



Lesson 17: How can we protect North Atlantic right whales?

Objectives: Students will learn about ways to minimize ship strikes and whale entanglements. Students will explore ways that they as individuals can help protect North Atlantic right whales.

You will need:

- Computers with internet access (for individual students or groups of up to 3 students)
- Copies of “*Help the Right Whale Fix What’s Wrong*” game student worksheet (page 17-5 and 17-6) for each student or group of students
- Copies of *Right whale Incident Data* student worksheet (page 17-12) for each student

Standards: CCSS.Math.Content.4.OA.A.1

Sunshine State Standards: SC.4.L.17.4; SC.4.N.1.1 (additional activity #2)

Strategy:

1. Explain to the students that today’s lesson will cover threats facing North Atlantic Right Whales (and other cetaceans).
2. Have students access the Right Whale Game at the Ocean Conservancy website (<http://act.oceanconservancy.org/rightwhalegame/rightwhale.html>). Explain that there will be three levels to the game—if students are working in groups, they should take turns so each student plays one of the levels. All students need to pay attention to all levels so they can fill out the worksheet, and so that they will know what they need to do when it is their turn to play.
3. Give students copies of the student worksheet. Tell students to read all of the questions on the worksheet so they will know what information they are looking for as they play the game (Note: the “fact pages” in the game appear in a different order each time the game is played, so the questions may not be sequential with the version of the game the students are playing.).
4. Allow students to play the game (they should read the information on the screen before clicking “Begin Adventure.” (Note: sound is available but not required for this game.) They may need or want to play it more than once to allow everyone a turn and to make sure they get all of the information filled out on the worksheet. Allow about 15 minutes for students to play the game and complete the worksheet. If students are having difficulty finding the answers to questions on the worksheet, encourage them to click on the “Print materials” link at the end of the game (this will open a pdf document which they can read without having to print it).
5. Once all students have played the game and completed their worksheets, review with them what they have learned about threats to right whales (from this lesson and lessons 15 and 16). Ask students to tell you things that are dangerous to right whales or pose a threat to right whales and write them on the board. Also discuss with students HOW each of the items listed affects the whales and write this next to each item. Your final list/table should include the following:



| Threat | Impact |
|--------------------------|---|
| Ships/boats | Hitting whales and injuring/killing them |
| Fishing gear/ropes | Entangling whales—may drown whales, may prevent them from feeding, may cause injury/infection |
| Noise | Prevent whales from communicating, finding mates, mother whales may lose track of calves |
| Trash | May be eaten by whales—not able to be digested, not nutritious |
| Harassment/ Annoyance | Surfers, kayakers, paddle boarders, jet skiers, and smaller vessel may annoy right whale and change their behaviors (feeding, nursing, mating, etc.), as well as put them at risk of injury. Mother and calves may be separated when trying to avoid annoyance. |
| Hunting | No longer a problem for North Atlantic Right Whales, but is the reason for their low numbers now |

6. Discussion/ Lesson:

- a. It might be beneficial at this point to explain a little bit about trap fishing off the northeastern US. Peak lobster fishing in the Gulf of Maine is in the summer and fall, but some lobstermen are fishing at all times of the year. Typically, commercial boats fishing for lobster set lines of traps where each trap is connected by rope to the next trap. There can be as many as 15-30 traps per line and a commercial lobsterman may set hundreds of traps at a time. Each line of traps has to have a buoy (attached by rope) at least one end, but the specific requirements vary with location. Traditionally, the ropes that were used to connect the traps would float, making a loop of rope between traps (see diagram on page 17-14). Fishermen are now required to use sinking ropes in certain areas as these sinking lines are hoped to reduce the entanglement risk to whales.
 - b. Explain to students that $\frac{3}{4}$ of North Atlantic Right Whales have evidence of entanglement (scars). Mention that fishermen have complained that sinking lines are more likely to get tangled on rocky bottoms, resulting in more broken rope and abandoned traps being left in the water. The idea of a low-density rope, which would float slightly and stay off the bottom, but would not float high enough in the water column to impact whales (hopefully) is being considered.
7. Ask students if they think any of the threats could be prevented, and if so, how. Ideas could include the following:

| Threat | How threat could be prevented |
|--------------------|--|
| Ships/boats | Ships need to slow down when whales are present or avoid areas where whales gather. Observers on boats can watch for whales in the water. Buoys that detect whale calls can indicate the presence of whales in an area. Shipping lanes can be re-routed. |
| Fishing gear/ropes | Floating ropes could be replaced with sinking ropes. Regulations could be developed to reduce the number of traps or the length of the fishing season. Fishermen could be allowed to only set traps when whales are not in the area (winter). |
| Noise | Avoid some activities (e.g. drilling at sea) when whales are present in the area. |
| Trash | People can be more careful when disposing of trash to make sure it |



| | |
|--------------------------|--|
| | can't blow or wash into the water. People can reduce, reuse and recycle more. People can select to buy products that come in biodegradable packaging. |
| Harassment/ Annoyance | People should always stay at least 500 yards away from a right whale. If you are swimming, surfing, kayaking, paddle boarding, jet skiing or boating and you see a right whale, you should always move away immediately. |
| Hunting | Laws have been passed to protect right whales from hunting. |

8. Discussion/ Lesson:

Explain to students that there have been some laws/regulations that have changed to help protect right whales.

- a. In 2009, the shipping channel into Boston was shifted slightly, from area where whales were found to be abundant to an area where they are less common. The change is expected to reduce the number of ship strikes in that area by about 60-80%. The change only increased the travel time for ships by 10-22 minutes. Additionally, if a right whale call has been detected by one of the acoustic buoys in the channel, ships must slow to no more than 10 knots (11.5 mph) and must post a lookout to watch for whales. All ships traveling through right whale feeding areas must also slow to no more than 10 knots at certain times of year (the dates vary by location). Although not mandated at this time, ships traveling into the ports of Fernandina, Jacksonville (FL), Brunswick (GA) and Cape Cod Bay (MA) are asked to use recommended vessel routes to reduce the risk of right whale strikes. Ships are required to slow down to 10 knots (about 11.5 mph) or less when traveling through the right whale calving area off southern Georgia and northeastern Florida between November 15 and April 15, and must also slow down in certain portions of the whales' migratory route (between Connecticut and Georgia) from November 1 through April 30.
 - b. In 2009, the federal government required the use of sinking ropes for lobster traps set in certain geographic areas.
 - c. In 1997, the Federal government issued approach limits for right whales. It is illegal to approach and remain within 500 yards of a right whale.
 - d. Hunting of right whales was banned in 1937.
9. Challenge students to think of any ideas that they, their families or their communities could do to help protect whales, especially right whales. Here are some possible ideas:
- a. Go slowly if boating in the migratory or calving area between November and April, or in the feeding areas in the spring and summer (see maps at http://www.nmfs.noaa.gov/pr/pdfs/shipstrike/compliance_guide.pdf).
 - b. Report right whale sightings—information about right whale locations is sent to ships traveling in the area so they know to slow down and keep a look out for the whales. In some parts of northeastern Florida, you can join a volunteer right whale sighting network (see www.marinelandrightwhale.blogspot.com) or report sightings to 877-WHALE HELP (877-942-5343).
 - c. Recycle fishing line and dispose of other fishing gear properly.



- d. Pick up trash, volunteer for coastal/beach cleanups, or start a recycling campaign.
- e. Do not approach a right whale, even if it is swimming close to shore. Remember to stay at least 500 yards away (that's more than 4 football fields in length!)
- f. Raise money for right whale research, sponsor or adopt a right whale (www.neaq.org: under "Membership and Giving," click on "Make a Donation," then scroll down to "Sponsor a Right Whale"; www.adoptrightwhales.ca).
- g. Report dead, injured or entangled whales to 877-WHALE HELP (877-942-5343).

Additional activities:

1. **Right whale mortalities** (data interpretation/math): Give students copies of pages 17-9 through 17-11. Ask students to complete the data sheet (page 17-12) using the information from this table.
2. **Lobsters vs. whales** (suggested for gifted or advanced students): Students will research how American lobster fishing in the New England region affects whales, specifically North Atlantic Right Whales. Divide students into 7 groups. Each group will be assigned a specific role: lobster fisherman, NOAA Fisheries Officer, right whale researcher, member of environmental activist group, member of local fishing coalition, ecotour operator (whale watch boat captain), state wildlife official. Each group will be tasked with using the internet to research and formulate answers to the following questions, from the perspective of their assigned role. Each group should select a spokesperson to represent them at a "public forum" (moderated by the teacher) to debate the statement, "Current lobster fishing practices are more of a threat to lobstermen than to whales." (Remind students that they will be speaking in the "voice" of their assigned role, and not necessarily voicing opinions that they agree with.)

Questions to be researched:

1. What current regulations exist for commercial lobster fishermen?
2. How have these regulations changed in order to try and protect whales? How has this affected lobster fishermen?
3. What do we know about the hazards of commercial lobster fishing to whales?
4. What additional regulations have been suggested for lobster fishing? How are these likely to affect lobster fishermen? Whales?

Each group may wish to do additional research to help support their position.

Teachers who are interested in learning more about lobster fishing might be interested in reading "The Secret Life of Lobsters" by Trevor Corson, or "The Lobster Chronicles: Life on a Very Small Island" by Linda Greenlaw.



Name: _____

“Help the Right Whale Fix What’s Wrong” game

STUDENT WORKSHEET

1. In what month do volunteers around the world pick up trash to help sea animals? _____

2. Why is trash harmful to sea animals?

3. In the first round of the game, the whale encounters krill, jellyfish and trash. Put a check mark in the appropriate box to show what effect each of these items has on right whales.

| Object | Effect on right whales | | |
|-----------|------------------------|-----------|---------|
| | Harmful | No effect | Helpful |
| Krill | | | |
| Jellyfish | | | |
| Trash | | | |

4. How long can right whales grow to be? _____

5. A right whale’s head is about _____ of its total body length.

6. About how long can right whales live? _____

7. What color do cyamids make the whale’s callosities look? _____

8. How are ropes that are attached to lobster traps dangerous for whales?

9. What are fishermen doing to reduce the risk of ropes to whales?



10. How long will right whale calves stay with their mothers?

11. How are ships dangerous to right whales?

12. How can ships reduce their threat to whales?

13. What were the three threats to right whales in this game?

a. _____

b. _____

c. _____



Name: _____

“Help the Right Whale Fix What’s Wrong” game

ANSWER KEY

- In what month do volunteers around the world pick up trash to help sea animals? September
- Why is trash harmful to sea animals? Trash can choke or poison sea animals (“millions of sea animals are choked or poisoned by trash each year”)
- In the first round of the game, the whale encounters krill, jellyfish and trash. Put a check mark in the appropriate box to show what effect each of these items has on right whales.

| Object | Effect on right whales | | |
|-----------|------------------------|-----------|---------|
| | Harmful | No effect | Helpful |
| Krill | | | ✓ |
| Jellyfish | | ✓ | |
| Trash | ✓ | | |

- How long can right whales grow to be? 50 feet
- A right whale’s head is about one third (1/3) of its total body length.
- About how long can right whales live? 60 years
- What color do cyamids make the whale’s callosities look? white
- How are ropes that are attached to lobster traps dangerous for whales?
When whales swim through the water, the lines may get wrapped around the whale’s flukes and flippers or through its mouth and baleen. This may prevent the whale from surfacing for air (i.e. the ropes drown



the whales) and also cuts into their skin so they cannot swim as well.

9. What are fishermen doing to reduce the risk of ropes to whales? They are using ropes that sink, which are less likely to entangle the whales
10. How long will right whale calves stay with their mothers? About one year
11. How are ships dangerous to right whales? They can hit whales, hurting or killing them.
12. How can ships reduce their threat to whales? Ships can slow down when they are in areas where whales are present
13. What were the three threats to right whales in this game?
 - a. Trash
 - b. Fishing ropes
 - c. Boats



Summary of North Atlantic Right Whale Incidents, 1999-2008

Compiled using data obtained from by the National Marine Fisheries Service Office of Protected Resources' Marine Mammal Health and Stranding Response Program, Northeast Regional Office, and Southeast Regional Office, with assistance from the Provincetown Center for Coastal Studies, New England Aquarium, and Woods Hole Oceanographic Institution.

Information Current as of April 13, 2008

| | Sex | Date | Location First Reported | Alive or Dead | Cause of Death |
|-----------|--|-------------|--|----------------------|---|
| 1 | Female (adult, 27+ yrs old) #1014 "Staccato" | 4/20/99 | MA (Cape Cod) | Dead | Vessel strike |
| 2 | Female (9+ years old) #2030 | 5/10/99 | MA (80 mi east of Cape Cod) | Dead | Entanglement |
| 3 | Male (adult, 20+ years old) #1130 "Zebra" | 3/01/00 | MA (6 mi east of Manomet) | Serious injury | Entanglement |
| 4 | Male (calf) | 3/17/01 | VA (Assateague) | Dead | Vessel strike |
| 5 | Male (adult, 21+ years old) #1102 | 6/8/01 | MA (58 mi east of Cape Cod) | Serious injury | Entanglement |
| 6 | Female (calf) | 6/18/01 | NY (Long Island) | Dead | Vessel strike |
| 7 | Male (adult, 19+ years old, 14m) #1238 | 11/3/01 | Canada (Magellan Islands) | Dead | Entanglement, Danish seine gear |
| 8 | Female (~1 year old, 11m) #3107 | 7/6/02 | Canada (off Briar Island, Nova Scotia) | Dead | Entanglement, inshore lobster fishery gear, |
| 9 | Female (adult, 14+ years old) #1815 | 8/22/02 | Canada (Scotian shelf) | Serious injury | Entanglement |
| 10 | Female (~1 year old, 12.6m) | 8/22/02 | MD (Ocean City) | Dead | Vessel strike |
| 11 | Unknown (3+ years old) #3210 | 8/30/02 | Canada (Bay of Fundy, Nova Scotia) | Serious injury | Entanglement, no gear recovered |
| 12 | Female (adult, 13+ years old) #2240 | 1/14/03 | FL (Jacksonville) | Serious injury | Entanglement, no gear recovered |
| 13 | Female (adult, 12+ years old) #2150 | 10/2/03 | Canada (off Digby, Nova Scotia) | Dead | Vessel strike |



| | Sex | Date | Location First Reported | Alive or Dead | Cause of Death |
|----|---|----------|---|---|---|
| 14 | Female (adult, 29+ years old, pregnant) #1004 "Stumpy" | 2/7/04 | VA (Virginia Beach) | Dead | Vessel strike |
| 15 | Male (calf) | 2/3/04 | FL | Dead | Unknown |
| 16 | Male (juvenile, 1 year old) #3346 "Kingfisher" | 3/17/04 | FL (SE of St. Augustine) | Injury | Entanglement |
| 17 | Female (adult, 12 years old) #2301 | 9/6/04 | Canada (Roseway Basin, Nova Scotia) | Dead (as of March 3, 2005 on Ship Shoal Island, VA) | Entanglement |
| 18 | Female (adult, 15 years old; pregnant) #1909 | 11/24/04 | NC (Ocean Sands) | Dead | Vessel strike |
| 19 | Unknown | 12/9/04 | MA | Dead | Unknown |
| 20 | Female (adult) | 1/9/05 | MA | Dead | Unknown |
| 21 | Female (adult, 14 years old, pregnant) #2143 "Lucky" | 1/12/05 | GA (Cumberland Island) | Dead | Infection from previous vessel strike |
| 22 | Female (adult, 11 years old at time of injury) #2425 | 3/10/05 | GA (Cumberland Island) | Serious Injury | Vessel strike |
| 23 | Female (9yrs old) #2617 | 4/28/05 | MA (Monomoy Island) | Dead | Vessel strike |
| 24 | Male (adult, first seen 1981) #1167 | 6/8/05 | MA (Great South Channel) | Injury | Entanglement - free of gear as of 3/30/07 |
| 25 | Unknown | 7/13/05 | MA | Injury | Vessel strike |
| 26 | Female (1 yr. old) #3445 | 12/3/05 | GA (St. Simons Island) | Injury | Entanglement |
| 27 | Male (calf, 5.4m without fluke) | 1/10/06 | FL (off Jacksonville) | Dead | Vessel strike |
| 28 | Unknown (calf, ~5m) | 01/16/06 | TX (Corpus Christi Bay) | Serious Injury | Vessel strike |
| 29 | Female (calf, 5.6m) | 1/22/06 | FL (off Ponte Vedra Beach) | Dead | Entanglement, monofilament fishing gear |
| 30 | Male (yearling) #3522 | 3/11/06 | GA (off Cumberland Island) | Serious Injury | Vessel strike |
| 31 | Female (sub-adult) | 5/18/06 | NY | Dead | Unknown |
| 32 | Female (unknown age, 9.6 m) | 7/24/06 | Canada (Campobello Island, New Brunswick) | Dead | Vessel strike |



| | Sex | Date | Location First Reported | Alive or Dead | Cause of Death |
|-----------|--|---|--|-------------------------------------|-------------------------------|
| 33 | Unknown | 8/16/06 | Canada (Bay of Fundy) | Injury | Entanglement |
| 34 | Female (adult, 14.7 m) | 8/24/06 (date of sighting, not reported until 9/3/06) | Canada (Roseway Basin, Nova Scotia) | Dead | Vessel strike |
| 35 | Male (adult, 22 yrs. old) #1403 Meridian | 9/17/06 | Canada (14m east of Swallowtail, Grand Manan Island) | Injury | Entanglement |
| 36 | Unknown | 9/27/06 | Canada (Bay of Fundy) | Injury | Entanglement |
| 37 | Male (2 yrs. old, 12.6 m) #3508 | 12/30/06 | GA (off Brunswick) | Dead | Vessel strike |
| 38 | Female (adult) #2029 | 3/9/07 | MA (20 mi SE of Chatham) | Injury | Entanglement |
| 39 | Female (2 yrs. old) | 3/19/07 | MA (Cape Cod Bay) | Injury | Vessel strike |
| 40 | Male (adult) #1424 | 3/25/07 | MA (75mi SW of Yarmouth) | Dead (originally entangled in 2002) | Entanglement |
| 41 | Male (calf) | 3/30/07 | NC (off Avon) | Dead | Entanglement, possible vessel |
| 42 | Female (5+ yrs. old) #3260 | 5/8/07 | MA (about 65 mi SE of Chatham) | Injury | Entanglement |
| 43 | Unknown (calf) | 8/5/07 | Canada (Bay of Fundy) | Injury | Vessel strike |
| 44 | Female (12 yrs. old) #2645 | 1/12/08 | MA (Cape Cod Bay) | Injury | Entanglement |
| 45 | Male (5 yrs. old) #3333 | 1/29/08 | GA (off Sapelo Island) | Injury | Entanglement |
| 46 | Male (2 yrs. old) #1980 | 2/3/08 | NC (Cape Hatteras) | Injury | Entanglement |
| 47 | Female (27+ yrs. old) #1140 "Wart" | 3/6/08 | MA (Cape Cod Bay) | Injury | Entanglement |



Name: _____

Right whale Incident Data

STUDENT WORKSHEET

- How many right whales are listed in the table? _____
- How many years does the table cover? _____
- What is the average number of right whale incidents per year? (Divide your answer to #1 by your answer to #2) $\frac{\text{_____}}{\text{(Answer to \#1)}} \div \frac{\text{_____}}{\text{(Answer to \#2)}} = \text{_____}$
- How many of the whales listed are female? _____
- How many of the whales listed are male? _____
- How many of the whales are calves? _____
- Use information from the incident data to complete the following table:

| Cause | Number of injured whales | Number of dead whales |
|---------------|--------------------------|-----------------------|
| Vessel strike | | |
| Entanglement | | |

- What type of threat causes more deaths, vessel strikes or entanglement?

- What type of threat causes more injuries, vessel strikes or entanglement? _____
- Were most of the incidents in northern waters (Canada, MA, VA, MD, NY) or southern waters (NC, GA, FL, TX)? _____



Right whale Incident Data

ANSWER KEY

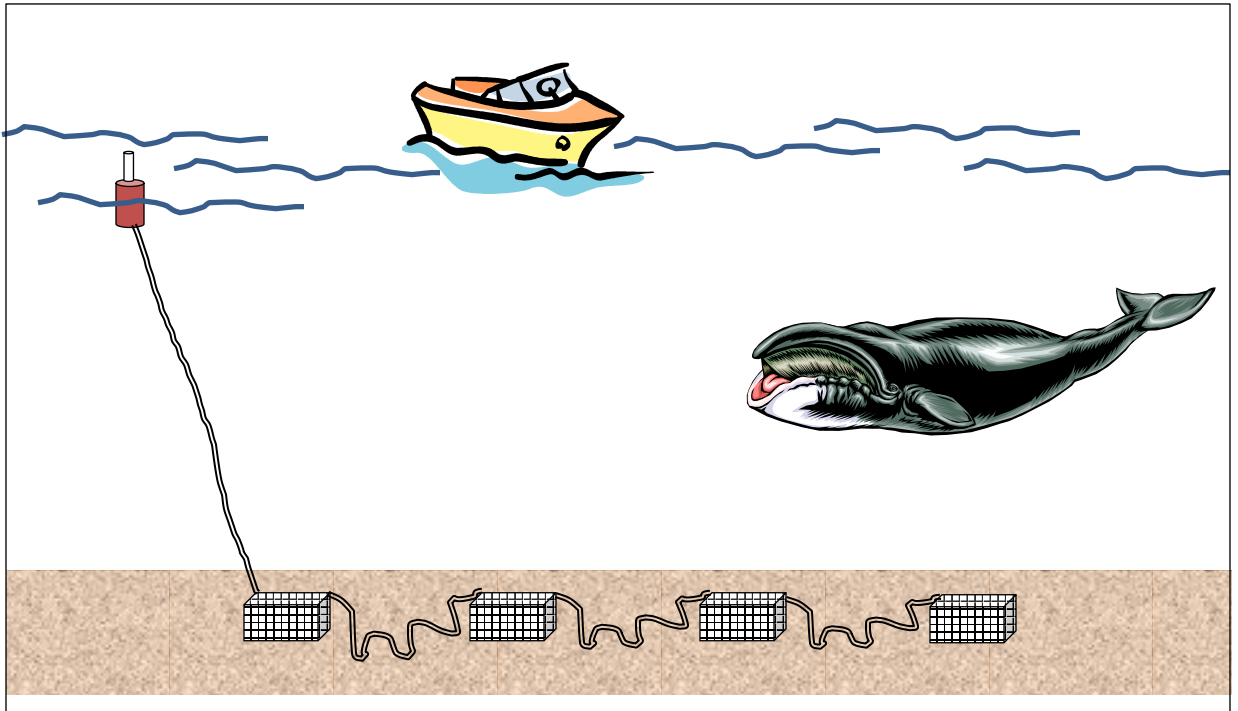
- How many right whales are listed in the table? 47
- How many years does the table cover? 9
- What is the average number of right whale incidents per year? (Divide your answer to #1 by your answer to #2) 47 ÷ 9 = 5 remainder 2 or 5 2/9 or 5.22
- How many of the whales listed are female? 25
- How many of the whales listed are male? 15
- How many of the whales are calves? 8
- Use information from the incident data to complete the following table:

| Cause | Number of injured whales | Number of dead whales |
|---------------|--------------------------|---|
| Vessel strike | 6 | 13 (or 14 if #31 is included here—in the table it is given as entanglement, possible vessel strike) |
| Entanglement | 17 | 7 |

- What type of threat causes more deaths, vessel strikes or entanglement?
vessel strikes
- What type of threat causes more injuries, vessel strikes or entanglement? entanglement
- Were most of the incidents in northern waters (Canada, MA, VA, MD, NY) or southern waters (NC, GA, FL, TX)? northern waters (32 of the 47)



a) Lobster traps set with sinking rope



b) Lobster traps set with floating rope

