OCEAN

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Outer Cape Environmental Awareness Newsletter

OCEAN is an advertising free, self-funded, environmental e-newsletter, created by the research team at Safe Harbor Environmental, for you our readers, to share as you wish. This 47th issue offers some of our research on close to home and far away issues, including insights into unexpected mysteries and some unique innovations. We have also included a section on "CHASING ZERO", tracking sometimes mysterious changes in Carbon news. We are also grateful for recent dispatches: from Dr. Robert Mayer Arzuaga, from the University of Puerto Rico, who is restoring Hurricane ravaged beaches in Puerto Rico and had some great news about the Biomimicry sand restoration system they were using, which was developed on Cape Cod; and from Keegan Burke, previous Safe Harbor Intern, who is now waking up at 3:30 AM and carrying Bear Spray, in Legendary Yellowstone National Park.

Thank you for your support, Gordon Peabody, Editor

June 2019 Issue No. 47

Editor's Recommendation: CHASING ZERO

We rarely recommend packaged programing but our friend Jenn Wilcox has provided visionary leadership in the field of Carbon Capture, with her book on the subject and now has a Ted Talk presentation, offering 14 minutes of understanding.

To watch, click here!

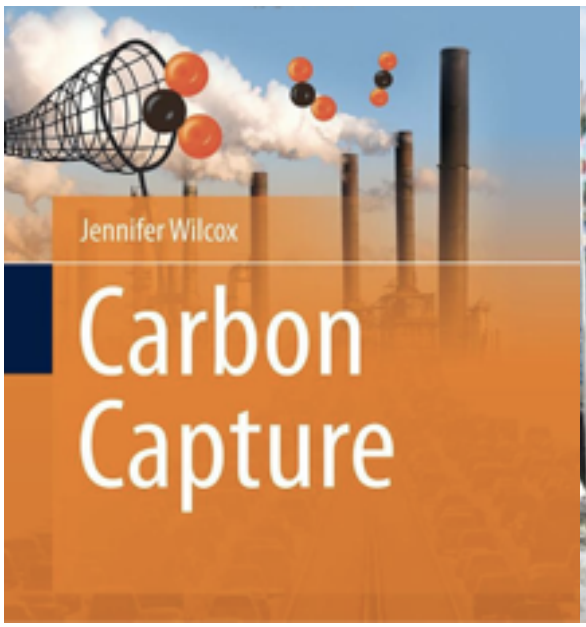


Image showing book cover, one of the first published on the subject.

The Author
Photo credit: G. Peabody

CHASING ZERO: UPDATE ON CARBON CAPTURE

The St Fergus Gas Terminal is involved in the Acorn Project.
Photo credit: North Sea Midstream Partners

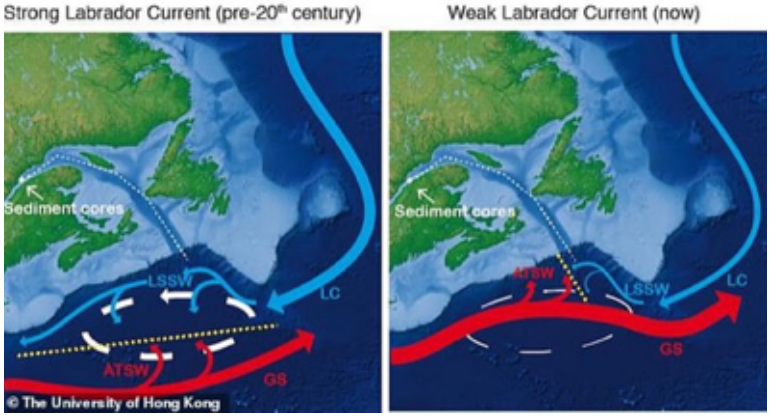
In the United Kingdom, groundbreaking developments are occurring in carbon capture and sequestration technology, commonly called CCS. The project, known as the Acorn CCS & Hydrogen project, is the first of its kind globally, and is aimed towards decarbonizing fuel sources in the UK and storing residual carbon underground in the North Sea. The Acorn CCS project will take the carbon out of natural gas (CH_4), distribute the remaining hydrogen for fuel, and then transport the carbon to sequestration sites, removing it from the carbon cycle for thousands of years. Several characteristics of the region make it ideal for this project. First, 35% of all natural gas used in the UK currently comes to shore from deepwater gas fields at the St. Fergus Gas Terminal in Scotland, meaning that implementing this technology at a single site will have a huge impact on energy usage in the UK. Secondly, gas pipelines to depleted and empty deepwater gas fields are already in place and available for use, allowing this project to be developed without constructing expensive infrastructure. This project will reuse the existing infrastructure, but instead of extracting gas, it will pump leftover carbon back into the earth's crust in the deep ocean. The Acorn project is expected to capture and sequester 200,000 tons of CO2, and will receive funding from the Scottish government, the UK government, as well as from sources in the rest of Europe to accomplish this. Despite these promising expectations, there is mixed support for the plan amongst policy makers. Some support it, with the idea that the only way to meet the goals of international climate agreements is to invest in CCS, and others think the funding could be better spent on developing renewable energy sources, improving energy storage technology, and increasing energy efficiency. If all goes smoothly, the Acorn project could be operational by 2020, but political will and financial support will determine whether it is built or not.

Futher information in the links below:
https://www.bbc.com/news/uk-scotland-scotland-business-46358715 , https://pale-blu.com/acorn/ , https://www.gasworld.com/acorn-ccs-project-releases-new-findings/2016374.article, https://www.technipfmc.com/en/media/news/2019/02/Acorn-Carbon-Capture-and-Storage-feasibility-studies-receive-UK-government-funding

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

WARMING WATER FOR MAINE

The Gulf of Maine is a region of the ocean offshore from New England and Nova Scotia that has historically been home to robust fisheries including lobster. Recent science shows that the Gulf of Maine is warming faster than 99% of other ocean regions, a change driven by global warming with impacts on fisheries in the region. Two ocean currents interact in the Gulf of Maine: the Labrador Current, which runs southward from Greenland bringing cold polar water, and the Gulf Stream, which runs north from the Caribbean Sea, bringing warm tropical water. Historically, the Labrador Current has dominated in the Gulf of Maine, and the Gulf Stream has been pushed offshore. As climate change progresses, however, melting ice sheets in the North Atlantic are dumping fresh water into the ocean, which is less dense, and thus changes the density driven circulation patterns. Scientists link this freshening of the North Atlantic to a weakening of the Labrador Current, allowing warm Gulf Stream waters to accumulate in the Gulf of Maine, causing drastic ocean warming.



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WARMING WATER FOR MAINE (cont.)

This change in temperature impacts the animals that live in the Gulf of Maine: sea turtle and marine mammal stranding's have become increasingly common, and warm water species have begun to show up where they haven't historically lived. Because the region has such a robust lobster fishery, changes in lobster distribution have also been a topic of recent concern. Over the past 20 years, the range of Maine Lobsters has shifted north and into deeper, cooler waters. This has had several impacts: lobster fishers in southern New England (for example, Rhode Island and Massachusetts) have seen declining catch, but lobster fishers in Maine have seen five-fold increases. However, despite the recent boom in the Maine lobster fishery, scientists and fishermen and fisherwomen alike are concerned that as waters continue to warm, the Maine lobster fishery will decline as it already has done in Rhode Island and Massachusetts. Catch in Maine dropped in 2017 by 22 million pounds, and there is fear this decline is a sign of what's in store. Stakeholders are hedging their bets by managing the existing fishery conservatively in hopes of increasing its resiliency to a warming Gulf of Maine.

A lobsterman throws a trap of the coast of Maine.
Photo credit: Associated Press

Further information in the links below:
https://www.washingtonpost.com/graphics/2019/national/gone-in-a-generation/fishing-climate-change.html?fbclid=IwAR1B5tYv5OwMP3olEGHoJH0Ldq5KPo8z7-k6eDf8gkehglsD45exQI1vxsA&noredirect=on&utm_term=.70b4195d7d00, https://eos.org/features/why-is-the-gulf-of-maine-warming-faster-than-99-of-the-ocean, https://www.theatlantic.com/science/archive/2017/01/what-a-real-debate-looks-like-in-climate-science/512444/, https://www.nature.com/articles/d41586-018-04322-x, https://www.nytimes.com/2018/06/21/climate/maine-lobsters.html

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

HURRICANES MAY BE RELOCATING

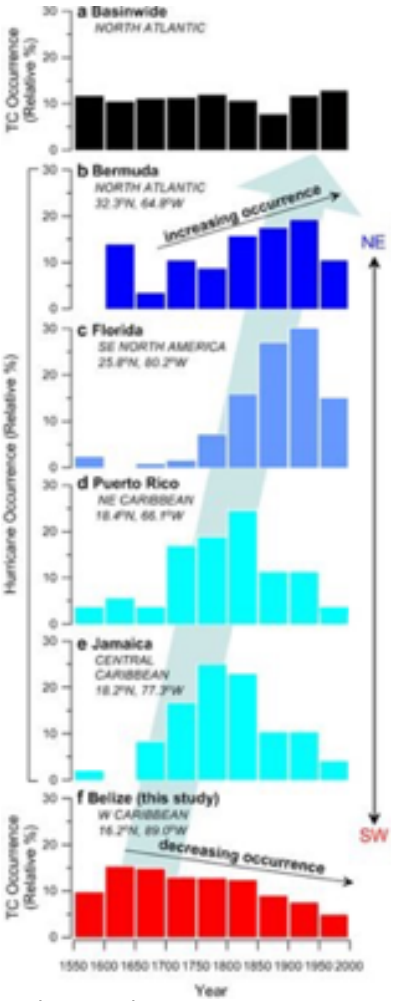

Photo credit: Nature.com

Hurricanes are storms that consist of winds circling around an area of low pressure. They form over warm ocean waters, and the energy required to form a storm comes from the energy stored in the heat of the ocean - the warmer the ocean is, the more energy a storm can absorb from it. Hurricanes are born from tropical disturbances, which are low pressure regions without organized winds patterns, and as they gain energy and evolve, they become tropical depressions (winds less than 39 mph), then tropical storms (winds below 74 mph) and finally evolve into hurricanes (winds over 74 mph). Warm ocean waters fuel this evolution by infusing heat energy into the storm system and increasing wind speeds. Hurricanes typically form in tropical and subtropical waters during the summer and fall months when ocean water is warmest: hurricane season in the Atlantic is defined as June 1 to November 30. Their tracks are determined by large scale pressure systems around the globe, which push these storms in a clockwise circle (in the Northern Hemisphere). As they move westward and ultimately northward, they encounter cooler water, and lose energy required to keep them strong, causing the storms to subside. However, as climate change progresses, scientists have observed and predicted shifts in global pressure systems. In particular, they have observed a poleward shift in low pressure bands around the subtropics, part of a circulation pattern called the Hadley Cell. Recent research links this shift in the Hadley Cell to changes in hurricane tracks.

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HURRICANES MAY BE RELOCATING (cont.)

Scientists examined stalagmites in a Caribbean Cave to reconstruct hurricane rainfall in Belize over the past 450 years based on ratios between certain carbon and oxygen molecules. Scientists found that there was a peak in tropical hurricane activity in 1650, which coincided with the Little Ice Age, and tropical hurricane activity has decreased since then. Paired with other record of observed storms, scientists determined that the total number of storms has not decreased, but rather that storm tracks have shifted northward, away from the Caribbean, and towards the eastern seaboard of the US. If this shift continues into the next century consequences could be dire for the population centers in the northeast, which have already begun to see the impact of this change.

Further information in the links below:
https://insideclimatenews.org/news/01122016/global-warming-hurricanes-northeast-us-coast, https://www.sciencedaily.com/releases/2016/11/161123124441.htm, https://www.nature.com/articles/srep37522.pdf, http://www.geo.utexas.edu/courses/387H/PAPERS/Emanuel,K.-Nature1987.pdf

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

PERUVIAN DOPLHIN AND SEABIRD MORTALITY EVENT

Photo credits: Reuters/Stringer

In early 2012, over 900 dolphins were found dead along the coast of northern Peru, all within a short three-month period. This is not common even in an extreme stranding event. So, what could have been the cause? Local biologists thought it could be partly from seismic testing by a petroleum company. A governmental research group, the Ocean Institute, suspected cetacean morbillivirus as the cause, which can have lethal symptoms such as pneumonia, encephalitis, and immune impairment. Government officials closed beaches to the public just in case whatever the cause was could harm humans.

An added complexity is that more than 1,500 seabirds were also being discovered deceased as well around the same time, slightly south to where the dolphins were dead stranding. The National Agricultural Health Services believed that the seabirds were starving to death because of food resource availability. The South American Institute data demonstrated that the coastal surface temperatures had been above average during this time period, a possible result of El Nino and/ or global warming, and since anchovies (their preferred prey) prefer cold water it is possible the fish inhabited depths these seabirds could not reach and therefore became malnourished.

Even 7 years later, despite rigorous necropsies and testing, no specific cause has been declared by officials, however, the Peruvian government have maintained that they believe the above average water temperature was the main contributor to these mortality events. Local stakeholders like fishermen and scientists, have doubts about the government's reporting and inconsistencies between statements and warnings, plus an independent research group (ORCA) said they found evidence of decompression sickness, which can be attributed to seismic testing for oil exploration. Unfortunately, it does not seem like a conclusion will be found and hopefully history won't repeat itself.
Further information in the link below:
https://www.nytimes.com/2012/05/08/world/americas/peru-has-no-answers-on-dead-dolphins-and-seabirds.html, http://www.ecology.com/2012/04/19/3000-dolphins-dead-peru/, https://www.scientificamerican.com/article/massive-dolphin-die-off-in-peru-may-remain-a-mystery/?redirect=1, https://phys.org/news/2012-05-peru-birds-dolphins-dead.html

*Thank you to **OCEAN** Researcher Brigid McKenna*

TRASH WHEEL INVENTION CLEANS THE HARBOR

Trash ending up in the water is not breaking news, but it is highly concerning. In the last issue of **OCEAN**, a new method of trash collecting using nets to trap trash in waterways in Australia received the 2019 OCEAN Environmental Award for Innovative Use of Existing materials. We are always interested in new and innovative ways to reduce plastic ending up in the environment, so we were excited to hear of an interesting method employed in the Baltimore harbor, the trash wheel.


Photo credit: The Waterfront Partnership

The trash wheel was created by John Kellett, a local sailor and engineer who wanted to reduce the trash he saw floating in the Baltimore Harbor every day. The trash wheel uses floating blooms to funnel harbor trash into a conveyor belt that is powered by the current and solar panels. It then collects the trash into an attached floating dumpster that can be transported to a transfer station and incinerated when full. This process can collect up to 38,000 pounds of trash a day with the most trash being collected after big storms.

The affectionately named "Mr. Trash Wheel" has now been floating in the harbor sucking up trash since 2014 and has pulled out over one million pounds of trash. It has been so successful that it has gained media attention and a twitter following. The handle, @MrTrashWheel, has over 19,000 followers liking and retweeting messages of environmentalism and reduction in plastic waste. The success of this innovative wheel has resulted in two more being created and installed in the harbor "Professor Trash Wheel" and "Captain Trash Wheel" in 2016 and 2018 respectively. Currently, there is research being done by other cities to replicate similar devices in other harbors and even the ocean.

Further information in the links below:
https://news.nationalgeographic.com/2017/02/mr-trash-wheels-professor-trash-wheels-baltimore-harbor-ocean-trash-pickup/?fbclid=IwAR2lx-BmFq74_W6fWF9OLfzF17vFWmFHCjOHGqbc4Fy97IQjx-eBPHswuc8, https://www.baltimorewaterfront.com/healthy-harbor/water-wheel/

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

BIODEGRADABLE AVACADO PLASTIC

Photo credit: BIOFASE.com

Plastic has been polluting our oceans and our planet for quite some time and we are only starting to realize its impact. Thankfully, many people around the world are coming up with innovative ideas to change what our favorite plastic products are made of and make them more sustainable. In the last issue of **OCEAN**, researcher Lindsey Stanton reported on a start up in Indonesia using seaweed as a replacement for plastic. We are extremely excited about the continuing movement away from plastic, and recently heard of another innovative alternative.

Scott Mungía, a chemical engineering student from Mexico came up with an incredible idea to make straws and cutlery out of avocado seeds in 2012. Since then he and his company Biofase have been working to develop biodegradable avocado seed products. Scott Mungía created an avocado based bioplastic that biodegrades in 240 days as opposed to regular plastic which can take over 100 years. This product goes above and beyond other alternative technologies through its design. The biodegradable straw and cutlery use food waste rather than food sources, and it is competitive to the market costs. The online retail store sells bulk amounts of their products, so you can order 40 boxes of 24-piece mixed cutlery for $759, which comes out to about $19 per box. While this price is still higher than the standard plastic cutlery it costs less than many other alternative material products. These products are a great alternative to plastic and work well for hot and cold food and drinks. We look forward to discovering more great innovative products like this.

Further information in the links below:
https://www.nowscience.co.uk/single-post/2019/02/03/Mexican-company-converts-avocado-pits-into-completely-biodegradable-plastic?fbclid=IwAR305w-L_GhXsDqrhkIKvV-Tf5ZD4SxqJpPco6TjltimHOlUDCJwEOpxpss, https://www.biofase.com.mx/copia-de-home-2

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

BABY PENGUINS ARE DISAPPEARING

Photo credit: DreamStime/Vladimir Seliverstov

One of the largest emperor penguin colonies called the Halley Bay colony located in the Wendell Sea in the Antarctic has been unable to successfully raise chicks in the past three years. In 2016, thousands of emperor chicks drowned when the sea-ice where they were being raised was destroyed during severe weather, and since this event emperor penguins of that colony have not been showing signs of trying to re-establish their population. This colony's population on average maintained between 14,000 to 25,000 breeding pairs for many decades, but has experienced a dramatic population decrease since 2016.

Emperor penguins rely on patches of ice to breed. This ice must last from April, when the birds arrive to the location to breed, all the way to December, when the baby penguins are ready to leave their nests. Since 2016, the sea ice has begun to break up early. This caused many of the baby penguins to drown as they had not yet grown the feathers needed to be able to swim. It has been observed that the sea ice they typically breed on has not been strong enough since 2016 and is now very susceptible to storms.

Another emperor penguin colony, the Dawson-Lampton Glacier colony, had been experiencing a similar degrease in population size from 2010 to 2015, however it now seems to be experiencing a jump in the population. Scientists believe that many of the birds from the Halley Bay colony may have moved over to the Dawson-Lampton Glacier Colony, however not all birds have moved. Scientists predict as the Antarctic warms up, we will see similar challenges to emperor penguin colonies.

Further information int the links below:
https://www.bbc.com/news/science-environment-48041487, https://www.usatoday.com/story/news/world/2019/04/25/emperor-penguin-colony-antarctica-nearly-gone-breeding-collapse/3573143002/

*Thank you to **OCEAN** Researcher Darya Lilie*

WE ARE WHAT WE EAT?

Over the last few decades, concern over pollution in the ocean has grown dramatically, specifically plastic pollution. Humans have known for years that when animals in the ocean consume plastic there is the potential for particles to bioaccumulate; and this accumulation can eventually reach humans through their stomachs. There are endless variables to determine how plastics may affect humans, including the type, size, shape of the plastic; and if there are any added chemicals. Effects from plastics on the human body can vary but may include inflammation, cellular proliferation and necrosis.

There is currently no evidence supporting the idea that plastic from seafood is accumulating in humans, however recent surveys off Cape Cod Massachusetts have found traces of microplastics in the gut of Scallops. While Scallops filter seawater they ingest particles of plastic, which in turn people consume when they eat the scallops. Other research has shown that oysters are also contaminated with microplastics. The full scale of the problem is still widely debated, while plastics have been proven harmful to humans it is unclear whether microplastics; once ingested, stay within our bodies, or if they pass right through. One thing is clear, plastic in our bodies, or in the bodies of things we eat it not ideal, regardless if it passes through or not.

Further information in the links below:
https://www.npr.org/sections/thesalt/2017/09/19/551261222/guess-whats-showing-up-in-our-shellfish-one-word-plastics, https://www.whoi.edu/oceanus/feature/junk-food/?fbclid=IwAR04LHziqITwnMmX5MfwFeJ8iqvCyEYpPdj0d3AIweyceyrnC55PsaWLOqw, https://www.seeker.com/earth/seafood-surprise-nanoplastics-can-embed-and-linger-in-scallops

*Thank you to **OCEAN** Researcher Lindsey Stanton*

Photo credit: Getty Images

DETETCTIVE WORK: 2019 SEABIRD DEATHS


Photo credit: Times of Malta

Back in February of 2019, an estimated 10,000 guillemots, a type of seabird, washed up along the Dutch coast. Another 10,000 birds were thought to have been left in the sea. All these birds were emaciated, and there was a fear that the cause of this disaster was a spill from 345 containers, that fell from the MSC Zoe container ship. There is no concrete evidence linking these deaths with the spill, however the timing is suspicious. Just after the spill birds began washing up along the coastline.

A study conducted by the Wageningen University and Research showed no sign of toxic substances or non-food substances – such as plastic, in the stomach of the birds. There was also no sign of poisoning, viruses or parasites. The current hypothesis is that these deaths occurred due to a difficult breading season. The idea being that once the birds were at sea the guillemots were unable to fish for their usual diet, resulting in a weakened state. Overtime due to insufficient amounts of food their state continued to deteriorate. Eventually a severe storm came which they were unable to survive, and many birds washed ashore.

This hypothesis explains why only birds along the Dutch Coast were affected, and why researchers were unable to find any evidence of poisoning. The one question left unanswered is why was it a difficult breading season? Across the globe animals face difficult times due to humans invading their space or climate change. Only time will tell if similar trends will continue for the seabirds, and for other species.

Further information in the links below:
https://www.wur.nl/en/newsarticle/Deaths-among-common-guillemots-caused-by-starvation.htm, http://www.bbc.com/news/world-europe-47142900, https://www.timesofmalta.com/articles/view/20190206/world/dutch-probe-mass-seabird-death-mystery.701286

*Thank you to **OCEAN** Researcher Lindsey Stanton*

HYDROGEN POWERED TRAINS

In September 2018, the world's first hydrogen-powered train began transporting passengers in Germany. This new, eco-friendly mode of transportation designed by the transit company Alstom uses electricity produced by a hydrogen fuel cell, which works by combining hydrogen gas with oxygen in the air. The only emission is water, making these trains a much more environmentally friendly alternative to diesel trains.

In the UK, Alstom has partnered with the UK railway company Eversolt Rail and finalized a new train design this year. These trains, named "The Breeze," will be running as soon as 2022. This technology has also caught the attention of various countries, including the Netherlands, Denmark, Norway, Italy and Canada.

Converting to hydrogen-powered trains will still have challenges. The production and storage of hydrogen associated with the expansion of these trains will be a costly investment. Furthermore, the current method of generating hydrogen still produces carbon dioxide emissions and an alternative, cleaner processes are much more expensive. However, similar to wind and solar energy, producing hydrogen will hopefully become more economically practical as more widespread research is conducted.

Further information in the links below:
https://www.independent.co.uk/news/science/hydrogen-powered-trains-transport-future-transport-diesel-cost-uk-a8786306.html, https://www.alstom.com/our-solutions/rolling-stock/coradia-ilint-worlds-1st-hydrogen-powered-train, https://www.theguardian.com/environment/2018/sep/17/germany-launches-worlds-first-hydrogen-powered-tra, https://www.goodnewsnetwork.org/uk-trains-will-run-on-hydrogen-power-within-three-years/?fbclid=IwAR3q1JK3FmM5ut97ik7iapDFCUHVERGrpu2ybUpp2f0mCNrugA013LccdvE, https://www.youtube.com/watch?v=f7MzFfuNOtY

*Thank you to **OCEAN** Researcher Isabella Bachman*


Photo credit: EPA/ David Hecker

A NICE SURPRISE, LEADING BY EXAMPLE

Photo credit: EPA / Nic Bothma

In May 2018, the European Parliament voted in favor of banning single-use plastics by 2021. The ban was supported by an overwhelming majority: 571 yays, 53 nays and 34 abstentions. This ban will fight marine pollution by eliminating single-use plastic items with existing alternatives, including straws, stirrers, cutlery and cotton buds. Furthermore, plastics with no current available alternative, such as burger boxes and other food containers, will have to be reduced by 25% by 2025. Cigarette butts, which are the second-most littered plastic, need to be reduced by half in 2025 and 80% by 2030. Annually, Europe produces 25 million tons of plastic waste, but only 30% of this waste is recycled. The ban addresses this by calling for a 90% recycling rate of all plastic beverage bottles by 2025.

Plastic currently makes up over 80% of all marine litter, and approximately 8 million tons of plastic enters the ocean each year. Vice President Jyrki Katainen stated that, "Once implemented, the new rules will not only prevent plastic pollution, but also make the European Union the world leader in a more sustainable plastic policy". It is estimated that the environmental damage caused by plastic pollution will cost Europe 22 billion euros by 2030, and plastic accumulated in the ocean has harmful effects on the fish and other marine life that consume it (and, in turn, humans who eat those fish). This ban will potentially be an important step towards curbing plastic pollution and the devastating effects it has on marine ecosystems.

Photo credit: AP images

Further information in the links below:
http://time.com/5560105/european-union-plastic-ban/, http://www.europarl.europa.eu/news/en/press-room/20181018IPR16524/plastic-oceans-meps-back-eu-ban-on-throwaway-plastics-by-2021, https://www.theguardian.com/environment/2019/mar/27/the-last-straw-european-parliament-votes-to-ban-single-use-plastics, https://www.bbc.com/news/world-europe-45965605

*Thank you to **OCEAN** Researcher Isabella Bachman*

SAFE HARBOR DISPATCH COLUMN

DISPATCH FROM YELLOWSTONE: We asked Kegan Burke how his life has changed since working as an Intern with Safe Harbor? "I now wake up around 3:30 AM to set mist nets for birds and always carry Bear Spray".

Keegan, in the field

"***Greetings from Wyoming!*** This season I was hired as a Biological Science Technician for the bird program at Yellowstone National Park.

This program is divided into three sections of monitoring that represents the avian diversity here in the park. Raptor monitoring includes breeding birds of prey such as Peregrine Falcons, Bald Eagles, Golden Eagles and Osprey. Although these species are no longer federally listed, they are of historical concern and our monitoring must meet guidelines for post delisting of species by the U.S Fish and Wildlife Services.

We conduct passerine point counts and use mist netting to monitor Songbird diversity and abundance in three distinct habitats throughout the park; Sagebrush and Grasslands, Willow riparian zones, and old growth forest. The Waterbird monitoring includes Common Loons, Trumpeter Swans and colonial nesting birds like pelicans and cormorants. YNP is unique because it has its own meta populations of these Waterbird species that are unstable and vulnerable to climate change.

Norris Geyser Basin

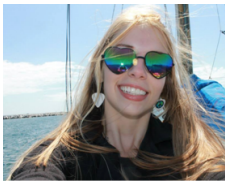
Between the geothermal geyser basins, the highest concentration of mammals in the country, and the diverse habitats throughout high elevations, it is no wonder Yellowstone was our first established national park. I am inspired and perplexed by the beauty and magnitude of this ecosystem with every step in the field. I am truly grateful to be doing something I love."

DISPATCH FROM THE BEACHES OF PUERTO RICO: Robert Mayer Arzuaga, from the University of Puerto Rico shared some good news with us. Arzuaga has been spearheading some of Puerto Rico's beach restoration efforts following serious Hurricane generated erosion last summer. He decided to experiment with a system called "Biomimicry" that was developed on Cape Cod, by Safe Harbor (a small interdisciplinary consulting group which specializes in developing natural energy systems to restore coastal erosion). The Biomimicry system uses Storm winds to deliver new sand, using a random matrix of simple wooden slats or shims, mimicking beach grass. The image below shows two months of collection, which surprised Arzuaga. Where there is a wide beach and sand supply, the system can increase dune or beach elevations by several feet a year.

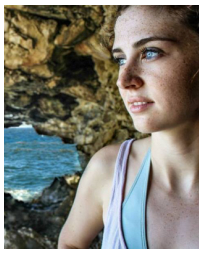
Photo credit: R. Arzuaga

OCEAN Research Coordinator Jessica Hillman shared some good news with us....

Jess and her partner, Victoria Babcock, are now engaged! All your friends at Outer Cape Environmental Awareness Newsletter and Safe Harbor wanted to officially send our Congratulations!



Thank you to Samantha Thywissen, for continuing for her work as ***Associate Editor*** all the way from San Francisco to make **OCEAN 47** 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!