

On the Trail of the Hudson's Migratory Fish

Students will practice addition and subtraction skills by tracking the movements of migratory fish of the Hudson River estuary.

Objectives: Students will solve word problems that require them to:

- add and subtract using data from tagged fish to calculate distance traveled, elapsed time, and growth;
- understand the life cycle of anadromous fish.

Grade level: Elementary (Grades 3-5)

Subject Area: Math, Social Studies (Geography), Science

New York State Learning Standards:

Mathematics, Science, & Technology Standards 3, 4

Skills:

- Use whole numbers to identify locations and measure distances.
- Add and subtract whole numbers.
- Apply mathematics in real world settings.
- Reason mathematically.

Duration:

Preparation time: 5 minutes

Activity time: 45 minutes

Materials: Each student should have:

- Worksheet: On the Trail of the Hudson's Migratory Fish
- Calendar (to determine number of days in each month)
- Hudson River Miles map
- Pencil
- If available, a wall map showing the Hudson and the eastern coast of North America is very helpful for in-class discussion.



Background:

Scientists attach numbered tags to fish to track their travels and growth. Anglers who catch tagged fish contact the scientists using information on the tags. The data they provide can be used to determine how far and how fast fish travel and how quickly they grow.

Striped bass, Atlantic sturgeon, and American shad are born in the freshwater part of the Hudson but eventually swim out into the Atlantic Ocean. They spend most of their adult lives at sea, returning to the river only to spawn (lay eggs). We think of them as "our" fish, but their visit here is just one piece of their long-distance migrations. Fishes with this life cycle (living in the ocean but entering fresh water to spawn) are called anadromous fishes.

Distances on the Hudson are often measured in Hudson River Miles. Hudson River Miles start at the southern tip of Manhattan. This spot, called The Battery, is River Mile 0. The estuary part of the Hudson ends at the Federal Dam in Troy at River Mile 153.

Activity:

1. In preparation for this lesson, have students do the Readings in Hudson River Natural History lesson titled "Atlantic Sturgeon of the Hudson River."
2. Discuss the concept of migration and the anadromous life cycle of many Hudson River fish.
3. Introduce the Hudson River Miles system; show students the Hudson River Miles map.
4. Go over the worksheet with the class or hand out as an in-class or homework assignment.
5. Some questions require students to add distance between a point upriver and New York to distance between New York and another site along the coast. A U.S. map is helpful here.

Assessment:

- Have students share answers to questions from worksheets, or collect and grade sheets.
- Make up similar elapsed time/distance/growth problems for quiz.
- Extension: Have students cut out two small paper tags of different colors to represent fish - one for when it was tagged, the other for when it was recaptured. Paste each to the Hudson River Miles map or map of the Atlantic Coast in the appropriate spot.

Vocabulary:

anadromous: lives in salt water but migrates back to freshwater to spawn

angler: a person who fishes with hook and line

data: pieces of information

fresh water: water that is not salty (rainwater is freshwater)

Hudson River miles: distance measured north from the Battery at Manhattan's southern tip

migration: animals' movement from one place to another

recapture: to capture again

scientist: a person skilled in science

sonic tag: tags that, when attached to fish, send signals heard by underwater microphones

spawn: to lay eggs; usually refers to animals that live in water

Resources:

The Hudson River Foundation's striped bass tagging program posts results at <http://www.hudsonriver.org/sb/> Illustrations and information about the fish described in this activity can be found on the New York State Department of Environmental Conservation website at <http://www.dec.ny.gov/animals/269.html>



On the Trail of the Hudson's Migratory Fish: ANSWER KEY

On the Trail of the Hudson's Migratory Fish

Many Hudson River fish are **anadromous**. This means that they are born in **fresh water**, travel to the ocean to grow up, and then return to the Hudson to **spawn** (lay their eggs).

Scientists attach numbered tags to fish to study **migration** and growth. When a tagged fish is caught, the lucky **angler** uses an address or phone number on the tag to report where and when the fish was caught and how big it was.

You will use real scientific **data** from tagged fish to find out how far fish travel and how much they grow. Show your work as you answer the questions below.



The tag on this striped bass is a thin plastic strip. It is inserted through the skin, much like the way people get
← *body piercings.*

The tagged fish is then released back into the water.



1. Striped bass #388381 was 16 inches long when tagged near the Statue of Liberty in November 1996. When caught near Seaside Park, New Jersey, in November 2001 it was 26 inches long.

(a) How many years had gone by since this bass was tagged? 5 years

$$\begin{array}{r} 2001 \\ - 1996 \\ \hline 5 \text{ years} \end{array}$$

(b) How much had it grown from 1996 to 2001?

$$\begin{array}{r} 26 \\ - 16 \\ \hline 10 \text{ inches} \end{array}$$

10 inches



2. Striped bass #289667 was tagged on September 16, 1992, at Danskammer Point on the Hudson, 67 miles north of the Battery in Manhattan. This fish was **recaptured** near the Statue of Liberty, 2 miles south of the Battery, on September 27, 1992.

(a) How many miles had it traveled since September 16? ***_69 miles_***

$$\begin{array}{r} 67 \\ - 0 \\ \hline 67 \text{ miles} \end{array} \qquad \begin{array}{r} 67 \\ + 2 \\ \hline 69 \text{ miles} \end{array}$$

(b) How many days did it take the bass to travel from Danskammer Point to the Statue of Liberty? ***_11 days_***

$$\begin{array}{r} 27 \\ - 16 \\ \hline 11 \text{ days} \end{array}$$

3. Striped bass #32057 was tagged on May 31, 1989 on the Hudson near Kingston, 90 miles north of New York City. It was caught on September 30, 1989 off Nova Scotia, Canada, 850 miles northeast of New York City.

(a) How many miles had the bass swum since being tagged? ***_940 miles_***

$$\begin{array}{r} 90 \\ - 0 \\ \hline 90 \text{ miles} \end{array} \qquad \begin{array}{r} 90 \\ + 850 \\ \hline 940 \text{ miles} \end{array}$$

(b) How many months had gone by? ***_4 months_***

$$\begin{array}{r} 9 \\ - 5 \\ \hline 4 \text{ months} \end{array}$$

4. American shad #12640 was tagged on April 9, 2001, near Cape May, New Jersey, 161 miles south of New York City. It was caught on May 6, 2001, in the Hudson near Selkirk, at **Hudson River Mile 136**.

(a) How many miles had it traveled since April 9? ***_297 miles_***

$$\begin{array}{r} 136 \\ - 0 \\ \hline 136 \text{ miles} \end{array} \qquad \begin{array}{r} 161 \\ + 136 \\ \hline 297 \text{ miles} \end{array}$$

(b) How many days had gone by? ***_27 days_***

$$\begin{array}{r} \text{April has 30 days} \\ - 9 \\ \hline 21 \text{ days} \end{array} \qquad \begin{array}{r} 21 \\ + 6 \text{ days in May} \\ \hline 27 \text{ days} \end{array}$$



5. In June 2004 at Kingston, an Atlantic sturgeon received tag #16709 plus a **sonic tag**. Sonic tags send a signal heard by underwater microphones. Scientists followed the signal as the fish swam south that summer. They last heard its signal in Haverstraw Bay, Hudson River Mile 40, in October.

In January 2005 this sturgeon was recaptured near Matapeake, Maryland, 180 miles up the Chesapeake Bay. The entrance to the Chesapeake is 310 miles south of New York City.

People pierce their ears to hang earrings. The same idea is used to attach tags on an Atlantic sturgeon.



(a) How many miles did this sturgeon travel from Haverstraw Bay to New York City?

$$\begin{array}{r} 40 \\ - 0 \\ \hline 40 \text{ miles} \end{array}$$

(b) How many miles did this fish travel from New York City to the entrance of the Chesapeake Bay?

310 miles

(c) How many miles did the sturgeon travel from the entrance of Chesapeake Bay to Matapeake?

180 miles

(d) In total, how many miles did this fish swim from Haverstraw Bay to Matapeake?

$$\begin{array}{r} 40 \\ 310 \\ + 180 \\ \hline 530 \text{ miles} \end{array}$$

