

OCEAN MIGRATIONS / INSTRUCTOR INFO

Summary

Scientists have been researching animal migrations all over the world for over a hundred years! However, there is still so much to learn, especially about marine species migrations (whales, tuna, sharks, etc.). With advanced tracking technology, scientists, such as those aboard the M/V OCEARCH, are able to collect more data and draw better conclusions about where the animals go, when, and why.

Part 1. Introduction to Migration

Part 2. Sea Turtle Migrations

Part 3. Salmon Migrations

Part 4. Shark Migrations

Activity 1. Migration Story

Goals & Objectives

The students will:

- Learn what migration is;
- Learn the different reasons why animals migrate;
- Learn about different animals in the ocean that migrate;
- Learn how we are working to discover more Information about shark migration.

Helpful Tips

1. The content in this lesson is related to OCEARCH and the Global Shark Tracker. Spend a few minutes getting familiar with the website and the tracker if you have not done so already. The Global Shark Tracker is also available as an app for iPhone and Android.
2. This lesson plan is designed to be adaptable to suit your specific needs. Use the entire lesson plan or just parts of it. This material can be expanded to be an entire unit or condensed for just one day in the classroom.
3. Vocabulary words will be underlined as they appear in the lesson plan. A complete list of vocabulary words is included as well.
4. Answers to questions and prompts for discussions will appear in italics.
5. Optional activities and content (side notes) will appear in a box. Use these to enhance your lesson and adapt it to suit your needs!
6. Have questions for OCEARCH Expedition Leader, Chris Fischer? Email info@OCEARCH.org to schedule a Skype session and let your students/child talk directly to Chris and the OCEARCH crew!
7. Email all questions about this lesson to info@OCEARCH.org.

OCEAN MIGRATIONS / STANDARDS

This lesson aligns with the following TEKS:

Grade 3 Science: 2F, 3D, 9A

Grade 4 Science: 3D, 7C, 10A

Grade 5 Science: 3D, 9A, 9C, 10A

This lesson aligns with the following Next Generation Science Standards:

From Molecules to Organisms: Structures and Processes 4-LS1-1

Science and Engineering Practice

Engaging in Argument from Evidence

- Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). (4-LS1-1)

Disciplinary Core Ideas

4-LS1-1 Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions. (4-LS1-1)

STEM

This lesson plan aims to assist teachers in implementing a STEM-based program into their classroom while inspiring the next generation of explorers, scientists, and stewards of the ocean. Based on real science and the Global Shark Tracker™, this lesson is intended to promote environmental awareness and to prepare students for STEM careers.

OCEAN MIGRATIONS / VOCABULARY

Accelerometer - A tag that records the acceleration (how fast an object's speed increases or decreases) of an object.

Biologist - A scientist who studies life, specifically organisms and their relationship to their environment.

Habitat - The natural home or environment of an animal, plant, or other organism.

Migration - The seasonal movement of animals from one region to another.

Migratory - Describes an organism that migrates.

Navigate - To travel a specific route that is sometimes difficult or dangerous.

PAT Tag - A device used to collect data such as water temperature, light, and depth.

Salinity - The concentration of dissolved salts in water. The average salinity of the ocean is 35 parts per thousand (ppt).

Satellite Telemetry - A method of research that uses orbiting satellites to detect signals emitted from tracking devices.

School - A group of fish.

SPOT Tag - A device used to collect location data.

Treacherous - Dangerous conditions.

OCEAN MIGRATIONS / PRE-LESSON ASSESSMENT

Use the following true/false and multiple-choice questions as an introduction/warm-up to the lesson topics. You can do this in a verbal or written format, as a game, individually, or as a whole class! A handout is provided if you wish to hand the questions out in a quiz format.

The questions do not need to be graded. They are intended to give the students an idea of what they will be learning and to see what they already know.

1. True or False

Sharks do not migrate.

Answer: False

2. True or False

In the winter, blue whales migrate to warmer waters to breed and give birth.

Answer: True

3. Approximately how many species of animals live in the world's oceans?

- a. 200,000 to 600,000
- b. 700,000 to 1 million
- c. 1,000 to 5,000

Answer: b

4. What species of mammal migrates the farthest?

- a. tuna
- b. red crab
- c. great white shark
- d. grey whale

Answer: d

5. Why do sea turtles migrate back to the beaches that they were born at?

- a. To visit their family.
- b. To feast on local fish and crabs.
- c. To lay their eggs.
- d. None of the above.

Answer: c

Name: _____

Date: _____

OCEAN MIGRATIONS

Select the correct answer(s) to each of the following questions.

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Sharks do not migrate.

2) True or False

In the winter, blue whales migrate to warmer waters to breed and give birth.

3) Approximately how many species of animals live in the world's oceans?

- a. 200,000 to 600,000
- b. 7000,000 to 1 million
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4) What species of mammal migrates the farthest?

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- d. None of the above.

OCEAN MIGRATIONS / LESSON PLAN

PART 1. INTRODUCTION TO MIGRATION 3-5 mins

Many species of animals travel hundreds and even thousands of miles each year in search of food, water, and shelter and to breed. This type of travel is called migration. Probably the most well-known animals that migrate are birds. They fly south in the winter to escape the cold temperatures in the north. *Ask students if they know of any other animals that migrate and for what reasons? Elephants migrate in search of water, stingrays migrate in search of food, salmon migrate to breed and lay eggs, and so many more!*

The study of animal migration is fascinating. Many scientists have dedicated their entire careers to studying a single species and their migration pattern. *Ask students why they think it's important to study animal migrations. We can learn a lot about migratory animals by studying them, including the best ways to protect and conserve the species and their habitats. We can learn their life cycle, where they go to find food, where they seek shelter during harsh seasons, and when they will be in certain areas.*

PART 2. SEA TURTLE MIGRATIONS 10-15 mins

The ocean is a vast habitat home to approximately 700,000 to 1 million different species of animals. A large majority of these animals are migratory, meaning they travel from one area of the ocean to another on a regular basis in search of the best food, water temperature, salinity, and more.

Sea turtles are an excellent example of an ocean animal that migrates. Female loggerhead sea turtles return to the same beach every time they are ready to lay eggs. Not only do they return to the same beach, they often lay their eggs within a few hundred yards of where they last nested, often after swimming hundreds of miles from where they usually forage for food. However, leatherback sea turtles migrate the farthest - an astounding 10,000 miles or more each year in search of jellyfish, their favorite meal!

Scientists aren't exactly sure how sea turtles are able to navigate the oceans, but it is believed that they use Earth's magnetic field, the chemistry of the water, and possibly ocean currents. To help solve the mystery, sea turtle biologists track sea turtles using satellite telemetry. This method of research involves safely attaching a tracking device to a turtle's shell and then using orbiting satellites in space to detect the signals emitted from the device. This type of research is vital to the survival of all sea turtle species, which are endangered of going extinct. If researchers learn where and when the sea turtles migrate, law makers can create laws to protect the turtles and their habitats!

PART 3. SALMON MIGRATIONS 10-15 MINS

Salmon are widely known for their epic migration up rivers to spawn (to lay eggs). Salmon begin their life as an egg far upstream in a freshwater river. After hatching, they slowly swim downstream towards the ocean. Once in the ocean, they form large schools for protection from predators. The school then spends the next four years (sometimes less), swimming hundreds of miles to the best feeding grounds. They continue migrating from feeding ground to feeding ground until they reach adulthood. Now they begin their epic journey back to the exact location they were first hatched.

The journey up the river is treacherous. The salmon must get past many obstacles such as waterfalls, fallen trees, and bears looking for a delicious salmon meal. Many of the salmon do not survive the migration back to where they were hatched. The ones that do survive are tired and weak. They have just enough strength to lay their eggs.

Why would salmon go through such great lengths to get back to where they originally hatched? Why not just lay their eggs in the ocean? Or still in the river but closer to the ocean? It has everything to do with the survival of the species. The salmon migrate back to where they were born because they know it is a safe place for their offspring to hatch. By laying their eggs far upstream, the eggs are protected from predators and harsh elements. This ensures that more individuals survive long enough to breed again. It's one of nature's most heroic life cycles.

SALMON MIGRATION SKIT

(Optional if time allows; 90 minutes)

Divide the class into small groups of four to five students. Each group will be performing a 5-minute skit based on salmon migration. The time frame for preparing and performing the skit should be broken down into three days of work, unless there is a more suitable time frame that works better for your particular class.

Day 1 - Group Research (30 minutes - 45 minutes)

Day 2 - Skit Preparation and Practice (30 minutes)

Day 3 - Skit Performance (5 minutes per skit)

The skits should explain:

- Where salmon are born.
- Where salmon go after hatching.
- What salmon do and where they go after reaching the ocean.
- Where salmon go when they are ready to lay eggs.
- How salmon get back to the river.

Skits can be funny, dramatic, or imaginative as long as they address the main points listed above!

PART 4. SHARK MIGRATIONS 10-15 mins

Introduction

Biologists have discovered that many shark species migrate for some of the same reasons as other ocean animals - to feed, breed, and even to maintain body temperature. However, very little is known about where the sharks migrate to, when, why, or whether they travel alone, in pairs, or in groups. We do know that these answers vary from species to species and even from individual to individual thanks to the studies being conducted by OCEARCH scientists and other leaders in the marine biology field.

Worldwide shark populations are under serious threat. According to the International Union for Conservation of Nature (IUCN), up to 30% of sharks and rays are threatened or endangered of becoming extinct. Therefore, monitoring shark populations is of great concern. Long-term tagging opportunities allow scientists to monitor shark migratory patterns, which enables leaders and policy-makers to make more informed decisions when planning conservation management strategies. If we know where great white sharks hunt, breed, give birth, etc., we can protect these locations to ensure the survival of the species.

Tagging and Tracking Sharks

OCEARCH tracks individual sharks of several different species, but mainly great white sharks. The crew works from a floating laboratory called the M/V OCEARCH, which is a 126 foot vessel equipped with a hydraulic lift and platform used to conduct scientific research on sharks and other large fish such as tuna. OCEARCH tags and tracks the migration patterns of these amazing apex predators using accelerometers, PAT tags (pop-up archival tags), and SPOT tags (Smart Position and Temperature Tag) (Figure 1).



Figure 1. SPOT tag (top) and accelerometer tag (bottom).

An accelerometer records the speed the shark swims every second. Over 8.5 million data points are recorded per day to measure the shark's every tail beat and change in body pitch and posture. This allows the researchers to monitor the shark's behavior immediately after it is safely released back into the water. The tag is designed to detach from the shark after a certain period of time, so scientists must wait to collect data until after the tag detaches from the shark.

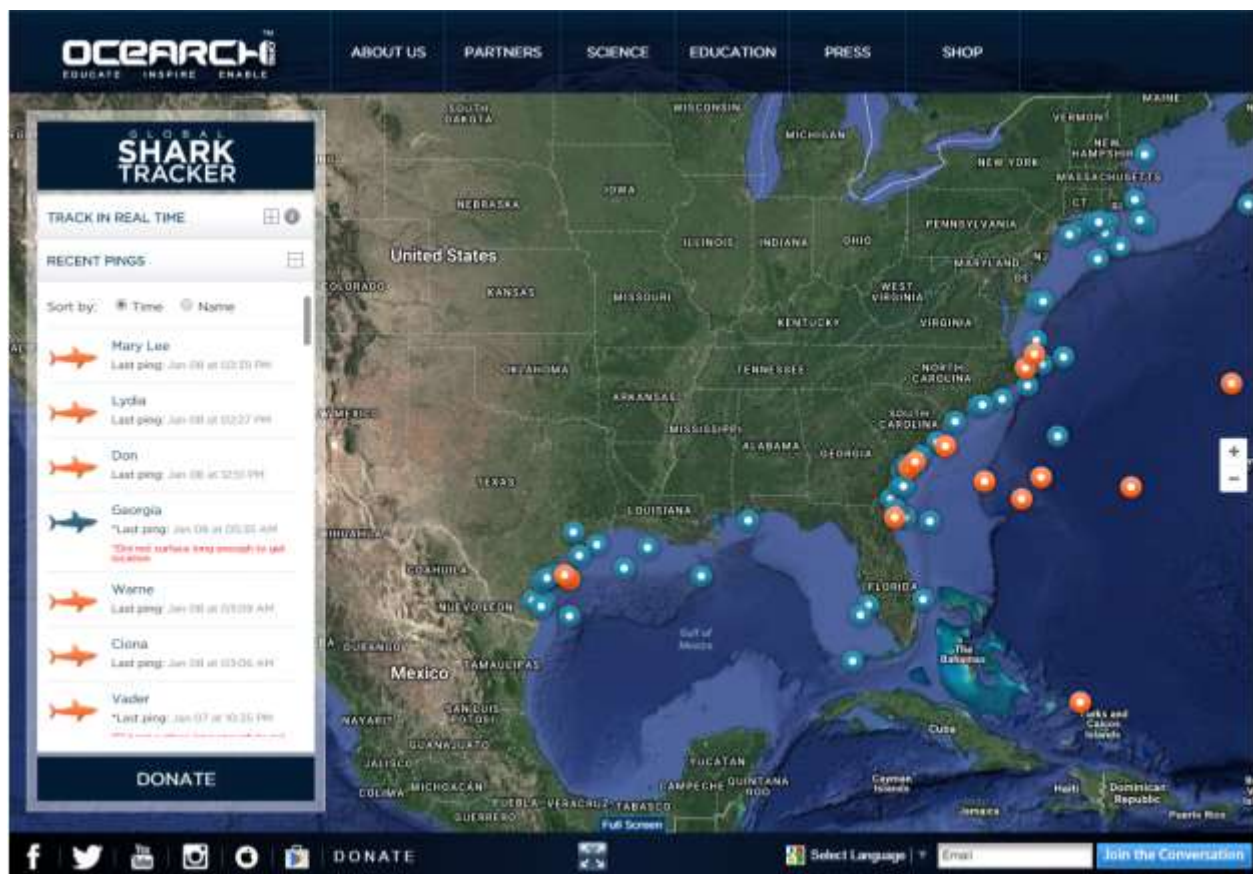
A PAT tag is used to collect data such as water temperature, light, and the shark's swimming depth. Just like the accelerometer, PAT tags detach after a certain period of time. Once retrieved from the water, scientists can then collect the data stored on the tag.

A SPOT tag sends regular signals to satellites using powerful transmitters every time a shark swims to the surface. The SPOT tag starts recording data, such as temperature of the water, depth the shark is swimming, and salinity immediately after the shark is released back to the ocean. The tag also records a "ping" that gives the geographic location of the shark on a map. This is the tag that allows you to track sharks in near-real time on the Global Shark Tracker™.

Global Shark Tracker™

Students can track tagged great white sharks and several other species of sharks with the easy-to-use Global Shark Tracker™ online at <http://www.ocearch.org/>

The website is free to use and only requires an internet connection and a web browser.



With this unique tool, students can:

- navigate the map to view different parts of the world;
- choose to view all of the tagged sharks in an area;
- select an individual shark and click "Where Have I Been" to view that shark's migratory pattern;
- track the location of the M/V OCEARCH vessel while on expeditions;
- keep up to date with the crew with a live social media feed;
- read detailed biographies of each shark, which includes information such as species, gender, stage of life, length, weight, tag date, tag location, total miles traveled, and much more!

OCEAN MIGRATIONS

/ ACTIVITY 1. MIGRATION STORY

INTRODUCTION

Marine biologists have discovered that many shark species migrate for some of the same reasons as other marine animals. In this story book activity, students will get to decide what happens to their shark on each page of its story. Where will it go? What will it do? How will the shark's migration story end?

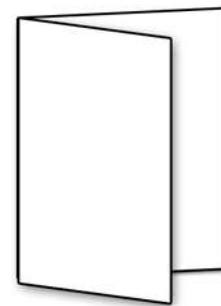
MATERIALS

- Paper (plain, lined, or construction)
- Writing/coloring utensils
- Scissors
- Glue
- Stapler and staples

INSTRUCTIONS

Making the Book

Each student should receive three sheets of paper. Lay the three sheets of paper together. Fold in half to create a book and staple in the middle to bind the sheets of paper together. If students are younger, have the books prepared in advanced. Each student should now have a blank book!



Writing a Migration Story

1. Read introduction to students: "Marine biologists have discovered that many shark species migrate for some of the same reasons as other marine animals. However, the fascinating thing about sharks is that in many cases, individual sharks migrate for different reasons depending on where they live, how old they are, whether they are male or female, and several other factors. Today, you are going to write the migration story of your own great white shark! Where will it go? What will it do? How will the shark's migration story end?"
2. Give students some time (5 minutes or so) to brainstorm for their story. They can use scrap paper to write ideas down. Ideas can include a title for their story, the name of their shark, cool shark facts, an exciting idea for the plot, or even how the story is going to end. If you have more time, allow students to research some ideas in the school library. By using the Global Shark Tracker, students can learn what species of sharks are found in different parts of the world, where the sharks tend to travel to, and more! The story of one of the OCEARCH sharks might even provide some inspiration for their own story!
3. Instruct students to think of a title for their book and to write the title somewhere on the front of their book.
3. Students should then write: "By: (student's name)" below the title.
4. On the back of the book cover, students should dedicate their book. This can be to a family member, a friend, the ocean, or even one of the OCEARCH sharks!
5. Now the students can fill the pages of their book with their story (this may be assigned as homework). The story should: have a main character (their shark!), describe the environment (what type of habitat the shark lives in), introduce a problem or obstacle for the shark (why it has to migrate), describe the shark's adventures as it migrates, and have an ending (where the shark ends up after its migration). Students can include other characters, including humans, as well as a conservation message.
6. Students can trade their stories to read, present them to the class, or turn them in for a grade.