

WHALE ANKLES AND DNA

SYNOPSIS

Students follow the Becoming Whales lesson with a look at more recent data (ankles and DNA) to see if their findings (and predictions based on those findings) are confirmed and sharpened. Students compare early whale ankle bones with similar ankle bones in other animals. They then compare sample strands of DNA from a protein found in suspected relatives to arrive at a conclusion about the closest living relative of whales today.

MAIN CONCEPT

Multiple lines of evidence that point consistently to the same conclusions serve to strengthen those conclusions.

ASSOCIATED CONCEPTS

Degrees of similarity of structure reflect actual degrees of relationship

DNA can be used effectively to assess biological relationships

ASSESSABLE OBJECTIVES Students will be able to...

1. distinguish ankle bones of related individuals from more distantly related individuals
2. compare DNA segments of a gene in different animals, count their differences, and conclude which are most closely related and those more distantly related.
3. recognize the significance of different lines of evidence pointing to the same conclusions.

MATERIALS

Teacher instructions (this lesson)

DNA Results Table for the overhead (to record results from teams for class to see and compare)

Key for the DNA Results Table for the overhead (let us know if any errors)

DNA Discussion Key (email webmaster for this, using your school email address, school name, city & state)

Whale DNA Activity Strips (to copy and cut apart strips, place all 11 from a sheet into its envelope, or have a lab assistant do this. Make up enough sets (envelopes) so that each team of 2-4 has a set.

For first time use, you could provide scissors and have students cut them apart, if there is class time.

TIME

Probably about 1 45 minute period for discussing the Ankles assignment, and doing the DNA assignment.

STUDENT HANDOUTS

Whale Ankles Activity sheet

Whale DNA Activity sheet

Envelopes with 11 DNA strips (one set per team)

Whale DNA Discussion sheet (both sides)

TEACHING STRATEGIES & PREPARATION

A. Do the "Becoming Whales" lesson.

B. Suggested sequence for these two activities:

1. After completing the "Becoming Whales" lesson, hand out the Whale Ankles Activity for homework.
2. Next day, discuss the conclusions from the Ankles activity, then hand out the Whale DNA Activity, along with the envelopes, each containing the 11 strips of DNA to be compared to each other (cut apart). Students, working in teams of 2-4 align the DNA strips (as suggested), 2 at a time, and count the number of nucleotides (letters) that differ between the two strips. Record in the proper space on the grid.

3. DNA Discussion. Student teams discuss and complete the DNA Discussion page (2-sides).

4. Class: Teams share their results with the class, and note that they come up with essentially similar "Family Trees" (phylogenies). This consensus strengthens the reliability that the data reflect real relationships.

You may want to show the key on the overhead, for kids to compare with theirs, or possibly collect discussions (or one per team) to grade, using the key for checking purposes. Please allow for reasonable variations reflecting slight differences in nucleotide counts. If you find that there is total (or major) agreement on numbers that differ with the KEY, please let us know (email the WEBMASTER) with that information.

5. Extension: Culminating information, and a suggestion for further (or individual) comparisons with other genes.

6. Reflection: Be sure students review the different lines of evidence pointing to the most likely relatives of whales: fossils (including hooves on toes), ankles, DNA.

PROCEDURES

Students follow procedures on the handout sheets.

ASSESSMENT

Observe participation of team members during the lesson.

Prepare questions for a summative test based on the main concepts developed during the experience. If you make a good one, please share with us (webmaster) so that we can share with other teachers.

BETA TEST: This is a beta version of this lesson, not used in classrooms yet. We would appreciate any and all feedback, with your constructive suggestions, its effectiveness, and its engaging qualities (i.e., did the kids enjoy it?)