

# If You Eat Seafood, You're Probably Eating Plastic

BY MARK FRIEDMAN

Researchers announced this past January that regular seafood eaters could be ingesting up to 11,000 microplastic particles per year. Although 99% of the particles pass through the body, at least one percent or about 60 particles, are absorbed into the body and do accumulate over time. In the ocean, plastic acts like a sponge picking up toxins and chemicals. Annually, about 8.8 million tons of plastic are dumped into the ocean, and about 9 million tons of plastic make its way into the world's oceans. These plastics come from a diverse range of sources, including clothing made from synthetic materials. When these types of clothes are washed, they shed thousands of tiny plastic microfibers. These microplastics are then ingested by marine organisms which we, in turn, eat. In addition, the sun's ultraviolet rays break down the plastic polymers into chemicals that disrupt human hormonal systems, especially those of adolescents and pregnant women.

Increasing evidence shows the negative impact of these plastics on marine organisms and humans. One such chemical component of plastics, described by Physicians for Social Responsibility, is Bisphenol-A (BPA). BPA is used in polycarbonate (i.e. hard) plastic products like water bottles, medical equipment, toys, consumer electronics, household appliances, and automobiles. Epoxy resins containing BPA are used as liners for many food and beverage cans and, surprisingly, in the very-common thermal cash register receipts.

We are pleased to report that a new collaborative effort between the National Association of Biology Teachers (NABT) biology club high school students in Los Angeles, California, Wakasa High School marine science students in Japan, and other student and environmental groups in Cambodia, Singapore, Chile, in addition to students in several other US states, are working together to form an international partnership to research the impacts of plastics. This school-to-school collaboration with Japan began in January of 2017 and already has students in each country selecting particular waterways, including harbors, oceans, and beaches to investigate types and the quantity of microplastics at these locations.



Plastic found along the tideline in Long Beach, California in the spring of 2017. Courtesy of Mark Friedman

Japanese marine biology teacher, Yasuyuki Kosaka initiated this collaboration with the Animo High School Marine Biology Club in Los Angeles, California. In advancing this international collaboration, Kosaka presented the students' research data from Wakasa High School at several workshops at the 2017 National Science Teachers Association (NSTA) convention in Los Angeles. He shared that the Japanese students found microplastic particles in the stomachs of oysters found in the Sea of Japan—a source of seafood (aquaculture and shell-fishing) for the city of Kyoto.

The NABT Los Angeles Microplastics Team from Animo High School had also collected water and sand samples from local sources such as Alamitos Bay, San Pedro harbor, and beaches at Dockweiler, Cabrillo, and Redondo and found tens of thousands of plastic nodules, macro and micro plastic debris, and substantial amounts of microplastics and filaments.

With instruction and collaboration with Linda Chilton (USC Sea Grant and NMEA board member), the Animo High School students developed standardized protocols. They took random quadrat samplings (with GPS coordinates) to a depth of 2 cm. Sand along with other biotic and abiotic matter was placed in buckets of water, the floating plastic was siphoned off and passed thru filter paper, and then counted.

For analyzing plastic in harbors and waterways, the Animo students used Algalita and 5Gyres protocols, focusing on plankton net tow for specific time and GPS coordinates, collection of biotic and abiotic matter from the cod-end that was poured thru filter paper and counted. This data was shared with other organizations and posted on a student developed website, featuring this club's and other high schools' research and action projects, articles, PowerPoints and videos, and plastic removal innovations.

The Microplastics Team captain Diana Cervantes from Animo High School shared that she had gained valuable experiences from the collaboration saying, "I have learned to be a better communicator and team player. Thanks to this overseas

collaboration I've also learned how to communicate with different people, and how to properly get my messages across."

Another member of the Microplastics Team, Jessica Gonzalez had a similar experience. "We realized that there is little awareness in our community on plastic pollution," Gonzales said. "We collected samples of microplastics at nearby beaches to show that microplastic pollution is a problem that directly affects marine organisms and humans. That initial passion to create awareness allowed us to present our research at science fairs to spark individuals from our community to make changes in their lives that will end the growth of microplastic pollution."



The Los Angeles-based Microplastics Team on Dockweiler beach, one of their beach sand research sites. Courtesy of Mark Friedman

Mikinori Matsui from Japan's Wakasa High School says, "Through study of microplastics, I learned not only the seriousness of plastic pollution but also the importance of cooperation. We must collaborate with people in other countries to solve this global problem. Now we collaborate with Los Angeles students. Our research has become very exciting. We want to continue to find solutions to this problem with them."

The high school students from Los Angeles were participants in the Algalita International POPS Youth Summit. Two Latina high school students from Los Angeles will be travelling to Chile in May, invited by NMEA member Carla Christie from the Universidad Austral de Chile, to present their findings and organize future collaboration with teachers and students.

All the NABT biology club high school members perform bi-lingual community outreach in Los Angeles. These take place at local aquaria (e.g. Cabrillo Marine Aquarium), parent meetings, health fairs, Earth Day, and other related events. One Saturday each month, the team leads LA Maritime Institute's tall ship passengers on a hands-on research and data collection expedition in San Pedro's harbor called, Explore the Coast/Explora la Costa, thanks to a grant from the California Coastal Commission. (The Commission supports environmental education programs that are often-overlooked in the Spanish speaking community.) The team teaches and shares the concerns about microplastics while passengers dissect Albatross boluses, separate plastic particulates from local sand samples, and discuss the human impacts and solutions during the expedition.

The high school students involved in the program around the world continue to share their research at local, regional, and international science fairs, while hoping to spread solutions to the microplastics problem as far as possible. For more information about collaborating on microplastic research and education at your local high school and access to the website and resources, see the author's biography.

### Microplastics Team Solutions to Microplastics

The team offers these solutions during presentations:

- Reduce food packaging
- Recycle existing plastic
- Adopt paper, bamboo, and cornstarch as a biodegradable substitute for plastic
- Make corporations pay for the clean-up costs of their businesses
- Advocate for more stringent environmental regulations while encouraging innovation and job creation

**MARK FRIEDMAN** is mentor to the Microplastics Team. Teachers and student environmental clubs interested in collaborating on Microplastic research and educational action campaigns can contact him at: [Marklewisfriedman@gmail.com](mailto:Marklewisfriedman@gmail.com)

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