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## Marine Biodiversity Activity Worksheet – Whale Evolution

*Instructions: Complete parts one, two, and three to demonstrate your knowledge on how fossil evidence determines the relationships of whale ancestors and their descendants. You will submit your completed worksheet. Be sure to include all three parts with your submission.*

(30 points possible)

**Introduction** [1 SEP] The evolution of whales may seem like a mystery. How did a large mammal come to live entirely in water, while other mammals evolved on land? Science holds the key to these questions. The discovery of fossils with transitional features demonstrates how whales transformed from land animals to ocean dwellers.

**Hypothesis** [1 SEP] How does fossil evidence determine the relationships of whale ancestors and their descendants?

**Since fossils are the remains of past organisms and show their traces, it can be shown what happened during their time (through the characteristics of the fossils).**

### Part One (12 points, 2 points each)

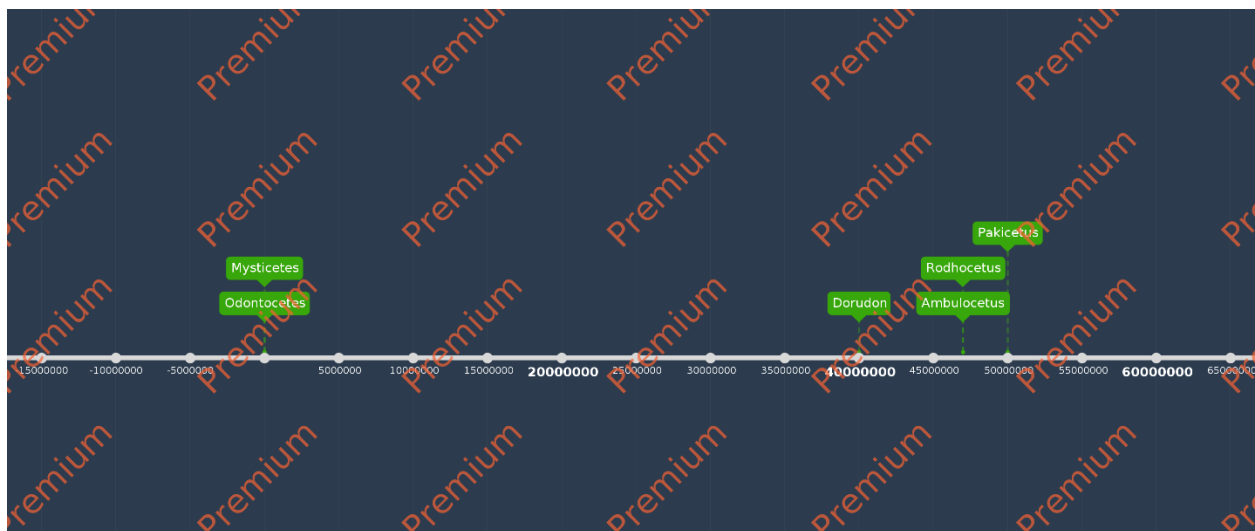
Write a short summary in your own words about each of these animals. The first four are whale ancestors, and the last two are modern whales. Note any major changes or adaptations, or interesting information from the fossil record. Each summary should be three to five sentences. You may research this information using reliable journals, books, or websites. **You can review reliable sources if needed. Be sure to note any sources you use.**

- **Pakicetus** – They lived along the margins of the Tethys Sea. This species existed during the Early Eocene Period and had an appetite for fish. They were adapted to live only on land, not water (according to the fossils found in 2001).<sup>1</sup>
- **Ambulocetus** – Existed during the Early Eocene Period, they were approximately 10 feet long and weighed over 500 pounds (heavier than Hulk). Remains of the species were first discovered in 1993, and they showed that they were capable of living in any type of body of water. Ambulocetus is another name for “walking whale.”<sup>2</sup>
- **Rodhocetus** – Just like the other species, they also existed during the Early Eocene Period. Discovered in the early 90s, they were given the name Rodhocetus, which also means “Rodho whale.” Based off of the discovered remains, it appears that they were adaptable to both water and land and spent their time in both places.<sup>3</sup>

- **Dorudon** – This species existed during the Late Eocene Period, around 41 to 33 million years ago. Remains were first discovered during the 1800s and were given the name Dorudon, which also means “spear-toothed.” They had a special feature of being able to “echo-locate.” This means that they could not use soundwaves to figure out where everything is, like whales today can do.<sup>4</sup>
- **Odontocetes** – Also known as the toothed whale, this species consists of mammals such as dolphins. Remains of this species were found in 1979. They have really good hearing, to the extent in which they can survive while being blind.<sup>5</sup>
- **Mysticetes** – Also known as the baleen whale, this species has some interesting adaptations. They lack teeth, however use baleen to filter the food they are consuming. They are also able to conserve oxygen while underwater, and have a slower heart while diving,<sup>6</sup>

## Part Two (6 points)

Create a timeline to show when each of these animals lived. You may create this by hand and submit a scanned or photographed copy, or you may use your choice of software to create it. All work must be original and show your name on it.



\*\*\*I couldn't exactly get my name directly on it, they didn't have a direct feature for that.

## Part Three (12 points, 2 points each)

Answer the conclusion questions below.

1. What types of skeletal changes occurred during whale evolution?

- **Larger/thicker bones.**
- **More blubber.**
- **Longer tail.**

2. What change (or transition) in habitat did whales' ancestors make?

**Instead of having habitats on land, their habitats changed to being in the sea.**

3. Which fossil organism in whale evolution do you think was the first to live mostly in water? Explain your claim with evidence and reasoning.

**I think that the first evolution to do this were the Ambulocetus species. Through observations of the discovered remains, adaptations were found that seem to show that the species was transitioning from one type to another (such as land to aquatic). Adaptations that were found include feet suitable for swimming, and longer back limbs.**

4. Explain the changes in the skeletons during the transition in habitat according to the theory of natural selection.

**As shown in the found fossils, whales at once were adapted to land. Eventually that changed to the water. During this "transitional" period, their skeletons would have had to change to adapt to these changes (going from land to water).**

5. What are the similarities and differences between the whale fossils?

- **They were different because the earlier ones had feet that were suitable to walk on land with, unlike them later being for the water.**
- **The earlier ones also had teeth, which they eventually lost over time.**
- **They are similar because of features like a curved back.**

6. How does fossil evidence determine the relationships of whale ancestors and their descendants?

**Since fossils are the remains of past organisms and show their traces, it can be shown what happened during their time (through the characteristics of the fossils).**

### Submission Checklist:

- ☐ ~~Part One: Three to five sentence summary included for each of the six animals~~
- ☐ ~~Summaries are in my own words~~
- ☐ ~~Summaries include information about adaptations when appropriate~~
- ☐ ~~Part Two: Timeline shows accurate dates and is labeled with all six animals~~
- ☐ ~~Timeline is my own original work~~
- ☐ ~~Part Three: Conclusion questions are answered in complete sentences and my own words~~