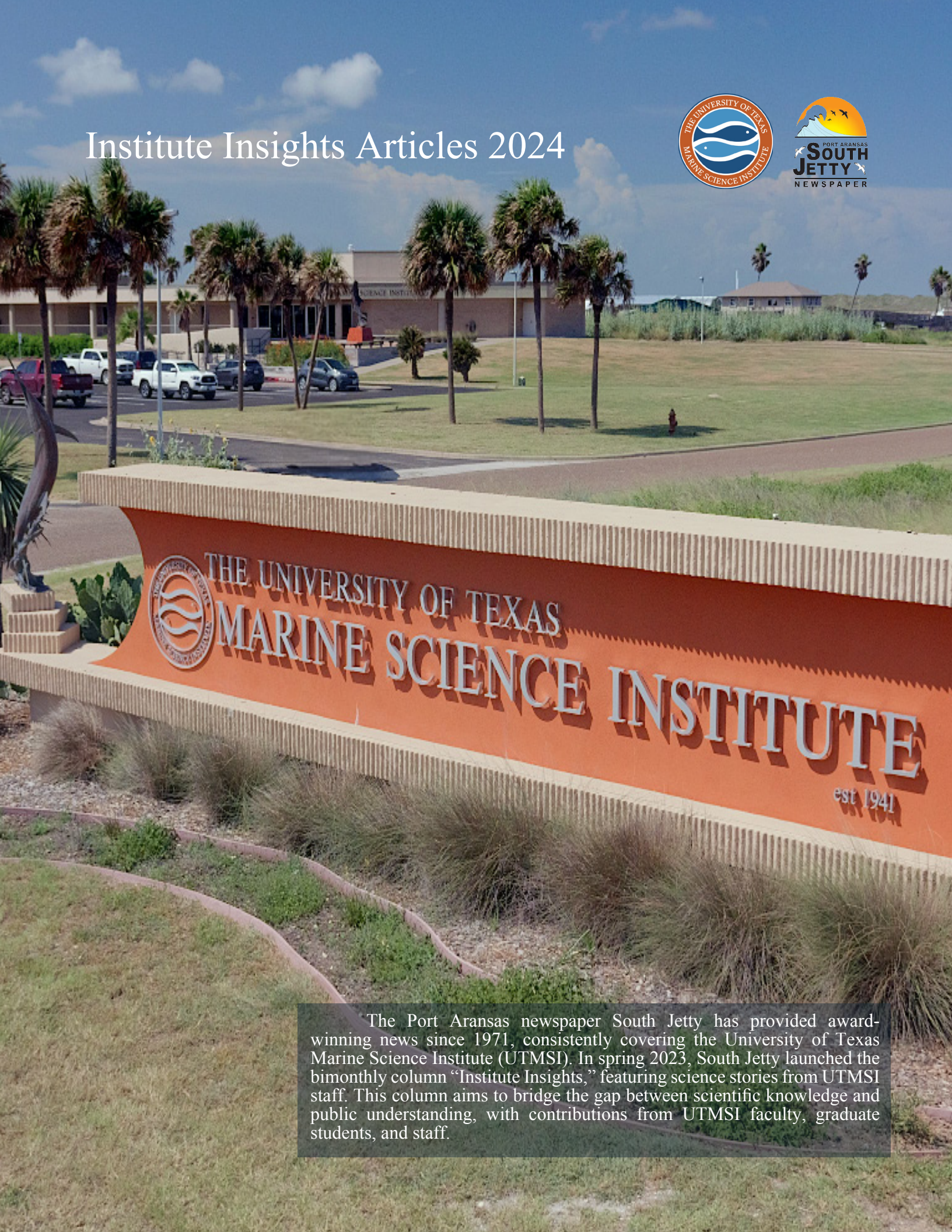
Institute Insights Articles 2024

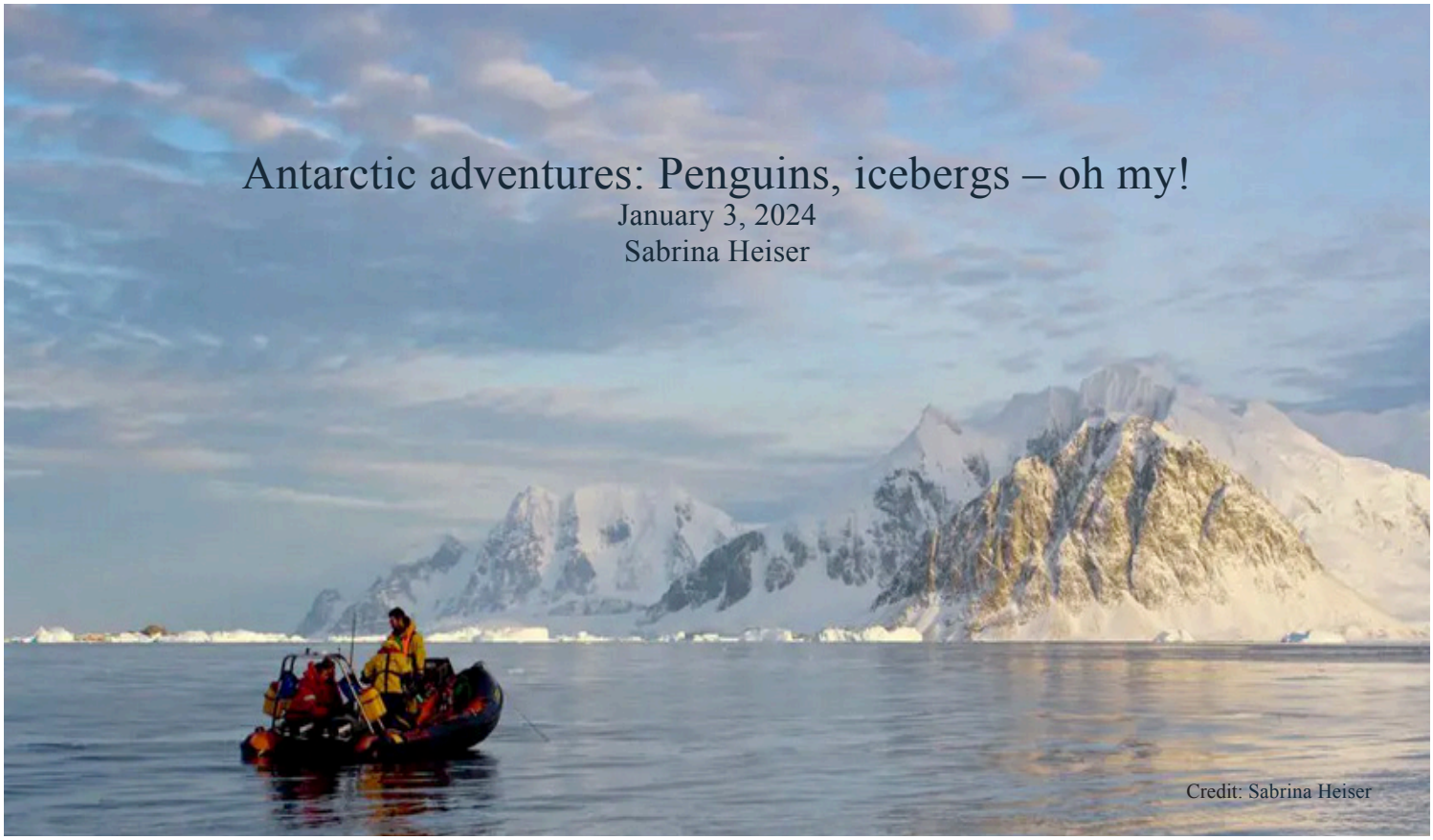


The Port Aransas newspaper South Jetty has provided award-winning news since 1971, consistently covering the University of Texas Marine Science Institute (UTMSI). In spring 2023, South Jetty launched the bimonthly column "Institute Insights," featuring science stories from UTMSI staff. This column aims to bridge the gap between scientific knowledge and public understanding, with contributions from UTMSI faculty, graduate students, and staff.

Antarctic adventures: Penguins, icebergs – oh my!

January 3, 2024

Sabrina Heiser



Credit: Sabrina Heiser

I was fresh out of undergraduate with a degree in marine biology. An inspirational seminar by an alumnus about her time as a marine research assistant with British Antarctic Survey at Rothera Research Station (western Antarctic Peninsula) encouraged me to explore my options after graduation. However, living and working in Antarctica seemed like a distant dream.

So, when I was offered the position with British Antarctic Survey, I was over the moon. I had a lot to pack and plan. Some of the training before we deployed was a little unusual for a marine biologist: lorry loader training (to operate a crane so we could launch the boats) and chainsaw training (to cut holes into the winter sea ice for sampling and SCUBA diving).

Finally, the long-awaited day of my departure arrived. There are several ways of getting to Rothera Research Station on Adelaide Island – I flew to the Falkland Islands and boarded the ship for a five-day journey across the Drake's Passage and down the peninsula. I will never forget when I sighted my first icebergs and my first penguins.

During the summer season, station was busy with around 100 people from a variety of different professions to keep the station running: chefs, maintenance staff (plumbers, electricians, mechanics, carpenters), doctors, station manager and other support personnel, pilots and plane mechanics, field assistants, boating and diving officer, scientists, you name it! However, it did not matter whether you were a scientist or support staff; everyone would take part in everyday jobs like washing dishes and cleaning the toilets.

As summer was winding down, station became quieter. The planes left to fly north and eventually the ship cast off for one last time, taking away the last of the summer personnel. For five months of winter it would be just 20 of us who keep the science going and the station running.

As the marine research assistant, I collected samples for the long-term monitoring program that has been going on continuously for over 30 years now. Twice a week in the summer and once a week in the winter, I took the boat out to the sampling station and collected data from the water column on temperature, salinity, and light availability. This allows us to determine how physical characters change throughout the year (seasonal patterns) and whether anything is changing between years. I also collected water that I brought back to the lab – I measured the amount of chlorophyll in the water, so we know when microscopic algae (phytoplankton) grow the most.

However, the favorite part of my job was when I got to put on my SCUBA gear and jump into the icy cold waves for monthly collections of organisms or to help on other projects. I would wear a dry suit with a thick undersuit (even thicker in the winter) to keep myself warm.

When I went diving for the first time, I did not really know what to expect, but I encountered a beautiful colorful world which was a big contrast to the white and icy blue landscape on the surface. Because of the extremely cold conditions, the metabolism of the organisms slows down causing them to grow much bigger than in warmer waters. Besides penguins, my favorite animal was the sea lemon – which is a bright yellow gastropod (i.e., snail).

Living and working at Rothera Research was an experience that will always stay with me. Beyond the unique location and job, the close-knit community on station was incredibly supportive. We formed music bands in our free time and celebrated midwinter like it was Christmas. Eventually, the day came when I boarded the last ship of the season. As I was waving goodbye, I was relieved to know that I would soon return as part of my upcoming PhD adventure.

I study fish behavior

January 31, 2024

Madison Schumm

Have you ever wondered what fish do? Sure, they eat and swim and sometimes are unlucky enough to get caught on a line. But what about all the time in between?

This question was something I had never asked myself until I was an undergraduate at the University of Texas at Austin, working in a fish behavior lab. As it turns out, fish do lots of things and express all sorts of behaviors, like shyness, boldness, sociability and even anxiety.

In the lab, we can actually test these behaviors in fish. For example, we can test an anxiety-like behavior using an aquarium felted half black, and half white. Most prey fish will prefer to hang out on the black half of the tank, where they are less visible against the background. We can then observe how long a fish spends in the black half and take that as a measure of anxiety about being preyed upon in fish.

When we look across a group of fish, we might discover that not all fish are alike. Some fish might be more bold than others or more social or more anxious-like. Interestingly, these behaviors themselves can be related and we often find that individuals that are more bold are more aggressive, exploratory and less anxious compared to their peers. If the individual is consistent in how it expresses these behaviors across time and context, then what we effectively have is a personality.

Animal personality, therefore, refers to related behavioral traits that are consistently observed in a fish and is the focus of much of my research at the University of Texas Marine Science Institute, where I am currently a PhD student. Specifically, I am interested in physiological processes (like metabolism or stress hormones—fish have cortisol too!) that may contribute to the formation of animal personality.

I work with a locally abundant fish, the sheepshead minnow. These fish live in shallow estuaries where they can tolerate a wide range of environmental stressors. This makes sheepshead minnows a great study system to study how the environment shapes physiology with resulting effects on behavior.

This work is important because, in the context of climate change, if an environmental stressor impacts a physiological system related to behavior, this could impact where fish are, where they go, and what they do in the places they inhabit.

Credit: Milkmanwest, Depositphotos

Inside an Alaskan ecosystem

February 14, 2024

Tamara Margarita Rivera

As a marine scientist, I am keenly interested in fish as a food source and how the natural and human inputs change and impact the fish we eat.

One of the best places to study those interactions is in Alaska, and in September and October of 2023, I was fortunate to spend two weeks in Alaska to collect samples for my research. I spent several hours on a commercial boat in Kachemak Bay where I went fishing for the very first time in my life and had to reel in a 35-inch Pacific halibut (Hippoglossus stenolepis). To say that my arms were sore the next day is an understatement!

Alaska's natural beauty was breathtaking – the miles of white-topped mountains you can see from the airplane window, the turquoise waters of Kenai Fjords, the bison roaming in grasslands, the big volcano located in between huge white glaciers, the sea otters and whales that come in and out of the bays. I even got the chance to see a sliver of the green northern lights across the night sky!

Credit: Kristin Nielsen

Along with its natural beauty, there are also important traditions and cultures in the subsistence communities of Alaska. Subsistence communities rely on a hunter-gatherer lifestyle for their diet and in remote areas in Alaska, their main source of protein is seafood.

Due to high transportation fees and long travel time, in remote areas the often few grocery stores stock low quality and expensive food. The orange juice we buy in our grocery store in Port Aransas for $4 could be as much as $18 in the remote regions of Alaska. Therefore, the subsistence lifestyle is more sustainable for those who are cut off from main roads.

For this reason, it is important to study the implications of dietary mercury exposure in subsistence areas due to the disproportionately high amounts of seafood they have to consume for their diet. My research will first investigate if mercury is being exported into the Gulf of Alaska and then assess if the mercury is being taken up into the food web.

Alaska is a great study site because it is going through many dynamic changes in a short period of time. Specifically, the melting of glaciers can be a source of mercury because as they melt metals and trace elements can be released into the surrounding environment that were previously trapped in the glaciers.

To better understand the potential mercury fluctuations in the Gulf of Alaska, my study will test the concentrations of mercury in the water, sediment and tissues of fish. Our primary concern is methylmercury, which is the most toxic form of mercury due to its bio-accumulative effects.

Bioaccumulation is when a chemical's concentration increases in the body of an organism over time. Mercury can only be transformed into methylmercury through the process of methylation which is done by microorganisms such as sulfate-reducing bacteria and methanogens. These bacteria are usually the culprits that make water have a rotten egg smell! Therefore, my research will also identify if these microorganisms are present in water and sediment samples.

We are also interested in quantifying the concentration of the trace mineral selenium in the ecosystem because selenium can modulate the negative effects of mercury toxicity. Selenium has many other health benefit as well such as supporting the immune system, protecting against cell damage and regulating metabolism and thyroid function.

Alaska has a lot of naturally occurring selenium that preferentially binds to mercury, creating a mercury-selenium complex that does not accumulate in tissue and can remove the mercury from the body. Selenium can be found in many of our food groups such as Brazil nuts, seafood, and poultry.

I am interested in better understanding the interactions between mercury and selenium in the dynamic ecosystem of Alaska in order to best inform dietary regulations for subsistence communities.

Credit: Edvaldo Vicente de Barcelos, PIxabay

An easy lift for a big impact

March 13, 2024

Katie Swanson

One of my favorite things about my job is seeing the positive impact we can have on the local bay systems.

As stewardship coordinator for the Mission-Aransas National Estuarine Research Reserve, it is my job to conduct research tracking our bay systems and oversee programs that instill a sense of stewardship. One of the programs that is very rewarding to help organize is the Texas Parks and Wildlife Department's derelict crab trap removal program.

This initiative happens very February, when Parks and Wildlife closes the bays to commercial and recreational crabbing for a 10-day period. For the past five years, I've led and organized the volunteer effort to remove derelict traps for the Aransas Bay System complex.

This effort wouldn't be possible without the help of dedicated partner organizations and many, many volunteers. This past Feb. 19, the winds died down long enough for us to get out on the water and go trap hunting. Two days before, we had to stand down a few of our boats due to 30 mph winds. Since the pause in the fishery closure always happens in the winter, it can make for a cold outing, but this year it was sunny and beautiful to be out on the water.

Searching for the derelict traps isn't hard mentally, but it can be physically tough. A lot of times, the traps are incredibly heavy and marred with muck and vegetation. The ones washed up on the shorelines can be especially heavy and full of shell hash and grown vegetation.

Aside from the physical workout (it was nice to be the boat captain this year), seeing the impact we have in removing them is super rewarding. Some of the traps are in areas of lush seagrass, and when we pull them up we know that the barren spot they have left behind will soon start to fill in with new growth.

It's also rewarding to know the animals that were saved. A lot of time, the traps have crabs, fish and even terrapins. All of these animals would have died, and the derelict trap would continue its ghost fishing and often turn into a navigational hazard as well.

There's yet another reason this is such a gratifying project – volunteers. The removal effort really mobilizes anglers. The Texas CCA (Coastal Conservation Association) often has a good turnout, and it is nice to work with this unique volunteer base that is very important to the

Credit: Texas Parks & Wildlife Department

bay systems. It's also a group we don't often get to work with.

Most of the volunteers take their own boats to patrol the area, and it's fun to think of a small fleet out on the water hunting for derelict traps. This year, for the Copano-Aransas Bay system (the area Mission Aransas NERR is tasked with overseeing), our volunteers brought in 201 derelict traps – mostly Port, St. Charles and Mesquite bays. We had over 35 volunteers put in over 220 hours.

Organization-wise, it's a small lift for a huge impact. Not only were we able to remove lots of traps from out local bay system but combined efforts in the mid-coast (Matagorda, San Antonio and Aransas) collected and removed 900 traps.

The other bay systems were organized by the San Antonio Bay Partnership, Lavaca Bay Foundation and Matagorda Bay Foundation. Volunteers and organizations included the U.S. Fish and Wildlife Service, Aransas National Wildlife Refuge, the Texas Parks and Wildlife Department Coastal Fisheries and game wardens, local chapters of the Coastal Conservation Association, Guadalupe Blanco River Authority, Guadalupe Blanco River Trust, San Antonio River Authority, International Crane Foundation, Mid-Coast Texas Master Naturalists, Dallas Zoo, Lavaca-Navidad River Authority and Texas Conservation Alliance.

I'm incredibly proud to be a part of this effort and reduce the number of ghost fishing from derelict crab traps. After all, fewer derelict traps create a more sustainable blue crab fishery, which means that I can continue to enjoy the crab stuffed flounder at our local restaurants.

Might seaweed be the next Texas farm crop?

October 09, 2024

Mark Lever

Since the Industrial Revolution, human societies have increasingly depended on the consumption of non-renewable resources, such as fossil fuels.

While fossil fuel combustion enabled the most rapid economic growth and technological advances in the history of humankind, its environmental side effects are increasingly becoming a threat. Increases in atmospheric greenhouse gas concentrations due to fossil fuel combustion are driving major planetary changes, including climate warming, ocean acidification, desertification and increased frequency of extreme hurricanes and winter freezes. These environmental changes are predicted to intensify further over the coming decades and become a much greater socioeconomic threat than they already are.

Several major initiatives, such as the United Nation's "Sustainable Development Goals" or the 2021 Nobel Prize Summit have proposed paths to future sustainability. All of these involve shifting global economies to exclusively using renewable resources.

A potentially important component of sustainable economic growth currently gaining worldwide attention is the cultivation of seaweed in outdoor farms. Seaweeds have served as human food since ancient times and are rich in nutrients such as proteins, polysaccharides, lipids, minerals, vitamins or dietary fiber. Certain seaweeds produce compounds with useful medical properties, e.g., sterols lower blood cholesterol, terpenoids reduce inflammation and may even provide future cures to Alzheimer's disease. Other seaweed compounds have sought-after textural properties, e.g., carrageenan and agar are widely used thickeners in cosmetic products and in dairy products, including ice cream.

Evidence suggests that farming shellfish with seaweeds can increase growth yields of both, and that seaweed-based dietary supplements can in some cases even be used to lower methane emissions from domestic cattle. Importantly, seaweeds can be grown almost anywhere in the ocean where light and hard surfaces for attachment are present and offer a low-cost form of farming because they do not rely on irrigation or fertilizer use.

In the United States, the recently growing interest in seaweed products has led to the emergence of seaweed farms in cold-water regions, such as New England, Alaska and parts of the West Coast. In so-called "ocean farms", laboratory-seeded ropes with seaweed are suspended from floating buoys and grown during the cold winter months – in many cases, together with mussels and scallops. Apart from an offshore pilot project of the U.S. Department of Energy involving Sargassum, seaweed farming is so far non-existent in Texas waters. This is surprising given how widespread warm-water seaweed cultivation is in other parts of the world. This seems like a missed opportunity, especially considering the astounding diversity of over 700 seaweed species in the Gulf of Mexico, and the vast, incredibly productive coastal bays on the Texas coast in particular.

Thanks to funding provided by the Texas Gulf Coast Research Center and the University of Texas Marine Science Institute (UTMSI) to my lab, this may change over the coming years.

My laboratory technician Daniel Hardin and graduate student Claire White are in the process of domesticating several native seaweed species in the laboratory and have – with permission from the U.S. Army Corps of Engineers – recently deployed seaweed ropes at several locations in local bays. By comparing the growth of different seaweed species under a range of closely monitored environmental conditions, including temperature, salinity and nutrient concentrations, we are trying to identify the best locations and seasons for the growth and production of each species.

In the future we hope to work with local oyster farmers on developing ecologically sound, commercially viable systems for the integration of seaweeds into oyster farms.

Lastly, given the 12 million domestic cattle that live in Texas, we hope to explore the use of dietary supplements to lower the vast amounts of methane being released by these cattle.

Credit: Liana Lerma

Looking for answers in the mud

April 10, 2024

Kathryn E. Appler

Credit: Kathryn E. Appler

Explaining to your friends and family you are going on a cruise makes it sound like a vacation, including sleeping in till lunch, sunbathing by the pool or playing shuffleboard on deck. Instead, I boarded the Research Vessel Pelican only to be happily covered in seawater and mud.

This scientific cruise in May 2023 was one of several investigating the impact of the summer low oxygen (hypoxic) zones on microbes in the water column and marine sediments. Low dissolved oxygen can be lethal or instigate the relocation of several economically valuable macro-organisms (fish and shrimp).

These sites, including the northern Gulf of Mexico, are often called “dead zones” and are created by several factors, including nutrient pollution and increased stratification in the warmer summer months.

The composition of the microbial community can help us understand which microbes consume oxygen, potentially impacting the persistence of these hypoxic zones. Other microbes, including archaea and bacteria, can thrive and survive in low or no oxygen. Understanding microbial diversity and activity can help scientists understand and potentially mitigate these events.

Long before hopping on board, cruise prep involved spending long hours collecting chemicals and calculating the number of gloves, tubes and pipette tips for sample preservation. Loading all our gear and personal belongings into a crammed Kia Sport, we began our two-day trek from Austin to Cocodrie, Louisiana. After securing all the delicate equipment onboard, we fell asleep, anticipating the beginning of our voyage.

Before dawn, geared up in orange safety vests, helmets and steel-toed boots, we headed to the multi-corer, consisting of a metal frame and several plastic tubes to collect sediment. Standing on the base to keep it level, we maneuvered it over the edge, stepping quickly back on the boat before it dropped about 20 meters out of sight. As the A-frame hit the bottom, the cables snapped back, and the cores (plastic tubes) snapped closed, collecting the mud. Then, the frame raised back up on deck as all the crew and researchers hustled to secure the swinging frame.

Credit: Kathryn E. Appler

When the multi-corer was secured, we released the tubes and began sectioning the cores for various research projects. Once the mud was onboard, the clock started to preserve as much as possible, rapidly scooping mud with sterile spatulas into pre-labeled tubes. We froze several vials immediately and kept the rest on ice before preservation, specifically to reduce the loss of DNA and RNA, which rapidly degrade.

After deploying the multi-corer once or twice, we spent the rest of the day in the wet lab, continuing preservation steps, labeling tubes and making notes about the sites. With the rocking, it was easy to get into a rhythm working at the bench, under the fume hood and on the deck. We repeated these steps at five sites.

After each successful sampling day, we joined another team of researchers to enjoy our temporary life at sea. This included fresh fish tacos and paella made by the incredible onboard chef, which rivaled any vacation cruise. We soaked up the sun and the spray from the waves on the bow, spotting dolphins, sharks and turtles. One rare sighting was a newborn dolphin with “fetal folds.” These are temporary marks from the mother’s rib cage that typically fade shortly after birth. After every day, we spent our nights watching the stars and passing oil rigs as we traveled to our next sampling station.

Returning to port, we safely secured our precious scientific cargo, packing our Kia Sport to the brim with coolers filled with mud. We said goodbye to the incredible crew and researchers with a night enjoying views of the bayou.

Pests on coral reefs

March 27, 2024

Christopher Hemingson

Credit: Rickard Abom/RRC

Coral reefs are iconic ecosystems that provide a variety of goods and services to humans. These range from supporting bountiful fisheries, protecting coastal shorelines f rom wave damage to inspiring and captivating visitors.

Despite the fact that over 300 million people globally depend on the world's coral reefs, they occupy just a sliver of the Earth's ocean (approximately .1 percent). Therefore, they are easily affected by imbalances in the ecosystem, or "stressors," whether that be warming water temperatures, runoff from land or harmful and invasive species.

Some stressors are easier to manage and control than others. Rising ocean temperatures are a global phenomenon, meaning it's a large and complex stressor to address individually. However, some stressors occur at more local scales which make them more receptive to direct management strategies.

One such pest that threatens coral reefs is the crown-of-thorns starfish (COTS): a large (approximately 2 feet across) starfish with 15 to 20 arms covered in venomous spines that deliver a painful sting. These starfish are unique in that their diet consists strictly of living coral tissue, meaning they can be voracious coral predators. Furthermore, they experience episodic populations explosions in which the number of starfish on a reef can reach the tens of thousands. Quite clearly, we can see why this species poses a threat to reef ecosystems if we as humans place value on maintaining healthy reef ecosystems with high coral cover.

Population irruptions of COTS have become more prevalent and consistent as humans have altered coastal ecosystems. The Great Barrier Reef in Australia is the longest continuous stretch of coral reef in the world and has started experiencing more periodic outbreaks of these starfish.

Credit: Rickard Abom/RRC

Recognizing this growing threat, the Australian Government initiated the Crown-of- Thorns Starfish Control Program which seeks to manage these population outbreaks to protect corals. This program operates by soliciting contractors who provide their own vessels and crew to help survey and manage the starfish populations.

COTS control occurs through the use of targeted culling dives in which the starfish are euthanized. These culling dives are conducted in a highly organized manner using a hands-on approach. Every managed reef is portioned into smaller sections called sites which are about 10 hectares in size (or just under 20 football fields).

If initial surveys have identified COTS at a specific site, a team of divers is deployed. These divers swim the site in a line on SCUBA and snorkel, hunting for any COTS which are typically located by the feeding "scars" they leave on corals after a meal. When a starfish is found, the diver injects it using a long, needle-like gun that delivers a lethal dose of bile salt solution – a liquid mixture that euthanizes the starfish within 24 hours. After every dive, the size and number of starfish culled is recorded. This data is used to track changes in starfish populations at that site which ultimately dictates when the site has reached healthy population levels and no longer requires culling.

Albeit somewhat unconventional, this program has been responsible for manually culling over 1.1 million starfish on the Great Barrier Reef since 2012. Following the completion of my PhD, I worked as a COTS diver for a year and a half (2021 to 2022). During my time, I witnessed first-hand the gradual control of starfish populations on a reef that we worked continuously during my employment. This approach works particularly well to protect specific reefs from COTS that are important for tourism and recreational fishing. It just goes to show that sometimes using your hands and getting your feet wet is the best way to get the job done.

Do fish swim efficiently?

May 22, 2024

Melman Neill

Credit: Melman Neill

The funniest part of studying animal behavior is noticing an overlap with human behavior.

This can be as simple as a cat defiantly covering its eyes with its paws when you turn on the lights, or as complex as a seagull approaching an unguarded container of fries on the beach, only to retreat when the owner turns and notices the threat to their food.

This past summer, I worked with an international team of researchers to uncover a more nuanced example of animal behavior that parallels humans: Fish choose swimming speeds the same way humans choose driving speeds.

When buying a car, people are often concerned with fuel economy. We want to know how many miles the car can drive on a gallon of gas, usually because we want the biggest bang for our buck at the fuel pump!

But it can be hard to find a straight answer, because the "miles per gallon" a car achieves depends in part on the speed you drive it. As the car drives at higher and more consistent speeds, it generally uses less fuel per mile until it reaches an optimal speed where efficiency is maximized. Fuel efficiency decreases again as you accelerate past the vehicle's optimal speed.

Fish swimming follows similar rules. Their fuel is the oxygen they breathe through their gills, but otherwise the math is the same.

Each fish has an optimal speed where they get the biggest bang for their buck in terms of distance travelled per amount of oxygen used.

Other researchers have shown that brook trout, when given a choice, will swim at their optimal speeds. However, my colleagues and I discovered there is more to the story.

Brook trout make long migrations with little need to stop. This is like driving on an open highway, where there is often no reason to drive faster or slower than your vehicle's optimal speed, provided you want to save money above all else!

But no one drives those speeds in town. Even if you would like to, there are far too many corners, intersections, and other vehicles to maneuver around.

We studied pile perch, non-migratory fish that live around piers, coasts, and channels. Due to their habitat, these fish need to be able to navigate around all manner of obstacles like rocks and pilings, just like someone driving through a town.

We built a massive circular tank that I call the "fish treadmill," which can maintain a range of flow speeds at once. The water moves slowly near the center of the tank and gradually speeds up as you move toward the edge. This allows the fish to choose which speed it would like to swim by positioning itself within the tank.

We compared each fish's chosen speed to its optimal speed, which we determined by measuring oxygen use at different swim speeds.

Every fish we tested chose a speed far slower than their optimal speed, which tells us pile perch probably have additional priorities other than being efficient when swimming, like avoiding obstacles or searching for food.

Fish have shifting priorities depending on their habitats, and they try to get the most bang for their buck when they can. They swim at their optimal speed when possible, but sometimes other factors have to take priority. This is like how we drive closer to our cars' optimal speeds on the highway, but slow down to prioritize safety and maneuvering when in town.

The next time you're watching a fish or another animal, remember that it navigates its environment, makes decisions, and reacts to changes the same way we do!

Field research on a remote island

June 05, 2024

Kyra Jean Cipolla

For the past three years, I have had the unique and amazing opportunity to conduct marine research at the Smithsonian's Carrie Bow Cay Marine Field Station in Belize.

When I tell people I travel to the tropics to study coral reefs, they imagine clear ocean water, sandy beaches, and a nice drink in a coconut with a tiny umbrella. Some of that is true (well, maybe just the first two).

An average fieldwork day for me looks like this: You wake up early in the morning, drink your coffee and prepare for the dive which includes packing the boat with gear and emergency oxygen kit, creating an anesthesia to collect fish and setting up cameras.

Then we drive the boat to our dive site. We dive for a couple hours, sometimes carrying heavy items such as tarps and nets weighed down with links of chain or bricks to secure data loggers.

Credit: Christopher Hemingson

Often, we spend an hour or so collecting fish from a small patch reef, characterizing the reef and documenting several environmental conditions.

After our dive, we surface, take off our dive gear, pull up anchor and drive back to the island. For my research, I often have small fishes (specifically cryptobenthic fish) we collected and imagery that must be processed ASAP, so I rush off to preserve specimens and backup data onto hard drives.

After a coffee break (with a ginger cookie or two), our team begins the workflow of identifying, photographing, weighing and measuring every fish, which may take the rest of the day, especially if there are over a hundred tiny fish caught while diving.

I cannot write about my field experience without sharing a bit about the country I visit. Belize is a beautiful country full of various biodiverse ecosystems including rainforests, savannah, wetlands, coastal mangroves and of course coral reefs. Belize is home to many cultures that are distinct from each other yet come together to create an amazing mix of foods, music, art and languages.

To reach Carrie Boy Cay requires three flights and a boat ride, all with suitcases full of equipment. On the island, we listen to Belizean music, and we are extraordinarily lucky to share the island with a spectacular cook. The two cooks I've met are the most amazing women who have become dear friends of mine.

The meals I have enjoyed over the trips are typical throughout the country and some specific to regions or cultures. For example, one of the ladies comes from the Garifuna people, descendants of an Afro-indigenous population living on the southern coast of Belize. She has shared many wonderful meals with us including hudut, a soup of coconut broth served with mashed plantain, fried fish and sahou, a so-called "Garifuna eggnog" of warm cassava, milk, vanilla and spices that feels like a warm hug.

Some other typical meals are journey cakes, fry jacks, salbutes and garnache. The meals not only fill my stomach and supply energy for diving and carrying heavy scuba tanks but with every meal and conversation with the Belizean people on the island, my heart is full.

Working in remote locations is anything but a vacation. The work we do here isn't just for knowledge but for understanding a changing marine environment that people rely on for economy and culture. I cannot stress enough the importance of appreciating and acknowledging the local cultures where scientists conduct their research. It is the chance to uncover mysteries of our underwater world while embracing a culture that is not your own.

Research cruise tough but rewarding

June 05, 2024

Kyle Runion

If you find the chance to combine work and adventure, do it.

Some of my most memorable work experiences are when I took the opportunity to volunteer on a scientific research cruise. In fact, I enjoyed it so much, I did it twice, both times with the National Oceanic and Atmospheric Administration (NOAA). In total, I spent about 20 days at sea during the summers of 2016 and 2017 – a drop in the bucket for the 'lifers' at sea, but long enough for me to take in the adventure and hold on to great memories.

Let me say: It wasn't any vacation. As a volunteer scientist on a research vessel, I was one of a handful of people charged with carrying out a scientific mission. There wasn't space for vacationers – literally. The ships I sailed on held 15 to 20 people, and operations ran 24 hours a day. That meant 12-hour shifts, and I drew the midnight-to-noon straw of hard work for one to two weeks.

At the same time, the work was thrilling.

The main goal of our research cruise was to provide a stock assessment of the sea scallop in George's Bank, a large chunk of shallow (relative to the ocean – still tens of meters deep) sea that extends almost 100 miles off the shore of New England.

We had two data collection campaigns to assess the scallop fishery. First, we conducted bottom trawl surveys where we dragged a net across the sea floor to harvest any and all organisms. With each trawl, the other volunteer scientists and I noted over 50 different species of ocean critters and counted bushels and bushels of scallops. On a subset of the scallops, we took detailed measurements about the size, weight and health as well.

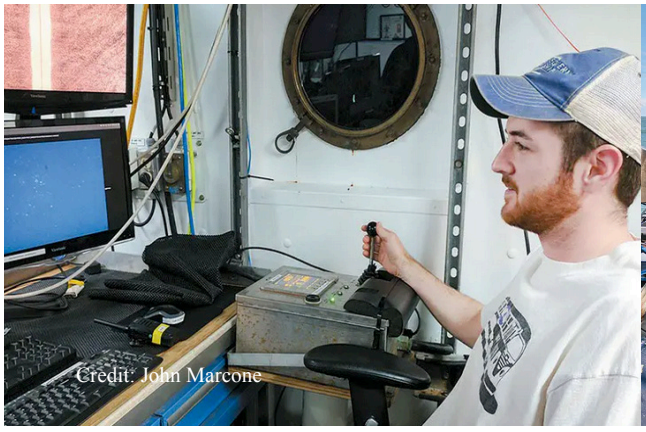
The second data collection campaign we completed involved the 'HabCam.' This was a contraption specially built for our boat to tow 1 to 2 meters off the ocean floor, where it captured detailed pictures so we could count organisms without harvest.

The HabCam required an attentive operator who would let out or draw in the tow line as the ship bounced with the waves and currents, and a handful of annotators who counted organisms in the photographs.

The NOAA bottom trawl survey I participated in is one of the longest-running surveys of its kind. It began in 1963 and has assessed the scallop fishery in the Northeast since the late 1970s. On the other hand, the HabCam survey was a new innovation, aimed at more efficient data collection. It felt inspiring to continue the tradition of the bottom trawl survey, while also trying to push the field forward with novel techniques.

For all the hard work these trips were, there was even time for a little fun. Specifically, after our 12-hour shift and 8 hours of sleep, we had 4 hours a day to ourselves. In that spare time, I watched Jaws with the crew (a uniquely eerie experience at sea), whale-watched as our boat was surrounded by humpback whales and caught up on reading. The few hours between intense work and rolling with the waves in my bunk felt surprisingly tranquil.

These experiences were a great introduction into ecological monitoring that helped kickstart my career in coastal research. I learned so much from the NOAA scientists and other volunteers that I still think about years later!



Credit: John Marcone

Credit: Kyle Runion

Credit: John Marcone

Investigating a massive die-off

July 02, 2024

Kody Barone

Wetland ecosystems, in particular mangroves, serve an important role in slowing down climate change. They do this by capturing greenhouse gasses from the atmosphere via photosynthesis and storing these gasses underground in the form of organic carbon (coined “blue carbon”).

Since their introduction to the Texas coast over a century ago, dwarf black mangroves have been performing this carbon sequestration processes, providing Texas a natural pathway to mitigating the pollution released by burning fossil fuels.

Worldwide, these ecosystems have been declining due to natural and anthropogenic disturbances such as hurricanes and in some regions even logging. One such local example occurred in February of 2021 when winter storm Uri hit Texas, resulting in the death of more than 2,000 hectares of the mangroves along our coast. This drastic die-off event brings up the possibility for not only the release of the carbon they have been storing over the last 100 years, but a decline in the amount of carbon our local wetlands are able to deposit.

Exactly how much carbon is being lost from these ecosystems? How fast is the carbon leaving? Is the carbon remaining in the soil heavily degraded? My work at UTMSI is trying to find those answers. However, before I could begin to answer these questions, I first had to find a location in Port Aransas that harbored mature mangroves that survived winter storm Uri. This proved to be difficult, but in June of 2023, after weeks of searching, I found several patches of 6-feet-tall, bright green, healthy mangroves in the Port Aransas Nature Preserve at Charlie’s Pasture, close in proximity to the Mustang Beach Airport. I have since found several other patches of “old growth” mangroves near the lighthouse on Harbor Island and on the backside of Mud Island.

After the mangroves were located, I collected multiple soil samples with the help of research scientist Kaijun Lu and undergraduates Nathalie Scott, Kadee Loyd and Sofia McKelvey. Playing with mud over the course of four days brought us a total of 355 samples that would be used for various lab analyses which tell me the amount of carbon and nitrogen, quality of carbon, what types of plants produced the carbon and nitrogen and sizes of the grains of sediment in the soil.

From recent lab experiments I estimate a total of 569 tons of carbon have been lost if 2,000 hectares of mangroves died from the freeze. This is the equivalent of carbon dioxide burned from 250,000 gallons of gasoline or the average energy needed to supply 272 homes for one year! It is also important to keep in mind that this loss of carbon will continue to grow as the carbon sequestered by these mangroves has ceased until they are able to reestablish a mature and healthy population.

Where did this carbon go exactly? Multiple pathways of carbon loss may be possible including the release of carbon back to the atmosphere in the form of carbon dioxide or methane due to microbes and the erosional processes of carbon attached to sediment grains being washed away as dead mangrove roots lose their ability to hold onto sediment.

While this loss of carbon is devastating news, the mangrove population has been steadily recovering. However, so is the rate of winter storms Texas is experiencing. Although carbon storage in our local wetlands can recover from Uri, if mangroves cannot keep up with an increase in intense freeze events we may begin to see a decline in these natural combaters of climate change.

Living life at two extremes

July 17, 2024

Mathea Kurtz-Shaw

Whenever I meet someone new and the inevitable topic of "what I do" comes up, my response is often met with confusion.

"So what do you do?"
"I'm a grad student at the UT Marine Science Institute."
"Cool! What do you study?'
"I study tiny animals and algae that live in the mud at the bottom of lagoons on the North Coast of Alaska.""Wait, what? Alaska, but I thought you said you went to school in Texas!"

Learning and researching in two completely different places can be as confusing for me as it is for other people. Traveling the 3,743 miles from Port Aransas, Texas, to Utqiagvik, Alaska and other areas on the North Slope can be both mentally and physically taxing. I find myself frequently shifting focus from Texas-based course material to Arctic sampling and processing methods. My body becomes confused as it switches to 24-hour daylight and then the shock of seeing a sunset again on the journey home.

On the surface, the Alaska and Texas coasts could not be more different. The Beaufort Sea coastline sees heavy snowfall, frozen lagoons, and 24-hour dark- ness for much of the year. The Texas Gulf Coast rarely sees a cloudy day or a dip below 50 degrees. Twenty-five percent of Texas's 30 million people live on the coast while 10,600 people call Alaska's North Slope Borough home.

Yet with all of these differences, both are communities inherently tied to the ocean. Whether it's recreational, subsistence, or commercial, the people of both Port Aransas and the North Slope are constantly interacting with their local waters. Many community members rely on their local estuaries for food and to make a living.

While this reliance on the ocean exhibits itself differently within each culture, I have had the privilege of talking with many people in both locations that are curious about what is happening beneath the surface of their local waters and how they are changing.

Even though my research looking at microalgae and invertebrates buried in the sediment is far from what they are usually asking about, I am able to talk about the connections and structure of these complex ecosystems and how we as humans are impacting them.

Their curiosity and concern inspire me to dig deeper into what previous generations of locals and scientists have learned and to continue listening intently to those who are witnessing the impacts on their local ecosystems every day.

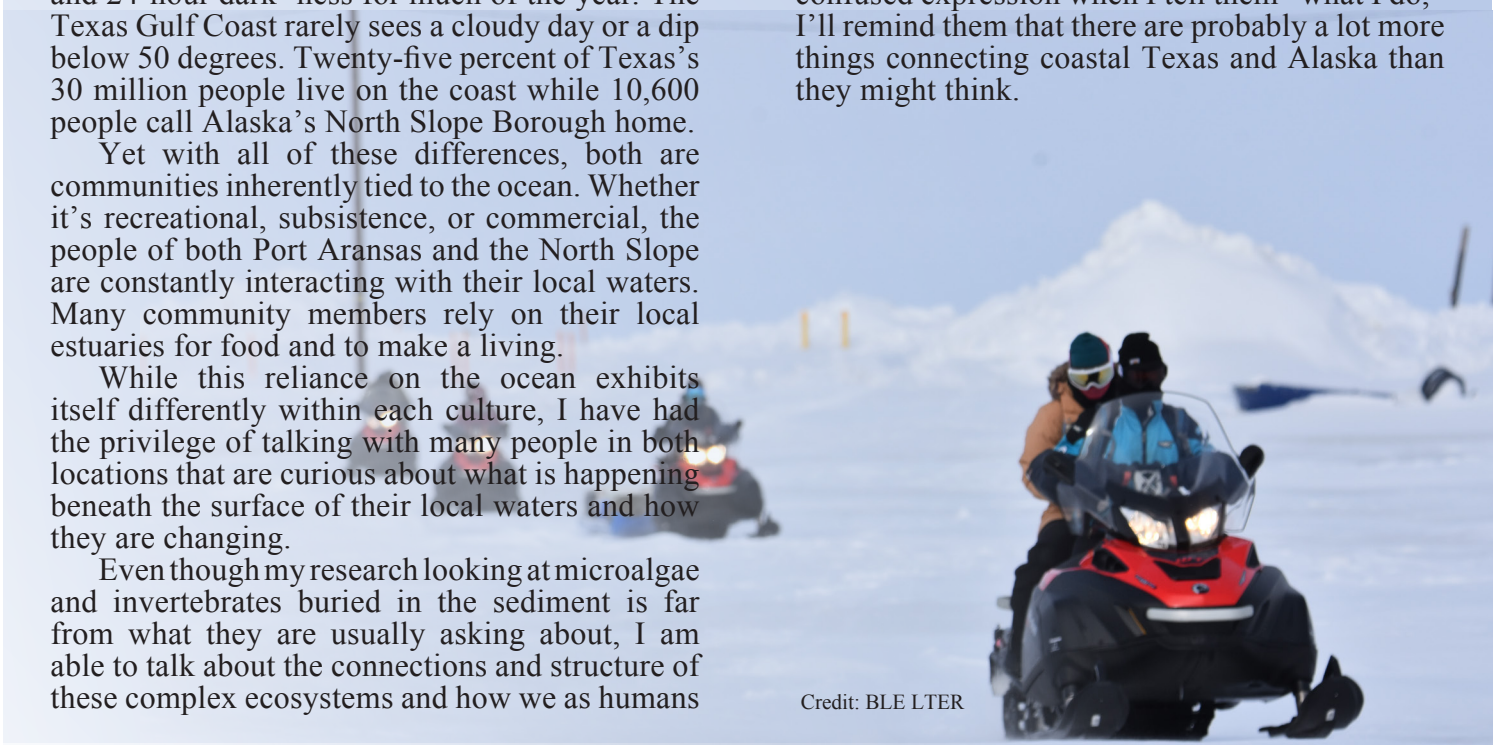
In particular, the questions that children of these different places ask about their local environment challenge me to be more fully present to what I witness each day in these communities.

I have had the pleasure of teaching kids in both Alaska and Texas about the amazing lagoon ecosystems of the Arctic. While the classrooms start with very different understandings of what these lagoons are like, both are filled with so many questions.

One of the activities the kids found most exciting was all about salinity. They measured the saltiness of different water and then tried to make their own "saltwater" to match. The kids wanted to know all about how different creatures would respond to the salinity of water and what could cause salinity to change in their environment.

Their insatiable curiosity reminds me of the privilege I have in observing and participating in these communities, whether it's in the Texas heat or the chilled air of the Arctic.

So the next time someone shoots me a confused expression when I tell them "what I do," I'll remind them that there are probably a lot more things connecting coastal Texas and Alaska than they might think.



Credit: BLE LTER

Tracking contamination in Antarctica

July 31, 2024

Sally Palmer

Interest in exploring the South Pole and Antarctica has captivated people since 650 A. D., with Polynesian navigators and continued through the golden age of exploration in the late 1800s with figures like Robert Falcon Scott and Ernest Shackleton. This fascination persists today. These explorations, and the subsequent establishment of research stations by various countries, introduced pollution to what is arguably the most pristine area on the globe.

Twenty years ago, I was fortunate to be part of a research team that established the first long-term monitoring program for McMurdo Station to track contamination in the marine environment. McMurdo Station, the largest U.S. base in Antarctica with year-round occupation, had some areas of legacy contamination from the 1950-70 era. Waste management efforts ramped up in the 1980s, and even 20 years ago, recycling efforts at McMurdo far exceeded anything implemented stateside.

I first traveled to McMurdo in 2000 to help establish the marine portion of the longterm monitoring plan. The uniqueness and intricacies of working at an Antarctic field station are beyond the scope of this column, but it was an experience I am honored to have and will never forget.

Credit: Steve Sweet

Getting to McMurdo involves extensive planning and effort, beginning in the U.S. with equipment planning and shipping, as well as numerous medical and dental visits to ensure clearance for deployment. The National Science Foundation, which manages the station, wants to ensure that personnel are healthy enough to handle the harsh environment, as medical evacuations to larger facilities in New Zealand are challenging.

Upon arrival, after days of safety briefings, we finally began our work. Most of our work was based on the sea ice within sight of the station, as contamination is localized around McMurdo.

With the help of station divers, we drilled holes in the ice, set up huts over them and processed sediment samples brought to the surface by the divers before taking them to the lab. Being in the hut was one of the highlights of the research.

The water was so clear that you could see straight to the bottom through the dive hole, revealing a carpet of life —anemones, sponges, starfish and giant nemertine worms — in the unpolluted control sites.

In contrast, the contaminated sites were markedly different. The sediment cores from these areas had so much oil and other chemicals that you could see and smell the contamination immediately. Processing the samples was relatively straightforward due to the stark differences: Control sites had diverse and abundant animal life in the sediment, while contaminated areas had very little.

In those early 2000s, our goal was to determine the extent of the contamination and design a monitoring plan for the future. The good news is that the contamination in the water was very localized and stable.

The plan we developed has been employed for several decades and continues in a reduced form today. I am proud to have been part of the team that helped ensure that while Antarctica is not as pristine as when the first explorers found it, efforts are being made to reverse human impact and prevent further damage.

Helping wildlife impacted by hurricane

August 14, 2024

Andrew Orgill

Credit: Andrew Orgill

Yellow- crowned night herons are small herons weighing about 1.5 pounds and have been seen sporadically in care at the Amos Rehabilitation Keep (ARK) over the years.

They breed in our area but are much more common further up the coast where saltmarshes and bayous are more common and their favorite prey item, crayfish, are more abundant. As juveniles, they are differentiated from the black-crowned night heron by their head shape and spotted versus streaked appearance.

This species, as well as other species of wading birds and Mississippi Kites, were majorly impacted by Hurricane Beryl, which displaced many birds from their nests. Most of these birds were fledglings, or close to fledgling age, which means the age when they are ready to leave their nest and begin learning to fly and forage on their own.

This storm came just a few weeks too early for hundreds of birds between the Matagorda and Houston areas. Not only were concerned locals reaching out to their local organizations, but some were reaching out to the ARK as well.

We know from the firsthand experience of Hurricane Harvey how destructive a hurricane can be. We knew we had to reach out to the local rehabilitators in the Matagorda area, approximately 90 miles up the coast from Port Aransas, where Hurricane Beryl hit, and offer the support that we could.

While undergoing construction at our own facility, we had some outside caging and spaces available. The animal rehabilitation community must work as a tightknit group, sharing information and moving animals amongst facilities to ensure the best care and options for release. The team at the ARK offered support for the wildlife impacted by the storm.

In the past, we have worked occasionally with Gulf Coast Wildlife Rescue (GCWR) in Angleton, which was in the direct path of the storm. GCWR, a nonprofit organization run entirely by volunteers, had been working tirelessly to care for wildlife displaced by Hurricane Beryl, all while managing significant storm damage to their facilities. They took in several hundred animals over just a few days and with the help of their local community, were able to respond to every call for help.

At the ARK, we offered to provide care for nine yellow crowned night herons that were displaced from their nests by the hurricane, and two brown pelicans that were weakened and bruised on the gulf beach, also affected by the storm.

These birds are eating well and gaining weight under our care. Our plan is to continue nurturing them until they are ready to fly and then return them to their natural habitat further up the coast soon for release. They immediately began voraciously feeding on a mixed diet of different types of fish and shrimp.

The recovery and progress of these night herons and pelicans can be followed on our Facebook page: @Amos Rehabilitation Keep – ARK at UT Marine Science Institute.

The collaboration between rehabilitation facilities highlights the importance of working together in disaster response. These collective efforts play a crucial role in the ongoing recovery and care of wildlife affected by the storm. Not only did the ARK assist the rehabilitation centers further up the coast, but facilities across the entire state stepped up to assist in this large-scale rehabilitation effort.

A day in the life of a broodstock manager

September 11, 2024

Leigh Walsh

Established in 1979, the University of Texas Marine Science Institute's (UTMSI) Fisheries and Mariculture Laboratory (FAML) has been at the forefront of advancing marine research in mariculture, fish nutrition, physiology and ecology. FAML is distinguished by its extensive systems of large tanks that house adult fish which produce eggs for year-round research projects led by our own scientists. Located near the Port Aransas ferry landing entrance on Port Street, FAML plays a critical role in supporting important research on species such as red drum, southern flounder and other sportfish. As the broodstock manager, my day revolves around ensuring the health and productivity of our broodstock, managing advanced recirculating seawater systems and supporting a variety of research projects.

Our day begins early, starting with a careful inspection of the broodstock fish which are housed in four different buildings. A primary task is checking for spawning, as the availability of eggs is crucial for the success of our research projects. Each morning, we assess whether spawning occurred overnight, which is an essential step for planning the day's activities.

Following this, we inspect the recirculating seawater systems that are vital for maintaining optimal conditions for our fish.

These advanced systems recycle and clean water within a closed loop, minimizing the need for new seawater and reducing discharge of wastewater and is environmentally friendly. We maintain 16 broodstock tanks that range in size from 10 to 23 feet in diameter and six raceways that are 20 or 45 feet long. We ensure that aeration, water flow and temperature control systems are functioning properly. This involves monitoring temperature sensors and heat pumps to regulate water temperature, and sand filters to maintain water clarity, which requires regular backwashing.

Natural seawater is pumped from the ship channel adjacent to FAML and it undergoes a thorough filtration process, which removes most particles, followed by sterilization treatments to eliminate bacteria, viruses and other contaminants.

Maintaining optimal water quality in the broodstock tanks is an ongoing process. We regularly monitor parameters such as temperature, salinity, ammonia, nitrite, pH, dissolved oxygen, and carbon dioxide. These measurements are critical for ensuring a stable environment for fish health and productivity. Observing fish behavior, signs of disease or stress is also essential for early detection of health problems, allowing us to make necessary adjustments to keep the fish in good condition.

In the afternoon, we feed the broodstock, which involves providing them with thawed fresh-frozen shrimp, squid and sardines. This high-quality diet is essential for their health, reproductive success and the quality of the eggs they produce.

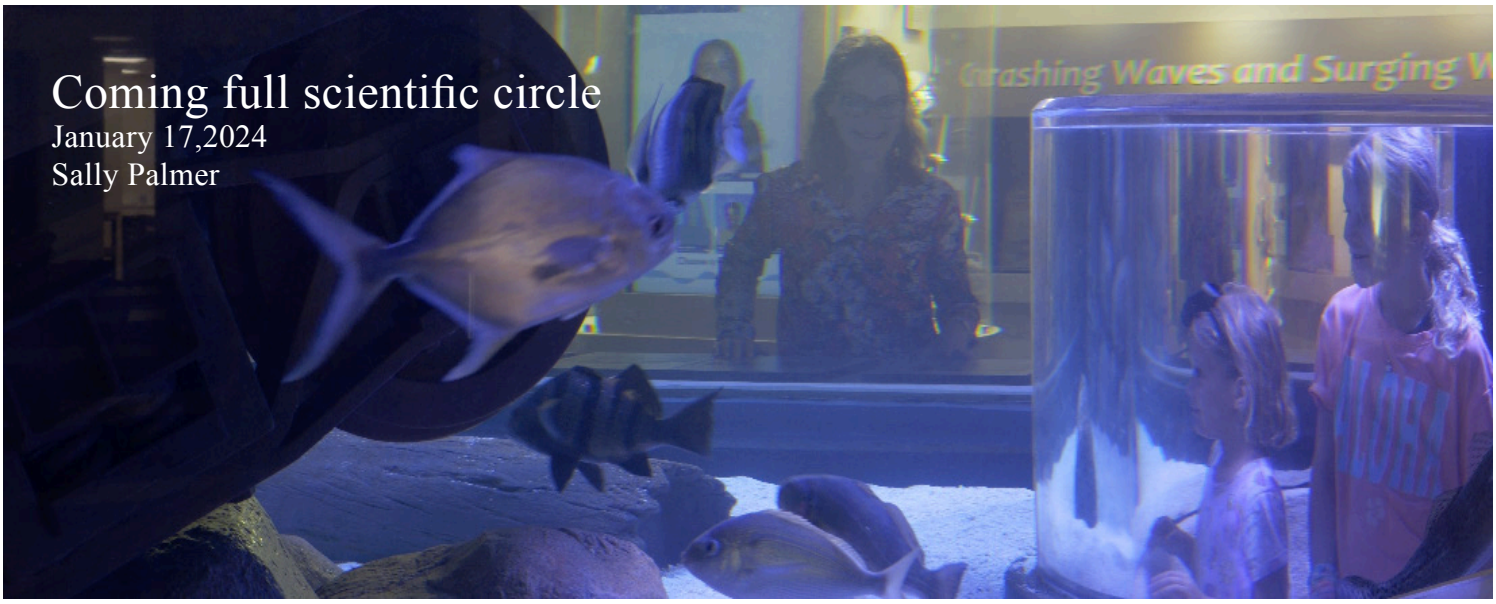
To get the fish to spawn when we want, we carefully adjust the temperature and light cycles in the tanks to simulate their natural spawning season. By mimicking these conditions, we can induce spawning throughout the year, ensuring a consistent supply of eggs and larvae for research purposes.

Our primary goal is to provide high-quality eggs and larvae for various research projects. This includes supporting faculty, scientific staff and graduate students involved in important studies. Current research includes examining the effects of maternal diet on offspring survival, which is critical for improving aquaculture practices and understanding fish development.

Additionally, we are collaborating with the Texas Parks and Wildlife Department in support of their Southern Flounder Stock Enhancement Program. This initiative aims to boost wild flounder populations through managed breeding and release of young flounder from TPWD hatcheries. We are investigating why flounder produced in hatcheries often lack pigmentation, a trait that makes them more susceptible to predators and less attractive to anglers.

Graduate students also use the fish larvae to study the effects of hypoxia, physiological stress, and pollutants, such as "forever chemicals," on larval fishes. These studies are essential for developing strategies to mitigate the effects of environmental stressors and pollutants on marine life.

At FAML, we are dedicated to advancing marine science and supporting sustainable fisheries on recreationally and commercially important fish species of the Gulf of Mexico.



Coming full scientific circle

January 17,2024

Sally Palmer

Some of my fondest memories are from the Oceans Class at Flour Bluff High School taught by Dr. David Bartling, who also happened to be a resident of Port Aransas.

Needless to say, an excursion aboard the R/V Katy at The University of Texas Marine Science Institute (UTMSI) was one of many field trips that we went on during the course. Those experiences are what made me fall in love with marine science and steered me to the career I have now at UTMSI.

It's a little surreal being an adult and seeing my child have those same experiences 30 years later. My current 6th grader was in Ms. Janice Ainbinder's class at Flour Bluff and last spring they came out to UTMSI for the R/V Katy trip and visit to the campus.

I even got to lead them on a tour and talk about our new Patton Center for Marine Science Education. I'm sure I wholeheartedly embarrassed her, which I have to admit was quite rewarding. Despite that, I hope that she retains the same wonder I still feel when being on the water or learning about the ocean and its creatures.

The R/V Katy is a wonderful inaugural experience to learn about marine life. The programming is such that you get to see, touch and smell all of the marine life from the ground up, from the stinky mud grabs with brittle stars (a personal favorite), to the trawl with always a large diversity of fish species, to the plankton tow that opens people's eyes to a vast array of plankton fueling the system.

Sometimes the trawls pull up bay squid. Getting to see a squid change color using the chromatophore cells through the stereo microscope is something I don't think that I'll ever forget.

I hope the excursion aboard the R/V Katy helped instill a love of science in my daughter and that the Katy does the same for everyone who goes aboard.

I'm also very pleased to report that the vessel will soon get a brand-new and more fuel-efficient engine with support from the Texas Commission on Environmental Quality. The current engine has been rebuilt several times and was in dire need of a replacement. The new one will ensure that not only me, my child, but maybe her own will get to experience what it's like to see what marine science is all about, and who knows, maybe there will be a third-generation scientist in the future.

It is not just a boat that has kept the program alive for all these decades, but the passion and dedication from the educators.

In addition to Janice Ainbinder and the late Dr. David Bartling, I'd like to acknowledge the impact that our local marine science teachers have on their students: Dr. Rick Tinnin, creator and long-serving director of UTMSI's marine education services; John Williams, R/V Katy naturalist for more than a decade; retired teacher Cliff Strain, administrator of Flour Bluff Intermediate School's Oceans Program; Katie Doyle, current administrator of Flour Bluff Intermediate School's Oceans Program; Adriana Reza, current education coordinator at UTMSI; Kimber Montanye, current R/V Katy naturalist and so many more.

Thank you to all of you educators who have continued to provide opportunities for students to learn about marine science despite the red tape, budget cuts and so many hurdles. I can assure you that the impact is great and it is worth it.

UTMSI flying toward bird-friendly campus

September 25, 2024

Kyra Jean Cippola

Have you ever seen a mysterious dusty imprint of a bird on glass or heard the unsuspecting “thud” as they flew into a window? Maybe you’ve seen injured birds on the ground around Port Aransas or wondered why so many birds were circling lights at the top of a building at night. If so, consider yourself a witness to one of the biggest environmental challenges of our time: the tragic loss of birds due to collisions with buildings and other lit structures across our increasingly human-altered landscapes.

Each year, nearly a billion birds fall victim to collisions with buildings in the U.S. alone! This happens mostly because birds cannot see glass as a barrier the way we do, and often fly towards what appears to be open sky, plants or habitat in reflections. While bird-glass collisions mostly happen during the day, they are also happening at night when artificial lights attract them in. As the use of glass and lights at night increases in our landscape, more and more birds are impacted every day. Fortunately, there are solutions, and a growing number of universities are joining efforts to make their buildings and campuses bird-friendly!

At the University of Texas Marine Science Institute birds are not just background music or fleeting shadows; they’re essential members of our ecological community that often contribute to seed dispersal, pest control and so much more. Port Aransas has many birds migrating through, making them vulnerable to collisions. Studies have shown that birds can have therapeutic effects on us, improving our mental well-being, reducing stress when we hear their song, inspiring our creativity, and, ultimately, connecting us to the awe of our natural world! Less birds in our shared skies should concern us all, as it signals broader environmental issues that can ripple effect into our own well-being.

These threats to birds are preventable, and our university community is uniquely positioned to flock to the solutions and make a lasting impact. Through our new Bird-Friendly Campus Initiative, MSI is building a conservation community to turn our campus into a more sustainable, bird-friendly sanctuary. We have installed bird-friendly designs on the front windows of Patton Center for Marine Science. We plan to expand installation on the Patton Center and other high-traffic bird areas on campus. The initiative is funded by the 2024 UT Green Fund Award granted to the newly reformed MSI Green Team.

Ways you can get involved today

- Visit our Patton Center and learn more about the research going on at UTMSI.
- Turn off outdoor lights when not in use.
- Advocate for bird-safe practices at work and in your residential area.
- Decorate your windows with washable window paint so they are visible to birds (kids love it too!)
- Spread awareness about this issue and how to mitigate it on social media.
- Plant native gardens to provide food and habitat resources for birds.

Our collective actions, no matter how small, can have a profound impact on the survival and well-being of migratory birds. By participating in monitoring, advocating for change, raising awareness, contributing to habitat restoration and supporting conservation efforts, the MSI Green Team strives to ensure the campus not only fosters academic growth but also acts as a haven for the migratory birds that grace our skies.

Information and inspiration for the bird-friendly project was provided by the U.S. Fish & Wildlife Service.

Eclipse experience exhilarating

April 24, 2024

Victoria Congdon

Perhaps there is something to the old adage, "everything is bigger in Texas."

Texans and visitors alike had a unique opportunity to experience an annular solar eclipse on Oct. 14, 2023, and total solar eclipse on April 8, 2024. Unfortunately, I was in Florida doing a postdoctoral fellowship for the annular solar eclipse but could not pass up the chance to see the total eclipse after hearing all excitement.

It was going to be the first total solar eclipse over Texas since 1878 and the last total eclipse viewable within the contiguous U.S. until Aug. 23, 2044! Call me a scientist, but I was most excited to see how the animals would react and the weather would change.

Most people planned their trip many months in advance, evidenced by sold-out hotels, cabins and tent/RV campgrounds across parks statewide. Since I recently came back to Texas as the Mission-Aransas Research coordinator, I did not plan appropriately so decided to embark on a day trip, heeding the advice of the Texas Department of Transportation to "expect heavier than-usual traffic," "leave early and stay late" and "no stopping on highway to view eclipse."

I certainly did not want to be out on the road right before, during or after the main event. Fredericksburg is 3.5 hours away, so I told myself to be out the door no later than 7 a.m., which was probably a gamble. I am not sure if the cloudy forecast and/ or the Monday workday had any bearing on traffic conditions, but thankfully traffic did not impede my trip until nearing my destination.

Like all of us, I despise traffic, but this time it was different. I cannot believe I am saying this, but traffic helped me slow down and take in the raw beauty of the scenic Texas Hill Country. The jagged rocky limestone cliffs and rolling tree-covered hills. The vineyards and wineries dotting the landscape.

But what truly caught my eyes were the stunning wildflowers that painted the highways. It was a perfect time to travel and take in all the Texas goodies – swaths of bluebonnet, Indian blanket, Indian paintbrush, Mexican hat, winecup, pink evening primrose, white prickly poppy, Texas thistle, common sunflower and I could go on forever. The trip already felt dreamy, and yet, I was not even at the grand event.

I arrived at my destination with time to spare, allowing for a walk through the vineyard as the blanket of clouds began to break overhead. Seasoned eclipse-chasers proudly donned their "Twice in a Lifetime" T-shirts, and one couple I spoke with made the trek all the way from North Carolina.

Spectators gazed up at the sky through their eclipse glasses in awe, marking the start of the partial eclipse at 1:15 p.m. Through the thinnest clouds, we could see the moon starting to obscure the sun, a magnificent sight. A band covering Pink Floyd's "The Dark Side of the Moon" played distantly in the background.

Although the clouds grew thick, eventually blocking the eclipse, the immersive experience was sensational. The moon's shadow crept in and air chilled. The bird songs that once filled the air became infrequent, overlapping with the chirps of crickets, then fully replaced by the crescendo of the chorus.

It was surreal – the sky was black, the temperature dropped around 10 degrees Fahrenheit, and it was nighttime at 1:35 p.m. We experienced 4 minutes and 15 seconds of totality – then like pressing rewind on a video, nature appeared to transition back to normal.

When I initially pictured a total eclipse, the iconic view of a ghostly white corona glowing around the moon came to mind. Although I did not witness this classic image, it was so much more than I could have imagined, a truly remarkable and breathtaking experience.

Credit: Abobe Stock

As Gulf coast res- idents, we have observed with concern the devastating impact of hurricanes Helene and Milton on the southeast- ern United States. Although tropical cyclones have been a part of the Gulf coast's way of life throughout recorded history, stronger storms have intensified quickly in recent years, reaching categories 4 and 5 over hours to a few days.

For example, Hurricane Harvey, which made landfall just north of Port Aransas in August of 2017, intensified from a tropical depression to a Category 4 hurricane over two and a half days. Hurricane Milton, which recently hit Florida's west coast, started as a tropical depression in the southwestern Gulf on Saturday, Oct. 5, and became a tropical storm the same day. By Sunday, it was a Category 1 storm, intensifying rapidly to a strong Category 5 storm on Monday and making landfall as Category 3 on Wednesday night.

The 2024 season is only the sixth year in which two Category 5 hurricanes (Beryl and Milton) have formed in the Gulf since 1950.

Milton is one of the strongest Atlantic hurricanes on record. Its impact was compounded by the prior passage of Hurricane Helene (Category 4), which hit Florida's Coastal Bend on Sept. 26, making its way through southeastern Florida, Georgia, South Carolina, North Carolina, Virginia and Tennessee.

Although hurricane wind speeds are dangerous and devastating, the rainfall and tornadoes that accompanied these very strong storms caused extensive damage and record death tolls in areas far from the coast.

Preliminary damage assessments for Hurricane Helene are as high as $250 billion, with only a small fraction covered by insurance. Hurricane Milton is estimated to cost insurers about $60 billion, and the overall cost is still being calculated.

An intense scientific effort has been underway to understand the drivers of the increased intensity of hurricanes in the Atlantic, including the Gulf of Mexico. There is widespread agreement within the scientific community that climate change driven by fossil fuel burning, deforestation and some agricultural practices has led to atmospheric warming through the greenhouse effect.

This has increased the heat transferred into the ocean's surface waters. Warmer waters fuel hurricanes and transfer more moisture into the atmosphere, causing increased rainfall following landfall.

Surface ocean temperatures have increased steadily since 1982, when remote sensing provided the ability to scan large ocean regions simultaneously. Warming is most notable during the fall, coinciding with the hurricane season.

Over the last three decades, the surface waters of the Gulf have increased by 1.5 degrees Fahrenheit during October. According to the National Oceanic and Atmospheric Administration, as hurricane Milton made its path eastward across the Gulf, ocean temperatures were 1 to 2.7 degrees Fahrenheit higher than the average for 1991 to 2000.

World Weather Attribution (www.worldweatherattribution.org/), an international scientific group that examines the links between climate change and severe weather events, estimates that in the absence of ocean warming due to climate change, Milton's winds would have been 10 percent lower.

This would have made it a Category 2 storm. Helene's rainfall would have been lower by 10 percent, and extreme rainfall events that accompanied the hurricane are much more likely.

Satellite observations and in-place measurements with sophisticated equipment such as oceanic buoys, gliders and ships of opportunity support this effort and lay the foundation for hurricane prediction.

Data are fed into several complex numerical models run on supercomputers; since no model

is perfect, hurricane forecasting is based on analysis of the joint results of multiple models, providing a more robust forecasting ability. Hurricane forecasting is still challenging despite this capacity, and precise landfall locations and intensity forecasts remain elusive.

A warmer Gulf of Mexico and an increased likelihood and frequency of stronger storms are facts Gulf Coast residents must confront through hurricane preparedness, awareness and the implementation of approaches to mitigate damages and avoid loss of life.

Discovering hidden allies in the sea

August 28, 2024

Ingrid Bunholi

Credit: Theresa Ruege

When we think of bacteria, the first things that come to mind are often negative— illness, infections and hospital bills. But, did you know that not all bacteria are bad? In fact, many play crucial roles in keeping us healthy, particularly those that make up our gut microbiome.

Just as bacteria are essential to human health, they also play vital roles in the marine environment. Take marine sponges, for example. These filter-feeding animals — yes, sponges are animals — are home to a remarkable variety of bacteria. In some cases, up to 38 percent of a sponge's wet weight is made up of bacterial cells! These microscopic residents contribute to the sponge's defense mechanisms, help with nutrition and even aid in the development of the sponge. This partnership is one of the reasons sponges have thrived as some of the most ancient animals on Earth.

Credit: Abbie Affleck

But the benefits of this relationship don't stop with the sponges. It turns out that sponges also play host to a variety of other marine creatures, including tiny cryptobenthic fishes — those small fish (less than 5 centimeters) that live close to the ocean floor. Some of these fish rely on sponges for both food and shelter. What's more, recent studies suggest that the bacteria living in sponges can be transmitted to the skin and gut of these fish, boosting their disease resistance and giving them a survival edge. Living in a sponge might just be better than having a beachside house!

One such fish is the tusked goby, Risor ruber, a little reef fish that grows to just 2.5 centimeters. This patriotic little guy even changes its color to blend in with its sponge home. My Ph.D. research is focused on exploring the relationship between Risor ruber and its sponge hosts, particularly looking at how the microbiome — the community of bacteria living on and in these animals — plays a role. Early findings are promising: About 65 percent of the sponge's microbiome is found on the skin of Risor ruber. One of the bacterial groups present in both the sponge and the fish has shown strong antibacterial activity against a wide range of fish pathogens. It seems this tiny fish knows how to pick a good neighborhood!

By studying these fascinating interactions, we can learn more about the delicate balance of marine ecosystems and perhaps even find new ways to protect them. Who knew that the humble sponge could hold such secrets?