

Middle and  
High School

# Shark Tracking



“Old Soldier” by Dr. Guy Harvey



# Shark Tagging and Tracking

**Overview:** Students become Shark Researchers as they simulate tagging sharks with satellite tracking devices and monitoring the movement and behavior of these sharks to better understand their biology and need for conservation.

**Grades:** Middle and High School

**Estimated Duration:** Two 1-hour classes plus time for research projects

**Objectives - Students will:**

- simulate collecting data from sharks in the field.
- simulate shark tagging with satellite tracking devices to continue to monitor the movement and behavior of sharks.
- track sharks using the GHRI tracking website to investigate migration patterns and behavior.

**Educator Background Information:**

To better understand shark behavior, migration patterns, and conservation needs, the Guy Harvey Research Initiative (GHRI.org) has been at the forefront of shark tagging and tracking efforts. The GHRI Team includes marine biologists, conservationists, and educators dedicated to studying and conserving sharks worldwide. Using advanced satellite tagging technology, the initiative gathers scientific data on various shark species, contributing invaluable insights into their life histories, behaviors and habitats. This information also plays a crucial role in informing policy decisions, fostering public awareness, and promoting the sustainable management of marine ecosystems.

## Shark Tagging and Tracking - Middle & High School

### FLORIDA STANDARDS ALIGNMENT

Middle & High School

**SC.6.L.14.5:** Identify and investigate the general functions of the major systems of the human body.

**SC.7.L.17.3:** Describe how biotic and abiotic factors affect the carrying capacity of an ecosystem.

**SC.8.N.1.2:** Design and conduct a study using repeated trials and replication.

**SC.912.L.17.9:** Use a model to predict the impact of environmental changes on the stability of an ecosystem.

**SC.912.N.1.1:** Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the appropriate experiment(s) to solve the problem.

### NEXT GENERATION SCIENCE STANDARDS ALIGNMENT

Middle & High School

**MS-LS2-2:** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

**HS-LS2-2:** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems.

**HS-LS2-8:** Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.

### MATERIALS

#### Shark Tagging

- Printed and cut out four species of shark - four of each species (shortfin mako shark, oceanic whitetip shark, tiger shark, whale shark)
- Printed tracking devices – each has a different number (5 per Research Team)
- Printed Shark Tag Datasheets (5 per Research Team)
- Smartphone or device with camera app
- Labeled DNA sample tubes (5 per Research Team)
- Labeled blood sample tubes (5 per Research Team)
- Labeled sampling loop or swab (5 per Research Team)
- Gallon size ziplock bag for “biological” samples (1 per Research Team)
- Stapler and extra staples (1 per Research Team)
- Measuring tape or ruler (1 per Research Team)
- Balance
- Timing device (1 per Research Team)
- Scissors
- Tape

#### Shark Tracking

- Access to GHRI tracking website

### ADVANCED PREPARATION

- Preview the slide deck and lesson.
- Confirm all video links in slide deck will work on your network.
- Print and cut out four species of shark four of each species (shortfin mako shark, oceanic whitetip shark, tiger shark, whale shark).
- Print tracking devices – each has a different number (5 per Research Team).
- Print Shark Tagging Datasheets (5 per Research Team).
- Hide sharks throughout room before class.



### ACTIVITY: Shark Tagging

Students become Shark Researchers as they simulate collecting data from and tagging sharks with satellite tracking devices to continue to monitor the movement and behavior of these sharks.

- Using the **Shark Tagging Student Slide Deck**, show the **Shortfin Mako Shark Expedition Notebook video** (2:29 min)
  - <https://www.youtube.com/watch?v=nSZ-3gzaPX0>
- Explain that shark tagging is a research method used by scientists to study movements and behaviors of sharks.
- In many cases, sharks are captured, tagged and released within a matter of minutes.
- During the tagging procedure, scientists often collect additional data including shark size, and take biological samples for health and genetic analyses.
- Explain that they are Shark Researchers trying to establish baseline blood levels to evaluate general health, document and identify individuals, investigate genetic relationships among populations and monitor shark movement and behavior through tracking.
- Sometimes sharks, like large whale sharks, are tagged while they are swimming.
- The type of tag deployed on a shark depends on the goal of the research.
  - Conventional tags – attached to dorsal fin and contain basic information (tagging date and contact info), and if recaptured, location information and growth can be determined.
  - Satellite tags – attached to dorsal fin and transmit location to satellite when the shark surfaces to provide real-time data on shark migration patterns.
  - Acoustic tags - emit a "ping" that can be detected by underwater receivers, allows researchers to track a shark's movements within a certain range.
  - Pop-up Satellite Archival Tags (PSATs) - satellite tags that detach from a shark after a certain period of time, then transmit stored data on depth, temperature, and light levels to satellites once they float to the surface.
- Hand out **Shark Tagging Datasheets**.
- Provide general directions for the activity:
  - As a Research Team of 2-3 researchers, select one of the four shark species (shortfin mako shark, oceanic whitetip shark, tiger shark, whale shark)
  - Together the Research Team searches for sharks.
  - Once a shark is caught, the Research Team has only 5 minutes to collect all of the data to minimize the stress on each shark.
  - If 5 minutes is up before all of the steps are complete, return the shark to where it was found and make a note on the datasheet.
- Search and tagging will take place for 20 minutes.
- Once activity is complete, start discussion about what they experienced.

### SHARK SAMPLING PROCEDURE

- Together the Research Team searches for sharks.
- Once a shark is “caught”, the Research Team has only 5 minutes to collect all of the data to minimize the stress on each shark.
- If 5 minutes is up before all of the steps are complete, return the shark to where it was found and make a note on the datasheet.
- Find a shark. If it is not tagged:
  - Start timer set for 5 minutes to minimize the stress on the shark.
  - Identify and record shark species on the **Shark Tag Datasheet**.
  - Take photos, including any unique markings or injuries. If a whale shark is encountered, photograph between first dorsal fin and gill slits (left side preferred, but either will work) for possible identification of individuals.
  - Measure and record total length.
  - Measure and record mass.
  - Collect fin clip and record tissue sample.
  - Collect and record blood sample.
  - Collect and record cloaca swab.
  - Record general condition, obvious markings, present or past injuries, and other comments.
  - Record satellite tag number.
  - Deploy satellite tag on dorsal fin (staple it).
  - Record time and date of tagging.
  - Replace shark where it was found.
  - Search for a new shark.
- Find a shark. If it is already tagged:
  - Start timer set for 5 minutes to minimize the stress on the shark.
  - Identify and record shark species on the Shark Tag Datasheet.
  - Take photos, including any unique markings or injuries. If a whale shark is encountered, photograph between first dorsal fin and gill slits (left side preferred, but either will work) for possible identification of individuals.
  - Measure and record total length.
  - Measure and record mass.
  - Collect and record blood sample.
  - Collect and record cloaca swab.
  - Record general condition, obvious markings, present or past injuries, and other comments.
  - Record tag number.
  - Record time and date of tagging.
  - Replace shark where it was found.
  - Search for a new shark.

### ACTIVITY: Shark Tracking

Students track sharks using the GHRI tracking website to investigate migration patterns and behavior.

- Using the **Shark Tagging Student Slide Deck**, show the **Andy the Tiger Shark video** and **Andy's tracking video**.
  - [https://www.youtube.com/watch?v=b\\_a9oLmBz5A&t=1s](https://www.youtube.com/watch?v=b_a9oLmBz5A&t=1s)
- Explain to students that the technological development of satellite telemetry has helped understand the migratory patterns and behavior of animals such as birds, dolphins, lions, sea turtles and sharks, in a way we could not before understand.
  - Satellite tags transmit real-time location information about sharks as they surface.
  - The satellite tag sends a signal to an orbiting satellite, which transmits the location information to a specific computer server.
  - The tag continues to send a signal until it falls off the shark, the battery life is over, or the shark has died.
- Show the **Shark Tracking Primer Video** (4:07min) to show how to use the GHRI Tracking website emphasizing the data available for the sharks that were tagged and tracked.
  - <https://vimeo.com/501946408>
- Ask students what types of information can they gather from the website.
- Let students explore the GHRI Tracking website and ask the following:
  - Do whale sharks or any sharks need to come to the surface? Why would they then?
  - Which shark traveled the longest distance?
  - Which shark had the longest tag duration?
  - Why do tags stop collecting data?
  - Are these the ONLY sharks in the area?
- Ask students what topics about shark biology and ecology can be studied from these data?
- RESEARCH PROJECT: Select a topic to address or develop your own research topic based on questions that can be answered, in part, by data from the GHRItracking.org.
  - Use the GHRI Tracking website to research your topic and provide evidence to support your claims.
  - Research projects can be presented in written or presentation format and should include:
    - Title
    - Introduction of the topic
    - Results from GHRI Tracking research
    - Discussion with evidence supporting the conclusions

# Shark Tag Datasheet

Tag number:

Date:

Out of water start time:

End time:

Already tagged? YES NO If yes, tag number:

## SHARK DATA

Species:

Male

Female

Total length:

Mass:

Collection location (GPS):

Photos? YES NO

General condition, obvious markings, present or past injuries, other comments:

## BIOLOGICAL SAMPLE DATA

Fin clip? YES NO If yes, tube number

Blood sample? YES NO If yes, tube number

Cloaca swab? YES NO If yes, tube number

## TAG INFORMATION

Transmitter attached? YES NO If yes, tag number

Location of tag:

Notes:

## LAB PROCESSING INFORMATION

Data uploaded into database? YES NO If yes, date.

Fin clip processed? YES NO If yes, date.

Blood sample analyses? YES NO If yes, date.

Cloaca swab processed? YES NO If yes, date.

Tag transmitting? YES NO

Shark named? YES NO If yes, name of shark:

Ping history:

























