

Cape Lookout National Seashore

# Life on the Outer Banks

An Educator's Guide to Core and Shackleford Banks

Sixth Grade Edition



Prepared by the  
*Core Sound Waterfowl Museum and Heritage Center*

Funded by a grant from the  
*National Park Service*

## **Parks as Classrooms**

The National Park Service's *Parks as Classrooms* program is a nationwide initiative to encourage utilization of the resources of America's national parks for teaching and learning. A visit to the National Park Service's homepage (<http://www.nps.gov>) reveals myriad learning opportunities available to our nation's students and teachers. Students will discover history and explore nature within the context of a changing world; and yet, within the boundaries of many parks, the hands of time are frozen to allow them a "snapshot" of the past. *Parks as Classrooms* focuses on bringing learning to life through exciting hands-on, experiential opportunities that are student-friendly, field based, and promote a sense of stewardship of park resources.

### **Cape Lookout's Classroom**

Lying just east of the North Carolina mainland are the barrier islands that compose the famed Outer Banks. Cape Lookout National Seashore protects some of the southern-most sections of this barrier island chain. The park covers the long, narrow ribbon of sand running from Ocracoke Inlet in the northeast to Beaufort Inlet in the southwest. The names given to these three barrier islands are Portsmouth Island (Portsmouth Village, although uninhabited, is at the north end of the island), Core Banks (where the Cape Lookout Lighthouse is located near the southern end of the island), and Shackleford Banks. These barrier islands are 56 miles long and consist mainly of three habitat zones: wide, bare beaches with low dunes covered by scattered grasses, flat grasslands bordered by dense vegetation, and large expanses of salt marsh alongside the sound. And, of course, the islands are surrounded by water, with the Atlantic Ocean to the east and south, Core Sound to the west of Core Banks, and Back Sound north of Shackleford Banks.

Under the park's protective watch, habitats rich with a diversity of flora and fauna thrive. The waters surrounding the park are feeding grounds for marine mammals and sea turtles, while spring and fall migrations bring many different species of birds. Shackleford Banks is home to a population of wild horses whose lineage can be traced back for hundreds of years to Spanish horses. No less diverse than the animal life are the plant species which have adapted to this harsh and constantly changing environment and flourish within the constant struggle against wind and sea.

Although Core and Shackleford Banks are free of the intrusions of paved roads, resort facilities, and bridges to the mainland, vestiges of the Banks' rich human history are still clearly evident. From Portsmouth—one of the earliest trading ports in North Carolina—to the family graveyard of Shackleford Banks, students gain an understanding of the men and women who carved out a unique lifestyle along the shores of Core, Back, and Pamlico Sounds. Anchoring the entire story of human habitation along the Banks is the more than 150 year old Cape Lookout Lighthouse. Its presence denotes aspects of a lifestyle lived close to and in harmony with nature's elemental forces.

### **The Classroom Guide**

This activity guide is one of a series to help teachers prepare their students for a visit to Cape Lookout National Seashore. Integrated within the science and social studies activities of the guide are selected narratives to give the teacher background information on this unique region of

North Carolina. In addition to pre-visit, on-site and post-visit activities, the guide contains poems and songs of the region as well as alternate activities to spark a student's imagination and stimulate problem-solving skill development. Teachers are encouraged to contact the Cape Lookout National Seashore, Division of Interpretation, 131 Charles Street, Harkers Island, NC 28531 (252-728-2250) to schedule visits for their classes.

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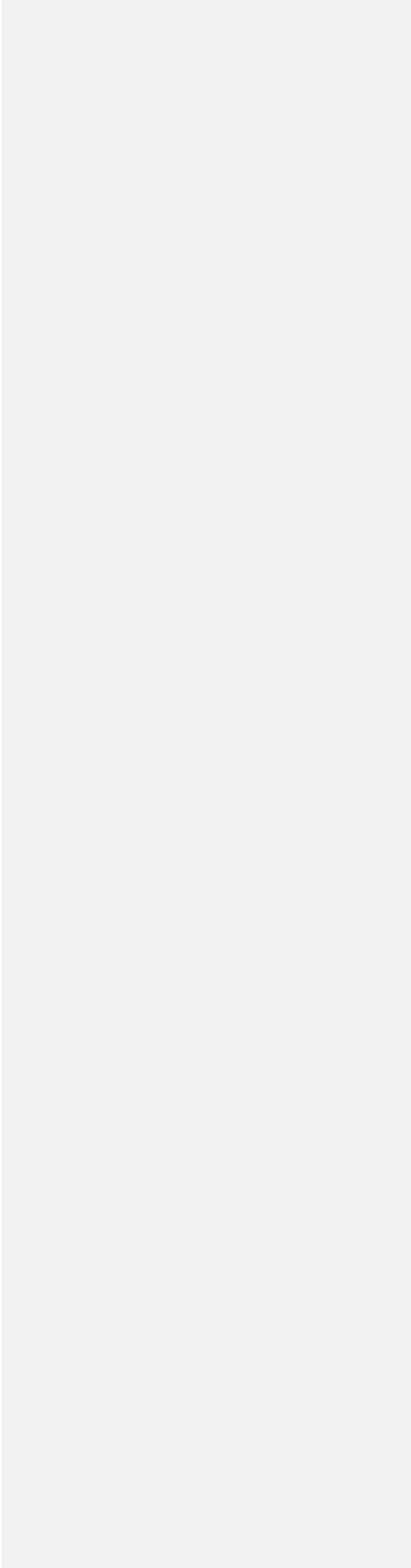
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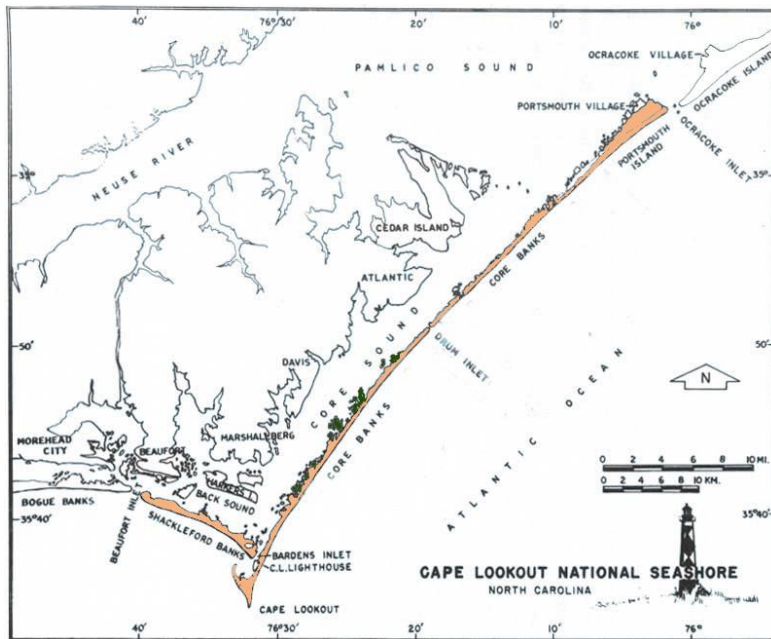
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## Introduction

The barrier islands of Cape Lookout National Seashore—the southern stretch of the North Carolina Outer Banks—are some of the last remaining natural, undeveloped barrier islands in the world. While these islands are constantly changing, the National Seashore consists of three main islands that are relatively stable: North Core Banks, which includes Portsmouth Village at the northern end; South Core Banks, which includes the Cape Lookout Lighthouse and Cape Lookout Village Historic District at the southern end; and Shackleford Banks, the former site of Diamond City and Wades Shore, and the current home of the Shackleford horses.

Although uninhabited today, the Cape Lookout National Seashore was home to many people over the years. These islands, also called banks because they formed a border along the coast of North Carolina, were used as temporary fishing encampments by the Coree Indians, a tribe belonging to the Algonquian family. Later, they were used by maritime communities engaged in a variety of subsistence activities such as fishing, whaling, and trading. A series of storms in the early 1900s drove many residents, often called Bankers, to the mainland.

The state of North Carolina began purchasing land in the Core Banks area in the 1950s in order to establish a park, but realized by the early 1960s that they did not have the resources to maintain the park. The U.S. Congress authorized the establishment of a national park in this area in 1966. The North Carolina government transferred its property on Core Banks and Portsmouth Island to the federal government in 1974. Shackleford Banks was added in 1985 as a proposed wilderness area. Today, the Cape Lookout National Seashore covers 56 miles of barrier island beach and over 29,000 acres of land and water—protecting the natural and cultural heritage of these islands for generations to come.

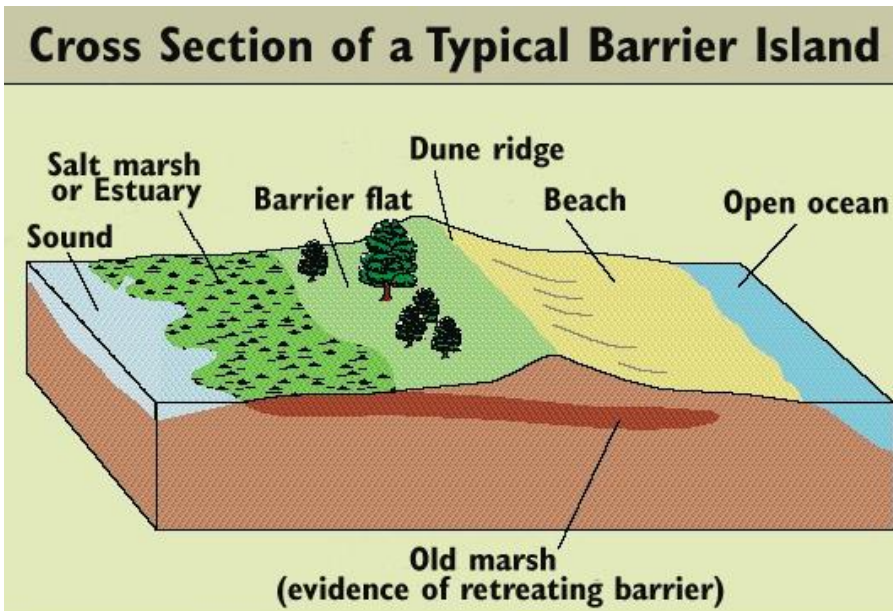
**Life on the Outer Banks - 6th Grade Edition**  
**Barrier Island Wildlife - What is a Barrier Island?**

**Science Lesson**

Barrier islands form as a result of thousands of years of geological processes involving erosion of mountain rock, transport of sand to the oceans, and the melting and formation of glaciers which result in the rise and fall of sea level.

Barrier islands are called such because they create a barrier between the open ocean and the mainland, protecting the main coastline from wind, waves, tides, currents, and storms such as hurricanes. They shelter the estuaries that form behind the islands. They also allow marshes to build up in the quiet waters of the sound.

Barrier Islands have distinct habitats (see the cross section below) from the ocean side to the sound marsh, to which animals and plants are uniquely adapted. On the high-energy ocean side life must be adapted to salty water and constant upheaval, and as you move from sound to the ocean on the island uplands you will find a succession of plant life increasingly adapted to salt.



“Here at the water’s edge, where the land meets the sea with marsh and shoal, sandy beaches and muddy bottom, is where life begins for all coastal people.”  
Karen Willis Amspacher, from *“The Spirit of the Tidewater Community”*



### **What are Inlets?**

The channel of water between adjacent barrier islands is known as an inlet. Inlets can be short-lived feature created when water breaches an island after a large storm such as a hurricane or a Nor'easter. They can also be longer lasting and provide a regular exchange between the sound or estuary and the open ocean: a gateway for a host of marine life and for boat traffic, although this usually requires human intervention such as dredging. The two contemporary inlets that define North Core Banks, the island where Portsmouth Island is located, are Ocracoke Inlet to the North and Ophelia Inlet to the South. Separating Core Banks from Shackleford Banks is Braden Inlet. The westernmost region of Shackleford Banks and therefore of the Cape Lookout National Seashore is separated from the next barrier island (highly developed Emerald Isle) by Beaufort Inlet.

### **The Ecology of Core Banks**

Throughout this barrier island, the varieties of habitats offer numerous places for many kinds of animals to live or to use on annual migratory visits. In some places, the forest is wide and allows for many animals to live here, including some found on the mainland such as raccoons and marsh rabbits. In some places, there is not much forest, and the dunes take up much of the space between the ocean and the sound. Here, there are numerous insects and plants, such as ant lions and greenbriers. In all places the beach is wide and sandy, offering one of the largest nesting and foraging areas for shorebirds such as black skimmers, oystercatchers, and ruddy turnstones, just to name a few. The most rapidly changing habitat is the sand beach within reach of high tide. This is no place for rooted plants or sessile animals; it is basically a detritus ecosystem populated by burrowing animals such as coquina (small clams), mole crabs (sand fleas), interstitial amphipods and isopods (tiny invertebrates that live in the sand), and feeding shorebirds. Primary productivity in the intertidal beach is limited to unicellular algae.



The dark “wrack line” on the beach marks the last highest tide.

### **Life in the Surf**

A beach is a very hard place to live. In the summer, it is often very hot and resembles a desert. Even though there is lots of water nearby, most animals need fresh water, and here there is rarely any in sight. On the beach and in the water, the sand is constantly moved by the wind and the water, which makes it a difficult place for anything to live.

The intertidal zone of the beach is the area between the high tide and low tides. In North Carolina, the tide changes from low to high approximately every five hours and 45 minutes. There are two high tides and two low tides every day.

Is it possible to see where the last high tide was? It is where it looks like waves washed up and went back out, but it may not be wet anymore. The sand will be smoother where the water washed over the beach and there will often be a line of debris, called a “wrack line” marking the last highest tide.

The area where the waves are breaking is the surf zone. Can anything live here? Surprisingly, yes! There are several organisms that live in this turbulent area. Invertebrates, like mole crabs and coquina clams, are small (less than 2 inches in length) and have adapted to living where the waves crash.

Mole crabs, also commonly known as sand fleas, resemble a thumb on the back side, but turn them over and they are a flurry of short looking crab-like legs, trying to quickly move away. Mole crabs are one of the smallest crabs on Earth. The females are usually only about one inch long, while the males do not get bigger than a half inch long. They are found all along the North Carolina coast in the surf zone. They are able to dig very fast to avoid the rough waves that break over them. As the waves wash back out, the mole crabs rise to the surface of the sand.

#### Mole Crab–

Kingdom: Animalia  
Phylum: Arthropoda  
Class: Malacostraca  
Order: Decapoda  
Family: Hippidae  
Genus: *Emerita*  
Species: *talpoida*



A mole crab on the beach

(Remember, when writing the scientific name of an organism, the genus name is first and the species name is second. The first letter of the genus is capitalized and the first letter of the species is lower case. The entire name is italicized or underlined, example: mole crab, *Emerita talpoida*)



Coquina clam

Marine Resources Research Institute SERTC staff  
(Susan Thornton-DeVictor, David Knowtt, Rachael King)

Coquina clams are the pretty little clams that burrow in the sand at the water’s edge. When their colorful shells are open and empty, they look like butterflies. Coquina clams are bivalves, which is a group including all two shelled animals like clams, oysters, and mussels. Coquina’s shells open up slightly when the waves wash over them. They are filtering the water for plankton, bits of algae and small animals that drift through the ocean, which is their main food source. As the waves retreat, the coquinas burrow back into the sand.

Mole crabs do the same thing. If you watch them carefully for a while, you will notice that they have little feather-like antennae that extend above them into the water. They, too, are filtering the water for the microscopic plankton that gets washed up on the beach.

The plankton and bacteria in the sand is food for other organisms (yes, there are bacteria in the sand). Tiny polychaete worms live in the sand along with other microscopic invertebrates. Birds run back and forth in the intertidal zone of the beach searching for this food buried between the sand grains. Some birds have specialized beaks for digging in the sand.

There are also many species of fish that come into the shallow waters near the surf zone. They are coming in to eat. Several fish common to North Carolina beaches like to feed on mole crabs, so they risk coming into the shallow water. These predatory fish hunting for their mole crab prey cannot see the mole crabs because the water is so turbulent, but they can sense their food in other ways. Larger fish enter the shallow water to eat smaller fish feeding on the invertebrates in the shallow water. Red drum, the state fish, is a common predator that preys on smaller fish along the beach

Scientists call the combination of all of these living organisms biomass. Biomass is the amount of living material found in one area, like the beach.



Polychaete worm

**Marine Resources Research Institute**, SERTC staff  
(Susan Thornton-DeVictor, David Knott, Rachael King)

**Spotlight: Red Drum**  
North Carolina's State Saltwater Fish



Record breaking red drum  
NC Division of Marine Fisheries

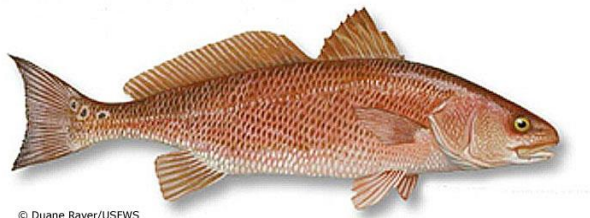
North Carolina is famous for its trophy-sized red drum that can weigh in excess of 40 pounds. These large fish are traditionally caught in the area between Cape Lookout and Oregon Inlet in either the surf or the sound.

In 1971, the North Carolina General Assembly designated red drum as the state's saltwater fish. In 1984, a red drum was caught off Hatteras Island that weighed 94 pounds and 2 ounces. In addition to holding the state record for red drum, this catch also set a world record for the largest tackle of any species. Of the 16 world records for red drum, 10 have been caught in North Carolina waters.

During the mating season, male red drum make a deep, drum-like noise by moving a muscle over their swim bladder—this is where they get their name. Black drum, weakfish, sea mullets, spot, spotted sea trout, and croaker are all related to the red drum, and most also make this drum-like noise. The red drum's color can range from a black or coppery color to almost silver, but the most common color is a reddish-bronze.

Red drum are also known as redfish, channel bass, spottail bass, red bass, and sea drum. Before they have fully matured, from 1 to 4 years of age, they are known as puppy drum.

The scientific name for red drum is *Sciaenops ocellatus*. *Sciaenops* is Greek for perch-like marine fish and *ocellatus* is Latin for eye-like colored spot. The Latin term refers to the black spot or spots on either side of the tail near the base. Scientists believe that the spots may fool predators into attacking the red drum's tail instead of near their eyes, allowing the animal to escape.



© Duane Raver/USFWS

Illustration of a red drum

**Life on the Outer Banks - 6<sup>th</sup> Grade Edition**  
**Barrier Island Wildlife - Life History Research**

**Pre-Site Visit Science Activity**

**North Carolina Essential Standards and Clarifying Objectives**

**6 Science**

6.L.2: Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment.

6.L.2.1: Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within food chains and food webs (terrestrial and aquatic) from producers to consumers to decomposers.

**Description:**

Students will analyze the life history of the mole crab or “sand flea,” one of many organisms living in the sand at the surf zone of a beach. They will then conduct their own investigation of another organism and create a life history.

**Vocabulary:**

Habitat  
Food Web  
Predator  
Prey  
Surf Zone

**Materials:**

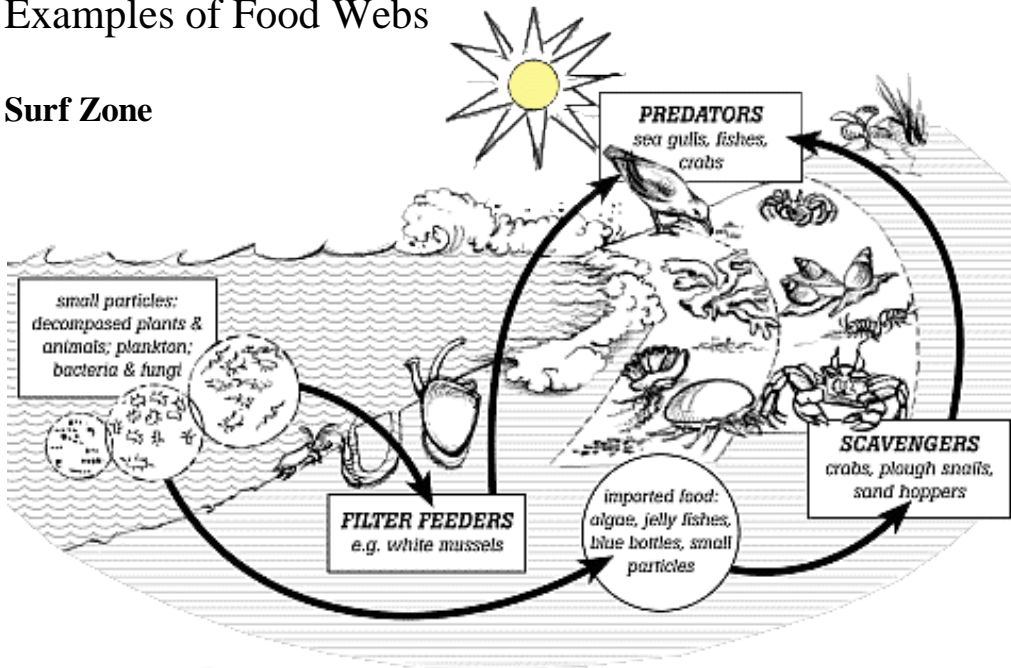
Food web of the surf zone  
Computer with internet access or library  
List of Common Organisms found at Cape Lookout  
Life History Card  
Pen or pencil  
String or yarn

**Directions:**

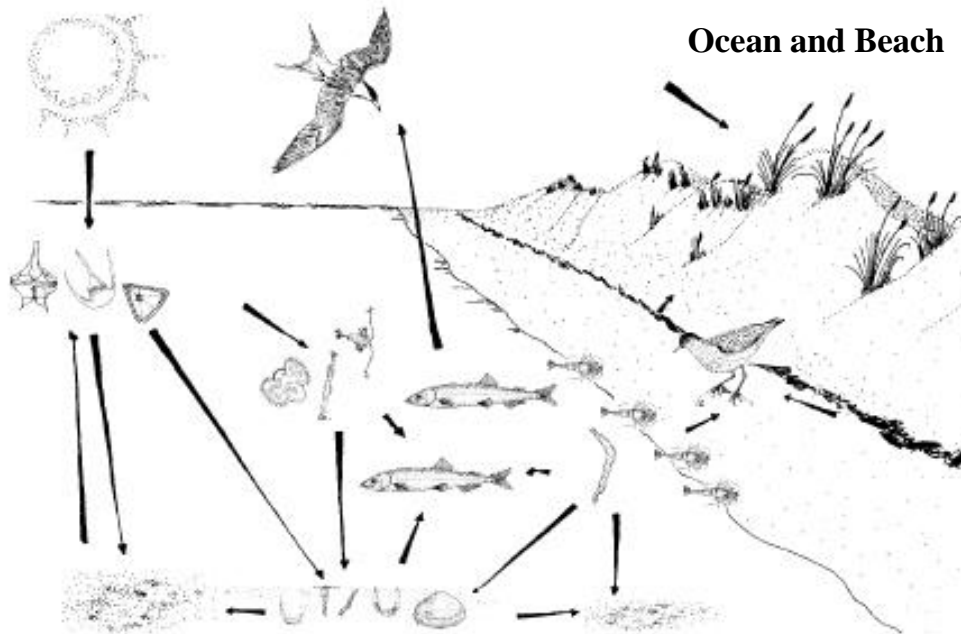
1. Students will study the life history of a mole crab (found in the “Life in the Surf” section) and a surf zone food web.
2. Each student will choose another organism from the List of Common Organisms found at Cape Lookout and will create a Life History Card for that organism using internet or library resources.
3. After completing the card, class members will tape their Life History Cards on the wall. Using string or yarn, the students will construct a food web using as many organisms as possible and making as many connections as possible.

# Examples of Food Webs

## Surf Zone

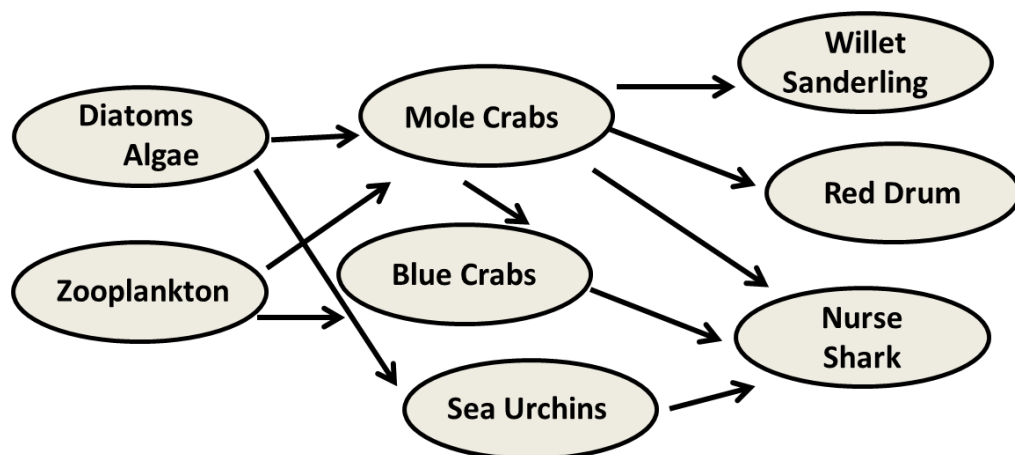


## Ocean and Beach





### Food Web of Mole Crabs



### Organisms Commonly Found at Cape Lookout

#### Generally Soundside:

Marsh  
 Periwinkle  
 Banded Tulip  
 Ribbed Mussel  
 Clam (Quahog)  
 Oyster  
 Sunray Venus  
 Mud Snail  
 Marsh Crab  
 Fiddler Crab  
 Hermit Crab  
 Blue Crab  
 Shrimp  
 Loggerhead  
 Turtle

Anole  
 Sand Dollar  
 Sea Urchin  
 Tube Worm  
 Egret  
 Ibis  
 Mallard Duck  
 Mullet  
 Pinfish  
 Flounder  
 Raccoon  
 River Otter  
 Rice Rat  
 Rabbit  
 Nutria

#### Generally Oceanside:

Lettered Olive  
 Knobbed Whelk  
 Slipper Shell  
 Moonsnail  
 Coquina Clam  
 Surf Clam  
 Cross-barred  
 Venus  
 Horseshoe Crab  
 Mole Crab  
 Ghost Crab  
 Black Skimmer  
 Brown Pelican

Cormorant  
 Sea Gull  
 Terns  
 Sanderling  
 Willet  
 Pufferfish  
 Skate  
 Red Drum  
 Shark  
 Bluefish  
 Dolphin

## Life History Card

**Biologist:** \_\_\_\_\_ **Date:** \_\_\_\_\_

Common name of an organism  
found at Cape Lookout: \_\_\_\_\_

Scientific name: \_\_\_\_\_

Size? \_\_\_\_\_

Where does it live? \_\_\_\_\_

What does it eat? \_\_\_\_\_

What are its predators? \_\_\_\_\_

Reproduction: \_\_\_\_\_

Movement: \_\_\_\_\_

Kingdom: Animalia

Phylum: \_\_\_\_\_

Class: \_\_\_\_\_

Order: \_\_\_\_\_

Family: \_\_\_\_\_

Genus: \_\_\_\_\_

Species: \_\_\_\_\_



**Life on the Outer Banks - 6<sup>th</sup> Grade Edition**  
**Barrier Island Wildlife - Field Study**

**On-Site Science Activity**

**North Carolina Essential Standards and Clarifying Objectives**

**6 Science**

6.L.2: Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment.

6.L.2.3: Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.

**Description:**

Students will conduct a field study of mole crabs (also called sand fleas) while experiencing a field trip to Cape Lookout National Seashore.

**Vocabulary:**

Population	Habitat	Predator	Invertebrates
Biotic Factors	Surf Zone	Prey	Mole Crabs
Abiotic Factors	Beach	Gills	Coquina Clams
Limiting Factors	Tides	Antennae	Plankton

**Materials for each group:**

Data sheets

Pencils

Measuring tape

Wide shovel or garden trowels

Bucket

Strainer or sieve (a kid's beach strainer or a colander will work)

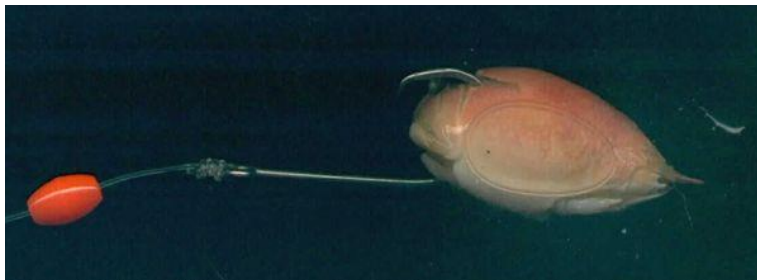
Survey flags or markers

Square meter quadrats (Provided by the Parks Service; see page 13 for directions to make your own)

**Directions:**

1. Prepare for the mole crab study prior to the visit to Cape Lookout National Seashore by dividing the class into groups of four.
  - a. Each group will conduct one set of samples.
  - b. Student groups should have a data sheet or journal to take with them to keep track of data, notes and questions that they have in the field visit.
  - c. Review safety rules and proper field attire.
2. On the beach, students will observe where the water is washing up onto the beach (the surf zone).
  - a. It would be helpful to have small survey flags for the students to mark their sample areas.

3. Each group of students should spread out at least 10 to 15 meters (33 to 49 feet) apart along the water line.
4. To start sampling, have each group stand at the water's edge.
  - a. If their toes do not get wet for three consecutive waves, they need to move closer to the water (Be Safe!).
  - b. The area where their toes get wet when the waves come in and are dry when the waves go out is the surf zone: which is less dangerous than areas where the waves are breaking.
  - c. If the shore is steep or the waves are rough, find a spot as close to the water as is safely possible.
  - d. **This is point A.**
5. The groups of students will sample in each quadrat using shovels, large-mesh strainers, and a bucket with seawater. See page 13 for details.
6. Students will use shovels and strainers to take samples of sand and water from the quadrat so that they cover the entire quadrat. (about 3 to 6 inches deep)
7. Have students use the strainers and bucket to filter out and count numbers of mole crabs in each sample.
8. Each sample should be counted and recorded in the data table.
9. Remember that mole crabs are living organisms and must be treated respectfully.
  - a. *Please* handle the crabs carefully and return them to the sand as soon as the students have finished counting.
10. This procedure should be repeated for four more samples away from the water (gradually get higher on the beach away from the first sample).
  - a. This will help students determine where the highest concentration of mole crabs is located and if there is a large number of mole crabs in the area.
  - b. If students reach dry sand and no longer have results, they should stop sampling.
11. Students may include sketches of the mole crab in their notes as well as other things that they see on the beach.



Live mole crabs are often used as bait for pompano and other fish  
Photo Credit: SoWal.com

### Making your own One Meter Square Quadrat

Quadrats are relatively simple and inexpensive to make. You will need the following materials and supplies for one 1 meter by 1 meter square quadrat.

#### Materials:

20 feet of  $\frac{3}{4}$  inch PVC pipe (there are different grades of pipe—look for the cheapest kind)

4 each,  $\frac{3}{4}$  inch PVC elbows (90 degrees)

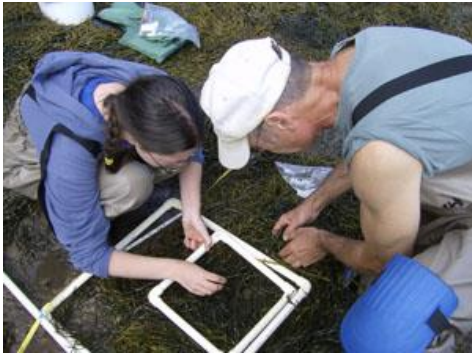
PVC cement

Hacksaw or PVC cutters

Tape measure

#### Directions:

1. Cut the PVC pipe into four 39" pieces
2. *Working in a well-ventilated area*, use PVC glue to attach elbows to one piece of PVC.
  - a. It is best to do this on a flat surface, so you can make sure that the elbows are in the same plane.
  - b. Follow the manufacturer's instructions for applying the glue.
  - c. Use this glue to attach the rest of the PVC together in a square.
3. The inside dimensions of the finished product should be approximately 1 meter (39.4 inches) on each side.



Students assembling and utilizing quadrats in the field

### Beach Animal Data Sheet

**Group Members:** \_\_\_\_\_

**Date:** \_\_\_\_\_

Describe how the sand and water ran out of your hand. \_\_\_\_\_

Sample Number	Mole Crabs Numbers (Use tally marks)	Coquina Clams Present? (Y or N) Number? Tally Marks	Sample Area Wetness*	Distance from sample # 1	Other Observations such as: Does water over wash area? How often? Depth?
1					
2				1 meter	
3				2 meters	
4				3 meters	
5 (if crabs are still present)				4 meters	

\*How moist is the sand in the sample area? USE: Dry/ Damp/ Very Moist/ Under Water most of time

**Life on the Outer Banks - 6<sup>th</sup> Grade Edition  
Barrier Island Wildlife - Finding Mole Crabs**

**Post-Site Visit Science Activity**

**North Carolina Essential Standards and Clarifying Objectives**

**6 Science**

6.L.2: Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment.

6.L.2.3: Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.

**Description:**

Students will compare data from the previous field study to determine where they found the most mole crabs and to analyze what other observations were made about the mole crabs.

**Vocabulary:**

Population	Habitat	Predator	Biotic Factors
Mole Crabs	Surf Zone	Prey	Abiotic Factors
Plankton	Beach	Food Web	Limiting Factors

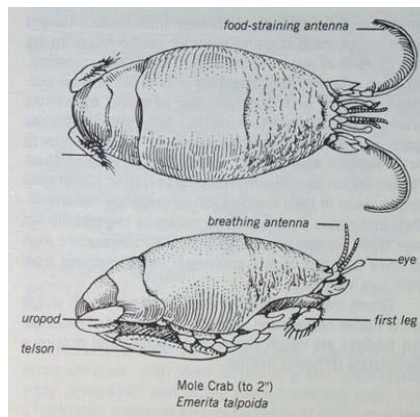
Comment [KW1]:

**Materials:**

Data sheet from the beach visit  
Computer or graph paper  
Pencils

**Directions:**

1. Students will plot their data on a bar graph or pictograph to show where the largest numbers of mole crabs were found in their field study on the beach.
2. Students will combine the class data to determine where the most mole crabs were found.
3. Students will discuss or answer the questions listed on the next page.



Sketch of a mole crab, also called a sand flea.  
Image Credit: Alice Jane Lippson, *Life in the Chesapeake Bay* (1984)

**Questions:**

- Where on the beach were the most mole crabs found? Was this area wet?
- Were there waves there all the time?
- Were there any mole crabs in the dry sand?
- Were there any other signs of animals in the same area?
- How can mole crabs live in the surf zone?

**Life on the Outer Banks - 6th Grade Edition**  
**Whales and Whaling in North Carolina**

**Science and Social Studies Lessons**

**Whales in North Carolina**

Much to the surprise of many people, whales are common animals along the North Carolina coast. Along with dolphins and porpoises, whales are marine mammals belonging to Order Cetacea (si-tey-shee-uh) and can be seen off the beaches of North Carolina throughout the year. (Teachers might wish review the characteristics of vertebrates and mammals with their students).

Kingdom: Animalia  
Phylum: Chordata  
Sub phylum: Vertebrates  
Class: Mammalia  
Order Cetacea

There are many cetaceans that are found along the North Carolina coast, but the most commonly seen is the bottlenose dolphin (*Turciops truncatus*). Bottlenose dolphins and porpoises are often confused with one another. The bottlenose dolphin is grey on its back (dorsal side) and lighter or white on the underside (ventral side). It is usually 6 to 15 feet long and the “nose,” or rostrum, sticks out 6 to 10 inches in front of the round head, which may be where the name bottlenose dolphin comes from. Porpoises are different in that they have no more than a couple of inches of rostrum in front of their head. Both dolphins and porpoises have teeth and feed on other animals such as small fish and squid. On average, a bottlenose dolphin will have approximately 44 teeth. There is a large population of bottlenose dolphins that are common in our near shore waters and sounds. Porpoises, however, are very seldom seen in North Carolina and are more likely to be seen north of Cape Hatteras.

Cetaceans, members of the Order Cetacea, are divided into two suborders: Odontoceti (oh-don-ti-see-tee), which are whales and dolphins that have teeth and Mysticeti (mis-ti-see-tee) which are whales that have baleen, a bristly material used to strain plankton and other small creatures from the water.



Humpback whales are baleen whales

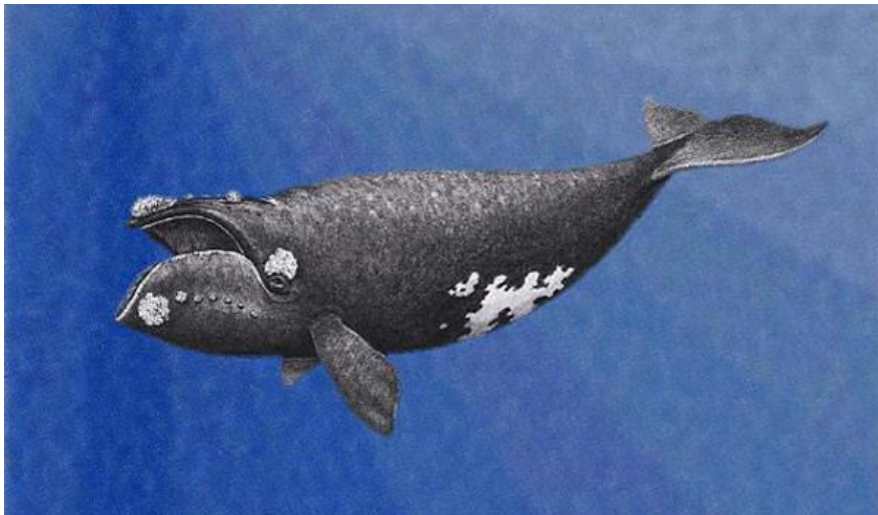
Odontocetes include dolphins and pilot whales which are common to the North Carolina coast. Other Odontocetes, such as porpoises, are seldom seen along this coast. The sperm whale, one of the largest whales in the world and a member of the suborder Odontoceti, are much less common in North Carolina's coastal waters.

Mysticetes include humpback whales and right whales which are common to North Carolina. Fin and minke whales have also been seen along North Carolina's coast. The largest animals on earth, blue whales, which can be up to 108 feet long, are very seldom seen here. Mysticetes have baleen, bristly plates that hang from the upper jaw, instead of teeth. Because of this, they feed much differently than toothed whales, and must use their baleen to strain food from the water.

Baleen is made of keratin and feels similar to a thick fingernail. It resembles a really large, long, beige to dark brown toothbrush. Baleen is used to strain plankton, small fish, squid, and krill, which are small shrimp-like animals, from the water. Baleen whales open their mouths wide and scoop up a large amount of water or simply swim through the water with their mouths open. As they close their mouths, they use their tongues to force the water out through the baleen, trapping the organisms in these bristly plates. They then use their tongue to wipe the baleen free of food, and then to swallow the organisms whole.

In the 1700 and 1800s, it was common practice along the mid-North Carolina coast to hunt for whales from shore. The most commonly caught whales were right whales.

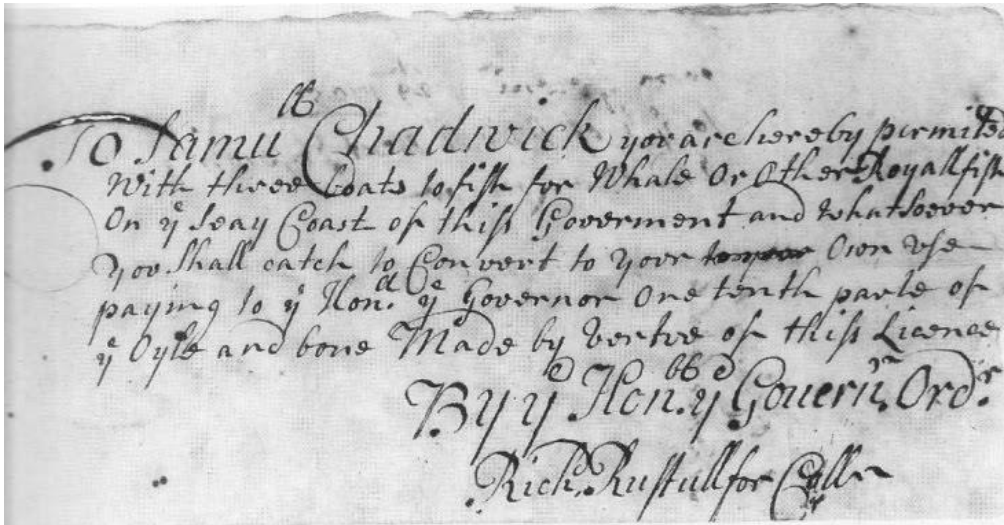
Right whales still come close to shore during their migrations northward in January, February, March, April, and May. In the summer they can be found off of the coast of Canada in places such as Nova Scotia, where they are busy feeding, and in the late fall they migrate as far south as Florida, where the females give birth, or calve.



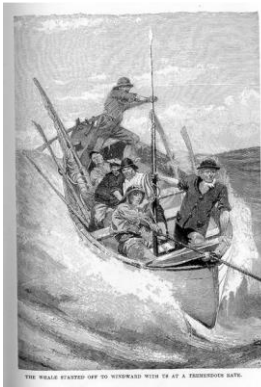
Right whales are baleen whales

## Shore Whaling

Samuel Chadwick, a New England whaler, was granted permission in 1726 to whale off the coast of Shackleford Banks. Shortly after, he was joined by Ephraim Chadwick and Ebenezer Chadwick, likely relatives. Together they began the whaling industry in the Cape Lookout area which would continue for one hundred and ninety years.



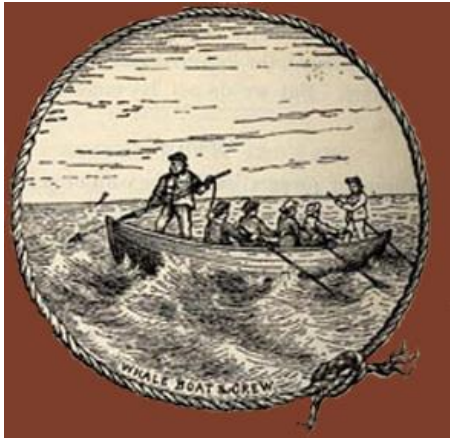
The whaling license granted to Samuel Chadwick in 1726



Whalers in a boat

The height of the whaling season was in February and March, as the Right Whales migrated through the area. On Shackleford Banks, the whaling was shore based, meaning that they waited for whales to come near the shore and then rowed boats out to the animals. Lookouts were posted throughout the season along the beach to keep an eye out for an approaching whale. As soon as a whale was sighted, the activity began. People from all over the area ran toward the ocean, calling to others along the way. Crews launched boats into the sea. These boats were considered the strongest, best built boats in the area. Even so, the men on the boats made sure to keep a safe distance from the lashing tail of the targeted whale.

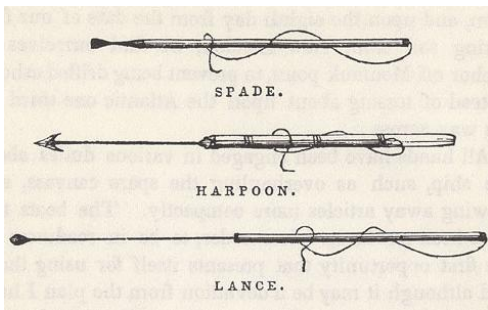




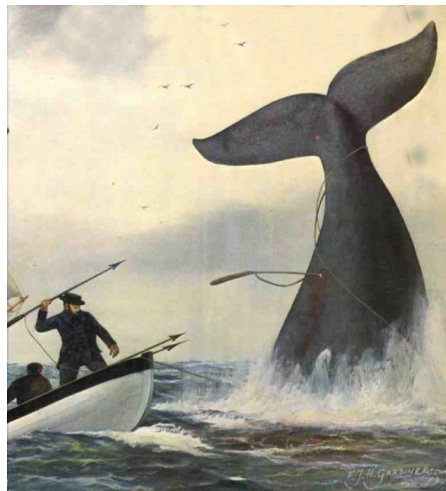
Whalers rowed small wooden boats from shore in pursuit of whales

Whales were killed by harpoons (long handled spears) and, after 1865, with the use of harpoon guns. The first shot signaled the beginning of an intense struggle between the men in the boat and the giant of the sea. There were usually eight people on the boat: one at the bow (front) to operate the harpoon gun, one at the stern (back) to steer, and six at the oars. They never knew how long the fight would last or how many shots would be fired before the whale would finally give up. The water around them would foam from the whipping of the whale's tail and turn red with blood.

Once the whale died, it would slowly float to the surface. When they saw this, the boat crew would cheer and raise their oars, letting those on the shore know they had caught their prize.



Harpoons



A whaler takes aim with his harpoon



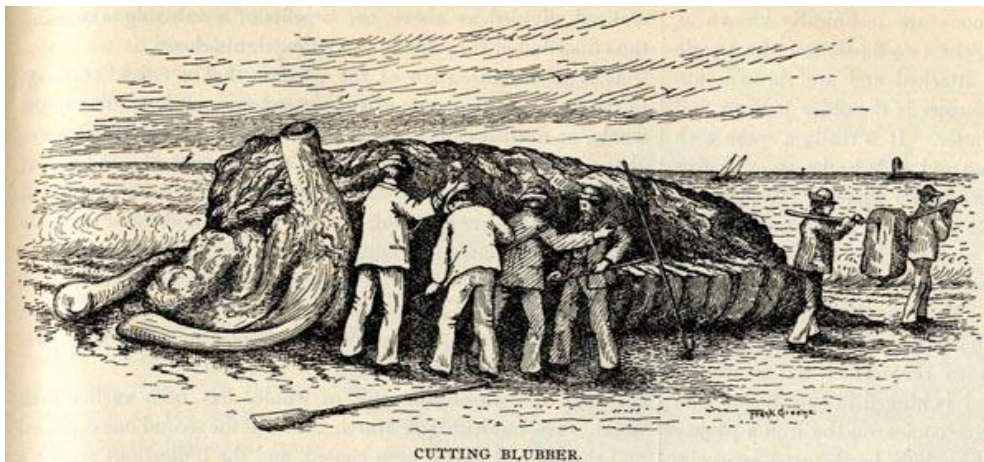
A whaling gun

## Processing the Whales

After the whale was killed at sea, the men on the wooden boat would tow it to shore. Once the whale reached the beach, the crews with sharpened knives and began to work. The whale was carefully butchered. Nothing would go to waste. The whale's blubber (fat) would be cut into chunks, which took two men to move. The blubber was placed in large vats called try-pots suspended over portable brick fire-boxes. Like frying chicken in a skillet, the fat would be rendered or tried out, which was a method for extracting the oil from the blubber by melting out the fat.

The whale oil was dipped from the try-pot and placed in a wooden trough which was lined with bushes. The bushes strained the oil and prevented large pieces of un-melted fat or loose whale meat from getting into the barrels at the bottom of the trough. The filtered whale oil was stored in these wooden barrels for shipping.

The whale's baleen and some of the bones were expertly cleaned and packed separately in 50 gallon barrels. It could take as long as 2 weeks to cut-up and boil one whale. Imagine the smell.



Cutting into the whale on Shackleford, illustration by, Frank Greene, 1890s



These try-pots were aboard a whale ship but the same set-up was used by shore whalers.

## Uses for Whale Products

### Why Whale Oil?

Why was whale oil so prized in times gone by? In the 1800s, watches, clocks, and chronometers (time keeping devices) were the most precise instruments of the day. All needed lubrication to operate at peak efficiency. Watchmakers relied on concoctions of olive oils and nut oils. These potions were often found lacking in keeping these delicate instruments working. Whale and dolphin oils were best for this purpose.

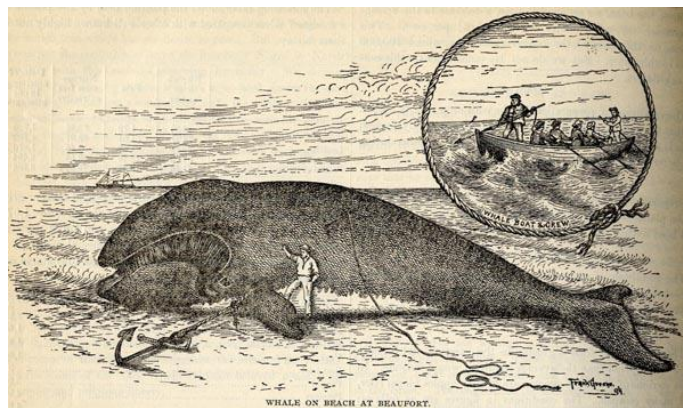
Of course, the principal use of whale oil was as an illuminant in lamps and as candle wax. Other uses came in time. In the 1700s, it was noted that the burning oil from sperm whales glowed brightly and clearly and did not have a disagreeable odor like the oil from right whales. Since sperm whales were not caught in Shackleford's whale fishery, the oil from local right whales was most commonly used to manufacture local soaps, varnish, cosmetics ("imparts a rich glossy sheen"), paint, and glaze (on photographs). It was also used to process textiles and rope and was burned to provide heat.

### Whale bone - Baleen

The right whale also supplied large amounts of whale bone. Whale bone, or baleen, is actually not bone; unlike bones which are made of calcium, a mineral, baleen is made from keratin, the same protein that makes skin, nails, hair, hoofs, and claws. Baleen, the large plates in the mouths of many whales and used by the whale to filter small food organisms from the sea, was used in a variety of nineteenth-century products: buggy whips, carriage springs, corset stays, fishing rods, hoops for women's skirts, umbrella ribs and many other applications which have now been replaced by plastic or steel. If baleen was not carefully cleaned as soon as removed from the whale's jaw, it developed an unpleasant smell that lowered its value.

## Which Whale? The Right Whale

The right whale earned its name from the early whalers because they were the "right" whales to catch. Their large amounts of oil, blubber and baleen or whalebone caused them to be slow swimming (easy to catch) and most importantly, because of the high fat content of their bodies, they float when killed. It was said that six 50-gallon barrels of oil could be rendered from just one right whale tongue.



[Right] Whale on Beach at Beaufort, illustration by Frank Greene, 1890s.

Since 1935, right whales have been a protected species, though some were killed illegally up until the 1970s. Currently, the North Atlantic right whale population is growing from 5 - 15% per year, depending on distribution and which sub-population is being considered. Currently, the North Atlantic population is 300 to 400.

### **What's in a Name?**

Shackleford had a unique whaling tradition: the residents named many of the animals they caught. The "George Washington Whale" was captured on the president's birthday, "Little Children's Whale" was chased and killed by boys from the community when the adults were otherwise occupied, and "Cold Sunday" was taken on a day that was reportedly cold enough to freeze ducks in mid-flight. Perhaps the most famous of the Shackleford's whales was "Mayflower," a fifty-foot right whale killed on May 4, 1874. This whale was notorious for its final fight; it capsized one boat and dragged another between six and eight miles out to sea before it died. Its fame continued to spread after its death when its skeleton was put on display in the North Carolina Museum of Natural Sciences in the 1880s and is still on exhibit there today.



"Mayflower" whale skeleton in North Carolina Museum of Natural Sciences  
Photo courtesy of John Hritz

### **End of an Era**

On March 16, 1916, North Carolina shore-based whalers caught and killed their last whale in the shallows off Cape Lookout. The last shore-based crew in the area disbanded the next year, after their gear was destroyed by a fire. These events marked the end of more than 190 years of tradition. Although whaling was never a major operation in North Carolina, the unique geography of the state and the tenacity of its residents allowed a small whaling industry to operate from colonial times through the early 20th century.



Until the industry's demise, Shackleford whalers held to the old traditional shore whaling fishery. After 1800, it was the only state south of New York truly participating in this shore-based industry.

The general downfall of whaling was caused by a combination of factors including the over-hunting of whales and the change in women's fashions that nearly eliminated the need for whale-bone (baleen) corsets. One would think that there would have been a great competitive clash between whale oil, kerosene from coal (coal oil), and petroleum in the opening years of the 1860s. However, these illuminants did not earnestly engage in battle for the U.S. market at that time because the Civil War—beginning in April, 1861—brought the New England whaling fleet to a virtual halt. A large number of the whaling ships were captured and sunk by the Confederacy. This hazard made an expedition perilous even before the whaling waters were reached. Nevertheless, sperm whale oil production carried on with its normally expected highs and lows.

North Carolina's whaling industry was also greatly damaged by particularly bad weather on the Outer Banks. Several large storms on Shackleford in the 1890s followed by a hurricane in 1899 prompted the population of Bankers to abandon the area for safer locations on the mainland or more sheltered islands.

With the passage of the Marine Mammal Protection Act in 1972, it became illegal for any American company to import raw material from marine mammals and for U.S. citizens or anyone in U.S. waters to commercially hunt marine mammals, like whales.



"Diamond City Harvest" Painting by Dan Edwards, 2009

**The Mayflower Whale**  
**By Gretchen Guthrie Guthrie**

I see a whaling crew in readiness  
And a lookout watching the sea,  
Loud and clear comes "THAR SHE BLOWS"  
Echoing through the trees.

Over the hills the message speeds  
Through the woods on Shackelford,  
And all of the villagers say a prayer  
"For this great blessing, thank you, Lord!"

James Lewis, Sam Windsor, Reuben and Seef Willis  
They're captains and whalers - they know what to do.  
Elzie and Bill and W. C. Guthrie  
Billy Willis, Sam Lewis - I see them, too.

Excited, the crews run for their boats  
And all in their places sit,  
As one captain shouts, "Row hard, my boys,  
Don't even take time to spit!"

The oars move forth, the bars move back  
The boat plows through the seas,  
An hour passes and back muscles tighten  
But still the men row in Harmony.

Two hours . . . three hours, should blades ache  
Leg tendons strain and biceps bulge out,  
"Pull on those oars, sons, take care for God's sake,  
There's the cow! Look at the height of her spout!"  
"Closer, boys, steady now." Josephus stands  
Shuts one of his eyes . . . harpoon in his hand,  
Takes careful aim and a whizzing sound  
Streaks over the ocean . . . a true mark is found.

A struggle begins between men and a fish  
A struggle, most likely, not soon to abate,  
Hours later blood spouts to tell who has won  
The Mayflower is awash in the Hook of the Cape.

**Life on the Outer Banks - 6th Grade Edition**  
**Whales in North Carolina Waters - Right Whale Life History**

**Pre-Site Visit Science Activity**

**North Carolina Essential Standards and Clarifying Objectives**

**6 Science**

6.L.2: Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment.

6.L.2.3: Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.

**Description:**

Students will do research to develop a life history of the right whale (a historically important species in this area) and another member of Order Cetacea.

**Vocabulary:**

Pectoral fin                      Dorsal Fin                      Callosities                      Fluke

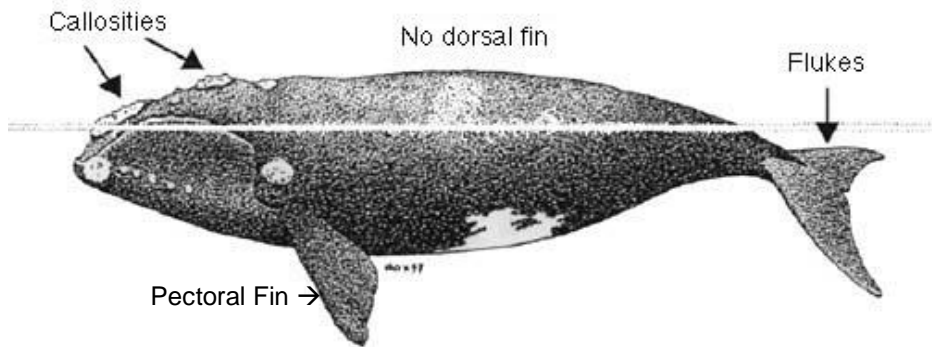
**Materials:**

Computer or Library access  
Pen or pencil  
Student worksheet

**Directions:**

1. Students will choose any member of Order Cetacea which can be found in the waters along the North Carolina coast.
2. They will compare this animal to the North Atlantic Right Whale. Preliminary information on the right whale and a list of common Cetaceans can be found on the following page.
3. Conduct library or internet research on the selected organisms. Students will use the research worksheet to record the following information
  - a. Habitat/Range
  - b. Physical Characteristics
  - c. Predators
  - d. Prey / Food
  - e. Migration Patterns
  - f. Population Dynamics (average age, care of young, etc.)
  - g. Other information
4. Write a basic life history of each, comparing and contrasting the two whales.
5. Include a food web (see example in previous activities) and drawings of the whales.

### North Atlantic Right Whales



North Atlantic Right Whale (*Eubalena glacialis*)

The Right whale is one of the most common whales in North Carolina, occasionally seen rolling just beyond the edge of the surf. It is known for having callosities (*kuh-los-i-tees*) around the head area. These are usually whitish and resemble fleshy moles or warts. This is one way that individual right whales are identified. Right whales also have short pectoral fins and no dorsal fin.

### Whales Found in North Carolina

Common Name	Scientific Name	Longest Lengths
Blue Whale	<i>(Balaenoptera musculus)</i>	108 feet (32.9 meters)
Bottlenose Dolphin	<i>(Tursiops truncatus)</i>	12 feet (3.8 meters)
Bryde's Whale	<i>(Balaenoptera edeni)</i>	55 feet (16.7 meters)
Fin Whale	<i>(Balaenoptera physalus)</i>	85 feet (25.9 meters)
Humpback Whale	<i>(Megaptera novaeangliae)</i>	52 feet (15.8 meters)
Minke Whale	<i>(Balaenoptera acutorostrata)</i>	30 feet (2.4 meters)
Pilot Whale	<i>(Globicephala macrorhynchus)</i>	15 feet (4.5 meters)
Right Whale	<i>(Eubalena glacialis)</i>	55 feet (16.7 meters)
Sei Whale	<i>(Balaenoptera borealis)</i>	60 feet (18.3 meters)
Sperm Whale	<i>(Physeter catodon)</i>	67 feet (20.4 meters)



**Cape Lookout Science  
Whales Research Sheet**

**Cetologist:** \_\_\_\_\_

**Date:** \_\_\_\_\_

North Atlantic Right Whale	2 <sup>nd</sup> Species:
Scientific Name:	Scientific Name:
Physical Characteristics:	Physical Characteristics:
Habitat / Range:	Habitat / Range:
Predators:	Predators:
Prey / Food	Prey / Food
Migration Patterns:	Migration Patterns:
Population Dynamics(age, care of young, etc.):	Population Dynamics(age, care of young, etc.):
Other Information:	Other Information:

**Life on the Outer Banks - 6th Grade Edition  
Whales in North Carolina Waters - Whales on the Beach**

**Site Visit Science/Social Studies/Math Activity**

**North Carolina Essential Standards and Clarifying Objectives**

**6 Science**

6.L.2: Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment.

6.L.2.3: Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.

**6 Social Studies**

6.H.2: Understand the political, economic and/or social significance of historical events, issues, individuals and cultural groups.

6.H.2.2: Compare historical and contemporary events and issues to understand continuity and change.

6.H.2.3: Explain how innovation and/or technology transformed civilizations, societies and regions over time (e.g., agricultural technology, weaponry, transportation and communication).

**6 Mathematics**

6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

6.RP.A.3: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations

6.RP.A.3d: Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

**Description:**

Students will compare the sizes of whales and dolphins by outlining the sizes of different Cetaceans on the beach. They will then compare them to common objects such as a bus, a car, a whaling boat and the Cape Lookout Lighthouse.

**Materials:**

Strings that are each 25 feet long (one for each group)

Flags or cones (five for each group)

Clipboard and paper or a notebook (one for each group)

Pencils or pens

100 ft. wind-up tape measure for the teacher (to check student work)

**Directions:**

1. Divide the class into five groups and have each group chose one species of whale that they have researched. The right whale and blue whale must be part of the 5 species chosen.
2. Remind each group of the length of their particular species.

3. Using the string as their only measuring tool, each group should mark off the length of their whale with two cones or flags. As they work with the string, they should write down each step of the process they used to make measurements across the beach.
4. Another cone should be used to mark the one-third point from the front. (This is generally the widest section of the whale.)
5. Calculate the width (generally one-fourth of the length). Groups should mark this width with the remaining cones.
6. When all groups have completed their calculations and markings, they should draw their whale's general outline in the sand.
7. When finished, share and compare how each group used the string to make accurate measurement possible.
8. Using the measurements for a typical Shackleford whaling boat ( ), draw the outline of the boat near the drawing of the right whale to give students a comparison of hunter and prey.
9. Estimate the size of the blue whale compared to the Lighthouse (163 feet tall)

**Life on the Outer Banks - 6th Grade Edition**  
**Whales in North Carolina Waters – Whaling Today**

**Post-Site Visit Social Studies/Math Activity**

**North Carolina Essential Standards and Clarifying Objectives**

**6 Social Studies**

6.H.2: Understand the political, economic and/or social significance of historical events, issues, individuals and cultural groups.

6.H.2.2: Compare historical and contemporary events and issues to understand continuity and change.

6.H.2.3: Explain how innovation and/or technology transformed civilizations, societies and regions over time (e.g., agricultural technology, weaponry, transportation and communication).

6.E.1: Understand how the physical environment and human interaction affected the economic activities of various civilizations, societies and regions.

6.E.1.1: Explain how conflict, compromise and negotiation over the availability of resources (i.e. natural, human and capital) impacted the economic development of various civilizations, societies and regions (e.g., competition for scarce resources, unequal distribution of wealth and the emergence of powerful trading networks).

**6 English Language Arts**

W.6.1: Write arguments to support claims with clear reasons and relevant evidence.

W.6.1a: Introduce claim(s) and organize the reasons and evidence clearly.

W.6.1b: Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.

**Materials:**

“Whaling Today” worksheet

Writing paper

Pencils or pens

**Directions:**

1. Students will work in small groups to brainstorm answers to the questions on their worksheet. Each student will need to put down answers as this worksheet will be used later as notes for their point of view essay.
2. Give the groups just enough time to answer the first question. They may remember some of the background information if you shared it with them earlier.
3. Share out with the entire group.
4. Continue with each question, one at a time. (Teacher notes on next page)
5. When you have finished the 5 questions, discuss writing from a point of view that requires reasons or evidence to support an opinion or argument. You may even have one already to share. (An editorial on an environmental issue?)
6. Have students write a point of view essay about whaling or another environmental issue.

## Teacher Notes for Whaling Today worksheet

1. Today, in most parts of the world, whaling is not permitted. Eighty seven nations have signed the International Whaling Convention that has banned whaling as a commercial enterprise. From 1726 into the late 1800s, whaling was an essential activity for the people of Shackleford and Core Banks. Why was whaling so important to the people of the Outer Banks?

[One of the most commonly hunted whales along Core and Shackleford Banks was the right whale. The right whale gets its name from being the “right whale” to hunt. Since it was a large slow moving whale, it was easier to hunt and a large proportion of the whale was blubber which was needed for oil (especially for the lighthouse oil lamps). And the large amount of blubber made the dead whale buoyant and therefore easier to bring to shore. The whalebone (baleen) was used for fashion accessories and tools.]

2. Discuss how changes in technology and the discovery of new products have made whaling unnecessary for most of the world.

[Beginning in 1859, petroleum drilling began in Pennsylvania (Quaker State Oil) and soon kerosene or mineral oil, which was distilled from crude oil, began to replace whale oil for lamps. Then, electric lamps replaced oil lamps. Whale oil was still used as a lubricant until whaling was banned in the 1970s. Plastics (also a product of petroleum) have replaced whalebone in many instances.]

3. The northern right whale was hunted nearly to extinction and is listed as the most endangered large whale. Their present population is listed at around two hundred. Since they haven't been hunted for nearly fifty years, why hasn't the population of northern right whales increased more rapidly?

[Female right whales do not have offspring until they are at least 10 years old and then, a twelve month pregnancy limits the number of offspring a female may have in her lifetime. Other environmental issues are habitat and food supply.]

4. Are there other animals in our area that have been “saved” by technology or changing needs?

[Turtles were once hunted for food and their shells. And even when they became less of a food source, they were caught and died in nets as with dolphins. Now many of the nets are safer for turtles and dolphins. Heron and egrets were once hunted for their feathers as adornments for women's hats.]

5. There are native peoples of the Pacific Northwest that are allowed to harvest a number of whales each year. This agreement was reached as a way for these people to preserve their heritage. There are also Japanese fishermen who feel that whaling is part of their heritage and culture. What do you think? Do you have alternative ideas to address this issue?

[Hopefully, there will be a lively discussion here.]

Cape Lookout Social Studies  
Whaling Today?

Social Scientist: \_\_\_\_\_

Date: \_\_\_\_\_

Today, in most parts of the world, whaling is not permitted. Eighty seven nations have signed the International Whaling Convention that has banned whaling as a commercial enterprise. From 1726 into the late 1800s, whaling was an essential activity for the people of Shackleford and Core Banks.

1. Why was whaling so important to the people of the Outer Banks?
2. Discuss how changes in technology and the discovery of new products have made whaling unnecessary for most of the world.
3. The northern right whale was hunted nearly to extinction and is listed as the most endangered large whale. Their present population is listed at around two hundred. Since they haven't been hunted for nearly fifty years, why hasn't the population of northern right whales increased more rapidly?
4. Are there other animals in our area that have been "saved" by technology or changing needs?
5. There are native peoples of the Pacific Northwest that are allowed to harvest a number of whales each year. This agreement was reached as a way for these people to preserve their heritage. There are also Japanese fishermen who feel that whaling is part of their heritage and culture. What do you think? Do you have alternative ideas to address this issue?
6. On a sheet of writing paper, write a personal point of view (opinion) essay about your feelings on the whaling issue or any other environmental/nature topic that you feel strongly about. Remember to state your argument early in the essay and then give several clear reasons or evidence to support your argument. Be sure to summarize your argument as part of your closing.

## Traveling Trunk Program

If you are a third through sixth grade teacher looking for a new way to give your students an exciting classroom experience, the Cape Lookout National Seashore Traveling Trunks Program may be what you are looking for. Traveling trunks bring a little bit of Cape Lookout to your school, library, scout troop, or youth organization. Each trunk is designed to introduce students and teachers to different subjects related to Cape Lookout National Seashore. They contain background information, classroom activities, student activity pages, games, books, and other educational materials

The curriculum guides contained in each trunk are designed to meet the goals and objectives of the North Carolina 1999 Standard Course of Study for grades three through six.



### The following trunks are available for loan to schools or other individuals:

**LIGHTHOUSES:** On the Outer Banks, lighthouses and their keepers provided an invaluable service assisting with navigation through the "Graveyard of the Atlantic." This traveling trunk will teach students about this important aspect of our maritime history. Through journals, hands-on artifacts, and classroom activities, your class can experience some of the daily activities of a lighthouse keeper.

**NATIONAL PARKS:** The National Park Service preserves and protects areas of scenic beauty and historical significance for both present and future generations. This traveling trunk will explore careers with the national parks and the service entrusted to protect them. Students can dress up like a park ranger and have an opportunity to visit some of the fantastic places preserved by the National Park Service.

**WHALES:** This traveling trunk will introduce students to the biology and behaviors of these intelligent and interesting creatures. Teachers and students can use the materials and activities in this trunk to actually experience what life would be like as a whale.

**SHARKS:** Sharks are mysterious and misunderstood creatures that have fascinated and frightened people for generations. A variety of classroom activities will introduce students to the biology and behaviors of these amazing animals.

To reserve a Traveling Trunk contact:  
Cape Lookout National Seashore  
Division of Interpretation  
131 Charles Street  
Harkers Island, NC 28531  
252-728-2250

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