



## OUTER CAPE ENVIRONMENTAL AWARENESS NEWSLETTER



**OCEAN** is an environmental education e-newsletter self funded by Safe Harbor Environmental, an inter-disciplinary consulting group on Cape Cod and contains no advertising. This issue is dedicated to young people our researchers have discovered around the world, who are stepping up to try and make a difference. We can ask nothing more from them, or of ourselves. Safe Harbor's experiment with Whale disentanglement research is included, as well as some women surfer film makers who discovered some inspirational children trying to make a difference in "paradise".

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### VEHICLES THAT ONLY EMIT WATER

With a world more focused on environmentally friendly inventions it seems the next frontier may finally be here. In 2018 the world's first hydrogen powered train started transporting passengers in Germany. This topic was originally covered in a previous article of [OCEAN](#) which can be found here. In the year since the train first launched everything seems to be going well. There are currently 14 more trains set to become part of the lower Saxony fleet in Germany. Other parts of Germany have expressed interest in getting hydrogen powered trains as well. With the success and excitement surrounding the hydrogen powered train this technology has begun to seep into other areas. Naturally the next step would be hydrogen powered cars.

One company Realsimple has designed a car called Rasa which is powered by hydrogen. The Rasa weighs 580 kilos or about 1280lbs and has a fuel cell that provides energy when hydrogen is combined with oxygen; while emitting only water. The design is unique, there are ultra-capacitors which help to recover energy typically lost from braking making it extremely efficient and environmentally friendly.

In the coming years the goal for Realsimple is to build charging stations to make the product more convenient. The current business model is to never sell a Rasa car and instead it aims to have drivers pay a monthly rental fee which will account for vehicle depreciation and fuel. The current estimate is that a monthly lease for the Rasa will cost 370 pounds per month, or about \$460 per month. Other manufacturers have estimated that their hydrogen powered cars may cost as much as \$50,000. With any luck in the next few years more companies will emerge with hydrogen options along with more charging stations.

Further Information:

<https://phys.org/news/2018-07-hydrogen-powered-cars-gradually-mainstream-europe.html>,

<https://www.riversimple.com/the-design-of-the-rasa/>

Thank you to **OCEAN** Researcher Lindsey Stanton



## MYSTERIOUS ARRIVALS IN FLORIDA



This year a Florida town was terrorized by an army of Blue Land Crabs that moved into the neighborhood seemingly overnight. In numerous videos that went viral the crabs can be seen walking the streets and even climbing on houses!

During this time of year, it is normal to see the occasional Blue Crab walking around, but this year was different. Individuals who live in the area have never seen so many crabs at one time. The end of June to the beginning of November is the mating season for the crabs and because of this they are seen more often. The crabs typically live within five miles of the ocean and burrow

underground, while foraging for food during the night. This year was a little different, an onslaught of heavy rains resulted in the crabs being forced out of their burrows. This eventually resulted in the crustaceans taking to the streets and neighborhoods.

In the coming years incidents like this may become more typical. If heavy rains during the breeding season becomes more routine the crabs may be forced out of their burrows more frequently. Only time will tell if similar events will become normal.

Further information:

<https://www.ajc.com/news/national/watch-land-crabs-descend-south-florida-city/vYGDBhQBgJrfRgUSXV4A00/>, [https://www.wftv.com/news/trending-now/watch-land-crabs-descend-on-south-florida-city/974730405?fbclid=IwAR2Xbh3HAj6z7V6sp\\_N01sjX-guWA96L-259ho-L174kydixewdizenxsUU](https://www.wftv.com/news/trending-now/watch-land-crabs-descend-on-south-florida-city/974730405?fbclid=IwAR2Xbh3HAj6z7V6sp_N01sjX-guWA96L-259ho-L174kydixewdizenxsUU), <https://www.orlandoweekly.com/Blogs/archives/2015/09/15/central-floridas-giant-land-crabs-are-now-emerging-from-the-earth>

Thank you to **OCEAN** Researcher Lindsey Stanton

## EXTREME WEATHER PHEONMENA

This past July, Greece was hit with what some would call a freak storm. This storm came on very suddenly and the worst of it lasted for about 20 minutes storm consisting of very high winds, rain, thunder, and lightning. The winds were so strong that there were reports of a small tornado. Some areas even experienced hail. This single storm event killed 7 people and injured hundreds more.

The storm was not the only unusual weather event in Greece this summer. It followed after a couple of days of severely high temperatures of 98oF. The weather was very hot up until the moment the storm made its appearance. The weather changed very drastically from a clear hot evening to a severe storm. According to Zanis Prodromos a professor of meteorology and climatology at Aristotle University of Thessaloniki this was an extreme phenomenon that resulted from a mesoscale convective system. A mesoscale convective system is a collection of thunderstorms that thrive in very high wind speeds. Whirlwinds can develop in the mesoscale convective system, and that is precisely what Greece experienced. Warming climate temperatures do increase the likelihood that the storms will become more severe over time, however they can't quit relate the storm that happened in Greece to climate change.

Greece is no stranger to storms. Every year it experiences one or two Medicanes (a term for hurricanes over the Mediterranean Sea). Hurricanes usually happen as a result of high temperatures. Hurricanes or Medicanes are the Earth's natural way of cooling itself down. Although the storm that happened in Greece in July was not a Medicane, it appeared as a result of very high temperatures (similar to Medicanes). It is normal for a mesoscale convective system to make an appearance in that part of the world, however the event that happened in July was extraordinary in magnitude. It appears that scientists are still trying to research this natural occurrence as they don't know much about the mesoscale convective system.

Further information:

<https://www.nytimes.com/2019/07/11/world/europe/greece-storms-halkidiki.html>, <https://www.bbc.com/news/world-europe-48945821>

Thank you to **OCEAN** Researcher Darya Lillie



## MORE MYSTERIOUS ARRIVALS

Sargassum seaweed has been showing up on tourist beaches with increasing frequency in recent years. This seaweed is smelly, unphotogenic, and gets in the way of swimmers and beach goers. However, it has not always been filling up the beaches of South Florida and the Caribbean. This recent issue has been perplexing scientists and they are now conducting research on why this is occurring.

A recent study published in *Science*, titled “The Great Atlantic Sargassum Belt” concluded that Sargassum, historically found in the Sargasso Sea, has become “the new norm” for the tropical Atlantic coast and the Caribbean Sea. The study details how the Atlantic Sargassum belt was seen in satellite imagery in 2011 reaching from West Africa to the Gulf of Mexico and that it has increased and varied with ocean currents since.

The study suggests that the Sargassum bloom in 2011 could have been a consequence of the Amazon Rainforest’s deforestation resulting in increased nutrient pollution from the Amazon River flowing into the ocean. This occurrence coincides biannually with regular nutrient upwelling from ocean currents which are likely fueling the Sargassum growth. However, further studies are needed before a clear conclusion can be made. It is particularly important to study the role that climate change and ocean acidification has had and potentially could have on this phenomenon.

In the meantime, innovative new ideas will be needed to solve the challenge of what to do with all of the Sargassum landing on tourist beaches. A few environmentally conscious uses include fertilizers, skin care products, and food. Continued research should be done on further uses that will help solve the problem of what to do with the Sargassum piling up on beaches.

Further information:

[https://www.tampabay.com/environment/sargassum-seaweed-now-piling-up-on-florida-beaches-becoming-a-regular-belt-across-atlantic-to-africa-20190704/?fbclid=IwAR38QFnV\\_ONnak11CesJLWKQmFwfbZyaGQs6oUN0W1ioOACiJ08yrMEkG\\_I](https://www.tampabay.com/environment/sargassum-seaweed-now-piling-up-on-florida-beaches-becoming-a-regular-belt-across-atlantic-to-africa-20190704/?fbclid=IwAR38QFnV_ONnak11CesJLWKQmFwfbZyaGQs6oUN0W1ioOACiJ08yrMEkG_I), <https://science.sciencemag.org/content/365/6448/83>

<https://science.sciencemag.org/content/365/6448/83>

Thank you to **OCEAN** Researcher Jessica Hillman



Photo credit: Greg Lovett

## OCEAN 2019 INNOVATIVE STRATEGY AWARD STUDENT INVENTS MICROPLASTIC SOLUTION



Fionn Ferreira, an 18-year-old from Ireland, was announced the winner of the Google Science Fair this summer. The competition, which was first run in 2011, is open to students aged 13 through 18, and Ferreira's winning project highlighted a new way to remove microplastics from water. Microplastics are plastic particles with a diameter of less than 5 nanometers and are common in many body products such as face scrubs, due to their exfoliating characteristics.

They also come off of synthetic clothing during washing. These particles are so small that they are rarely removed from water during treatment, and they commonly end up in waterways and ultimately in the ocean. Small fish which feed on plankton can mistake these tiny plastic particles for food and consume them; then, plastic particles accumulate in larger fish which eat the smaller fish. This happens in fish that humans consume as well. Ferreira used oil and magnetite to create a magnetic fluid, known as a ferrofluid. Microplastics suspended in water bond to the ferrofluid and Ferreira then removed the ferrofluid and microplastics from the water using a magnet. This method was 87% effective, and was most effective on microplastics from clothing, and least effective on polypropylene plastics. Ferreira hopes to scale this new technology so that it can be used at water treatment plants.

Further information:

[https://www.thejournal.ie/irish-student-science-award-microplastics-4745270-Jul2019/?utm\\_source=shortlink&fbclid=IwAR1vJUialm-SY2sTgyjIR0QFabI8RM5ICpkTFWTnLRzJrgzYUQa1d3jev0A](https://www.thejournal.ie/irish-student-science-award-microplastics-4745270-Jul2019/?utm_source=shortlink&fbclid=IwAR1vJUialm-SY2sTgyjIR0QFabI8RM5ICpkTFWTnLRzJrgzYUQa1d3jev0A),  
<https://www.forbes.com/sites/trevornace/2019/07/30/irish-teen-wins-2019-google-science-fair-for-removing-microplastics-from-water/#1f6317cd373f>

<https://>

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

## CLEAN WATER FROM SUNLIGHT

Engineers have recently developed a method to combine carbon free energy production and water purification. Currently, huge amounts of water are used to produce energy, and similarly, huge amounts of energy are utilized in desalinating water. A new device aims to solve both these problems with one solution. It is an adaptation of a solar panel - typically solar panels only turn 10-20% of sunlight to power. To make use of the unused energy, scientists developed a membrane distillation unit attached to the solar panel. Water vapor is generated with the unused heat, and pushed across a membrane, where it condenses on the other side. The device is a three-stage distillation device, meaning that the heat released in condensation drives the next cycle of water evaporation. The device produced three times more water than typical solar powered water purifiers, and generated electricity with 11% efficiency. Experiments show that a device one meter across can produce 1.7 kg of clean water per hour. Scientists are hopeful that this device can be used on an industrial scale, but in order for that to happen certain logistical challenges must be addressed; the main limitation is that the device requires large amounts of land to be effective at producing water.

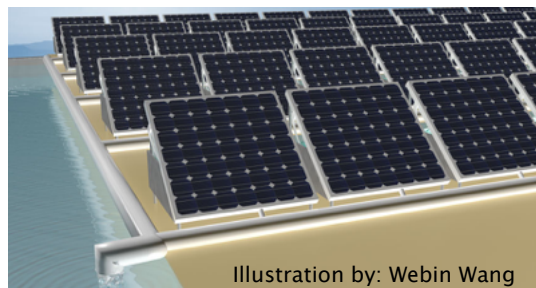


Illustration by: Webin Wang

Further information:

<https://www.bbc.com/news/science-environment-48910569>, <https://www.sciencenews.org/article/solar-powered-device-produces-energy-cleans-water>

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

## SURFER-FILMMAKER DOCUMENTS INDONESIA PLASTIC INITIATIVE

EDITOR'S NOTE: This is most definitely not just another surf video. It includes meeting extraordinary, activist children trying "to create a world we would want to live in".



Photo credit: roammedia.com

Four women, Anna Ehrgott, Lisa Shelden, Nicole Gormley and Meg Haywood Sullivan, have documented a recent surfing journey across Indonesia. 8,617 miles away from home, the surfers spent three weeks surfing from Bali to Java. One particular wave location, which according to filmmaker Nicole Gormley was "so special I can't even tell you the name", took the women on a plane trip, ferry ride and 20-hour drive to get to.

During their surfing adventures, they documented local environmental initiatives, linking up with various non-profits that were tackling plastic pollution in Indonesia. Behind China, Indonesia is the second largest plastic polluter in the world. In fact, plastic pollution has gotten so bad that Bali officials declared a "garbage emergency" on the island. One of the leading NGOs addressing plastic pollution in Indonesia was started by two sisters, Melati and Isabel Wisjen, at ages 10 and 12. Melati and Isabel were inspired to start their organization after learning about leaders including Nelson Mandela and Ghandi in school and began to think about how they as youth could make a difference in their community. Their organization Bye Bye Plastic Bags encourages youth all over the globe to take action through educating others on the detrimental effects of plastic waste and developing solutions to eliminate plastic pollution.

The surfers had the opportunity to volunteer with the organization and discuss ways that everyone can become a part of the solution. Melati acknowledges that the plastic pollution problem can feel overwhelming, but she is also hopeful. "People need to realize their power as a consumer is massive," she states in the film. Everyone has the ability to be a part of the solution by saying no to one plastic, one bag, bottle or straw at a time. "We want to create a world we would want to live in".

Further information:

<https://roammedia.com/roam-presents-indo-dream-drift/>, <http://www.byebyeplasticbags.org/>

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

## EDIBLE "PLASTIC" WRAP

Three chemistry PhD students have been recognized internationally for an invention that has the potential to be a major step towards more sustainable farming. William Joyce, Nick Aristidou, and Stelios Chatzmicahail from Imperial College in London have created an edible bioplastic as an environmentally friendly alternative to bale wrap. Worldwide, approximately 8 billion bales of livestock feed are used on farms, and according to Joyce, enough plastic waste is produced annually to wrap around the world over 20 times. Furthermore, a study at Montana State University found bits of plastic wrap built up in stomachs of cattle, which can have fatal consequences for the animal.

The researchers studied the enzymes inside livestock in order to develop an edible biopolymer. Furthermore, they have added nutrients to the edible bale wrapping that can enhance cattle digestion and as a result lower methane emission. This edible bale wrap has been designed to withstand sufficient periods outdoors without letting water in. In addition to its environmental benefits, the researchers estimate that it "could save a farmer with a 100-cow herd 1,080 hours typically spent unwrapping the bales. They predict that the product will be ready to be put on the market in the next several years, and that if it reaches large-scale production could be sold at a cost similar to plastic wrapping.

Further information:

[https://www.fwi.co.uk/livestock/livestock-feed-nutrition/edible-bale-wrap-developed-reduce-livestock-farm-waste?fbclid=IwAR2m8Ph7EV0A5vp3953pV4sQojdgrOLssyaKj4f6X8jfKiH\\_AsSiTr2Voj0](https://www.fwi.co.uk/livestock/livestock-feed-nutrition/edible-bale-wrap-developed-reduce-livestock-farm-waste?fbclid=IwAR2m8Ph7EV0A5vp3953pV4sQojdgrOLssyaKj4f6X8jfKiH_AsSiTr2Voj0), [https://www.agupdate.com/tristateneighbor/news/livestock/net-wrap-has-advantages-but-is-not-good-for-the/article\\_3441645e-26f8-11e8-bffd-53c2252467d4.html](https://www.agupdate.com/tristateneighbor/news/livestock/net-wrap-has-advantages-but-is-not-good-for-the/article_3441645e-26f8-11e8-bffd-53c2252467d4.html), <https://www.rnz.co.nz/national/programmes/thiswayup/audio/201805013/edible-hay-bale-wrapping>

Thank you to **OCEAN** Researcher Isabella Backman



Photo credit: Farmer's Weekly

# INNOVATIVE STRATEGY MAY REDUCE WHALE ENTANGLEMENT

By Gordon Peabody, [OCEAN](#) Editor

New ideas can be like morning coffee, briefly appreciated and then gone. One problem begging for a new idea, caught our attention this year: “Due to potential Whale entanglement (endangered North Atlantic Right Whale), Lobstering may be restricted in Cape Cod Bay”. Everyone in Massachusetts is legally a stakeholder in our Natural Resources. Because our Coastal Communities are linked together, any degree of restrictions or closure, may have wide ranging financial and social reverberations. Prohibition of any activity should be the last resort, after every alternative has been exhausted.

While high tech alternatives are being explored, perhaps a low tech alternative has gone unnoticed: Safe Harbor has spent the past year self-funding an experiment with lobster buoy counterweights, created from seaweed (Irish Moss) gelatin and sand, which would hold the buoy on the bottom, gradually dissolving in sea water, on a known time scale. Here are a few images from small scale models we used for experimentation. Various densities of gelatin-sand mixes, in Styrofoam cups, which were placed in saltwater and monitored.



Photo credit: Gordon Peabody

Pictured above: Styrofoam cups with tracking numbers, will float when mix dissolves.

When counterweight model durations approached four days, we met with a lifelong Lobsterman, who was also a good friend. “It’s a terrible idea and no one would use it”. “Everyone would be setting lines of traps over each other”. Taken aback at first, we also understood that a collaborative approach would be important to move forward. We would need to consider subset alternatives such as light weight marker buoys on light weight, breakaway lines and perhaps new gear setting guidelines (north-south or east-west), which, according to a retired Boston area Lobsterman, were already in place during his time on the water. Safe Harbor is limited in our ability to expand our experiment and we are making our “*seaweed-sand-counterweight system*” public domain and encourage others to share the idea.



Photo credit: Gordon Peabody

Pictured above: Safe Harbor Intern Ferran, mixing various densities of gelatin and sand.



Photo credit: Gordon Peabody

Pictured above: Low tech materials: sand; gelatin; water and mixing container.



Photo credit: Gordon Peabody

Pictured above: Safe Harbor Intern Ferran, with containers which will go into sea water.

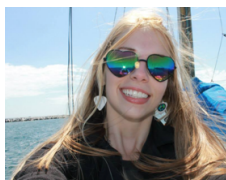
**OCEAN** supports restoration of our Coastal Resources, including the Herring River in Truro and Wellfleet. For 100 years this once proud, Herring river, estuary system, has been forced to breathe through a straw (see image below). We think improvement is overdue.

Get an update from <http://www.friendsofherringriver.org/>

Or check out this [great video](#) to learn more.

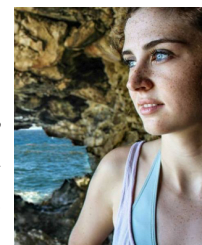


**STAY TUNED FOR OCEAN 50!**



Thank you to Samantha Thywissen, for continuing for her work as *Associate Editor* all the way from San Francisco to make **OCEAN 49** a publication we are all proud of.

To Jessica Hillman,  
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