Title

PART 3 Lesson: Populations

PART 3 Activity: Turtles, Turtle Everywhere!

Grade level

3-5

Time

60 minutes

Student Target

SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
SC.3.N.1.5 Recognize that scientists question, discuss, and check each other's evidence and explanations.
SC.3.N.1.6 Infer based on observation.
SC.3.N.1.7 Explain that empirical evidence is information, such as observations or measurements that is used to help validate explanations of natural phenomena.
SC.3.N.3.2 Recognize that scientists use models to help understand and explain how things work.
SC.3.N.3.3 Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.
MAFS.3.OA.3.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division or properties of operations.
MAFS.3.NBT.1.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 ×60) using strategies based on place value and properties of operations.
SC.4.L.17.4 Recognize ways plants and animals, including humans, can impact the environment.
SC.4.N.1.1 Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
SC.4.N.1.3 Explain that science does not always follow a rigidly defined method ("the scientific method") but that science does involve the use of observations and empirical evidence.
SC.4.N.1.4 Attempt reasonable answers to scientific questions and cite evidence in support.
SC.4.N.1.5 Compare the methods and results of investigations done by other classmates.
SC.4.N.1.6 Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.
SC.4.N.1.7 Recognize and explain that scientists base their explanations on evidence.
SC.5.N.1.1 Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic

observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
SC.5.N.2.1 Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.
SC.5.N.1.3 Recognize and explain the need for repeated experimental trials.
SC.5.N.1.6 Recognize and explain the difference between personal opinion/interpretation and verified observation.
MAFS.5.NBT.2.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

Materials

Teacher:

- Vocab Sheet
- Post-it Notes, stickers, or dry erase marker

Students:

- Activity Page: 1 (one for each student biologist) (print three sets if you plan on doing advanced activity)
- Activity Pages: 2-6 (cut out)
- Activity Pages: 7-11 (cut out)*
- Activity Pages: 12-16 (cut out)*
- 3 clipboards

*Only use if doing advanced activity

PART 3 Lesson: Populations

***Change the grade/age to match your own. These are just examples.*

Explain to the students that they are going to act as biologists for this next activity.

Each species has a population, just like humans do. For example, the population in Martin County, FL is 148,817. Does this mean that this many people live in the United States? No, this is only the population in the smaller region of Martin County.

What does that mean?

A population is a summation of all the organisms of the same group or species, which live in a particular geographical area. For example, what is the population of your class? ***Get the students to count the number of kids in the class***.

Does that mean that's the population of the whole school? Would it be easy to do count the number of kids in the school during recess? Why not? *Students are running around and moving, making it difficult to count them.*

As biologists, it is impossible for us to know exactly how many sea turtles are out in the wild.

Ask the students why. *Because they migrate and only come up to land to nest, it is hard for us to count how many sea turtles exist in the wild.*

Instead of counting EVERY sea turtle in the whole world, we take a sample size. Let's try this with your school first.

For example, if there are 21 students in your 4th** grade classroom and you know there are 5 fourth grades in the whole school, about how many students in your school are in the 4th grade? Multiply on the board and label the different numbers "sample" and "estimated population". You just sampled your classroom and made an estimate for the whole school. Let's try to go further with this:

How many girls are in your class? How many classrooms are there in the school? Multiply those numbers together to get an estimate of the number of girls in the whole school. See attached worksheet for some examples to go over on the board. Let the students know that this number won't be exact because some classes/populations may not be as numerous as yours. That is why this is an estimate.

Explain to the students that they will be making observations about the class and school. By writing these observations down and comparing/contrasting, we are collecting and analyzing data.

PART 3 Activity: Turtles, Turtles, Everywhere!

- Activity Page: 1 (make 3 copies if you plan on doing the advance activity)
- Activity Pages: 2-6
- Activity Pages: 7-11*
- Activity Pages: 12-16*

We want to know how many boys are in the 4th** grade at our school. How would we do that? Let's count how many boys are in our class (sample) and multiply by how many 4th grade classes there are to get an estimate of how many boys are in the 4th grade (population).

_____ boys in our class x _____ 4th grade classes = _____

Next we want to know how many 9 and 10 year olds there are in your school. Let's take a sample in our classroom. There are:

_____ nine year-olds
_____ ten year-olds

_____ nine year-olds x _____ 4th grade classes = _____
_____ ten year-olds x _____ 4th grade classes = _____

How would we figure out how many brunettes/blondes there are in the whole school?
_____ brunettes
_____ blondes

_____ brunettes x _____ classes in the school = _____
_____ blondes x _____ classes in the school = _____

Explain to the students that a sample size for a population should be fairly large. As scientists, we try to have a sample of 30 or more. This will give us a more realistic estimate of the whole population.

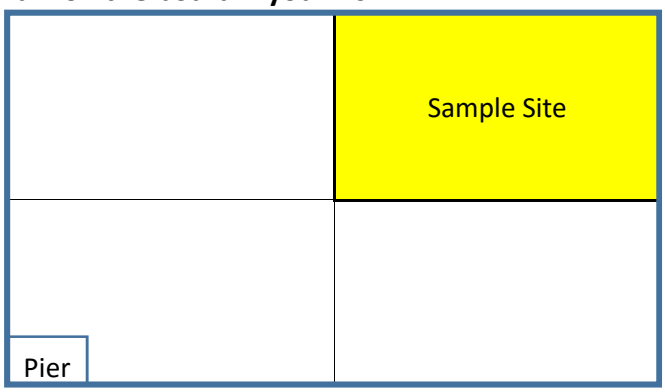
Briefly, explain to the students that just as humans get classified by age (baby, teenager, adult), so do sea turtles. For this exercise, students will be classified into hatchling, juvenile or adult.

Hatchlings = newborn
Juveniles = ~1-10 years
Adults = ~15+ years

We also classify by species (loggerhead, green, leatherback) and gender (male, female).

For the next activity, we will need three biologists chosen by the teacher. *Choose at your discretion as this role requires the three students to use a chart and document how many sea turtle students they encounter.* You will also draw the chart on the board**. Explain to the students that we will be sampling in a lagoon near a pier. In this habitat, we have some small reefs, seagrass and it's fairly shallow.**

Since we can't realistically count turtles in the entire lagoon, we will be sampling ¼ of the area. See below and draw on the board if you wish:



The remaining students will be swimming sea turtles. Each one will have a turtle card (Activity Pages 2-6) denoting what type of turtle they are, their size class and if they have any injuries. The biologists must go up to the moving turtles and tag them with a sticker or post-it note (you can also use a dry erase marker to make an X or check mark on the laminated turtle card). The scientists must also look at each sea turtles card and document which species and age class they are as well as if they have any injuries. They will document their findings as they go on their data sheet (Activity Page 1). Each documented turtle will get written down as a hash mark under the correct category to be totaled at the end. For example, the biologists would write the loggerhead turtles they encounter like this:

Loggerhead

	Healthy	Boat Strike	Fishing Hook
Hatchling			
Juvenile	I	I	II
Adult	II	I	III

A tagged turtle must not be documented twice so let the biologist know that each time they document a turtle, they must tag them with either a sticker, post it note, or dry erase marker. These turtles cannot be counted again. At the end of the activity when all turtles are marked, get the biologists to stand up and tell you how many of each species/size class they found. Tally them up at the end and fill in the data sheet you drew on the board. You should have:

Loggerhead

	Healthy	Boat Strike	Fishing Hook
Hatchling	0	0	0
Juvenile	1	1	2
Adult	2	1	3

Green

	Healthy	Boat Strike	Fishing Hook
Hatchling	0	0	0
Juvenile	2	3	1
Adult	1	2	0

Leatherback

	Healthy	Boat Strike	Fishing Hook
Hatchling	0	0	0
Juvenile	0	0	0
Adult	1	0	0

There seem to be a high number of adult loggerheads with fishing hooks and a lot of juvenile greens with boat strike injuries. **Prompt the students to think about what they know about each species and why they think this might be:**

Adult loggerheads live in nearshore habitats, often looking for food. We might infer that these areas are commonly utilized by fisherman as well and that loggerheads go after their bait, thinking it's food.

Juvenile green turtles eat lots of seagrass and since this area is pretty shallow, it's possible a lot of boaters recreate here because it's safe to swim.

Why is it that we have seen no hatchlings? Hatchlings live in the sargassum seaweed in the Gulf Stream Current until they become juveniles, then they migrate back to the seagrass beds.

Why is it that we see hardly any leatherbacks? Leatherbacks utilize the open ocean and deep sea habitats and aren't typically seen inshore. Since we saw one adult, we may look at the time of year. If it's summer, we might infer that it's a female, coming in to nest. If it's winter, we

may assume that it's a fluke, since it is the only one we counted. Small numbers like 1 don't lend much to data.

To wrap up, explain to the students that they just looked at samples of a population for two reasons:

1. To compare characteristics among the population in order to make inferences.
2. To estimate a population from a sample (see below).

Get the students to try and figure out how we would apply this sample to figure out how many turtles are in the whole lagoon. Since we sampled ¼ of the lagoon and didn't count recaptured turtles, we would take our sample and multiply by 4. This would give us an estimated population of turtles that are in the entire lagoon.

Extra Activity (for advanced or older groups):

Explain to the students that researchers often go out to the same site multiple times. This can simply be to count more turtles in order to estimate the population more accurately, or to see population changes from year to year.

After our first site visit, the pier closed down due to a bad storm. Our biologists want to know if this has affected the sea turtle populations in a positive way. The hypothesis, or guess based on previous observations, is that the pier closure will mean less fishing hook injuries for sea turtles. Personal opinions and guesses are not enough, however. As biologists, we need to make observations, collect data and look at the results to be sure.

With old numbers still up on the board, do the activity again with the second set of cards. Keep the same biologists or switch them up, it won't matter.

At the end, you should have:

Loggerhead

	Healthy	Boat Strike	Fishing Hook
Hatchling	0	0	0
Juvenile	1	1	2
Adult	0	3	4

Green

	Healthy	Boat Strike	Fishing Hook

Hatchling	0	0	0
Juvenile	0	3	3
Adult	1	2	0

Leatherback

	Healthy	Boat Strike	Fishing Hook
Hatchling	0	0	0
Juvenile	0	0	0
Adult	0	0	0

You'll notice that the number of boat strikes and fishing hook injuries have gone up in adult loggerheads and fishing hook injuries in juvenile greens has also increased. **How can this be if the pier closed down?**

Get the students to think about some consequences of the pier closing. Will those fishermen stop fishing all together? Have them come up with a hypothesis or best guess based on the data they collected.

Chances are, once the pier closed, fisherman found a different way to fish in the area: boats. You can see the number of boat strikes also went up in the adult loggerheads. This disproves our hypothesis but leads us to believe that other measures must be taken to ensure a better population.

Our biologists take this matter up with the state of Florida and because of our data, officials have decided to mark that area as a protected nature preserve. This means, no fishermen, no boats, nothing man-made. The one exception is that we as researchers are allowed to go back after one year and sample again to test our new hypothesis that no boats and no fishing will increase the population.

Run the activity again with the third set of cards and you should get:

Loggerhead

	Healthy	Boat Strike	Fishing Hook
Hatchling	0	0	0
Juvenile	2	0	2
Adult	5	0	0

Green

	Healthy	Boat Strike	Fishing Hook
Hatchling	0	0	0
Juvenile	5	0	1
Adult	4	0	1

Leatherback

	Healthy	Boat Strike	Fishing Hook
Hatchling	0	0	0
Juvenile	0	0	0
Adult	0	0	0

You'll notice a significant increase in healthy turtles and a decrease in all boat strikes and most fishing hook injuries. No boats in the area certainly has helped but we do still notice fishing hook injuries. This is most likely because sea turtles can survive and live with fishing hook injuries. They probably either swam into the area already hooked or got the hooks left over from the fishermen still on the bottom of the ocean in that habitat.

The biologists now take this information to the state to conclude that yes, the closure of the pier and the creation of the nature preserve really has helped the sea turtle population in that area.

Explain to the students that this is why we as biologists collect data. We want to know what's going on with sea turtles and what, if any, impacts we as humans have on them.

In the real world, we as scientists would sample each area on multiple days. We want to make sure the data we collected one day is similar to any other day we would go out. This is repetition and it's required in science to improve accuracy and ensure that our conclusions are based on reliable data, not one fluke sample.

Loggerhead

Hatchling	Healthy	Boat Strike	Fishing Hook
Juvenile	Healthy	Boat Strike	Fishing Hook
Adult	Healthy	Boat Strike	Fishing Hook

Green

Hatchling	Healthy	Boat Strike	Fishing Hook
Juvenile	Healthy	Boat Strike	Fishing Hook
Adult	Healthy	Boat Strike	Fishing Hook

Leatherback

Hatchling	Healthy	Boat Strike	Fishing Hook
Juvenile	Healthy	Boat Strike	Fishing Hook
Adult	Healthy	Boat Strike	Fishing Hook

Loggerhead

Juvenile

Healthy

Loggerhead

Juvenile

Boat Strike

Loggerhead

Juvenile

Fishing Hook

Loggerhead

Juvenile

Fishing Hook

Loggerhead

Adult

Healthy

Loggerhead

Adult

Healthy

Loggerhead

Adult

Boat Strike

Loggerhead

Adult

Fishing Hook

Loggerhead

Adult

Fishing Hook

Loggerhead

Adult

Fishing Hook

Green

Juvenile

Healthy

Green

Juvenile

Healthy

Green

Juvenile

Boat Strike

Green

Juvenile

Boat Strike

Green

Juvenile

Boat Strike

Green

Juvenile

Fishing Hook

Green

Adult

Healthy

Green

Adult

Boat Strike

Green

Adult

Boat Strike

Leatherback

Adult

Healthy

Loggerhead

Juvenile

Healthy

Loggerhead

Juvenile

Boat Strike

Loggerhead

Juvenile

Fishing Hook

Loggerhead

Juvenile

Fishing Hook

Loggerhead

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Boat Strike

Loggerhead

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Healthy

Green

Juvenile

Fishing Hook

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Adult

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Green

Adult

Healthy

Green

Adult

Fishing Hook