



OUTER CAPE ENVIRONMENTAL AWARENESS NEWSLETTER

OCEAN 53 introduces some interesting videos we wanted to recommend and share with our readers. **OCEAN** is a self-funded, environmental education newsletter for Safe Harbor Environmental Services, a multidisciplinary, environmental consulting group on Cape Cod. This issue contains articles by **OCEAN** Researchers, ranging from “*VANISHING BIRDS*”; to “*INNOVATIVE FLOOD PROTECTION*”; to *the “NURDLE APOCALYPSE”* in New Orleans. We publish this newsletter for people with an interest in the environment and in climate action. Please feel free to share **OCEAN** with friends who share your interests. It is a Public Domain publication. Thank you, Gordon Peabody, Editor

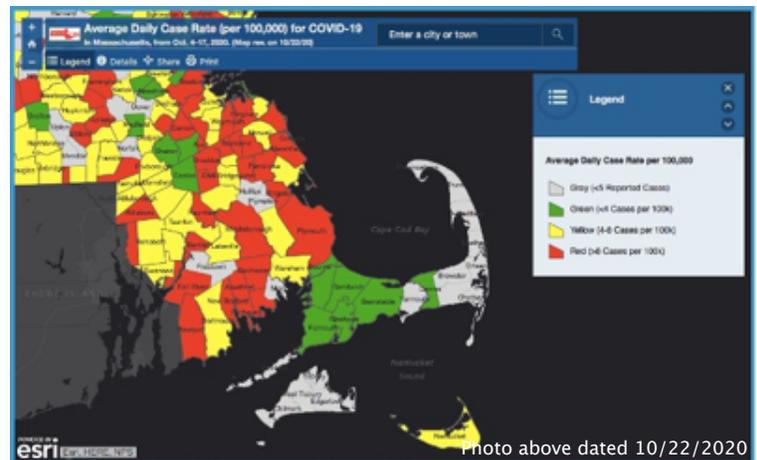
November 2020 Issue No. 53

KEEPING SAFE (PART III)

OCEAN has been providing updated information and resources on COVID-19 for the past couple of issues and we continue to encourage our readers to stay informed and follow local health guidance. We want to continue to share resources and safety tips with our readers to better enable our community to stay healthy.

As of October 5, 2020 lower-risk communities in Massachusetts moved into Step II Phase III of reopening, increasing indoor capacity and gathering limits ([read for more info](#)). The link to this map ([pictured](#)) shows the updated risk level based on average daily case rate for COVID-19 in your town. Make sure to stay aware of any changes in health advisories and remember to maintain social distance, mask wearing, and handwashing as much as possible as we enter the colder months here on Cape Cod.

For up to date Cape Cod and the Islands information from the Barnstable County Department of Health and Environment please view: www.barnstablecountyhealth.org to view up to date local information from the Massachusetts Department of Public Health please view: www.mass.gov/covid19. If you have local questions you can view the [Barnstable County COVID-19 Resource Center Community Tips](#) or contact them at COVID-19@barnstablecounty.org.



Remember to stay informed on local advisories and updates. We hope everyone is staying healthy this fall!

Further information:

www.barnstablecountyhealth.org

www.mass.gov/covid19

https://www.barnstablecountyhealth.org/community_tips

Editor's Recommendation: EYES TO THE SKY

OCEAN is proud to highlight the work of one of our previous Safe Harbor interns, Charles Post. We are very proud to share this extraordinary video he recently helped to create. Sky Migrations was presented by REI and can be viewed [online](#). The video features stunning imagery of birds such as the powerful Golden Eagle and shows the important work that Charles and any others are doing to track and understand rapture migrations, to help preserve and protect the environment. We wish Charles the best in this important work and we hope you will watch the beautiful video he helped create. <https://www.rei.com/blog/stewardship/rei-presents-sky-migrations>



We also want to congratulate Charles and Rachel Pohl, fellow explorer and Artist, on their recent marriage in Bozeman Montana on September 15, 2018. To view a short video of Rachel: <https://www.youtube.com/watch?v=pHfJ64eoIco>. We are sure their adventures will be beautiful, and we hope to see more videos in the future. Charles Post is an ecologist, National Fellow at The Explorers Club, co-founder of The Nature Project.

*Thank you to **OCEAN** Researcher Jessica Hillman*



Charles as an intern for Safe Harbor
Photo by Gordon Peabody



Filmmaker and ecologist, Charles Post, and a sharp-shinned hawk pause before it is released.
Photo by Forest Woodward



Charles Post and Rachel Pohl, at the Flying Fish Cafe in Wellfleet.
Photo by Gordon Peabody

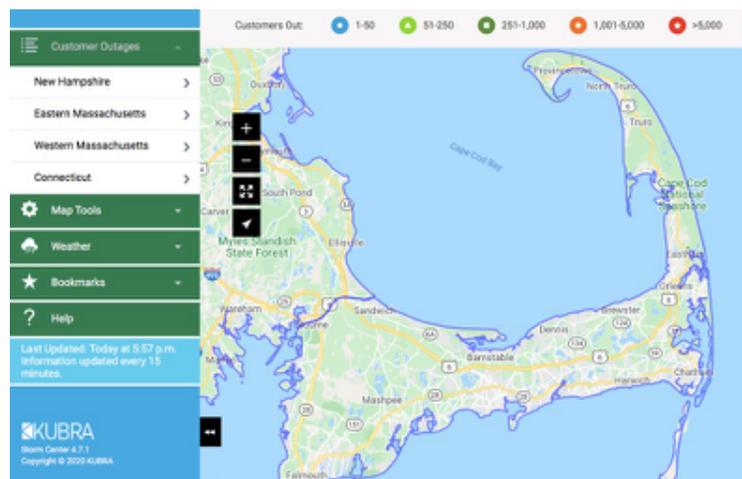


Rachel Pohl, in her element. "Be curious, slow down."
Photo by Eddie Bauer

LOST POWER? USE THIS INFO LINK

We all know that Cape Cod can get hit by some strong winter storms and that occasionally the strong winds can cause power outages. This could be particularly difficult this year while we are all doing our best to keep socially distant and healthy. Keep this link in your back pocket for winter storm power failure information:

<https://outagemap.eversource.com/external/default.html>



*Thank you to **OCEAN** Researcher Jessica Hillman*

COASTAL RESTORATION USING BIOMIMICRY

OCEAN provides periodic updates on the environmental restoration work conducted by Safe Harbor. In this issue we are pleased to share a report from the popular New England TV news show “Chronical” featuring Safe Harbor’s Biomimicry sand collection system. [This video](#) features the effectiveness of the Biomimicry system on an Ocean beach on Cape Cod. We hope that sharing this short video with our **OCEAN** readers, will show more people that biomimicry is a great practical solution to beach erosion, not just on the Cape, but for beaches everywhere.

In **OCEAN 47**, we shared a [Dispatch from the Beaches of Puerto Rico](#). We were happy to inform our readers that University of Puerto Rico-- Professor Robert Mayer Arzuaga, was implementing Biomimicry on local beaches after some hurricane generated erosion, showing this system could be taken anywhere. Safe Harbor is also sharing a [Biomimicry in Action video](#) detailing the process used for Biomimicry and the successes we have found. We hope that seeing the system will inspire others to seek simple yet creative systems to conserve and protect our shorelines. Safe Harbor developed this simple, innovative Coastal Restoration System, powered by storm wind energy, following five failures. They have since made their Biomimicry concept Public Domain, open to world-wide use. Please feel free to view and share [this video](#) with anyone interested.

Further information: <https://www.youtube.com/watch?v=WhIeGvG8caw>, <https://www.youtube.com/watch?v=z0QZXdfjHY>

*Thank you to **OCEAN** Researcher Jessica Hillman*



Biomimicry sand collection on Cape Cod Ocean Beach,
Photos by Gordon Peabody

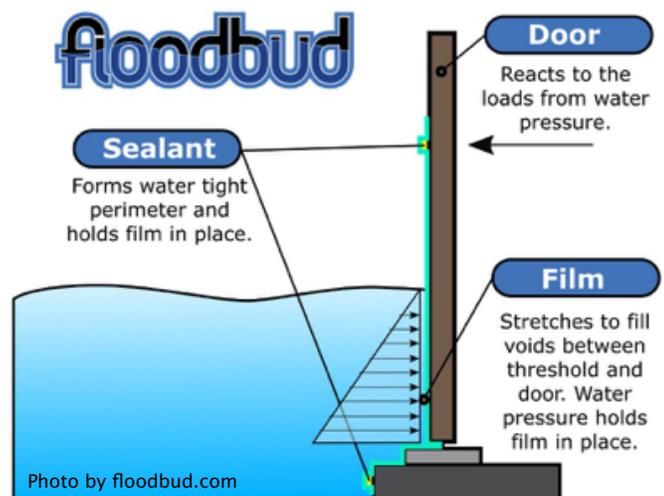


INNOVATIVE FLOOD PROTECTION PRODUCT

The 2020 Atlantic hurricane season has been record-breaking. There have been more than twice the amount storms of an average hurricane season. Around 90% of the coastal zones along the East Coast and the Gulf of Mexico have experienced at least one hurricane or tropical storm warning. With such an increase in tropical storms and extreme weather, it is important to develop resources and implement preventative measures to help individuals and communities affected by the extreme weather. For example, Nick and Judy Christensen, the inventors of Floodbud, have created a way to prevent flooding during extreme weather conditions. Floodbud is new to market this year, utilizing “the latest in aerospace composite materials, specifically vacuum bagging materials,”. Floodbud’s retail price is \$24.99, and after purchase, customers will receive both a synthetic rubber sealant and a nylon film. Although this product was designed to help their home in East Florida deal with severe storms, this product is now available all around the U.S., to prevent flooding from the runoff of snow. If severe tropical storms and weather patterns continue at the rate they are now, Floodbud may contribute to the safety and wellbeing of threatened homes.

Further information: <https://floodbud.com/>, <https://www.washingtonpost.com/weather/2020/09/23/atlantic-hurricanes-record-2020/>

*Thank you to **OCEAN** Researcher Tess Holland*



A NEW RIVER IS ON THE WAY

OCEAN has been a consistent supporter Cape Cod's extraordinary Herring River Restoration Project. This project goal is to return a blocked river back into a productive estuary system for residents, fishermen and shell fishermen. Healthy estuaries contribute to healthy Coastal Communities, by extending social, financial and ecosystem benefits to inshore and offshore ecosystems. We are sharing a short, information rich video on this restoration in Cape Cod's own back yard. We recommend taking a few minutes to [watch it](#).

In [OCEAN 43](#) we shared an article [a River Should Never Kill its Fish](#) to inform our readers of how important healthy coastal resources and this particular estuary are to Cape Cod. The Herring River salt marsh estuary system was once over 1,100 acres, until the dike was constructed 100 years ago, as an ill-fated attempt to create farmland. The dike shrank the estuary to just 35 acres, ending healthy water circulation, acidifying water, creating oxygen deficiencies and allowing bacteria populations to surge and cause shell fishing area closures.

By disclosure, **OCEAN** Editor Gordon Peabody, was Chair of the Herring River Technical Committee, made up of representatives from Wellfleet, Cape Cod National Seashore and local, State and Federal Government and the Scientific community. HRTC performed a full review of all technical publications regarding the Herring River and its historical role in Herring and Oyster fisheries. The Committee then created 13 sub committees and developed a Conceptual Restoration. We encourage you to [watch](#), [read](#), and stay up to date on the progress of this important restoration: <https://zygotedigitalfilms.wistia.com/medias/my3oakwfpr>

Additional updates are available through Friends of Herring River: <http://www.friendsofherringriver.org/Contact-Us>

Further information:

<https://static1.squarespace.com/static/58910d716a4963f35f8da04d/t/5e98b1c683fb7158d30e4ae7/1587065295009/OCEAN%2B47.pdf>

*Thank you to **OCEAN** Researcher Jessica Hillman*



Unproductive, invasive Phragmites reeds have replaced previously productive Spartina Marsh grass habitat. As saltwater flow is slowly restored, many of these habitats will naturally restore themselves.

TRACKING ANOMALOUS WEATHER

Recent years have broken many historical weather records; for example, 2019 brought the hottest summer temperature and the hottest winter temperature on record in the U.K., and extreme flooding. 2019 broke more than 120,000 extreme weather records in the U.S., including records related to temperature and precipitation. Extreme flooding dominated the Midwest. March temperatures in Alaska reached 70 degrees and on the Fourth of July, Anchorage, AK was hotter than Key West, FL, and Hawaii got its lowest elevation snow on record. In 2020, Phoenix, AZ had temperatures over 110 for 50 days straight. These types of extreme weather events have long been linked to climate change, but a recent study from Stanford University suggests that the influence of climate change on extreme weather has been under-estimated for years, particularly for hot and wet weather events. The under-estimation is due to the increase in climate forcing that occurred between the attribution and verification stage of scientific research. These

results mean that climate change could actually be the driver for more extreme heat and precipitation events than was previously thought.

Further information: <https://www.bbc.com/news/science-environment-53601257>
<https://www.cnn.com/2019/12/23/us/2019-us-weather-records-trnd/index.html>
<https://advances.sciencemag.org/content/6/12/eaay2368>
<https://news.stanford.edu/2020/03/18/climate-change-means-extreme-weather-predicted/>

*Thank you to **OCEAN** Researcher Rae Taylor-Burns*



Seen above, historic floods inundate Nebraska. Photo by NASA Earth Observatory

METEOTSUNAMIS ARE REAL

It has long been stipulated that a changing climate will lead to seasons with more powerful and more extreme natural disasters, as temperature change in the atmosphere and the oceans contributes to shifting weather patterns.

A new topic of study, meteotsunamis, may be another possible result of climate change. These large waves are just beginning to be explored, documented, and categorized by science. Described as large or tsunami-like waves of meteorological origin, meteotsunamis occur when rapid changes in barometric pressure (ie. storm-like conditions) above a body of water cause displacement below, resulting in waves.

Unlike typical tsunami events, which are the effect of impact, meteotsunamis waves can last from a few minutes to several hours, depending on the duration and intensity of the storm system above. And, unlike other severe weather events, meteotsunamis are being documented year-round: since these storms are triggered from extreme weather, scientists and locals are witnessing small to large meteotsunamis from thunderstorms, tropical storms, hurricanes, and Nor'easters alike, often when these storm systems follow the coastline. As coasts are already fragile and critical zones for absorbing storm impact and protecting landmass, an increase in meteotsunami activity could become a major problem for coastal communities already in season storm paths.

Currently, NOAA is studying these storms along the eastern seaboard, where they've determined averages 25 meteotsunamis per year. These events occur worldwide, however, they are more common in the Great Lakes (126 events per year), and throughout the western Atlantic, Mediterranean, and Western Pacific coasts.

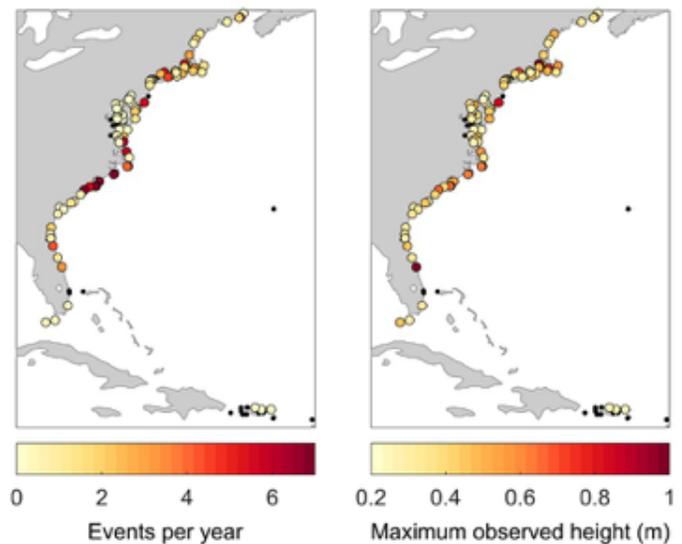
According to NOAA, the average meteotsunami waves that impact the eastern seaboard are less than 1.5 feet high. However, at least once a year a wave exceeds 2 feet, which is large enough to cause significant destruction and possible injuries. Though New Jersey and Rhode Island have experienced these events, the most impacted areas thus far have been documented around the Carolinas and Long Island Sound.

The frequency of these events is peaking in mid-Summer and mid-Winter months, around the more severe summer thunderstorms and winter Nor'easters. In the areas most impacted, the continental shelf plays the significant role: hitting hardest where the coast is shallow, with bays, estuaries, and inlets. While less likely to be impacted by hurricane or tropical storm season, Cape Cod is already highly susceptible to wind and storm surge damage from Nor'easters and rogue summer thunderstorms.

Fortunately for many on mainland Cape Cod, the barrier islands of Nantucket, Martha's Vineyard, and outer region of Chatham act as a buffer for many storm systems that wash over the region. Likewise, deep water further offshore (over 100 miles, by the Northeast Canyons and Seamounts) can deter pelagic storm systems from gaining strength as they near the isthmus. However, much of the Cape could be severely impacted by meteotsunami events. Powerful waves with surge capabilities, coupled with already raging storms, could significantly damage and alter areas that are susceptible to overwash. The island communities of Nantucket and Martha's Vineyard, and those near Pleasant Bay, could see even greater yearly changes to the islands, inlets, and tidal flow if meteotsunami events occur continuously in this region.

Further information: <https://oceanservice.noaa.gov/podcast/july19/meteotsunamis.html>, <https://www.noaa.gov/news/you-might-not-have-noticed-but-about-25-meteotsunamis-hit-east-coast-each-year#:~:text=New%20research%20published%20this%20month,feet%20high%20and%20relatively%20harmless,https://nhess.copernicus.org/articles/6/1035/2006/>,

Thank you to **OCEAN** Researcher Jamie Fitzgerald



Dusek et. al. April 2019. (NOAA)
Image: NOAA scientists analyzed 22 years (1996-2017) of water level observations at 125 tide gauges along the East coast and found that on average 25 meteotsunamis impact the East Coast each year. The figure on the left shows the average number of meteotsunami events per year for each location, and the figure on right shows the maximum observed wave height for each meteotsunami event. Small black dots indicate no events observed at those locations. Photo by NOAA

"NURDLE" APOCALYPSE

The Ocean is a very powerful system, yet as an ecosystem, it is very sensitive to pollutants. Almost 80 percent of chemical and physical pollutants come from sources on land, including cargo spills.

On August 2, 2020 a storm hit the Gulf Coast and a cargo ship in New Orleans spilled containers filled with more than 25 tons of plastic pellets, known as "nurdles". Nurdles are raw materials for almost all plastic products. The spill is being referred to as "a nurdle apocalypse." The incident occurred when containers were knocked off the container ship CMA CGM Bianca.

In late August, the company responsible for this event attempted to clean up the tons of tiny bits of plastic that were spilled in the Mississippi River. Unfortunately, the cleanup efforts were not successful enough, due to the fact that these efforts were late in starting. Most of the millions and millions of nurdles will end up in the Gulf of Mexico and possibly be mistaken for food by birds and small fish. In addition, there are other water pollutants that adhere to these nurdles and may contribute to secondary impacts. These nurdles can move up the food chain very quickly, eventually being ingested by humans. In addition, the cleanup is very limited. Leaf blowers and butterfly nets are the predominate tools being used and it may not be sufficient.



Photo by Sophia Germer for NOLA.com

Further information: <https://www.desmogblog.com/2020/08/28/new-orleans-louisiana-plastic-spill-mississippi-river-nurdle-apocalypse>, https://weather.com/science/environment/video/nurdle-apocalypse-in-mississippi-river-after-plastic-spill?cm_ven=hp-slot-1

Thank you to **OCEAN** Researcher Madeline Conley

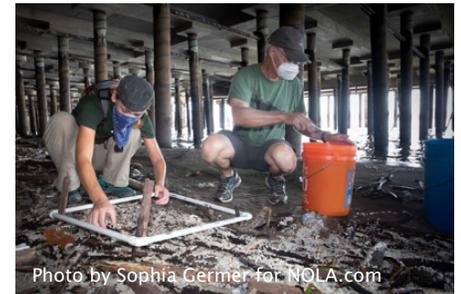


Photo by Sophia Germer for NOLA.com

MYSTERY SURROUNDS LOSS OF BIRDS

Back in September a mystery began surrounding the death of thousands of birds in New Mexico following record breaking temperatures and even snowfall. In order to explain the event a hypothesis began to emerge. The thought was that influence from the historic wildfires recently ravaging the country created so much smoke that it eventually suffocated the birds. Many of the birds were found with depleted fat stores and appeared disoriented and emaciated, which fits with the smoke theory. The thought was that many of the birds had to flee the area prior to replenishing fat stores. However, some scientists believe that there is a simpler explanation for this phenomenon, lack of food.



Photo by Brandon Brown

A rapid temperature change, as seen in New Mexico can cause insects to become dormant or dead. This leads to a lack of food for the birds. This will often affect migratory birds more so than native birds because native birds tend to have larger fat stores and knowledge of good areas to shelter. Following examination of the birds following the mass die off event it showed lack of fat stores and further examination showed signs of starvation and dehydration. Though it will take additional time to come up with a final reason for the mass die-off event climate change may be a likely answer.

In recent years there have been an increase in the number of mass die off events for birds, which may be related to weather change events.

Further information:

www.popularmechanics.com/science/animals/a34042911/mass-bird-die-off-america-explanation/, <https://nypost.com/2020/09/23/mass-bird-deaths-in-new-mexico-may-be-from-cold-snap-experts/>, www.nytimes.com/2020/09/15/us/dead-birds-new-mexico-colorado.html?referringSource=articleShare

Thank you to **OCEAN** Researcher Lindsey Stanton

A DIFFERENT SPECIES AND A DEADLY PANDEMIC

Chytridiomycosis, or amphibian chytrid fungus disease, has no correlation to the current novel coronavirus pandemic but certainly has impeccable timing. There are a number of lessons to be learned by an emergent disease shocking the status quo. But the lessons of the current pandemic show that not only can a strain of virus transcend species, it can become a shock to the status quo, and can change life in an instant. We may think our experience is unique but there is certainly reason to wonder if that is true. Globalization, expanding populations, and changing climates, are all exponentially contributing to a future of new challenges for all species on our planet.

In times of uncertainty, we rely on our understanding of measurable indicators. For many Earth and ecological scientists this is largely based off studying biological indicator species, or species that are sensitive to particular stressors in an environment, in order to learn more about how these factors affect vulnerable communities in a complete ecosystem. The bad news is that global pandemics of disease across continents is not new to humans or amphibians. Since the times of European colonization, we have seen deadly spreads of infectious agents, from the introduction of smallpox to Native Americans throughout the 18th century, to the blight of 1904 that wiped out the American Chestnut tree, there are numerous examples of the unintended consequences of our global travel economy. While the benefits of collaboration and trade cannot be understated, the need for regulation is dire and humans have the unique advantage to make a difference in economic systems driving these problems.

Chytridiomycosis is an infectious disease that affects amphibians worldwide. It is caused by the chytrid fungus (*Batrachochytrium dendrobatidis*) also known as “Bd”. This fungus is capable of causing sporadic deaths in



Photo by Joel Sartore for National Geographic

many amphibian populations as well as an astounding 100% mortality in others. In a global [study of 41 scientists published in 2019](#) by *Science Magazine*, the chytrid fungus pandemic was demonstrated to have driven the decline of **501 frog and salamander species worldwide**. That is approximately 1 out of every 16 known amphibious species on our planet. Out of the chytrid-stricken species studied, 90 have gone extinct or are presumed extinct in the wild. Another 124 species have declined by more than 90%. Nearly all of the 501 amphibious species impacted by the fungal disease were concluded to have experienced declines caused by Bd, only one species showed plausibility other factors could have “significantly contributed” to the species’

population decline. “Chytrid fungus is **the most destructive pathogen** ever described by science—that’s a pretty shocking realization,” said Wendy Palen, a biologist from Simon Fraser University in British Columbia who contributed to the study for *Science*.

Researchers from the article say that we can’t reverse the damage that Bd has already done. The fungus has already spread worldwide and eradicating it from the environment is nearly impossible. The **good news** is that we can do something to “flatten the curve” and stop it from spreading. The study’s authors contend that our best bet is to regulate and reduce the global trade of wild amphibians as well as improve screening procedures. The pet and meat trades play a major role in continuing the pathogen’s spread. A [2018 study](#) by *Science Magazine* confirmed that all major strains of Bd, including the one most responsible for the global pandemic, are present in amphibians purchased at pet-shops. Better screening procedures for international trade, alongside educational campaigns educating both buyers and sellers on the symptoms of infected amphibians, could prove to be critical for the amphibious population on Earth.

Further information : <https://www.nationalgeographic.com/animals/2019/03/amphibian-apocalypse-frogs-salamanders-worst-chytrid-fungus/>, <https://science.sciencemag.org/content/363/6434/1459>, https://www.washingtonpost.com/lifestyle/home/two-plans-to-bring-back-the-american-chestnut--one-by-hybridization-one-by-genetic-engineering/2019/12/17/8fc28ff4-16c7-11ea-a659-7d69641c6ff7_story.html#:~:text=The%20American%20chestnut%20was%20killed,environmental%20catastrophe%20is%20widely%20known. https://www.environment.gov.au/system/files/resources/279bf387-09e0-433f-8973-3e18158febb6/files/c-disease_1.pdf

Written by **OCEAN** Associate Editor Samantha Thywissen

LOBSTER WITH A SURPRISING "EXTRA"

It is no mystery that plastic is detrimental to the health of our oceans causing polluted waters, ingestion, entanglement, and ultimately the death of many sea creatures. However, a more mysterious, newer field of study is called microplastics, which is defined as plastic debris measuring less than 5 millimeters in length. Unlike larger plastic debris that can be found all over the ocean, microplastics are often found in the pelagic zone, or upper ocean which poses a great risk to organisms present in this zone, including larval forms of lobsters.

The impact of microplastics can vary by location, food availability, and the present stage of life. During development, larval forms of lobsters face different types of exposure to microplastics with varying negative effects. As scavengers, adult lobsters will often consume larger microplastics that have sank to the seafloor while feeding. In early larval stages, microplastics were found to accumulate cephalothorax carapace and developing gill folds, whereas later larval stages are shown higher levels of consumption. Microplastics in the lobster's gill folds can disrupt respiration as well as ingestion, which can cause a decrease in survival rates. Ultimately, these problems can decrease the growth rate of lobsters which may have long-lasting impacts on the lobster industry.

Unfortunately, plastic is not the only thing lobsters have to worry about. Ocean acidification and rising ocean temperatures have already been seen to negatively impact sea life. Plastic pollution will make impacts on sea life worse. The good news is that scientists have already begun to tackle the issue of microplastics, including plastic-eating bacteria where more information can be found in [OCEAN 50](#).

Although solutions are being tested to solve our plastic problem, we must continue to do our part in reducing single plastic use by reusing and recycling when possible. Many states are already doing their part in reducing single-use plastic including state bans or fees on plastic bags and plastic straw bans. Although these are not the answer to all our problems, each step is in the right direction of helping lobsters and other sea creatures flourish.

Further information: <https://www.forbes.com/sites/allenelizabeth/2020/04/19/these-lobsters-can-breakdown-microplasticsand-thats-bad-news/>, <https://www.necn.com/news/local/microplastics-are-harming-growth-of-maine-lobsters-study/2297287/>, https://www.sea.edu/sea_research/ocean_plastics_marine_pollution, <https://www.sciencedaily.com/releases/2020/07/200707083958.htm>

Thank you to **OCEAN** Researcher Abigail Eilar



PURSES BELONGING TO MERMAIDS?



Photo by Save Our Seas Foundation

If you've ever taken a stroll along the beach, it is possible that you have come across a mermaid purse tangled in the seaweed. No, these pillow-shaped cases aren't some mythical accessory, but actually egg cases for baby sharks and skates! These egg cases, which can be mistaken for the air bladder on seaweed, are identifiable by the horns or curly tendrils on their corners.

Although usually pillow-shaped, mermaid purses can be found in a variety of shapes and sizes. In Ruth Leeney's article, "Mermaids' purses," published on the Save Our Seas Foundation's website, she explores the different forms of mermaid purses that various species of sharks and rays produce. Leeney, founder and Director of Protect Africa's Sawfish, was last featured in [OCEAN 43](#) for her educational children's book, "King of Fishes." Her research and work with communities all over Africa to protect one of the least understood fish in the world are very important to sawfish conservation.

In Leeney's article, she encourages us to do our part in marine conservation. A mermaid purse's location on the beach provides scientists valuable information on which locations are significant for unborn sharks and skates protection. By taking a picture and making note on its location, we can do important citizen science work for marine conservation organizations. Shark Trust (www.sharktrust.org), for example, has recorded over 250,000 egg cases from all over the world!

Further information: <https://marinedimensions.ie/what-is-a-mermaid-purse/>, <https://saveourseas.com/mermaids-purses>

Thank you to **OCEAN** Researcher Izzy Backman

SAFE HARBOR SHOUTOUTS

FOLLOW-UP TO MERMAIDS' PURSE ARTICLE:

THANK YOU TO RUTH LEENEY

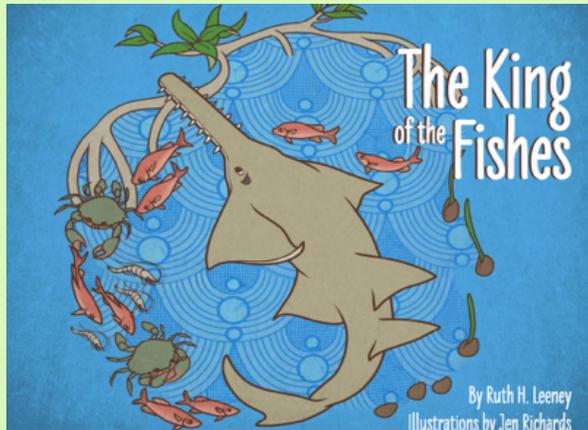
Ruth is a National Geographic Explorer, marine biologist, social scientist, and science communicator. She is the founder and director of Protect Africa's Sawfishes. She works to better understand where in Africa, and elsewhere in the developing world, highly threatened sawfishes still exist, and the threats they face in those places.

For a pdf of Ruth's wonderful book on Sawfish:

https://issuu.com/saveourseas/docs/the_king_of_fishes_-_english_edition



Photo sourced from Exploring by the Seat of your Pants



A GENTLE FAREWELL:

THANK YOU AND FAIR WINDS TO KRISTYNA SMITH

A gentle farewell to a friend and one of our long time core people at Safe Harbor. Kristyna is now working with the Town of Orleans Conservation Department. We wish her continued, professional growth in her hometown!



Thank you to Samantha Thywissen, for continuing for her work as *Associate Editor* all the way from San Francisco to make **OCEAN 53** a publication we are all proud of.

To Jessica Hillman,
we thank you for keeping us all connected
and for all your hard work as *Research Coordinator*.



Check out our website for other free publications: <http://safeharborenv.com/free-publications/>

Thank you for your support!