

Carousel of the Living Sea

Objective:

1. Students will understand how fish breathe and swim compared to humans.
2. Students will be able to use technology to understand specific marine animals in their natural habitat.
3. Students will demonstrate knowledge and compare various habitats.
4. Students will describe characteristics of specific marine animals.
5. Students will be able to analyze data and predict results.

Performance Objectives:

Grade 1: Strand 1: Concept 1 – PO 1 & 2

Strand 2: Concept 2 – PO 1-3; Concept 3 – PO 2;
Concept 4 – PO 1; Strand 4: Concept 1 – PO 2-3;
Concept 3 – PO 2

NGSS: 1-LS1-2-B; 1-LS3-1-A

Grade 2: Strand 1: Concept 1 – PO 1-2; Concept 3 –
PO 1-4; Strand 4: Concept 1 – PO 1; Concept 2 –
PO 2

NGSS: 2-LS2-1-A; 2-LS4-1-D

Grade 1 – 2

Key Vocabulary:

- Habitat
- Species
- Adapt
- Gills

Related Literature:

Life in the Ocean

Lucy Baker

*The Earth is Mostly
Ocean*

Allan Fowler

In the Sea

David Elliott

Background Information: Carousel of the Living Sea

Oceans cover about 70% of the surface of the Earth. Oceans are very deep and have marine animals and plants in them. Many people use the words “ocean” and “sea” to mean a large body of water. An ocean is much larger than a sea. You can find oceans and seas on a map of the world. Oceans and seas are filled with salt water. Many of the same type of marine animals and plants are located in both oceans and seas.

The ocean contains many different habitats. For example, a clown fish lives its life in and around a sea anemone found in a coral reef area. A shark lives in a different habitat within the same ocean. An example from land is a honey bee whose habitat includes a beehive, while a butterfly's habitat is nothing like a hive; however they can both live in Arizona.

Fish and other marine life have learned to co-exist in the salt water regions of the world. Marine animals that live in ocean and sea have specific traits that allow them to live in salty water. For example, fish have a rather stream-lined body with fins that allow them to move quickly through the water. Fish have gills for breathing underwater. Humans have lungs that allow them to breathe, and they cannot breathe underwater. Some marine animals, such as whales and dolphins, have lungs too, and they must come to the surface to breathe air before diving below the water again.

Some marine animals have **adapted** to life both in and out of the water. Fish live and breathe in the water. Fish are vertebrates, which mean they have a backbone. Fish have **gills**, fins, scales and are cold-blooded. They breathe with their gills and are protected by their scales. Fish need oxygen to live, and have gills that take in water and remove oxygen for the fish. The carbon dioxide that is left floats out of the fish and back into the water. Humans need oxygen to live just like fish. As humans breathe air in and out, the lungs remove oxygen from air and send carbon dioxide out through the air.

The fins on a fish move the fish along in the water. There are some fish that can glide across the surface of the water while others can swim to the deepest depths of the ocean. Fish can see well in the water, they can taste their food and fish can even hear. Fish like to eat other fish, fish eggs, mollusks, marine plants, algae, and a few other delicacies.

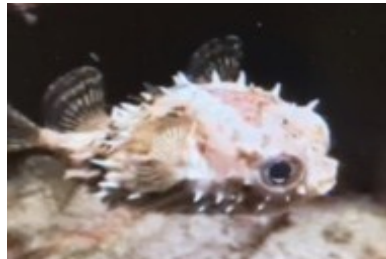
Even the body shape of the fish tells a story about how it lives. Fish with streamlined bodies are usually fast swimmers and capable of catching prey with great speed. Many tropical fish have a more flattened body as they do not require as much speed but need to fit into small crevices in rocks for protection.



The **puffer fish** is a type of ocean creature with very unique characteristics. There are several different **species** that can be found from the Pacific Ocean to the Red Sea. Puffer fish can range in size from about 4 feet long to only an inch long

depending on the type. While the puffer fish is a slow swimmer, it can use a burst of energy to try to escape danger. Puffers can even swim backward!

Puffer fish have tapered bodies with large stomachs. They also have pointed spines that help them look fierce. These fish can change their shape in an instant. If the puffer senses danger, it can gulp water into its large stomach and blow up like a floating balloon. Puffer fish have a toxin in their body that can be deadly to any predator that eats them.



Green Sea Turtles are found around the world in warm subtropical and tropical ocean waters. There are 7 species of sea turtles and the green sea turtle can grow 3-4 feet in length and up to 350 pounds. They are marine reptiles, which means they have scales, lay eggs, are cold-blooded (ectothermic) and breathe air. Even though sea turtles spend almost all of their lives at sea (except when females lay their eggs on land) they still need to come to the surface to breathe.



Females lay eggs on sandy beaches in nests on the same beach they were born. Eggs and sea turtle hatchlings face the biggest threats because they are so small and become prey for many animals. Every

species of sea turtle is threatened due to beach habitat loss, human development, getting caught as bycatch (on accident) and pollution.

The shell of a sea turtle is fused with their skeleton and backbone. The top of their shell is called a carapace and the bottom of their shell is called a pastron. The sections on their carapace are called scutes. Unlike other turtles or tortoises, sea turtles do not have the ability to pull their head into their shell for protection. Instead, they have smooth streamlined heads and flippers to help them move through the water gracefully, or for hydrodynamics. Their front flippers are their main source of power and movement through the water and their hind flippers assist with steering. Adult males have much longer larger tails than adult females. Their shell color varies from dark brown to a lighter yellowish brown so, they are not named after the color of their shell. They are named after the food they eat as an adult and the color of their insides! As juveniles, green sea turtles are omnivorous eating both seagrasses and small fish, but as adults, they are strictly

herbivores and eat seagrasses. They have a mouth called a beak with a serrated jaw to assist with eating seagrasses. The internal organs and fat of green sea turtles are green due to their adult diet. (<https://www.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Sea-Turtles/Green-Sea-Turtle.aspx>)

California sea lions can be found all up and down the Pacific coast, as far North as British Columbia and as far south as Mexico. The average lifespan of a California sea lion is approximately 15-25 years. Lifespan can exceed 30 years under human care because of the opportunity for consistent food supply and veterinary care, as well as the absence of predators, pollution, and habitat destruction. Adult California sea lion females weigh between 110-220lb on average; males weigh between 440-880lb when full grown. Sea lions typically cruise at speeds of around 12 miles per hour, but can reach bursting speeds around 20mph.

Females typically have the appearance of a flat head, whereas adult male sea lions have a raised forehead on the center of their skull, caused by a ridge of bone, called a sagittal crest. This can be about 1-2 inches high when fully developed. Sagittal crests tend to be present on the skulls of adult animals that rely on powerful biting and clenching of the teeth, such as carnivores. Male California sea lions can also 'flex' the muscles on top of this crest, causing the crest to rise, when posturing aggressively or defensively toward other male sea lions.



Male sealion displaying his Sagittal crest.

Sea lions can hold their breath for up to 20 minutes and can dive to depths of around 900ft, although they typically don't because their food source is in much more shallow waters. Sea lions are voluntary breathers, which means they consciously have to think about every breath they take. Their nostrils are naturally closed, but sea lions have specific muscles in their cheeks called myastacial muscles that flex to open their nostrils when they want to take a breath.

On the front of their face, or muzzle, they have whisker like appendages called vibrissae. They have 20-30 per side, or 40-60 total. They are made up of keratin, like our fingernails, but are highly sensitive to motion because they have nerve endings and muscle tissue in them. In dark, murky waters they use their vibrissae

to detect schools of fish and changes in currents. Vibrissae feel much like uncooked spaghetti!



Close up of vibrissae.

Sea lions use thermoregulation to help cool or warm their bodies. Their flippers are highly vascular, with lots of capillaries close to the surface of the skin, and can easily distribute warmth or cold to other parts of the body. When a sea lion is cold, it will float on the surface of the water and hold its flipper(s) up to absorb the sun's rays. This flipper will absorb the heat, which is circulated to the rest of the body. When a sea lion is too warm, the process is reversed as they lay on land and hold up their flipper(s) to absorb a cool breeze or dip their flippers in the cool waters, which helps to cool the blood and distribute it to the rest of the body.

Pacific harbor seals are found north of the equator in both the Atlantic and Pacific Oceans. In the northeast Pacific, they range from Alaska to Baja California, Mexico. They favor near-shore coastal waters and are often seen on rocky islands, sandy beaches, mudflats, bays, and estuaries. They are the most widely distributed species of pinniped (walruses, eared seals, and true seals). They are true or crawling seals, having no external ear flaps. True seals have small flippers and must move on land by flopping along on their bellies. An adult can attain a length of 6 ft. and a weigh 290 lb. Blubber under the seal's skin helps to maintain body temperature. Females outlive males (30–35 years versus 20–25 years).



Pacific harbor seals spend about half their time on land and half in water. They can dive to 1,500 feet for up to 40 minutes, although their average dive lasts three to seven minutes and is typically shallow, and they sometimes sleep in the water. They are opportunistic feeders, eating sole, flounder, sculpin, hake, cod, herring, octopus, and squid. While harbor seals swim safely in the surf, they will often curiously watch humans walking on beaches. However, they are wary of people while on land and will rush into the water if approached too closely or disturbed. In fact, if disturbed too often, they have been known to abandon favorite haul-out sites or their pups.

Both courtship and mating occur underwater. The mating system is not known, but thought to be polygamous. Females give birth once per year, with a gestation period of approximately nine months. Birthing of pups occurs annually on shore. The timing of the pupping season varies with location, occurring in February for populations in lower latitudes, and as late as July in the subarctic zone. The mothers are the sole providers of care, with lactation lasting four to six weeks.

SEA LIONS vs. SEALS

- California sea lions have external ear flaps, while seals have only small holes that are the opening of an internal ear. Sea lion ears are similar to our external earlobes, but folded tightly to protect from water entering the ear canal.
- Sea lions have long foreflippers to hold their weight, and can rotate their hind flippers to walk on land. Seals have short, stubby foreflippers and cannot walk on land, but instead undulate, much like an inchworm. Sea lions use their foreflippers to propel them through water, whereas seals use their hind flippers as their main power source.
- Sea lions have nails on the middle three digits of their hind flippers. Their foreflippers have no nails or hair. Seals have nails on both hind and foreflippers.
- Sea lion vocalizations sound like a bark or roar, which is how they got their name. Seals demonstrate sounds such as wheezes, wretches, and blows.

Additional Resources:

Pufferfish Inflating: <https://www.youtube.com/watch?v=rAGWO5i2C5M>

Green Sea Turtle Feeding on Jellyfish:

<https://www.youtube.com/watch?v=DmNOsOm0JiE>

Baby Turtles Entering the Ocean:

<https://www.youtube.com/watch?v=t1kFiehGh9s>

Sea Lions Barking: https://www.youtube.com/watch?v=ds6Qcrf_Gks

Seals vs Sealion Video: https://www.youtube.com/watch?v=wJ-F4n_XjTM

Sources: NOAA; National Geographic; World Wildlife Federation; National Aquarium; Encyclopedia of Earth; Florida Museum of Natural History; U.S. Department of Natural Resources. Photos: OdySea Aquarium and public domain.

Procedures and Activities:

1. State the learning objectives.
2. Read related literature and discuss the general topic. Discuss the ocean as a biome. Explain the concept of a habitat in the ocean. Use examples of the desert tortoise habitat and the penguin habitat.
3. Review the vocabulary words as they relate to the topic.
4. Compare how humans use lungs to breathe and fish use gills. Ask students to give other examples of animals with lungs and ones with gills.
5. Use technology for students to investigate their favorite ocean animal.
6. Use the microscope to compare size, texture, and details of sand, shells, or leaves.
7. Review the concept of comparing characteristics in marine animals and land animals.
8. Review the concept of varied habitats both on land and in the ocean.

Additional literature:

Star of the Sea: A Day in the Life of a Starfish, by Janet Holfman

What lives in a Shell? by Kathleen Weidner Zoehfeld

Life in the Ocean: The Story of an Oceanographer, by Sylvia Earle

Ocean Life from A to Z, by Cynthia Stierle



This fish indicates a “take along” activity.

Activity: Pre and post field trip activity. Before the field trip, ask them what they think they know about the oceans or ocean animals. Following the field trip,

ask students what they learned during the field trip. In small groups or as a class, discuss the students' responses.

Activity: **Pre or post field trip activity.** Using a map or globe, ask students to locate the Pacific and Atlantic Oceans. Students then locate Arizona on the map. Ask students what ocean is closer, the Pacific or Atlantic. Ask students to look for other bodies of water that are oceans and seas.

Activity: 'Label the Fish' can be used as a quiz or an activity.

Activity: Following discussions about ocean habitats, give students the ocean habitat handout. Ask students to think about their favorite marine animal and its habitat (polar bear, whale, seahorse, otter, penguin, and shark). Using technology, students investigate the animal and complete the habitat sheet. This activity can be done with a presentation at the end.

Activity: Give students the handout, 'If I Could Be a Fish.' Students can use their imagination and creativity to complete the activity.

Activity: 'Seals vs. Sea Lions' is an activity that challenges students to look beyond the basics of similarities. Using a Venn diagram, students can visualize characteristics that are shared by seals and sea lions.

Activity: The classification grid is a higher level thinking activity. Students make comparisons, analyze data, and create graphs. Predictions can be made regarding the compatibility of specific ocean animals.

Activity: 'On the Beach' is an activity that allows students to explore the variation in ocean materials, sea shells. This activity can be expanded to include math skills, use of a microscope, measurements, classification, analysis, and prediction.

Activity: 'Turtle Cookie' is where students can create a tasty treat.

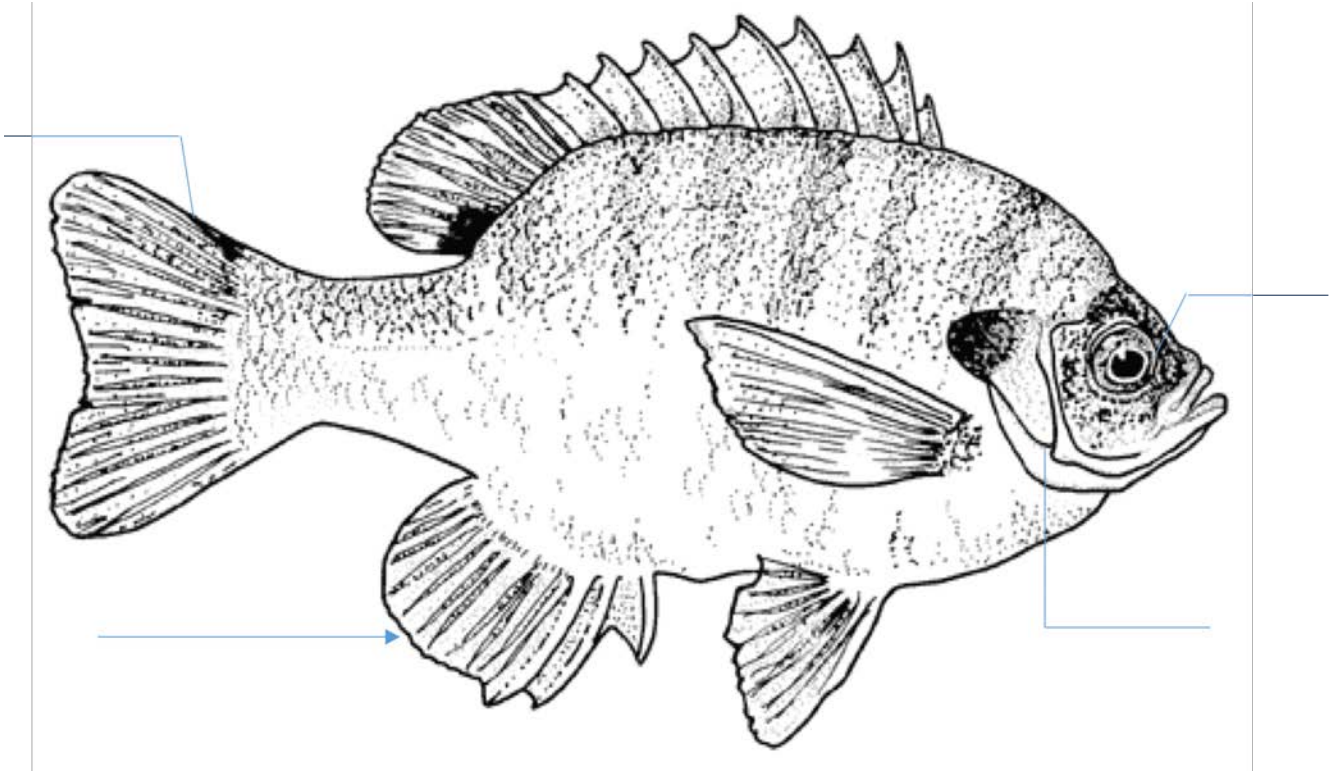


Activity: 'Scavenger Hunt' is a take-along sheet that students can complete on their visit to the aquarium.

Activities meet the STEM education guidelines involving problem solving, investigation, gathering data, analysis, using technology, application of math skills, integration of interdisciplinary instruction and inquiry.

Reflections and Assessments: Students may be evaluated on the basis of participation. Many activities are designed to be expanded for varied grade levels, prior learning and differentiated instruction. Activities may be done individually or in groups. Assessment will vary due to the level of difficulty in activities.

Label the Fish



Label each part on the fish and explain what they do:

Eye _____

Fins/Tail _____

Gills _____

Ocean Habitat

I am researching this habitat because:

Major animals and plants found in this habitat:

This ocean habitat can be described as:

The 3 main facts about this habitat:

Ocean Habitat Picture

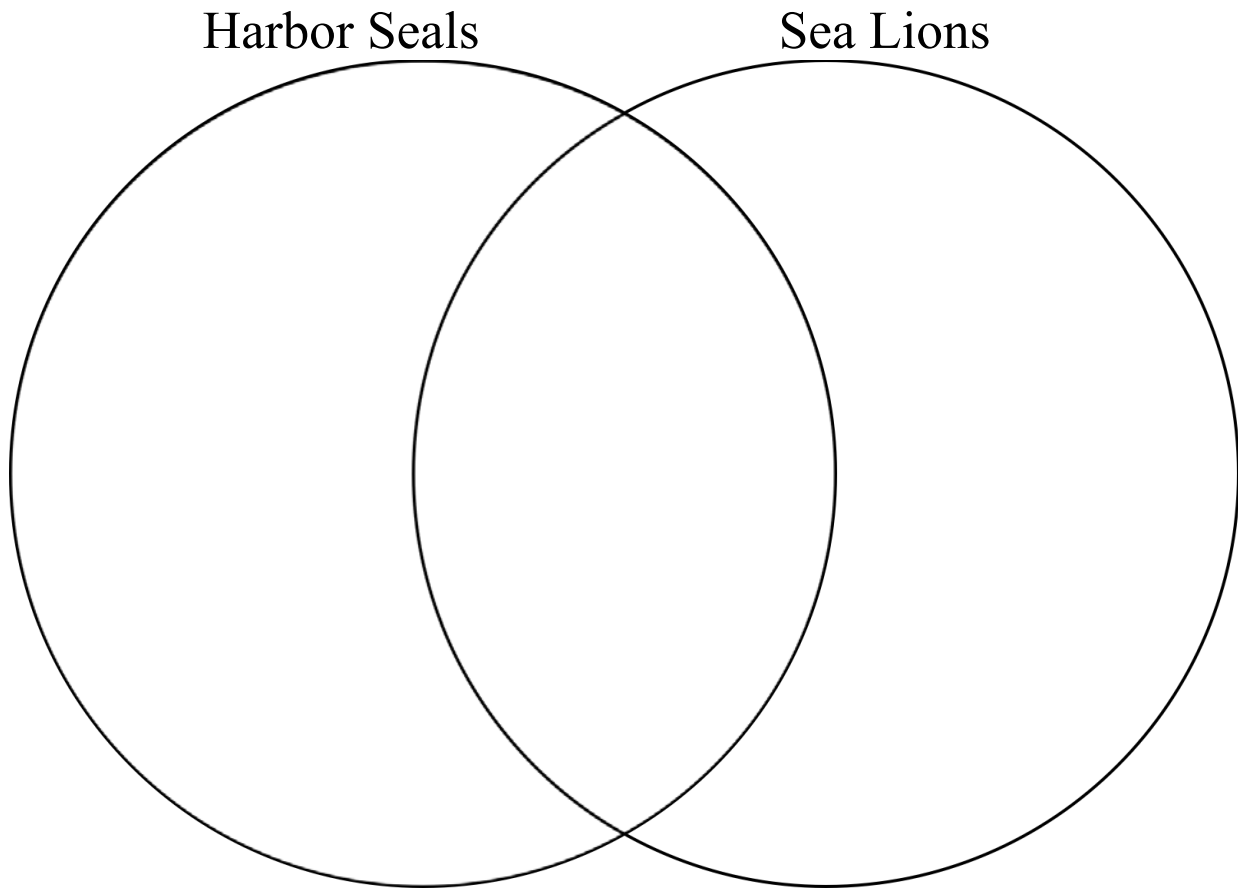
If I Could Be a Fish...



In the box, draw a picture of a fish you would like to be. Write the story below.

Seals vs. Sea Lions

Compare and contrast characteristics of Harbor Seals and California Sea Lions.



What can you conclude about the similarities and differences between harbor seals and sea lions?

Classifying Ocean Animals

Place an X in the box that matches with the animal's characteristics.

Ocean Animal	Fins	No Skeleton	Breathes Air	Swims	Lay Eggs	Flippers
Sea Urchin						
Fish						
Crab						
Sea Turtle						
Sea Anemone						
Sharks						
Jellyfish						
Sea Lion						

Total:

Tally up the total number of X's from each category.

Classifying Ocean Animals Key

Place an X in the box that matches with the animal's characteristics.

Ocean Animal	Fins	No Skeleton	Breathes Air	Swims	Lay Eggs	Flippers
Sea Urchin		✦				
Fish	✦			✦	✦	
Crab		✦			✦	
Sea Turtle			✦	✦	✦	✦
Sea Anemone		✦				
Sharks	✦			✦	✦	
Jellyfish				✦		
Sea Lion			✦	✦		✦

Total: II III II (5) III II

Tally up the total number of X's from each category.

On the Beach

Grade level: Pre K - 2

Objective: Students will learn about the size, shape, texture, and makeup of sea shells.

This activity meets the **STEM** education standards, and can be modified for various grade levels.

Students begin the activity in small groups. Each group receives a bag of assorted sea shells. Students look over the shells and assemble them by size, shape, texture, color and/or weight (if scales are available).

Ask students what generalizations can be made about the shells and why?

Explain the term ‘sample’ and that this is only a sample of the kinds of shells found in the ocean and on ocean shores. Students (Pre-K – K) select one shell, show it to the class and describe it (big, small, rough, smooth, etc.). Draw and color a picture of the shell.

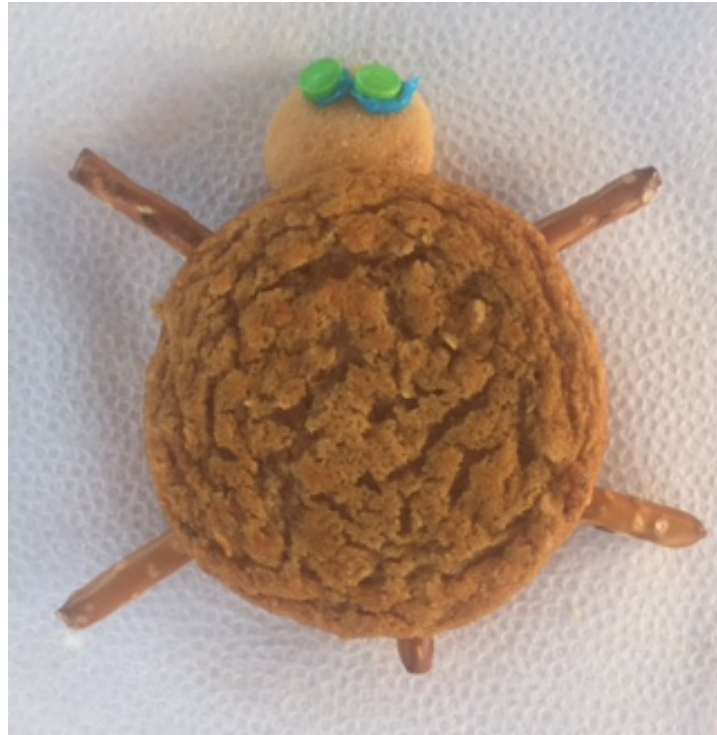
Grade 1-2: Students select one shell and write a description of the shell. Use rulers to determine the size of the shell. They may want to draw and color the picture of their shell.

Ask:

1. If we were creating a sea shell collection, where would we go to find the shells?
2. What information about the shells would we need to make the collection? (ex: location found, description and type of shell)
3. Explain what a sample means and how it relates to a sample of sea shells. Ask students how many shells they need for a ‘sample’ collection?
4. Is it possible for us to collect all of the shells in the ocean? Why?
5. What do these shells tell us about other shells in the ocean?

Materials: Bags of sea shells (craft store), paper, ruler, crayons.

Turtle Cookie



Snack Items: Pretzel sticks, Vanilla wafers, White frosting, Blue food coloring, Mini candy for eyes, Oatmeal (any flavor) cookies

Directions: Each turtle cookie has 4 ½ pretzel sticks, 2 oatmeal cookies, 2 candy eyes, one vanilla wafer, white frosting to hold the cookies together, and blue frosting to attach the eyes.

Spread white frosting on the bottom of both cookies. Place 4 pretzel legs and the half piece for the tail; place the vanilla wafer (head) in place and put the second cookie on top. Secure the cookies by pressing lightly. With a small amount of blue frosting, frost the candy eyes and put on the head. A tasty treat, for sure!



Scavenger Hunt

Locate these animals in the aquarium and answer the questions.



What Do Asian Small Clawed Otters eat?

What is my name?



What habitat are clownfish found?

What is my name?



Scavenger Hunt

Locate these animals in the aquarium and answer the questions.



What Do Asian Small Clawed Otters eat?

Fish, crabs, snails, frogs, lizards, birds and small mammals.

What is my name?

Scalloped Hammerhead



What habitat are clownfish found?

Coral reefs- sea anemones

What is my name?

Moon Jellies

