

NOAA Gray's Reef National Marine Sanctuary Acoustic Fish Tagging Project

Activity: Tagging in the classroom – Grades 1 - 5

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Focus

This activity is to help students understand the technology used by scientists at Gray's Reef.

Focus Questions

How does an acoustic tagging system work?
What does an acoustic tagging project tell us?
How is data collected and processed?

Learning Objectives

- Students will learn how the acoustic tagging equipment works.
- Students will learn how scientists can interpret data and what the data can tell us.

Materials Needed

- ✓ One pack of multicolored construction paper
- ✓ String
- ✓ One set of non-toxic magic markers per team
- ✓ 4 desks or cardboard boxes or screens
- ✓ Two sheets of notebook paper for each "receiver"
- ✓ A pencil for each "receiver"
- ✓ A stopwatch or wrist watch for each "receiver"
- ✓ Divider of some kind (can be a large cardboard box, cubicle divider, book shelf, desk, or anything that is taller than a sitting child and can be easily moved around.)
- ✓ White board or chalk board
- ✓ Chalk or dry erase marker

Total Teaching Time

One 60-minute period

Seating Arrangement

Students who are the "Receivers" need to be on the outside of the room, where no one may move behind them. Also, the "receivers" need to be seated on the floor with the divider about 10 ft in front of them. The "tagged" students need to be able to walk freely about the room.

Maximum Number of Students

20

Key Words

Receiver

Transmitter

Detection range

Background Information

In this lesson, students will learn how some current technology works and how scientists use it to understand fish movements.

Purpose

To better manage marine resources, we need to understand the biology of fishes and what factors impact their behavior. The acoustic tagging project will help managers understand how much time red snapper and three grouper species (gag, red and scamp) spend in particular areas of Gray's Reef National Marine Sanctuary. Also, this project will allow us to track their daily, seasonal, and annual movements to better understand the behavior of these fish. The movement patterns may vary between individual species being studied or between individual age groups.

There are several questions we hope to answer, such as:

- Do resident times differ between species?
- How do temperature and/or weather affect the amount of time the fish spends in the sanctuary?
- Does the time of day have an effect on the amount of time the fish spends in the sanctuary?
- Does the period of the lunar cycle have an effect on the amount of time the fish spends in the sanctuary?

Acoustic tracking offers many benefits as compared to direct observation or conventional tag and recapture. Direct observations of subjects may alter fish behavior. In contrast, acoustic tagging allows us to detect whether a fish is present in or absent from the target area, without having to be there. Also, conventional tag and recapture can have more impact on the fish since this process requires the fish to be handled multiple times. Acoustic tagging allows us to receive more present-absent data with relatively less stress to a fish.

Fourteen acoustic receiver array units (Figure 1) are placed around Gray's Reef National Marine Sanctuary to listen for tagged fish. If you or someone you know happen to accidentally pull up one of the receiver arrays (Figure 4) please keep the array and call us at 912-598-2345. We will retrieve the

unit and return it to the water in the appropriate location so that we can continue tracking fish in Gray's Reef National Marine Sanctuary.

Tags and Receivers

Sixteen fish are currently tagged with transmitters: seven scamp, *Mycteroperca phenax*, five gag, *Mycteroperca microlepis*, three red snapper *Lutjanus campechanus*, and one red grouper *Epinephelus morio*. These fish were caught using hook and line and vented (gas expelled from the swim bladder) using an empty hypodermic needle. The tags were then surgically implanted into the fish's abdominal cavity. These tags emit a unique "ping" every 120 seconds at a frequency, which the acoustic receivers can detect up to about 200 meters.

Fourteen acoustic receivers are deployed in the sanctuary. An acoustic receiver array consists of the receiver attached to a buoy line that is suspended vertically in the water column using two subsurface floats and a steel bar as an anchor. The receiver is attached about 1.5 meters from the bottom so that when the bottom gets stirred up by fish or weather the receiver is not affected. Divers retrieve the receivers once every three months, download the data, and then return them to their mooring.

Period #1: 60 minutes

Seating Arrangement

Students who are the "Receivers" need to be on the outside of the room, where no one may move behind them. Also, the "receivers" need to be seated on the floor with the divider about 10 ft in front of them. The "tagged" students need to be able to walk freely about the room.

Activity Instructions

Use the construction paper, string and markers to make a sign for each student. Label some signs as R-1, R-2, R-3, etc, for each student that will be a "receiver". Label the other signs as T-1, T-2, T-3, etc, for each student that will be a "tagged fish". "Receivers" will sit with their back to a corner or wall, so the fish cannot go behind them, and face forward with a pencil and paper in their hand. About 10-15 ft in front of the receiver, place a cardboard box, divider, or anything that blocks their sight. This represents how far a receiver can detect a fish. The "tagged fish" will then walk anywhere around the receivers, including between the "receivers" and the divider. Every time a "receiver" sees a "tagged fish", the receiver writes down the number of the "tagged fish" and the time on the watch. Remember to make sure all of the watches are displaying the same time. This activity should go for about 10 to 15 minutes. It can be made longer if the teacher desires.

At the end of the exercise, students or the teacher should write the "receiver" detections on the white board/ chalk board. While this is being done, students can draw a map of the room. This map needs to include where the "receivers" are located. A map for each fish should be done. Then students will organize the receiver detections in order by time. Then, starting with the first recording, students can draw on the map from receiver to receiver the path the "fish" took. Remind students that the "receiver" could only detect the fish so far out and to represent this distance on the map.

Extensions:

1. Assign or ask the students to choose another tagging-tracking project and write a report on it. The students should be able to use the internet to research most of the projects and to download images.
2. Ask the students to brainstorm other ideas of how to answer the questions:
 - Do resident times differ between species?
 - How does temperature and/or weather affect the amount of time the fish spends in the sanctuary?
 - Does the time of day have an effect on the amount of time the fish spends in the sanctuary?
 - Does the period of the lunar cycle have an effect on the amount of time the fish spends in the sanctuary?
3. Ask the students to choose one question and an accompanying idea from those brainstormed in #2 and develop a detailed plan for their research project.