Whale Family Clues

Use fossils and living traits to trace evolutionary relationships.

ZOO.1.3 "Recognize that the classification of living organisms is based on their evolutionary history and/or similarities in fossils and living organisms."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline two fossil clues that link whales to land mammals, and circle two clues from living animals. Put an X beside the sentence that explains why whale and shark body shape is weak evidence of close ancestry.

Where Do Whales Belong?

1. At a museum, a whale skeleton can look like a puzzle. Its front flippers contain the same basic arrangement of upper arm, forearm, wrist, and finger bones found in land mammals. Living whales also breathe air and nurse their young. Sharks have fins and streamlined bodies, but they are fish, not mammals. Whales and sharks move through water in similar ways, so natural selection can favor similar body shapes in both groups. Scientists do not classify animals by overall appearance alone. They look for inherited traits that may point to a shared ancestor.

2. Fossils add evidence that living animals cannot provide. Pakicetus, an early whale relative, lived on land and had an ankle bone with a distinctive double-pulley shape also found in even-toed hoofed mammals. Later whale fossils, including Ambulocetus, show features suited to life both in water and on land. Basilosaurus, a fully aquatic ancient whale, had tiny hind limbs that could not support its weight on land. Together, these fossils show changes within a whale lineage rather than a sudden jump from a land animal to a modern whale. The ankle is especially useful because it links early whale relatives with a larger mammal group.

3. Among living animals that are not whales, genetic comparisons place hippos closer to whales than any other group. This does not mean whales descended from modern hippos. Instead, whales and hippos inherited DNA from a common ancestor that lived long ago. Fossils of early whales help explain why an aquatic animal belongs near hoofed mammals on an evolutionary tree, while DNA helps test that placement. The shared body shape of a whale and a shark reflects similar challenges of swimming, not a recent common ancestor. Classification works best when scientists compare several clues and ask whether each similarity is inherited or developed independently.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does the ankle bone of Pakicetus help scientists place early whale relatives in a larger mammal group?

2. What do the tiny hind limbs of Basilosaurus suggest about the history of whales?

3. Which living group is closest to whales outside the whale group, and what evidence supports that placement?

4. Why is a whale's streamlined shape not enough to classify it with sharks?

3 YOUR TURN

Your own words

A fossil called Mudstep has a forked ankle and three-ridged molars like living hill runners, but a flattened tail like living pond paddlers. In 3 to 4 sentences, propose which group shares a more recent common ancestor with Mudstep and explain why the tail alone is weaker evidence.

ANSWER KEY

Whale Family Clues

HIGH SCHOOL · ZOO.1.3

PART 1 · READ AND MARK

Underline two fossil clues that link whales to land mammals, and circle two clues from living animals. Put an X beside the sentence that explains why whale and shark body shape is weak evidence of close ancestry. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does the ankle bone of Pakicetus help scientists place early whale relatives in a larger mammal group?	**Its distinctive double-pulley ankle shape is also found in even-toed hoofed mammals, suggesting an evolutionary link.**
2	What do the tiny hind limbs of Basilosaurus suggest about the history of whales?	**They are evidence that the whale lineage changed from land-dwelling ancestors, even though Basilosaurus could not use those limbs to walk on land.**
3	Which living group is closest to whales outside the whale group, and what evidence supports that placement?	**Hippos are the closest living nonwhale group, according to genetic comparisons.**
4	Why is a whale's streamlined shape not enough to classify it with sharks?	**Similar swimming challenges can favor similar shapes in unrelated groups. Whales are mammals, while sharks are fish.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Mudstep likely shares a more recent common ancestor with hill runners. Its forked ankle and three-ridged molars give two clues that support this relationship. A flattened tail alone is weaker evidence because Mudstep and pond paddlers could have developed similar tails for moving through water.

Accept a different conclusion in Part 3 only if the student uses the stated traits to make a clear evolutionary argument and explains why one shared trait may be misleading.