Kelp Forest Coevolution: Lesson 2 Teacher Guide & Student Materials
Explore

Objective(s):

- Students will be able to differentiate kelp from plants, using evidence

Teacher Guide:

[5 minutes] Bellringer Question: [Show a picture of kelp on board as a reminder from prior day] Describe kelp to someone who has never heard of it.
Students answer Bellringer question in pairs or in a notebook.
Teacher call on 3-4 students, and call out common phrases/ideas: Listen especially for students saying “plant” (this will be a circle-back point at the end of class).

[24 minutes] Kelp vs Plants Data Dive
Students use the diagrams to answer questions. Can work individually or in groups (do NOT jigsaw).
Teacher circulates to monitor for completion & accuracy. Keep pacing to between 6-8 minutes per piece of evidence (e.g. after 10 minutes, everyone should be about on #4), keeping in mind the last is the longest. Stop to do a class check-in and go over selected answers, if needed.

[20 minutes] Is kelp a plant? CERC
Students write a Claim-Evidence-Reasoning-Counterclaim paragraph to answer the question.
Teacher can either have quiet work time, work with a small group, or circulate. Depending on how experienced the students are, teacher may also do the following:

- Use one of the 2 scaffolded CERC handouts, rather than having students freely write on loose leaf
- Have students discuss each part in groups before writing (e.g. 2 minutes to discuss claim at your table, now 2 minutes to write, etc. for each section. This will take >20 minutes)
- Have students write then show-call specific aspects of each part (e.g. 2 minutes to write claims, project 1 example from a student that is either strong [and why] or weak [and how it could be improved]
- Omit the Counterclaim portion (*Note!* If you have not taught counterclaims before, this is a relatively easy one to start with. *Example: Some people might say kelp* is *a plant because they look similar. However this is false because… etc.*)

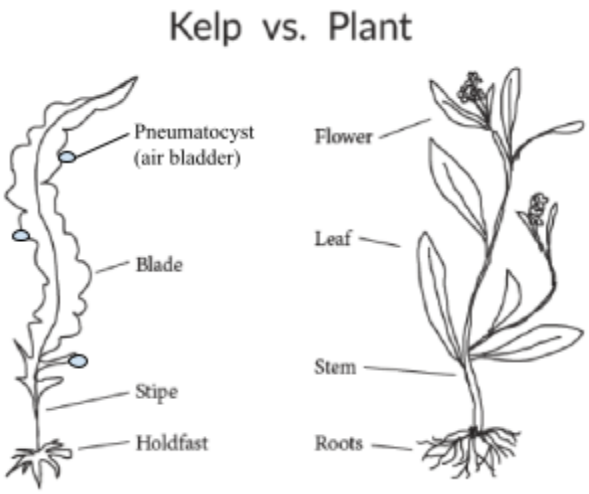
What is Kelp?

Name: _____

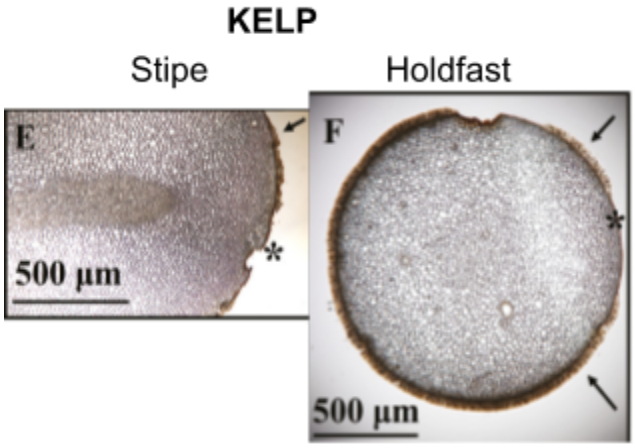
Date: _____ Period: _____

Evidence #1: Kelp vs. Plant Physiology

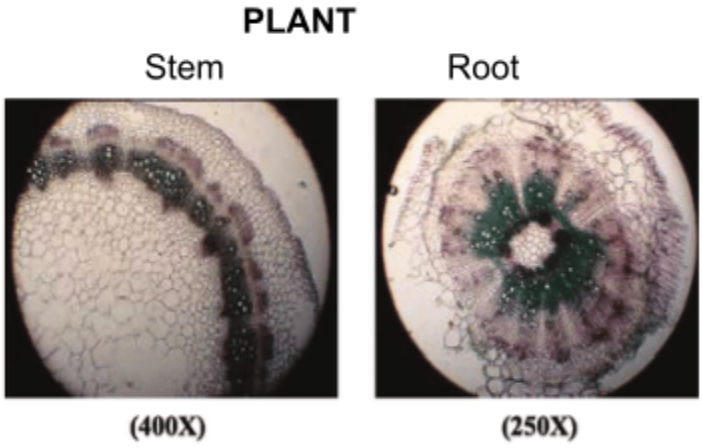
1. What is 1 example of similar structures with similar functions in a kelp and plant? Explain: _____
   _____
   _____
   _____
   _____
2. What is 1 example of a unique structure OR function in either a plant or a kelp? _____ Using what you know about the habitat of this organism, explain why that structure/function might exist:
   _____
   _____



Evidence #2: Kelp vs. Plant Cells



Source: Akita et al., 2016.



Source: Zamani et al., 2012.

3. What do you notice about the cells in a kelp stipe and kelp holdfast? Do they look very similar to each other, or different? _____
4. What about plant cells? Do the plant cells all look similar, or look different? _____
   _____
5. After comparing kelp and plants at the cellular level, which do you think is a more complex organism? Explain: _____
   _____

Evidence #3: Evolutionary Tree of Giant Kelp (*Macrocystis*)

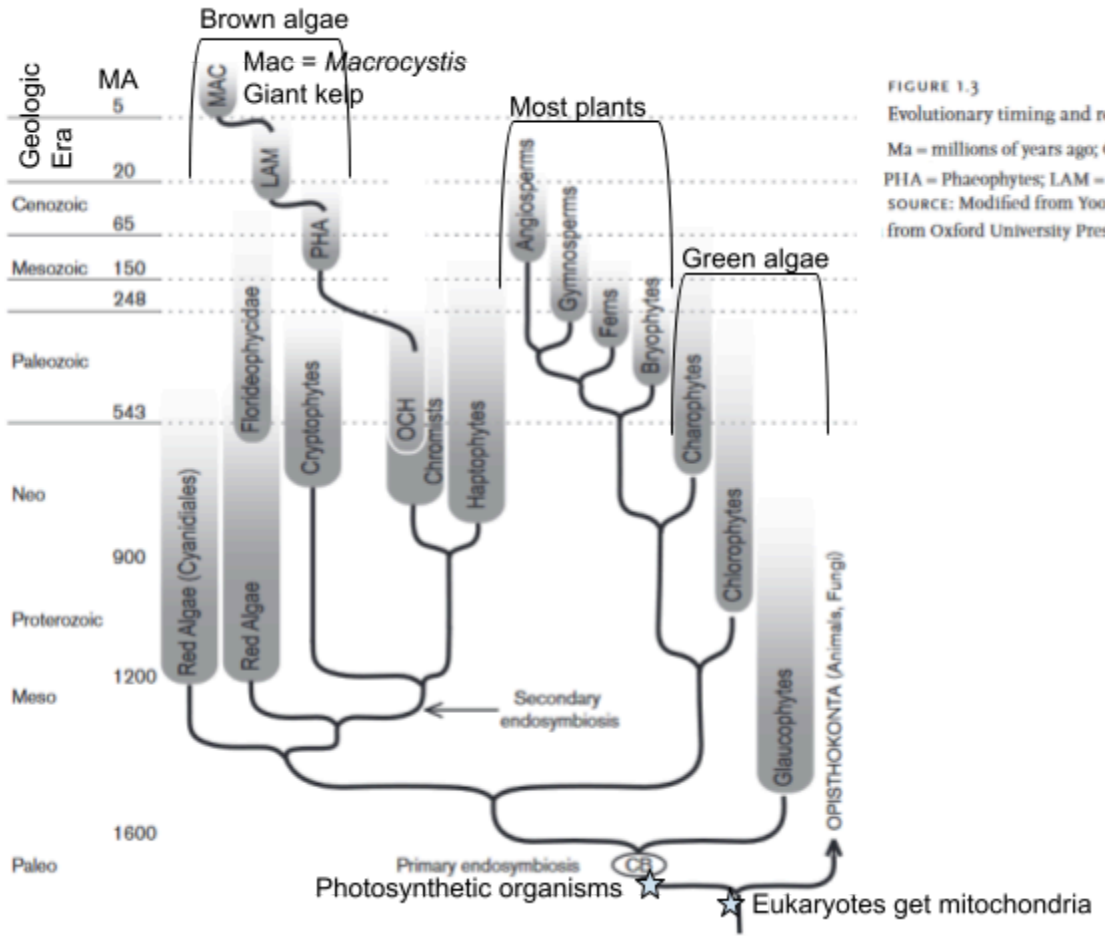


FIGURE 1.3
Evolutionary timing and relationships leading to *Macrocystis*.
Ma = millions of years ago; CB = cyanobacteria; OCH = Ochrophyt
PHA = Phaeophytes; LAM = Lami-nariales; MAC = *Macrocystis*.
SOURCE: Modified from Yoon et al. (2004), reprinted with permiss
from Oxford University Press.

6. Read the key to the right. What does "MA" mean? _____
7. Find "Animals, Fungi" on the tree and underline it. Trace back and find the point where all animals/fungi diverged (separated) from the rest of the species on this tree (*). When did that happen? _____
   So what do all the organisms on the left branch have in common? _____
8. Find "Most plants" on the tree. This includes *angiosperms* (all flowering/fruiting plants), *gymnosperms* (non-fruiting plants like conifers, pine trees, etc.), *ferns*, and *bryophytes* (mosses). During what <u>geologic age</u> did the branch of "common" plants start to evolve? _____
9. How many types of algae can you find? List them: _____
10. Find Giant Kelp and circle it. When did giant kelp start to evolve? _____

Synthesis: CER Paragraph

Now, after examining ALL of the evidence, write a short Claim-Evidence-Reasoning-Counterclaim paragraph to answer: **<u>Is giant kelp a plant?</u>**

- Write your answer on a separate sheet of paper
- Use at least TWO specific pieces of evidence in your "Evidence" portion.
- For a strong counterclaim, use a new piece of evidence to <u>refute</u> the wrong claim.

Now, after examining ALL of the evidence, write a CERC paragraph to answer:

<u>Is giant kelp a plant?</u>

Make sure that your paragraph includes at least TWO specific pieces of evidence!!

Claim: _____

_____

_____

Evidence: _____

_____

_____

_____

_____

_____

Reasoning: _____

_____

_____

_____

_____

_____

_____

_____

_____

Counterclaim: _____

_____

_____

_____

_____

_____

Now, after examining ALL of the evidence, write a CERC paragraph to answer:

Is giant kelp a plant?

Write your work in complete sentences!

Claim: Answers the question	
Evidence: Use at least 2 specific pieces of evidence from class today	One piece of evidence was…. This shows that… Another piece of evidence was… This shows that….
Reasoning: Explains why your evidence supports your claim.	
Counterclaim: Give one alternative answer to the question, and explain why it is WRONG.	Some people might say that… However this is wrong because…