

## Education

# Marine Debris: The Probability of Human Impact



## Grade Level

- Grade 3-5

## Timeframe

- Usable as two separate 30-45 minute lessons.

## Materials

- Trash to show the students (e.g. soda bottles, candy wrappers, plastic bags, plastic utensils, bottle lids, etc.)
- Spinners
- 20 colored beads (5 white) per individual/pair/group of students.
- Small opaque bags/boxes
- Cups

## Key Words

- Marine Debris
- Ecosystem
- Probability



## Activity Summary

The detrimental effect of marine debris on ocean ecosystems is the focus of the lesson. While discussing dangers of debris to marine organisms and their food sources, students will discover the concept of probability. Students will explore how the presence of marine debris in food supplies can increase over time through a probability experiment.

## Learning Objectives

Students will be able to:

- Define marine debris, explain where it comes from, and describe its effects on the ocean.
- Recognize and demonstrate probability as a fraction or ratio.
- Illustrate human impact on the marine ecosystem if no action is taken to help prevent marine debris.
- Develop ways to help prevent marine debris in their own class, school, home, and/or community.

## Background Information

*Marine debris* takes the form of plastic bottles, plastic bags, packaging, wrappers, discarded fishing nets/lines/traps, cans, glass, and any other trash that winds up in the ocean. Litter can travel along rivers and storm sewers, and overflow from dumps. All waterways flow to the ocean and marine debris converges on beaches or in *oceanic eddies*.

The debris does not belong in the ocean and has detrimental effects on the wildlife and habitats that make up the marine *ecosystem*. Many animals get caught in *derelict* nets or fishing lines, plastic soda rings, and industrial piping.

Marine animals do not know the difference between trash and food. For example, a turtle will see a plastic bag floating in the water and think it is a jellyfish. Birds cannot digest plastic fragments and starve because they cannot get enough nutrients.

(Additional information in “Resources” section)

## Vocabulary

**MARINE DEBRIS** – Trash that ends up gathering on beaches or floating in the ocean.

**OCEANIC EDDIES** – Circular currents in the ocean

**ECOSYSTEM** – System formed by interaction of organisms and their environment.

**DERELICT** – abandoned/deserted

## Preparation

- Gather the materials
- Print attached activity templates and pictures.
- Attach spinner template to existing spinners.
- Sort 20 colored beads per individual/pair/group including 5 white beads.

## Procedure

- Instructor should provide some background information about marine debris: what it is, where it comes from, and that it causes harm to marine wildlife that try to eat it.

### ➤ Activity 1: Using spinners to illustrate probability

1. Each student/pair/group receives a spinner and the Student Activity Sheet: Food or Trash?
2. Students follow the instructions on the activity sheet.

#### **Discussion Questions:**

- How can litter from a park get to the ocean?
- What can happen to coral reefs that get covered by lost nets?

#### **Extensions:**

- Students can make their own spinners. Draw examples of marine debris and food in the spaces
- 
- Instructor should provide some background information to the students about birds and marine debris: Birds have to eat a lot in order to get enough energy to fly. However, sometimes they eat bits of plastic along with fish. Birds cannot digest plastic, so it takes up room in their stomach and they cannot get enough food.

### ➤ Activity 2: Eat like a Bird

1. Each student receives an opaque bag of 20 beads (including 5 white) and the Student Activity Sheet: Eat like a Bird.
2. Instructor gives the students 5 seconds to “eat like a bird”. They must pick out as many beads as possible from their opaque bag (one at a time) and put them in their cup.
3. The students need to count the white beads (zero if none), record the number on their activity sheet as “marine debris”, and put them back in the bag. The rest of the beads in the cup should be counted and recorded as “food”, then put in a separate cup (labeled “waste” if desired).
4. The process repeats until most or all of the food is gone from the bag.
5. Instructor will go over calculating the “Total in Bag” with the students, if necessary.
6. Students will fill out the rest of their activity sheet.

#### **Discussion Questions:**

- How does the probability of getting marine debris change as more food is removed? Think about how the amount of white beads pulled out of the bag increases per round.
- What does a higher probability of getting marine debris mean for the birds?

#### **Extensions:**

- Add probability of marine debris to probability of food to show that they always add up to 1.
- Remove the white beads (marine debris) and re-add the food to demonstrate how less marine debris benefits wildlife.

## Education Standards

<b>National Education Standards</b>	Math 3-5: Number and Operations, Algebra, Data Analysis and Probability, Connections, Representation Geography 3-5: Environment and Society (14) Science K-4: Life Science, Science in Personal and Social Perspective Science 5-8: Science in Personal and Social Perspective
<b>Ocean Literacy Principles</b>	1 – The Earth has one big ocean with many features (g) 6 – The ocean and humans are inextricably interconnected (e, g)

## Resources

### Books:

Brown-Babcock, Maria. *Save Our Seas*. Center for Marine Conservation and California coastal Commission, 1993, CA.

### Websites:

#### NOAA Marine Debris Program

“The NOAA Marine Debris Program (MDP) supports national and international efforts to research, prevent, and reduce the impacts of marine debris.”

<http://marinedebris.noaa.gov/about/welcome.html>

MDP Educational Resources – Information, materials, and publications that can be used to prevent and address marine debris.  
<http://marinedebris.noaa.gov/outreach/welcome.html>

#### NOAA Ocean Explorer

“The NOAA Ocean Exploration program provides a variety of learning and teaching tools designed to engage broad audiences and enhance America’s environmental literacy through the excitement of ocean discovery.”

<http://oceanexplorer.noaa.gov/edu/welcome.html>

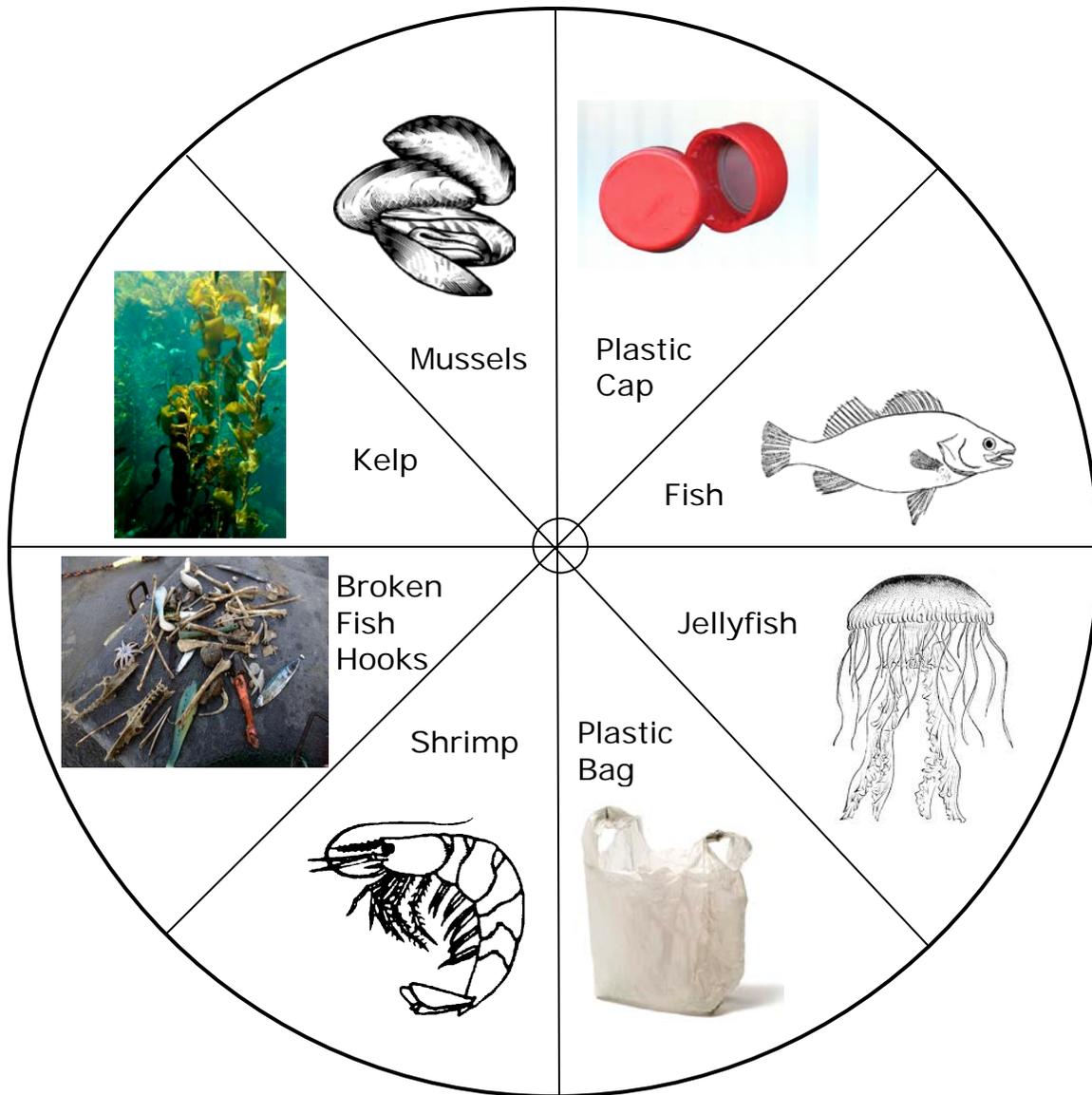
## Acknowledgement

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## Attached

Spinner Template  
Student Activity Sheet – Food or Trash?  
Student Activity Sheet – Eat like a Bird

Coloring sheets that focus on marine debris.  
Pictures that show the effects of marine debris.



<http://bestclipartblog.com/clipart-pics/fish-clip-art-1.gif>

[http://image1.masterfile.com/em\\_w/01/09/14/608-01091489w.jpg](http://image1.masterfile.com/em_w/01/09/14/608-01091489w.jpg)

<http://naturespharmacy.org.uk/Kelp.jpg>

<http://bestclipartblog.com/clipart-pics/jellyfish-clipart-5.gif>

<http://www.arthursclipart.org/seacrustaceans/Shrimp.gif>

<http://img2.timeinc.net/toh/i/g/products/1009-plastic-bags/00-plastic-bags.jpg>

<http://seattletimes.nwsourc.com/ABPub/2008/10/15/2008270892.jpg>

<http://imgs.easy2bid.com/picture/product/201001%5C21-30e2cdd0-d798-4a37-8469-adfd6971358c.jpg>

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Food or Trash?

Student Activity Sheet

**Marine Debris** is trash that ends up on beaches or in the ocean. Marine wildlife cannot tell the difference between food and trash.

1. Choose a marine animal you want to represent:

Whale

Turtle

Sea Lion

Pelican

2. Over the course of 8 days, your animal goes out and searches for food.
3. Use the spinner to determine if you find food or trash.
4. Spin 8 times and record what you find for each day by using check marks to fill in the table below.

Day	Food	Trash
1		
2		
3		
4		
5		
6		
7		
8		
<b>Amount</b>		

(Continued on next page...)

**Look at the spinner.**

How many **total** items are there? \_\_\_\_\_

How many items are “**food**”? \_\_\_\_\_      How many items are “**trash**”? \_\_\_\_\_

You can write this as a fraction to represent probability. Fill in the numbers:

$$\frac{\text{Food}}{\text{Total}} = \frac{\square}{\square} \quad \text{“There is a } \underline{\hspace{1cm}} \text{ out of } \underline{\hspace{1cm}} \text{ chance the item is food.”}$$

(Food)                      (Total)

$$\frac{\text{Trash}}{\text{Total}} = \frac{\square}{\square} \quad \text{“There is a } \underline{\hspace{1cm}} \text{ out of } \underline{\hspace{1cm}} \text{ chance the item is trash.”}$$

(Trash)                      (Total)

**Look at your table.**

Do your recorded numbers match the probabilities you calculated? \_\_\_\_\_

If they do not match, what was your probability that the item was **trash**?  $\frac{\text{Trash}}{\text{Total}} = \frac{\square}{\square}$

**Discussion:**

1. If your probability did/did not match the spinner probability, why do you think that is?
  
2. How does marine debris get to the ocean?
  
3. How can you help limit the amount of marine debris?

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Eat like a Bird

### Student Activity Sheet

As a bird, you have to eat as much as possible to have energy enough to fly. You have a bag of food (non-white beads) with some bits of marine debris mixed in (white beads). In 5 seconds, you will need to pick out beads one at a time and put them into the cup.

For each round:

Record the number of white beads you pick out in the row "Marine Debris".

Record the number of non-white beads you pick out in the row "Food".

(The *new* Total in Bag = the *previous* total – food beads taken out.)

Round	1	2	3	4	5
<b>Total in Bag</b>	<b>20</b>				
<b>Marine Debris</b> (white beads)					
<b>Food</b> (non-white beads)					

Put the white beads back in the bag.

Put the rest of the beads in the "waste" cup.

- The amount of marine debris beads *in the bag* remained constant (5 white beads), because they were put back into the bag after each round.
- The probability of choosing a marine debris bead (white) for each round can be written as:  $\frac{5}{\text{Total in Bag}}$
- The amount of food beads *in the bag* changed, because some were left out after each round.
- The probability of choosing a food bead (non-white) for each round can be written as:  $\frac{\text{Total in Bag} - 5}{\text{Total in Bag}}$

Fill in the table of probabilities (the first round is done for you as an example):

Round	Marine Debris	Food
<b>1</b>	$\frac{5}{20}$	$\frac{15}{20}$
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b>5</b>		

# Example Student Work

## Eat like a Bird

### Student Activity Sheet

As a bird, you have to eat as much as possible to have energy enough to fly. You have a bag of food (non-white beads) with some bits of marine debris mixed in (white beads). In 5 seconds, you will need to pick out beads one at a time and put them into the cup.

For each round:

Record the number of white beads you pick out in the row “Marine Debris”.

Record the number of non-white beads you pick out in the row “Food”.

(The *new* Total in Bag = the *previous* total – food beads taken out.)

Round	1	2	3	4	5
<b>Total in Bag</b>	<b>20</b>	<b>14</b>	<b>10</b>	<b>7</b>	<b>5</b>
<b>Marine Debris</b> (white beads)	<b>0</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>5</b>
<b>Food</b> (non-white beads)	<b>6</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>0</b>

Put the white beads back in the bag.

Put the rest of the beads in the “waste” cup.

- The amount of marine debris beads *in the bag* remained constant (5 white beads), because they were put back into the bag after each round.
- The probability of choosing a marine debris bead (white) for each round can be written as:  $\frac{5}{\text{Total in Bag}}$
- The amount of food beads *in the bag* changed, because some were left out after each round.
- The probability of choosing a food bead (non-white) for each round can be written as:  $\frac{\text{Total in Bag} - 5}{\text{Total in Bag}}$

Fill in the table of probabilities (the first round is done for you as an example):

Round	Marine Debris	Food
1	$\frac{5}{20}$	$\frac{15}{20}$
2	<b><math>\frac{5}{14}</math></b>	<b><math>\frac{9}{14}</math></b>
3	<b><math>\frac{5}{10}</math></b>	<b><math>\frac{5}{10}</math></b>
4	<b><math>\frac{5}{7}</math></b>	<b><math>\frac{2}{7}</math></b>
5	<b><math>\frac{5}{5}</math></b>	<b><math>\frac{0}{5}</math></b>