

EXPEDITION GULF STREAM STEM ACTIVITY PACKET

Summary

Explore and discover the ocean with OCEARCH as we go on expedition! Learn more about currents, navigation, sharks, whales, sea turtles, our impact on the ocean, and track the pings of your favorite sharks and Olive Ridley sea turtles. You will learn how to identify these species, participate in inquiry and research projects, and build STEM skills while using the OCEARCH Global Shark Tracker to gather near real-time data to complete these activities.

There are several ways that you can be a part of the OCEARCH global community during Expedition Gulf Stream and beyond:

- Download the free OCEARCH STEM Learning Curriculum for grades K-8
- Make a difference by hosting a Change 4 FINS fundraising event at your school
- Follow and engage with us on our social media platforms (Twitter, Facebook, Instagram, and YouTube)
- Sign up at education@ocearch.org to receive the education newsletter for updates and upcoming events
- Register for a Teacher Workshop (virtual & in-person) with one of our education ambassadors
- Schedule a Skype Session with an OCEARCH team member and get your students' questions answered
- Join us for STEM education and outreach events when we're in your community
- Kick Plastic by reducing the use of single-use plastic bottles and bags in your classrooms and at home

Together we can educate, inspire, and enable the next generation of scientists, explorers, and stewards of the ocean.



Grade Level: 3-12



EXPEDITION GULF STREAM CURRENTS, EDDIES, FRONTS, AND FILAMENTS

The Gulf Stream is a giant river of seawater connecting the life of the Caribbean, Gulf of Mexico and North Atlantic. It drifts northward at about 3 knots, providing warm water, nutrients and numerous habitats for every level of sea life. The Gulf Stream flows north in a clockwise pattern. Which way is clockwise? Draw arrows showing the direction of clockwise on the circle.

1. How or why do you think it flows north and in that direction?



2. The Gulf Stream is made up of other currents that flow into it. They are the North Equatorial Current, the Caribbean current, the Antilles current and, the Florida Current. The Gulf Stream also changes position! Find the position of the Gulf Stream on NOAA's website to map its exact location from the Florida Current to Newfoundland, and then draw and label it on the map below.



3. What do you think happens to the flow of water in the Gulf Stream after it forms the northwest border of the North Atlantic Gyre?

4. The Gulf Stream also is a major influence on the weather in Europe. Label Europe on the map above. How does the Gulf Stream have an affect on the weather there?





5. What do you think happens to the warm water the Gulf Stream transports from the Caribbean once it reaches sea ice and cooler waters in the North Atlantic?

6. What forms as a result of the changing temperature and density in the salt water of the Gulf Stream?

7. What is an Eddy?

8. Circle the Eddies in the picture below.



9. The Gulf Stream has both direction and speed. It flows at a rate of 2 knots. That is 300 times faster than the Amazon River! What do you think would happen to the speed of the Gulf Stream if the water became warmer?

10. What do you think would happen to the Gulf Stream if the water within it became colder as a result of an increase in melting sea ice?





EXPEDITION GULF STREAM ATLANTIC OCEAN MIGRATIONS

Many animals, including sharks, sea turtles, whales, dolphins, and seals, migrate the North Atlantic Ocean. Data on these species in the North Atlantic is needed because they are difficult to locate, research, and sometimes tag. During Expedition Gulf Stream, scientists will be researching these types of animals to observe their use of the Gulf Stream.

New tag technology is constantly being developed to enable researchers to gather the data they need about different marine species to better understand their migratory patterns. Some species come to the surface of the water frequently enabling a satellite tag, like the SPOT tags on the sharks on the OCEARCH Global Shark Tracker, to give location data. With other shark species such as bull and tiger sharks, generating location data can be difficult due to their habitat use of warmer, coastal waters. Warm water causes the SPOT tags to become bio-fouled and stop working.

There is still a lot of information needed about how these marine animals use the Gulf Stream. During this Expedition, scientists hope to understand linkages between the current of the Gulf Stream and the animals that use it.

- 1. If you were studying a marine species like whales or sea turtles, how would you attach a satellite tag or other kind of telemetry tag in order to research the migrations of these species?
- 2. Why do you think researchers want to know about the migrations of whales and sea turtles?
- 3. Draw and design a tag that would help you collect location, depth, and temperature data for whales and sea turtles:
- 4. How would you attach the tag? What challenges might you face in using this kind of tag?
- 5. Would you like your whale or sea turtle species to ping in on the OCEARCH Global Sharks Tracker? What would you name it?
- 6. What would you hope people learn by following their tracks?







EXPEDITION GULF STREAM ACTIVITY: SEA TURTLE CASE STUDY

Name:

Sea turtles face many obstacles during their life cycle. The biggest reason these species have become endangered is due to the impact people have on them. In the sea turtle case studies below, see if you can identify what is wrong with the sea turtle, why, and in your opinion, what can be done to help it. Please note that these are fictional case studies, but are based on real issues sea turtles face in the ocean.

Case Study 1: A mature male Loggerhead Sea Turtle is found by some fishermen struggling to swim and breathe. It was found in an area with a lot of commercial fishing. It seemed to have something wrapped around it. The fishermen do not approach the sea turtle and call NOAA and to help. But what is wrong with the sea turtle? What happened ? Circle what caused the injury from options below.

Boat Strike Entanglement/Ghost gear Parasites Case Study 2: A mature female Loggerhead Sea Turtle crawls on shore and appears to be injured. Some beachgoers see her and call NOAA to report it. When the rescue team arrives, they notice that the sea turtle has a crack in its shell. What do you think could've caused the injury? Circle what caused the injury from options below.

Parasites

Entanglement/Ghost gear

Case Study 3: Some sea turtle researchers out on a boat, doing fieldwork, found an immature male Olive Ridley Sea Turtle. It appeared to be in some kind of trouble. When the researchers approached the turtle, there was something in its nose, causing it to have difficulty breathing. The sea turtle was taken to a rescue center because it still seemed ill. It had MRI imaging done, and there was something in the shape of a bag in its stomach. What do you think caused the Olive Ridley sea turtle to have trouble breathing and digesting? Circle what caused the injury from options below.

Entanglement/Ghost gear

/ STEM LEARNING SPONSORS:

Parasites

YETI

ANDRY'S

Boat Strike

Boat Strike



EXPEDITION GULF STREAM MARINE DEBRIS

Marine debris is defined as "any persistent solid material that is manufactured or processed and directly, or indirectly, intentionally, or unintentionally, disposed of, or abandoned, into the marine environment, or the Great Lakes" (NOAA). Marine debris can include things that are big or small, like plastic straws, soda can rings, tires, fishing gear, and plastic bags. It is estimated that there are 5.25 trillion pieces of marine debris or more. This debris can look like food to animals and if eaten, can cause injury or death. For example, a plastic bag floating in the water can look a lot like a sea turtle's prey…a jellyfish.



When lost, discarded, or abandoned fishing gear or lines are left in the ocean, it can continue to trap and entangle marine life. It is referred to as **ghost gear**. Ghost gear also impacts the environment and impedes navigation, or migrations, of marine animals. It is estimated that ghost gear accounts for about 10% of marine debris. '

How can we help?

One of the ways we can help with keeping marine debris out of the ocean is to reduce, reuse, and recycle the items we use everyday. We can avoid using items that are made of single-use plastic, like straws and plastic bags. We can use a reusable water bottle or coffee cup, and we can buy items from companies that don't use plastic packaging.

We can also participate in cleanups or pick up items whenever we are at the beach and around our neighborhood. Free divers and scuba divers can use their dives to clean up marine debris and ghost gear as well.





EXPEDITION GULF STREAM ACTIVITY: MARINE DEBRIS

Name:

Now that you have learned about marine debris and ghost gear, what solutions do you have to help with this global problem? What are the challenges we face in finding, and removing, ghost gear and marine debris? What are some steps that you will take at home to help combat marine debris or ghost gear?





EXPEDITION GULF STREAM ACTIVITY: GHOST GEAR

Name:

1. Research types of nets and gear left behind. Name the different gear and briefly describe issues exist with each type of gear. Example: abandoned crab pot: other marine life can become trapped in the pot and they can die.

1. 2. 3. 4. 5. 6.

2. Pick two of the following marine organisms. Describe the impacts that ghost gear has on them.

Coral Reefs Fish Sea turtles Right Whales Sharks Dolphins

Organism 1:

Organism 2:

3. How is the deep sea impacted by ghost gear?

4. What do you think can be done to help with the ghost gear issue?



/ STEM LEARNING SPONSORS:



EXPEDITION GULF STREAM ACTIVITY: GHOST GEAR

Create a campaign to spread awareness about ghost gear. Use the space below to create a draft. Use data to draw a picture, make a poster or infographic, or write a persuasive speech or letter to a representative in Congress to educate, inspire, and enable a change for this issue.





Grade Level: 6-12



YETI

ANDRY'S

EXPEDITION GULF STREAM INVASIVE MARINE SPECIES

Species that grow and reproduce quickly, and spread aggressively, with potential to cause harm, are called invasive. An invasive species can be any kind of living organism - animal, plant, insect, bacteria, or fungus - that is not native to an ecosystem and causes harm. These types of species can harm the environment, the economy, or even the human health. Invasive species are among the leading threats to native wildlife. Approximately 42% of threatened or endangered species are at risk due to invasive species.

Invasive species are primarily spread by human activities, often unintentionally. People, and the goods we use, travel around the world very quickly, and they often carry uninvited species with them. Ships can carry aquatic organisms in their ballast water, while smaller boats may carry them on their propellers. Insects can get into wood, shipping palettes, and crates that are shipped around the world. Some ornamental plants can escape into the wild and become invasive. And some invasive species are intentionally or accidentally released pets.

One of these invasive species is the Lionfish. They are native to the Indo-Pacific, but are now established along the southeast coast of the United States, the Caribbean, and in parts of the Gulf of Mexico. While we don't know exactly how lionfish got to the Atlantic, it is believed that humans provided a helping hand. Experts speculate that people have been dumping unwanted lionfish from home aquariums into the Atlantic Ocean for up to 25 years.

Since lionfish are not native to Atlantic waters, they have very few predators. They are carnivores that feed on small crustaceans and fish, including the young of important commercial fish species such as snapper and grouper.

During this expedition, scientists will study these fish to better understand the potential threat they pose to key reef and commercial fish species.



YETI

LANDRY'S

EXPEDITION GULF STREAM ACTIVITY: LIFE CYCLE OF A LIONFISH

Name:

Scientists are studying the life cycle of the lionfish as well as the impact it is having on the ecology of the areas they are found in. If scientists are able to understand what the life cycle of the lionfish is, they can control the populations during their different life stages.

One of the reasons that lionfish have become so invasive is because of the number of larva they are able to have, how quickly they grow, and the lack of a natural predator in their environment.

Label the life stages of the lionfish below: lionfish eggs, juvenile lionfish, and adult lionfish



If you were a researcher in this field, how would you use this information to help control the population of this invasive species?