

JOURNEY ACROSS THE NORTH ATLANTIC GYRE

FINAL REPORT
June 2 –23, 2015



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THE SEA CHANGE EXPEDITION SUMMARY

The 2015 SEA Change Expedition traveled over 3000 nautical throughout the North Atlantic Gyre with a crew made up of 64 scientists, activists, musicians, students, educators, artists, policymakers and product designers, resulting in the collection of 38 ocean surface samples, all plastic positive, with the highest concentrations found in the Hudson River, adjacent to Manhattan. Along with the Schooner Mystic crew of 14 sailors, multiple partners (NGOs, companies and research entities), eleven students from four universities and several high schools, and many professional watermen and women, including Musician, Waterman and Activist Jack Johnson and Ocean Enthusiast Celine Cousteau joined the Expedition to carry out the research and communicate the solutions to the issue of plastic pollution.

SEA Change Expedition Highlights

- The SEA Change Expedition traversed 3000 nautical miles, collecting 38 surface samples, all plastic positive, carried out 17 visual surveys, and conducted research on three beaches in The Bahamas and Bermuda
- All crewmembers participated in science and solution discussions during the SEA Change Expedition, adding 58 more ocean Ambassadors to the 5 Gyres network
- Highest concentrations of plastic pollution found in samples taken from Hudson River in NY
- Expedition crew participated in the 5 Gyres All Islands Youth Summit in The Bahamas, reaching over 150 local and international students and teachers
- 11 university, high school and elementary participated in the SEA Change Expedition
- 5 Gyres launched a crew search contest for a seat on the Expedition that resulted in over 800 qualified candidates

Pictures from the SEA Change Expedition can be found here:

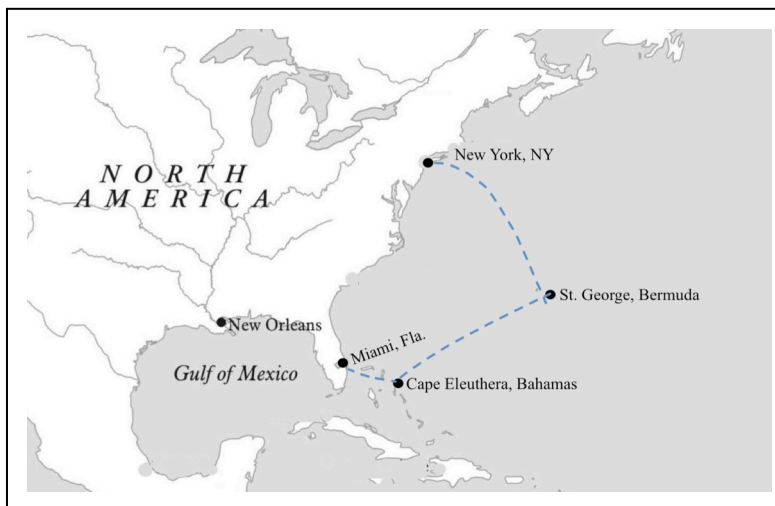
Top Photos	https://app.box.com/files/0/f/4018856483/Photos_(Share_with_Crew)
Photo Submitted by Crew	https://app.box.com/files/0/f/3678041851/Post-expedition_images
Sponsor Photos	https://app.box.com/files/0/f/3791837330/Partner_Product_Photos

Articles that highlight the SEA Change Expedition:

http://www.rodalorganiclife.com/wellbeing/jack-johnson-sailing-search-plastic-smog
http://www.iancheney.com/observatory/2015/sargasso
http://www.huffingtonpost.com/lisa-kaas-boyle/jack-johnson-takes-out-th_b_7554806.html
http://upstreampolicy.org/trawling-for-plastic-sketches-from-the-bermuda-triangle/
http://ecowatch.com/2015/08/17/microplastics-are-everywhere/
http://www.treehugger.com/ocean-conservation/ocean-plastic-smog-not-island.html

THE SEA CHANGE EXPEDITION ROUTE AND VESSEL

The 2015 SEA Change Expedition was made up of three legs, from Miami to New York, with a wide circle through the North Atlantic Gyre to Eluthera Island in The Bahamas and Bermuda, with over 3000 nautical miles of sailing with an eclectic crew of scientists, activists, students, educators, artists, policymakers and product designers, with one goal in mind, “How do we solve the problem of plastic pollution in our oceans?”



We sailed aboard the [Schooner Mystic](#), a 167-foot-long 3-masted schooner captained by William Widman and his crew of 14 sailors, including one engineer. They sailed the vessel while guest crew on each leg conducted research to sample the sea surface for microplastics. Each day, three crew lectures were given, often leading to hours of discussion about solutions.



EXPEDITION PARTICIPANTS

5 GYRES SEA CHANGE EXPEDITION 2015 FINAL CREW		
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EXPEDITION RESEARCH OBJECTIVES AND METHODS

1. Manta and Hi-speed (AVANI) trawling

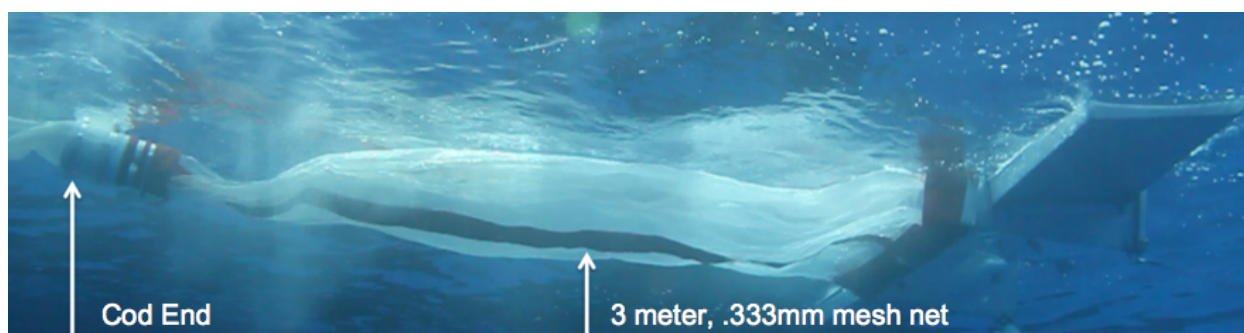
Two pieces of equipment were used to sample the sea in different ways, both capturing a sample of plastic pollution from the sea surface at high and low speeds. By using both trawls one after the other, we are able to have a continuous sample of the sea surface for the entire voyage. We collected 38 trawl samples.

Surface samples were collected using a Manta Trawl with a 0.6 x 0.15 m² rectangular opening manta trawl with a 3-meter long, 333-micron net and a 30 x 10 cm² collecting bag.



The AVANI trawl has a 10-cm wide net opening and is 0.5-m tall and is designed to capture surface plastics from the ocean's surface while under full sail, sailing at speeds up to 8 knots.

Samples from both nets are preserved in isopropyl alcohol and sent to a lab to count and weigh particles in 3 size classes (.33-1mm, 1-5mm, >5mm). The data will be used to describe the distribution of microplastics across the North Atlantic gyres.



2. Visual observations

Since larger debris is not measured effectively by our trawls, crew carried out 17 visual observations on deck for a concentrated 60 minutes at a time. This creates a 4th size range of macroplastic data to go with our microplastic data.

	Sheeting and Tarps	Plastic Bags	Bottles (Beverage)	Bucket	Styrofoam	Other plastic items	Glass bottle	Glass light bulbs and fluorescent tubes	Other (Describe)	Buoys/Floats	Misc. Line	Misc. Nets	Other Fishing Gear	Plastic Fragment
SIZE														
DISTANCE														
BUOYANCY														
COLOR														

3. Beach Surveys

In the Bahamas and Bermuda we conducted beach surveys to determine particle counts per square meter on three selected beaches. The intention is to compare this data from year to year to establish trends, but also plug this data into our iGyre coastal model (in development).

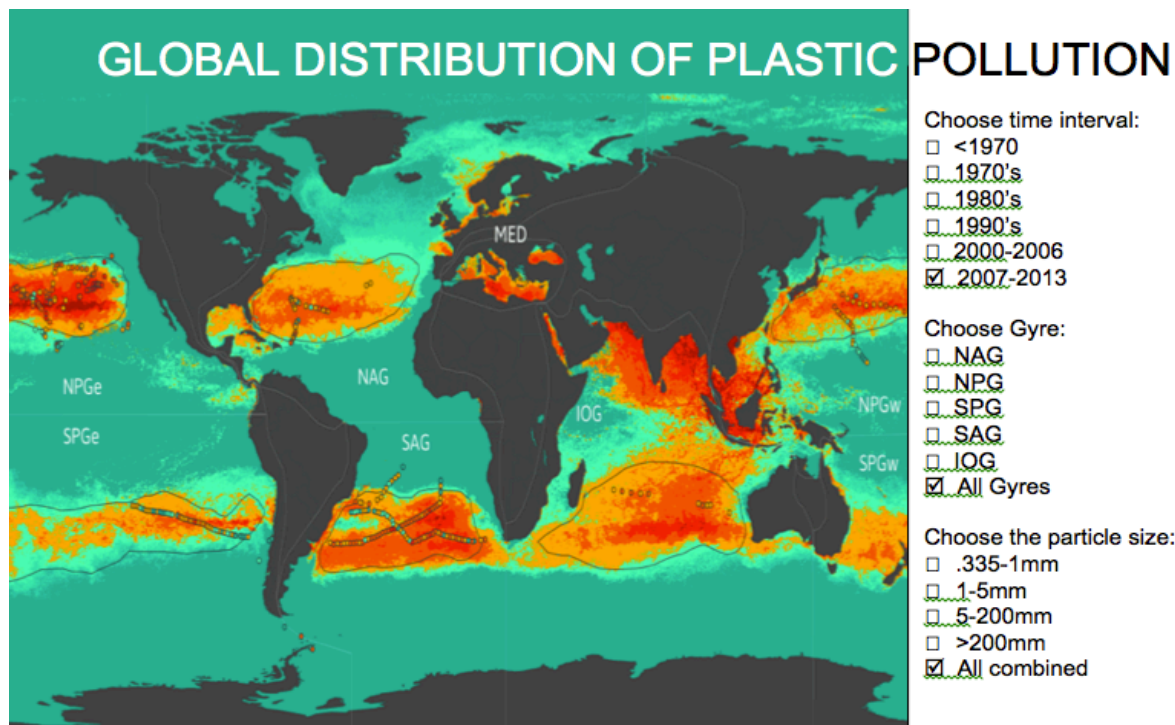


Carolyn Box with students Bermuda

4. iGyre: Plastic Ocean

We will use all available data to recalibrate our global ocean model that estimates the global concentration of plastic pollution in our oceans. Our first iGyre global estimate was published in December 2014 (see link below), estimating that there is over 269,000 tons (5.25 trillion pieces) of plastic pollution floating on the surfaces of our oceans. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111913>

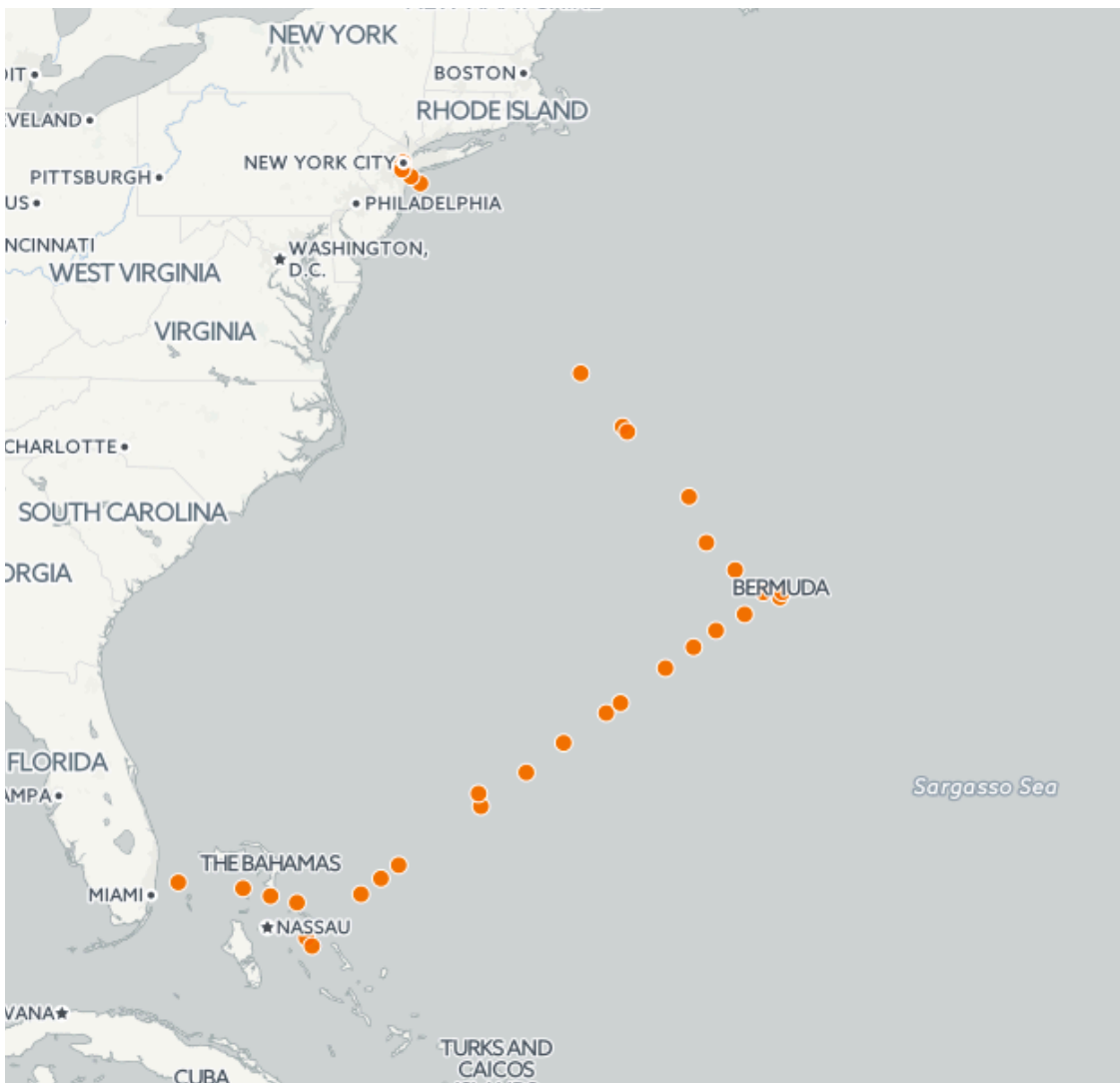
Data collected now on our North Atlantic 2015 expedition will be combined with our 2014 Iceland Expedition and all other recently published data on particle densities worldwide to determine a new estimate of the total weight and particle count of plastic pollution worldwide.



Global Map update scheduled for Dec. 2015

PRELIMINARY RESULTS

During the expedition we collected 38 samples from the Manta and AVANI trawls. The highest trawl densities were found in Trawl 17 (256,518 particles/km²), Trawl 23 (142,135 particles/km²), both near Bermuda, and Trawl 37 (174,416 particles/km²), near the Hudson River mouth in New York, with no other trawl breaking 100K particles per km². These numbers only reflect particles greater than 1mm, and will surely grow when we include the size fraction between 0.33-1mm.



One of the largest samples (Trawl 37) was collected at the mouth of the Hudson River, closer to the New Jersey side of the river. Evidence of sediment attached to the plastic objects and the nature of the objects themselves, supports the idea that this sample is

from Combined Sewage Overflow (CSO), whereby street runoff after heavy rain and semi or untreated sewage is discharged together.



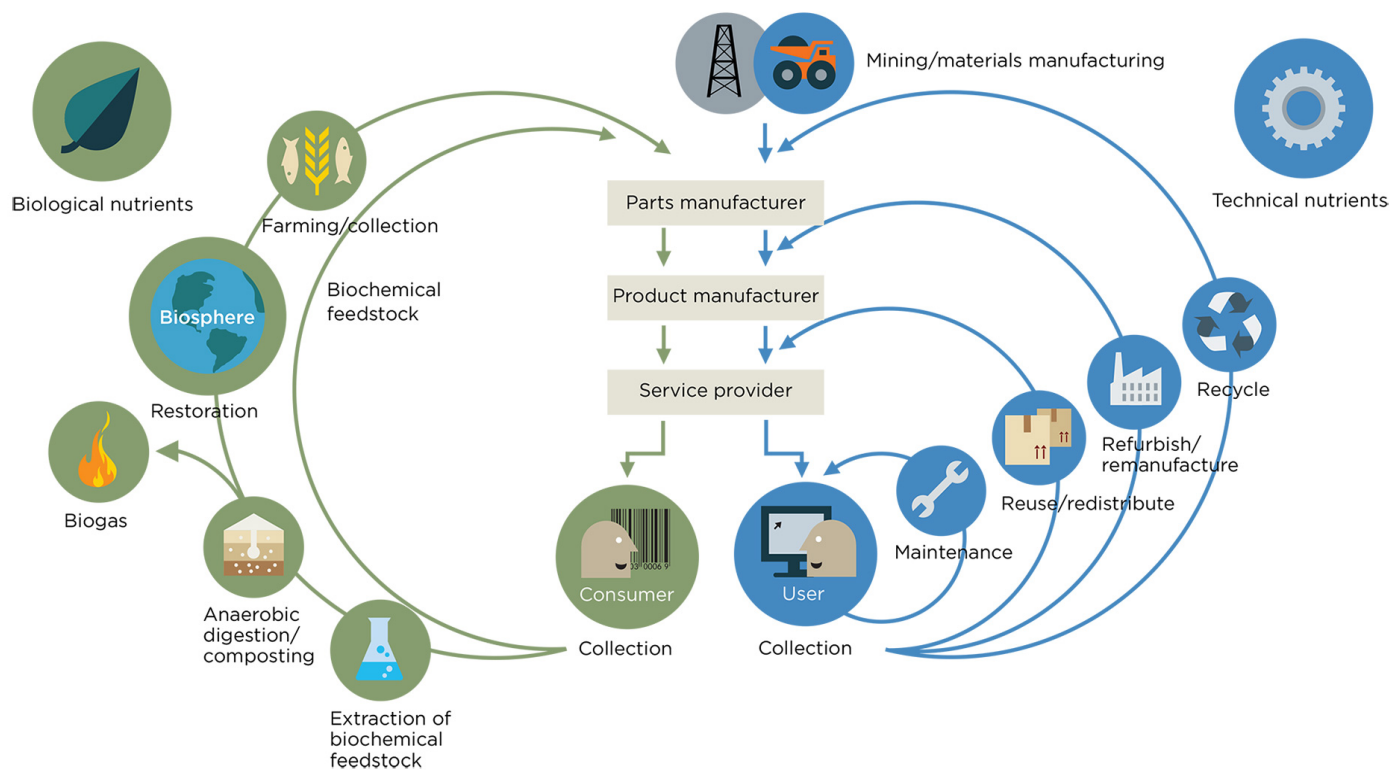
This sample like others collected near shore to dense urban populations, shows how cities behave at metaphorical horizontal smokestacks that feed the Plastic Smog of our oceans.

SOLUTIONS

The Sea Change Expedition focused on how to solve the growing problem of plastic marine pollution by inviting thought leaders from industry, science and society to share their successes.

Our overall goal is to get away from the linear economy that moves materials from extraction to the eventual landfill, incinerator or the environment. These means of managing waste are leaks in the system, and result in environmental pollution. We want a circular economy, and that takes innovation.

In an ideal world of a circular economy all materials extracted and consumed are returned to the biosphere or manufacturer, leaving nothing to persist outside these natural and manmade cycles. All solutions exist somewhere in this system.



When we talk about solutions we divide them into three categories: Consumer Awareness, Producer Responsibility and Waste Management. On the Expedition we heard from crew engaged in each of these categories, and the good news is that all solutions presented aboard the Mystic fit the circular economic model.



Consumer Awareness. Of the crew there were pioneers in sustainable lifestyles and messaging about plastic marine pollution, from Lauren Singer, founder of Trash is for Tossers, to Kimi Werner, spear fisherwoman and Patagonia Ambassador who advocates traditional ways of living within one's means. Every crewmember brought to the Expedition their own expertise.



Producer Responsibility. To reverse the "Throw Away" society embraced in the 1950's you simply have to invest in things you don't throw away. On the expedition were products designed to last, like Klean Kanteen and Chico Bags. These were complimented with the other side of corporate responsibility, "Benign by Design". Companies like LUSH and Acure, are working hard to change the chemical aftermath of their product use. Others, like Fish People and Marley Coffee, have adopted Corporate Social Responsibility (CSR) policies that challenge their competitors to do the same.



Waste Management. Returning sorted waste to the manufacturer, is the work of MBA Polymers and Packaging 2.0. They create a circular economy around plastics by through recovery and/or remanufacture. Also Bureo Skateboards, transforming old nylon fishing nets into new boards, thus saving plastic from the eventual dump, incinerator or the sea.

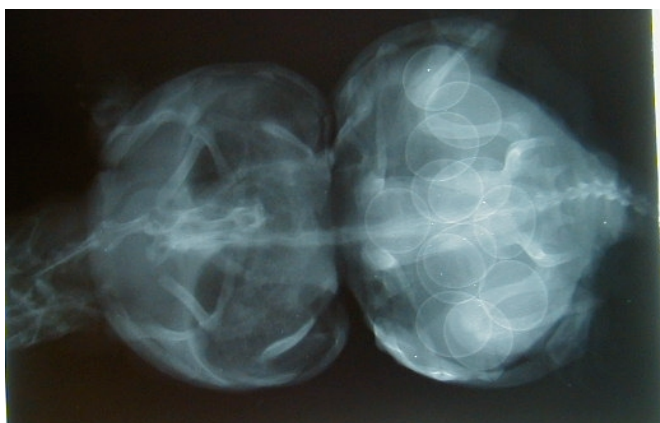
These are but a few examples of the innovations that will upend the linear economic model.



CONCLUSION

Schooner Mystic safely carried 64 crewmembers in three expedition legs over 3,000 nautical miles from Miami to NYC, via the Bahamas and Bermuda. Our research goals were met, including testing new protocols to analyze samples while at sea by “Citizen Scientists”. Crewmembers walked away with tools they can use to become Ambassadors for the plastic pollution issue. We are encouraging crewmembers to participate in our Ambassador Programs (<http://gyrexperts.ning.com/>), where Expedition Crew, partners, and key volunteers become part of a network of experts and activists working in communities around the world to combat the global health crisis of plastic pollution.

The long drive from New York to Los Angeles involved a brief detour to New Orleans to pick up non-human celebrity. In the early 1990’s a snapping turtle appeared on the doorstep of the New Orleans Audubon Zoo with a plastic ring from the neck of a milk jug bound around its waist. The turtle, weighing over 3 pounds, was the size of a football. The constriction prevented her skeleton from developing normally, resulting in an hour-glass shape of the carapace, earning her the moniker “Mae West”. The presence of eggs confirms her gender.



With the plastic ring removed, she happily lived on a farm in Louisiana for 20 yrs until the property was sold this summer, leaving Mae West without a home. The 5 Gyres Institute picked up Mae West and drove her to California, where she now sits in quarantine at the Star Eco Station in Culver City, where she will soon be on public display.

It’s a fine conclusion to a successful expedition.