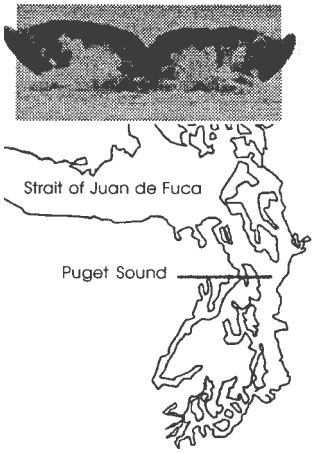
# Researching Gray Whales - March 21

### Key Concepts

l. Individual gray whales can be recognized by natural markings around the dorsal region of the whale.

2. Population information can be derived once individuals are identified.

3. During their migrations, gray whales sometimes enter Puget Sound and other inland waters where they are extensively studied.




## Background

Each year, some migrating gray whales enter Puget Sound and other inland waters. These "side trips" put the whales in close contact with humans. This, of course, is a delight for whale watchers. It is also a boon to cetologists, those scientists who study whales and dolphins. The shared interests of the whale watchers and scientists have sometimes fostered the creation of effective partnerships in which whale watchers provide sighting information and photographs to scientists who catalog and analyze this data. For example, in Washington state, Cascadia Research Collective produced a comprehensive status report entitled "Gray Whales of Washington State: Natural History and Photographic Catalog" based on such collaborative efforts.

Even when gray whales are observed in inland waters, the fleeting time they spend at the surface makes the identification and study of individual whales difficult. Under ideal circumstances both the left and right sides of the whale's back around the dorsal hump and the ventral side of the flukes are photographed. Since gray whales do not always raise their flukes out of the water and observers sometimes only see one side of a whale, the catalog listings are not always complete, a fact which complicates the task of identification.

None-the-less, a great deal has been learned about gray whales. Once thought to strictly travel between breeding grounds along the coast of Baja California, Mexico and feeding grounds in Alaska waters, we now know that some animals return year after year to inland waters such as Puget Sound where they may spend four months or more. Other animals spend the summer off the coasts of Mexico, California, Oregon, and Washington. We also know that many feed as they migrate and have a good idea of their diet.

It seems certain that collaborations between scientists and whale watchers will increase and that they will continue to provide valuable information toward our understanding of gray whales.

## Teaching Hints

"Researching Gray Whales - March 21" continues the story line of a mother and calf gray whale migration while providing your students with an opportunity to use original research data to learn how gray whale research is conducted, as well as some of the findings of that research. The activity is comprised of three parts: "Part 1 - Pausing in Puget Sound" which furthers the story line, "Part 2 - Gray Whale Study" in which students analyze text from a research paper, and "Part 3 - What Was Learned" in which students analyze the graphically presented results of the study.

### Part 1 - Pausing in Puget Sound

Have students read "Pausing in Puget Sound" and answer the three questions by themselves. Then have students gather in pairs or groups of 3-4 to discuss their responses to questions 2 and 3. Have each group prepare a list of what scientists might be interested in learning about gray whales. On left hand side of the list, have each student initial the questions she or he would like to study if the student was a scientist.

### Part 2 - Gray Whale Study

Part 2 includes excerpts from a published scientific paper. Be aware that the reading level may be difficult for some of your students. The interspersed questions are designed to decrease the difficult and highlight pertinent items in the excerpts. Depending on the abilities of your class, you may choose to have students complete "Gray Whale Study" either individually or as a cooperative reading assignment patterned after that used in Part 1. Alternatively, you may wish to have each student read a different section of the article and share the highlights with the group. After students have shared information from the article, the group discusses the study questions. Finally, each student answers the questions herself.

### Part 3 - What Was Learned

Part 3 provides one of the bar graphs from the same scientific paper excerpted in Part 2. Strategies similar to those used in Part 2 are called for in the student analysis of the graphically presented data. Choose the approach that will work best with your class.

## Key Words

**catalog** - a list or record, in this case a collection of the best photographs of each individual gray whale and text regarding those gray whales

**dorsal** - of, or pertaining to, or situated at the back

**flukes** - the triangular shaped tail fin of whales

**inland waters** - in this case, more or less protected bays and inlets connected to the ocean (e.g., Puget Sound)

**knuckles** - in this case, protuberances (bumps) along the back of gray whales

**mottling** - markings characterized by pots or blotches of a different color or shade

**pigmentation** - in this case, coloration of the skin

**photo-identification** - a technique for identifying individual whales by studying characteristic markings recorded on photographs

**scarring** - markings left as a result of the healing of some injury

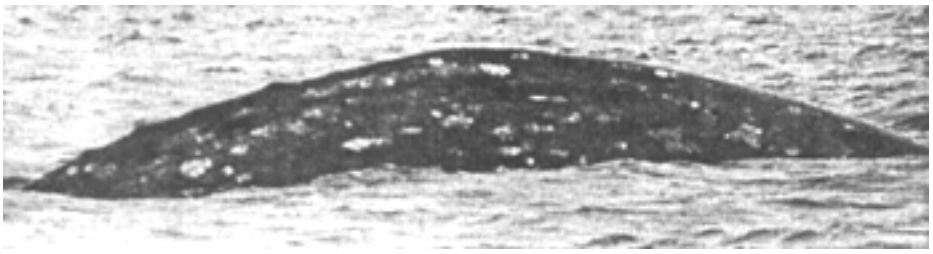
**species** - the basic category of biological classification, composed of related individuals that resemble one another, are able to breed among themselves but not able to breed with members of another species

**stranding** - in this case, a gray whale has died and washed ashore

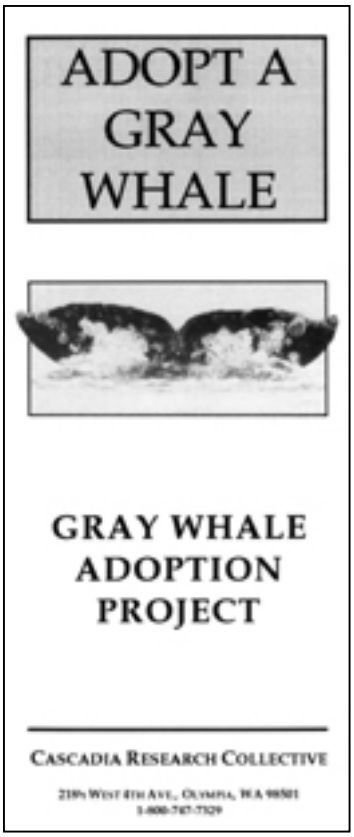
**ventral** - of, or pertaining to, or situated at the belly or abdomen

## Extensions

1. Consider "adopting" a gray whale. For a modest donation, the Cascadia Research Collective Gray Whale Adoption Project provides an annual adoption which includes an adoption certificate, a custom photograph of the whale you have adopted, information and sighting history of that whale, and an annual update on the status of Cascadia's research and new findings on gray whales.



Whale 21 - (name needed)




Like to have a whale named after you or your school? For an additional donation, you can even choose a name for one of the whales now only identified by a number. The project supports Cascadia's research and educational efforts in identifying and tracking gray whales, examining strandings, and providing information on gray whales to the public and students. For more information, contact: Cascadia Research Collective; 218 1/2 W. Fourth Avenue; Olympia, Washington 98501; 1-800-747-7329.

## Answer Key

Part 1 - Pausing in Puget Sound

1. Answers will vary, but most students will be able to define "inland sea" as a bay or inlet connected to the ocean.

2.a. Answers will vary, but may include such topics as: life span, feeding preferences, swimming mechanics, social relationships, population size, diseases, physical features, distribution, timing of migration, how they navigate, how they locate food, and causes of mortality.

2.b., 3. Answers will vary depending upon student preferences and prior knowledge.

Part 2 - Gray Whale Study

1. Scientists used information provided by the public to help determine the arrival and departure dates of whales in inland waters. Using the public essentially increased the "eyes" of the scientists; many people where watching for the whales rather than only a few scientists.

2. Cascadia Research Collective encouraged the public to sent them information by sending letters asking for information to people who live and

work on the water who had reported sightings in previous years. Use of existing hotline telephone numbers also encouraged public participation.

3. The boat surveys were conducted primarily to take identification photographs of whales.

4. The scientists photograph both the left and right sides of the whale's back around the dorsal hump and the ventral side of the flukes when possible. These parts were chosen because they are often visible above the surface of the water.

5. Markings such as pigmentation of the skin, mottling, scarring, and barnacles, which varied between individuals, are useful and a reliable means of identifying gray whales.

6. Answers will vary. Since the question calls for an opinion, accept any reasonable answer. Many things make it difficult to identify a whale using a photograph taken several years earlier, including: fading of scars, additional scarring, changes in barnacle numbers or locations, and changes in pigmentation or mottling.

7. The Northwest Marine Mammal Stranding Network is the organization that coordinates the examination of stranded marine mammals along the northwest coast.

8. A variety of information can be learned from a stranded whale carcass, including a confirmation of the species, length and other external measurements, blubber thickness, sex, and condition. Contaminant analyses of some of tissues can also provide valuable information.

9. Answers will vary but should be an expanded version of what students noted in question 2, Part 1 (i.e., topics as: life span, feeding preferences, swimming mechanics, social relationships, population size, diseases, physical features, distribution, timing of migration, how they navigate, how they locate food, and causes of mortality).

## Part 3 - What Was Learned

1. Photo-identification is used to verify that some of the same whales return from one year to the next.

2.a., b., c. March, April, and May had the highest number of whale sightings.

3.a. Most whales are observed in spring and early summer with the peak in May.

b. The spring and early summer observations are during the northbound portion of the whale migration. Gray whales spend the summer in arctic waters and are, hence, en route.

4. Since ghost shrimp live in the mud and are favorite food for gray whales, it is not too great a leap to think that the trail of mud the gray whales leave behind might be related to feeding.

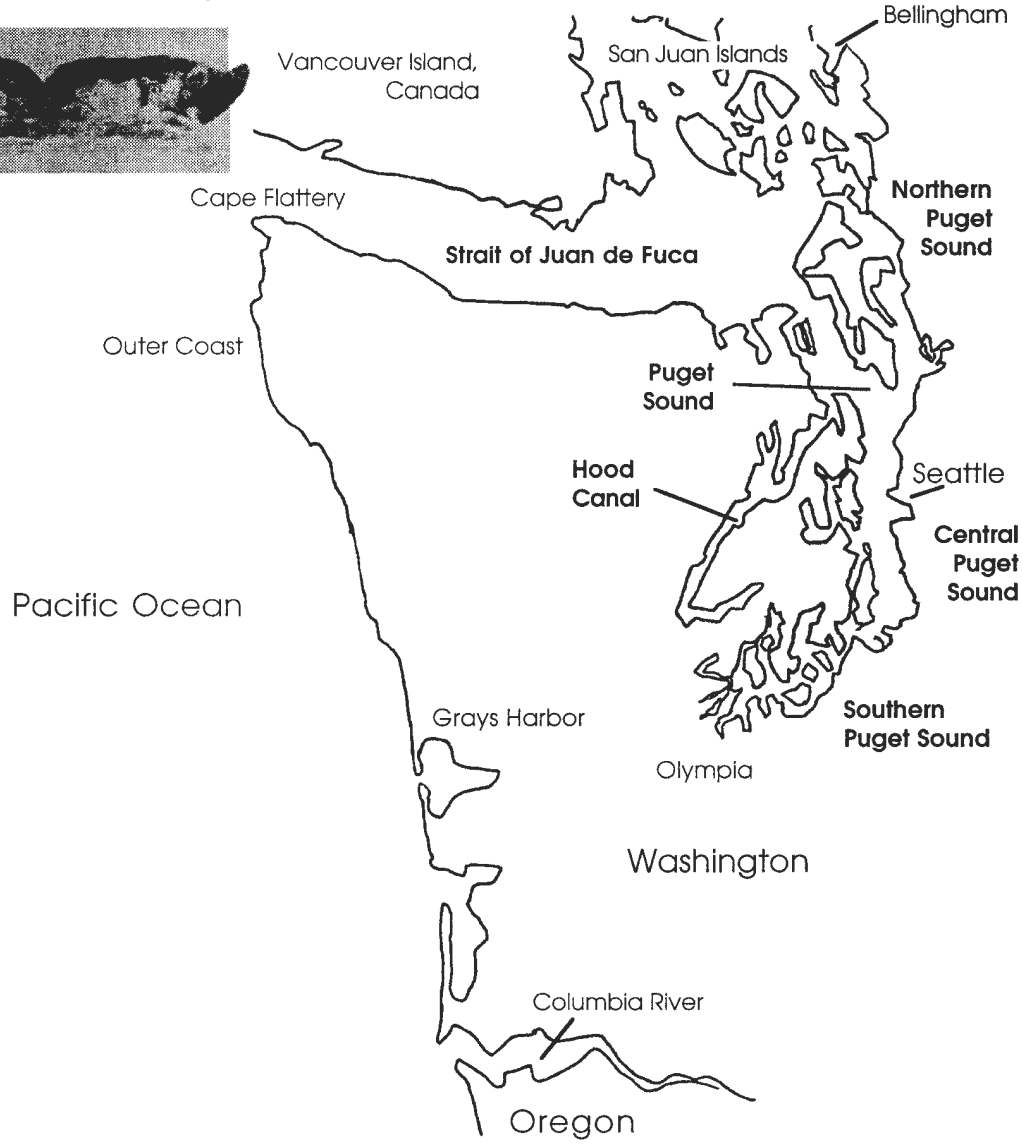
5. A possible answer as to why gray whales might be low on stored food reserves in late spring or early summer is derived from the following facts:

- Gray whales spend the summer months eating vast quantities of food.
- They eat little while on the breeding grounds and, apparently, during open ocean migration.
- The Washington portion of their northern migration is very near the end of the migration.

In short, when whales arrive off Washington in March and April, they have not fed much since the previous summer and are low on stored food reserves.

6. It could be argued that the gray whales are a barometer of the health of the environment; like the proverbial canary send down with coal miners to forewarn of a deterioration of the mine environment. In this sense, we should selfishly be concerned about levels of pollutants in the bodies of gray whales. It can be easily argued that, since all life is part of the whole, we should be concerned for the sake of the whales, as well.

# Researching Gray Whales - March 21




## Part 1 - Pausing in Puget Sound

Rounding the cliffs of Cape Flattery, Washington our whales turn to the east. They swim toward the Strait of Juan de Fuca and the entrance to Puget Sound. Most of the other whales continue to the north. A few remain along the Washington coast. Our whales take a short detour and enter Puget Sound. Each year some gray whales enter this "inland sea".

1. Find Puget Sound on the map above. Why do you think it is called an "inland sea"?

Their appearance in Puget Sound does not go unnoticed. The general public always enjoys their visits. This year several teams of scientists are ready for their arrival. The scientists know that these whales give us a rare chance to study them closely.

2. a. What might scientists be interested in learning about gray whales?

b. If you were a scientist, what questions would you like to be able to answer? (Hint: Make a list of everything you have ever wondered about whales.)

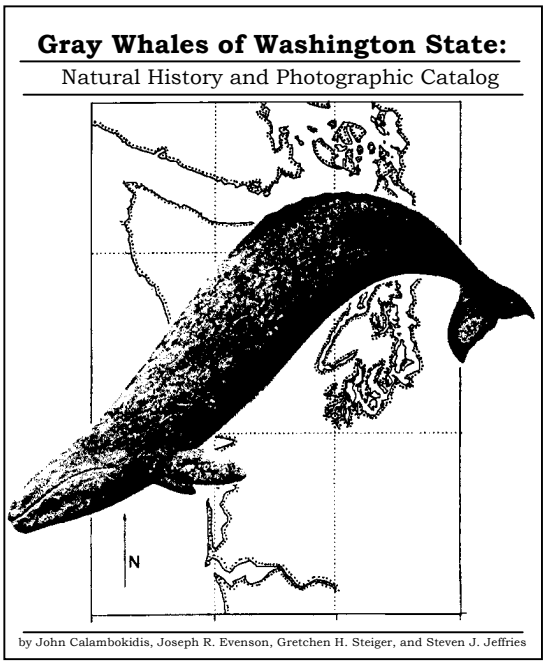
3. Pick one of the questions you raised. How might scientists go about trying to answer it?

## Part 2 - Gray Whale Study

Several groups study gray whales in Puget Sound. One of them is Cascadia Research Collective. *Gray Whales of Washington State* describes some of the ways Cascadia scientists have studied those whales. Use the article to answer the following questions:

# Gray Whales of Washington State*

Research conducted by Cascadia Research Collective, 1984-1994




*excerpted with permission from *Gray Whales of Washington State: Natural History and Photographic Catalog* by John Calambikidis, Joseph R. Everson, Gretchen H. Steiger, and Steven J. Jeffries. 1994. Cascadia Research Collective

Our research on gray whales in Puget Sound began in 1984. Most of the results have come from our photo-identification research that began in 1986 and has been on-going since 1990. The research results reported here focus on the whales that enter the inland waters (Puget Sound, the Strait of Juan de Fuca, and Grays Harbor) or remain along the Washington coast after the northbound migration.

## SIGHTING REPORTS

Sighting reports from the public provide valuable information on the arrival and departure dates of whales in inland waters. We solicited reports of gray whales from the public by posting signs that listed a toll-free telephone number at marinas and boat launches. Before the arrival time of the gray whales in Puget Sound, we sent letters asking for information to people who live and work on the water who had reported sightings in previous years. We also received information from the Whale Hotline of the Whale Museum in Friday Harbor and several reports from the Marine Animal Resource Center (MARC) in Seattle. Sightings reported to the Whale Museum and MARC were compared to those reported to Cascadia to eliminate duplication.

1. How did the scientists take advantage of gray whale sightings by the general public in doing their research?

2. What did they do to encourage the public to send them information?

VESSEL EFFORT

Between 1990 and 1993, we conducted 112 boat surveys between March and September, primarily to take identification photographs of animals . . . Vessel surveys were primarily conducted in areas where gray whales were encountered in previous years or where there were current sightings. The regions surveyed included the Washington outer coast, northern Puget Sound. . .and Southern Puget Sound. . . .The primary vessels used were 14-18 ft inflatable boats. Whale watch boats were used on occasion in Grays Harbor.

3. Why did the researchers conduct boat surveys?

PHOTO-IDENTIFICATION TECHNIQUES

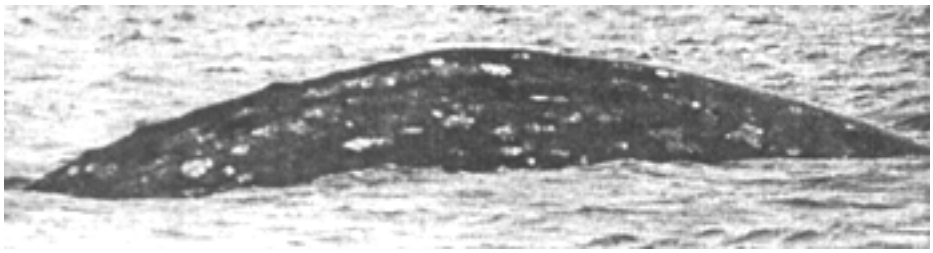
For photographic identification of a gray whale, both the left and right sides of the whale's back around the dorsal hump were photographed (although gray whales do not have a dorsal fin, they do have a dorsal hump which can be used as a reference point). . . We also photographed the ventral side of the flukes for identification when possible, although whales did not always raise their flukes out of the water.

We also took identification photographs of dead gray whales when they were reported to the Northwest Marine Mammal Stranding Network. . .

From the photographs, individuals were distinguished by comparing the natural markings around the dorsal region of the whale. The markings included pigmentation of the skin, mottling, scarring, and barnacles, which varied between individuals. These markings have provided a reliable means of identifying gray whales over long periods . . . We also used a computer program to match the relative distances between the knuckles along the back of the whales to match individuals.

4. What parts of the whale do the scientists photograph for identification purposes? Why did they choose these parts?

5. What kinds of markings are useful in identifying individual whales?



The best photograph of the right and left sides of each whale (for each sighting) was selected from the negatives. . . Photographic prints were compared to whales we had seen in previous years; each new whale was assigned an . . identification number and added to our catalog. Photographs in our catalog included those from the public and other researchers. . .

6. Why do you think is it sometimes difficult to identify a whale using a photograph taken several years earlier?

EXAMINATION OF DEAD GRAY WHALES

The Northwest Marine Mammal Stranding Network is the organization that coordinates the examination of stranded gray whales and other marine mammals. Records of gray whale strandings from 1977 to 1993 that were examined by participants of the stranding network were compiled for this report from our own data as well as . . data reported by other researchers . . .

At a minimum, examinations served to confirm the species and in most cases determine length and other external measurements, blubber thickness, sex, and condition. . . National Marine Fisheries Service has conducted contaminant analyses of some of tissues of gray whales . . .

7. What organization coordinates the examination of stranded marine mammals along the northwest coast?

8. What information can scientists learn from a stranded whale carcass?

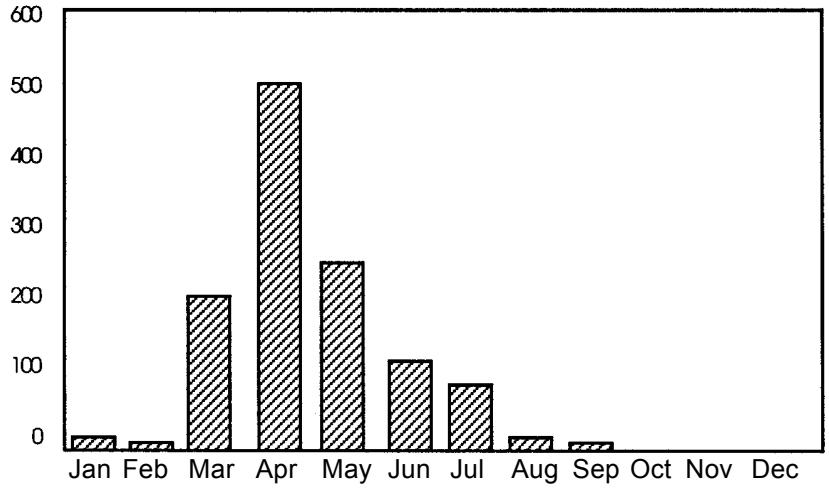
9. Why do you imagine the scientists wanted to identify individual whales entering Puget Sound?

## Part 3 - What Was Learned

These and other studies have been helpful. What has been learned about gray whales in Puget Sound? Lots. Scientists have learned that many of the same gray whales are seen in Puget Sound year after year. The whales often stay in the same area for several weeks at a time. The average length of time a whale stayed was 47 days. Some whales have stayed as long as 3 months.

1. How can scientists be sure that some of the same whales return from one year to the next?

The graph below shows the months in which whales have been sighted in Washington Waters between 1990 and 1993:



2. Which three months had the highest number of whale sightings?

   a.

   b.

   c.

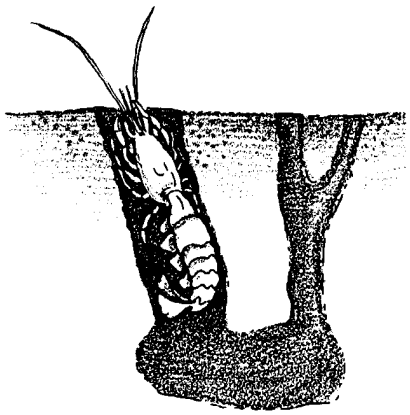
3. a. When are most gray whales observed in Washington?

   b. Is this during the northbound or the southbound portion of their migration? Explain your answer.

What do the whales do while in Puget Sound? Their primary activity seems to be feeding. The scientists observed several typical behaviors. They think the behaviors are related to feeding. The whales:

- Circle repeatedly over the same area.
- Dive, leaving a trail of mud, a sign that the materials on the bottom had been disturbed.
- Swim on their side in shallow water.

In Puget Sound, ghost shrimp are an important food source for gray whales. These shrimp live in the shallow mud of quiet bays throughout Puget Sound. You will learn more about what gray whales eat and how they feed in future lessons.



4. Think about where ghost shrimp live. Why do scientists think that the trail of mud the gray whales leave might be related to feeding?

Each year one or more strandings has occurred in Washington waters. A stranding means that a gray whale has died and washed ashore. Most of these strandings occurred in late spring or early summer. This time is toward the

end of the whales' northbound migration. Scientists suspect many of these whales were seriously weakened by lack of food. Some of them lingered several weeks in the southern parts of Puget Sound before they died.

5. Why might gray whales be low on stored food reserves at this time of year?

Some scientists wonder if these dead whales might have died from pollution. They are trying to determine the levels of pollutants in the dead whales. They are also trying to find those levels in healthy whales. Do the dead whales have higher levels? So far research has not provided a final answer.

6. Often the bottom sands and muds near cities are contaminated. These are the areas where pollution from industry and homes often ends up. Why might we be concerned about levels of pollutants in the bodies of gray whales?