

TEXAS PLASTIC POLLUTION SYMPOSIUM

April 5, 2023 - University of Houston-Clear Lake



MATAGORDA BAY
MITIGATION TRUST



THE UNIVERSITY OF TEXAS
MARINE SCIENCE INSTITUTE



NURDLE PATROL.org



MISSION • ARANSAS
NATIONAL
ESTUARINE
RESEARCH
RESERVE



A PROGRAM OF TCEQ



PORT HOUSTON™



COASTAL BEND
BAYS & ESTUARIES PROGRAM



Texas
Master
Naturalist™
Galveston Bay Area Chapter



AMERICAN BIRD
CONSERVANCY



SPLASH
STOPPING PLASTICS AND
LITTER ALONG SHORELINES



GALVESTON BAY
FOUNDATION



HARC

University of Houston Clear Lake



BAYOU PRESERVATION
ASSOCIATION

Bayou Theater

University of Houston Clear Lake



Environmental Institute of Houston

Bayou Theater at the University of Houston-Clear Lake, Houston, TX
TexasPlasticPollutionSymposium.com

Welcome!

The Texas Plastic Pollution Symposium planning committee is proud to host the 5th 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 third year in a row, the symposium is offered in a hybrid format, with both in-person and virtual options. For those attending in person, meals will be catered by UHCL and include snacks, beverages, and lunch. There will be over an hour for lunch, followed by our keynote presentation by Maia Corbitt, PhD, President of Texans for Clean Water.

Student presenters are an important aspect of this symposium. This year, we are pleased to honor best student awards for both oral and poster 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, Mission-Aransas NERR/UT
Marine Science Institute

Tracy Weatherall, Mission-Aransas NERR/UT
Marine Science Institute

Katie Swanson, Mission-Aransas NERR/UT
Marine Science Institute

Lisa Marshall, Galveston Bay Estuary Program

Matthew Abernathy, Galveston Bay Estuary
Program

Christian Rines, Galveston Bay Estuary
Program

Amanda Hackney, Black Cat GIS and
Biological Services

Stennie Meadours, Galveston Bay Area
Chapter- Texas Master Naturalist

Lisa Scobel, Galveston Bay Foundation

Richard Gibbons, American Bird Conservancy

Elizabeth Virgl, American Bird Conservancy

Chloe Dannenfelser, American Bird
Conservancy

Joanie Steinhaus, Turtle Island Restoration
Network

Morgan Huette, Turtle Island Restoration
Network

Erin Kinney, Houston Advanced Research
Center

Kelli Gallagher, Port of Houston

Quinn Hendrick, Coastal Bend Bays &
Estuaries Program

Morton Sager, Bayou Preservation Association

A special thank you goes to all the volunteers and moderators.

Follow the meeting on social media with #TxPPS2023

Table of Contents

Table of Contents	3
Invited Speaker Biography	4
Symposium Schedule	5
Poster Titles & Presenters	8
Abstracts for Oral Presentations	10
Abstracts for Poster Presentations	19
University of Houston-Clear Lake Parking Map	25
University of Houston-Clear Lake Bayou Building Map	26

Invited Speaker Biography

MAIA CORBITT

**Director of Mission Giving – Garver, Black, Hilyard Family Foundation
President – Texans for Clean Water**



Maia Corbitt directs grant funding to mission purposed organizations for the Garver Black Hilyard Family Foundation, focusing on litter prevention through research and policy. She also serves on the boards of directors for the National Stewardship Action Council (NSAC), Keep America Beautiful, and as president of Texans for Clean Water. Maia previously worked with Booth, Ahrens & Werkenthin PC, a water law and lobby firm, and as Executive Director of the State of Texas Alliance for Recycling (STAR). She started her career in waste and water systems at the Lower Colorado River Authority (LCRA) in Austin after graduating from the University of Texas.

Symposium Schedule

April 5, 2023

8:00 a.m. **In-Person Registration**, Bayou Building - University of Houston-Clear Lake
Virtual Log-In, Zoom link provided in email

8:30 a.m. **Welcome**
Lisa Marshall, Galveston Bay Estuary Program
Jace Tunnell, UT Marine Science Institute

MONITORING

8:45 a.m. **Mexico Nurdle Patrol**
Jace Tunnell*

9:00 a.m. **Occurrence of Microplastics in Tributaries of Galveston Bay**
Zulimar Lucena*

9:15 a.m. **Estimating Abundance of Microplastics in Surface Waters of the Galveston Bay Watershed**
Emily Cox*§, Jenny W. Oakley, George Guillen

9:30 a.m. **Fate of Microplastics in Texas Bays**
William Bailey*§

9:45 a.m. **Microplastics and Solid Waste Study on Marine and Coastal Ecosystems in Mexico**
A. I. Hernandez-Soriano*§, Alvarez-Zeferino J.C., Cruz-Salas A.A., Vazquez-Morillas A., Ojeda-Benitez S.

10:00 a.m. **Tracking Trash**
Anabella Wilems*§

10:15 a.m. **BREAK**

10:30 a.m. **Litter Across Texas - Analysis of the Texas Litter Database**
Erin Kinney*, Stephanie Glenn*

10:45 a.m. **Designing for Circular Economies: Creating Impact from Local Plastic Waste Using Off-Grid Containerized 3D Printers & Practice Based Learning**
Charlotte Craff*

* Indicates presenter

§ Indicates student presentation

CHEMISTRY OF PLASTIC POLLUTION

Plastics, Polycyclic Aromatic Hydrocarbons, and Mercury Interactions within the Matagorda Bay System: Does This Pose a Risk to Fish Health?

11:00 a.m. Oluniyi O. Fadare*, Nigel Lascelles, Jessica T. Myers, Jeremy L. Conkle, Jessica Dutton, and Hussain Abdulla

Photodegradation Patterns Differ Among Different Types of Plastics After Long-Term UV Exposure

11:15 a.m. Xiangtao Jiang*§, Scott Gallager, Rut Pedrosa Pàmies, Emil Ruff, Alexander B. Bochdansky, Zhanfei Liu

Microbial Exopolymeric Substances Mediating Micro-, and Nano-Plastics

11:30 a.m. Transport

Chen XuChen Xu*, Peter H. Santschi, Wei-Chun, Chin

LUNCH and POSTER SESSION

Lunch will be served in Atrium II.

The poster presentations will be in the Garden Room.

KEYNOTE PRESENTATION

Current State of Plastics: Reality and Rhetoric

Ms. Maia Corbitt, President of Texans for Clean Water

CHEMISTRY OF PLASTIC POLLUTION

Quantifying Tire Wear Particles on Austin, Texas Roads: Early Insights

1:30 p.m. Towards an Overlooked Source of Pollution

Cole Carrabba*§, Cornel Olariu, William Bailey

Upstream Plastic Pollution and the Myth of Chemical Recycling

1:45 p.m. Jennifer Hadaya*, Michael Lewis, Naomi Yoder

IMPACTS TO FISH AND WILDLIFE

Dickinson High School Environmental Improvement Efforts (NOAA Ocean Guardian School Grant)

2:00 p.m. Payton Landolt, Mark Villarreal, Laila Jackson, Jackson Colton, Avery Minasi, Kailee Hernandez, Taylor Williams, Gavrielle Baecker (*§)

* Indicates presenter

§ Indicates student presentation

2:15 p.m. **Born on the Bayou: Marine Debris Distribution and Composition in the Galveston Bay Watershed**
Amanda Hackney*, Jesse Lucas, Lee Ann Wilde

2:30 p.m. **Making a SPLASH: Bird Conservationists Addressing the Threat of Plastic Pollution**
Celeste Silling*, Chloe Dannenfelser*

2:45 p.m. ***BREAK***

SOLUTIONS

3:00 p.m. **Bioprospecting Plastic Pollution Solutions**
Kasia Dinkeloo*

3:15 p.m. **Environmental Education: An Effective Litter Prevention Strategy**
Liz Virgl*

3:30 p.m. **Surfrider Foundation's Local and National Efforts to Reduce Plastic Pollution**
Neil McQueen*, Jennifer Savage*

3:45 p.m. **City-Scale Reusable Foodware Systems**
Kristina Gerken*

4:00 p.m. **Empowering the Next Generation of Wildlife Advocates**
Colleen Cavanaugh*, Colley Hodges*

4:15 p.m. **Spreading the Word on Nurdle Pollution: Leveraging Technology to Raise Awareness and Mobilize Action**
Son Nguyen*

4:30 p.m. **Raising Awareness on Plastic Pollution Through Eco-Art and Education**
Kelsey Malan*

4:45 p.m. **Presentation of Student Awards, Coastal Bend Bays and Estuaries Program Symposium Wrap up and Closing Comments**

5:00 p.m. **Symposium Ends**

* Indicates presenter

§ Indicates student presentation

Poster Titles & Presenters

The primary poster session for this symposium is scheduled from 11:45 a.m. - 1:00 p.m. on Wednesday, April 5, 2023, in the Garden Room of the Bayou Building at the University of Houston-Clear Lake campus. The Garden Room will also host the snacks and beverages during the meeting breaks, which will provide additional time to view the posters, though the authors are only expected to be present during the lunch time poster session.

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

Artificial Weathering of Laboratory Generated Microplastic Particles (LG-MPP): Towards Defining Reference Materials

Taiwo Ayorinde*§, Precious Obiako, Clancy Collom and Dr. Christie Sayes

Bioprospecting the gut Microbiome of *Zophobas morio*: The Search for Plastic-Degrading Microbes

Rigoberto Carmona*§, Gloribel Carmona, Isaiah Mitchell, and Dr. Kasia Dinkeloo

Characterizing Class A Land-Applied Biosolids and Microplastics Emerging to Quantify Transport from Agricultural Fields to Freshwater Systems

Marcela Strane*§, Dr. Devin Shaffer

Crowd Sourcing Plastic Pollution Data Throughout the United States and Beyond

Tracy Weatherall and Jace Tunnell

Development of a Novel Method for Micro(nano)plastics Extraction in Particulate Organic Matter and Surface Water from Lavaca Bay System.

Oluniyi O. Fadare*, Leisha Martin, Nigel Lascelles, Jessica T. Myers, Karl Kaiser, Wei Xu, Jeremy L. Conkle and Hussain Abdulla

Exposure of Terrestrial Birds to Microplastic: The Effects of Urbanization and Ecological Traits

Alexis Baum*§, Dr. Jennifer Smith

Microbial Communities Associated with Microplastics and Detritus Collected on the Shores of Galveston Bay

Alliana Olalde, Laura Packer*§, Paul Shrewsbury IV, Michael G. LaMontagne

Microplastic Accumulation in the South and North Shores of Maui, Hawai'i

Victoria Teoh*§, Marc H. Hanke

* Indicates presenter

§ Indicates student presentation

Microplastics in the Galveston Bay Watershed: The Big Impacts of Tiny Pollution - Citizen Science Sampling
Morgan Huette*

Prevalence of Antibiotic Resistant Vibrio Species Associated with Microplastics in Galveston Bay
Allison M Wyrick*§, Alex Estala, Michael G. LaMontagne

Selective Culture and Sequencing of Polystyrene-Degrading Microbes From the gut the Superworm, *Zophobas morio*
Gloribel Carmona*§, Rigoberto Carmona, Dr. Kasia Dinkeloo

The Distribution and Weathering Status of Plastic Pellets (nurdles) Along Southwestern Gulf of Mexico Shorelines from Veracruz to Campeche, Mexico
Jianhong Xue, Xiangtao Jiang, Jace Tunnell, Zhanfei Liu*

The Identification and Quantification of Microplastics (MPs) in Soil Samples Using Fluorescent Imaging & MPs Effect on Plant Development
Wendi Deng*§, Dr. Kasia Dinkeloo

The Nurdleome
Vibha Annaswamy*§, Dr. Kasia Dinkeloo

Towards Long-Term Monitoring of Plastic Pollution in the Matagorda Bay Systems: Quantitative Analysis and FTIR Characterization of Macroplastics
Casey Gallagher*§, Oluniyi O. Fadare, Jeremy L. Conkle, and Hussain Abdulla

Using Image Classification Methods to Detect Coastal Debris After Major Storms
Jennifer Avila*§, David Retchless

Using Nurdles to Solve the Plastic Pollution Hurdle
Kristen Lowe*§, Dr. Kasia Dinkeloo

* Indicates presenter

§ Indicates student presentation

Abstracts for Oral Presentations

MONITORING

Mexico Nurdle Patrol

Jace Tunnell*; University of Texas Marine Science Institute

Nurdle Patrol is a citizen science project led by the Mission-Aransas National Estuarine Research Reserve (Reserve) at the University of Texas Marine Science Institute in Port Aransas, Texas. In 2021, the Reserve received a NOAA Marine Debris Program grant to work with partners at the Universidad Veracruzana to expand efforts throughout Mexico. Globally, over 7,000 volunteers have collected over 15,500 surveys at over 7,000 sites across the world to help identify possible sources of the plastic pellets (nurdles) washing up on beaches, riverbanks, and lake shorelines. This presentation will dive into specific efforts going on in Mexico to identify nurdle concentrations, expansion of partners, hosting symposiums, translation of website and educational materials, and looking into policies that surround the Mexico plastics industry for handling nurdles.

Occurrence of Microplastics in Tributaries to Galveston Bay

Zulimar Lucena*; U.S. Geologic Survey

Litter and trash, including plastics, are relatively prevalent in Galveston Bay and its tributaries, and the accumulation of microplastics is of increasing concern. Microplastics are particles less than 5 mm in diameter; these small particles are derived from degradation or mechanical breakdown of larger plastic objects or particles and introduced to waterways through various pathways, including urban runoff and wastewater effluent. Microplastic accumulation in Galveston Bay has the potential to affect the health of marine organisms, including oyster reefs and fish. Previous studies have found that oysters can ingest and accumulate microplastics and in the Texas Gulf Coast, microplastics have been found in fish, with higher frequencies associated with species that consume vegetation and shrimp. The U.S. Geological Survey (USGS), in cooperation with the Galveston Bay Estuary Program, assessed the occurrence of microplastics in tributaries to Galveston Bay to provide information about the spatial distribution and concentrations of microplastics in the Galveston Bay watershed. Microplastics samples were collected in the water column of nine tributaries to Galveston Bay at USGS water-quality monitoring stations. Two samples were collected at each monitoring station, one during a runoff event and one during baseflow conditions. Microplastics in each sample were then visually identified, quantified, and chemically characterized by Raman spectroscopy. Preliminary results show high variability in both the concentration and chemical composition of microplastics among the monitoring stations, with the highest concentrations of microplastics observed near urban and industrial areas. The information obtained through this reconnaissance study provided a preliminary assessment of the extent and nature of microplastics pollution in the Galveston Bay watershed that can be used as a foundation for future research and abatement. Additional data collection is underway to help improve our understanding of the occurrence of microplastics in Galveston Bay and inform future water resource management and restoration decisions.

Estimating Abundance of Microplastics in Surface Waters of the Galveston Bay Watershed

Emily Cox*, Jenny W. Oakley, George Guillen; University of Houston - Clear Lake, Houston, Texas, Environmental Institute of Houston, University of Houston - Clear Lake, College of Science and Engineering. *(Student presentation)*

The introduction of plastic in society has been extensively advantageous, yet 60% of all plastics ever created remain in landfills or the environment, where they never fully decompose. Instead, larger plastic debris fragment into microplastics (MPs), plastic particles less than 5mm diameter. MPs pose many ecotoxicological risks as they are ubiquitous in the environment and naturally absorb contaminants. Heavily urbanized estuarine ecosystems are particularly vulnerable to MP pollution although research of plastic pollutants in such environments is sparse. While studies have been

conducted in areas of the Gulf of Mexico, the distribution and concentration of MPs in Galveston Bay, home to the largest petrochemical refinery complex in the country, is not fully understood. The characterization of MP pollution in Galveston Bay is significant because establishing the magnitude of the problem will serve to inform the best management practices. We estimated the concentration of MPs found in surface waters of Galveston Bay. MPs floating in surface waters were collected from five shoreline sites and five open bay sites in Trinity Bay and upper and lower Galveston Bay using replicate water grabs. Water samples were vacuum filtered before enumerating the number of MPs per sample under a dissecting microscope. Shoreline sites were found to have a higher concentration of total MPs/liter than open bay sites, and the plastic fragment category accounted for 66% of all MPs counted. This research provides a baseline for continuous MP monitoring and MP studies in Galveston Bay.

Fate of Microplastics in Texas Bays

William Bailey*; University of Texas at Austin Department of Geological Sciences. (*Student presentation*)

Microplastics (MP) have become a global contaminant, reaching every continent, and posing significant health risk to humans and the ecosystem. With approximately 8-14 million tons of plastic entering the oceans every year, only approximately 1% of this pollution can be quantified, signifying an immense mass balance problem. This study aims to investigate a bay environment along the Texas Gulf Coast for microplastic pollution to model MP distribution and concentration. Sampling campaigns targeted three large Texas bays (San Antonio, Matagorda, and East Matagorda bays), yielding sediment grabs and push cores from the bays and adjacent shorelines. Density separation procedures are utilized to extract MPs from bay sediments and map microplastic concentration within the bay environment. This study aims to: 1) define best practices and principles for MP extraction and analysis; 2) enhance our understanding of key controls governing sediment transport in bay environments with focus on MP transport and deposition; 3) understand the role of storms on bay and barrier island evolution; and 4) quantify the delivery of Colorado River sediment and MPs to Matagorda Bay. Preliminary results indicate the presence of microplastics in both San Antonio and Matagorda Bay sediments. The visual inspection of the sediments accumulating behind the barrier islands (i.e., San Jose) suggest bay microplastics could be sourced from the beach sands during storms rather than just from river catchments. Future sampling campaigns will focus on identified MP concentration “hot spots” to understand the bay sediment dynamic and to fill current knowledge gaps in bay sedimentary processes.

Microplastics and Solid Waste Study on Marine and Coastal Ecosystems in Mexico

Hernández-Soriano A. I.*; Alvarez-Zeferino J.C., Cruz-Salas A.A., Vazquez-Morillas A., Ojeda-Benitez S; Universidad Autónoma Metropolitana, Universidad Autónoma de Baja California. (*Student presentation*)

Marine ecosystems in Mexico are of great importance because of the environmental services they provide and their contribution to the development and economic growth of the country. Nonetheless, due to waste mismanagement, microplastic and marine waste pollution has become a problem in those ecosystems.

Mexico has around 11,000 km of coastline, being 17 coastal states, each one with different regulations. The group called “Microplásticos en ambientes marinos” (Microplastics in marine environments) was settled in 2017 by the Universidad Autónoma Metropolitana and now works alongside the Universidad Autónoma de Baja California; to this day, the group has developed methodologies for studying microplastics in various compartments (superficial water, beach sediments and marine species) and for solid waste on beaches.

For studying microplastics (MP), 33 beaches have been sampled along Mexico (11 from the Atlantic and 22 from the Pacific), in which there has been found an interval concentration of 31.7 - 545.8 MP/m². The most common characteristics were microplastics of fragment type, polyethylene composition, white color and particles with the largest length of 2 mm. For the study of marine waste, samples from different beaches have been taken, including two protected natural areas in which plastics have been identified as the most common material and cigarette butts as the most common waste.

The generated information has contributed to strategy development for marine pollution with microplastics and marine waste prevention and mitigation.

Tracking Trash

Anabella Wilems*; Seabrook Intermediate School (*Student presentation*)

Have you ever wondered what happens to plastic that falls into the bayous and creeks around Houston? Tracking Trash details a science fair project implemented by Anabella Wilems, an 8th grader at Seabrook Intermediate School, in which she used GPS trackers to determine the route and speed of plastic pollution in various bayous across the Houston region. Anabella will share her research methods, findings, and offer solutions to help combat marine debris at a local level.

Litter Across Texas – Analysis of the Texas Litter Database

Erin Kinney*, Stephanie Glenn; Houston Advanced Research Center

From its inception, one of the goals of the Texas Litter Database was to provide the means to analyze the types and geographic distribution of litter across the entire state. The open-access database is available to all users to input a variety of datasets, from monthly adopt-a-path style clean-ups to full audits. The Texas Litter Database allows for quick viewing of the overall database with its built in map and graphing options. A deeper dive into the downloadable database allows any user to compare clean up data and determine the most common types of litter collected between metro areas or counties and across different environments. For instance, in the counties comprising the Lower Galveston Bay watershed, film food or drink wrappers, cigarette butts, and bottle caps are the most common types of trash. Not surprisingly, when only sites with water are analyzed, fishing lines and lures go from the 5th most common type of trash to the 2nd most common. Water sites also had twice as many bottle caps as bottles, whereas non-water sites had five-times as many bottles as bottle caps. These differences seem small, but they highlight the importance of identifying features of litter cleanup locations as important meta-data. Metadata are essential to provide the proper context for litter types to best inform preventative actions.

Designing for Circular Economies: Creating Impact from Local Plastic Waste Using Off-Grid Containerized 3D Printers & Practice Based Learning

Charlotte Craff*; re:3D, Inc.

Plastic waste pollution is an increasingly prevalent environmental issue, with a recycle rate of only 9% for all the worldwide plastic ever produced. The Designing for Circular Economies: Creating Impact from Local Plastic Waste Using Off-Grid Containerized 3D Printers & Practice Based Learning project convenes academia, educators, nonprofits and industry experts to develop a deployable, net-zero-footprint manufacturing system that enables lay users to design and manufacture goods from plastic waste, resulting in sustainable infrastructure with significant socio-economic impact. The system includes an interactive design tool and sustainability dashboard to help users better quantify the environmental impacts and economic opportunities of redirecting waste streams originally designated for a landfill, into feedstock for 3D printing goods in a circular model. This project will stimulate job creation for historically underserved people through plastic preparation, 3D design and 3D printing. The workforce serving priority includes zero-waste and technology education with the goal of creating jobs and services for underserved communities. This solution leverages re:3D's expertise in 3D printing directly from plastic waste, Austin Habitat for Humanity's desire for customized 3D printed home goods made from plastic trash, The University of Texas at Austin's expertise in engineering design and Life Cycle Value Analysis (LCA), The University of Wollongong's expertise in the built environment, and Western Sydney University's experience in the materials science of 3D printing with recyclables. The collaborative effort is working with Austin Habitat for Humanity to better understand waste generated from their operations, product needs of low-income homeowners and users who will customize/buy/use the goods, the metrics needed for the LCA, and comprehensive requirements for the hardware, software & training solutions. This project is part of the 2022 Cohort for the National Science Foundation's Convergence Accelerator, Track I: Sustainable Materials for Global Challenges,

and is funded by both NSF and Australia's national science agency: Commonwealth Scientific and Industrial Research Organisation, (CSIRO).

CHEMISTRY OF PLASTIC POLLUTION

Plastics, Polycyclic Aromatic Hydrocarbons, and Mercury Interactions Within the Matagorda Bay System: Does This Pose a Risk to Fish Health?

Oluniyi O. Fadare*, Nigel Lascelles, Jessica T. Myers, Jeremy L. Conkle, Jessica Dutton, and Hussain Abdulla; 1. Department of Physical & Environmental Sciences, Texas A&M University-Corpus Christi TX, 2. Delaware River Basin Commission, Trenton, NJ, 3. Department of Biology, Texas State University, Aquatic Station, San Marcos, TX.

The Matagorda Bay system presents one of the worst-case scenarios due to the industrial input of plastics, polycyclic aromatic hydrocarbons (PAHs), and mercury (Hg). Our study aimed to assess the role of macro(micro)plastics in PAHs and Hg mobility within the Matagorda Bay system. We measured the Hg concentrations in macro(micro)plastics deposited along Matagorda Bay shorelines and quantified the PAHs concentration on microplastics extracted from wrack line debris. Additionally, the gastrointestinal tract, muscle, and liver of three economically important fishes within the bay [*Sciaenops ocellatus* (n=47), *Cynoscion nebulosus* (n=85), *Paralichthys lethostigma* (n=46)] were examined for microplastics while their muscle and liver were analyzed for Hg. PAHs and Hg concentrations were quantified using Triple Quadrupole GC-MS/MS and Direct Mercury Analyzer. From our preliminary results, microplastics accounted for 2.62-21.3% mass (14.8 ± 7.13) of the wrack line debris and mass ranged from 60.2 ± 29.6 - 197 ± 15.7 mg g⁻¹. No plastic particle (>1 mm) was observed in fish gastrointestinal tracts. All 16 target PAHs were detected, with a total concentration of 28,786 ng g⁻¹. Hg concentrations in the muscle for all species and plastics (preliminary data) were 0.07 - 0.16 µg g⁻¹ dw. and 0.01- 0.08 µg g⁻¹ dw, respectively. The microplastic mass and PAH concentrations exceeded the highest concentrations found in peer-reviewed literature. Muscle Hg concentrations are lower than state and federal advisory levels. The comprehensive data will improve our understanding of plastic-PAHs/mercury interactions to better manage the coastal systems' health, educate stakeholders, and inform policy and regulations in the region.

Photodegradation Patterns Differ Among Different Types of Plastics After Long-Term UV Exposure

Xiangtao Jiang^{1*}, Scott Gallager², Rut Pedrossa Pàmies³, Emil Ruff³, Alexander B. Bochdansky⁴, Zhanfei Liu¹; 1. The University of Texas at Austin - Marine Science Institute; Port Aransas, Texas, 2. Coastal Ocean Vision; North Falmouth, Massachusetts, 3. The Ecosystems Center, Marine Biological Laboratory; Woods Hole, Massachusetts, 4. Old Dominion University, Norfolk, Virginia. (*Student presentation*)

Plastic debris is known to degrade into smaller particles in the marine environment through physical and chemical processes, generating plastic-derived weathering products that can have detrimental effects on marine organisms and ecosystems. Investigating the environmental fate of plastics under different processes, such as UV irradiation, is critical. In this study, we exposed two major categories of plastics (4/4 cm films), semi-crystalline plastics (HDPE, LDPE, and PP) and amorphous plastics (PS and PC), to UV irradiation in seawater under laboratory conditions for 3-9 months. Fourier Transform Infrared (FTIR) spectroscopy and Thermogravimetric analysis (TGA) were used to study the photodegradation of these plastics. Our results revealed that different oxygen-containing functional groups were generated from all types of plastics on their surface, including carbonyl, hydroxyl, and ketone groups. However, the degradation rate of plastic tabs was relatively slow, and the oxidation extents were less significant than plastic powders in the relevant studies. Additionally, the thermal stability of semi-crystalline plastics HDPE, LDPE, and PP remained largely unchanged after UV exposure, while that of amorphous plastics PC and PS slightly increased, indicating a greater structural stability of PC and PS. Furthermore, the molecular weights of PS and PC plastics first decreased and then slightly recovered during the irradiation, suggesting that chain scission dominated the reaction of polymer chains, while cross-linking occurred with different degrees during the process. Overall, our study provides insights into photodegradation mechanisms of different plastics in marine waters,

highlighting the importance of considering different types of plastic and their respective degradation rates.

Microbial Exopolymeric Substances Mediating Micro-, and Nano-Plastics Transport

Chen Xu*, Peter H. Santschi, Wei-Chun, Chin; Texas A&M University at Galveston

Plastics are widely produced and used with an annual global plastic production ~360 million tons per year in 2018. Plastic pollution is one of most critical environmental problems to be addressed, with the ocean as the ultimate depository for most of the waste. Intense mass media coverage around „The Great Pacific Garbage Patch“ has highlighted the severity, persistence and expansive nature of plastic pollution in the marine environment. Substantial accumulation of plastic litter through a variety of pathways such as air-water exchange, treatment plant effluents, urban runoff and river discharge, is a major scientific and public environmental concern. Marine plastic waste, through chemical mechanisms or physical forces, can be broken down (fragmented) into micro- and nano-size particles in seawater. Detailed survey (distribution) data and toxicity assessments for microplastics and nanoplastics have been documented. However, the impact of these microscopic plastic particles on fundamental aquatic processes has been understudied. This presentation will focus on the biophysical mechanisms governing the interactions between nanoplastics and natural organic matter such as EPS in aggregating these materials and either leading to it entering food webs or being transported to the seafloor. Specifically, the source and composition of EPS and how they can influence the aggregation with micro/nano plastics is discussed, including the interactions between microbes, enzymes, and ROS in EPS formation and hence the aggregation into marine plastic snow.

Quantifying Tire Wear Particles on Austin, Texas Roads: Early Insights Towards and Overlooked Source of Pollution

Cole Carrabba*, Cornel Olariu, William Bailey; Jackson School of Geosciences, The University of Texas at Austin

Tires are a commonly underrepresented source of microplastic pollution. Tire tread wears throughout the lifespan of the tire, and a large portion of this material is initially deposited on the road. Large gaps in knowledge begin to exist directly after particle emission, but recent studies have shown microscopic rubber particulates in high concentrations on roadways. Although the quantity of microplastics entering the environment at the road interface remains ambiguous, efforts have been made to estimate emissions in some regions of the globe. In this study the quantities of tire microplastic on Austin, Texas roads were measured at several locations with a vacuum filtration system. The samples were separated by density and their plastic particles were counted with a Leica M125C microscope. This dataset is the first attempt at measuring in-situ tire-wear pollution in the state of Texas. Initial counts of each sample contained an average of 1496 tire rubber particles between 70-150 μm in a 0.092 m^2 area (1 ft^2) of road shoulder along 24 Austin roads. An accurate estimation of tire wear emissions will serve as helpful preliminary information for future, upscaled research efforts. Understanding the transport pathways of microscopic pollutants will be fundamental to any form of mitigation attempt down the road.

Upstream Plastic Pollution and the Myth of Chemical Recycling

Jennifer Hadaya^{*1}, Michael Lewis², Naomi Yoder³; 1. Air Alliance Houston, 2. Environment Texas, 3. Healthy Gulf

Upstream plastic pollution such as air pollution from chemical and plastics production facilities is a significant and sometimes forgotten factor in plastics pollution. This presentation will examine ExxonMobil Baytown as a case study in upstream plastic pollution. ExxonMobil Baytown is the largest petrochemical plant in the United States. Now in addition to the chemical complex and refinery, ExxonMobil Baytown has built a “chemical recycling” plant on the same campus. According to publicly available emissions and violations data, the ExxonMobil Baytown facility has had a “High Priority Violation” status every quarter since April of 2020. Adding chemical recycling only increases emissions. Chemical recycling is not actually recycling at all. It is just a dressed up name for burning plastic to fuel the production of more plastic: burning pollution creates air pollution, to ultimately manufacture more pollution. The myth of chemical recycling illustrates that, at yet another link in the

lifecycle of plastic pollution, we can't recycle our way out of the waste problem. Furthermore, turning plastic pollution into fuel perpetuates fossil fuel dependence, as opposed to providing a genuine solution toward transitioning away from fossil fuels usage. This presentation will discuss the deep and lasting effect petrochemical pollution has on public health and ecosystem health and how advocates are forging new solutions using ExxonMobil Baytown as a case study.

IMPACTS TO FISH AND WILDLIFE

Dickinson High School Environmental Improvement Efforts (NOAA Ocean Guardian School Grant)

Payton Landolt, Mark Villarreal, Laila Jackson, Jackson Colton, Avery Minasi, Kailee Hernandez, Taylor Williams, Gavrielle Baecker; Dickinson High School. *(Student presentation)*

Dickinson High School has been awarded the NOAA Ocean Guardian School grant for the last 5 years. As part of the grant the students in Aquatic Science have been trying to promote awareness within the school building, add equipment and reusable water bottles to reduce single use plastic consumption on campus, participate in beach clean ups, and maintain a raingarden with a cistern. Aquatic Science Honors students will present about the efforts over the last 5 years to lessen their impacts on marine debris and improve environmental quality in the surrounding aquatic environments. They will discuss why plastics are used so widely in the United States, the effects these plastics have on wildlife and human health, and what DHS students have done to positively impact the local environment. They will discuss the reusable water fountains added throughout the high school campus over the last 5 years, the distribution of reusable water bottles, the participation in beach clean ups, and the maintenance of our on campus raingarden to reduce storm water runoff.

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

Amanda Hackney*, Jess Lucas, Lee Anne Wilde; Black Cat GIS and Biological

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. 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). Preliminary results on a spatial model of trash "hot spots" in Houston area waterways based on this data will be presented. 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 local stakeholders about types of litter to form litter prevention strategies.

Making a SPLASH: Bird Conservationists Addressing the Threat of Plastic Pollution

Celeste Silling*, Chloe Dannenfelser*; Stopping Plastics and Litter Along Shorelines (SPLASH)

Texas faces a serious trash problem. According to a study conducted by NOAA and the Ocean Conservancy, Texas has the highest average weight of trash debris per mile surveyed of any state in the nation. Trash also accumulates on the Texas coast ten times faster than it does on the coasts of other Gulf states. Trash on beaches poses a serious threat to wildlife, including birds. In response to an overwhelming amount of bird entanglements, American Bird Conservancy teamed up with Gulf Coast Bird Observatory and Black Cat GIS to create SPLASH (Stopping Plastic Pollution Along Shorelines) in 2020. Since its inception less than three years ago, SPLASH has hosted 65 cleanups and removed over 26,000 lbs of trash from beaches and waterways. Along with doing cleanups, we also do outreach work to the public and work with local landowners and governments to improve trash management practices. Looking forward, we aim to gather more long-term data to inform our trash management consultations, broaden our volunteer base, and work with more local partners to host events.

SOLUTIONS

Bioprospecting Plastic Pollution Solutions

Dr. Kasia Dinkeloo*; University of Texas at Austin

Bioprospecting is the search for useful products from natural sources. By studying plants, animals, and microbes, scientists have discovered materials, medicines, and enzymes that have changed the world. Through the Freshman Research Initiative at the University of Texas at Austin, high school and undergraduate researchers are working to make such discoveries. Currently, the Bioprospecting research group is pursuing projects focusing on 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!). This presentation aims to give a research update for work completed on the following projects: bioprospecting from nurdles, exploring the gut microbiome of plastic-eating superworms, and understanding the impact of plastics on rhizosphere interactions.

Environmental Education: An Effective Litter Prevention Strategy

Liz Virgl*; American Bird Conservancy

SPLASH, or Stopping Plastics and Litter Along Shorelines, is a partner program started by the American Bird Conservancy, Gulf Coast Bird Observatory, and Black Cat GIS working toward creating cleaner environments through outreach, community science, and education. Since 2020, SPLASH has worked with 24 schools, 14 youth groups, and has reached 3,125 students. We have found education to be an effective, preventive strategy to mitigate trash and plastic pollution by developing young, environmental stewards and changing community behavior. By targeting students in the classroom and providing outdoor experiences we are not only providing younger generations with mitigation skills and mindsets, but also impacting whole communities through intergenerational learning. This talk will explore our educational strategies in the classroom and the field, the impacts on student behavior, and future plans and partnerships.

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

Neil McQueen*, Jennifer Savage*; 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 the species, from the smallest to the largest, that live there.

Neil will provide an update on the Texas Coastal Bend Chapter's Skip the Plastic Program, the Texas Nurdle Bill, and Surfrider's plastic pollution efforts on the national level. If she can make it to the symposium, Jennifer Savage, Surfrider's Plastic Pollution Initiatives Senior Manager will present the last portion of the talk.

City-Scale Reusable Foodware Systems

Kristina Gerken*; Perpetual

If designed and operated optimally, reusable foodware programs for take-out food and beverages have the potential to be better for the environment than single-use plastics, create good local jobs, be economically sustainable over time, help cities manage their waste generation and collection, and be cost competitive with disposables for local businesses.

Perpetual, a nonprofit launched in early 2022, partners with cities, reuse service providers, and other stakeholders to implement immersive reuse systems that eliminate single-use disposables, starting with foodware.

This presentation will address Perpetual's work in Galveston to implement a reusable foodware system

informed by a community-based design process. It is estimated that disposable foodware contributes nearly 200 million items and over 1,500 metric tons to MSW in Galveston each year. Switching 50% of Galveston's disposable foodware to reusable foodware would result in a reduction of over 5,000 tons of GHG emissions and 750 tons of solid waste annually. Perpetual believes Galveston is poised to lead on reusable foodware, benefiting the environment and the local community. Perpetual's lead local partner in Galveston is Turtle Island Restoration Network.

Reusable foodware systems allow consumers to borrow a reusable cup or container from a restaurant or cafeteria and return it when they are done with it, either in the same location or at one of many collection bins around town. Businesses would pay a per use fee comparable to disposables. A third party would collect, clean, and redistribute the reusable items to ensure the system is efficient, hygienic, and convenient.

Empowering the Next Generation of Wildlife Advocates

Colleen Cavanaugh*, Colley Hodges*; Houston Zoo

Plastic Free July is a global movement that helps millions of people be part of the solution to plastic pollution, helping to save marine animals. Hundreds of businesses, local governments and community organizations participate in the Plastic Free July challenge each year, working to reduce single-use plastic in their communities. Since going single-use plastic bag, bottle, and straw free, the Houston Zoo has participated in this challenge for the past several years, encouraging staff and volunteers to make changes to their daily plastic consumption habits. Recently, this challenge has been championed by Zoo teen program participants. The Zoo's teen programs inspire Houston-area teens to problem solve ways to save animals in the wild and empowers them to influence others to take action. By providing teens with opportunities to act, these programs aim to cultivate care for the environment and inspiration to become lifelong advocates for all wildlife both locally and globally. During the summer, teens explore the challenge of plastic pollution, its effects on wildlife, and ways to reduce single-use plastic usage. Teens participate in Plastic Free July by committing to one action to reduce their single-use plastic. Through this initiative teens were not only taking action themselves but were also influencing friends and family to change their behaviors as well. This presentation will showcase how Zoo teens are making a difference for wildlife and include an invitation to all participating organizations at the Plastic Pollution Symposium to join these students in the 2023 Plastic Free July challenge.

Spreading the Word on Nurdle Pollution: Leveraging Technology to Raise Awareness and Mobilize Action

Son Nguyen*; Conrad Blucher Institute for Surveying and Science

Plastic pollution is one of the most significant environmental issues we face today. Nurdles, small plastic pellets used in the manufacturing of plastic products, are a contributor to this problem. The Conrad Blucher Institute for Surveying and Science (CBI) has conducted research and developed the Nurdle Patrol website and mobile apps to help the University of Texas - Marine Science Institute (UTMSI) raise awareness of the harmful impact of nurdles on the environment and to empower individuals to collect data about their marine environments.

This presentation will showcase how technology can be used to increase public awareness and educate citizen scientists on the impact of nurdles on our planet. We will delve into how the Nurdle Patrol website and apps promote action in our community. We will also discuss how we use data collected by these tools to drive change and promote sustainable practices.

Lastly, the presentation will focus on how CBI is exploring new ideas to engage younger audiences in the fight against nurdles. This includes developing educational content that is engaging and accessible to children and partnering with schools and youth groups to provide hands-on opportunities to learn and become citizen scientists. We aim to inspire others to use technology and innovation to address the urgent issue of plastic pollution and to empower individuals to take action in their communities for a more sustainable future.

Raising Awareness on Plastic Pollution Through Eco-Art and Education

Kelsey Malan*; Artist Boat

Artist Boat is a nonprofit organization that connects people to Gulf Coast environments through mind-opening experiences such as exploring nature and creating eco-art. Plastic pollution awareness is always woven into our public education events and art competitions. Annually, Artist Boat hosts two art contests, a festival, and public beach tours to help raise awareness about plastic pollution.

In the Marine Debris Art Contest, artists of any age can create an eco-art masterpiece that inspires people to action using marine debris they picked up around the beach. Artwork is put on display at Galveston Art League where people can vote for their favorite and get inspired.

Another art competition Artist Boat hosts annually is Beautify the Bucket. Artists from seven different age categories get to adopt the blue trash barrels along Galveston Beaches and turn them into something beautiful. By turning these trash barrels into public eco-art, it gets the attention of the beachgoers thus encouraging proper use of trash receptacles.

These beautified buckets are judged and displayed in June at the Artist Boat World Ocean Day Festival. This festival also hosts ocean-related exhibitors from local businesses/organizations, live entertainment on stage that raises awareness, live painting opportunities, art workshops, and Bucket Brigade Beach Tours.

Bucket Brigade Beach Tours are free interpretive tours that take the public to explore the creatures and features of Galveston Beaches while learning about the plastic pollution along the way.

Artist Boat firmly believes in the power of raising awareness and educating the public about plastic pollution.

Abstracts for Poster Presentations

Artificial Weathering of Laboratory Generated Microplastic Particles (LG-MPP): Towards Defining Reference Materials

Taiwo Ayorinde*, Precious Obiako, Clancy Collom and Dr. Christie Sayes; Baylor University (*Student Poster*)

Microplastic pollution is a serious environmental concern due to the potential to induce toxicological effects on both aquatic and terrestrial organisms. When plastic waste enters the environment, they are subjected to an array of environmental conditions as well as biotic and abiotic agents. Preliminary studies have shown that plastic debris interacts with natural stressors which could result in physicochemical changes in that plastic particle surface which in turn can promote the deformation and discoloration of microplastic particles as well as serve as a sorbent material for organic and inorganic substances in the environment. Understanding the weathering process is difficult, especially when considering the different weather conditions globally. Hence, the development of laboratory simulations using simulated environmental stressors can aid in the design of experiments studying the fate, transformation, and eventual effects of degraded microplastics. Currently, there is limited knowledge about degradation mechanisms, changes in surface morphology, and chemical compositional changes of aged plastic particles. In this study, laboratory generated pristine plastics were micronized and exposed to simulated solar radiation, thermal oxidation, increasing salinity conditions, and chemical oxidation over prescribed time periods ranging 1 week to 3 months. Thereafter, characterization of the weathered particles were assessed using Energy dispersive x-ray-Scanning electron microscopy (EDX-SEM), fourier transform infrared spectroscopy (FTIR) to explore changes in surface morphology and chemical composition, respectively. Preliminary results show that short term weathering does not significantly change the properties of real-life particles. The findings of this research will help policymakers make educated judgments regarding the potential health effects of weathered microplastic exposure in humans.

Bioprospecting the gut Microbiome of *Zophobas morio*: The Search for Plastic-Degrading Microbes

Rigoberto Carmona*, Gloribel Carmona, Isaiah Mitchell, and Dr. Kasia Dinkeloo; University of Texas at Austin. (*Student poster*)

Plastics are some of the most useful and convenient inventions for mankind. Could you imagine a world without them? While plastics are omnipresent in our everyday life, they are also increasingly detrimental to the environment. Plastic waste is not easily degraded, and is piling up by the day. The larvae of the darkling beetle, *Zophobas moro*, (also known as Superworms!) have been shown to ingest and degrade styrofoam—they host microbes in their gut capable of depolymerizing polystyrene. While several studies have been initiated on the superworm gut microbiome, it is known that microbiomes can shift for a variety of reasons such as environment and diet. Here, we have conducted experiments in which our superworms are fed diets composed of various elements including styrofoam and other plastic polymers. We are now in the process of conducting targeted metagenomic sequencing to understand how ingestion of plastic polymers might impact worm gut microbial communities, with an eye towards identifying new plastic-degrading microbes for further characterization.

Characterizing Class A Land-Applied Biosolids and Microplastics Emerging to Quantify Transport from Agricultural Fields to Freshwater Systems

Marcela Strane*§, Dr. Devin Shaffer; University of Houston. (*Student poster*)

Microplastics (MPs) are emerging contaminants that pose a threat to human health, agricultural applications, and aquatic environments, and thus, there is an active global effort to mitigate MP pollution. Biosolids, which are wastewater-derived solids that are rich in nutrients and often land applied as fertilizers and retain and pose a potential risk of rereleasing MPs into the environment. With rainfall-induced runoff events, MPs can be transported to surface water bodies. To better understand the transport of these microplastics from terrestrial to aquatic environments, the physical and chemical properties of Class A Hou-Actinite biosolids and the MPs contained within were characterized. The size distribution of the biosolids were determined by image analysis using ImageJ and by gravimetric analysis using the ASTM

sieving method (Standard D6913/D6913M - 17). The results were statistically compared using Origin Lab data analysis software to determine whether the biosolid sizes followed a Normal Distribution or Lognormal Distribution. Microplastics were separated from the biosolids by visual inspection and by gravity separation in a saturated sodium chloride solution following the NOAA Marine Debris Program protocol. The MPS chemistry was characterized by Raman spectroscopy with reference to the SLoPP-E and SLoPP Raman spectral libraries. Sizes of the extracted MPs size were measured by ImageJ Analysis. The results of this study are contributing to a microplastic library for agricultural environmental samples with the goals of bridging the gap in knowledge about the potential rerelease of microplastics into the environment from land-applied biosolids.

Crowd Sourcing Plastic Pollution Data Throughout the United States and Beyond

Tracy Weatherall* and Jace Tunnell; The University of Texas Marine Science Institute.

Nurdle Patrol's citizen science program has recorded plastic pellet concentrations along beaches, lake shorelines, riverbanks, and railroads from volunteers conducting 10-minute surveys. Over 5,000 citizen science volunteers have collected 16,000+ surveys at more than 5,000 sites across the United States, Mexico, and 16 other countries to help identify possible sources of the plastic pellets (nurdles). Nurdles are small plastic pellets that are the basis of almost everything plastic. Nurdles look like food to animals causing possible intestinal blockage and/or starvation if eaten, and they absorb harmful chemicals in the environment that are known to have negative impacts on fish and wildlife. Other benefits to the Nurdle Patrol program include removal of nurdles from the environment, creating an awareness about the nurdle issue, and using citizen science data in management decisions. This presentation will focus on Nurdle Patrol efforts by citizen scientists along the Gulf of Mexico, what the data is showing, and future direction of the program in changing policy about plastics reaching the ocean.

Development of a Novel Method for Micro(nano)plastics Extraction in Particulate Organic Matter and Surface Water from Lavaca Bay System.

Oluniyi O. Fadare*, Leisha Martin, Nigel Lascelles, Jessica T. Myers, Karl Kaiser, Wei Xu, Jeremy L. Conkle and Hussain Abdulla; 1. Department of Physical & Environmental Sciences, Texas A&M University-Corpus Christi. 2. Department of Life Sciences, Texas A&M University-Corpus Christi, 3. Department of Marine and Coastal Environmental Science, Texas A&M University at Galveston, Galveston, 4. Delaware River Basin Commission, Trenton, NJ.

Lavaca Bay is a hotspot for plastic of various sizes, colors, and shapes, which was traced to the activities of Formosa plastics cooperation and other anthropogenic activities within this locality. While microplastics such as nurdles have received adequate monitoring within this Bay system, small plastic particles (<1 mm) released by the same company remain neglected. These plastic particles, which are more numerous compared to other plastic sizes, are difficult to remove from the environment, potentially adsorb more contaminants, and are easily ingested by marine species. We developed a novel procedure that exploits water-alcohol (binary mixture) solvation and hydrophobic interaction mechanisms to extract microplastics from particulate organic matter (POM) and surface waters in Lavaca Bay. The isolated microplastics were quantified and characterized using FTIR and SEM. The particle size and percentage weight ranged from 30 - 1000 μm ; 100 - 2500 μm and 2.62-21.3% w/w; 0.04-0.42% w/v for POM and surface water, respectively. having different polymer types, colors, and shapes, where polyethylene (65%) and polypropylene (18%) are the major polymers identified. Method recovery assessed using spiking yielded 89-93.1% and was validated by visual sorting with dye staining. The method's merits are that it is low-cost, simple, and has an environmentally-sustainable approach that is efficient for various particle sizes, shapes, types, and sample matrices. Also, this low-cost approach and the near-universal availability of ethanol make this method suitable for use in peer-reviewed research and educational settings across regions of the world where plastic debris is a major challenge.

Exposure of Terrestrial Birds to Microplastic: The Effects of Urbanization and Ecological Traits

Alexis Baum*, Dr. Jennifer Smith; University of Texas at San Antonio. *(Student poster)*

Microplastics (<5mm) have deleterious impacts on wildlife and biodiversity. However, little research has examined the exposure of terrestrial birds to microplastics, and it is unknown how urbanization relates. This study aims to investigate terrestrial birds' exposure to microplastics by examining gastrointestinal

contents and the correlation between ecological traits such as foraging type and microplastic loads. Birds will be collected during window strike surveys in southern Texas. We also will compare microplastic exposure of terrestrial birds across an urban gradient using Crested Caracaras (Caracara cheriway) as a model system. During the breeding season, we will collect Crested Caracara regurgitated pellets under nests in San Antonio, Texas. Digestive tracts and regurgitated pellets will be digested in a 10% potassium hydroxide solution, filtered, and microplastics will be visually counted under a stereomicroscope. To circumvent misidentification, Fourier-transform infrared spectroscopy (FTIR) will be employed for polymer identification. We predict that most sampled birds will contain microplastics with higher loads in ground foraging species such as granivores. We also anticipate a correlation between microplastic loads in pellets and urban land usage. This research will provide insight into microplastic exposure of terrestrial birds and produce information that can be used to inform management plans that mitigate the potential effects of microplastics on wildlife.

Microbial Communities Associated with Microplastics and Detritus Collected on the Shores of Galveston Bay

Alliana Olalde, Laura Packer*§, Paul Shrewsbury IV, Michael G. LaMontagne; Clear Falls High School, University of Houston-Clear Lake. *(Student poster)*

Coastlines of Texas are highly polluted with microplastics (μPs). These particles can disperse pathogens that can threaten the health of bathers and result in closures of shellfish industries. Biofilms on μPs can also facilitate transfer of antibiotic resistance genes and could contribute to emergence of highly virulent strains of pathogens. Driftwood and other detritus are also common on beaches but few studies have compared the microbial communities associated with detritus and μPs. To address this, we collected detritus and μPs on two beaches along the shores of Galveston Bay. Readily-culturable, aerobic, heterotrophic bacteria were isolated from these particles and identified with a matrix-assisted laser desorption - time of flight mass spectrometry system. Cluster analysis of mass spectra generated from 30 isolates identified 12 phylogenetic groups. The library generated from detritus included *Brevundimonas vesicularis*, which is an opportunistic pathogen, and a large cluster, of 10 isolates, that were not observed on μPs. The library generated from μPs did not contain any bacteria that were identified with the mass spectrometry system but included a cluster that was predominantly associated with μPs. These results suggest that detritus and μPs both support different bacterial communities.

Microplastic Accumulation in the South and North Shores of Maui, Hawai'i

Victoria Teoh*§, Marc H. Hanke; The Honors College, University of Houston. *(Student poster)*

Microplastics can be found in every environment around the world and are becoming more prevalent in the marine ecosystem as the use of plastic continues unabated. Over 8 million metric tons of plastic travel from the land to the ocean each year; plastic in the ocean degrades into microplastics, releasing harmful chemicals. Microplastics are plastic particles ranging in size from 1mm to 5mm that threaten the marine ecosystem by becoming incorporated into food webs and being sequestered in sediments on beaches. Archipelagos, such as Hawai'i, are at high risk of plastic pollution. This study quantified microplastic abundance on the north and the south shores of Maui, Hawai'i. The north shore of Maui experiences strong currents and is more industrialized, while the south shore is protected from strong currents and experiences greater tourism. During June and July 2022, microplastics were sampled at three tidal levels on two northern and two southern beaches. The south shore had finer sand, a significantly greater abundance of microplastics, and significantly greater quantities of microplastics at higher tide lines when compared to the north shore. These results suggest current dynamics and increased anthropogenic impact may be contributing to microplastic loads 10 times higher on the south shore beaches. Understanding the sources and types of microplastics is needed to further protect Hawai'i's fragile ecosystems.

Microplastics in the Galveston Bay Watershed: The Big Impacts of Tiny Pollution - Citizen Science Sampling

Morgan Huette*, Turtle Island Restoration Network.

Galveston, Texas, is a small barrier island situated in a geological location that results in large deposits of marine debris on its shores. Galveston Island is at the bottom of the very large Galveston Bay watershed, which contains 3 large metropolitan cities, and is positioned in such a way that it is a major collection point for marine debris traveling the currents circling the Gulf of Mexico. The sheer amount of marine

debris along the entire Texas Gulf Coast is a concern, and as materials like plastic break down, an increasing number of microplastics (i.e., plastic particles and fibers <5 millimeters (mm)) are being found in the environment. With the potential impacts microplastics have on our coastal ecosystems and the Gulf of Mexico's diverse marine organisms, microplastics have become an emerging issue of concern in Texas.

Turtle Island Restoration Network (TIRN) started a citizen science sampling project for the Galveston Bay watershed in 2017 by adopting the protocols from the Mississippi State University (MSU) Sampling and Processing Guidebook (Appendix B) and the Florida Microplastic Awareness Project (FMAP) Volunteer Manual (Appendix C). In the past 3 years, the project has been in partnership with the Environmental Institute of Houston (EIH) at University Houston of Clear Lake. This poster presentation will display how this continued citizen science microplastic study has not only engaged volunteers, interns, and students in microplastic sampling, processing, and data summarization of surface water and sediment samples, but also has increased public knowledge on the issue of microplastics.

Prevalence of Antibiotic Resistant Vibrio Species Associated with Microplastics in Galveston Bay

Allison M Wyrick*§, Alex Estala, Michael G. LaMontagne; University of Houston-Clear Lake.
(*Student poster*)

Microplastics (µPs) are ubiquitous in marine systems and threaten the health of marine animals. These particles could also facilitate the spread of antibiotic resistance genes, which could lead to outbreaks of antibiotic resistant bacteria (ARB). Galveston Bay is coupled to a highly urbanized and industrialized watershed. This system has high levels µPs and receives wastewater from the largest medical center in the world. This effluent may be rich in antibiotics but little is known about the prevalence of ARB associated with µPs in this system. To address this, we deployed model µPs by suspending mesh bags in Galveston Bay. After harvest, bacteria were isolated from µPs and identified with matrix-assisted laser desorption ionization - time of flight mass spectrometry. *V. alginolyticus*, an important cause of waterborne disease, was the most abundant bacteria isolated. Representative isolates were then tested for resistance to 12 antibiotics with a disc diffusion assay. Of five isolates tested, four were resistant to multiple antibiotics. This suggests that µPs in Galveston Bay may be a hot spot for multi-antibiotic resistant strains of *V. alginolyticus*.

Selective Culture and Sequencing of Polystyrene-Degrading Microbes From the gut of the Superworm, *Zophobas morio*

Gloribel Carmona*§, Rigoberto Carmona, Dr. Kasia Dinkeloo; University of Texas at Austin
(*Student poster*)

The plastic crisis is a manmade global issue that is negatively impacting biospheres and wildlife all across the world. It is estimated that around 6.3 billion tons of plastic waste was generated between 1950 and 2015, of which only 9% was recycled. The characteristic that makes plastic so useful is the very characteristic that makes plastic so threatening; its durability and inability to degrade. However, recent advances research involving plastic-degrading enzymes provides a potential solution to this pressing issue. The larvae of the Darkling Beetle *Zophobas morio*, (commonly called Superworms), have been shown to ingest and digest polystyrene with the help of their gut-dwelling microbes. It is evident that these creatures possess some incredible biodegrading abilities, and that these abilities could potentially be used to help solve the plastic crisis. Here, we have extracted and selectively cultured the gut microbes of superworms using a media containing polystyrene as a sole carbon source. We will present preliminary findings of microbial barcoding and isolation experiments with the end goal of isolating and characterizing microbial species capable of depolymerizing polystyrene.

The Distribution and Weathering Status of Plastic Pellets (nurdles) Along Southwestern Gulf of Mexico Shorelines From Veracruz to Campeche, Mexico

Jianhong Xue, Xiangtao Jiang, Jace Tunnell, Zhanfei Liu*; University of Texas Marine Science Institute.

Plastic pollution is one of most challenging issues in the marine environments due to its resistance to degradation and potential toxicity to organisms. Nurdles, also known as plastic pellets, are one of plastics

commonly found along the Gulf of Mexico shoreline. To evaluate the polymer type and weathering degree, nurdles were collected from Veracruz to Campeche shorelines in September 2022. Our results showed that nurdles at Allende and Coatzacoalcos were the most abundant, while those in Ciudad del Carmen and beyond were in very low abundance. For the polymer type, 95% of the nurdles were made of polyethylene, with the other 5% polypropylene. Weathering Index (WI) was used to evaluate polyethylene nurdles based on FTIR. Four functional groups, including hydroxyl (R-OH), carbonyl (C=O), carbon-oxygen (C-O), and double bond (C=C) were included for the calculation of WI. Nurdles collected from Veracruz, Allende and Coatzacoalcos have significantly higher WI than those collected in Campeche. This pattern may be related to sources of nurdles and coastal current of Gulf of Mexico. These results will be further compared and discussed with nurdles collected from South Texas.

The Identification and Quantification of Microplastics (MPs) in Soil Samples Using Fluorescent Imaging & MPs Effect on Plant Development

Wendi Deng*, Dr. Kasia Dinkeloo; The University of Texas at Austin, College of Natural Sciences, The Freshman Research Initiative. (*Student poster*)

Microplastics (MPs) are plastics less than 5 mm in length that are formed for manufacturing purposes and when larger plastics degrade. Because of our extensive use of plastic and limited recovery through recycling, plastic wastes accumulate, leading to MPs leakage in our environment. Unfortunately, the impact of MPs on our environment is not fully understood. To study this topic, it's important to be able to identify and quantify MPs in a given soil sample. While there are several proposals from past literature, there isn't much data on testing these methods using real-life samples. Thus, this study investigates whether one of these methods, Nile Red stain coupled with a fluorescein isothiocyanate (FITC) filter, may be an effective way to locate MPs in soil samples. For this experiment, soil samples were collected from five areas around UT Austin (Turtle Pond, Greenhouse area, Clark Field, Jester Garden, and trash area). Screening using a fluorescence microscope showed that on average, there are more MPs in the trash area and in areas with high foot traffic. Another part of the study involves determining whether MPs would affect the germination rate and growth of radishes (*Raphanus sativus*). The results revealed that MPs accumulation in seeds results in a lower germination rate and that radish stems tend to curve more often when grown in soil containing MPs. The findings in this study provide evidence that Nile Red stain & FITC filter can efficiently screen for MPs in soil samples and that MPs may negatively affect plant development.

The Nurdleome

Vibha Annaswamy*§, Dr. Kasia Dinkeloo; University of Texas at Austin. (*Student poster*)

Microplastics such as nurdles are significant contributors to marine pollution, taking thousands of years to decompose naturally. As plastics persist in the environment, they are often colonized by microbes. By studying microbes that are living on nurdles, we hope to identify species that may have the ability to break down the plastic they reside on to use as a carbon source. Initially, individual colonies were cultured, isolated, and analyzed using DNA sequencing to identify the species closely associated with the nurdles. However, to gain a more comprehensive understanding of the nurdle microbiome, we have moved towards targeted metagenomic sequencing of groups of nurdles from the Texas Coast. Here, we hope to (1) understand the full diversity of coastal nurdle-dwelling microbes, and (2) identify potential species of interest for plastic or pollutant degradation.

Towards Long-Term Monitoring of Plastic Pollution in the Matagorda Bay Systems: Quantitative Analysis and FTIR Characterization of Macroplastics.

Casey Gallagher*§, Oluniyi O. Fadare, Jeremy L. Conkle, and Hussain Abdulla; Department of Physical & Environmental Sciences, Texas A&M University-Corpus Christi, TX. Delaware River Basin Commission, Trenton, NJ. (*Student poster*)

The ecosystem services provided by Texas's coastal bays and estuaries are highly prized assets that fuel the region's economy. Tourism, recreational and commercial fisheries in coastal Texas contributed a total of \$24.3 billion to the region's economy in 2014 alone, supporting 33,880 jobs. Texas's coastal zone economic viability of recreational and commercial fisheries is tied to the water quality of our rivers and coastal bays. Plastic debris in rivers, streams, and coastal bays is a growing threat to Texas's economy; first, it is unsightly, potentially reducing tourism, and second, it affects aquatic organisms' health. We

monitored and assessed the ubiquitous macroplastic debris within Matagorda Bay as part of our ongoing research on plastics and mercury interaction. From only July 2022 survey, a total of 568 plastic items were collected. The total plastic weight per site ranged between 0.14 and 813.25 g. The sites North and South of the causeway in Point Comfort recorded the highest and lowest macroplastics. Using Fourier-transform infrared spectroscopy (FTIR), the most abundant plastic-type across all sites were polyethylene (33.5%), polypropylene (20.9%), and polystyrene (10%). Principal component analysis (PCA) showed a positive correlation between the polymer type, plastic color, and sampling location revealing post-consumer plastic discharge. The final outcome of this monitoring program is expected, among others, to provide comprehensive data on plastic litter sources, driving factors, and major contributors that need to be targeted in a litter-minimization strategy to protect Matagorda Bay systems from plastic pollution, reduce the negative effect of mismanaged plastic debris and ensure sustainable recreational and commercial fisheries within bays.

Using Image Classification Methods to Detect Coastal Debris after Major Storms

Jennifer Avila*§, David Retchless; Texas A&M University Galveston, Department of Marine and Coastal Environmental Science. (*Student poster*)

To inform best practices for the use of GIS in coastal debris identification, this project compares the effectiveness of image classification methods used to identify coastal debris after a major flood event. Using ArcGIS, supervised versus unsupervised classification methods for debris identification are compared using aerial imagery captured by NOAA for the Galveston Bay Area following hurricane Ike. Coastal debris identified include larger, identifiable items such as building materials (e.g., pickets and roofing), furniture, and fishing gear, as well as large debris fields composed primarily of smaller debris items (likely including everyday items such as plastic water bottles and food wrappers). Understanding how to best identify these coastal debris is important to help pinpoint both areas in need of cleanup during the recovery phase and areas where debris are likely to become concentrated following future storms. This information can help to shift resources towards areas with heavy coastal debris loads, thus helping plan for future debris cleanups. This information can also be used to identify hot spots of coastal debris along the coastline and examine the relationship between coastal debris and other variables, including coastal development, socioeconomic changes in nearby communities, and climate change. Future work will extend these results to consider the implications of protective structures like the planned Coastal Spine for post-storm debris distribution and concentration.

Using Nurdles to Solve the Plastic Pollution Hurdle

Kristen Lowe*§, Dr. Kasia Dinkeloo; University of Texas at Austin. (*Student poster*)

Nurdles are small plastic pellets that are used in the manufacturing of plastic goods. These pellets are all too often found in ocean, coastal, and inland environments due to spills or accidents in transit. As the nurdles persist in the environment, they are colonized by microbes. We theorize that some microbes found on the surface of these nurdles may in fact be using the nurdle as a carbon source, and can therefore research the microbes associated with these nurdles to help tackle the global plastic pollution crisis. If we can identify and isolate these microbes, we could potentially characterize and extract their enzymes for plastic degradation purposes. Here, we tackle this problem by culturing microbes associated with nurdles from various environmental sources for microbial barcoding. Previously, *Pseudomonas* species were identified in our lab from nurdles sampled from Mustang Island, TX. Analysis of nurdles sampled from a separate location, Cox Creek, TX, strongly indicated the presence of a *Lysinibacillus* species. *Bacillus*, *Fictibacillus*, and *Nocardiopsis* species were also identified from these nurdles with less certainty.

University of Houston-Clear Lake

Parking Map

Campus Directory

North Campus

Buildings

- ① Police Department
- ② Central Services
- ③ North Office Annex (NOA) 1&2
- ④ Recreation and Wellness Center
- ⑤ STEM and Classroom Building
- ⑥ Hunter Hall
- ⑦ Student Services and Classroom Building
- ⑧ Bayou Building

Parking

- A Faculty/Staff
- B Faculty/Staff
- C State Vehicles
- D Faculty/Staff
- E Student
- F Student
- G Student
- R Visitor

Paystation

- P D4 Parking & Rec.&Wellness
- R Parking & Visitor Lot

South Campus

Buildings

- H Arbor Building North
- I Arbor Building Central
- J Arbor Building South
- K Delta Building
- L University Forest Apartments

Parking

- G Student
- J Student

Paystation

- P G Parking & Delta



University of Houston-Clear Lake

Bayou Building Map



BAYOU BUILDING
FLOOR
1

MAP KEY

- FACULTY/ADVISORY
- CLASSROOM
- WELLNESS
- PUBLICATIONS
- DEVELOPMENT
- ARTS & CULTURE
- DINING & EVENTS
- STORE
- INFORMATION
- ELEVATOR
- STAIRS
- RESTROOMS

