



OUTER CAPE ENVIRONMENTAL AWARENESS NEWSLETTER



This 50th Issue of **OCEAN** commemorates an idea I had ten years ago: to create an innovative, environmental e-newsletter, linking us together through our shared challenges. Our readership now reaches about 5,000 readers worldwide. With this hallmark issue of **OCEAN 50**, I am renewing my commitment to be self-funded, with no advertising. Thank you to our readers, for your continuing support, in sharing our new and newer ideas. Your comments are always welcome, at my email address listed below. Thank you for reading and sharing **OCEAN**.
gordonpeabody@gmail.com Gordon Peabody, Editor

January 2020 Issue No. 50

QUAKES IN ENGLAND HALT FRACKING

Fracking has reached the headlines once again; this topic has been covered multiple times through **OCEAN** articles including “Thousands of Fracking Spills” and “What’s Shaking in Oklahoma?”. However, following a magnitude 2.9 earthquake in England related to fracking by Cuadrilla Resources, the activity has been suspended. This is because the Oils and Gas Authority in the country ruled that further seismic activity could not be ruled out. Fracking has been suspended until the industry is able to reliably predict and control any tremors linked to fracking. This is not to say the process will be banned all together, if the industry is able to prove/ensure that tremors and earthquakes will not happen permissions may be reinstated.

Some argue that this temporary ban is just an election stunt by Business Secretary Andrea Leadsom, because it is an election year. Others in England, including the Labour, Lib Dems and the Green Party, argue for a permanent ban on fracking. They argue that based on current technology it is unlikely to see a future in the United Kingdom where fracking does not cause earthquakes. Regardless of how long this ban lasts, whether it ends up being permanent or temporary it is a step in the right direction.



Photo credit: Christopher Furlong/Getty Images

Further Information:

<https://www.bbc.com/news/business-50267454>, <https://fortune.com/2019/11/03/britain-bans-fracking-earthquakes/>

Thank you to **OCEAN** Researcher Lindsey Stanton

**CAPE ARCHITECTURAL FIRM WINS
OCEAN INNOVATIVE ENVIRONMENTAL DESIGN AWARD;
**OWNER JOY CUMING RECEIVES
ENVIRONMENTAL VISION GRANT****

A “BETTER, SIMPLER” kayak storage concept, significantly reduces environmental and social stress in mixed use coastal areas. Architects are usually known for building design but Joy Cuming, the owner of Aline Architects on Cape Cod, shared her extraordinary vision of integrating design with the environment, to help resolve the ongoing conflicts involving kayak storage in sensitive environments, Thank you!

For more information on these two alternative designs, go to

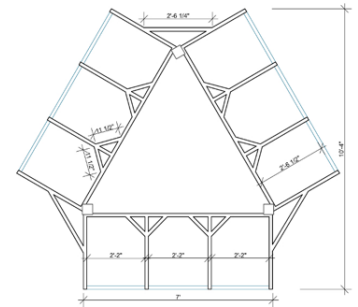
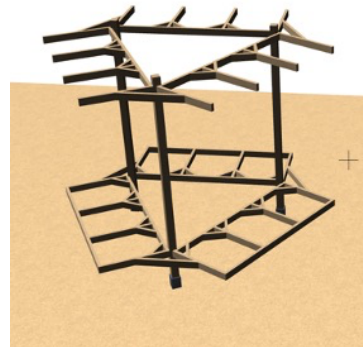
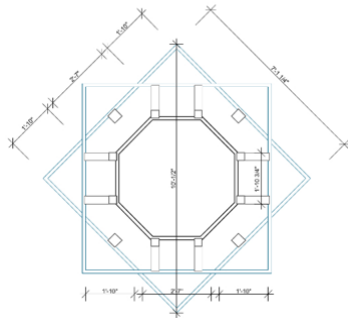
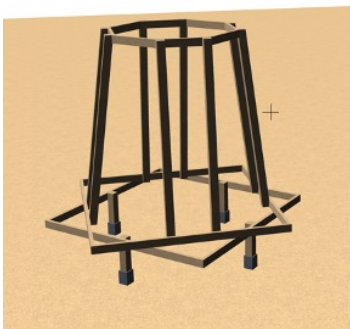
<http://alinearchitecture.com/about-us/>



VERTICAL STORAGE
 SIGNIFICANTLY REDUCES
 SPACE NEEDS



THIS IS A SECOND
 VERTICAL STORAGE
 ALTERNATIVE



THESE VERTICAL SYSTEMS CAN USE HELICAL ANCHORS



VERTICAL STORAGE
 SIGNIFICANTLY IMPROVES USE
 OF SPACE IN SENSITIVE SOCIAL
 AND ENVIRONMENTAL AREAS.

LOBSTERS AND WHALES



Population dynamics of the Northern Right Whales has become a hot topic of discussion in Maine. Environmental groups suspect that the use of fishing gear is the main reason for the northern right whale's endangered status. As a result, the National Marine Fisheries Service required Maine to propose a reduction of the number of vertical lines by 50 percent. This has caused tension with Maine lobster fishermen who say there is currently little evidence that whale entanglement, caused by vertical lines used in lobster traps, is negatively affecting the whales on major scale.

Typically, northern right whales travel further off shore through the Gulf of Maine. Most of the lobster gear is located closer to the coast where the whales are rarely seen. Recently people have observed the whales further north in the Gulf of St. Lawrence. There have been killings of right whales by ship strikes or Canadian fishing gear not rigged with whale safe features that have been reported. Maine's fishermen and government have contended that efforts to measure the cause of the decline in the northern right whales should be done before any accusations. These measures include: tracking

studies, environmental changes, and using peer reviewed threat assessment modeling.

There is a simple strategy that could possibly help prevent whale entanglement. It's a new innovative idea developed over the last year by Safe Harbor Environmental. A seaweed-sand counterweight system. It is a lobster buoy counterweight created with gelatin made from seaweed and sand. This counterweight would hold the buoy at the bottom while it slowly dissolves in sea water. This is a new idea and still in the process of development, but could potentially be helpful in solving the whale entanglement problem.



Further information:

https://www.pressherald.com/2019/08/15/maine-voices-lobstermen-face-threat-of-the-extinction-of-their-way-of-life/?fbclid=IwAR1Hh2oNW77uC04TTk89VwP87a4Segpz5IjJFuyZ6fEcWIRZc1pglWa2D_I, <https://static1.squarespace.com/static/58910d716a4963f35f8da04d/t/5dcff82348fc0223597374b1/1573910577520/OCEAN+49.pdf>

Thank you to **OCEAN** Researcher Darya Lilie

GIFT FOR BEES

Honeybees contribute to our ecosystem in many beneficial ways. We all love honey and the beautiful flowers that bees pollinate. Unfortunately, bees have been in the news for a more sinister reason lately, the harmful impact neonicotinoids have endangered our bees. **OCEAN** has reported on this issue several times, most recently in **OCEAN 35**'s "Update on Bee-Kind." This report elaborated on the potentially detrimental impact of this pesticide on bees.

It is with this in mind, that we are happy to report about positive efforts made to save our bees. One city in the Netherlands, Utrecht, has put forth a helping hand to the honeybees that is as innovative as it is simple. They have supported local biodiversity by planting greenery on top of 316 bus stops throughout the city. This gift to the Honeybees also serves a greater purpose for residents of the city by improving air quality and retaining rainwater. This is just one ecologically friendly step the city has taken that could easily be replicated closer to home. We hope to continue to learn from innovative new ideas around the world and we applaud Utrecht for their gift to the Honeybees.

Further information:

https://www.independent.co.uk/news/world/europe/bus-stop-plants-green-roof-bees-holland-utrecht-a8997581.html?fbclid=IwAR3mmS19eceEO2lj49Q-Axq8cTxvNqLvn4Y0ozR-R-vv3ABOggM_s7RliY

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



THE "ELSEWHERE" DEPARTMENT



We have a tendency to define environmental events by local impact and overall scale.

Two current, contrasting examples would be the localized panic in southern Florida created by the Sub-Arctic air intrusion that resulted in thousands of cold-stunned Iguanas dropping from Trees and a world away in Australia, a continent the size of the US seemed to be on fire, impacting hundreds of thousands of people and millions of animals.

Further information:

<https://www.theguardian.com/commentisfree/2020/jan/23/fire-raining-on-beaches-red-skies-and-a-billion-animals-killed-the-new-australian-summer>

<https://www.bbc.com/news/av/world-51230794/iguanas-falling-from-trees-in-florida>



MYSTERY CAPE COD DEAD ZONE

This past fall, the lobster industry on Cape Cod suffered major losses. Throughout the fall of 2019, Cape Cod fishermen pulled up their lobster traps to find the traps full, but the lobsters dead, along with all the other animals in the traps. In response to calls from concerned fishermen worrying about contamination of Cape Cod Bay waters, researchers at the Provincetown Center for Coastal Studies set about to determine the cause of the lobster deaths. Results from their field research suggest that the culprit for the death of animals in lobster traps was a lack of oxygen in the bottom water of Cape Cod Bay, a condition called hypoxia.

Seasonal hypoxia is not a new phenomenon - it happens when the surface water warms over the summer. Warm water is less dense than cold water, and so it floats on the surface of colder dense water; this is known as stratification, and prevents oxygen from the air from mixing into deep water in the bay. Animals that live in the bottom water of Cape Cod Bay continue to breathe during this time, further depleting the oxygen content in the deep. Similarly, anything that decomposes in the bottom water also consumes oxygen. These are all-natural processes, and result in low oxygen levels at the end of summer in Cape Cod Bay bottom water; what was new this fall was the level that oxygen dropped to. Typically, when fall sets in, the surface water cools as the days become shorter, and winds cause turbulence that results in mixing. The water becomes less stratified, allowing for oxygen to mix into deeper water from the atmosphere. Scientists suggest that this fall, warm and calm weather prevented the surface water from mixing oxygen into bottom waters. Animals kept breathing at the bottom of Cape Cod Bay, and decomposition continued as normal; however, the bottom waters did not get the infusion of oxygen rich surface waters as they typically do. This created a hypoxic environment.

Marine animals are sensitive to oxygen levels. When they don't have enough oxygen to survive, they can typically relocate and move away from hypoxic areas. However, animals that are less mobile may suffocate, and any animal that has been caught in a lobster trap will die. Owen Nichols of the Provincetown Center for Coastal Studies said that scientists have not made a direct link between this event and climate change, but that understanding the drivers of extreme hypoxia in Cape Cod Bay will be a research priority going forward. Fishermen on Cape Cod are taking action to ensure they aren't caught by surprise again in the future. They can't control the weather or climate, but by closely monitoring oxygen levels in Cape Cod Bay, they are hopeful that going forward they will know when conditions become dangerously hypoxic. To achieve this, the lobstermen's association is aiming to get funding from the state to pay for oxygen sensors so that they can strategically place traps outside of hypoxic zones.

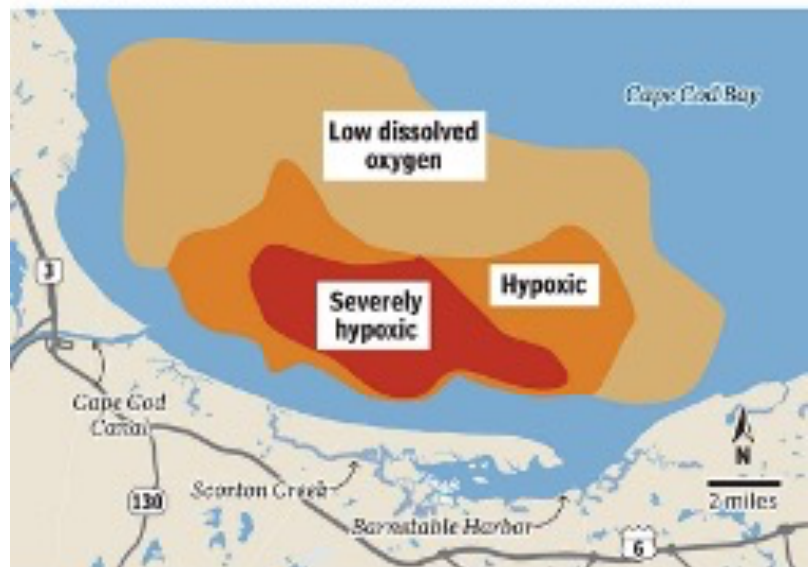
Further information:

https://www.wgbh.org/news/local-news/2019/10/23/mysterious-lobster-deaths-in-cape-cod-raise-climate-change-concern?amp=true&fbclid=IwAR0mH1Tg_H_bbtOppijlZNSDUCAg_GMtkA56AX2XwabuY90oDBVJsLSAokc, <https://www.capecodtimes.com/news/20191003/lobsters-fish-fall-victim-to-low-oxygen-levels-in-cape-cod-bay>, <https://www.wgbh.org/news/local-news/2019/10/23/mysterious-lobster-deaths-in-cape-cod-raise-climate-change-concern>

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

Cape Cod Bay 'dead zone'

Hypoxic conditions, with reduced levels of dissolved oxygen, can cause stress or death in bottom-living organisms, such as lobsters.



Sources: Massachusetts Division of Marine Fisheries maps4news.com/HERE

GATEHOUSE MEDIA

COMMUNITY STRESS FROM SLR

As sea levels rise and hurricanes cause increasing flooding, some urban areas are being inundated more frequently. In response the Federal Emergency Management Agency (FEMA) has mandated that certain buildings be



Photo credit: G. Peabody

“lifted” to get them out of flood zones. This policy is at odds with the aims of some historical preservation societies, which want to maintain the visual character of historic regions. Some property owners who face increasingly frequent flooding want to lift their buildings to defray long-term costs, whether required by FEMA or not, and have been met with resistance from historical preservation societies. This issue has caused social and cultural friction. For example, Charleston, South Carolina is home to historic architecture, and has a downtown area designated as a National Historic Landmark District, but suffers frequent flooding. For the past several decades, lifting of buildings had been deterred by the Charleston preservation community. However, the preservation community recently changed its stance, and put out a

statement explaining their desire to find the “sweet spot between reducing damage to our historic buildings from flooding events while preserving their physical integrity and historic architectural proportion and character”. Similarly, in Provincetown, MA, the planned renovation of a building triggered the FEMA requirement for lifting when construction costs increased unexpectedly. The Provincetown Zoning Board of Appeals was against the building lift, and is hoping that the property can be waived from the FEMA requirement, since it is on the National Registry of Historic Places. Neighbors also hoped for the waiver to be approved; the owners’ first priority was to get their renovation finished, lift included or not. With many interests and increasing threat of flooding, this issue is complex.

Further information:

https://www.historiccharleston.org/blog/controversy-raising-historic-buildings/?fbclid=IwAR0OwHw3GrM6ZHxjHVWFwIAZvdJINKpd8mBm4Wd7nQ5swwn0fHLAJNjXc_Y, <https://coast.noaa.gov/states/stories/charleston-sea-level-rise-strategy.html>, <https://www.citylab.com/environment/2019/09/hurricane-dorian-charleston-flood-climate-change-high-tides/597475/>

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

BUILDING A BETTER OYSTER

Most of us know that a mule is an infertile cross between a donkey and a horse, but fewer people know that many farmed oysters we eat are similarly an infertile cross between two different types of oysters. Most animals, including humans and wild oysters, are diploid, meaning they (we) have two sets of chromosomes in each of their cells. These diploid, double chromosome oysters reproduce seasonally; reproduction requires production of gametes (eggs and sperm), which consumes energy. As oysters spend energy getting ready to reproduce, they spend less energy on growth; as a result, they take longer to reach an appropriate size for harvest, and the quality of their meat may decline during summer, when their bodies are mostly comprised of gonads, or when they become less meaty after spawning. . A solution to this problem was developed by Dr. Standish Allen, who invented the triploid oyster in the late 1970s, by changing the way oysters produced gametes. Typically, a gamete has a single chromosome, or is haploid. When two haploid gametes combine, the resulting organism is diploid. Allen developed a method to create diploid gametes, and when a diploid gamete meets a haploid gamete, the resulting organism is triploid.

(continued on the next page)

BUILDING A BETTER OYSTER (cont.)

Triploid oysters have three chromosomes, and are unable to reproduce, much like a mule. This means they grow faster, because all their energy is focused on growth rather than on reproduction. Triploid oysters are commonly used in hatcheries because they reach a larger size and can be harvested earlier. They have the drawback of being picky - if conditions aren't right, they might not grow faster than their diploid cousins. Due to this tradeoff, shellfish farmers on Cape Cod grow both haploid and diploid oysters.

Further information:

<https://wellfleet.wickedlocal.com/news/20180816/extra-chromosomes-make-august-oysters-extra-plump>,

https://www.theatlantic.com/technology/archive/2014/09/todays-oysters-are-mutants/380858/?te=1&nl=cooking&emc=edit_ck_20190902%3Fcampaign_id&instance_id=12043&segment_id=16661&user_id=b06cc2932124adf9c1508fcf4c86681e®i_id=7223995220190902&fbclid=IwAR3v6CnDZHt8h_kCO5UCfmGsth3OZ7NTNNcbpohy8c7HVu2DAKltQAib9t8

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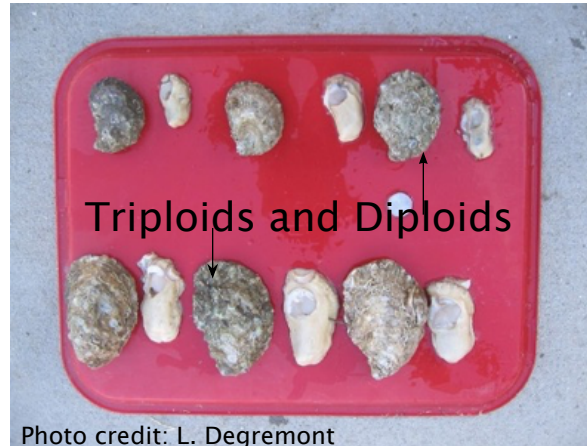


Photo credit: L. Degremont

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

OCEAN INNOVATIVE PRODUCT AWARD: **“MAKING PLASTIC FROM FISH”**

Lucy Hughes, a student at the University of Sussex, has received the prestigious James Dyson Award for designing a plastic alternative made out a fish waste. The bio-plastic, named MarinaTex, is stronger than low-density polyethylene (LPDE). LPDE is currently used in plastic bags and can decompose in four to six weeks. The design will be ideal for single-use packaging including food packaging. Through her efforts, not only does Hughes address the growing amount of plastic ending up in our oceans but also the 172,702 tons of fish waste generated each year in the United Kingdom alone.



Hughes visited a local fish processing plant where she studied the plant's waste stream. Among the shellfish exoskeletons, blood, and organs she found that fish skin and scales had the most promising qualities for becoming a usable bio-plastic. After experimenting with different organic binding agents, Hughes selected agar from red algae due to numerous environmental benefits, including that it does not require fresh water or fertilizers to grow.

OCEAN INNOVATIVE PRODUCT AWARD: **“MAKING PLASTIC FROM FISH”**

Hughes emphasizes a circular economy model. In our current linear economy, we tend to take resources from the earth, utilize these resources and then dispose of them. However, a circular economy model aims to minimize waste and make the most out of the resources we are currently using. On the MarinaTex website, the example of milk bottles is given. After a plastic milk bottle is consumed, it is recycled and reused over and over again until it finally wears down. Through this model, the maximum potential of the milk bottles is utilized.

MarinaTex is still being researched and developed; therefore, it is not available on the market yet. However, Hughes hopes to get her bio-plastic on the market by 2021.

Further information:

<https://www.marinatex.co.uk>, <https://www.jamesdysonaward.org/2019/project/marinatex/>,
<https://www.theguardian.com/environment/2019/nov/14/plastic-substitute-made-of-fish-waste-hauls-in-uk-designer-dyson-award>

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

MAKE-OVER FOR WIND ENERGY

Wind turbines have just received a new makeover. Vortex Bladeless, a Spanish company founded by David Suriol, David Yáñez and Raul Martín, have designed a bladeless wind turbine that harnesses energy through vibration. The wind turbine, which Suriol describes as looking “like an asparagus,” is a cylinder held up with an elastic rod. Energy is generated as wind causes Vortex Bladeless to oscillate.

There are numerous benefits to this new design. Vortex Bladeless is much cheaper to build than traditional wind turbines, costing 51% less. Traditional wind turbines are responsible for creating some noise pollution; one study even finding that noise pollution created by wind turbines can even reduce property values between 3 and 7 percent. In contrast, Vortex Bladeless is silent. Furthermore, windmills are responsible for the deaths of approximately 140,000 to 328,000 birds in North America per year. The design of Vortex Bladeless, on the other hand, would greatly reduce the risk of avian death. Finally, because the bladeless wind turbine requires fewer parts to build, it even creates a smaller carbon footprint.

Vortex Bladeless does have its critics. For example, wind energy specialist Martin Hansen from the Technical University of Denmark criticized the design, stating, “If you have a common propeller-type wind turbine, you have a big area swept by blades. Here you just have a pole”. Although Vortex Bladeless does generate 30 percent less power than a traditional turbine, twice as many turbines can be built in the same space as compared to traditional turbines. Meanwhile, the company has raised considerable funds through private capital and government funding and receives up to several hundred emails per day from people inquiring about their design. While the company is not offering any products yet, their goal is to sell their products worldwide and currently plan on offering an available product by the end of 2020.



Photo credit: Vortex Bladeless

Further information:

<https://www.audubon.org/news/will-wind-turbines-ever-be-safe-birds>, <https://vortexbladeless.com/technology-design/>, <https://www.researchgate.net/publication/268807359> The Vindication of Don Quixote The Impact of Noise and Visual Pollution from Wind Turbines, <https://www.technologyreview.com/s/537721/bladeless-wind-turbines-may-offer-more-form-than-function/>, <https://vortexbladeless.com/faq>

*Thank you to **OCEAN** Researcher Isabella Backman*

A MICROSCOPIC SOLUTION TO THE PLASTICS PROBLEM?

EDITOR'S CHOICE, MOST INTERESTING ARTICLE

Plastic poses a tenacious pollution problem. As a cheap, easily produced material, plastic has transformed scientific research, medical capabilities, and transportation, but is ubiquitous in our daily lives, found in shampoo bottles, food wrappers, clothing, and even some tea bags. In 2015, humans produced 448 million tons of plastic. Each year, eight million tons of plastic finds its way into the ocean, where unsuspecting organisms can mistake the plastic for food, or become entangled and even strangled by flexible plastics. While reducing our plastic consumption and recycling of harder plastics may help stymie the pollution crisis, we still have to deal with the billions of tons of plastic currently circulating around our earth. Flimsy polyethylene terephthalate (PET) plastics cannot be recycled and leaches harmful chemicals into our soil, water, and bodies. Moreover, plastic was not thought to be biodegradable. Until now.

Bacteria are microorganisms found virtually everywhere on earth. Some bacteria species have developed an enzyme allowing them to naturally digest plastics. Jeanny Yao and Miranda Wang were high school students in 2012 when they discovered this bacterium in Vancouver, Canada. They found that the bacteria would break PET plastics into carbon dioxide, water, and other chemical compounds that could be used in new materials. Their bacteria research eventually proved unfruitful, and they transitioned to chemical processing of plastics, creating Biocellation, a biotech solution meant to upcycle plastic.



While Yao and Wang have moved on from researching plastic-eating bacteria, several other scientists took up the investigation. In 2016, an international team of scientists attempted to synthesize the plastic digesting lipase enzyme found in *Ideonella sakaiensis* bacteria, and actually mutated the original enzyme, enhancing its performance. Under their supervision, the enzyme took a few days to break down PET plastics into its original components, which ideally will be used to make new plastics, negating the need to extract additional fossil fuels for new plastic creation.

Morgan Vague also took on the plastic-eating bacteria hunt in college, and discovered three *Pseudomonas* species of bacteria that have a lipase enzyme which digests PET plastic. While this digestion process naturally takes several weeks, Vague is looking to expedite the bacteria's plastic consumption by exposing the PET plastic to UV light, softening the plastic and making it more digestible.

Bacteria could be a viable solution to breaking down PET plastics, upcycling the material for future use. Currently, this process is not being done on a scale is not large enough to tackle our global plastic pollution crisis, but with time, Vague hopes you will be sending your plastic waste to a "compost heap," where bacteria give a second life to your single use plastics.

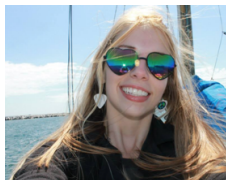
Further information:

<https://www.theguardian.com/environment/2018/apr/16/scientists-accidentally-create-mutant-enzyme-that-eats-plastic-bottles>, <https://www.nationalgeographic.com/environment/habitats/plastic-pollution/>, <https://www.fastcompany.com/3059629/these-students-are-developing-bacteria-that-eats-our-plastic-pollution>, <https://doi.org/10.1101/647321>, <https://www.launch.org/innovators/miranda-wang/>

Thank you to **OCEAN** Researcher Dana Bloch

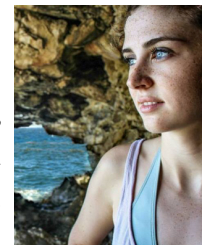
OCEAN continues to support the restoration of Cape Cod's stressed natural resources, including Wellfleet's 1,100 acre, struggling marsh habitat, which has been isolated behind a dike, constructed 100 years ago. Make your own decisions on this restoration project.

For more information: <http://www.friendsofherringriver.org/>



Thank you to Samantha Thywissen, for continuing for her work as *Associate Editor* from the West Coast to publish **OCEAN 50**.

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



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Thank you for your support!