

## Program on Water Quality Community Science for Middle School



### Microplastics: Plastic Tow Activity

#### Background:

Plankton are vital for all sealife, as they are an important start to the food chain. There are four types of plankton that reside in ocean waters: phytoplankton (plant), zooplankton (animal), bacterioplankton (bacteria), and virioplankton (virus) <sup>1</sup>. Due to their microscopic size, scientists utilize plankton nets to sample plankton from the ocean water. This device is a cone shaped device that skims through the ocean water as a boat moves, filtering out the plankton by capturing them on a silk screen.

Recently, this plankton tow device has begun to be used by scientists to sample microplastics in the water. By towing across measured distances and for a specific amount of time in water, scientists can quantify how much plastic is floating along the surface of the water. Already, the Sea Education Association (SEA), who has been studying the western North Atlantic for over 2 decades for microplastics, has discovered concentrations of microplastics across a routine 1,450 km transect <sup>4</sup>. This activity will conduct a short version of this type of study, with the objective to use a plankton net to sample microplastics within our local waters.

This activity will take place at the Duke Marine Lab (on one of the marine lab boats), and will utilize materials provided by the Community Science Initiative, .

Recommended preparation activity: Watch the short movie: "Smog of the Sea" <sup>2</sup>

#### Objectives:

##### Students will learn to:

- Use a plankton net to collect microplastic samples
- Observe and measure microplastic pieces per sample
- Collaborate as a class to assess and compare results
- Observe trends regarding amount of microplastic and location of tow

##### Materials:

- 2 Plankton nets (with attachment parts for boat)
- 4 Tweezers/small forceps
- Graph paper
- 2 fine mesh strainers/coffee filter
- 4 Wash bottles or 1 hose
- 2 Buckets
- 2 rulers (centimeters)

## Methods:

1. While boat is moving, place plankton net in water on side of boat, with rope attached. Ensure the net does not tow along the wake of the boat.
2. Keep net floating/skiming along surface of water as boat moves at ~2 knots.
3. Maintain this for ~20 minutes.
4. Safely lift and remove plankton net from the water, ensuring nothing held in the net is released.
5. Over a bucket with a strainer/coffee filter hovering above, turn the net inside out, allowing items in the net to fall into the strainer/coffee filter. Use wash bottles or a hose to assist in removing items from the net.
6. Sift through items caught in coffee filter/strainer, separating natural plants (i.e. sargassum) from man-made items (i.e. plastic, rope).
7. On graph paper, separate plastic items by size using tweezers.
8. Make note of the types of plastic and other man-made items collected, as well as the size variation in the data sheet provided.
9. Repeat Step 1-8.

## References

1. Center for Coastal Research. "Techniques" Available at: <http://coastalstudies.org/right-whale-research/techniques/>
2. Cheney, Ian. "Smog of the Sea" Available at: <https://www.thesmogofthesea.com/watch-film/>
3. Faure, F., Saini, C., Potter, G., Galgani, F., de Alencastro, L. F., & Hagmann, P. (2015). An evaluation of surface micro- and mesoplastic pollution in pelagic ecosystems of the western mediterranean sea. *Environmental Science and Pollution Research International*, 22(16), 12190-12197. Doi: <http://dx.doi.org.proxy.lib.duke.edu/10.1007/s11356-015-4453-3>
4. Kaiser, J. (2010). The Dirt on Ocean Garbage Patches. *Science*, 328(5985), 1506-1506. Retrieved from <http://www.jstor.org/stable/40656416>

## WORKSHEET 1: PREDICTIONS

What types of natural plants/materials do you think the plankton net will collect?

What types of man-made materials do you think the plankton net will collect?

How small of plastic pieces do you predict will be caught in the plankton net?

## WORKSHEET 2: ACTIVITY OBSERVATIONS

		Sample 1	Sample 2	Sample 3	Sample 4
<b>Distance Offshore (miles)</b>					
<b>Speed of boat (knots)</b>					
<b>Time of plankton tow (minutes)</b>					
<b>Number of materials collected</b>	Plastic <sup>3</sup>	Film: _____ Fragments: _____ Pellets: _____ Lines: _____ Foams: _____ Other: _____	Film: _____ Fragments: _____ Pellets: _____ Lines: _____ Foams: _____ Other: _____	Film: _____ Fragments: _____ Pellets: _____ Lines: _____ Foams: _____ Other: _____	Film: _____ Fragments: _____ Pellets: _____ Lines: _____ Foams: _____ Other: _____
	Natural				
<b>Size Plastic Piece (cm)</b>	Smallest				
	Largest				

