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Living Oceans
Foundation

STANDARDS

- **CCSS:** RST.9-10.1, 2, 3, 4, 5, 7, 8, 9, 10; RST.11-12.1, 2, 3, 4, 7, 8, 9, 10; W.9-10.2, 4, 7, 8, 9; W.11-12.2, 4, 7, 8, 9; SL.9-10.4, 6; SL.11-12.4, 6
- **NGSS:** HS-LS4-1
- **OLP:** 4.B.1, 4.B.2, 5.C.22

ONLINE CONTENTS

- [Classification Quiz](#)
- [What Clade R U?](#) Interactive (at bottom of *How To Build A Cladogram* section) Use the interactive program to learn and explore more about the anatomy of a stony coral polyp.
- [What Are Corals? Video](#) Classification helps scientists tell species apart. This educational video explains modern biological classification categories from the most general (domain) to the most specific (species).

CLASSIFICATION

This lesson is part of the *Classification* unit, which explains how to organize the millions of organisms on Earth. Below is a summary of what is included in the entire unit.

UNIT CONTENTS

A. [Background Information](#)

- How Do We Classify Organisms?
- Linnaean Naming System
- Coral Classification
- Modern Classification
- Understanding Cladograms
- How to Build a Cladogram

B. Lessons

[Watch It! Naming Nature](#)

- A worksheet to accompany the [Naming Nature](#) video

[Classify This!](#)

- A worksheet to classify an organism and identify its characteristics

[Rules, Rules, Rules](#)

- A worksheet about scientific names

["Taxing" Corals](#)

- An activity to classify corals based on their characteristics

[In Light of New Evidence](#)

- A writing assignment on an organism that has been reclassified

[The Key to ID](#)

- An activity using a dichotomous key for sea stars

[And Then There Was One](#)

- An activity to create a dichotomous key for corals

[Cladograms 1](#)

- A lesson on creating and interpreting a cladogram

[Cladograms 2](#)

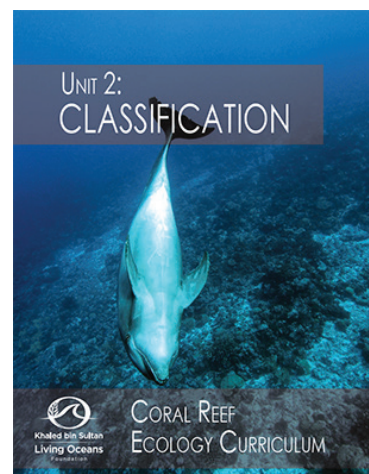
- A lesson on creating and interpreting a cladogram (with traits already included)

[Read It! Troubling Taxonomy](#)

- A worksheet to accompany the [Troubling Taxonomy](#) field blog

[Read It! Blue, You Say?](#)

- A worksheet to accompany the [Blue, You Say?](#) field blog



LESSON 5

TEACHER'S NOTES

AUTHOR

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LEARNING OBJECTIVE

- Construct a cladogram.

KEYWORDS

- Clade
- Cladogram
- Classification

MATERIALS

- Internet and/or library
- Watch It! Naming Nature** student worksheet
- Lesson 5: Cladograms 1** or **Cladograms 2** student worksheet

STANDARDS

- CCSS:** RST.9-10.4, 5, 7; RST.11-12.4
- NGSS:** HS-LS4-1
- OLP:** 4.B.1, 4.B.2, 5.C.22

PROCEDURE

- Watch *Naming Nature* YouTube video (<https://youtu.be/5h5nSivm1K!>) and answer questions on **Watch It! Naming Nature** student worksheet.
- Teach *Unit 2: Classification - Background Information*.
- There are two worksheet options:
 - Lesson 5: Cladograms 1** student worksheet. This worksheet is more challenging. Students must come up with their own set of shared characters.
 - Lesson 5: Cladograms 2** student worksheet. Students are already provided with shared characters.
- Students will need access to the internet and/or library.
- See *Background Information: Understanding Cladograms* for a procedure on how to make cladograms.





LESSON 5

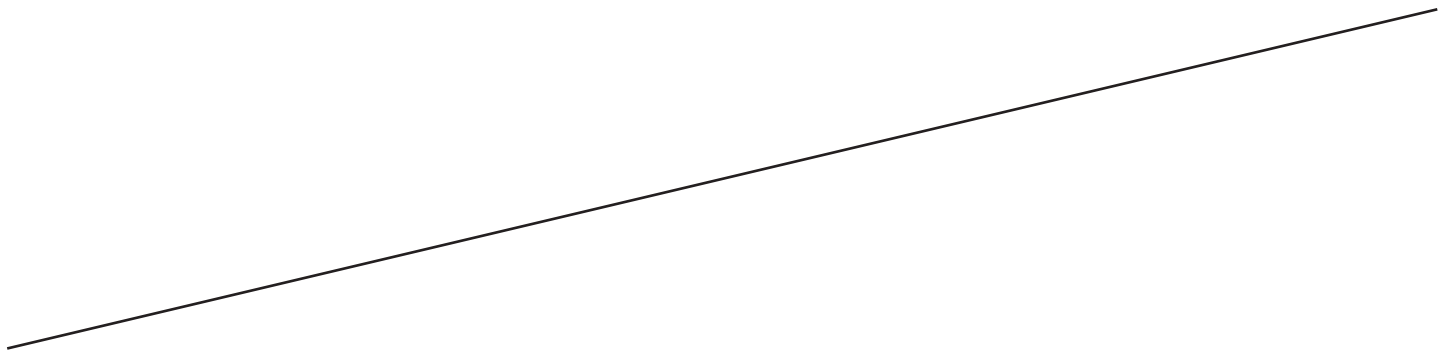
CLADOGRAMS 1

INSTRUCTIONS:

1. Figure out the shared characters of the organisms in the chart.
2. Mark an 'X' in the boxes when the organism shares that characteristic.

Characters	Butterflyfish	Coral	Flatworm	Nudibranch	Sea Star	Sea Turtle	Shark	Sponge

3. Draw a cladogram based on the results from the chart. Make sure to include the organism's name and the shared characters.



LESSON 5

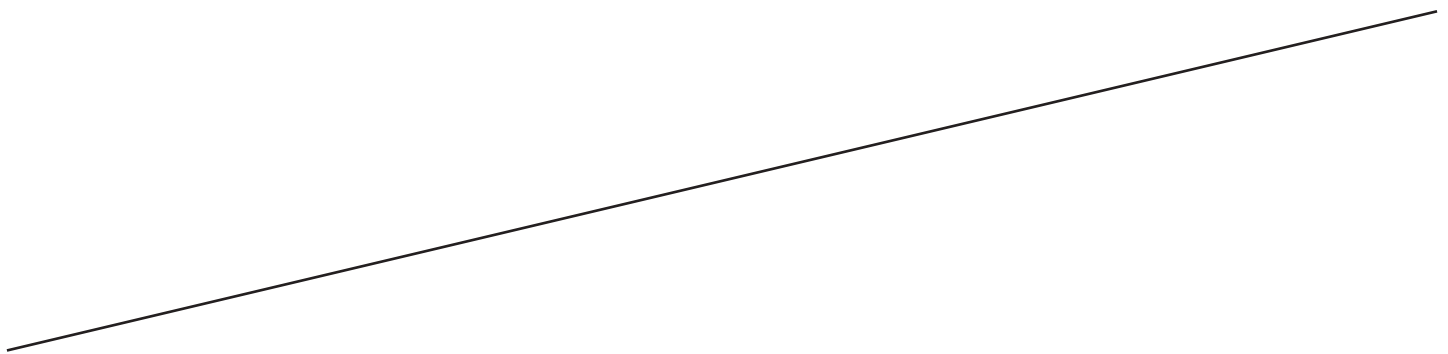
CLADOGRAMS 2

INSTRUCTIONS:

1. Mark an 'X' in the boxes when the organism shares that characteristic.

Characters	Butterflyfish	Coral	Flatworm	Nudibranch	Sea Star	Sea Turtle	Shark	Sponge
Cartilaginous Skeleton								
Deuterostome Development								
Multicellular								
Symmetrical								
Triploblastic								
True Coelom								
Use Gills to Breathe								
Vertebrate								

2. Draw a cladogram based on the results from the chart. Make sure to include the organism's name and the shared characters.



INSTRUCTIONS: Answer the following questions based on the cladogram that you drew.

1. How many traits do sea turtles and sharks have in common? _____
2. What organism evolved before nudibranchs? _____
3. What organism evolved after sea stars? _____
4. In which organism did a true coelom begin to develop? _____
5. Which characteristic evolved first? _____
6. Which organism(s) have a deuterostome? _____
7. Which organism(s) have a true coelom and gills? _____
8. Are corals more closely related to sponges or flatworms? Explain:

9. Are there characteristics that all of these organisms share? If so, which one(s)?

10. Which organisms are most distantly related? _____
11. You discovered a new organism that has these characteristics: multi-cellular, symmetrical, triploblastic, but does not have a true coelom or deuterostome. Where would you place the organism in your cladogram?

12. Describe three pieces of information that you can obtain from a cladogram.

LESSON 5

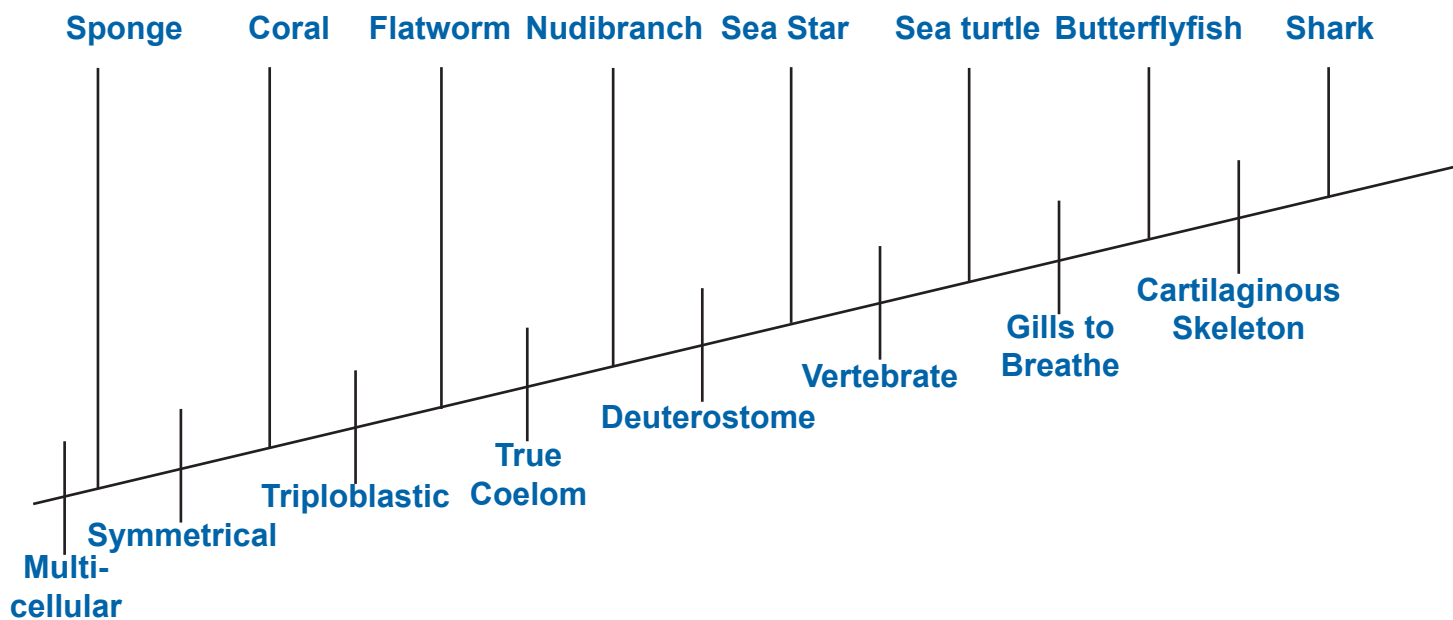
CLADOGRAMS 1 & 2

INSTRUCTIONS:

1. Mark an 'X' in the boxes when the organism shares that characteristic.

Characters	Butterflyfish	Coral	Flatworm	Nudibranch	Sea Star	Sea Turtle	Shark	Sponge
Cartilaginous Skeleton							X	
Deuterostome Development	X				X	X	X	
Multicellular	X	X	X	X	X	X	X	X
Symmetrical	X	X	X	X	X	X	X	
Triploblastic	X		X	X	X	X	X	
True Coelom	X			X	X	X	X	
Use Gills to Breathe	X						X	
Vertebrate	X					X	X	

2. Draw a cladogram based on the results from the chart. Make sure to include the organism's name and the shared characters.



INSTRUCTIONS: Answer the following questions based on the cladogram that you drew.

1. How many traits do sea turtles and sharks have in common? 6
2. What organism evolved before nudibranchs? Flatworm
3. What organism evolved after sea stars? Sea turtle
4. In which organism did a true coelom begin to develop? Nudibranch
5. Which characteristic evolved first? Multicellular
6. Which organism(s) have a deuterostome? Sea star, sea turtle, butterflyfish, shark
7. Which organism(s) have a true coelom and gills? Butterflyfish, shark
8. Are corals more closely related to sponges or flatworms? Explain:
Flatworms because corals and flatworms have two characteristics in common. Sponges and corals only have one characteristic in common
9. Are there characteristics that all of these organisms share? If so, which one(s)?
Yes, all of the organisms are multicellular.
10. Which organisms are most distantly related? Sponges and sharks
11. You discovered a new organism that has these characteristics: multi-cellular, symmetrical, triploblastic, but does not have a true coelom or deuterostome. Where would you place the organism in your cladogram?
This organism would branch from the flatworm because it has the same characteristics as the flatworm
12. Describe three pieces of information that you can obtain from a cladogram.
 - Shared characteristics
 - Probable relationships
 - Probable sequence of origins
 - Number of shared characteristics between organisms
 - Closest evolutionary relationship; furthest evolutionary relationship