Ocean Theme Day
Traveling Outreach Program
Pre- and Post-Visit Activities
Grades 5-6
The National Aquarium is a nonprofit organization whose mission is to inspire conservation of the world’s aquatic treasures.

This booklet was prepared by the Education Department at the National Aquarium.

Illustration: Cindy Belcher

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Ocean Theme Day
A 45-minute auditorium program and 20-minute lab sessions for Grades K—6

A school-wide package is a great way to give classes in multiple grade levels (K-6) the opportunity to benefit from a traveling outreach program. Each package includes:

- Two auditorium presentations.
- Ten interactive discovery sessions that allow students to explore the theme in depth and to investigate animals introduced in the auditorium presentation. Each 20-minute session is limited to one class (30 students maximum) to allow for optimal learning. Parent volunteers are required to assist with interactive discovery sessions. See Parent Volunteer Instructions on page 4 for more information.

OUTREACH PROGRAM DESCRIPTION

Auditorium Presentation:

Sharks: They are unique creatures adapted for survival—not the fearsome eating machines portrayed in the movie Jaws. There are two different presentations: each one can be adapted for different grade levels (K-2; 3-6).

Marine Mammals: Learn about the amazing adaptations these animals have to survive. There are two different presentations: each one can be adapted for different grade levels (K-2; 3-6).

Discovery Labs: Students explore the ocean world by examining shark jaws, whale vertebrae, baleen, shells, live animals, and much more. (Live animals subject to availability.)

PLANNING FOR THE OUTREACH PROGRAM

This lesson includes pre- and post-program activities that will supplement the auditorium program and discovery lab sessions. These activities can be incorporated into units about animal adaptations, relationships and diversity, as well as food chain studies. Other complementary units include social studies units addressing the importance of these animals to different world cultures or map studies examining the distributions of species around the globe. This lesson should be covered in three days including the outreach program at your school.

AAAS Benchmarks

5F/E1-3-5: A great variety of kinds of living things can be sorted into groups in many ways using various features to decide which things belong to which group.

5A/E1-3-5: In classifying organisms, scientists consider details of both internal and external structures.

MD Voluntary Curriculum: Reading

Grade 5-1.0 General Reading Processes E.3.i
Use a graphic organizer or another note-taking technique to record important ideas or information.

MD Voluntary Curriculum: Science

Grade 6-1.0 Skills and Processes C.1.a
Organize and present data in tables and graphs and identify relationships they reveal.

Grade 6-1.0 Skills and Processes A.1.d
Locate information in reference books, back issues of newspapers, magazines and compact disks, and computer databases.
Day 1: Pre Outreach Program Activities

Before educators from the National Aquarium’s School Programs Team visit your school, read the Teacher Background section found on pages 6-15 and share with your students. There is a section for each topic covered in the Discovery Labs: sharks, invertebrates, whales and other marine mammals. As a class, complete Activity 1– More than Just the Skeleton on pages 16-21 and Activity 2– Whale Migration on pages 22-27. These activities will allow students to familiarize themselves with the different animals that live in and around the ocean as well as to have the students learn about how and what baleen whales eat.

Day 2: Outreach Program at Your School

On the day of your outreach programs, the National Aquarium’s School Programs staff will present two 45 minute auditorium programs—one for grades K-2 and one for grades 3-6. Ten to twelve discovery lab sessions (depending upon what is written on your contract) will take place in a separate room throughout the school day. See sample schedule on page 5.

Auditorium Presentation Requirements:
1. A room large enough to hold all of the students scheduled to attend that presentation.
2. Students should be seated and ready to begin at the start time that is listed on the contract.
3. Allow 1 hour for each presentation.

Discovery Lab Session Requirements:
1. Labs need to be in one room for the entire day. The room needs to contain four large tables (or desks that can be pushed together), a power outlet and, if possible, a sink.
2. Each individual class will come to this room approximately two minutes before their scheduled time. Teachers should have the class divided into four groups.
3. Lab sessions are twenty (20) minutes each in duration. Each session is identical.
4. National Aquarium’s School Programs staff will need a copy of the schedule upon arrival.

Parent Volunteer Instructions:
1. Parent volunteers need to arrive approximately 30 minutes prior to the start time of the first lab session for training.
2. Each parent volunteer will be in charge of one station during the entire Discover Lab session.
3. The parent volunteer’s main task will be to guide the students through the assigned stations and actively engage students with questions and fun facts.
4. Useful questions include: “Why might an animal have a shell?,” “Where have you seen shells like these?,” “Why do sharks lose so many teeth?,” “Why are the teeth shaped like that?,” and/or “How does a whale catch its food?” Object comparisons are also useful (i.e. find similarities, differences, etc.)
5. Please also focus the students’ attention back on the National Aquarium instructor when it is time to rotate to the next station.
SAMPLE SCHEDULE

The formal education staff at the National Aquarium is happy to review your schedule to ensure that the program will run smoothly. Please send a copy of your schedule via fax to 410-659-0116 Attn: Outreach or email schoolprograms@aqua.org.

<table>
<thead>
<tr>
<th>Time</th>
<th>Program</th>
<th>DISCOVERY LABS</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-10 a.m. (extra time allotted for transition and set-up for the next program)</td>
<td>Grades K-2</td>
<td>9-9:30 a.m. Aquarium staff will also set up labs during the morning presentation</td>
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<tr>
<td>10-11 a.m.</td>
<td>Grades 3-6</td>
<td>9:30-10 a.m. Train morning set of volunteers</td>
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<tr>
<td>10-10:20 a.m.</td>
<td>Grade 1</td>
<td></td>
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<tr>
<td>10:25-10:45 a.m.</td>
<td>Grade 1</td>
<td></td>
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<tr>
<td>10:50-11:10 a.m.</td>
<td>Grade 2</td>
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<tr>
<td>11:15-11:35 a.m.</td>
<td>Grade 2</td>
<td></td>
</tr>
<tr>
<td>11:40 a.m.-12 p.m.</td>
<td>Grade 3</td>
<td></td>
</tr>
<tr>
<td>12-1 p.m.</td>
<td>Lunch, rest animals, train afternoon volunteers</td>
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</tr>
<tr>
<td>1-1:20 p.m.</td>
<td>Grade 3</td>
<td></td>
</tr>
<tr>
<td>1:25-1:45 p.m.</td>
<td>Grade 4</td>
<td></td>
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<tr>
<td>1:50-2:10 p.m.</td>
<td>Grade 4</td>
<td></td>
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<tr>
<td>2:15-2:35 p.m.</td>
<td>Grade 5</td>
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<tr>
<td>2:40-3 p.m.</td>
<td>Grade 5</td>
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DAY 3: POST-OUTREACH PROGRAM ACTIVITIES

The day after the outreach program complete Activity 3–Classifying Critters: Who’s My Cousin found on pages 28-33 and Activity 4–Culture Shark found on pages 34-44. These activities will reinforce what students learned from the Aquarium’s presentation and discovery lab.
Teacher Background

**SHARKS**

There is probably no other animal on Earth that people fear as much as the shark. Movies and books have made it seem that the world’s oceans are full of hungry sharks waiting to attack anyone who enters the water. However, the more we study sharks, the more we learn the truth about these magnificent fish.

Sharks, rays and skates belong to the group of fish called **Chondrichthyes**. Sharks developed over 400 million years ago and the first ray dates back to about 150 million years ago. Since this time, both have changed very little on an evolutionary scale. These animals are fish because they are cold-blooded, are strictly aquatic, obtain oxygen from the water using gills and they have fins used for swimming. However, not all fish are the same. There are two main groups of fish: those with a bony skeleton and those with a cartilaginous skeleton.

**CARTILAGINOUS FISH VS. BONY FISH**

Sharks, rays and skates have a “skeleton” made solely out of cartilage. Cartilage is a tough, flexible material that also forms people’s ears and the tips of their noses. Bony fish, making up 30,000 different species, have an entire skeleton made from bone.

Cartilaginous fish lack the gas-filled **swim bladder** that bony fish have. The swim bladder helps with buoyancy. It fills with gas, by diffusion through blood vessels, to help the fish float. If the fish pushes gas out of the swim bladder, it becomes more dense and sinks. Instead, sharks and their cartilaginous relatives have an oily liver. Since oil is less dense than water, this helps the shark remain buoyant.

Cartilaginous fish have five to seven gill slits that they use to extract oxygen out of the water in order to breathe. Bony fish have only one gill opening that is protected by a hard outer covering called an **operculum**.

Bony fish have scales whereas sharks, skates and rays have more primitive structures protecting their skin called **dermal denticles**. Dermal means “skin” and denticles refer to “teeth.” The pointed end of these denticles faces the tail of the animal. When touching a shark from their head toward their tail, it feels very smooth. However, when touching the shark in the opposite direction, from tail to head, it feels very rough similar to sandpaper. Sharks’ bodies are covered with these structures whereas rays and skates only have dermal denticles down the middle of their backs. These specialized scales reduce drag to allow more efficient swimming as well as protect these fish from predators and parasites.

### Differences Between Bony Fish and Cartilaginous Fish

<table>
<thead>
<tr>
<th></th>
<th>BONY FISH</th>
<th>CARTILAGINOUS FISH</th>
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<tbody>
<tr>
<td><strong>Skeleton</strong></td>
<td>Made of bone</td>
<td>Made of cartilage</td>
</tr>
<tr>
<td><strong>Buoyancy</strong></td>
<td>Gas-filled swim bladder</td>
<td>Oily liver</td>
</tr>
<tr>
<td><strong>Number of gill openings</strong></td>
<td>One gill opening covered by operculum</td>
<td>Five to seven gill slits</td>
</tr>
<tr>
<td><strong>Body covering</strong></td>
<td>Smooth scales</td>
<td>Dermal denticles</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td>Goldfish, tuna, sea bass, etc.</td>
<td>Sharks, rays, skates, chimeras</td>
</tr>
</tbody>
</table>
SHARK SENSES

Although sharks have changed very little in the last 400 million years, they are in no way inferior to modern bony fish. In fact, sharks have a number of specialized senses and adaptations making them one of the most efficient predators on Earth. A shark’s most acute sense is smell. When swimming, the shark moves its head from side to side in order to detect and follow the area of most concentrated scent. About 70 percent of its brain is used for olfactory function. A shark can smell blood or “fish juices” up to 1320 ft (400 m) away.

Sharks are well adapted to hear underwater. Scientists have found that some sharks have ears that are capable of hearing at a distance as far as 820 ft (250 m). However, most sharks hear up to 295 ft (90 m) away. Sharks specialize in hearing low frequency sounds, like those made by struggling animals splashing in the water.

At 100 ft (30 m) away, the sense of the lateral line becomes effective. The lateral line is a network of canals, pores and sensitive cells, filled with fluid, that run horizontally along the body. The pores are attached directly to nerves that stimulate a muscle response from the brain. It is used to detect sound waves, vibrations and disturbances in the water.

Sharks can use their sense of sight about 50 ft (15 m) away. They see best at dawn and dusk by using a structure called a tapidum lucidum, which is behind the retina of the shark’s eye. The tapidum lucidum consists of a special layer of cells that act like a mirror, allowing a shark to see 10 times better in dim light than humans.

Sharks also have sensory organs called Ampullae of Lorenzini, which are most effective at about 6 ft (2 m) or less. They are fluid-filled pores surrounding the mouth and nose of sharks and rays. These pores detect the weak electrical fields given off by animals as well as changes in temperature. The Ampullae of Lorenzini are particularly useful in dark or murky waters when prey animals are hiding under the sediment.

Touch and taste are almost interchangeable because both are only effective upon contact. The jaws of most sharks are only loosely connected to the skull and are very mobile. As it starts to bite, the shark’s snout bends up and out of the way while the jaws move forward. The mouth moves back under when the shark bites its prey.

After getting a good hold, the shark may also shake its head from side to side to help tear out a chunk of meat. It then swallows its prey whole, relying on enzymes and hydrochloric acid in its stomach to break down the entire prey into basic nutrients.

“Sense-ational Sharks”

<table>
<thead>
<tr>
<th>Distance</th>
<th>Sense</th>
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<tbody>
<tr>
<td>0 ft</td>
<td>Touch/Taste</td>
</tr>
<tr>
<td>6 ft</td>
<td>Ampullae of Lorenzini</td>
</tr>
<tr>
<td>50 ft</td>
<td>Vision</td>
</tr>
<tr>
<td>100 ft</td>
<td>Lateral Line</td>
</tr>
<tr>
<td>295-820 ft</td>
<td>Hearing</td>
</tr>
<tr>
<td>1320 ft</td>
<td>Smell</td>
</tr>
</tbody>
</table>

DIET

There are many different species of sharks (about 400!) and they range in size from about 6-8 inches (Dwarf Lantern Shark, Etmopterus perryi) to about 46 feet (Whale Shark, Rhincodon typus). Because of this range, the diet of all sharks cannot possibly be the same. Larger sharks prey upon marine
mammals (seals, dolphins and sea lions), other sharks, sea turtles and even birds. Other sharks may have a more specific diet of crustaceans (like crabs) or mollusks (like snails). Three of the largest sharks; Whale, Megamouth and Basking Shark, actually eat tiny floating plants and animals in the ocean called plankton.

Different species of sharks have different shapes and sizes of teeth that are specialized for the kinds of food they eat. Notched teeth with serrated edges like those of the tiger shark or thin, pointy teeth like the shortfin mako shark are used for grasping and holding onto prey. White sharks have narrow teeth in their bottom jaw used for holding and sharp serrated triangular teeth in their top jaws for cutting. Oceanic whitetip sharks have serrated, wedge-shaped teeth used for cutting out large mouthfuls. Port Jackson sharks have hard, flat teeth for crushing crabs, clams, oysters and other shellfish. Whale sharks have tiny, nonfunctional teeth—they filter-feed plankton through their gills. Some sharks, such as the nurse shark, use barbels or whiskers to probe bottom sediment in search of food.

Shark teeth fall out easily because they are loosely rooted in a jaw made of soft cartilage and sharks often eat animals with hard parts like bones or shells. Some sharks can loose up to 30,000 teeth in their lifetime. The inside of a shark’s jaw has anywhere from five to fifteen rows of teeth that usually lie flat until the tooth in front of it falls out. When a tooth is lost, another rotates forward to replace it within 24 to 48 hours. The process of tooth replacement is very similar to the movement of a conveyor belt or the steps on an escalator.

**SHARK MYTHS**

Much attention has been focused upon the interaction between sharks and humans in the past several years. Of the approximately 400 species of sharks, only 32 species have ever been documented in attacks on humans. According to the International Shark Attack File (ISAF), there are an average of 50-75 unprovoked shark attacks each year worldwide, and only about 5 result in a fatality. Scientists theorize that human attacks may happen as a result of territorial responses, inquisitive testing, accidental interference with mating activities or, as in most cases, mistaken identity.

Despite their bad reputation, most sharks are shy and harmless, avoiding people and other large animals whenever possible. Only a dozen kinds of sharks are considered dangerous to humans. On the other hand, people kill over a million sharks per year. Their rough skin and sharp teeth have been used historically for sandpaper and spears. Today, the skin is used to make strong leather. Many sharks are hunted for their meat and cartilage or for their fins, to make shark fin soup.

Sharks are also killed to make fertilizer or to be used in research. Many sharks die as accidental by-catch, caught by fishermen who intended to catch another species. Shark populations are declining and, without protection, may not be able to bounce back from the pressures put on them by humans. Scientists who study sharks are working to find out more about these amazing animals and how to better protect their survival.
**WHALES**

“Smiling” dolphins, mysterious blue whales, playful killer whales – whales capture our imaginations. Like all mammals, they breathe air with lungs, have hair on their body at some point in their lives, bear live young, nurse the young with milk from mammary glands, have a four-chambered heart and maintain a constant internal body temperature.

Toothed and baleen whales belong to a group called Cetaceans. Cetaceans are found in the oceans around the world. The larger whales may venture into cold polar waters, while smaller whales like dolphins and porpoises frequent warmer waters. Four types of dolphins even live in fresh water in large tropical rivers like the Amazon.

**FEEDING**

Whales are carnivores (meat-eaters). The toothed whales include many species of dolphins and porpoises, the pilot whales, the beaked whales (Baird’s whale), the narwhal, the orca and one large whale- the sperm whale. Most toothed whales feed on schooling fish and squid that they catch with their sharp, cone-shaped teeth. The orca or killer whale eats larger fish and small marine mammals such as seals and sea lions. Another toothed whale, the beluga, catches crustaceans and mollusks (snails, squid, octopus).

The baleen whales are among the largest animals ever to live, yet they feed on small animals called krill and other types of plankton (floating animals that cannot swim against the current). Inside the mouths of these giant creatures are structures called baleen, which is a flexible, fringed comb made of the protein keratin. Keratin is also found in hair, whiskers, claws, hooves and fingernails of other animals. Baleen plates hang in rows from the whale’s upper jaw. There are three different ways that baleen is used. Bowhead and right whales swim constantly with their mouths open. Tiny zooplankton are caught on the baleen as the water flows between the sheets and out the corners of the jaw. These animals function as giant plankton nets and can be recognized by their “upside-down smile.”

The second way whales use baleen is to capture larger zooplankton, including shrimp-like krill and small schooling fish. To do this, whales engulf a great mouthful of water and strain out the food that has been trapped on the hairs of the baleen. Since the prey is larger, the hairs are more coarse. The blue whale, the fin whale and the humpback whale use this method. They can be recognized by the “pleats” on their throat which can expand when they take in a large mouthful of water and prey.

The third strategy used by baleen whales is used by the California gray whale. These whales swim on their sides sucking in and straining out animals living on or near the bottom of the ocean.

**INSULATION**

It is difficult to maintain a warm internal temperature while living in cold waters. Both toothed and baleen whales have a heavy insulating layer of fat below the skin called blubber. This blubber keeps the whale warm as well as helps store that extra fat for when food is scarce.

**BREATHING**

All whales use a structure called a blowhole to breathe. The blowhole is on top of the head so that these animals can easily breathe at the surface of the water. The blowhole stays closed unless the whale opens it. Baleen whales have two openings in their blowhole while toothed whales have only one opening.
Although they all must surface to breathe air, some whales can dive deeper and stay down longer than others. Dolphins stay close to the surface and can stay underwater for 15 to 20 minutes. Sperm whales dive much deeper to depths of 3280 ft (1000 m) or more and can stay underwater for up to 1 hour. During diving, a reflex response causes the heart rate to slow and shuts off blood flow to the muscles. This saves oxygen-rich blood for the heart and brain.

**SWIMMING**
Dolphins, porpoises and other whales have tails called flukes that are horizontally flattened. As their tails move up and down, the animals are pushed through the water. The whales’ pectoral or side fins serve for steering and stabilization. The animal’s streamlined shape helps them glide through the water.

**HEARING**
Whales live in a dark and murky world. Some have a system of **echolocation**, or sonar, that is used to locate food or obstacles. Dolphins and porpoises are particularly adept at echolocation. They emit a series of clicks that are focused into sound waves by the rounded melon on their head. The sound waves travel out, hit an animal or object, and bounce back to the whale, resonating through the lower jaw and into the inner ear of the whale. A large section of the dolphin and porpoise brain is devoted to processing sound wave information.

In the darkness of the sea, sound is also used to communicate with other members of the same species. The songs of humpback whales, the low pitched boom of blue whales, the chirps and trills of the beluga and the whistles of dolphins are all ways of cetacean communication. The very low-pitched sounds of the blue whales may travel hundreds of miles through the water. The great splashes whales make when they breach (leap out of the water) make loud sounds that carry for many miles and may also be a form of communication.

**SEEING**
Cetaceans can see as well in water as above the water. Many whales stick their heads out of the water and appear to be looking around. This behavior is called **spy-hopping**.

**REPRODUCING**
Whales typically have one offspring every two or so years. Twins are possible but are very rare. While dolphins usually stay in warmer waters year-round, many other whales migrate from cold feeding grounds to warmer seas to give birth. Over time, the mother and calf develop a very strong bond. The mother whale stays close to her calf and directs its movements carrying the calf in her “**slip stream**,” a type of current which develops as the mother swims. Calves are born without a thick layer of blubber to keep them warm. Warm waters allow the calves to maintain their body heat without expending as much energy. Calves will eventually develop this thick layer of fatty blubber by feeding on very rich, high-fat milk.

**ANIMAL CLASSIFICATION**
The diversity of animal life on Earth is astounding. Each animal has an unique body plan that allows it to survive and adapt to its given surroundings. With so many different kinds of animals, it is important to classify living things in
Categories. It can be hard at first to try and categorize all the living things, but after studying each animal similarities can be found. These similarities are what scientists, called taxonomists, use to classify animals.

Animals are classified into categories called taxa. There are seven main levels that organisms can be placed into: Kingdom, Phylum, Class, Order, Family, Genus and Species. (An easy way to remember this is to remember the sentence King Phillip Came Over For Great Spaghetti. Each capital letter stands for a level.) All animals are in the Kingdom Animalia. As you move from kingdom to species the animals that are grouped together share more and more characteristics at each succeeding level.

**INVERTEBRATES**

Invertebrates are animals without a backbone. Since invertebrates do not have a skeleton, their bodies have adapted in ways to help them survive in their environment. When you visit the beach you will often find these invertebrates or objects that they have left behind.

**CRABS, LOBSTERS AND SHRIMP**

These animals are all related, but it is not because they taste good! These animals are all in the phylum scientists call Arthropoda. The term arthropoda means “jointed leg.” They share many traits, the first being their legs. Animals in this phylum have ten jointed legs, which means that their legs can move. People also have jointed legs and arms (i.e. our knees and elbows). Another trait these animals share is their outer covering. Instead of a shell to protect their bodies, arthropods have an exoskeleton. This exoskeleton is a hard outer covering over the animal’s entire body. The exoskeleton does not grow with the animal and therefore must be shed for the animal to increase in size. This shedding process is called molting.

**CLAMS, OYSTERS, MUSSELS AND SNAILS**

Have you ever collected shells from the beach? Those shells once provided the homes and shelters for animals called mollusks.

Scientists call this phylum Mollusca because it means “soft-bodied” in Latin. A hard shell protects the soft bodies of many of these animals. Snails have one shell. Some of their relatives, like clams and oysters, have two shells. The squid and octopus are also members of this group but their version of a shell is inside their body or may have completely disappeared. Their soft, shell-less bodies allow them to move quickly through the water and squeeze into small spaces.

**SEA STARS, SEA URCHINS AND SAND DOLLARS**

These animals may not look alike, but they are all related and share important traits that help them move. Each one of these animals has suction-cup like feet called tube feet. These tube feet help the animals to move over rocks and hold them in place when waves crash over them. They also have a spiny skin covering to help protect them. For this reason scientists call this group of animals the Echinoderms (“echino” means spiny and “derm” means skin). Another attribute that these animals share is their mouths are located in the middle of their bodies. The sea urchin has five teeth to help them chew food while the sea star actually throws up its stomach to digest the food.
CORALS, JELLIES AND ANEMONES

When visiting the beach, there are certain types of animals that can give a powerful sting. These animals belong to the phylum *Cnidaria*, a word that means “stinging cells.” These special stinging cells are used by the animals to catch food or to protect themselves. Coral is an example of a cnidarian. Although coral may look like a rock at first glance, it is a colony of many organisms. This colony creates a calcium carbonate skeleton that gives the coral its shape. While coral remains in one place, their cousins, the jellies, float through the water relying on currents to carry them. Many people may have experienced the familiar pain from a jelly sting. Each tentacle has thousands of stinging cells (*nematocysts*) that each contain a trigger. When that trigger is touched, the venom shoots out much like a harpoon directly into the bloodstream. Those nematocysts regrow when the jelly is alive but can still sting when the animal is dead. The sea anemone also uses stinging cells on its tentacles to catch food and to protect themselves. Anemones are best known for their *symbiotic relationship* with clownfish. Clownfish are able to live inside of anemones because they have a mucus coating that keeps the anemone’s stinging cells from hurting them. The clownfish cleans the anemone of leftover fish and algae giving the fish an extra food source. The anemone is given better circulation because the clownfish fan their fins while swimming around the anemone.

SPONGES

Sponges are soft, porous, stationary animals that live in the ocean. They filter food out of the water by pushing water through a system of tunnels and chambers. The sponge belongs to its own phylum, *Porifera* (meaning “pore-bearing”). Sponges are many different colors like red, yellow, blue and pink and many different shapes, including barrels, flat and round. Each sponge has only four kinds of cells, whereas humans have many different types (hair cells, eye cells, red blood cells, etc.). Many fishermen consider sponges to be a nuisance because they take up space in their trawl nets. Sometimes, these fishermen break the sponges in half thinking this will kill the sponge. However, it only creates more sponges because both halves will grow into new sponges.
Glossary

**Ampullae of Lorenzini** – series of fluid filled holes around the nose and mouth of a shark that detect vibrations

**Arthropoda** – a phylum of invertebrates that include crustaceans, insects, horseshoe crabs and milli/centipedes

**Baleen** – fringed plates that hang from the upper jaw of baleen whales and strain plankton from the water

**Blowhole** – hole(s) on top of a whale’s head for breathing

**Blubber** – layers of fat that provide insulation

**Carnivore** – an animal that eats meat

**Cetaceans** – all whales, which includes dolphins and porpoises

**Chondrichthyes** – class which includes sharks, skates, rays and chimeras that have a skeleton made solely of cartilage

**Cnidaria** – group of animals with stinging cells such as jellies, sea-wasps, anemones and coral

**Crustaceans** – a mainly aquatic invertebrate that has jointed legs and must molt, or shed, its exoskeleton, to grow; examples include crabs, lobsters and shrimp

**Dermal denticles** – “skin teeth” found on cartilaginous fish

**Echinoderms** – meaning “spiny skin” these animals include sea stars, sea urchins, sand dollars and sea cucumbers

**Echolocation** – system used by dolphins and other toothed whales to detect objects by emitting high-pitched sounds that reflect off the object and return to the animal creating a mental picture of what is around them

**Exoskeleton** – hard external covering on the outside of the body; literally “outside skeleton”; the animals shed this shell (molt) and have a soft shell underneath which will soon harden; examples include lobsters, shrimp, crabs, tarantulas and millipedes

**Invertebrate** – animals without a backbone

**Keratin** – protein that is found in hair, nails, horns and beaks

**Lateral line** – horizontal line of fluid filled holes along the body of a fish that detects vibrations in the water

**Mollusks** – an invertebrate with a soft body covered by a thick membrane; can have 0,1,2 or 8 shells; examples include clams, oysters, snails and scallops; octopuses and squid are examples of mollusks without an external shell

**Molting** – the process in which arthropods grow larger; the exoskeleton splits and the animal backs out of it to reveal a new, larger, soft exoskeleton that hardens after a few days

**Nematocysts** – stinging cells that are present in the phylum Cnidaria

**Operculum** – bone that covers gill opening in bony fish
Phylum – grouping together all classes of organisms that have the same body plan

Plankton – drifting or somewhat mobile plants and animals; usually flow with ocean currents; many are microscopic in size; examples include egg larvae, algae, krill and jellies

Porifera – the phylum of sea sponges

Slip-stream – current that is formed next to the mother whale while swimming in which the calf floats in during its first weeks of life

Spy-hopping – a whale looking above the water to see its surroundings

Swim bladder – organ in bony fish that helps with buoyancy

Symbiotic relationship – a relationship that is mutually beneficial to each species

Tapidum lucidum – mirror-like structure in the eyes of sharks that helps them see very well in dim light

Taxa – a category or group in which similar animals are placed

Tube feet – suction-like feet found on all echinoderms that are used for feeding and locomotion
Resources

NATIONAL AQUARIUM, BALTIMORE, MD
aqua.org
Navigate the Aquarium website to find animal information sheets, resources and fun activities for your students.

THE SECRET WORLD OF SHARKS AND RAYS
WNET Video Distribution
Write to:
PO Box 2284
South Burlington, VT 05407
Call: 1-800-336-1917
An overview of the world of sharks and the roles they play in nature. Worldwide, there are more than 370 species of sharks, which vary greatly in size, shape, preferred habitat, and prey. This film explores their world and that of their close cousins, the rays.

ANIMAL PLANET
animalplanet.com
This website contains a great list of web links to find information about ocean animal facts and conservation.

SHAPE OF LIFE
shapeoflife.org
A revolutionary eight-part television series that reveals the dramatic rise of the animal kingdom through the breakthroughs of scientific discovery. This website features activities, resources, animal facts and scientist biographies.

INTERNATIONAL SHARK ATTACK FILE
http://www.flmnh.ufl.edu/fish/Sharks/ISAF/ISAF.htm
The Florida Museum of Natural History maintains this website that has accurate accounts of the history and frequency of shark attacks.

DISCOVERY OF SOUND IN THE SEA
dosits.org
This website run by the University of Rhode Island provides information and audio files about sounds in the ocean.

LITTLE GUIDES: WHALES, DOLPHINS & PORPOISES
Editor: Peter Gill
This book provides very detailed information about individual species of whales, including their biology, key facts, and distributions.
Activity 1 — More than Just the Skeleton

DESCRIPTION

Students will read a passage about sharks, bony fish and whales. They will then compare and contrast the three animals. The students will then write an article comparing two of the animals.

PROCEDURE

Make copies of the student pages found on pages 18-21.

Part A
Students will read the selection provided.

Part B
Students will use the chart to organize the information about the three animals.

Part C
Students will complete the Venn diagram to compare and contrast bony fish, sharks and whales.

Part D
Students choose two of the three animals and write an article comparing and contrasting them.
Activity 1 — More than Just the Skeleton

PART B

**BONY FISH**
- Swim bladder
- Scales
- Herbivore
- Omnivore

**SHARK**
- Gills
- Cold-blooded
- Lay eggs
- Cartilage
- Dermal Denticles

**WHALE**
- Teeth
- Carnivore
- Bone
- Live birth

- Blowhole
- Mammal
- Warm-blooded
- Baleen

**NATIONAL AQUARIUM**
Ocean Theme Day – Grades 5-6
Activity 1 — More than Just the Skeleton

DIRECTIONS TO STUDENTS

Read the paragraphs below. Use the information to compare and contrast whales, bony fish and sharks.

PART A
Read the following paragraphs.

There are many interesting animals that live in the ocean. Among these animals are bony fish, sharks and whales. People often get confused about the differences between bony fish, sharks and whales.

FISH (BONY FISH AND SHARKS)
Fish are animals that live in the water. They breathe oxygen from the water. Most fish have fins for swimming. Fish are cold-blooded, which means their temperature depends on the surrounding environment. Fish often lay eggs, although some may give birth to live young. There are two main groups of fish—fish with a skeleton made of bone and fish with a skeleton made of cartilage. Cartilage is what people’s noses and ears are made of. Tuna, goldfish and sea bass are examples of bony fish. Fish with skeletons made of cartilage are sharks, rays, skates and chimeras.

Bony fish and cartilaginous fish (sharks and their relatives) have to find some way to keep from sinking. This is referred to being buoyant in the water. Bony fish do not sink because they have a swim bladder that acts as a gassy float. To keep buoyant, sharks and their relatives have an oily liver instead of a swim bladder.

One similarity between these groups is that both sharks and bony fish breathe oxygen using gills. Sharks have five to seven gill slits used for breathing. Bony fish have one gill opening that is protected by a hard outer covering. Also, both kinds of fish have fins to swim in the water. These two kinds of fish are different in that they have different body coverings. Bony fish have smooth scales on the outside of their bodies. Sharks have special scales called “dermal denticles.” Dermal means “skin” and denticles refers to “teeth.” Bony fish eat many different things. Depending on the species, fish may eat plants or animals. Sharks are mainly carnivores or meat eaters.

WHALES
Whales are another type of ocean animal. Although whales live in the water, they are not fish. Whales are mammals. Whales breathe oxygen by using their blowhole on top of their head. Whales are also warm-blooded which means that their body has to stay a constant temperature. Whales are carnivores.

There are two main types of whales. These are toothed whales and baleen whales. Toothed whales have teeth for catching their prey. Dolphins and sperm whales are examples of toothed whales. Dolphins eat fish in the water and sperm whales eat squid. Baleen whales have plates of baleen in their mouths. These plates help to strain out small animals in the water, which the whale then swallows. Humpback whales and blue whales are examples of baleen whales.
Activity 1 — More than Just the Skeleton

PART B

Using what you have learned in the reading and from other sources such as the internet or your school library, complete the chart with characteristics for each type of animal.

<table>
<thead>
<tr>
<th></th>
<th>BONY FISH</th>
<th>WHALES</th>
<th>SHARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity 1 — More than Just the Skeleton

PART C

Write the characteristics you listed on the chart on the Venn diagram.
Activity 1 — More than Just the Skeleton

PART D

Pick two of the animals you researched and write an article about the similarities and differences between the two. Include at least two similarities and two differences.

Name: ________________________________________
Activity 2 — Whale Migration

DESCRIPTION

Students will study the migration patterns of baleen whales, focusing on North Atlantic right whale migration as they plot actual data from a tagged right whale.

PROCEDURE

1. Copy and distribute the student pages found on pages 25-27.
3. Using the map and data points found on pages 25-27, have students work alone or in small groups to plot all the data points and see where Metompkin (a North Atlantic right whale) traveled.
4. Students should then answer the questions following the map activity individually.
5. Discuss as a class what other hazards whales may encounter during their migrations. For example, the whales may collide with ships using the same routes and/or they may have a hard time finding a place to give birth as coastal marine habitats are decreasing due to growing human populations.
**Activity 2 — Whale Migration**

**STEP C**
Use the reading and your plot points on the map to answer the following questions.

1. **What is migration?** Migration is the journey a baleen whale takes every year from the summer feeding grounds to the winter breeding grounds.

2. **Why was Metompkin in warmer waters for the winter?** Metompkin was in the warmer waters for the winter to find a mate or give birth to a calf.

3. **How many miles did Metompkin travel since January 6, 1996 until March 5, 1996?** Approximately 1,000 miles.

4. **Where do you think Metompkin will travel to for the summer? Why does she leave the warmer waters?** Metompkin will travel north, probably to Cape Cod, MA or the Bay of Fundy. She leaves the warmer waters to find more food at the feeding grounds in the colder waters.

5. **In August of 1996, Metompkin was seen without any fishing line or rope on her but she did have scars from being entangled. Where do you think the fishing line and rope came from? What can you do to help stop this from happening to other animals in the ocean?** The fishing line and rope probably came from boaters or fishermen who lost their fishing line or rope that fell into the ocean from a boat. Answers will vary. Possible answers include picking up trash/litter on the ground making sure to wear gloves and have an adult with you, throwing your trash away into the trash can, recycling, sharing information you learned with friends and family, etc.
Activity 2 — Whale Migration
Activity 2 — Whale Migration

STEP A
Read Whale Migration: An Amazing Journey.

WHALE MIGRATION: AN AMAZING JOURNEY

Baleen whales like the humpback whale, the North Atlantic right whale and the blue whale travel great distances every year. This journey is called migration. The whales spend the summer in the cold waters where there is plenty of microscopic plants and animals for them to eat called plankton. As summer ends, the whales will travel down to warmer waters near tropical areas for the winter. This is where the baby whales are born. Baby whales, or calves, grow a thick layer of blubber during the winter to keep them warm on the long swim back to the cold waters of the feeding grounds.

On January 1, 1996, a North Atlantic right whale, one of the most endangered baleen whales, was found near Jacksonville, FL with fishing line and rope stuck around its back and flippers. The whale’s name was Metompkin, and she was in the warmer waters of Florida for the winter. Scientists were able to cut most of the rope off, but they were not able to untangle her from over 300 feet of fishing line before she traveled north for the summer. The scientists decided to attach a tag to the rest of the rope and fishing line. This tag would be able to send a signal to a computer so that the scientists could “see” or track where Metompkin was going without following her in a boat. With the information from Metompkin’s tag, scientists were able to learn more information about right whale migration than was ever known before!
Activity 2 — Whale Migration

DIRECTIONS

STEP B
Follow Metompkin’s route by plotting the following data points on the map. Make sure to write the date next to each plotted point.

<table>
<thead>
<tr>
<th>DATE</th>
<th>LATITUDE</th>
<th>LONGITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 6, 1996</td>
<td>30°N</td>
<td>81°W</td>
</tr>
<tr>
<td>January 24, 1996</td>
<td>32°N</td>
<td>79°W</td>
</tr>
<tr>
<td>January 30, 1996</td>
<td>34°N</td>
<td>75°W</td>
</tr>
<tr>
<td>February 3, 1996</td>
<td>36°N</td>
<td>71°W</td>
</tr>
<tr>
<td>February 22, 1996</td>
<td>38°N</td>
<td>64°W</td>
</tr>
<tr>
<td>March 5, 1996</td>
<td>39°N</td>
<td>54°W</td>
</tr>
</tbody>
</table>

STEP C
Use the reading and your plot points on the map to answer the following questions.

1. What is migration?

2. Why was Metompkin in warmer waters for the winter?

3. How many miles did Metompkin travel since January 6, 1996 until March 5, 1996?

4. Where do you think Metompkin will travel to for the summer? Why does she leave the warmer waters?

5. In August of 1996, Metompkin was seen without any fishing line on her but she did have scars from being entangled. Where do you think this fishing line came from? What can you do to help stop this from happening to other animals in the ocean?
Activity 2 — Whale Migration
Activity 3 — Classifying Critters: Who’s My Cousin?

DESCRIPTION

Students will become familiar with the ways in which animals are grouped. The class will visually compare various ocean animals and place them into groups based upon similar characteristics.

PROCEDURE

1. Make copies of the Who’s My Cousin Student Pages and the Flow Chart found on pages 30-33. Distribute to your students.
2. As a class, read the student reading and discuss how scientists classify animals. Refer to the teacher background on pages 10-12 for more information.
3. Break the students into pairs.
4. Have each pair use the Flow Chart to group the animals based on similarities. Students should reflect on their interactions with the live animals or animal artifacts during the Discovery Lab session. You can have the students list the animals or cut and paste them onto a sheet of notebook paper.
5. For each group of animals, students should list or write one sentence about the animals’ similarities.
6. Students can present their groupings or simply turn in their work. Class discussion questions can include: What common traits did the animals have? How did you group the animals? How have scientists grouped these animals?
Activity 3 — Classifying Critters: Who’s My Cousin?

GROUP 1:
These animals all have jointed legs and an exoskeleton.

Blue Crab
Hermit Crab
Horseshoe Crab
Krill
Lobster

GROUP 2:
These animals all have a soft body and a hard shell.

Clam
Oyster
Scallop
Snail
Whelk

GROUP 3:
These animals all have stinging cells.

Brain Coral
Jellies
Plate Coral
Sea Anemone

GROUP 4:
This animal has pores in its body. It is the only animal in its group.

Sponge

GROUP 5:
These animals all have spiny skin. Also, their bodies are arranged like the spokes on a wheel.

Sand Dollar
Sea Star
Sea Urchin
Activity 3 — Classifying Critters: Who’s My Cousin?

DIRECTIONS TO STUDENTS

STEP A
Read the following paragraphs.

When you visit the beach you can find many different kinds of animals. These animals can live in the ocean, on land or in both! Some of these animals have hard shells, some have soft bodies, and some can even sting you!

Many animals are related to each other. Scientists put animals into groups with other animals that are similar. The more traits two animals share the more closely related they are. Can you think of two animals that are related to each other? Sometimes animals do not look the same but are still related. Horseshoe crabs, spiders and scorpions are related to each other because they have similar legs and have to molt (or shed their exoskeleton) to grow.

On the following pages, there are pictures of some of the animals you might find at the beach. With a partner, complete Step B. Group the animals that you think are closely related to each other.

STEP B
1. With your partner, study each animal.
2. Look at each animal to find traits that they have in common. Hint: Do any of them have shells? Do any of them have legs?
3. Use the Flow Chart to help categorize the animals. Think about the live animals and animal artifacts that you saw during the Discovery Lab. How did these animals feel? Did the animals have legs to move? How might these animals get their food?
4. Put the animals into groups. Each group should have something in common. You can list the animals or cut out each animal and glue each group onto a piece of paper.
5. For each group that you made, list the characteristics that those animals have in common.
Activity 3 — Classifying Critters: Who’s My Cousin?

**Instructions**

Begin your search at the box labeled "Start." Work through the chart by selecting the branch that best describes each species. Keep choosing between the branches until you reach a sign, which indicates that you have identified the animal’s group. Species that fall into the same box are related.

**Start**

- **No Backbone**
  - These animals are called invertebrates. Examples include slugs, snails, octopuses, crabs, and fish.
- **Jointed Legs**
  - Jointed legs are legs that can bend in the middle (like our legs). These animals have an exoskeleton around the outside of their body for protection.
- **No Jointed Legs**
  - These animals do not have legs or have legs that do not bend at a joint.
- **Stinging Cells for Protection and Eating**
  - These animals have tentacles with stinging cells on them. They use these cells to catch their food. Some animals with stinging cells also have a soft body. One example is an animal that a clown fish lives in. Some animals with stinging cells have a hard body. These animals make up reefs in the Caribbean.
- **No Stinging Cells for Protection and Eating**
  - These animals do not use stinging cells to catch their food. They feed using other methods.

- **Pores**
  - Pores are tiny holes along the outside of the animal’s body. These animals all have small holes on the outside of their body.
- **No Pores**
  - These animals do not have small holes on the outside of their body.

- **Soft Body**
  - These animals have a soft body and some way to protect them. Some have shells and others use exoskeletons or other methods.
- **Spiny Skin**
  - Some animals have spikes all over their skin. Sometimes the spines are big; sometimes they are very tiny. These animals feel prickly when you touch them.

- **No Spiny Skin**
  - The skin of these animals feels smooth. There are no spikes on the outside of the animal’s body.

**Backbone**

- These animals are called vertebrates. Examples include birds, mammals, reptiles, amphibians, and fish.
## Activity 3 — Classifying Critters: Who’s My Cousin?

<table>
<thead>
<tr>
<th>Classifying Critters</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Sea Anemone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue Crab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brain Coral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hermit Crab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand Dollar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jelly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horseshoe Crab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scallop</td>
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</table>
Activity 3 — Classifying Critters: Who’s My Cousin?

<table>
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<tr>
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<th>PLATE CORAL</th>
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<td><img src="image5" alt="Lobster" /></td>
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<table>
<thead>
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<th>SEA URCHIN</th>
<th>SPONGE</th>
<th>WHELK</th>
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<tbody>
<tr>
<td><img src="image7" alt="Sea Urchin" /></td>
<td><img src="image8" alt="Sponge" /></td>
<td><img src="image9" alt="Whelk" /></td>
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</tbody>
</table>
Activity 4 — Culture Shark

DESCRIPTION
Students will read stories of the cultural views of sharks/rays from various locations including the United States. As a group, they will then compare and contrast their specific location’s view with that of the U.S. by completing a Venn diagram as well as answering discussion questions.

PROCEDURE
1. Copy the student pages found on pages 35-42.
2. Divide the class into 5 groups, with each group receiving a different reading on one of the 5 various locations, a reading on the U.S., a Venn diagram and discussion questions. Groups should read the paragraphs on their specific location first.
3. Have students read the paragraphs about their specific location’s view on sharks/rays and then the paragraphs about the U.S.
4. Using the Venn diagram found on page 41, have students work in their small groups to compare and contrast their specific location’s view with that of the U.S.
5. Students should answer the discussion questions following the Venn diagram activity individually.
6. Discuss as a class each location’s view on sharks/rays and how that compares to that of the U.S. The discussion questions on page 42 can serve as an outline for class discussion.
Activity 4 — Culture Shark

DIRECTIONS
Students will read stories of the cultural views of sharks/rays from various locations including the United States. As a group, they will then compare and contrast their specific location’s view with that of the U.S. by completing a Venn diagram as well as answering discussion questions.

STEP A
In your small group, please read the paragraphs below. Use the information to compare and contrast your location with the U.S.

PACIFIC ISLANDS- HAWAII

The pacific islands consist of many islands in the Pacific Ocean. Hawaii, the 50th state of the United States, is one of these islands. Hawaii is a place full of rich culture that has a major connection to the shark. In Hawaii, sharks are considered gods and/or ancestors which are both feared and celebrated in many ways.

There are many ancient Hawaiian myths and legends some of which are still believed in today. The main animal in many of these legends and myths is the shark. To the Hawaiians, the shark is believed to be one of the greatest gods. One of the most powerful shark gods is Kamohoali‘i. It is believed that he brought his sister, Pele, the goddess of volcanoes, to Hawaii by guiding/steering her canoe. There are even many stories of Kamohoali‘i and other shark gods being called upon by fishermen/boaters to help guide their boats back to safety in bad weather or if lost at sea. When calling to the shark gods, fishermen/boaters would light a fire and put offerings or gifts from either plants or fish into the water for the gods in return for their help.

Hawaiian ancestors are thought to communicate to and protect their descendants through animals such as sharks. Hawaiians believe that sharks are one of the greatest Aumakua, which means guardian spirit. In stories, the shark is often the protector of the people. Each family would have a guardian spirit. Ancient Hawaiians did not eat their family’s Aumakua because this would upset the gods and bring bad luck to the family. However, some Hawaiians such as the shark callers would attract and kill sharks for food. They believed that their ancestors provided sharks for food for their family. Before the hunt, the shark callers would pray to the shark gods. It is said that Hawaiian chiefs would go out and catch sharks so that they could eat the eye of the shark. They have a belief that eating the eye of the shark would allow them to see into the future.

There is a story of a shark god that transforms into a human in order to marry an island girl. According to the story, they have a child and the child has shark jaws on his back that he hides from the others. He has the ability to transform into a human as well as a shark. In order to be nice, the boy is not allowed to taste meat because if he did, he would begin to attack others, including humans, for their meat. One day, the boy did eat meat and from that day on he would go from island to island transforming into a shark that would attacked people in the water. Despite these scary shark stories, the shark is still respected.
Activity 4 — Culture Shark

DIRECTIONS
Students will read stories of the cultural views of sharks/rays from various locations including the United States. As a group, they will then compare and contrast their specific location’s view with that of the U.S. by completing a Venn diagram as well as answering discussion questions.

STEP A
In your small group, please read the paragraphs below. Use the information to compare and contrast your location with the U.S.

LATIN AMERICA
Latin America consists of Mexico, Central America, South America and the Caribbean. It is surrounded by the Pacific Ocean, Atlantic Ocean, Caribbean Sea and the Gulf of Mexico.

Central America consists of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama. Central America has many different cultural groups that both fear and honor the shark and their cousin the ray. The ancient Mayans would use the word “xoc” (pronounced Shoke) when talking about sharks. Therefore, it is believed that the English word “shark” comes from the Mayan word “xoc” seeing as they sound very similar. Most of the ancient cultures would honor these animals with different forms of art, many of which are still around today.

Ancient Central American metal smiths would make jewelry especially necklace charms in the form of sharks. The ancient Mayans would use sting ray spines and shark teeth in sacred rituals as well as create pictures and carvings of sharks and rays in and on the stone they would use to build temples. The fishermen of Central America would also perform ceremonies and pray to the fishing gods to watch over them and aid them in finding the food that they need to catch.

The Kuna people live off of the coast of Panama. The Kuna people believe that nature is connected to the spiritual world. For example, the sawfish, the shark’s cousin, is a protector of the Kuna people and therefore the Kuna do not kill them. There are stories of sawfish saving fishermen’s lives. In order
Activity 4 — Culture Shark

DIRECTIONS
Students will read stories of the cultural views of sharks/rays from various locations including the United States. As a group, they will then compare and contrast their specific location’s view with that of the U.S. by completing a Venn diagram as well as answering discussion questions.

STEP A
In your small group, please read the paragraphs below. Use the information to compare and contrast your location with the U.S..

AFRICA

Africa is the world’s second largest continent and is surrounded by the Mediterranean Sea, the Suez Canal, the Red Sea, the Indian Ocean and the Atlantic Ocean. There are many people who live on the coast in the continent of Africa. Many of these coastal people honor both shark and ray spirits.

Some of the communities will honor the sharks and rays by having festivals and holding rituals. During some of these events, dancers will wear masks of sharks and rays. For example in West Africa, the men of the Bidjogo community have initiation ceremonies that focus on a hammerhead-like shark. The young men of the community will dress up and try to behave like the shark so that they can gain their power and strength. They believe by doing this they become strong men. In Africa, there is an African king that also believes in the power and strength of the shark like the people of the Bidjogo community. The king is named Shark King in hopes that he would become powerful and strong. He desires these traits so that he could successfully fight off anyone that would try to conquer his people.

Another community called the Ijo, live in the Niger River Delta in Nigeria. The Ijo people believe in water spirits. In order to honor these water spirits, the Ijo people have masquerades, a large gathering with costumes and masks, in which they wear detailed shark headdresses. This is their way of celebrating the shark.

In some parts of Africa, a special ritual is performed by boat builders. When building a new boat, the builders would rub oil from hammerhead sharks' liver over the wood. They believe that this will ensure a safe trip and good weather.

There are many ways that sharks artifacts and parts are used in Africa. Specifically, in West Africa, harpoons are used in order to get shark parts. The Ashanti tribe from Ghana use shark skin as a way to protect and carry their metal swords.
Activity 4 — Culture Shark

DIRECTIONS
Students will read stories of the cultural views of sharks/rays from various locations including the United States. As a group, they will then compare and contrast their specific location’s view with that of the U.S. by completing a Venn diagram as well as answering discussion questions.

STEP A
In your small group, please read the paragraphs below. Use the information to compare and contrast your location with the U.S.

AUSTRALIA
Australia is surrounded by the Indian, Southern and Pacific Oceans. The aboriginal people of Australia believe that the shark and the ray are very special animals. For example, the Yolngu people of Northern Australia believe that sharks and rays took part in creating the Earth. In order to share these beliefs, the Yolngu people use art. They create special bark paintings. They use the bark from the eucalyptus tree and paint them in order to tell their stories and beliefs involving the sharks and the rays.

Although many do consider these animals sacred, many people of Australia believe that the ancestors gave them sharks and rays for food. They have ceremonies, create art, and sing in order to keep a good relationship with the animals and ancestors so that they can have plenty of and continue to use these animals for a food source. For example, they use the Australian instrument, the didjeeridu, in order to tell about shark’s movement in the water.

The Yolngu people also create totem pole sites that are sacred and a place to worship certain species. Many of the people believe that their original ancestor, called Mana, is a shark, specifically the bull shark. Therefore, many have totem poles and stories for and about the bull shark. The story of Mana starts with another clan's ancestor attacking him. After the attack, Mana is very angry and in a rage comes out of the water towards the land. Mana carves rivers in the land using his teeth. Some teeth fall out and it is said that they make the trees specifically the pandanus trees which have serrated edges just like Mana’s teeth. Therefore, Mana, a bull shark, is a major part of the creation story.

For the Torres Strait Islander people, sharks are well respected and represent law and order. A few of the Torres Strait Islander people have sharks on their totems as well just like the Yolngu people. For the Torres Strait Islander people, shark totems are represented in their dances. For example, each island group has a special dance of their own that they perform all over the area. With each dance, there is a different costume and a head dress. For example, to represent the hammerhead shark, they make a special hammerhead shark head dress. There are many different people of Australia but they all have something in common, their respect for the shark.
Activity 4 — Culture Shark

DIRECTIONS
Students will read stories of the cultural views of sharks/rays from various locations including the United States. As a group, they will then compare and contrast their specific location’s view with that of the U.S. by completing a Venn diagram as well as answering discussion questions.

STEP A
In your small group, please read the paragraphs below. Use the information to compare and contrast your location with the U.S..

EAST ASIA
East Asia consists of the People’s Republic of China, Taiwan, Japan, North Korea, South Korea and Mongolia. East Asia is surrounded by the Pacific Ocean, Sea of Japan, Yellow Sea, East China Sea, Philippine Sea and the South China Sea. Sharks and rays are viewed very differently across cultures. Some cultures honor and worship sharks and rays while others fear them. Some believe they were put on this Earth as a food resource while others think they are the spirit of their ancestors and would never decide to eat them for food. In many Asian countries, many believe that sharks are a resource to be used for as food or for making tools.

Japan is an island in East Asia located in the Pacific Ocean. In ancient times, Japanese warriors would put shark or ray skin on the handles of their swords. The tiny teeth called dermal denticles on the skin of these animals make the skin feel very rough. If wrapped around a sword handle, the handle would be easy to hold on to, therefore helping them keep their swords when fighting in battle. The Japanese are considered to be the first people to use this technique for their swords and therefore making their weapons very valuable. In addition to using the skin, the Japanese would use shark liver oil in order to help their plane engines work properly during World War II. Today, shark liver oil is thought to be a cure for many illnesses.

In Asia, sharks are considered a delicacy. For example, the Chinese culture considers sharks to be a very important part to certain traditional food dishes such as shark fin soup. Shark fin soup is considered to be one of the four most important dishes in Chinese culture. Shark fin soup is usually served in order to honor a guest or for celebrations. For example, shark fin soup is always served at a Chinese wedding. If the soup is not served, it will make the family look bad. In addition to being a soup for guests and celebrations, serving this soup or eating this soup means that you are of high class. Lastly, shark fin soup is believed to help heal the sick.

Although shark fin soup is very popular in many Asian cultures, the practices that are used in collecting the shark fins for the soup are putting our shark populations at risk. Many shark fins are obtained by a practice called shark fining. Fishermen will catch the shark, cut off their fins and then release the shark back into the water. Unfortunately, without the fins, the shark cannot swim and will eventually sink to the bottom and die. Places all over the world are taking a stand against how shark fins are collected. For example, to show their support of shark conservations, Disneyland in Hong Kong decided to stop selling shark fin soup for weddings in the park.
Activity 4 — Culture Shark

DIRECTIONS
Students will read stories of the cultural views of sharks/rays from various locations including the United States. As a group, they will then compare and contrast their specific location’s view with that of the U.S. by completing a Venn diagram as well as answering discussion questions.

STEP A
In your small group, please read the paragraphs below. Use the information to compare and contrast your location with the U.S..

UNITED STATES
The United States is located in North America, the third largest continent in the world. It is surrounded by the Atlantic Ocean, the Gulf of Mexico and the Pacific Ocean. The overall view on sharks in the West especially within the United States seems to be that of fear.

Unlike many other cultures, in North America sharks are usually negatively portrayed in the arts and are usually not considered gods as in some other cultures from around the world. Movies such as Jaws have a great impact on its viewers and have given sharks a bad name. The shark for many is a symbol of danger. I’m sure when we all think of sharks; the Jaws theme song comes to mind! For many people, the image of just a shark fin poking out of the water is a scary sight and represents bad things to come. This movie has made many people afraid of sharks and most of what they have seen is not even based on actual shark behavior facts. This fear of sharks most likely stems from the fact that many people are not properly informed when it comes to the animal. When people do not have the proper facts or do not have enough facts, people can become easily scared.

People can be scared of sharks for many different reasons, not simply just from the media. A great step to lessen the fear of sharks especially within the United States is to learn the facts. For example, did you know that you are more likely to get hurt from getting hit by lightening, getting a bee sting or having sand holes collapse around you at the beach than from a shark attack!? Although, most films and paintings do not show sharks in a positive way, recently, documentaries and films have been trying to change that fact. In these films, it seems that the shark’s role is reversed. For example, in the movie Shark Tale, Lenny the shark is a vegetarian. He is not a man eating monster but rather a gentle shark who just wants to make friends. Also with scientists really focusing more on shark research, the correct facts are being given, which is beginning to lessen people’s fear of sharks. Shark research can even benefit humans directly. For example at the National Aquarium, researchers are using blood from the Nurse shark to research ways to find and treat infectious diseases such as anthrax. This process does not hurt the shark. It is just like getting your blood drawn at the doctor’s office. From their research, they have found an antibody, protein that attacks germs, in the Nurse shark’s blood that can quickly bind to and show if anthrax is present. Researchers hope to one day develop a vaccine for this disease. Hopefully over time, sharks will gain more and more respect among the U.S..
Activity 4 — Culture Shark

DIRECTIONS

STEP B
In your small group, use the information from your readings to compare and contrast your location with the U.S.
Activity 4 — Culture Shark

DIRECTIONS

STEP C
Individually, use the information from your readings and the Venn diagram to answer the discussion questions below.

1. Name of your location.

2. What oceans or body of water surround your location? Look on a map.

3. How does your location’s culture view sharks/rays? Be specific. (i.e. Are they scared of sharks?, Do they worship them? Do they use parts of the shark as part of their way of life?)

4. How does the culture show their beliefs in sharks/rays? Be specific. (i.e. perform ceremonial dances etc.)

5. Compare/contrast your location’s view on sharks/rays with that of the U.S.?

6. Why do you think that the majority of the locations seem to have a different view of sharks/rays than in the U.S.?

7. Write one new fact about your location’s view on sharks/rays that you did not know from before?

8. What is your view on sharks/rays?

9. Many sharks are becoming or already are threatened. What can you do to help sharks?

10. What is your favorite type of shark or ray? Why? Draw a picture of your favorite shark or ray on the back of your paper!
Activity 4 — Culture Shark

Monterey Bay Aquarium
http://www.montereybayaquarium.org/efc/efc_smm/smm_gallery_pi.asp
http://www.montereybayaquarium.org/aa/aa_pressroom/content/media/mbaq-04-sharks%20basic%20kit.pdf

Demon Fish: travels though the hidden world of sharks
By: Juliet Eilperin

Shark: In peril in the sea
By: David Owen.
ISBN: 978-1-74175-032-4

Sharkpedia
By: Nancy Ellwood and Margaret Parrish

Face to Face with Sharks
By: David Doubilet and Jennifer Hayes
ISBN: 978-1-4263-0404-0

The Secret Life of Sharks: A leading marine biologist reveals the mysteries of shark behavior
By: A. Peter Klimley, Ph.D.

Eyewitness Shark
By: Miranda MacQuitty
ISBN: 978-0-7566-3778-1

The Shark: Splendid Savage of the Sea
By: Jacques-Yves Cousteau and Philippe Cousteau

Sharks: Fact and Fantasy
By: Judith L. Chovan and Sara E. Crump
ISBN: 0-93864-27-0

The Sharks
By: Robert F. Burgess
ISBN: 75-107669

The Life of Sharks
By: Paul Budker
ISBN: 0-231-08314-9

Sharks of Polynesia
By: R.H. Johnson
ISBN: 2-85700-221-1
Activity 4 — Culture Shark

AUSTRALIA

Marine Education Society of Australia:
The cultural significance of sharks and rays in Aboriginal societies across Australia’s top end
By: Matthew T. McDavitt

Adaptation of above for primary school age. By: Jacqueline Foster

U.S./ASIA/POLYNESIA

Shark Culture
http://www.sharktrust.org/content.asp?did=35983

HAWAII

The cultural aspects of sharks
By: Charles Maxwell Sr
http://www.pacfish.org/sharkcon/documents/maxwell.html

By: Keith Bradsher

U.S.

International Shark Attack File
http://www.flmnh.ufl.edu/fish/sharks/isaf/isaf.htm

Nurse Sharks: key to Anthrax Diagnosis, Treatment?
By: Bijal P. Trivedi