



MICROPLASTICS

Sampling and Processing Guidebook



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Microplastics are plastic pieces smaller than 5 millimeters, which is about the width of a pencil eraser. They come in different forms, including microbeads, microfilms, microfibers, and microfragments. Many microplastics start out as larger plastic products (plastic water bottles, beach toys, or large fishing nets) that get broken up over time. Some begin as intentionally small plastics for cosmetic purposes (beads in face exfoliants, toothpaste).

Microplastics have been found all over the ocean—from the surface water to deep-sea benthic zones (lowest level of the ocean). There are even reports of microplastics being found frozen in Arctic ice! These small plastic pieces are often mistaken as food and can be ingested by small organisms like plankton to larger organisms like whale sharks. Not only are plastics indigestible, but they may also be toxic to the animals that consume them.

Plastic is absorbent, like a sponge, so it absorbs hydrophobic chemicals from the water it floats in. There are all kinds of chemicals in seawater—from pesticides to steroids to BPA—that can be very harmful to humans and wildlife. Plastic can absorb these chemicals.

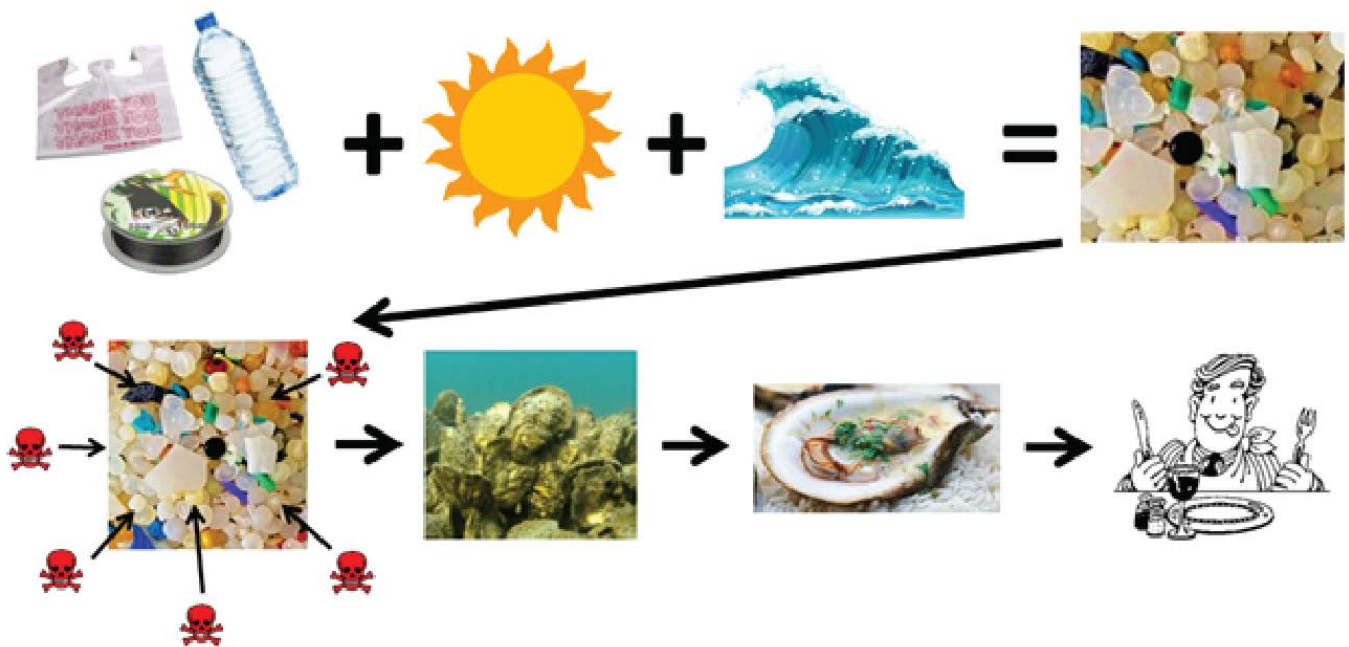


Figure 2. Conceptual flow diagram linking plastic pollution, microplastic creation, and bioaccumulation in oyster populations, which may be consumed by humans. Top series: Anthropogenic plastics are introduced to the waterways and break down into microplastics via photo-oxidation and physical forcing. Bottom series: Microplastics absorb toxins from the water column and can be removed from the water column via filter-feeders such as oysters. Harvested oysters may expose humans to microplastics and their associated toxins. (By Caitlin Wessel)

PRIMARY VERSUS SECONDARY MICROPLASTICS

There are two categories of microplastics: primary and secondary (see Figures 3 and 4). Within these categories, microplastics are usually separated into four types: microbeads, microfibers, films, and fragments.

Primary microplastics include plastic particles that are purposefully manufactured as small pellets, beads, and fragments. Many everyday cosmetic products, including face wash, toothpaste, exfoliants, deodorant, and make-up, contain plastic microbeads. Fortunately, in 2016, the United States passed a law banning the production of personal-care products and cosmetics that contain microbeads. This law took effect in July 2017 and, in July 2018, it will no longer be legal to sell these products in the United States.

Another common form of primary microplastics are “nurdles,” which are small plastic pellets that serve as raw material in the creation of plastic products. Throughout the transportation and handling process, they can get carelessly spilled into the environment. Due to their size, shape, color, and smell, nurdles are often mistaken as food by many different marine animals.

Secondary microplastics are the result of the breakdown of larger plastic pieces. The environment cannot naturally break down plastic materials. Chemical and physical processes like wave action, heat, UV radiation, and animal grazing cause plastics to break up into smaller and smaller pieces. For example, washing clothing causes synthetic fibers like nylon, polyester, and acrylic to shed microfibers that can eventually be flushed out to sea.



Figure 3. Nurdles, a form of primary microplastics, found on a beach in Mississippi. (Photo by Mandy Sartain)



Figure 4. Plastic fragments, a form of secondary microplastics, found on a beach in Mississippi. (Photo by Mandy Sartain)

EXAMPLES OF MICROPLASTICS

Identifying microplastics can be a little difficult. It is easy to confuse something organic (e.g., eggs, copepods, carapace, seeds) for a microplastic. Microplastics are usually brightly colored, frequently blue or reddish.

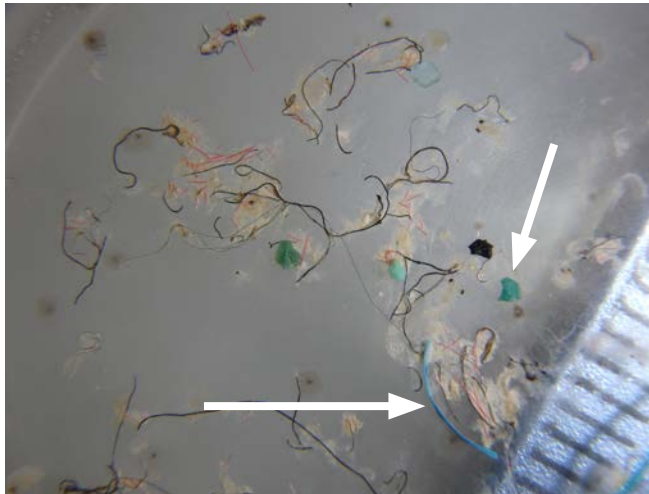


Figure 5. Microfiber and microfragment pieces viewed through a microscope. *(Photo by Caitlin Wessel)*



Figure 6. Microfragment. *(Photo by Mandy Sartain)*



Figure 7. Microfiber. *(Photo by Caitlin Wessel)*

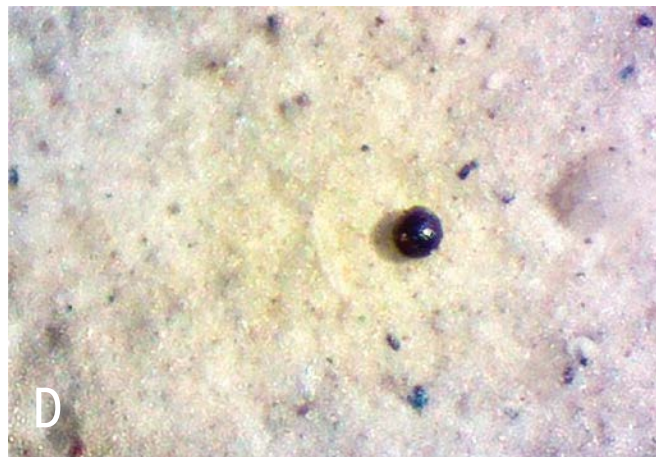
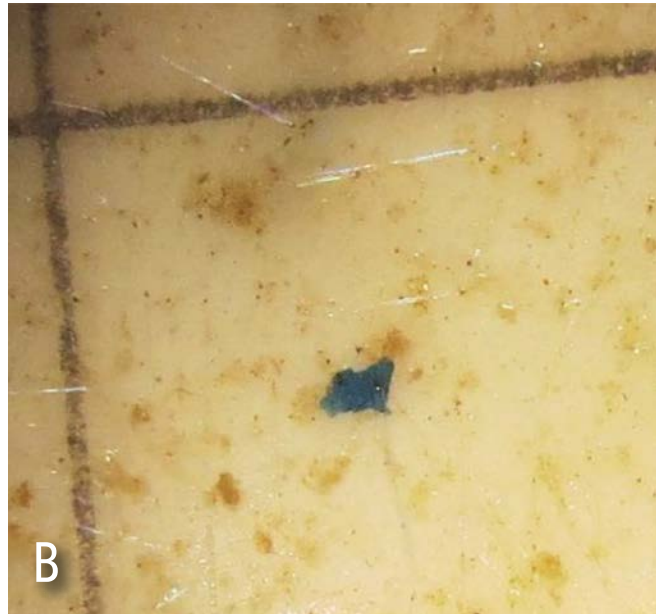
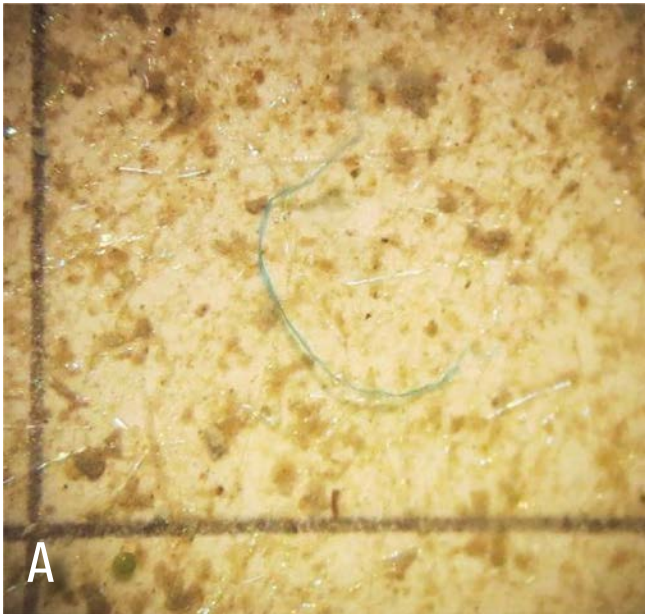


Figure 8. Examples of microplastics: A) microfiber, B) microfragment, C) microfilm, and D) microbead. (Pictures from Florida Microplastic Awareness Project Website)