have values higher than 300 nurdles/10 min been reached.

Abundance and Distribution of Nurdles in Front of Saint Stanislaus Over Time

Jackson Reid*; Saint Stanislaus Marine Science *(Student Poster)*

Throughout this school year, I have committed almost every possible marine science period to search for nurdles. Through this, I have gained extensive hands-on knowledge of the state of the nurdles, and how their abundance is affected by environmental and anthropogenic circumstances. In my survey area in front of Saint Stanislaus in Bay St. Louis, Mississippi, I've found nurdles every single day that I looked for them, finding as few as six and as many as 208 in 10 minutes. Nurdles are notably affected by the weather, finding substantial amounts in strand lines composed of small, mostly organic material that are much larger and higher on the beach after storms. Sometimes, the nurdles are particularly abundant or scarce despite the lack of outlier weather conditions, which is likely due to fluctuations in the source of nurdles, as large amounts are often found of the same size, shape, and makeup, meaning they are likely from the same manufacturer or batch. I also found that nurdles of differing composition can also be found in different areas of the shore, as smaller, more dense nurdles are found lower down the beach and larger, more buoyant ones are more often found in the strand lines. The most area I've covered in a day is about 150m, and on the low end I covered around 40m. This school year I've collected 1,409 nurdles in this tiny footprint, in front of my high school, while the entire Mississippi Gulf Coast measures over 130,000m.

Solutions to Pollution: Utilizing Beach Clean Ups to Better Inform the Public and Policy

Eleanor TenBrink*, Maryssa Gates*, Morgan Bruce; Bahr Marine Ecology Lab at Texas A&M University-Corpus Christi *(Student Poster)*

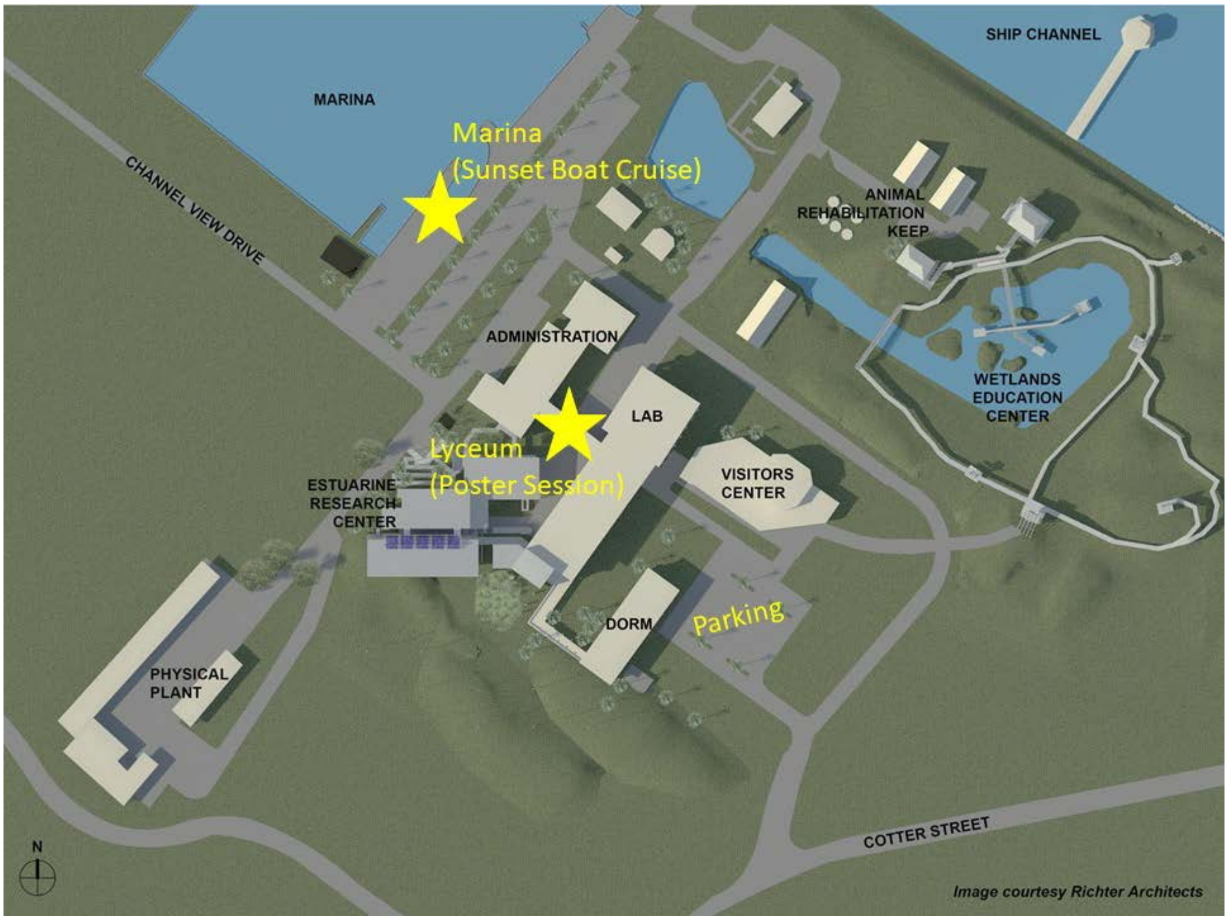
The beaches in the Coastal Bend are a valuable monetary resource and have provided an escape for the community during the pandemic, but increases in plastic pollution threaten these ecosystems and the resources they provide. Therefore, the Bahr Marine Ecology Lab at Texas A&M University- Corpus Christi (TAMU-CC) began a local environmental stewardship initiative at the onset of the pandemic to combat the increase in plastic pollution while educating the public. To date, we have conducted eight one-hour beach clean ups at University Beach and engaged with 92 people. A total of 364.4 lbs of trash has been collected across 10 categories, with a significant increase in plastics associated with the pandemic (i.e., masks, single-use plastics, gloves). Results of these cleanup have been shared with committees at TAMU-CC, Rookery Island Clean-up, Surfrider Foundation, Texas General Land Office, Adopt a Beach Program, and many others. By collecting this data, the severity of plastic pollution in a specified location can be determined and be used to inform the public, potentially reducing its impact. Additionally, informing local interested parties and the Texas Legislature can increase awareness in the public about plastic pollution and demonstrate the need for policy against plastic pollution.

Is bioplastic an environmental pollutant?

[1]Lee J Pinnell, [2]Andrea Di Cesare , [3]Jeremy Conkle, [4]Jeffrey W Turner*; [1]Veterinary Education, Research, and Outreach Program, Texas A&M University and West Texas A&M University, College Station, Texas, [2]Water Research Institute, National Research Council of Italy (CNR-IRSA), MEG - Molecular Ecology Group, Largo Tonolli, Verbania, Italy, [3]Department of Physical and Environmental Sciences, Texas A&M University-Corpus Christi, Corpus Christi, Texas, [4]Department of Life Sciences, Texas A&M University-Corpus Christi, Corpus Christi, Texas

Marine environments are sinks for conventional, petroleum-based plastic waste. Bioplastic is widely regarded as a green alternative with similar physical properties. However, the effects of bioplastic loading in marine environments are largely unknown. Using shotgun metagenomics, we have previously shown that polyhydroxyalkanoate loading promotes a rapid, significant, and long-term (424-day) shift in benthic microbial community structure through the stimulation of sulfate-reducing microorganisms. Specifically, compared with polyethylene terephthalate and ceramic controls, sulfate-reducing microorganisms were the dominant and more diverse taxa colonizing polyhydroxyalkanoate, accounting for 25-40% of the overall microbial community. Here, we report that polyhydroxyalkanoate biofilms accumulate antimicrobial and metal resistance genes coding for trimethoprim resistance, multidrug resistance, macrolide-lincosamide-streptogramin resistance, polymyxin resistance, and multimetal resistance. Further, the relative abundance of antimicrobial and metal resistance genes was strongly correlated ($R=0.97$, $p<0.05$), and multidrug-resistant and hemolytic *Bacillus cereus* group bacteria, resistant to beta-lactams, vancomycin, and bacitracin, were readily isolated from polyhydroxyalkanoate biofilms. This bioplastic-mediated shift in benthic microbial community structure coupled with the accumulation of antimicrobial and metal resistance genes and the presence of multidrug-resistant and potentially pathogenic bacteria raise important questions. Is bioplastic an environmental pollutant? Will bioplastic loading contribute to the spread of antimicrobial resistance in the marine environment? In consideration of anticipated increases in bioplastic production and use, it would be prescient to know the answers to these questions.

UT Marine Science Institute 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.

Upcoming Events & Meetings

The Future of Oceans Plastics: Designing Diverse Collaboration Frameworks
April 5-7, 2022
https://euromarinenetwork.eu/news/the-future-of-ocean-plastics-designing-diverse-collaboration-frameworks/

Texas Adopt-A-Beach 2022 Coastwide Spring Cleanup
April 9, 2022
https://www.texasadoptabeach.org/

GomCon
April 25-28, 2022
https://web.cvent.com/event/f677ed8c-31e0-415c-b600-62b6c02d76a6/summary

TCEQ public hearing- revision to the Texas Surface Water Quality Standards
May 2, 2022
https://www.tceq.texas.gov/waterquality/standards/WQ_standards_revisions.html

7th International Marine Debris Conference (South Korea)
September 18-23, 2022
https://www.7imdc.org/

Texas Bays and Estuaries Meeting
September 21-22, 2022
www.texasbaysandestuariesprogram.com

1er Simposio Mexicano de Contaminación por Plásticos (Veracruz, México)
September 28, 2022
Details to come later