Program on Water Quality
Community Science for Middle School

Duke NICHOLAS SCHOOL OF THE ENVIRONMENT
DUKE UNIVERSITY MARINE LAB

DUML COMMUNITY SCIENCE

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Microplastics: Anemone Feeding Experiment

Background:

While microplastics are small and often invisible to the naked eye, their impact on marine ecosystems is tremendous. Microplastics can enter the ocean as small particles like microbeads in cosmetics and fibers from polyester clothing, or they can be formed through photodegradation of larger plastics like bottles, bags, straws, cigarette butts, and other types of plastic marine debris.[1] Hundreds of thousands of microfibers are released during just a single wash and are too small to be removed through wastewater treatment.[2] Aside from the plastic that has been burned for energy, every piece of plastic ever created is still on the earth.[3] It doesn't just disappear, and much of it has broken down into tiny microplastics in the ocean. In fact, scientists predict that there will be more plastic than fish in the ocean by 2050.[4]

Microplastics are often mistaken by marine life for food, just like sea turtles can mistake a plastic bag for a jellyfish. Even though we know we shouldn't eat plastic, many marine species don't realize what they're eating isn't food. Microplastics have shown to be ingested by organisms at the bottom of the food web, like plankton.[5] In addition to the toxins already within microplastics, they absorb harmful chemicals onto their surface due to their physical chemistry.[6] Once microplastics enter the food web, the plastic particles are passed from one species to another and their associated toxins biomagnify, becoming even more toxic than they were to begin with.[7].

Scientists are only beginning to understand the extent of the microplastics problem and what species are being affected. The objective of this experiment is to observe the behavior of the anemone *Aiptasia pallida* when offered several different types of plastic and to document how much of these particles are ingested by this animal.

Objectives:

Students will learn to:

- Identify different types of plastics that can become microplastic particles
- Use forceps to offer particles to the anemones
- Observe and understand their feeding behavior
- Collaborate as a class to assess and compare results for various particle types
- Calculate percentage of particles ingested for each particle type
- Construct a bar graph illustrating these percentages to visually depict the differences among particle types

Materials:

- Plastics: plastic water bottle pieces, plastic bag pieces, styrofoam (squished), plastic pellets, cleaned sand (control)
- Anemones (*Aiptasia pallida):* put 3-4 in separate glass containers (about 5-8 containers total)
- Forceps

Setup:

1. Assign groups
    a. There can be up to 8 groups (depending on class size). Each group will be assigned different types of plastics.

Methods:

1. Use forceps to gently place a single plastic particle into contact with an anemone tentacle for no more than 1-2 seconds and withdraw forceps.
    a. Take great care not to agitate the anemone or place the particle in or near the mouth opening.
    b. Repeat for other polyps (if more than one in a group)

2. Observe behavior and record response on group data sheet.
    a. First record if the particle attached to the anemone.
    b. If particle attaches, observe anemone for 5 minutes and record if the particle was ingested.
    c. If ingested, note the time and whether the anemone regurgitates the particle.

3. Repeat steps 2 and 3 for each of the polyps, offering only a single particle to each polyp.
    a. Keep track of which polyps have been offered a particle to avoid offering multiple particles to the same polyp.

4. Calculate the total number of attached particles, and total number of ingested particles for your group.

5. Each group report their findings to entire class, and each person record all findings on class data sheet.

6. Calculate percentage of plastic particles attached to the coral polyps and the percentage of particles ingested.

7. Create a bar graph of the percentages of ingested particles, with a separate bar for each particle type.

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Scientist: _____

WORKSHEET 1: Anemone feeding predictions

Question: Will anemones eat marine debris plastics?

Treatments:

- Microplastics (plastic water bottle pieces, plastic bag pieces, styrofoam, plastic pellets, sand).

Hypotheses:

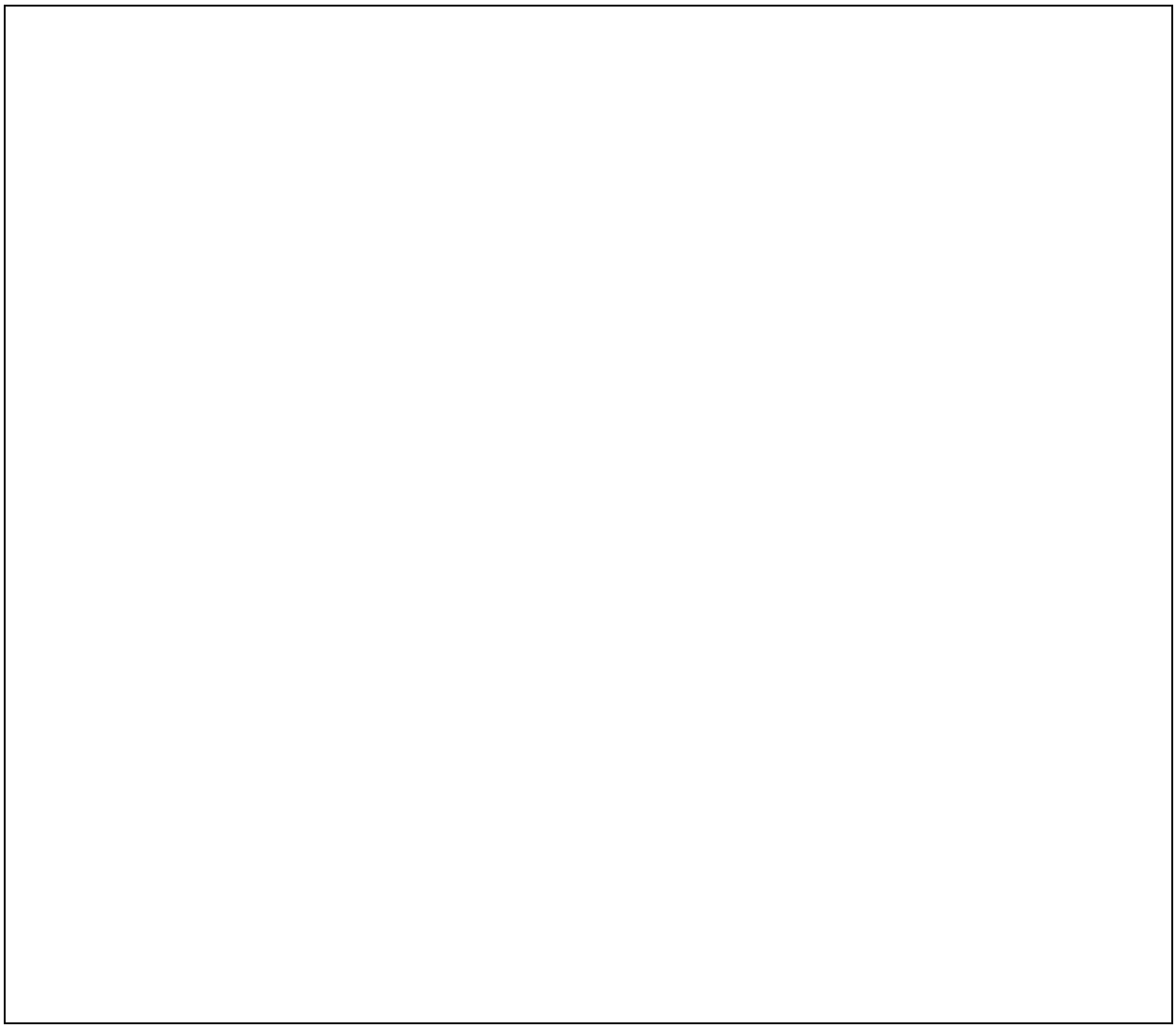
- Which material do you think the anemones will prefer? Why?

Predictions:

- If anemones prefer _____, then _____

Graphically draw your predictions for your experiment:

- What will be on the y-axis? Units? [ingested, attached, refused, time?]
- What will be on the x-axis? Units?



Do you think there will be a difference among the treatments? Why or why not?

data sheet:

Particle type	offered	attached	ingested	Time ingested

Equations:

% attached $= \frac{\#\ attached}{\#\ offered} \times 100$

% ingested $= \frac{\#\ ingested}{\#\ offered} \times 100$