

**RESOURCE LIBRARY**

ACTIVITY : 1 HR 40 MINS

## Marine Migration

Students use videos and a mapping tool to identify species, populations, and communities of marine organisms and make observations about how they are impacted by anthropogenic disturbances.

**GRADES**

9 - 12+

**SUBJECTS**

*Biology, Ecology, Earth Science, Oceanography, Geography, Human Geography, Physical Geography*

**CONTENTS**

3 PDFs, 3 Videos, 3 Links, 1 Image

## OVERVIEW

Students use videos and a mapping tool to identify species, populations, and communities of marine organisms and make observations about how they are impacted by anthropogenic disturbances.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/marine-migration/>

## DIRECTIONS

### 1. Have students watch and discuss the video “Census Ocean Observing.”

Tell students that they will be using a series of videos and online resources to explore human impacts on specific marine species. Distribute the Marine Migration Video Notetaking worksheet and have students read the directions and questions for the video “Census Ocean

Observing.” Show students the Census of Marine Life video (4 minutes). Allow students time to answer the questions on the worksheet. Then check students’ answers.

- *According to the video, what are three threats that affect all nations?* (overfishing, pollution, and the destruction of coastal habitats)
- *What effects can changing ocean temperatures have on marine organisms?* (changes in where species live and travel, distribution of essential nutrients, shifts in food webs)
- *What is the Census of Marine Life?* (a 10-year, 80-nation collaboration of marine scientists working on new technologies that monitor and measure life within an emerging global ocean observing system.)
- *What types of technologies are the scientists developing and using in their research?* (acoustic sensing to track marine animals at large scales; cataloguing of short DNA sequences for rapid and accurate species identification and biodiversity assessment; satellite tagging devices that can study animal life histories, collect physical and chemical data in previously inaccessible areas of the ocean, and track migratory routes to identify feeding and mating hotspots)
- *What are some of the outcomes scientists hope to achieve with this research?* (to measure the impact of climate change on marine life; to manage fisheries, coastal ecosystems, and water pollution; to detect harmful bacteria in seas; and discover new pharmaceuticals to help save lives)

## **2. Have students watch the Census of Marine Life video “About TOPP.”**

Have students read the “About TOPP” video questions that are included in the Marine Migration Video Notetaking worksheet. Tell students to think about the ecological questions and technologies the TOPP scientists are using in their research. Show students the video (3 minutes) for the Census of Marine Life’s Tagging of Pacific Predators (TOPP) research program and discuss the questions. Check students’ responses to the questions.

- *What ecological questions are the TOPP scientists hoping to answer through their research?* (How do pelagic animals live? Where do they forage and breed? Where do they go? Where are the hotspots and migratory corridors where species congregate to feed and breed?)

- *What oceanographic technologies are TOPP scientists using to answer these questions?* (microprocessors, satellites, electronic tags and tracking devices, oceanographic databases and data processing software)
- *How could TOPP project data be used to protect marine species from anthropogenic disturbances and threats?* (Data will help to identify important migratory corridors, feeding/mating/birthing grounds, and seasonal movement of these important predatory species. With a better understanding of species biogeography, ocean resource managers and lawmakers can better protect these species by establishing marine protected areas, altering shipping lanes, and regulating fisheries and sources of sound pollution.)

### **3. Activate students' prior knowledge about migration and biogeography.**

As a class have students brainstorm animals that migrate. Ask: *Why do animals migrate?* Elicit from students that different animals migrate for different reasons, but mostly it is to be in habitats and climates suitable for breeding, birthing, and feeding. Then ask students to break down the root words of *biogeography*. Explain that biogeography is the study of the distribution of biodiversity over space and time, and that the biogeography of ocean animals is an important part of marine biology.

### **4. Have students record and analyze data about marine migration.**

Divide students into small groups and give each student a copy of the Marine Migration Research worksheet. Tell students that they will be using the TOPP oceanographic database and online resources to learn more about the biogeography and migratory habits of the seven Pacific Ocean predatory species listed on the worksheet. Assign each group one of the seven focus species. Review the directions with students and have them complete the worksheets. When students have completed their worksheets, have them go to the TOPP homepage, click on the Feature Story section of the page, and use the videos and slideshows provided to find out more about their species and its migratory habits.

### **5. Ask each group to present their findings.**

Have each group present their findings to the class. As other groups listen, ask them to fill in the Marine Migration Chart worksheet with information about the other marine species presented by their classmates.

## **6. Have students map the data.**

Using the Water Planet Mega Map or the World Physical Tabletop Maps, both included in the World Physical MapMaker Kit, have students draw the migration routes of the ocean predators they researched. Ask students to identify the ecosystems that their animal travels through. Compare the migration routes map to the National Geographic Global Shipping map. Ask: *Which migratory animals will be impacted by shipping?* Then compare the migration routes map to the MapMaker Interactive map with the population density layer turned on. Ask: *Which migratory animals will be impacted by coastal development, runoff, and other anthropogenic threats on land?*

## **7. Have students reflect on what they have learned.**

Allow students time to discuss and record their answers to the following questions on their Marine Migration Chart worksheet. As a class, discuss their responses and emphasize main points by referring back to the videos and the ecological principles addressed. Ask:

- *Why do some marine animals migrate?* (feeding, mating, birthing, nesting, changing ocean or climate conditions, anthropogenic threats)
- *How could research on the biogeography and migratory habits of marine species help protect them from anthropogenic threats?* (information could improve management strategies and aid in the establishment of marine protected areas)
- *How do human activities both in and out of the ocean impact marine migrations?* (ship and boat traffic, boat strikes, sound pollution, fishing, coastal run-off, degradation of water quality)
- *Which stakeholders are most likely to be concerned about this problem?* (fishermen, commercial shipping companies, ecotourism ventures, coastal resorts)
- *What do you think their views would be?* (Possible response: loss of income if they change fishing practices or shipping routes; concern for migratory animals; loss of income from

# Modification

Have students present information about their group's ocean predator using presentation or slideshow software.

## Informal Assessment

Assess students' completed worksheets and ocean predator presentations for accuracy and comprehension.

## Extending the Learning

Have students research and map the migratory habits and biogeography of other marine animals. Then ask them to present information about case studies of regulations or marine protected areas that were established to protect the migratory routes of those animals.

## OBJECTIVES

## Subjects & Disciplines

### Biology

- Ecology

### Earth Science

- Oceanography

### Geography

- Human Geography
- Physical Geography

## Learning Objectives

Students will:

- describe the migratory habits and biogeography of marine animals
- explain the ways in which anthropogenic threats impact the migratory habits and biogeography of marine animals

# Teaching Approach

- Learning-for-use

# Teaching Methods

- Cooperative learning
- Discussions
- Information organization
- Research
- Visual instruction

# Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Information, Media, and Technology Skills
    - Information, Communications, and Technology Literacy
    - Media Literacy
  - Learning and Innovation Skills
    - Communication and Collaboration
- Critical Thinking Skills
  - Analyzing
  - Understanding
- Geographic Skills
  - Acquiring Geographic Information
  - Analyzing Geographic Information
  - Answering Geographic Questions
  - Organizing Geographic Information

# National Standards, Principles, and Practices

IRA/NCTE STANDARDS FOR THE ENGLISH LANGUAGE ARTS

- **Standard 8:**

Students use a variety of technological and informational resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

## **NATIONAL GEOGRAPHY STANDARDS**

- **Standard 1:**

How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information

- **Standard 14:**

How human actions modify the physical environment

- **Standard 18:**

How to apply geography to interpret the present and plan for the future.

- **Standard 8:**

The characteristics and spatial distribution of ecosystems and biomes on Earth's surface

## **NATIONAL SCIENCE EDUCATION STANDARDS**

- **(9-12) Standard C-4:**

Interdependence of organisms

- **(9-12) Standard C-6:**

Behavior of organisms

- **(9-12) Standard E-2:**

Understandings about science and technology

- **(9-12) Standard F-4:**

Environmental quality

- **(9-12) Standard F-5:**

Natural and human-induced hazards

## **OCEAN LITERACY ESSENTIAL PRINCIPLES AND FUNDAMENTAL CONCEPTS**

- **Principle 5c:**

Some major groups are found exclusively in the ocean. The diversity of major groups of organisms is much greater in the ocean than on land.

- **Principle 6a:**

The ocean affects every human life. It supplies freshwater (most rain comes from the ocean) and nearly all Earth's oxygen. It moderates the Earth's climate, influences our weather, and affects human health.

- **Principle 6c:**

The ocean is a source of inspiration, recreation, rejuvenation and discovery. It is also an important element in the heritage of many cultures.

- **Principle 6g:**

Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

- **Principle 7d:**

New technologies, sensors and tools are expanding our ability to explore the ocean. Ocean scientists are relying more and more on satellites, drifters, buoys, subsea observatories and unmanned submersibles.

- **Principle 7e:**

Use of mathematical models is now an essential part of ocean sciences. Models help us understand the complexity of the ocean and of its interaction with Earth's climate. They process observations and help describe the interactions among systems.

## **Preparation**

### **What You'll Need**

#### **MATERIALS YOU PROVIDE**

- Pencils

#### **REQUIRED TECHNOLOGY**

- Internet Access: Required
- Tech Setup: 1 computer per small group, Projector, Speakers
- Plug-Ins: Flash

#### **PHYSICAL SPACE**

- Classroom
- Computer lab

#### **GROUPING**



- Large-group instruction
- Small-group instruction

## OTHER NOTES

Before starting the activity, download and queue up the videos and online map links. Using the MapMaker Kit Assembly video as a guide, print, laminate, and assemble the Water Planet Mega Map and World Physical Tabletop Maps.

## BACKGROUND & VOCABULARY

### Background Information

The biogeography of many marine animals involves wide-ranging migrations throughout a variety of habitats in order to access their necessary feeding, birthing, mating, and nesting grounds. Changing climatic and ocean conditions and a number of anthropogenic threats impact the success of migratory animals in accessing the ocean resources and conditions they need to survive. Research and technology that focus on the study of migratory patterns, biogeography, and preservation of marine animals will help identify and eliminate the anthropogenic impacts that threaten migratory marine species.

### Prior Knowledge

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### Recommended Prior Activities

- [An Imbalance in our Ocean](#)

### Vocabulary

Term	Part of Speech	Definition
anthropogenic disturbance	<i>noun</i>	changes to the natural environment caused by human activity.
biogeography	<i>noun</i>	study of the distribution of species and ecosystems in space and time.

Term	Part of Speech	Definition
migration	<i>noun</i>	movement of a group of people or animals from one place to another.
overfish	<i>verb</i>	to harvest aquatic life to the point where species become rare in the area.
stakeholder	<i>noun</i>	person or organization that has an interest or investment in a place, situation, or company.

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## For Further Exploration

### Websites

- [Global Tagging of Pelagic Predators \(GTOPP\)](#)
- [R.J. Dunlap Marine Conservation Program: Virtual Expedition](#)
- [National Geographic Education: National Teacher Leadership Academy \(NTLA\)](#)

FUNDER

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