UF IFAS Extension UNIVERSITY of FLORIDA

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SOLUTIONS

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aqua-notes

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Sea Grant Florida

March 2016

Mark your calendars…

- March 4—April 15—Coastal Master Naturalist class, Volusia County. See www.masternaturalist.org for more information or to register.
- March 29—May 3—Coastal Master Naturalist class, Duval County. See www.masternaturalist.org for more information or to register.
- More on back page!

Florida Microplastic Awareness Project

The Florida Microplastic Awareness Project is really taking off. Thanks to all the regional coordinators and volunteers who are contributing their time and effort for training, collecting samples, analyzing water samples for microplastics and educating people about ways to reduce their contribution to the global plastic problem. The project has been underway for six months now, and we are getting some interesting data. You will see some of the data to date in this newsletter, and can check out the Google Map through the project website (www.plasticaware.org) at any time to see updates.

Florida Microplastic AWARENESS PROJECT

Marine Debris Program NOAA www.MarineDebris.noaa.gov Keep the sea free of debris!

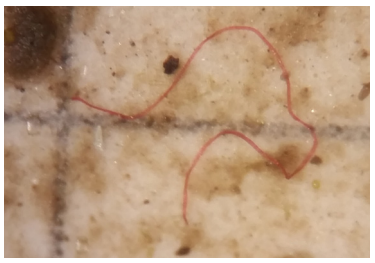
M. P. McGuire

Maia McGuire, PhD
Marine Extension Agent

Florida microplastics data

Volunteers with the Florida Microplastic Awareness Project are collecting one-liter water samples in coastal areas and analyzing them for the presence of microplastics (plastics less than 5 mm in size). As of the end of February, 2016, here is a summary of the data:

- # of samples analyzed=233
- # of locations sampled=146
- % of samples containing plastic=90
- Average # of pieces of plastic per liter=6.5
- % of plastics as fibers=85
- % of plastics as fragments=8
- % of plastics as microbeads=6
- % of plastics as films=1



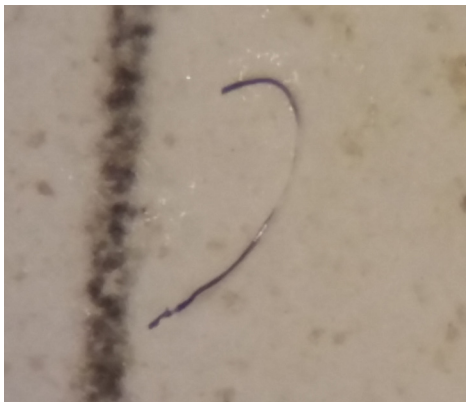
Red plastic fiber photographed through a microscope

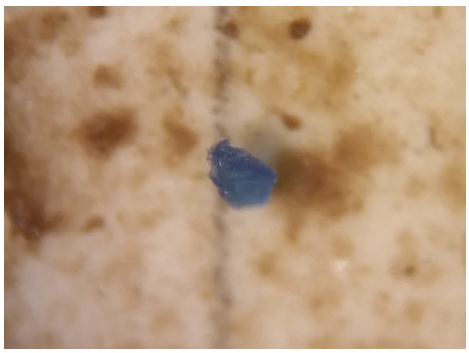
Where do microplastics come from?

When I first wrote the proposal seeking funding from NOAA's Marine Debris Program for the Florida Microplastic Awareness Project (in December 2014), I was hoping to that the project would let me learn more about the types of microplastics in Florida's coastal waters. I was anticipating finding significant numbers of plastic microbeads, which are found in many personal care products and which enter the ocean in effluent from wastewater treatment plants. While these microbeads do comprise a portion of the plastics that we are finding, by far the greatest type of plastic is in the form of microscopic fibers. While I do not have the equipment needed to analyze the type of plastic, studies in other places have found that fibers are primarily polyester or acrylic. These types of fibers are common in wastewater treatment plant effluent.

When we bathe or do laundry, we can introduce microbeads and plastic fibers into the wastewater stream. At the end of 2015, President Obama signed the Microbead-Free Waters Act, which prohibits the manufacture and sale of "rinse-off cosmetics" containing microbeads that are "intended to be used to exfoliate or cleanse the human body." The bill does explicitly include toothpastes, but seems to not include deodorants, makeup or lotions. The ban on the manufacture takes effect in January, 2017 and the ban on sales starts January 2018. While this is a good first step in addressing microplastics in the aquatic environment, there is still much more that needs to be done, and each of us can play a part.

Microscopic fibers are shed from fabrics each time that they are washed. Synthetic fabrics (polyester, acrylic, nylon, polypropylene, "microfiber," etc.) are made from petroleum-based plastic. While natural fibers like cotton and rayon will biodegrade in the environment, synthetic fibers do not. Wastewater treatment processes are not designed to remove these tiny, very buoyant fibers. As a result, the fibers (and microbeads) can end up being discharged into natural water bodies as part of the wastewater effluent.





Blue plastic fiber (top) and fragment (bottom) on filters, viewed under a microscope. The grey lines are grid marks on the filters.

Another type of microplastic includes all of the small pieces of plastic that result from the disintegration of larger plastic items. Petroleum-based plastic never biodegrades. Instead, it becomes weathered and, over time, breaks apart into smaller and smaller pieces. These plastic fragments can be found in our coastal waters along with the fibers and microbeads.

So what can we do? There are many simple choices that we can make to reduce our use (and therefore disposal) of plastic. Many people are already choosing to use reusable shopping bags and beverage containers (hot and cold). If you eat at a restaurant, consider asking the server not to give you a straw. You can also take your own, washable, container to the restaurant to use as a "to go" box. When shopping for clothing or linens, check the fabric label and look for natural fibers rather than synthetic fabrics (these include nylon, polyester, acrylic, microfiber and polypropylene).

What do we know about microplastics in the ocean?

Manta trawl. Photo from 5gyres.org.

Many researchers have conducted studies to try and estimate the amount of plastic in the ocean. The most common method used for studying microplastics is to tow a net called a manta trawl. The mesh of this net is about 1/3 of a millimeter in size (about 1/100 of an inch). Water passes through the net, and objects that cannot pass through the holes collect in a container at the end of the net. When the net is removed from the water, the contents of the container can be examined and sorted to separate plastic from plankton. One very comprehensive study estimated that there are 4.85 trillion (4,850,000,000,000) pieces of plastic smaller than 5mm in size at the sea surface globally. (Erikson et al., doi:10.1371/journal.pone.0111913)

There is very little published research about the effects of microplastics on marine (or freshwater, or terrestrial) organisms. We know from both laboratory studies and examination of stomach contents of wild-collected animals that many marine filter-feeders are able to eat microplastics, and that they are doing so in the environment. While much of the plastic may ultimately be excreted, plastic fibers may become somewhat caught in the lining of digestive tracts.

In one study, Pacific oysters were fed on either algae alone, or algae plus plastic microbeads for a two-month period. The oysters whose diet included plastics had significant decreases in egg production and sperm mobility compared to the control animals. Additionally, larval yield and survival were lower in the oysters which had eaten plastic, compared to controls. The authors theorize that the oysters put energy into clearing the plastics ("elevated maintenance"), reducing the energy available for reproduction.

Other studies have examined the accumulation of toxins on the surface of floating plastics, as well as the leaching of those toxins into the tissues of animals that eat the plastics. In addition to the toxins found as persistent organic pollutants in ocean water, the plastics themselves contain potentially toxic compounds (used in their manufacture). These toxins have been measured in both water samples and in the tissues of animals that have eaten plastics.

So what does all this mean? Unfortunately, we need many more studies before we can draw any conclusions. For now, we should try and reduce the amount of plastic that is entering the ocean (and freshwater). While it is tempting to want to remove existing plastics from the ocean, this is something that is not really a feasible goal. The ocean has a surface area of about 140 million square miles. Plastics have been found at depths of up to 300 feet in the water column, and in sediments as much as two miles below the ocean's surface. Many of the plastics are microscopic and cannot be filtered out of the water without also filtering out all of the plankton.

Small plastic pieces found in beach sand (average of 8 pieces per square foot). Only plastics visible with the naked eye were recorded. Ruler is showing centimeters.

We're now on Facebook—check out facebook.com/NEFLSeaGrant and "like" it to keep informed about coastal topics in the region. Don't have a Facebook account? That's OK—you can view the page without one :)

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More "Mark your calendars"

- March 19-20—Florida SpringsFest (Silver Springs State Park, Ocala). Event is from 10 am to 4 pm each day. We will be looking for microplastics in spring water on the morning of Sunday, March 20. https://www.facebook.com/floridaspringsfest
- April 15—St Augustine Beach Arbor Day (5-7 pm). St Augustine Beach City Hall. http://augustine.com/event/arbor-day-st-augustine-beach
- April 23—Bartram Bash, Alpine Groves Park, St Augustine, 9 am—4 pm.
- April 23—Earth Day events at Washington Oaks State Park and Jacksonville Landing
- May 20-22—Wild Amelia Festival (Amelia Island, FL). See http://www.wildamelia.com/Nature_Festival.html for more information.

Please check the calendar at http://calendar.ifas.ufl.edu for other environmental education programs around the state.