



Module 2 Microplastics on the Menu

Lesson Time

75 minutes

Essential Question

What can humans do to keep manta rays healthy?

Materials

Copies of Worksheets
Rulers
Small paper bags
Salt, Spoons, Beakers
Card stock

Objectives- Students Will

Identify and measure different sizes of plastic
Communicate data with peers

Florida State Standards

Science: SC.3.P.8.3 Compare materials and objects according to properties such as size, shape, color, texture, and hardness.

SC.3.P.8.2 Measure and compare the mass and volume of solids and liquids.

SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

NGSS CrossCuttingConcepts

Cause and Effect
Patterns
Scale, proportion, quantity

Background Information:

Manta rays are filter feeders, meaning they strain food out of the water. When they find a patch of food, they unroll their cephalic (head) fins to help funnel the plankton-rich water into their mouths. They swim with their mouth open and chest cavity extended to allow for water and food to flow through. The food gets trapped in the manta ray's gills and then the manta can swallow it. Manta rays do have teeth, but they are very small and they don't use them for feeding. Manta rays eat plankton, small fish, krill, and crustaceans.

Manta rays are sadly susceptible to trash floating in the ocean. Most of the trash in the ocean comes from the land, washing into the sea through rivers and streams. Much of the trash in the ocean is plastic pieces. Plastic doesn't ever disappear it just breaks into smaller and smaller pieces called microplastics. Microplastics can float on the surface, hang in the water column, or sink to the bottom due to different densities.

Dr. Elitza Germanov has been working to understand the implications of microplastics on filter feeders. When mantas are filtering for their food, they are also eating plastic pieces. Dr. Germanov's research is important because it is the first time documenting that manta rays, do in fact, eat the plastic floating around them.

She estimated that manta rays are consuming 63 pieces of microplastic every HOUR! Whale sharks consume even more plastic, with Dr. Germanov calculating that they eat 137 pieces of microplastics each hour!





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5C's

Collaboration
Creativity
Critical Thinking
Communication

Vocabulary:

Krill: small, shrimp-like crustacean

Macroplastic: plastic items larger than 5mm

Microplastic: plastic items smaller than 5 mm

Phytoplankton: microscopic plants which live in sea water

Plankton: organisms that are unable to swim against a current

Zooplankton: microscopic animals

Teacher Preparation:

1. Make copies of "Schoolyard Trash Scavenger Hunt" and "Trash Analysis Worksheet"
2. Collect beakers, scale, salt, spoons, rulers
3. Collect card stock for "Trash Awareness Poster" and make copies.
4. Small paper bags for trash pieces





Procedures:

Pre-Lesson: Assess prior knowledge about Manta Rays. Show Introductory Video if needed. <https://www.youtube.com/watch?v=tC06JYwpmDE>

Step 1: Engage: Inquire

Individual or Partner

Go outside to do "Schoolyard Trash Scavenger Hunt."

Make sure students wash their hands immediately upon return. Set guidelines for the size of trash to pick up and expectations for outside behavior. The purpose of this activity is to find *very small* pieces of trash.

Instruct students to tell teacher if they see an unsafe piece of trash and to not touch.

Give students small paper bag to collect their pieces of trash.

Step 2: Explore: Video

Show video clip of manta ray swimming through trash: <https://www.youtube.com/watch?v=JL0VSfZ0yX4>

Step 3: Explain: Discuss Trash survey

Ask: *How many pieces of trash did you see? Is our schoolyard similar to the ocean with the amount of trash? Why or why not? Justify your conclusions and communicate them to your peers. What source of trash was the biggest? Respond to the arguments or claims of others.*

Step 4: Elaborate: Trash Analysis Lab

Individual or Partner

Prepare items for Lab: beakers, salt, spoon, and scales. Students will complete Trash Analysis Lab. Save the trash for Step 5.

Step 5: Evaluate: Trash Awareness Poster

Students will glue their trash onto poster. Encourage students to share with family members or hang in hallways. Google and project photos of plankton such as krill and copepods to present for students to draw. Students can also discuss and share what their "Take Action" steps will be.

Linguistically diverse learners: Offer information about plastics in native language. Welcome information and ideas from all voices.





Schoolyard Trash Scavenger Hunt

Name(s) _____

Directions: Go outside and find four **small** pieces of trash with your partner. Identify, measure, and record your information below. Give the pieces of trash to your teacher to collect.

Please wash your hands as soon as you return to your classroom!

Trash Piece #1

What is it ? Or what did it come from?

Measure the object length: _____

Circle the unit: cm/ mm

Trash Piece #2

What is it ? Or what did it come from?

Measure the object length: _____

Circle the unit: cm/ mm

Trash Piece #3

What is it ? Or what did it come from?

Measure the object length: _____

Circle the unit: cm/ mm

Trash Piece #4

What is it ? Or what did it come from?

Measure the object length: _____

Circle the unit: cm/ mm

Plastic Facts:

Not all plastic is bad. We need plastic in our lives like bike helmets and medical equipment.



Single use plastic is a problem for the environment, humans, and animals.



Plastic does not ever go away! It just breaks down into smaller pieces.



Animals, including manta rays eat plastic.



Not all plastic can be recycled.



Recycling plants are so full of plastic, they cannot recycle any more!





Trash Analysis Lab

Name (s) _____

Take the mass of all of the trash collected:

Mass _____ grams

Do you see a pattern in what type of trash you collected the most?

As a class,

What was the smallest piece of trash?

_____ cm/mm

As a class,

What was the largest piece of trash?

_____ cm/mm

Part 1: Fill up a Beaker or glass jar with water: Add trash pieces:

How many pieces float?

How many pieces sink?

Do any pieces stay in the middle?

Part 2: Empty water, save trash. Make saltwater by adding salt to water and stir to mix. Add trash pieces:

How many pieces float?

How many pieces sink?

Do any pieces stay in the middle?

Which model is more accurate to represent what Manta rays encounter in the ocean?

TASK: Compare properties

Sort your trash by size

Sort your trash by color

Sort your trash by texture

Wash your hands!



Take Action!

Make a list of things you can do to reduce your single plastic use. This will help our Earth including manta rays!





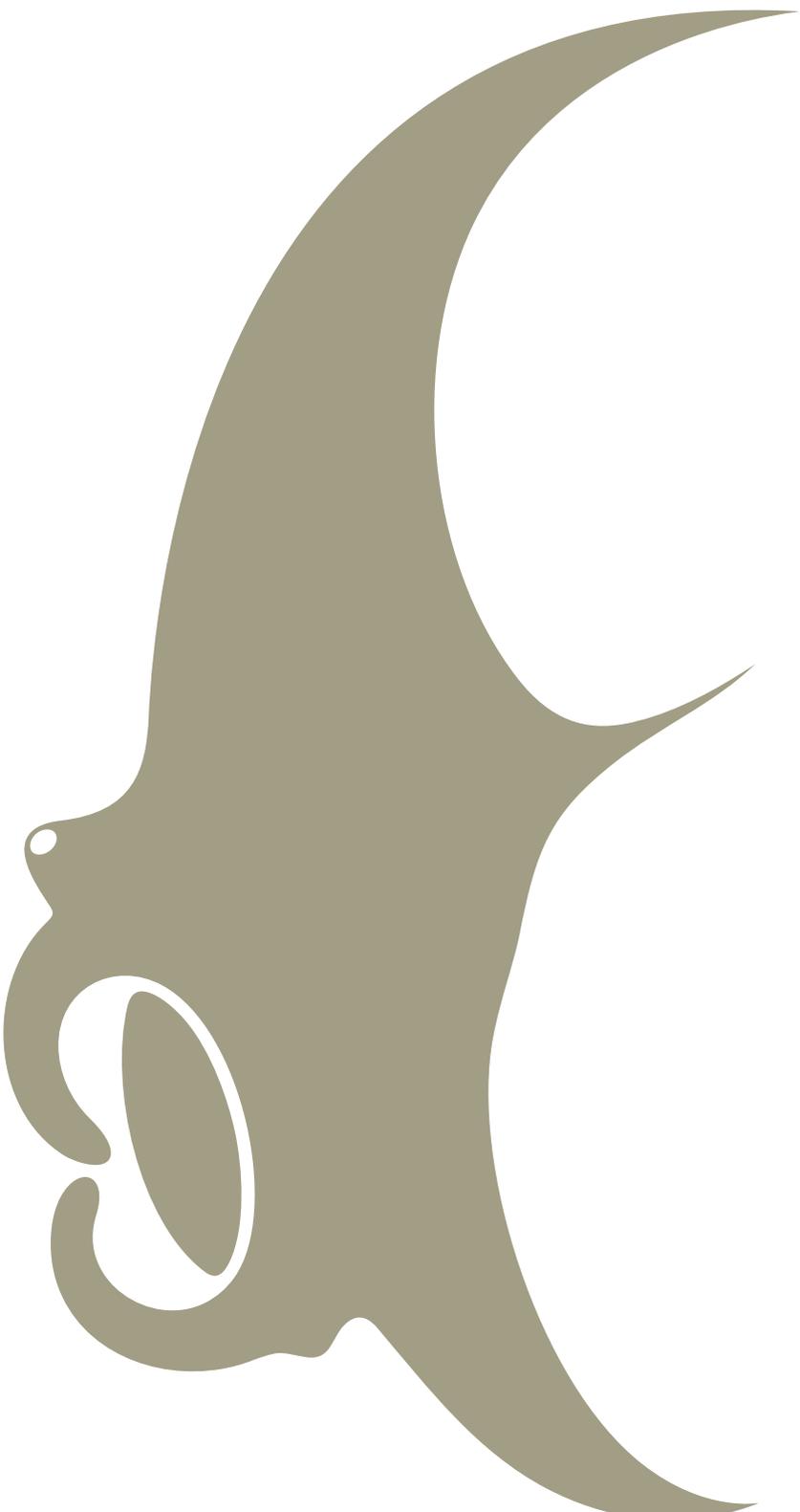
Trash Awareness poster.

Create Title

Glue on your pieces of plastic

Draw plankton and krill

Write one thing people can do to help reduce trash in the ocean. Post in hallways for others to see.



Exit Ticket**SC.3.P.8.3**

Name:

You compared your trash by properties such as color, texture and size. What are other ways to classify or group your trash?

Exit Ticket**SC.3.P.8.2**

Name:

Define mass:

What was the unit you used when you measured mass?

Exit Ticket**SC.3.L.15.1**

Name:

Do you think that manta rays who live near less plastic in the ocean are more healthy than those you saw in the video? Explain your answer.



Meet the Scientist



ELITZA GERMANOV

Project Leader, Manta Ray
Program, MMF Indonesia

Degree:

Ph.D Murdoch University,
Western Australia

What she does in the field:

- Snorkel with mantas
- Give presentations to schools
and public
- Work with other scientists
- Collect and measure plastics
- Collect manta vomit and poop!

Research Focus:

Ellie is a conservation biologist focusing on manta rays. She has a background in microbiology, immunology and biochemistry. She started her career as a biochemist, often working in a lab. She enjoyed SCUBA diving as a hobby and she was so enthralled with the ocean that she became a SCUBA Instructor. The more she went diving, the more she loved the large animals of the sea—the megafauna. She decided to pursue her graduate work in Conservation Biology.

Her current project focus is understanding the implications of microplastics in the marine environment on filter feeding marine megafauna. Her microplastics research is in collaboration with Udayana University in Indonesia.





MARINE MEGAFUNA FOUNDATION

SCIENTIST
SERIES
FOR STUDENTS
Grade 3

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Author:

Hilary Penner M.Ed

Scientific Advisory:

Jessica Pate, M.Sc
MMF Florida Project Manager

Grant provided by:



We value your feedback!

Please fill out this Teacher Evaluation form at shorturl.at/zlJT4
As a Thank You, your class will receive a *Manta ray Adoption Certificate!*

We'd love to see your lessons in action!

Please send an email to florida@marinemegafauna.org and tag us in social media.

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 Marine Megafauna Foundation

Resources:

https://www.researchgate.net/profile/Elitza_Germanov

<https://amru.org.au/group-member/elitza-germanov/>

