

Name: _____

Evolution of Barbellus

Purpose: students will demonstrate that they understand how to create an evolutionary tree using fossil evidence and to hypothesize (using the language of natural selection) the steps in the evolution of these imaginary organisms.

Materials:

- Handout of Barbellus species
- Scissors
- Large sheet of construction paper
- Tape
- A sticky note per group
- white lined paper (1 sheet)

Background:

Evolution may be defined as “changes in organisms over time.” Some evidence for these changes comes from fossils. By comparing living things of the past (fossils) with organisms living today, we can see that there have been major changes that have taken place over long periods of time.

There are many organisms that lived in the past that no longer exist today.

Most fossils are found in sedimentary rock. Organisms that are trapped in mud and sand remain there after the mud has turned to rock over millions of years. Over time, the strata of rock build up higher and higher as new mud and silt is laid down. The organisms that are trapped can be dated if we know the age of the rocks in which they are found. Of course earthquakes and other movements of the earth can disrupt the “picture” we have of the strata.

The information we get from fossils is not always complete because not all organisms form fossils. The conditions have to be just right. Some transition organisms might be missing and we have to hypothesize what they might have looked like and hope that someday we will find fossil evidence to support our hypothesis.

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The diagram below shows where these Barbellus species were found in exposed layers of rock along a stream. Your task is to try and build an evolutionary tree showing these species and then write a paragraph explaining how the evolution of these species might have happened.

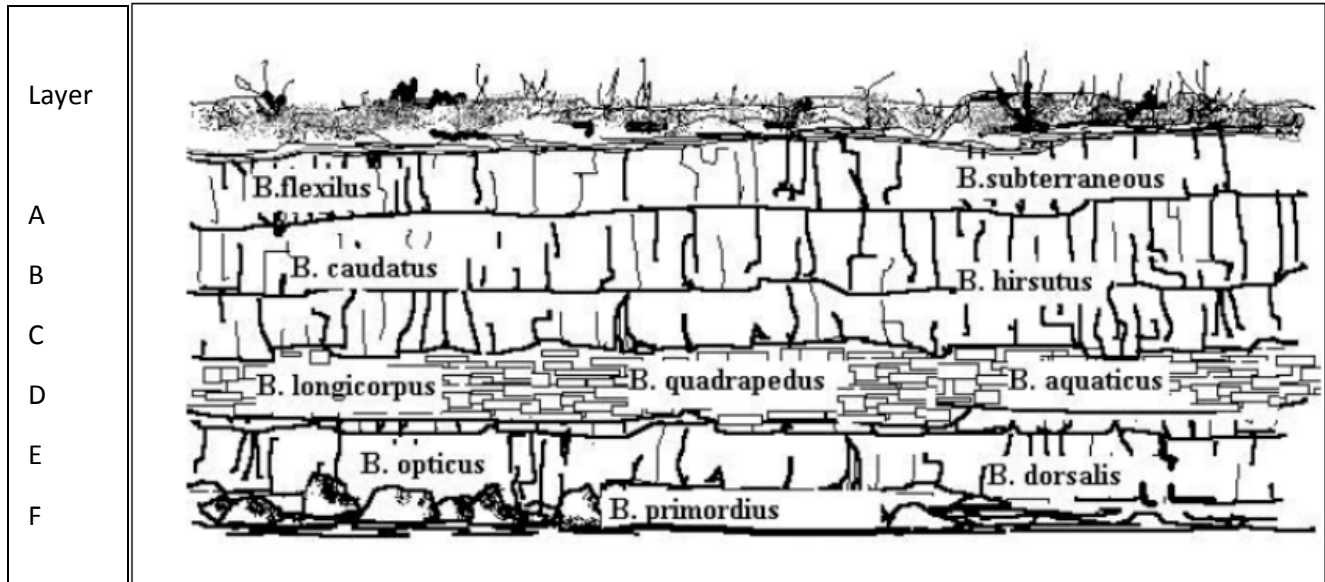


Diagram of fossil locations in strata.

Procedure:

A. Before you begin the activity, answer the following questions:

- What is a genus?
- What is a species?
- What is the importance of variation in a population of organisms? (p 397-399)
- Which fossil layer (A-F) is the oldest? Explain your answer.

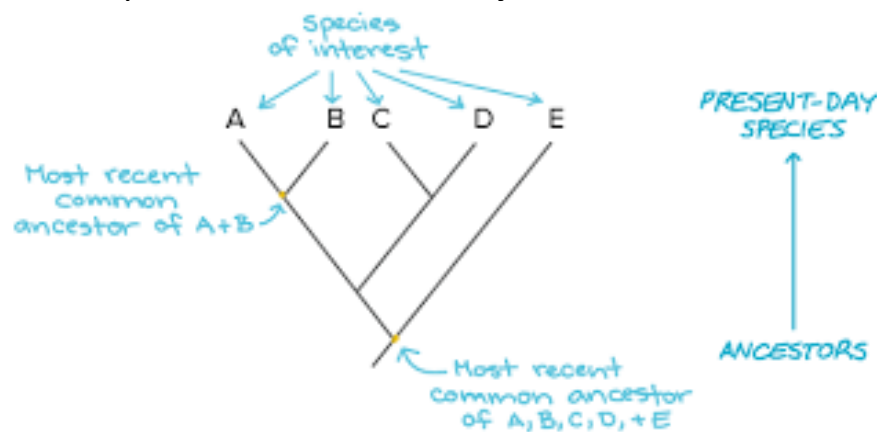
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- e. Explain the difference between the word “ancestor” and the word “descendant.”
- f. What is the role of the environment in evolution by natural selection? (397-399)

B. Once you have finished the questions, in paired groups, one student should cut out the pictures of the Barbellus species. **Be sure to cut on the straight lines so that the names of the species stay with the pictures.** The next student can begin procedure “C”.

C. Using the diagram above to determine the relative age of the fossils AND the similarity of features, create an evolutionary tree of the Barbellus Family (Oldest=B. primordius on the bottom). Arrange your Barbellus pictures so that they are in the correct **strata**. You should carefully position them so that they are above their **inferred ancestors**. This is the part of the procedure where you have to do some thinking. Your tree will probably have branches. But you should use what you know about slow changes over time to connect ancestors to the most likely **descendants**. **When you think you have a good arrangement, ask your teacher to look at it.**

D. When you are both satisfied, tape your pictures in place and draw the connecting lines so that you have an **evolutionary tree**.



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E. Now, look at your connections. Find a connection between an **ancestor** and a **descendant** where you think there are so many differences that there must be an **intermediate organism** that has not been found yet. Draw this organism (a “missing link”) on your post-it note and place it on your poster

F. Finish the poster, the questions, the write-up and you are finished!

Discussion Questions

1. Select two species of *Barbellus* that you have decided are closely related. Give a hypothesis that explains the differences in adaptations.
2. Explain how mutations in DNA account for the differences in the physical characteristics of the various species of *Barbellus*.
3. During the poster activity you found a place where there is a “**missing link**” in your evolutionary tree. In other words, the part of your poster between two fossils that you connected where you think there might be an **intermediary form**. You drew an illustration of what that intermediary form would look like and placed the post-it on your poster in the correct place.
***Explain here, why you made the prediction that you did.**

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4. Explain the evolution of the Barbellus from the oldest (B. primordius) to most current descendant. Be sure to include the observed physical changes (**adaptations**) and your explanation of how these changes evolved. You should use words such as “**mutation**”, “**selection**,” “**adaptation**,” “**extinction**,” etc. Be sure to include an explanation of how environmental changes led to the evolution of the different species. Be very careful not to use language such as “Barbellus hirsutus grew legs so he could walk on land” or “Barbellus opticus wanted to see better so he grew bigger eyes.” You need to explain evolution in terms of environmental changes, natural variation in populations, adaptations, mutations, and natural selection.