



SHARK TAGGING LESSON PLAN

Main discipline:

Marine Science

Objective:

To educate students about shark tagging as a citizen science activity, emphasizing its significance in understanding shark behavior, ecology, and conservation.

Other disciplines:

Citizen Science, STEM, Ethics, Geography, Mathematics and Language Arts

Social skills:

Teamwork, planning and problem solving skills

National Standards:

- NGSS (Next Generation Science Standards):
 - HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
 - HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
 - HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects:
 - CCSS.ELA-LITERACY.RST.11-12.1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
 - CCSS.ELA-LITERACY.RST.11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media in order to address a question or solve a problem.
- National Geographic Education Standards:
 - Science: Standard 4 - The Physical and Human Characteristics of Places.
 - Geography: Standard 6 - How Culture and Experience Influence People's Perceptions of Places and Regions.

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What students can expect to learn:



Students will grasp the importance of shark tagging as a valuable tool for collecting data on shark behavior and ecology. They will understand the diversity of shark species in Biscayne Bay and the collaborative nature of scientific research. Additionally, they will develop an awareness of ethical considerations in wildlife research and recognize the interconnectedness of disciplines in scientific inquiry.

After participating in a shark tagging expedition and completing the lesson, students will possess a comprehensive understanding of the shark tagging process, including the procedures involved and the significance of the data collected for scientific research. Additionally, students will demonstrate proficiency in differentiating between various shark species found in Biscayne Bay, showcasing their knowledge of species identification and ecological diversity within marine ecosystems.

Assessment Evidence



Student responses on “I used to think, now I think” and “see/think/wonder” charts can be taken back and displayed for further exploration or as evidence of learning on the field trip.

Prior Knowledge Before Lessons



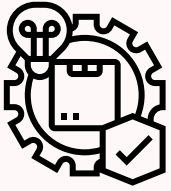
Students should research sharks and understand the following:

- How do marine biologists learn about sharks?
- What dangers to their survival do sharks face?

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Vocabulary Words



1. **Long Line:** A fishing gear consisting of a long line with multiple baited hooks attached at intervals. Long lines are often used to catch large fish, including sharks, for scientific research or commercial purposes.
2. **Drum Line:** A type of fishing gear used to capture sharks, typically consisting of a buoy attached to a submerged baited hook by a line that is wound around a drum. When a shark takes the bait, the drum spins, indicating a catch.
3. **Fin Clip:** A small piece of a shark's fin that is removed for identification or research purposes. Fin clips are often used to mark individual sharks for long-term monitoring and tracking studies.
4. **Parasite:** An organism that lives on or inside another organism (the host) and benefits at the host's expense. Parasites can affect the health and behavior of sharks and may be studied as part of shark biology research.
5. **Biopsy:** A procedure in which a small sample of tissue is removed from an organism for examination or analysis. In shark tagging, biopsies are often taken to study genetic characteristics, hormone levels, or pollutant levels in shark tissues.
6. **Ultrasound:** A medical imaging technique that uses high-frequency sound waves to create images of internal body structures. In shark tagging, ultrasound may be used to examine the reproductive organs, pregnancy and internal anatomy of sharks without harming them.
7. **Ram Ventilation:** A method of respiration used by some sharks in which they swim with their mouths open to allow water to pass over their gills, facilitating oxygen exchange. Ram ventilation is an important adaptation for sharks that need to maintain a continuous flow of water over their gills to breathe.
8. **Buccal Pumping:** A method of respiration used by some sharks in which they actively pump water over their gills by opening and closing their mouths. Buccal pumping allows sharks to breathe while stationary or swimming at low speeds.
9. **Stable Isotopes:** Atoms of the same element with different numbers of neutrons, resulting in different atomic masses. Stable isotopes of elements like carbon and nitrogen are used in shark tagging studies to trace the sources of nutrients in shark diets and to understand their feeding ecology and migration patterns.

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Lesson Prior to Shark Tagging Expedition

1. You are about to embark on a citizen science expedition. What is “citizen science”
Watch this video <https://www.amongfins.com/the-film> and learn a little more about citizen science in shark research.
2. Did you know that there is a big gap in STEM for females and minorities? Although our population is about 50% males and 50% female, males make up the greater share of the STEM workforce. About two-thirds (65%) of those in STEM occupations are men and only about one-third (35%) are women. Plus, hispanics only represent about 15% of the total STEM workforce, and Asian and black and brown backgrounds only represent 10% and 9%, respectively. But programs like Surf Skate Science and Minorities in Shark Sciences, are working to change this. Watch this Shark Tagging videos to seek what to expect on our tagging trip and learn more about the gap in STEM: <https://youtu.be/AS2Fdlcqlqg?si=zthNLBSVIQ2iAXsy>
3. "What is a shark?" Dr. Neil Hammerschlag explains what makes sharks different from other fishes and what are some of their roles within their ecosystems. Watch this short video <https://youtu.be/tl59d1LkT14>
4. You may have heard of “shark tagging” as it is a method commonly used to study sharks, but how does it work? Watch this video https://youtu.be/Umjnqz_eccg
5. What data will we be collecting? Our main sampling location is just off Miami, Florida on Biscayne Bay. In this video, SRC's research technician Shannon Moorhead goes through the different species of sharks that can be found in this area, the different samples and measurements that are taken during each shark's work-up and how researchers can utilize this data to learn more about these animals. https://youtu.be/_jrpZCiANK
6. While you shark tag you will be collecting a lot of data that will be taken back to the lab. Are you curious to know what a shark research lab looks like? This video gives you a quick tour of SRC's base of operations. Our team members explain how we carry out our research, how our methods have evolved and the different topics of shark research and conservation that we investigate. Watch here <https://youtu.be/VM8v7MpKErU>

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7. What did you learn? Answer these questions from the videos you watched by using the chart below:

Question	What do you SEE ? (Share what you learned)	What do you THINK about that?	What does it make you WONDER ?
What is citizen science and why is it important?			
How many shark species exist?			
What sharks might we find in Biscayne Bay?			
What is the process for tagging and data collection?			
What types of tags are used and when/why are these tags used?			
What scientific data do we collect, who do we report it to and why?			
What can we learn when we find a shark that has already been tagged?			
Why do scientists clip a piece of the fin?			
What are stable isotopes?			
What is the difference between ram ventilation and buccal pumping? How does this change how we tag the shark?			
How do humans impact sharks?			
How do sharks help coral growth?			

8. Open the What did you learn? Answer these questions from the videos you watched by using the chart below: map on the screen and zoom in on our area.

- a. Click on one of the markers and view/read the information and images in the pop up window about that shark.
- b. Click on the “Shark Profile” to see more information about that shark- it will appear in the window on the left of the screen

9. Calculate each shark’s estimated weight from one of our last tagging trips.

- a. Convert centimeters to inches
- b. Use the Shark Measurement Calculator to convert the Total Length (inches) to a Curved Fork Length (inches)
- c. Use the Shark Measurement Calculator to convert a Curved Fork Length (inches) to a Whole Weight (pounds)
- d. Add the estimated weight of the shark to the chart on the next page.

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Type of Shark	Length in Centimeters	Length in Inches	Curved Fork Length	Estimated Weight
Black Tip #1	164			
Tiger Shark	259			
Black Nose #1	124			
Black Tip #2	159			
Nurse	190			
Black Nose #2	96			

10. We all have misconceptions about sharks. What are some of the ways learning about sharks has changed your perspective?

I used to think... (write a few statements of what you used to think about sharks)	Now I think...(write a few statements of how your thoughts have changed)

More Information About the Shark Tagging Process



What sharks we might find?

[Species Descriptions for Identification](#)
[Shark Identification Guide](#)

- [Black Tip Shark](#)
- [Blue Shark](#)
- [Bull Shark](#)
- [Dusky Shark](#)
- [Great Hammerhead](#)
- [Longfin Mako](#)
- [Nurse Shark](#)
- [Sandbar Shark](#)
- [Scalloped Hammerhead Shark](#)
- [Silky Shark](#)
- [Blacknose Shark](#)
- [Tiger Shark](#)

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What can you expect? We will load the boat and the staff at UM Field School will go over the proper procedures and safety. Next we will divide into team of 4 to 5 students. Each team member will have a job. One person will be in charge of making sure the shark stays wet with the shower. Two people will measure. One person will tag. One person will clip the fin. And, if a team of 5, the last person will check for parasites.

Before we tag, we must catch a shark. The UM team will prepare the bait, long line and drum line.

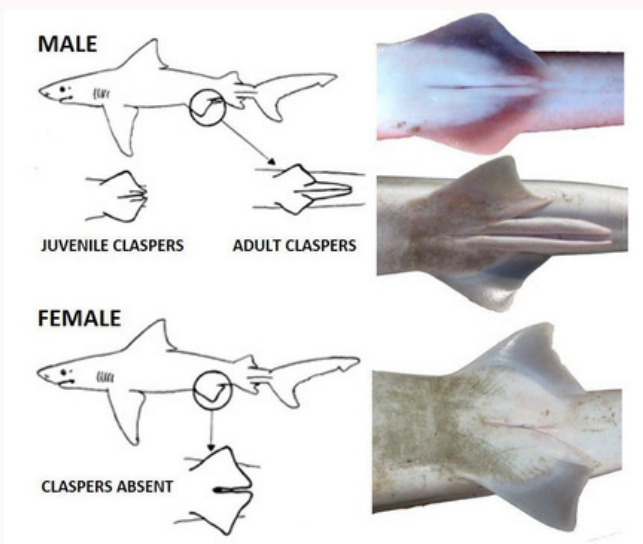
When researching wild elasmobranchs, several methods can be used to capture and sample them. In this video, SRC's research technician Shannon Moorhead explains how modified drumlines can be used by scientists to safely attract and sample sharks. Watch the video here: [.https://youtu.be/rzO8_QCgY4s](https://youtu.be/rzO8_QCgY4s)

Next, we will take turns throwing out the lines, bait and bouys. Then we wait and pray for a shark.

The UM team will bring the shark onto the research deck. Our team will make sure they have their safety gear (pfd) on and are ready to collect the scientific info. The UM team will then call each of the team members in order to do their assigned duties. Listen carefully and share data with a loud clear voice.

How to tell if a shark is male or female:

Identification of sex in sharks by the presence or absence of claspers. Look at the underside of the shark at the pelvic fins. In males, a clasper will extend out from the inside edge of each pelvic fin, females do not have claspers.

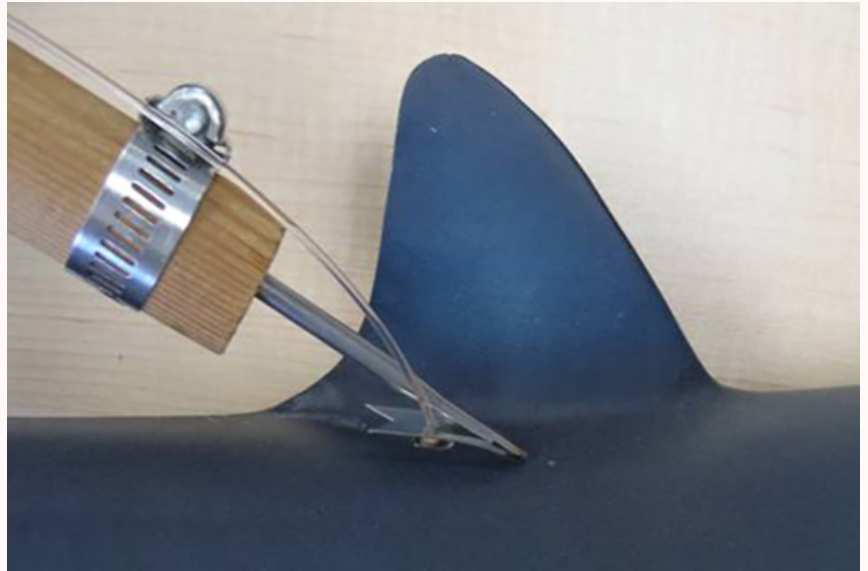


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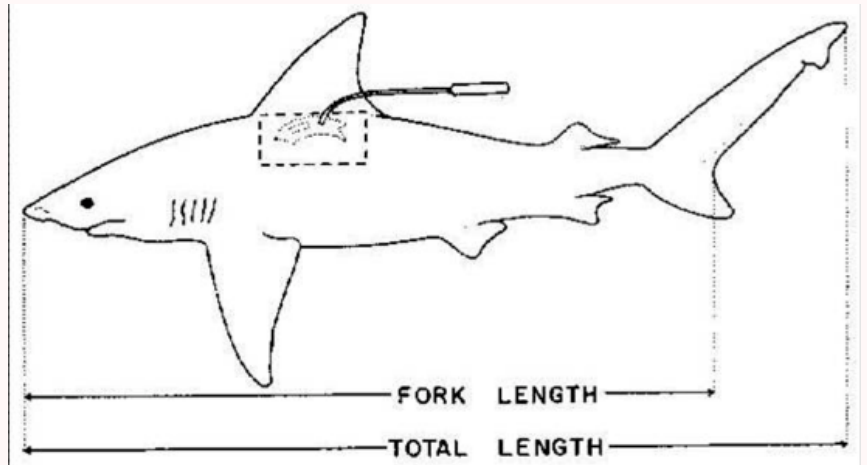
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Inserting a Tag

Look at the photo to the right to see a tag pole with tag showing correct placement near first dorsal fin and the drawing of shark showing tag placement below the first dorsal fin with the metal dart under the shark's skin and the capsule trailing toward the tail.



- Tags should be inserted into the muscle of the back near the first dorsal fin at an angle toward the head of the fish.
- Aim the tag at the base of the first dorsal fin with the two rear points facing the shark and quickly thrust downward.
- The dart head should come to rest approximately 1" to 1½" beneath the shark's skin with the capsule trailing away from the head of the shark.
- In tagging small sharks, care must be taken to avoid injury to the backbone. To control the depth of penetration, make an incision with the point of a knife and carefully push the dart head into the muscle.



What to do if you catch a tagged shark:

When you catch a shark with a tag in it, we ask that you record the following information as accurately and completely as possible:

- Tag number, type, and color
- Species and sex
- Date of capture
- Location caught (latitude and longitude preferred)
- Length and/or weight and whether it was estimated or measured
- Type of length (fork or total) and/or type of weight (whole or dressed)
- Fishing method (rod and reel, longline, etc.)
- Release condition: did you keep the shark or release it alive—if released alive, indicate whether released with the same tag, a different tag, or no tag and condition of the fish

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Be sure to include your name, mailing address, daytime phone number, and email address.

There are several ways you can report this information to NOAA:

- Call (877) 826-2612 toll-free
- Email us at sharkrecap@noaa.gov
- Use our [online reporting form](#)
- Mail in the information to Cooperative Shark Tagging Program, NOAA's National Marine Fisheries Service, 28 Tarzwell Drive, Narragansett, RI 02882

NOAA will send you a report with information on the shark caught and a hat to thank you for your participation.

Learn More

- * [UM Marine Biology Curriculum](#)
- * [Sharks4Kids Curriculum](#)
- * [Seakeeprs Shark Conservation Curriculum](#)
- * [Among Fins Videos](#)

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