

Lesson Plan: The Impact of Climate Change on Sex Determination in Sea Turtles

- Teacher-submitted lesson plan, contributed by Dr. Ravindra Varma Polisetty, Assistant Professor, Sri Venkateswara College (University of Delhi), India

As a **high school Biological Sciences** teacher, you can use this set of computer-based tools to help you in teaching about **chromosomal and environmental sex determination in various species**, and the **factors that influence sex determination in sea turtles**.

This lesson plan allows students to learn about the mechanisms for determination of gender in different species, and specifically, in sea turtles. The activity will help students understand the possible effects of climate change (specifically, increase in temperature) on the sex ratio and population of sea turtles.

Thus, the use of this lesson plan allows you to integrate the teaching of a climate science topic with a core topic in Biological Sciences.

Use this lesson plan to help your students find answers to:

- *Discuss sex determination in various biological species.*
- *Explain chromosomal sex determination and environmental sex determination.*
- *How might climate change influence sex determination in sea turtles?*
- *How might climate change affect sea turtle population, in particular, and marine ecosystems, in general?*

About the Lesson Plan

Grade Level

High school

Discipline	Biological Sciences
Topic(s) in Discipline	Sex Determination in Species, Chromosomal Sex Determination, Environmental Sex Determination (ESD), Sea Turtle Biology, Biodiversity, Ecology
Climate Topic	Climate and the Biosphere
Location	Global, Florida (USA)
Access	Online
Language(s)	English
Approximate Time Required	75 – 90 min

1 Contents

- 1. Micro-lecture (video) (~6 min)** A micro-lecture (video) that introduces the topic of sex determination in various biological species and explains the influence of environmental factors such as temperature on sex determination in some species.
<https://ed.ted.com/lessons/sex-determination-more-complicated-than-you-thought>
- 2. Video (~8 min)** A video that explains how climate change may alter the sex ratio in sea turtles and may cause species extinction.
<https://www.pbs.org/newshour/show/sea-turtles>

3. Classroom/Laboratory activity (~60 min)

A classroom/laboratory activity to observe, understand, and discuss the effects of climate change on soil temperature near sea turtle nests, and the possible consequences on the sex ratio of sea turtles.

<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/75527> (Part 4 - Laboratory Activity and Analysis Questions)

4. Suggested questions/assignments for learning evaluation

- Discuss sex determination in various biological species.
- Explain chromosomal sex determination and environmental sex determination.
- How might climate change influence sex determination in sea turtles?
- How might climate change affect sea turtle population, in particular, and marine ecosystems, in general?

2 Step-by-step User Guide



Here is a step-by-step guide to using this lesson plan in the classroom/laboratory. We have suggested these steps as a possible plan of action. You may customize the lesson plan according to your preferences and requirements.

1. Introduce the topic through a video micro-lecture

- Introduce the topic of sex determination in various species.
- Discuss chromosomal and environmental sex determination with examples.
- Play the micro-lecture (video, approx. 6 min) "[Sex Determination: More complicated than you thought](#)" to introduce the topics of sex determination, chromosomal sex determination in various biological systems, and the role of environmental factors in determining the sex of some species.

The video provided by TED-Ed can be accessed at <https://ed.ted.com/lessons/sex-determination-more-complicated-than-you-thought>.

2. Play a video

- Discuss environmental sex determination in sea turtles and emphasize the possible impact of climate change on sea turtle populations. You may briefly introduce the topic of climate change to your students now.
- Play the short video (approx. 8 min) "[Climate change is hurting the sex lives of sea turtles](#)" to explain how an increase in Earth's temperature due to climate change might adversely alter the sex ratio of sea turtles and might subsequently impact sea turtle population.

The video "Climate change is hurting the sex lives of sea turtles", provided by PBS NewsHour, is available at <https://www.pbs.org/newshour/show/sea-turtles>.

3. Conduct a classroom/laboratory activity

Now, conduct the classroom/laboratory activity in Part 4 of the teaching module "Sea Turtle Sex and Climate Change" (from CPALMS) to explore the topic in more detail. This activity will help students to build models of sea turtle nests, simulate the effects of rising temperature due to climate change by using different light sources, collect data, and discuss the possible effects of climate change on the sex ratio and population of sea turtles.

Navigate to the teaching module "[Sea Turtle Sex and Climate Change](#)", created by D. Marsica and available on CPALMS.

- From the Attachments section, download the files "[sea turtle lab setup.bmp](#)", "[sea turtle lab setup 2.bmp](#)", and "[Sea Turtle Sex and Climate Change Student Lab Handout.docx](#)".
- Then, conduct the activity described in Part 4 (Laboratory Activity and Analysis Questions).

Students can collect and analyze the data as described in the activity, and can then discuss the possible effects of climate change on sea turtle populations.

4. Questions/Assignments

Use the tools and the concepts learned so far to discuss and determine answers to the following questions:

- *Discuss sex determination in various biological species.*
- *Explain chromosomal sex determination and environmental sex determination.*
- *How might climate change influence sex determination in sea turtles?*
- *How might climate change affect sea turtle population, in particular, and marine ecosystems, in general?*

3 Learning Outcomes

The tools in this lesson plan will enable students to:

- describe chromosomal and environmental sex determination in species
- discuss the role of environmental factors in sex determination of sea turtles
- explain the potentially adverse effects of climate change on sea turtle population
- discuss and predict the impact of climate change on ecosystems

4 Additional Resources



If you or your students would like to explore the topic further, these additional resources will be useful.

1. Reading

A reading, “Turtles”, by George R. Zug in ENCYCLOPAEDIA BRITANNICA:

<https://www.britannica.com/animal/sea-turtle>

2. Video

A video, “What is Climate, Climate Change, Lines of Evidence”, from The National Academies of Sciences, Engineering, and Medicine:

<http://youtu.be/qEPVyrSWfQE>

3. Classroom/Laboratory Activity

Parts 1 and 2 of the teaching module, "Sea Turtle Sex and Climate Change", from CPALMS:

<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/75527>

5 Credits/Copyrights

All the teaching tools in our collated list are owned by the corresponding creators/authors/organizations as listed on their websites. Please view the individual copyright and ownership details for each tool by following the individual links provided.

We have selected and analyzed the tools that align with the overall objective of our project and have provided the corresponding links. We do not claim ownership of or responsibility/liability for any of the listed tools.

1. Micro-lecture, "Sex determination: More complicated than you thought"

Educator and Narrator: Aaron Reedy; Animator: Buzzoo Associates, Inc.; [TED-Ed](#)

2. Video, "Climate change is hurting the sex lives of sea turtles"

[PBS NewsHour](#)

3. Classroom/Laboratory activity, "Sea Turtle Sex and Climate Change"

D. Marsica, content available on [CPALMS](#)

4. Additional Resources

George R. Zug, [ENCYCLOPAEDIA BRITANNICA](#);

[The National Academies of Sciences, Engineering, and Medicine](#);

D. Marsica, content available on [CPALMS](#)