

LAB – Sea Turtle Sex Determination and Climate Change**BACKGROUND**

Presently, it is estimated that only one sea turtle in thousands survive to adulthood and reproduce! That's a staggering number; and temperatures due to climate change have huge implications on the sea turtle populations because the sex of the hatchling is a result of the temperature at which the incubation occurs. Incubation temperatures that become skewed by two to three degrees can produce 100% males or 100% females; therefore, any nest manipulation of the incubation environment has the potential to skew the 1:1 sex ratio of sea turtle populations.

On average, each sea turtle nest contains 100 eggs. The female digs a nest to a depth of 46-56 cm (18-22 inches) and deposits the eggs. There is a natural temperature gradient that occurs within the nest. The eggs at the upper range of temperature (29C) produce females at the lower range produce males. According to the New England Aquarium (www.neaq.org), research suggests that Loggerhead sea turtle nests in Florida are already producing nest that are 90% female as a result of high temperatures, and if warming raises temperatures by an additional 1 degree (C) or more, no males will be produced (2014).

Pre-Lab Questions (You can use the introduction to this lab, your notes, the internet, and <https://www.youtube.com/watch?v=XcdpnvUBinA>)

1. When is sea turtle nesting season?

2. Where do sea turtles nest?

3. How many species of sea turtle exist today? What is their conservation status (Common, Rare, Threatened, Endangered)?

4. How is sea turtle sex determined?

5. What is climate change? In what ways can climate change impact ecosystems?

6. On average, how many eggs are in each sea turtle nest?

METHODS:

1. Report to a lab station where all materials are provided
2. Use the provided material to create a model of a sea turtle nest.

Materials List:

- Metric ruler
- Thermometer
- 1000 mL Beaker
- 25 marbles (each marble represents 4 eggs)
- Light source with light bulb
- Wax Pencil
- Sand – enough to fill a 1000mL Beaker

3. Measure about 3cm from the top of beaker and draw a line and label it: Surface.
4. Now measure 3 cm from that line and write: 6cm. Do this three more times until you reach the bottom line which should be 12 cm. (Five lines in all: surface, 3cm, 6cm, 9cm, and 12cm)
5. Fill the bottle with sand up to the top of the beaker
6. Begin to add marbles as you add sand up to the 3cm line.
7. Finish adding sand from the 3cm line to the surface. There should not be any marbles above the 3 cm line.
8. Draw your nest model lab design in the box below. Label the nest, the eggs, the sand substrate, the measurements, the light/heat source, and the predicted temperature gradient.

Your nest model:	Make a prediction of a temperature gradient here:
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9. Place your nest model under a light/heat source assigned by your teacher. After approximately _____ minutes or the following day, record your data in the date chart below.

Depth	Temperature
surface	
3 cm	
6 cm	
9cm	
12cm	

12. Now circulate around the room and gather data from the Control Nest and from the other nests in the class. You should use the thermometer at each station to gather the measurements from each nest. Rotate to the next highest number and lab group 12 should go to 1.

Depth (from surface)	Temperature of Nests (Lab Group #s)					
	1	2	3	4	5	6
Surface						
3cm						
6cm						
9cm						
12cm						

13. Once all of your data is collected, return to your seat and answer the following questions individually.

Analysis Questions:

1. How does temperature affect the population ecology of sea turtles?
2. Can human activities effect sea turtle populations and ecosystems in general?
3. How is research collected to determine the sex of sea turtles?
4. What are the effects of climate change on sea turtles?
5. Would the loss of sea turtles affect the aquatic food web? Would the consequences be positive, negative, or both?
6. What would happen to the sea turtle population if more females were produced than males?

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7. Based on the data collected how many female sea turtles will hatch from your nest? How many males?
8. What are the correlations between what you see in your nest model and what is happening on the nesting beaches?
9. Compare your data with another group? Is the data similar or different? Explain.
10. What is the ratio of males to females in your nest? Will this ratio change the population of sea turtles over time?
11. What are some factors that will affect the daily temperatures of sea turtle nests on the beach?
12. Are there discrepancies between your data and the data from other nests? Why?