Bones Beneath Waves

Use fossil evidence to trace ancestry, adaptation, and extinction.

ESS.3.8 "Analyze and interpret the record of shared ancestry, evolution, and extinction as related to natural selection using fossils."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each mention of a shared trait, circle evidence of a change over time, and number the three fossils from oldest to youngest in the table. Use your marks to separate what the fossils support from what they cannot prove.

From Shore to Sea

1. Imagine a shoreline 50 million years ago and a mammal that looks nothing like a whale. Its fossils contain a thickened ear bone also found in later whale relatives. The table tracks three fossil mammals from rock layers of different ages. Their limbs and ear bones offer clues about relationships and changing ways of moving.

FOSSILS OF EARLY WHALE RELATIVES

Fossil	Approximate age	Limbs and body	Ear bone
Pakicetus	50 million years old	Limbs suited to walking on land	Thickened
Ambulocetus	48 million years old	Strong limbs used on land and in water	Thickened
Basilosaurus	40 million years old	Tiny hind limbs and an elongated body	Thickened

2. A shared, unusual ear bone supports the idea that these animals inherited it from a common ancestor. Changes in limb size across the fossils suggest that whale relatives became better suited to swimming. Natural selection could favor traits that helped animals find food and survive in water. Fossils alone cannot show that one listed species descended from another.

3. Basilosaurus is extinct, but whales still live today on other branches of the whale family tree. Its last known fossil does not show why its species died out. Gaps in the fossil record mean new finds could change parts of this history. Even so, shared ear bones and changes in limbs support an evolutionary link.

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare the oldest and youngest fossils in the table. What change in movement do their bodies suggest?

2. What fossil trait supports shared ancestry among all three animals, and why?

3. How could natural selection help explain the limb changes shown in the table? Use evidence from two fossils.

4. What does the passage tell you about Basilosaurus and extinction? What can its fossils not tell you?

3 YOUR TURN

Your own words

Imagine a newly found 44-million-year-old fossil with a thickened ear bone, medium-sized hind limbs, and flattened tail vertebrae. In three or four sentences, place it among the table fossils, explain what its traits suggest about ancestry and natural selection, and state one limit of this evidence.

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PART 1 · READ AND MARK

Underline each mention of a shared trait, circle evidence of a change over time, and number the three fossils from oldest to youngest in the table. Use your marks to separate what the fossils support from what they cannot prove. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare the oldest and youngest fossils in the table. What change in movement do their bodies suggest?	**Pakicetus had limbs suited to walking on land, while Basilosaurus had tiny hind limbs and an elongated body. The evidence suggests a shift toward swimming.**
2	What fossil trait supports shared ancestry among all three animals, and why?	**All three had a thickened ear bone. This unusual shared trait supports inheritance from a common ancestor.**
3	How could natural selection help explain the limb changes shown in the table? Use evidence from two fossils.	**Ambulocetus had strong limbs used on land and in water, while later Basilosaurus had tiny hind limbs. Traits that improved survival in water could have become more common through natural selection.**
4	What does the passage tell you about Basilosaurus and extinction? What can its fossils not tell you?	**Basilosaurus is extinct, although whales survive on other branches. Its fossils do not show why its species died out.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The new fossil belongs between Ambulocetus and Basilosaurus by age. Its thickened ear bone supports shared ancestry with the listed whale relatives. Its limbs and tail vertebrae suggest that swimming was important, so natural selection may have favored traits useful in water. The fossils cannot prove that this species was a direct ancestor of Basilosaurus.

Accept other evidence-based descriptions of the shift toward swimming. Students should treat natural selection as a supported explanation, not something the fossils prove directly.