



March 4-5th, 2021



MATAGORDA BAY MITIGATION TRUST



Beach Resort in South Padre Island, Texas

Welcome!

The University of Texas Marine Science Institute, Mission-Aransas National Estuarine Research Reserve, Texas Parks and Wildlife Department, Texas Sea Grant, Gulf Guardians, Coasta Cleanups, and South Padre Island Convention and Visitors Bureau are proud to host the third 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.

This year the symposium is a hybrid meeting, with both in-person and virtual presentations. For those attending in person, meals will be catered by the Beach Resort Hotel Restaurant. There will be over an hour for lunch, followed by a great presentation by Diane Wilson about her life growing up on the coast and her fight with Formosa Plastics.

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

Texas Plastic Pollution Symposium Planning Committee:

Jace Tunnell, Aarin Hartwell, Katie Swanson, Tracy Weatherall, Kate de Gennaro, Christina Marconi, Carolyn Cardile, Liana Garcia, Mayra Nunez, Sarah Cunningham, Victor Baldovinos, Shelby Bessette, and Tonya Tallard.

A special thank you goes to volunteers and moderators:

Abe Waterman
Costal Cleanups
Gulf Guardians
Rocket Surfers
Texas Master Naturalist

Follow the meeting on social media with #TxPPS2021

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Invited Speaker Biography

Diane Wilson, fourth-generation shrimper, boat captain, mother of five, author, and an environmental, peace, and social justice advocate



During the last 30 years, Diane has launched legislative campaigns, demonstrations, hunger strikes, sunk boats, and even climbed chemical towers in her fight to protect her Gulf Coast bay.

She is a co-founder of Code Pink, the women's anti-war group based in Washington, DC and co-founder of the Texas Jail Project, which advocates for inmates' rights in Texas county jails. Since 2012, Wilson has been executive director and waterkeeper of San Antonio Bay

Estuarine Waterkeeper on the Texas Gulf Coast. In 2016, she and a small group of former workers and whistleblowers from Formosa Plastics started collecting plastic violations over a 20-mile area of Lavaca Bay and surrounding waterways. Within a 4-year period they have collected over 2500 samples of violations and 6000 videos and photos of plastic pollution coming from Formosa Plastic outfalls. In 2017, Texas RioGrande Legal Aid filed a citizens Clean Water suit on behalf of Wilson and the San Antonio Bay Estuarine Waterkeeper. In June 2019, a federal judge ruled on their behalf and declared Formosa a serial offender with over 1800 clean water violations. The case was settled in December 2019 with a precedent setting \$50 Million awarded towards local environmental projects. The plaintiffs received no funds.

Wilson was featured in the award-winning documentary *Texas Gold*, and in *Americans Who Tell the Truth*, a portrait series by photographer Robert Shetterly. She won the Blue Planet Award in Berlin, Germany for her activist work and in March 2020 Netflix featured the SABE Waterkeeper story in Dirty Money series, Point Comfort.

Wilson is the author of three books: *Unreasonable Woman*, *Diary of An Eco-Outlaw*, and *Holy Roller* that was published by Chelsea Green Publishing. She is currently working on her fourth book.

Symposium Schedule

March 4th, 2021

8:00 AM - **Registration**, Beach Resort in South Padre Island, Texas

9:00 AM - **Welcome and Opening Remarks**, Jace Tunnell, Director, Mission-Aransas National Estuarine Research Reserve at The University of Texas Marine Science Institute

POLICY AND URBAN COMMUNITIES

9:15 AM - **Nurdle Patrol: Inspiring Change**
Jace Tunnell

9:30 AM - **Plastic Pollution Policy in Texas**
Shelby Bessette*, Chancy Schaaf* (*Student presentation*)

CHEMISTRY OF PLASTIC POLLUTION

9:45 AM - **Bioplastic accumulates antibiotic and metal resistance genes in marine sediments**
Andrea Di Cesare, Lee J Pinnell, Diego Brambilla, Giulia Elli, Raffaella Sabatino, María B Sathicq, Gianluca Corno, Colin O'Donnell, Jeffrey W Turner*

10:00 AM - **Effects of micro- and nano-plastics on EPS aggregate formation**
Peter Santschi*, Wei-Chun Chin, and Chen Xu

10:15 AM - **Evaluating weathering status and sources of nurdles along beaches of Texas**
Xiangtao Jiang*, Jace Tunnell, Zhanfei Liu (*Student presentation*)

10:30 AM - **Mercury and Plastic in Commercial and Recreational Fisheries in Lavaca, Matagorda, and San Antonio Bays: Risk Assessment and Interaction between the Two Contaminants**
Jeremy L. Conkle*, Jessica Dutton

10:45 AM - **BREAK**

MONITORING

11:00 AM - **Microplastic abundance and distribution along the continental shelf in the northern Gulf of Mexico**
Caitlin Wessel*, Andrew Lucore, Gillian Palino

11:15 AM - **Presence of Microplastics in rivers that propagate within the Veracruz Reef System and in reefs exposed to their discharges.**
Alexa Osio Mendoza*, Lorena Rios Mendoza, Horacio Pérez España (*Student presentation*)

11:30 AM - **Analysis of Microplastic Pollution on Three Texas State Park Beaches**
Maureen J Hayden (*Student presentation*)

11:45 AM - **LUNCH**

INVITED SPEAKER

1:00 PM - **Life and Times of the hunt for plastic in Lavaca Bay**
Diane Wilson

IMPACTS TO FISH AND WILDLIFE

1:30 PM - **Occurrence of microplastics in the diets of juvenile fish of Texas Coastal Bend bays**
M. Gray Ryan*, Simon J. Geist (*Student presentation*)

1:45 PM - **An Assessment of Microplastics in Resacas of the Lower Rio Grande Valley**
Wes Franklin*, Elizabeth Heise (*Student presentation*)

2:00 PM - **Effects of microplastics in olfactory function of Texas bass species**
Mar Huertas*, Jeremy Conkle, Christie M. Sayes

2:15 PM - **Trash ingestion by green sea turtles (*Chelonia mydas*) over a 33-year period along the Texas coast**
Daniel Y. Choi*, Donna Shaver (*Student presentation*)

2:30 PM - **BREAK**

SOLUTIONS

2:45 PM - **From Grants to Invoices: A Sustainable Model for Fishing Gear Recycling**
Nicole Baker Loke*, Sara Aubery, Erin Adams

3:00 PM - **Ocean Friendly Foodware: Helping Restaurants Embrace Legislation**
Rachael Coccia*, Jennie Romer*

3:15 PM - **Plastic Pollution & the Service-Learning Classroom: A Case Study from the Mississippi Gulf Coast**
Christopher D. Foley*, Alen Hajnal*, Elizabeth Englebretson*

3:30 PM - **Combating Plastic Pollution Using Citizen Science**
Kimber De Salvo Anderson

3:45 PM - **Wrap-Up and Closing Remarks**
Jace Tunnell

4:00 PM - **POSTER SESSION (In-Person ONLY)**

4:30 PM - **PROGRAM END**

Poster Titles & Presenters

The poster session for this symposium is scheduled from 4:00- 4:30pm on Thursday, March 4, 2021. Happy hour will begin at 4:00pm 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 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.

Source-to-Sink: Tracking Tire Microplastic Pollution in Texas

Cole L. Carrabba*, James H. Gearon, Cornel Olariu (*Student presentation*)

Impact of Plastic on Air Pollution in the Lone Star State: A Review

Md. Salahuddin Majumder*, Amit U. Raysoni (*Student presentation*)

Removal of methyl blue from aqueous solution affected by biochar feedstock and possible Microplastic cleanup implementation

Carlos García Patlan*, Dr. James Kang (*Student presentation*)

Plastic **Free** Padre Family Expo

March 5, 202

****In-Person Attendance Only****

BEACH CLEANUP

- 8:30 AM - **Registration**, Beach Resort in South Padre Island, Texas
- 9:00 AM - **Cleanup and Nurdle Patrol**, behind the Beach Resort in South Padre Island, Texas
- 11:00 AM - **Lunch**, onsite options include Sea4Ever Buffet, Taco Palenque and SeaSide Grill

OUTSIDE EDUCATION BOOTHS

- 11 AM - **Texas Parks and Wildlife Department:** Longline Exhibit/Table (Front Parking Lot)
Gulf Guardians: Plastic Free Padre/ Photo Booth & Pledge signs, Eco Bricks
SPI Sessions: Plastic Art Activities by the *Rocket Surfers*
Costa Cleanups: Beach Cleanup Info
Coastal Studies: Touch Tank CSL and Watershed Model
Sea Turtle Inc.: Plastics and Sea Turtle Wildlife
Texas Master Naturalists: Information
South Padre Island Environmental Health Department: Recycling

PLASTICX TALKS

Location: Pool Common Area (Outdoor)

- 12:00 PM - **Recycling on South Padre**
Victor Baldovinos; Director, SPI Environmental Health Dept.
- 1:00 PM - **Volunteerism, Areas Needing Cleaning and Upcoming Events**
Tonya Tallard; Founder, Costa Cleanups
- 2:00 PM - **Recouping: Steps to Success after Deadly Arctic Freeze**
Khrystyne Jamerson; Education Director, Sea Turtle Inc.
- 2:30 PM - **Creating Art with and In Your Environment**
Abe Waterman; World Renowned Sand Sculptor and Artist, Art Director Gulf Guardians
- 3:00 PM - **Unlitter It**, music & presentation
Lucinda "Sandy Feet" Weirenga & Jose Sanchez; Sons of the Beach
- 3:30 PM - **Trashion Fashion Show**
Rocket Surfers, SPI SESSIONS Kids Camps

OUTREACH DISCUSSIONS

Location: Hibiscus Room (indoor)

- 12:00 PM - **How Plastic Pollution Effects Sea Turtles & Marine Life**
Khrystyne Jamerson; Education Director, Sea Turtle Inc.
- 12:30 PM - **Be A Beach Buddy- Data Collection, Brand Auditing**
¹Tonya Tallard, ²Aarin Hartwell; ¹Costa CleanUps, ²Gulf Guardians
- 1:00 PM - **Help Fight Plastic Pollution: Nurdle Patrol (Workshop & Discussion)**
Jace Tunnell, Director, Mission-Aransas National Estuarine Research Reserve at The University of Texas Marine Science Institute
- 2:15 PM - **Plastic Free Gulf Coast (Video Presentation)**
Elizabeth Englebretson; Founder & Manager, "Plastic Free Gulf Coast"
- 2:30 PM - **Transitioning Local Culture & Businesses to Plastic Free Living**
Aarin Hartwell; Founder and Initiative lead, Gulf Guardians, "Plastic Free Padre"
- 3:00 PM - **The Effects of Illegal Fishing on the Local Ecosystem**
Mike Gonzalez; Texas Game Warden, Texas Parks and Wildlife
- 4:00 PM - **Environmental Filmmaking (Workshop & Discussion)**
¹Rene Rhi, ²Aarin Hartwell; ¹President, Brownsville Film Society, ²Gulf Guardians
- 5:00 PM - **Smog of the Sea (Film Screening and Discussion)**
LaVida Judd, Discussion Host

Abstracts for Oral Presentations

POLICY AND URBAN COMMUNITIES

Nurdle Patrol: Inspiring Change

Jace Tunnell; Mission-Aransas National Estuarine Research Reserve at the University of Texas Marine Science Institute

Nurdle Patrol is a citizen science project led by the Mission-Aransas National Estuarine Research Reserve at the University of Texas Marine Science Institute in Port Aransas, Texas. Over 2,300 volunteers have collected over 7,000 surveys at over 3,000 sites across the Gulf of Mexico to help identify possible sources of the plastic pellets (nurdles) washing up on beaches, riverbanks, and lake shorelines. Nurdle Patrol is looking to gather information about where nurdles are located across the Gulf of Mexico, remove the nurdles from the environment, create awareness about the nurdle issue, and change policy about plastics reaching the ocean. Nurdles are small plastic pellets and are the basis of everything plastic. They are small and look like food to animals, and they absorb harmful chemicals in the environment so could be deadly to some animals. You can be a part of the solution by doing your own survey! Come to this presentation to hear how you can get involved, and to see the latest efforts of policy changes in Texas.

Plastic Pollution Policy in Texas

Shelby Bessette*, Chancy Schaaf*; UT Rio Grande Valley (*Student presentation*)

Stronger policies to mitigate plastic pollution are necessary on all government levels. Policy change often has origins at the grassroots level, but it can be difficult to have policies established and implemented state and nationwide in long established systems. We often find small case studies of local laws attempting to reduce plastic pollution, such as plastic bag bans, or companies banning plastic straws. Towns and cities can create their own programs to help with the pollution problem, however these programs can be challenged and even prohibited statewide. Evidence of this occurrence is noted in the Texas Supreme Court case, Laredo Merchants Association v. The City of Laredo, where Laredo's city-wide plastic bag ban resulted in legislature that prevented Texas cities from implementing similar policies locally. As a conservative state, Texas is more lenient on pollution laws and regulations, which is evident in the fact the state has some of the worst water quality readings in the country. Through the lens of the Punctuated Equilibrium Theory and examining the role of political subsystems and previous punctuations in pollution policy, we will evaluate the steps activists and leaders can take to create movements in policy towards reducing plastic pollution, as well as evaluate the potential of passing vital legislation.

CHEMISTRY OF PLASTIC POLLUTION

Bioplastic accumulates antibiotic and metal resistance genes in marine sediments

¹Andrea Di Cesare, ²Lee J Pinnell, ¹Diego Brambilla, ²Giulia Elli, ¹Raffaella Sabatino, ¹María B Sathicq, ¹Gianluca Corno, ²Colin O'Donnell, ²Jeffrey W Turner*; ¹Microbial Ecology Group, Water Research Institute, National Research Council of Italy, ²Texas A&M University Corpus Christi

The oceans are increasingly polluted with plastic debris, and several studies have implicated plastic as a vector for drug-resistant pathogens. Bioplastic is widely regarded as a promising biodegradable replacement to conventional petroleum-based plastic, but the effects of bioplastic pollution on marine environments remain largely unknown. Here, we present the first evidence that bioplastic accumulates antibiotic resistance genes (ARGs) and metal resistance genes (MRGs) in marine sediments. Biofilms fouling ceramic, polyethylene terephthalate (PET), and polyhydroxyalkanoate (PHA) were investigated by shotgun metagenomic sequencing. Three groups of antibiotic resistance genes were significantly more abundant in PHA: trimethoprim resistance (TMP), multidrug resistance (MDR), and macrolide-lincosamide-streptogramin resistance (MLS). One group of metal resistance genes was significantly more abundant in PHA: multimetal resistance (MMR). The relative abundance of ARGs and MRGs were strongly correlated based on a Mantel test between the Bray-Curtis dissimilarity matrices ($r=0.97$, $p<0.01$) and a Pearson's analysis ($r=0.96$, $p<0.01$). Further investigation (e.g., selective culturing, genome sequencing, phenotype testing) revealed that PHA biofilms included *Bacillus cereus* strains that were multidrug resistant, hemolytic, and potentially pathogenic. Taken together, it is clear that conventional plastic and now bioplastic are not responsible choices if society hopes to quell the spread of antibiotic resistance.

Effects of micro- and nano-plastics on EPS aggregate formation EPS aggregate formation

¹Peter Santschi*, ²Wei-Chun Chin, ¹Chen Xu; ¹Texas A&M University at Galveston, ²University of California Merced

Microbially produced exopolymeric substances (EPS), containing hydrophilic polysaccharides and more hydrophobic proteins, are important for the formation of marine gels and plastic snow. Microgel formation can be greatly accelerated by the presence of small amounts (1-10% of ambient organic carbon concentration) of hydrophobic nanoplastic particles or purified EPS of higher protein content (Ding et al., 2008, *Marine Chem.*, 112, 11). Later Ding et al. (2009, *Terr. Atmos. Ocean. Sci.*, 20, 741), showed that phytoplankton EPS microgel formation is less accelerated by nano-plastics in seawater. In both cases, it was demonstrated that hydrophobic interactions dominated, which cannot be affected by EDTA additions, in contrast to hydrophilic interactions. In Chen et al. (2011, *PLoS ONE*, 6(7), e21865) and Shiu et al. (2020, *STOTEN*, 135681), we showed that phytoplankton EPS microgel formation is greatly accelerated by nano-plastics in seawater likely due to a higher protein content of the EPS produced. The importance of protein/carbohydrate ratios of EPS aggregates was recently demonstrated by Santschi et al. (2020, *Mar.Chem.*, 218, 103734). Shiu et al. (2020, *STOTEN*, 135681) showed that EPS microgel formation from dissolved organic matter was also greatly accelerated by nano-plastics in different river and lake waters in addition to seawater. Patches of algal cells with 1 μm polystyrene micro-particles encased in an EPS matrix have been observed. This marine plastic snow mechanism explains why significant amounts of more buoyant micro- and nanoplastics

can sink and end up in marine sediments, and/or are easily eliminated out of the water by filter-feeding organisms.

Evaluating weathering status and sources of nurdles along beaches of Texas

¹Xiangtao Jiang*, ²Jace Tunnell, ¹Zhanfei Liu; ¹University of Texas at Austin Marine Science Institute, Port Aransas, Tx, Mission-Aransas National Estuarine Research Reserve at the University of Texas Marine Science Institute (*Student presentation*)

Nurdles, the pre-produced plastic pellets used for making plastic products, are now a major source of plastic pollution on beaches often due to unregulated spills during production and transportation. To evaluate the weathering status and sources of the nurdles, we analyzed the nurdles collected along the shoreline of Texas, where nurdles are widespread and in high abundance on beaches. Lightly and heavily weathered nurdles were categorized. Our results showed that new absorption peaks at 1500-1800 cm^{-1} , ester carbonyl (-COO-) and ketone group (C=O), were produced as a result of weathering of nurdles from Fourier Transform Infrared Spectroscopy (FTIR) analysis. There were more mechanically eroded cracks and grooves on the surface of heavily weathered nurdles than lightly weathered ones from Scanning Electron Microscope (SEM) analysis. Higher concentrations of pollutants were detected on heavily weathered nurdles compared with lightly weathered ones. The different weathering status of nurdles and relatively high concentrations of pollutants on heavily weathered nurdles suggest a potential risk of weathered nurdles to marine organisms. These findings need to be considered for toxicity evaluation and resource management. The analysis of sources of nurdles via pyrolysis gas chromatography-mass spectrometry (Pyr-GC/MS) and gel permeation chromatography (GPC) is ongoing and results will be presented.

Mercury and Plastic in Commercial and Recreational Fisheries in Lavaca, Matagorda, and San Antonio Bays: Risk Assessment and Interaction between the Two Contaminants

¹Jeremy L. Conkle*, ²Jessica Dutton; ¹Texas A&M University - Corpus Christi, ²Texas State University

There is an abundance of plastic litter and pellets in Lavaca in Matagorda Bays as well as legacy mercury pollution. Surprisingly, little is known about how this mercury has spread throughout these ecosystems and even less is known about the role that plastic litter and pellets may have played in this spread. Thanks to the generous support of the Matagorda Bay Mitigation Trust, starting this summer, we will be studying this issue by examining plastic and mercury prevalence and their interactions within Lavaca, Matagorda, and San Antonio Bays. These pollutants will be studied in water, sediment, and economically important fisheries. Additionally, within the fisheries studied, the selenium:mercury molar ratios will be determined as this ratio may be a way to assess the safety of mercury-contaminated seafood. The results of this work will help to understand the presence and spread of plastics and mercury within the systems while also generating data that can aid management decisions. More broadly, this work will provide data to better assess seafood safety and the ability and role of plastics in the transport of mercury in the environment.

MONITORING

Microplastic abundance and distribution along the continental shelf in the northern Gulf of Mexico

¹Caitlin Wessel*, ²Andrew Lucore, ³Gillian Palino; ¹NOAA Marine Debris Program, ²Mississippi State University, ³The University of Tennessee, Knoxville

In collaboration with the NOAA Fisheries Southeast Area Monitoring and Assessment Program (SEAMAP), sampling from 2016-2018 yielded the first estimates of sea surface and water column abundances of microplastics in the Gulf of Mexico. Presently, 96 separate stations have been sampled across the continental shelf of the northern Gulf of Mexico ranging from offshore of Brownsville, TX to the Florida Keys. A combination of sampling techniques (whole water sampling, neuston and bongo tows) found microplastics ranging in size from 1 μ m to 5 mm at every station. It was found that either high concentrations of microplastics were found at the surface with low concentrations in the water column or vice versa. However, high concentrations were not found in both the water surface and within the column. Of the whole water samples collected, 99% contained microplastics with an average of approximately 7 microplastics per liter. This average abundance is higher than estimates of less than 1 microplastic per meter squared that models produced in 2015 predicted for the Gulf of Mexico using data from the Atlantic Ocean and an order of magnitude less than samples reported from four sites off Louisiana in 2017. This demonstrates the need for further site sampling to validate models and previous predictions of microplastic concentration and spatial distribution within the Gulf of Mexico.

Presence of Microplastics in rivers that propagate within the Veracruz Reef System and in reefs exposed to their discharges.

¹Alexa Osio Mendoza*, ²Lorena Rios Mendoza, ¹Horacio Pérez España; ¹Instituto de Ciencias Marinas y Pesquerías, Universidad Veracruzana, ²Department of Natural Sciences University of Wisconsin Superior (*Student presentation*)

The plastics production has been increasing since the beginning of its industrialization in the 20th century, characterized by being durable and cheap materials that are easily marketed and discarded. The degradation of this material allows its fragmentation, giving rise to small particles called microplastics (<5mm), which currently represent one of the main pollutants in aquatic environments. A source of distribution of microplastics towards the seas and oceans are rivers, due to the contribution of sediment by drag from the basins. The objective of this study is to analyze the variation in the abundance of microplastics between the three rivers with the highest incidence within the PNSAV and in two reefs exposed to their discharges in rainy and dry seasons over a year. The site that presented the highest abundance of microplastics in both seasons was the Jamapa River (18 in the dry season and 63 in the rainy season), the most recurrent size classification was 3-3.9mm in the dry season, while in the rainy season it was de 2-2.9 mm, most of the shapes found were fragments and there was a greater presence of white and transparent colors.

Analysis of Microplastic Pollution on Three Texas State Park Beaches

Maureen J Hayden; Texas A&M University, Department of Biology, Marine Biology IDP Program (*Student presentation*)

Within the past week have you used a straw, plastic grocery bag, plastic utensil, or a plastic water bottle? If so, then there is a likelihood that even if you properly disposed of the single-use plastic item, it might end up back in the environment. A published two-year survey of marine debris spanning the Gulf of Mexico (GofM) from North Padre Island National Seashore, Texas to Santa Rosa, Florida found that marine debris accumulation rates were ten times greater in Texas than similar coastlines of the north central GofM, with 69-95% of the marine debris consisting of plastics (Wessel et. al., 2019). The goal of this study was to conduct and assessment of the extent of microplastic pollution on Texas state park beaches (Galveston Island, Mustang Island and Sea Rim). Collections took place during the months of June and July during the summer, from September to November during the fall of 2019, and January-February during the winter of 2020. (Permit No: 2019-R4-01). We used a modified surface sediment sampling protocol based on the NOAA Marine Debris Monitoring Program. At each beach, we laid out a 50 X 1 meter transect on the high tide line. We characterized the samples using a dissecting microscope with a camera attachment, and measured microplastics using ImageJ. Microplastics were found at all three sample sites at all collection times. Galveston Island State Park had the most microplastic pollution and amount of microplastics collected for all months sampled.

IMPACTS TO FISH AND WILDLIFE

Occurrence of microplastics in the diets of juvenile fish of Texas Coastal Bend bays

M. Gray Ryan*, Simon J. Geist; Texas A&M University- Corpus Christi (*Student presentation*)

Microplastic pollution in the marine environment is an area of growing concern. The presence, abundance, and effect on marine and estuarine species of microplastic pollution is known to vary geographically, so a complete understanding of global microplastic pollution is dependent heavily on local studies. Despite containing critical nursery habitat for a variety of environmentally and ecologically important fisheries, most bays of the Texas Coastal Bend have not been assessed for interactions between microplastics pollution and residing juvenile fish. In the present study, the digestive tract contents of juvenile fish from five Texas Coastal Bend bays were analyzed for microplastics, and the color, type, and size of each was recorded. Results indicate a tendency for nearly every individual to ingest microplastics occurring in the environment. There is also evidence of temporal and spatial variation in microplastic ingestion by juvenile silversides (*Menidia beryllina*), as well as differential ingestion on the basis of microplastic color.

An Assessment of Microplastics in Resacas of the Lower Rio Grande Valley

Wes Franklin*, Elizabeth Heise; University of Texas Rio Grande Valley (*Student presentation*)

Recent studies have found that every area of the Earth's hydrosphere has been subject to microplastic pollution. Microplastics are microscopic pieces of plastic that are under 5 mm in length. These microplastics are both manufactured through cosmetic microbeads, nurdles, and microfibers from clothing. They also originate from the breakdown of larger plastics through mechanical and chemical processes. Because of the prevalence of microplastics in all water systems on Earth, my hypothesis is that the resacas in the Brownsville area will contain these plastics. Microplastics tend to congregate in three major areas of the environment (water, sediment, and animals). These plastics can be found in the water column, sediment, or in the digestive tracts of animals. Because of this, we have strategized our sampling to include water

samples, sediment samples, and fish samples. I have completed sampling for my thesis and am now working on analysis of the samples. Our two targeted fish species are Sailfin Catfish (*Pterygoplichthys disjunctivus*) and Gizzard Shad (*Dorosoma cepedianum*). All the samples were surveyed under a stereomicroscope in order to identify the microplastics, from there, the microplastics were photographed and analyzed in an infrared spectrometer, which identifies the composition of the plastics. Analysis of fish samples have begun. I am currently analyzing the *D. cepedianum* and *P. disjunctivus* samples from the five resaca systems, and the analysis thus far has shown that microplastics were present in 82% of fish captured.

Effects of microplastics in olfactory function of Texas bass species

¹Mar Huertas*, ²Jeremy Conkle, and ³Christie M. Sayes; ¹Texas State University, ²Texas A&M Corpus Christi, ³Baylor University

Increased plastic pollution affects aquatic environments. Due to increased plastic material waste in natural aquatic ecosystems, fish are threatened by the breakdown of macro-sized plastics into small particles, individual monomers, and leached inorganic chemical species. Each of these transformation products can be easily ingested and absorbed by biological tissue. Most of the studies reporting health effects of microplastic effects on aquatic organisms have focused on the transfer of particles to different organs. However, little is known about the physiological or biochemical effects of these compounds in either short-term (acute) or long-term (chronic) exposures; in fact, the scientific community doesn't even understand the scope of induced lethality of any aquatic species. Here, we present the interdisciplinary methodology used by three independent laboratories designed to systematically investigate the transformations and effects of microplastics and their derivatives to fishes. Data suggested that microplastic particles, regardless of its chemical composition, exposed to largemouth and striped bass species are incorporated through the nose to the brain, dampen olfaction, and compromise several physiological responses associated with the sense of smell, like reproduction and feeding. Our combined efforts have promise to positively impact the rearing of fish species for restoration or recreational purposes in the Texas aquatic environment.

Trash ingestion by green sea turtles (*Chelonia mydas*) over a 33-year period along the Texas coast

^{1,2}Daniel Y. Choi*, ²Donna Shaver; ¹North Carolina State University, ²Padre Island National Seashore (*Student presentation*)

Despite exponential growth of marine anthropogenic debris in recent decades, trash ingestion by sea turtles in the Gulf of Mexico, particularly by green sea turtles (*Chelonia mydas*), is not understood. Existing studies have primarily reported only the presence or absence of trash ingestion, which is uninformative, especially with small sample sizes. Here, gastrointestinal tracts were examined of green sea turtles that stranded in Texas between 1987 and 2019, and 226 of 464 turtles ingested trash (49%). This number doubled overtime from 33% in 1987–1999 to 66% in 2019, though mass of ingested items was lowest in 2019. No turtles showed evidence of death directly related to trash ingestion. Compared to other regions, trash ingestion was low. Small turtles (<25 cm) ingested trash more frequently and in greater amounts than larger turtles. Small turtles also ingested more hard plastic while larger turtles ingested sheet-like and threadlike plastics, which may correspond to size-based habitat shifts. However, better understanding of diet-related selectivity in trash ingestion may require further measurement of environmental trash availability, especially in Sargassum habitats where pelagic turtles forage. This is among the largest turtle ingestion studies to date and among few worldwide to use standardized methodology and data reporting, such as amount, size, and category of trash

items. The low mass of ingested trash by Texas green sea turtles is encouraging, but thorough study of trash ingestion among other threatened species in the Gulf of Mexico is vital to responsible sea turtle conservation.

SOLUTIONS

From Grants to Invoices: A Sustainable Model for Fishing Gear Recycling

Nicole Baker Loke*, Sara Aubery, Erin Adams; Net Your Problem LLC

Net Your Problem LLC offers a responsible waste management solution (=recycling) for end of life fishing gear in coastal communities. We accomplish this by liaising with communities, hiring local representatives, consulting with all types of partners, engaging with the fishing industry, setting up logistics of collecting gear and then exporting the gear to various recyclers depending on the composition of the material and the capacity of the community. Each community that we have worked in has required a totally unique logistics plan and a different business model. In this business, you absolutely need locally tailored solutions, and our solution has collected 914,000 lbs. of gear from Alaska, Washington, Maine and California since 2017. When I first started this business, and introduced the concept to new stakeholders, the terms volunteer, grants, non-profit and the like were frequently mentioned. Should we not be able to make a living by advancing ocean sustainability, improving waste management and making a planet positive impact? There are certainly a lot of corporations profiting by polluting the environment, so it is time to stop feeling guilty. Recycling fishing gear fulfills my need to be an environmentally responsible citizen of this Earth, and only by paying myself a living wage will I be able to continue reducing the impact of maritime waste on coastal communities. Imagine if a business charged a city to do a beach cleanup. Sounds weird, but shouldn't someone get paid for their time providing a service that someone else needs?

Ocean Friendly Foodware: Helping Restaurants Embrace Legislation

Rachael Coccia* & Jennie Romer*; Surfrider Foundation

The Surfrider Foundation and their network of activists are established leaders in advancing plastic reduction legislation. Nearing 300 plastic pollution victories, Surfrider is now refining their approach to tackle one of the top threats, single-use foodware, in a more comprehensive manner. This includes involving key stakeholders, in this case restaurants, in the conversation. This session will discuss the intersections between Surfrider's policy work and their national Ocean Friendly Restaurants program. With over 650 restaurants participating in the program, they serve as powerful proof that single-use plastic reduction can be achieved without causing financial hardship on businesses. In fact, many restaurants save money and benefit from positive press and public perception when they upgrade their sustainability practices. All participating restaurants follow a set of mandatory and optional criteria which strategically align with our policy goals. These include only offering utensils and other takeout accessories upon request, requiring reusables only for dine-in meals, and not using EPS foam or plastic bags. Bill 40 in Oahu will be discussed as a success story; showing what can be achieved when restaurants take an active role in advocacy. The container preemption will also be discussed as a challenge in Texas as well as ways to get around this roadblock. Both the Comprehensive Foodware Policy Toolkit and the Ocean Friendly Foodware Guide will be shared as key resources.

Plastic Pollution & the Service-Learning Classroom: A Case Study from the Mississippi Gulf Coast

¹Christopher D. Foley*, ¹Alen Hajnal*, and ²Elizabeth Englebretson*; ¹University of Southern Mississippi, ²Plastic Free Gulf Coast

The promises of academic service-learning are many. Prior research has indicated that academic service-learning inspires college students to achieve higher graduation rates (Lockeman & Pelco, 2013); to grow socially and intellectually as human beings (Yorio & Ye, 2012); and to experience “an enhanced sense of civic responsibility” (Bringle & Hatcher, 1995). But can service-learning alter undergraduates’ pre-existing environmental attitudes? This research question assumes particular importance in the Gulf Coast region, where widely perceived anti-environmental attitudes coexist alongside a spectacular history of socio-environmental disasters--from Hurricanes Katrina and Harvey in 2005 and 2017 to the B.P. Oil and New Orleans Nurdle Spills in 2010 and 2020.

Drawing on the case study of a service-learning partnership between Plastic Free Gulf Coast and general education students at the University of Southern Mississippi Gulf Park campus, this presentation will explore the potential of environmentally focused service-learning courses to alter students’ pre-existing environmental attitudes. At the beginning and end of the Fall 2020 semester, USM students enrolled in environmentally focused service-learning courses were invited to take a brief version of the previously validated “Environmental Attitudes Inventory” survey (Milfont & Duckitt, 2010), supplemented with additional questions designed to assess students’ attitudes toward plastic pollution in the Gulf Coast region. After providing an overview of the study and its methodology, presenters will share their initial findings from the Fall 2020 semester.

Combating Plastic Pollution Using Citizen Science

Kimber De Salvo Anderson; Turtle Island Restoration Network

Galveston, Texas is a small barrier island that is impacted by plastic pollution from several sources including local industries, being at the bottom of a watershed that contains over half of all residents in Texas, and being a notorious region in the Gulf of Mexico where numerous currents deposit marine debris. Turtle Island Restoration Network is engaged in a two-pronged citizen science-based approach to combat and understand the problem of plastic pollution. To combat the problem of plastic pollution we have several programs that encourage grassroot efforts to inspire individual lifestyle changes including Bring the Bag, The Final Straw Galveston, Balloon Busting Crew, Monofilament Recovery and Recycling Program tubes, Cigarette Butlers, and beach cleanups. To understand the impacts of plastic pollution around Galveston we are (1) engaging with local grade schools to conduct routine monitoring of sand and water samples for microplastics and (2) quantifying how many cigarette butts are collected in our Cigarette Butler program. However, due to COVID restrictions, we have had to rethink and adjust our plans in terms of field work, communication, and timelines. I will share what our struggles have been and what we have learned about conducting citizen science during a pandemic.

Abstracts for Poster Presentations

Source-to-Sink: Tracking Tire Microplastic Pollution in Texas

Cole L. Carrabba*, James H. Gearon, Cornel Olariu; University of Texas at Austin: Jackson School of Geosciences (*Student presentation*)

The state of Texas contains approximately 22 million registered vehicles which drive over ~680,000 miles of road every year (TXDOT). Tires are a significant but relatively understudied source of microplastics which emit individual particles typically ranging from 5 μm to 220 μm (Martini et al., 2014). We quantified microrubber pollution generated along Texas roads using calculations related to the weathering rates of tires. Using the 2019 TXDOT roadway inventory, which provides annualized traffic data (counts) and roadway segment lengths (Km), we calculated microrubber emissions values for every catalogued roadway in the state. We estimate passenger vehicles (Light Duty) emit approximately 0.26 g/km of microrubber particles on average, with commercial vehicles (Heavy Duty) emitting 10x more (2.6 g/km) on average. Unsurprisingly, large metropolitan areas such as Houston, Dallas-Fort Worth, San Antonio, and Austin are pollution hotspots due to large numbers of cars and dense road networks. Major thoroughfares are likewise a large contributor to tire-based microplastics, with the Texan portion of I-35 alone emitting 36 metric tons per annum. Our research quantifies the tire waste produced on Texas' roadways—6,306 metric tons in 2019. All of this material is blown by the wind or washed through the creeks and rivers of Texas where it might locally accumulate and reach high concentrations. We also segment pollution hotspots along roads using river watershed maps in order to estimate areas of risk. A clearer picture of tire pollution will aid future research and creative solutions to Texas' microplastic pollution.

Impact of Plastic on Air Pollution in the Lone Star State: A Review

Md. Salahuddin Majumder*, Amit U. Raysoni; The University of Texas Rio Grande Valley (*Student presentation*)

Usage of plastic has increased tremendously in the last century and continues to increase even today. There are many detrimental effects of plastic usage on air, water, soil, and more specifically human health. This research review focuses on the air pollution and its impact on all these media in the state of Texas. The review would focus on the major sources of plastic pollution in this state and what remedial measures need to be undertaken to reduce the plastic pollution footprint. Finally, the review would also focus on means and methods that could be incorporated in lieu of plastic air pollution.

Removal of methyl blue from aqueous solution affected by biochar feedstock and possible Microplastic cleanup implementation

Carlos García Patlan*, Dr. James Kang; UTRGV School of Earth, Environmental, and Marine Sciences (*Student presentation*)

Micropollutants in water are a problem in many bodies of water, but low-cost, organic water filters can help resolve this problem. In this study, different biochars were tested in the filtration of methyl blue, a mimic water pollutant, from water samples at different concentrations.

Methylene blue acts as a pollutant when placed in water; it dilutes, and it is difficult to filter out of the water. Four different types of Biochar were put to the test by absorbing the methyl blue from the solutions at different concentrations; the biochars were created using aspen bedding, palm tree biomass, and avocado seeds, all of which were cooked at three different temperatures, as well as a commercially bought biochar, AquaTech biochar, all medium grain sized (2.8-1.4 mm). The effects of grain size and cooking temperature of the biochar were studied. Overall, the most effective biochars are AquaTech and Palm tree biochar, while the least effective biochar was Avocado biochar. It is a possibility that Biochar could be a solution implemented to combat pollution of microplastics within the ocean.