

Exercise: Read the article, “Marine Mammals as Ecosystem Sentinels,” based on a passage from a peer-reviewed journal article “Marine Mammals as Ecosystem Sentinels” (Moore, 2008) describing the gray whale as a sentinel species. Students complete the worksheet after reading the article.

Discuss as a group the evidence provided and propose a possible scientific hypothesis for the evidence. Match the evidence provided with the scientific interpretation of the evidence, as published in the referenced article and summarized in the student version of the article. The students are required to synthesize the data and observations noted in the article and recognize these as evidence. The students are also required to identify the scientific interpretation from the article summary. (Alternatively, students are given a list of evidence and interpretations and must match them correctly.)

Gallery Walk Unit 4

Instructor creates four stations around the room and divides the students into groups of 5–6. Each station will consist of a large, blank sheet of butcher or plain paper in a poster size, and a set of large markers. The stations should be positioned along the walls or on flat tables large enough for all group members to gather around to write on the poster paper, view poster content and discuss. For larger classes, have students divide into two or more major groups, so that each gallery walk has a maximum of 24 students, as groups larger than four discourage equal participation among members.

For classes larger than 48 students, consider assigning larger groups of students 2–3 concepts that they must investigate or review, and have each group prepare a summary, ready to report orally to the rest of the class. The groups would work at tables and skip the posters placed on the walls. Then each group is “called upon” to report out one concept, evidence and interpretation to the rest of the course, rotating through each of the four large groups/concepts one at a time.

Each group is assigned a blank poster and given a card with the scientific study they are to be assigned. Each assigned reference is one of the citations in the passage from the article. Alternatively, the cards can be a summary of the topic, concept or evidence they are tasked to find. For example, for the station that summarizes information on the southbound migration, students would receive a card with the words “Southbound Migration” written on it. After students create a title for the station based on the topic of the card, the students then fill in their poster at station one with the correct information to match their assigned reference. The four stations will each have a unique concept from the article.

Group Rotations — Review for Instructors (Note that a printable page of instructions for students, to be placed at each poster, follows this review).

Part 1: Change in Distribution and/or Behavior of Gray Whale. Students create a title for the poster (concept) and list the evidence for this concept.

After 8 minutes, students switch stations as a group and fill in Part 2 at the next poster.

Part 2: Propose a scientific reason for the concept noted at the last station, related to climate change, or interpretation for this noted evidence.

After 8 minutes, students switch stations as a group and fill in Part 3 at the next poster.

Part 3: Categorize the evidence and interpretation as to which part of the Gray Whale Life Cycle is most affected, feeding (wintering grounds), breeding (summering grounds), or migration route.

After 8 minutes, students switch stations as a group and fill in Part 4 at the next poster.

Part 4: Agree or disagree with evidence and interpretation. List supporting facts, details from the data described in the article.

After 8 minutes, proceed to Discussion/Wrap Up.

STATION ROTATION INSTRUCTIONS

For this activity, you will complete six rotations. The instructions for tasks to be completed at each station are noted below.

Rotation 1 – Change in Distribution and/or Behavior of Gray Whale

1) Create a title for the poster (concept). Number your poster with the scientific study you were assigned, #1 through #4.

2) List the evidence for this scientific study provided in the “Marine Mammals As Ecosystem Sentinels” article. It should be summarized in the homework you completed before class.

Rotation 2 – Interpretation Related to Climate Change

1) Propose a scientific reason for the scientific study provided to you in the last rotation. This reason should be related to climate change, or interpretation for this noted evidence. This information is summarized in the article, “Marine Mammals As Ecosystem Sentinels.”

Rotation 3 – Life Cycle Affected

1) Categorize the evidence and interpretation as to which part of the Gray Whale Life Cycle is most affected, feeding (wintering grounds), breeding (summering grounds), or migration route.

Rotation 4 – Review Evidence and Interpretation

- 1) Review the posts provided by the first three rotations.
- 2) Agree or disagree with the evidence and interpretation.
- 3) Note any changes in writing on the poster. Include comments, additional facts or evidence, or alternative interpretations.

Oral Presentation:

After students have visited each of the four stations, they return to their original stations as a group and present summary to class orally, stating the Change in Distribution and/or Behavior of Gray Whale (Evidence) and the accompanying Change in Environmental Conditions (Interpretation).

Summary of Activity/Quick Write:

List three behavioral changes observed in gray whale populations and the appropriate environmental conditions that could have contributed to these observations. Do you agree that gray whales can be termed “ecosystem sentinels”? Do you think scientists should study large animals such as whales in relation to climate change research?

Summary of Information for Stations, Evidence, Interpretation

Station Number	Evidence	Interpretation
1	One-week delay in southbound migration	Response to late 1970s regime shift in the North Pacific
2	Reduction in calf numbers and changes in timing of occupation of breeding lagoons by gray whales	Response to 1997–1998 El Nino perturbation of the North Pacific ecosystem
3	Gray whales feeding year-round offshore in Kodiak Island, Alaska	Response to localized prey availability along the migration route

4	Gray whale calls detected in the western Beaufort Sea over the winter of 2003–2004	Response to reduction in sea ice, providing access to Arctic areas over winter
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Summary of Information for Scientific Study, Evidence, Interpretation, Geographic Location, Life Cycle Affected

Scientific Study	List the evidence cited in the article	Evidence Relates to this Change in Environment	Life Cycle Affected
1) Southbound Migration	1 week delay in southbound migration	Regime Shift in North Pacific	Migration
2) Calf Numbers and Lagoon Occupancy	Reduction in calf numbers and changes in timing of occupation of breeding lagoons	1997–98 El Nino perturbation of the North Pacific ecosystem	Breeding
3) Feeding Year Round	Feeding year-round offshore at Kodiak Island	Availability of localized prey along migration route	Feeding
4) Gray Whale Calls	Gray whale calls detected in western Beaufort Sea over winter of 2003–04	Reduction in sea ice, providing access to Arctic areas over winter	Feeding/Wintering Habits