Outer Cape Environmental Awareness Newsletter

SafeHarborEnv.com

JUNE, 2023 ISSUE
NO. 62

What's inside this issue:

A word from OCEAN's Editor:

GORDON PEABODY

OCEAN 62 contains two, very unusual, in my opinion, articles. New England Coastal Fishermen have been plagued by invasive Green Crabs. Now, in an extraordinary development, a Fisherman is using them to create a unique Whiskey! In our "Close to Home" section, a local woman has been part of a for profit business recycling used fishing gear that might normally be abandoned. She is working on an expanding, National scale. OCEAN environmental e-newsletter is the educational publication of Safe Harbor, an interdisciplinary environmental consulting group on Cape Cod. OCEAN and our research team is funded by me, so you will never find advertising or solicitations. This is your newsletter, exploring innovative solutions and unusual problems. OCEAN is intended to be shared. Thank you for your support.

-Gordon Peabody

Harnessing Waves

THANK YOU TO **OCEAN** RESEARCHER TESS HOLLAND

Mutriku, a small coastal town in Northern Spain, is making big waves in the green-energy industry. In 2011, an energy plant powered by the force of ocean waves was unveiled and has since proved to be a hugely impactful addition to the town. The plant powers 250 households by generating 296 kilowatts of energy, which cuts about 600 tons of carbon emissions each year. The plant, built from a pre-existing seawall by Ente Vasco de la Energía (EVE), features 16 turbines that each contain an air chamber. When a wave breaks at the seawall, the force of the wave creates high-pressure air that rises upwards through the chambers, thus powering the turbine. This process generates the electricity that powers the town of Mutriku. Electricity is also generated by the air pulling back through the turbine when waves recede.

The wave energy plant not only serves the community by generating electricity, but it also keeps the harbor safe. The seawall breaks dangerously strong waves that previously threatened fishermen and hindered them from reaching open waters. Now, they can travel safely through the harbor. Moreover, Mutriku welcomes innovators to use their chambers to test out new turbines and generators. Experiments using Mutriku's chambers allows innovators to see how well their product will withstand rough conditions, but may also help lower costs for future wave technology.

Wave technology, like the Mutriku wave energy plant, could become a big, green source of electricity for Europe and beyond. Richard Kemeny from BBC estimated that "the global potential of waves alone is enough to meet Europe's energy demand 10 times over". Violeta Bandrés, a guide at the Mutriku Tourism Office, says "the sea has been, is and will be a fundamental part of life for Mutrikuarra". With the ocean being such an important part of the lives of many Cape Codders, it is critical we further develop our relationship with it by following in Mutriku's footsteps and harnessing the power of the waves along our beautiful coastline.

Further information:

- https://www.dw.com/en/harnessing-wave-power-in-spain/video-44041739.
- https://www.bbc.com/travel/article/20230122-the-spanish-town-powered-by-waves.
- https://www.renewable-technology.com/projects/mutriku-wave-energy-plant/.
- https://www.bimep.com/en/mutriku-area/technical-characteristics/.

Image source:
https://www.bbc.com/travel/article/20230122-the-spanish-town-powered-by-waves

Flesh Eating Bacteria

THANK YOU TO **OCEAN** RESEARCHER TESS HOLLAND

Following Hurricane Ian this past September, residents of Florida faced a significant uptick in the number of infections caused by the flesh-eating bacteria Vibrio vulnificus. In Lee County, the area most impacted by the hurricane, there were 28 documented cases and 8 documented deaths in 2022 due to Vibrio vulnificus. This is the highest number of cases confirmed since 2008, when documentation of infections began.

According to the Florida Department of Health, Vibrio vulnificus thrives in post-hurricane conditions. Since they are halophiles, organisms requiring salt to live, the warm, brackish, standing floodwater creates the optimum environment for the bacteria to survive. Sewage spills, common in severe hurricanes, can also cause bacteria populations to increase. The bacteria enter the body through open wounds or cuts but can also be present in raw shellfish such as oysters, clams, and mussels. If a contaminated shellfish is ingested, the individual is at risk of developing a Vibrio vulnificus infection. Healthy individuals often experience milder symptoms, such as vomiting and diarrhea. Individuals who are immunocompromised, however, are at risk of developing more severe conditions, such as necrotizing fasciitis (death of flesh), and in some cases, sepsis.

This upcoming hurricane season, it is important to be aware of this risk and take safety precautions to protect locally against Vibrio vulnificus infections, especially with rising sea levels and rising water temperatures on Cape Cod. The Florida Department of Health recommends avoiding ingesting and handling raw shellfish, and avoiding exposure to brackish waters, especially if one has open wounds.

Further Information:

- https://weather.com/health/video/florida-flesh-eating-bacteria-cases-an-important-reminder-as-hurricane-season.
- https://www.bbc.com/news/world-us-canada-63309246.
- https://www.floridahealth.gov/diseases-and-conditions/vibrio-infections/vibrio-vulnificus/.
- https://www.cdc.gov/vibrio/wounds.html.

Image Source: https://www.bbc.com/news/world-us-canada-63309246

Is it Getting Hotter? Gulf of Maine Records Second Hottest Year

THANK YOU TO **OCEAN** RESEARCHER CATIE URQUHART

The Gulf of Maine Research Institute (GMRI) recently published a study indicating that last year (2022) was the second hottest year on record. GMRI uses sea surface temperature—or SST— to measure the impacts of our changing climate on their systems. In fact, last year's average SST of 53.66 degrees Fahrenheit was 3.72 degrees warmer than the average over the past 3 decades according to GMRI. Unfortunately, 2022 temperatures were not a fluke; the hot waters fell just short of the hottest average SST recorded in Maine, which occurred in 2021. The most severe temperature variations occurred in the Winter months, setting records for highest monthly SST in both November and December.

Warming waters are not unique to Maine; data published by the National Oceanic and Atmospheric Administration since 1981 indicate heatwaves across all oceans on Earth. Even during multiple years of La Niña weather conditions, typically characterized by extreme cooling, our oceans saw hotter than normal temperatures. Most meteorologists are in agreement that these hot temperatures are the result of anthropogenic—human caused—climate change. The Gulf of Maine is known for being one of the fastest warming regions of any ocean on our planet; with SSTs increasing in temperature at a rate 97% faster than the rest of the planet. Early studies indicate that these warming waters have already had negative impacts on Maine's fin and shellfish, including none other than the famous Maine lobster.

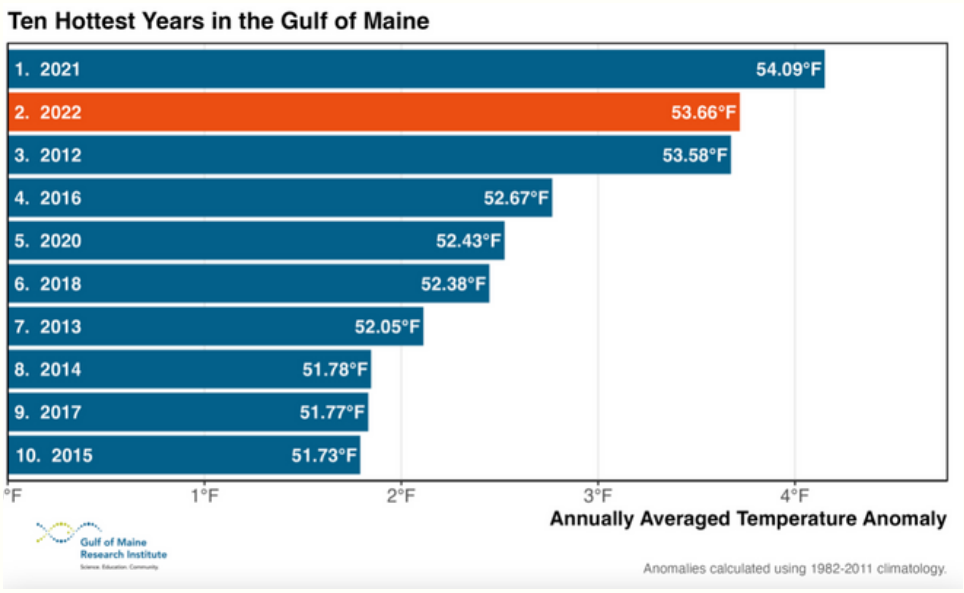

Image Source: https://www.massaudubon.org/get-outdoors/wildlife-sanctuaries/wellfleet-bay/about/our-conservation-work/horseshoe-crabs

Further Information:

- https://online.ucpress.edu/elementa/article/9/1/00076/118284/Climate-impacts-on-the-Gulf-of-Maine-ecosystemA
- https://climatereanalyzer.org/clim/sst_daily/
- https://www.theguardian.com/environment/2023/apr/08/headed-off-the-charts-worlds-ocean-surface-temperature-hits-record-high

Acrylic, Nylon, and Seaweed Plastic...? Oh my!

THANK YOU TO **OCEAN** RESEARCHER CATIE URQUHART

This is a year of many innovations in the sustainability field. One instance of this innovation is a plastic made from seaweed produced by the startup Notpla in London. Founded by Rodrigo Gonzalez and Pierre Paslier while they were students, the startup has now won the Earthshot Prize, a grant of one million euros given by Prince William, to further their research into their sustainable plastic. The pair originally developed an "Ooho" which gained much attention on social media for being a clear, edible bubble. Eventually the Ooho transformed into the Notpla, which is deemed a sustainable plastic, but in fact is not a plastic at all. True plastics are comprised of polymeric resins, materials that release many greenhouse gasses when being produced and are known for creating pollutants that harm animals and the environment. But Notpla is made from "one of nature's most renewable resources," brown seaweed!

Notpla's website explains that brown seaweed is the ideal resource because it naturally grows up to a meter a day, doesn't require fresh water or fertilizer, won't compete with food crops, and works to de-acidify our oceans. On top of these benefits, packaging made from Notpla materials biodegrade naturally in 1-2 months. From coatings on food takeout containers and single-use water bottles to paper, snack bags, and their signature "pearls" that can be used to hold a single dose of toothpaste or other substances, Notpla boasts a wide variety of uses. Perhaps if companies begin to invest in biodegradable packaging materials like Notpla, we can halt the buildup of floating plastic islands in our oceans and microplastics being found in in human and animal bodies.

Further Information:

- https://www.notpla.com/
- https://www.bbc.com/news/business-63841761

Image Source: https://www.notpla.com

Florida Sargassum

THANK YOU TO **OCEAN** RESEARCHER ABIGAIL EILAR

As summer vacation is nearing, Florida beachgoers may have some unwelcome guests. Since 2011, yearly booms of the floating seaweed Sargassum have inundated coastal areas in Florida, the Gulf of Mexico, and the Caribbean. Although not a new phenomenon, the Great Atlantic sargassum belt is of concern this year because its growth started early and doubled in size between December and January and is some of the largest recorded.

Sargassum can inundate mangroves by removing the oxygen from the water creating dead zones for areas that provide nursery habitats for fish, help protect coastlines, and provide habitat for various species. Coral reefs and seagrasses may also be negatively impacted. Human health is a concern because sargassum usually breaks down within 48 hours on land and releases toxic hydrogen sulfide affecting those with respiratory problems. During handling or removal, people also must be mindful because the tissue contains arsenic. Brian Lapointe, a researcher with Florida Atlantic University Harbor Branch Oceanographic Institute (HBOI) explained the sargassum belt usually has its peak in Florida around mid-summer during July.

Lapointe also described one hypothesis to the growth may be caused by changes in the nitrogen cycle, specifically the ratio of nitrogen to phosphorus increasing, the burning of biomass, and the use of fertilizers. Other researchers point out that like red tide problems Florida is also experiencing, these excess nutrients in combination with warmer temperatures and light create perfect conditions for the growth of the sargassum and harmful algal blooms alike. Florida continues to try and remove these large blooms when able, but risk shoreline erosion and damage to sea turtle nests. With more knowledge, tracking abilities, and how to best remove the sargassum, there is hope of finding future solutions on how mitigate harmful effects.

Further Information:

- https://www.cnn.com/videos/world/2023/03/15/exp-florida-seaweed-brian-lapointe-intv-fst031502aseg1-cnni-world.reuters
- https://news.fiu.edu/2023/the-great-atlantic-sargassum-belt-is-carrying-a-massive-bloom-of-brown-seaweed-toward-florida-and-the-caribbean
- https://www.npr.org/2023/03/15/1163385168/sargassum-seaweed-florida-mexico-beaches

Image Source: https://www.floridarambler.com/environment/sargassum-seaweed-florida-beaches/

Artificial Turf: Friend or Foe?

THANK YOU TO **OCEAN** RESEARCHER ABIGAIL EILAR

Artificial grass, known as turf, is used across North America in places like sports fields, parks, and lawns as a grass alternative. Turf is often chosen for its lower maintenance compared to grass, less likelihood of flooding, and the lack of water needed in places where drought is of concern. Although often seen as a good alternative, turf comes with its own downfalls with the use of materials such as recycled rubber and per- and polyfluorinated substances (PFAS).

Recycled rubber and tires have been shown to contain carcinogens including benzene and heavy metals which could be of concern over time with increased exposure. PFAS have gained a lot of exposure in recent years about concerns of their presence in drinking water in which a lot of exposure occurs in addition to their presence in nonstick cookware, packaging, and as we know turf. Unfortunately, PFAS are often labeled as "forever chemicals" because they do not break down easily, can remain in the body for many years, and have been linked to cancers, endocrine disruption, and a weakened immune system. When six previous Philadelphia Phillies baseball players all died from a rare cancer called glioblastoma, questions were raised on the cause and if it was related to PFAS in turf they played on at Veterans Stadium. Although there is no way to determine the cause of their cancer, it does raise questions and concerns about public health and the materials we may be exposed to daily and their effects. Places like Boston are airing on the cautionary side and have banned artificial turf in parks, and others in Connecticut, California, and Massachusetts are also trying to limit their use. The spark in conversation about these professional players highlights the need for discussion and research on PFAS in turf and the potential health risks to determine the future use of artificial turf.

Image Source: https://www.momscleanairforce.org/artificial-grass-isnt-always-greener-toxic-chemicals-in-synthetic-turf/

Further Information:

- https://earthjustice.org/feature/breaking-down-toxic-pfas?sourceid=1045710&ms=230313_paid_advacq_gg_pfas_embed&gclid=CjwKCAjwjMiiBhA4EiwAZe6jQ71AdFrh32g5w5n-f1dXaHwxn9BuzEYidSaxbYLzls00nRZz6dWIkxoCcosQAvD_BwE
- https://www.theguardian.com/environment/2022/sep/30/boston-bans-artificial-turf-toxic-forever-chemicals-pfas
- https://www.theguardian.com/society/2023/mar/10/phillies-ball-players-cancer-artifical-turf?CMP=oth_b-aplnews_d-1

The Fruitful Desert

THANK YOU TO **OCEAN** RESEARCHER PARKER DAVENPORT

The semi-arid subtropic desert climate of Peru is home to thousands of species of birds, reptiles, and mammals. However, not many would expect a prehistoric sperm whale to be on that list. In mid-February, paleontologists discovered a sperm whale skull, estimated to be over 7 million years old in Lima, Peru. The 4.3-foot-long skull, complete with a coherent jaw and full set of teeth, has been hypothesized to belong to a whale ranging anywhere from 16-18 feet long. Researcher Aldo Benites-Palomino gives homage to this significance by noting in the Tico Times, "Normally you get fragments of teeth or the jaw," but in this case it is "the entire skull with ear bones, plus two articular vertebrae". So, it begs the question why this skull was so well preserved? Most soil within Peru is classified as being moderately well drained coarse-loamy, isotic, frigid Aquic Haplorthods. In layman's terms, this is just a type of soil series native to this region in Peru. This soil series is a specific type of spodosol, which is a type of soil order where an amplitude of organic matter accumulates. This accumulation of organic matter creates a high retention rate for micronutrients and macronutrients, such as phosphorous, which is essential for preservation. Other essential macronutrients and micronutrients include calcium, iron, magnesium, manganese, and potassium, all of which are also retained in the soil. Therefore, it is no surprise the prehistoric whale skull has been coined "one of the best-preserved remains of its kind in the world" by NBC. The skull currently resides in Lima's Natural History Museum and is on display for all to see. It is common for sperm whales to beach themselves in coastal countries such as Peru as they often get caught too close to shore as the tides change. Yet, the duality of Peru's location and ideal soil, this could be the first discovery of many other perfectly preserved fossils.

Image Source: https://uk.news.yahoo.com

Further Information:

- https://www.nbcnews.com/video/paleontologists-unearth-seven-million-year-old-sperm-whale-skull-in-peru-163536965574
- https://ticotimes.net/2023/02/15/worlds-best-preserved-fossil-of-prehistoric-sperm-whale-found-in-peru
- https://soilseries.sc.egov.usda.gov/OSD_Docs/P/PERU.html#:~:text=PERU%20SERIES%20The%20Peru%20series%20consists%20of%20moderately,a%20dense%20substratum%20and%20very%20deep%20to%20bedrock.

Bother to Bottle

THANK YOU TO **OCEAN** RESEARCHER PARKER DAVENPORT

Infamously known as the cockroaches of the sea, the invasive green crab continues to decimate ecosystems from New England to the Pacific. Since arriving in North America in the mid-1800s, after riding across the Atlantic in the ballast water on ships, the European Green Crab has been wreaking havoc in native waters. These organisms are iteroparous, meaning they reproduce multiple times over the course of their life span, with females laying up to 185,000 eggs at once. With no direct predators, their population is subject to exponential growth and expansion into other habitats. An adult green crab can eat about 40 mussels, clams, or oysters a day, often outcompeting other native species for food while also introducing problems to the shellfish industry. Under this stress, most aquatic food chains cannot support this level of competition, leading to a collapse in biodiversity as other species begin to die off. Moreover, green crabs can damage eel grass habitats when burrowing or digging for prey. Eel grass habitats are a great nursery habitat for species, so the interference of these habitats can destroy populations of life forms at the source. Normally, winter acts as natural selection to keep crab number down, yet, with temperatures increasing, crabs can survive the winter. So, could there be a way to control these catastrophic crustaceans?

In the words of Commercial Marine Fisheries Specialist Gabriela Bradt, "invasive does not mean inedible". While many restaurants struggle to incorporate green crabs into their menu, a New Hampshire distillery has found a way to turn green crabs into whiskey. The Tamworth Distillery purchases about 1000 crabs at a time from a local harvester, then slowly simmers them and incorporates the stock with their house made spirit. With just over 90 crabs used per bottle, it is an extremely effective way to reverse the effects of green crabs. Additionally, it tastes great as its complex mix of cinnamon, mustard seed, allspice, dill seed, paprika, coriander, bay leaf, and cloves has amassed great reviews. Although the problem will not be solved in a day, this a great example of how a small group of driven individuals can make a massive difference. In their words, "Well, if you can't beat 'em, might as well eat 'em! Or in our case, DRINK 'EM!"

Further Information:

- http://tamworthdistilling.com/spirits/crab-trapper/
- https://m.youtube.com/watch?v=e5qaT7btWeU
- https://www.cnbc.com/video/2022/08/25/new-hampshire-distillery-turns-invasive-crabs-into-whiskey.html

Image Source: https://www.oldsaltblog.com/2022/07/crab-trapper-whiskey-fighting-mutant-green-crabs-one-bottle-at-a-time/

Close to Home: Netmyproblem.com

Slow but steady, with the support of our Fishermen, we are redefining end of life use for fixed and movable fishing gear. A for profit group, NetYourProblem.Com, has developed strategies for reselling the various plastic components of fishing gear into marketable plastic pellets. In the Cape Cod area, Truro resident Caitlin Townsend has been coordinating deliveries of miles of trawl lines and tons of old nets, which she collects in a New Bedford warehouse, to be sorted and sold. Townsend has crewed on a local Lobster boat and has an energy we found admirable. Our phone interview was sandwiched between Townsend's trip to Montauk to pick up several tons of netting and a PBS interview in New Bedford. The next several weeks have Townsend scheduled for trips to Bristol Bay in Alaska, Seattle and San Diego, to learn more about gear recycling efforts. In our opinion, she has a "Tiger by the Tail".

NetYourProblem.Com

Further Information:

- https://capecodfishermen.org/2023/02/

Thank you!

Editor's Final Thoughts:

I am grateful for the curiosity of our research team, led by Jessica. In our next issue we will meet one of our researchers. Catie Urquhart, a recent Tufts Graduate, has a real job, yet somehow finds time to generate the creativity to put together each issue of Ocean. Thank you Catie!

-Gordon Peabody, **OCEAN** Editor.

Check out our website for other free publications:
www.safeharborenv.com/ocean-newsletter

Thank you for your support!

Gordon Peabody,
Safe Harbor Director

Jessica Hillman,
Research Coordinator

Catherine Urquhart,
Associate Editor

www.safeharborenv.com