

DOLPHIN RESEARCH CENTER

Mapping Cetacean Distributions

Grade Level: 6th-8th

Objectives: Students will determine the geographical distributions of various cetacean species by plotting their locations on a world map. Students will also examine how and why geographical distributions change over time.

Florida Sunshine State Standards:

Science

SC.G.2.3.3 The student knows that a brief change in the limited resources of an ecosystem may alter the size of a population or the average size of individual organisms and that long-term change may result in the elimination of animal and plant populations inhabiting the Earth.

Social Studies

SS.B.1.3.1: The student uses various map forms (including thematic maps) and other geographic representations, tools, and technologies to acquire, process, and report geographic information including patterns of land use, connections between places, and patterns and processes of migration and diffusion.

National Science Education Standards:

Content Standard C (5-8) - Populations and Ecosystems: The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

Background: Cetaceans can be found all over the world. Some species, such as the pantropical spotted dolphin and the striped dolphin, have fairly large geographic distributions centered around the equator. Other species, including the harbor porpoise and Hector's dolphin, have much smaller geographical distributions. Many baleen whales, such as the blue whale and the humpback whale, migrate to spend part of the year in feeding grounds and the remainder of the year in their breeding grounds. The terms below describe these different types of distributions.

Key Terms

Latitude: The angular distance north or south of the earth's equator, measured in degrees along a meridian, as on a map or globe.

Longitude: Angular distance on the earth's surface, measured east or west from the prime meridian at Greenwich, England, to the meridian passing through a position, expressed in degrees.



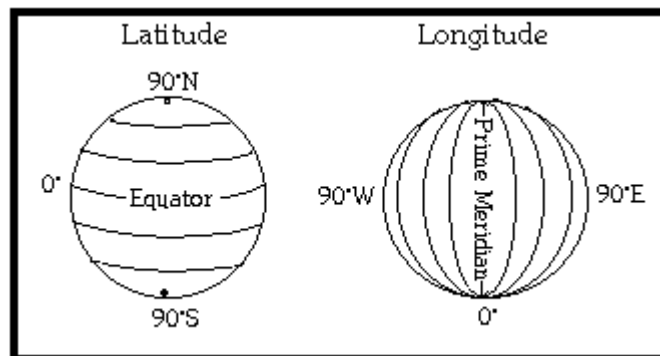
Mapping Cetacean Distributions

Type of Distribution	Definition	Examples
Cosmopolitan or Circumglobal	Found all over the world; many migratory species are considered cosmopolitan	Fin whale Blue whale
Circumpolar	Found near either the North Pole or South Pole	Bowhead whale Narwhal
Pantropical	Found in tropical waters north and south of the equator	Pantropical spotted dolphin Striped dolphin
Coastal	Found close to coasts	Harbor porpoise Heaviside's dolphin
Pelagic	Found in the open sea either all year or part of the year	Sperm whale Blainville's beaked whale

The lines of longitude and latitude found on a map can be used to plot the geographical distributions of various cetacean species. Lines of latitude run horizontally across a map and are measured in degrees. The equator is located at 0° latitude, which is the longest line of latitude. The lines get smaller as one moves towards the poles. The North Pole is defined as 90°N, and the South Pole is defined as 90°S.

Lines of longitude (also known as meridians) run vertically across a map. These lines are also measured in degrees. The prime meridian runs through Greenwich, England and represents 0° longitude. The International Date Line is represented by 180° and is found directly opposite the prime meridian.

These lines allow us to pinpoint any location on the globe. Given the coordinates 25°N 80°W, one could look on a map and find the city located at the intersection of 25°N latitude and 80°W longitude (in this case, Miami, FL). Similarly, one could examine a variety of different points to determine the geographical distribution of cetacean population or species.



Materials:

For the class:

- Large world map
- Pushpins
- Overhead projector (optional)
- Transparency of world map (optional)



Mapping Cetacean Distributions

For each group:

- An orange
- Marker

For each student:

- World map and Circumpolar map
- Colored pencils or crayons
- **Mapping Marine Mammal Distributions** handout
- **Australian Sea Lion Distribution** map (The map is Figure 1 from the “Historical Distribution and Abundance of the Australian Sea Lion on the West Coast of Western Australia”, found at <http://www.fish.wa.gov.au/docs/frr/frr148/frr148.pdf>)

Teacher Prep Notes: Make a copy of the **Mapping Marine Mammal Distributions** handout and the world and circumpolar maps for each student. Also, you will need to provide each student with a copy of the **Australian Sea Lion Distribution** map.

Ensure that each student has access to the necessary colored pencils. If you plan to have volunteers use lines of latitude and longitude to plot points on the large map, prepare a list of coordinates. Various websites will provide you with the exact coordinates of major cities, and these are a good resource to quickly generate a list to use during class time. If you will be using an overhead projector, you will need to make transparencies of the maps provided in the handouts.

Place students in groups of approximately four students. Students will be working independently for a majority of the lesson, but grouping students will allow them to share materials and discuss answers at the end of the mapping activity. If your students already have an understanding of latitude and longitude, just skip the activity with the orange and move on to the cetacean activity.

Procedures:

1. Give each group of students an orange and a marker. Have the students use the marker to place a few dots at different locations on the orange. Ask students to independently write a description of where each of the dots is located. Students should then share their descriptions with their group members. Students will find that it is difficult to accurately describe the location of each dot.
2. Ask the class to suggest things that might make it easier to describe the location of the dots. Students should discuss the benefits of adding labeled lines to the orange.
3. Show the large world map to the class. Explain the lines of longitude and latitude found on the map. Discuss how they are labeled. Have volunteers use pushpins to mark major cities on the map, using coordinates you provide.
4. Tell students that these coordinates are not only used to locate cities. One additional use would be to identify geographical distributions of different species.
5. Explain that cetaceans can be found all around the world. Some species have very small distributions, while others can be found in nearly all of Earth’s oceans.



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6. Pass out the **Mapping Cetacean Distributions** handout. As a class, read through the introductory paragraph. Have the students fill in the table, providing a definition of each term, as well as examples of cetacean species exhibiting those types of distributions. You can either provide students with this information, or have them look it up using resources such as reference books or the Internet.
7. Once students have completed the table, they may proceed with the mapping activity. Have students examine the world map and circumpolar map. Point out the lines of longitude and latitude on the map. If you have an overhead projector, you can use a transparency of the world map to point out the necessary map features and to plot some of the points along with the students in order to ensure their understanding. (NOTE: Make sure to point out to students that the latitude lines are not equidistant. Use a globe so show that Earth is wider in the center and narrower at the top, so this has been taken into consideration when creating the flattened map.)
8. The graphing activity can be done in a variety of ways. Each student can plot all of the coordinates listed. Alternatively, each group member could plot a different species and then the students can share their results with their group. Also, students could work independently to complete some of the distributions in class while completing the remainder for homework.
9. Distribute the **Australian Sea Lion Distribution** map in order to allow students to answer questions 5 and 6.

Wrap Up: Discuss student responses to the questions. Engage the students in a discussion pertaining to the changing distribution of the Australian sea lion. Explain how the data was collected (from historical accounts to current data collection) and discuss the possible natural and anthropogenic causes of the shifting population (ex: sealing, increased pup mortality, disease, changing water temperatures, etc).

Taking it Further:

- Have students select and research two of the cetacean species from this activity. Students can compare and contrast the habitat requirements of the two species and examine how this effects their global distributions.
- Ask students to look up a cetacean species that was not included in the activity. Students can use resources to identify the geographical distribution of the species they have chosen and create their own mapping activity! Have students generate a list of coordinates that represent their selected species' geographical distribution. Their classmates can then plot the coordinates to find the range of this cetacean species.

