3RD-5TH

Teacher Resource Guide

Introduction

- Delve into these activities and games to prepare your students for an animal encounter and engage them with new ocean topics!

Contents

WAVE FOUNDATION AT NEWPORT AQUARIUM

Science Standards:

Kentucky Academic Standards (KAS)

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some less well, and cannot survive at all.

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Disciplinary Core Ideas

LS1.A: Structure and Function

LS1.D: Information Processing

LS4.D: Biodiversity and Humans

Science and Engineering Practices

Asking Questions and Defining Problems

Analyzing and interpreting Data

Developing and Using Models

Obtaining, Evaluating, and Communicating Information

Crosscutting Concepts

Patterns: Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products.

Systems and System Models: A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. A system can be described in terms of its components and their interactions.

NAAEE Guidelines

Strand 1A, Grades K-4: Questioning – Generate ideas and questions about objects, organisms, events, places, and relationships in the environment.

Strand 1E, Grades K-4: Organizing and analyzing information – Identify patterns and relationships in events, designs, organisms, and sets of numbers.

Strand 1F, Grades K-4: Working with models and simulations – Use models to summarize observations of the environment.

Strand 1G, Grades K-4: Drawing conclusions and developing explanations – Use models and examples to explain their thinking.

TIDE POOL SCHOOL

Goal: Understand how tide pool animals are perfectly equipped for life in the intertidal zone.

Useful vocabulary terms:

Abiotic: a non-living factor in the environment.

Biotic: a living factor in the environment.

Carnivore: an animal that solely relies on other animals for food.

Ecosystem: a biological community of organisms that interact with each other and their physical environment.

Herbivore: an animal that feeds on plants.

High tide: the state of the ocean tide when it is at its highest.

Low tide: the state of the ocean tide when it's at its lowest.

Observation: the act of looking or noting a fact or behavior.

Omnivore: an animal that eats both plants and meat.

Predator: an animal that eats another animal for food.

Prediction: a statement or guess about the future based on evidence or observation.

Prey: an animal that is eaten by another animal for food.

Scavenger: an animal that regularly consumes decaying animal flesh or plant matter.

Tide pool: a pocket of seawater that fills the intertidal zone at high tide and where water remains during low tide.

Activity #1

Tide Pool Partners

- Introduction to predator prey relationships.

Adapted from: Project WILD, Good Buddies activity

This activity reviews more than just tide pool partners! The idea is to start with predator prey relationships that may be more familiar with students, such as bear/fish or spider/house fly. As the list below progresses, the more complex the relationships become. That is because these animals have multiple prey/predator relationships within their environment. The *Teacher Fact Sheet* below will have the pairs and relationship descriptions. There are animals that are mentioned more than once and only have one picture card for this reason. This will allow the students to think more critically about these relationships and better understand how organisms are connected like a web and not just a chain.

Materials

- Tide pool partners picture cards (pages 9 and 10)
- Tide pool partner sheet (pages 7 and 8)

Activity Outline

1. Print out the tide pool partner picture cards and cut them out.
2. Have the students define and describe predator and prey.

   Prey: animals that are killed and eaten by another organism

   Predator: an animal that kills and eat another organism

3. For the first round, pass out the pairs at the top of the list as these relationships may be more familiar and direct. This activity works best in groups of 6-10 (must be even numbers).
4. Once all the students have their card, have them walk around and find who they think their predator or prey partner is.
5. After the students find their partner, ask them who is the predator and who is the prey. Have them give their thought process as to why they think this relationship exists.
6. Use the fact sheet to describe the predator prey relationships after they have shared their thoughts.

7. Pass out the next round of partner cards, which should be more ocean-oriented. Repeat steps 3-5.
8. For the last round, they should all be tide pool-oriented pairs (highlighted on the *Teacher Fact Sheet*). This round should be more complex, as many of these animals have multiple predators and prey items, not just the ones listed. Allow the students to think through these relationships while they find their partners. Remember, they may have more than 1.

Post-Activity Discussion

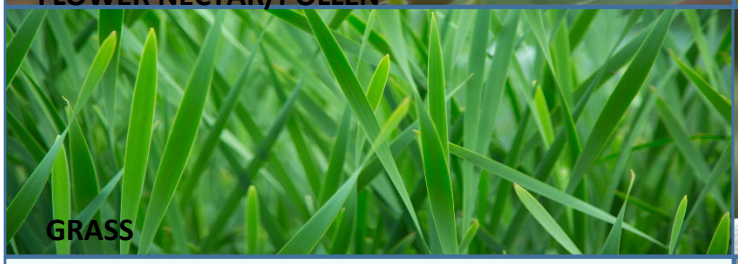
Ask the students if there were any relationships that they did not expect or surprised them. What other predator prey relationships may these organisms have and why? There are blank cards on the card sheet that can be used for students to make a few of their own pairs.

Organisms (prey/ predator)	Relationship comments
Flower pollen-nectar/bees	Bees are commonly known as great pollinators, spreading flower pollen as they go from plant to plant eating nectar and even pollen. Bees are considered omnivores, occasionally eating fruits and other animal carcasses. They mainly rely on pollen and nectar as a food source.
Grass/Grasshopper	Grass is a primary producer, making its own food using sunlight for photosynthesis. A grasshopper is a primary consumer that eats grass and other plants.
House fly/spider	A spider will spin its web and wait for an insect like a house fly, or other invertebrates, to fly/crawl their way into their sticky trap. Once the prey is trapped, the spider may bite to inject their venom into the prey to immobilize. They then wrap them in a cocoon like structure of more web.
Salmon/grizzly bear	Salmon typically hatch in fresh water then migrate to the ocean to live as sea fish until it's time to reproduce. They will travel upstream from Northern Pacific or Atlantic basins. Grizzly bears often hunt and rely on salmon in their diet as well as berries and other fish.
Sardines/African penguin	South African penguins live off the coast of South Africa on warm beaches where most of their diet consist of fish, especially sardines, which are abundant in South Africa unless overfished.
Sea jelly/leatherback sea turtle	Leatherback sea turtles are one of the 7 species of sea turtles and rely almost entirely on gelatinous foods likes jellyfish despite their great size. This also makes them vulnerable to plastic pollution, as items may be mistaken for a sea jelly snack.
Stingray/hammerhead shark	The hammerhead shark, along with many other sharks, have a sixth sense called electroreception that allows them to sense their prey before they see them. A hammerhead's sense allows them to detect a stingray hiding under the sand, pin them down with their long, flat heads, and eat them.
Krill/blue whale	Krill are a type of very small crustacean that are at the bottom of the food chain but are very abundant in the ocean. Blue whales are the largest animals on the planet and are a type of baleen whale, meaning that they filter feed by engulfing large tons of water and consume the small critters in it. Their diet is almost exclusively krill, but krill may also be eaten by seals, penguins, and other fish.
Plankton/barnacles	Barnacles are sessile crustaceans, meaning they do not move and cement themselves to hard surfaces like rocks. Their hard shells protect them from the current while they feed on plankton during high tide. Plankton are so small that they are unable to swim through the current, so they mainly float/drift.
Fighting conch (prey)/horse conch (predator)	Fighting conchs are a species of sea snails that are omnivorous scavengers. They eat both plants and meat that they find laying on the ocean floor. The horse conch, however, is a carnivorous snail that will eat other fish and conch species such as the fighting conch.
Horse conch/octopus	Although the horse conch is a carnivorous predator itself, it is not at the top of the food chain and will be preyed on by one of its predators, the octopus.
Sea urchin/sea otter	Sea urchins can be herbivores or omnivores feeding on algae and sometimes other tide pool animals. Despite their spines, sea otters are one of a sea urchin's main predators. They use their strong paw and rocks to crack open sea urchins.

Kelp/sea urchin	Kelp is brown macro algae that can grow in large groups that we call kelp forests. In a kelp forest, sea urchins can thrive off eating the kelp as a main food source.
Hermit crab/sea gull	Hermit crabs are often opportunistic omnivores that eat small fish, left-over food particles, and will munch on macro algae. Sea gulls have a wide range of animals in their diet, one of them being the hermit crab.


FLOWER NECTAR/POLLEN


BEE


GRASS


GRASSHOPPER


HOUSE FLY


SPIDER


SALMON


BEAR

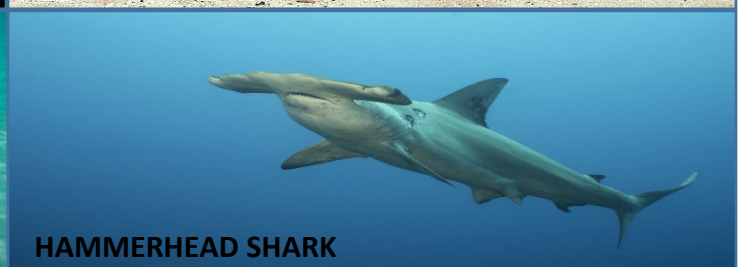

SARDINE


AFRICAN PENGUIN


SEA JELLY

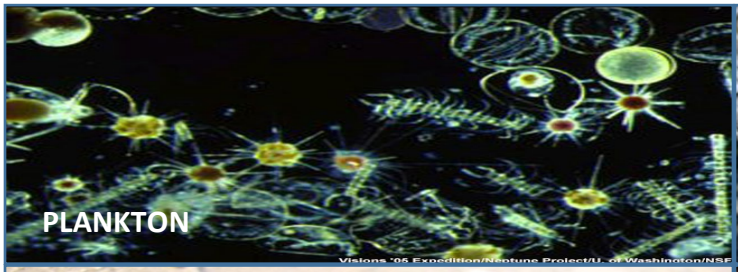

LEATHERBACK SEA TURTLE


STINGRAY


HAMMERHEAD SHARK


KRILL


BLUE WHALE


PLANKTON

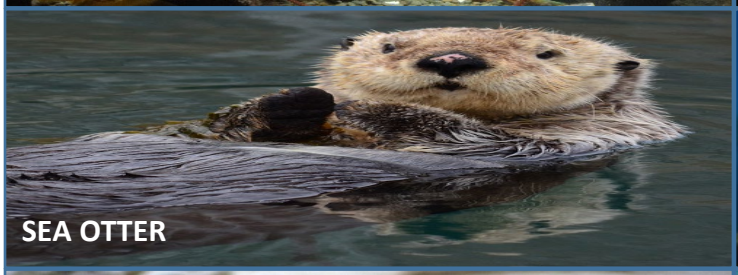

BARNACLES

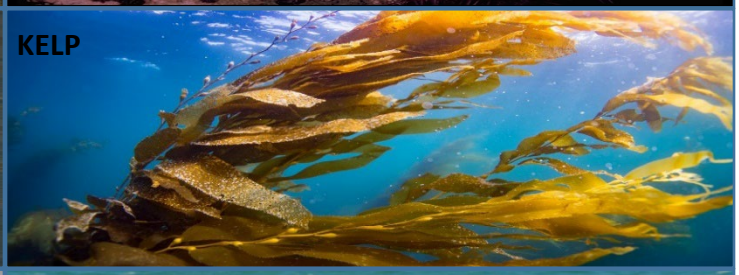

FIGHTING CONCH


HORSE CONCH


OCTOPUS


SEA URCHIN


SEA OTTER


KELP


HERMIT CRAB


SEA GULL

Activity #2

Ecosystem Factors

- Introduction to abiotic and biotic factors.
- Skills: determining factors in a tide pool ecosystem

Adapted from: Aquarium of the Pacific, Science Stars

This activity is help students understand what abiotic and biotic factors are, how to identify them in a tide pool ecosystem, and how these factors play a role in the ecosystem.

Materials

- Tide pool ecosystem sheet, one per student (page 12)
- Markers/crayons
- Dry erase board and marker OR something large to write on (projection screen, chalkboard, etc.)

Activity Outline

1. Ask the students if they have any previous understanding of abiotic and biotic factors. Once they have made their suggestions, write these two definitions on the board:

Abiotic: nonliving factors presented in an ecosystem

Biotic: living factors presented in an ecosystem

2. Explain that both factors play an important role and influence the health of the ecosystem.
3. Next, hand out the tide pool ecosystem sheets, one per student. Have them choose two different colored markers. One color will represent abiotic factors, while the other will represent biotic factors. Give them 15 minutes to color in their sheet, coloring what they believed to be abiotic or biotic factors with the associated color.
4. Give the students a chance to come up and write their answers under the definitions on the board.

Post-Activity Discussion

Why are abiotic factors important? Why are biotic factors important? How do they work together? After discussing why these factors are important, relate it to this specific ecosystem: how do abiotic and biotic factors work together in tide pools?

Tide Pool Ecosystem

Tide Pool Ecosystem Answer Sheet

Abiotic:

Water (ocean currents and waves), sunlight, sand, temperature, clear skies, rocks, clouds (precipitation)

Biotic:

Algae, sea urchins, kids exploring, crabs, fish, plants, anemones, bivalves, sea snails, sea star, seaweed, kelp, octopus

Why are these factors important?

Abiotic and biotic factors are important for shaping ecosystems. It is all living (biotic) and nonliving (biotic) factors that work together. Abiotic factors, such as temperature and salinity, help ecologist make predictions about ecosystem, survey and environment, and understand why changes are happening. When these factors can be investigated, ecologist can predict ecological events like species endangerment/extinction, overpopulation, growth rates, and more.

Activity #3

Pocket Pools

- Create your own tide pool out of recycled items!
- Skills: crafting

Adapted from: The Imagination Tree

Have an abundance of egg cartons laying around? This craft is a great way to not only mimic a tide pool ecosystem, but is a great conversation starter about reducing, reusing, and recycling!

Materials

- Recycled egg cartons, one per student
- Paint, particularly blue
- Paint brushes and paint jars
- Green felt, or any material to make sea grass
- Cardstock of various colors
- Scissors
- Markers/crayons/colored pencils
- Optional: miniature toy sea creatures (crabs, sea stars, fish, etc.)
- Miniature shells
- Glue
- Hot glue (teacher use only)
- Optional: blue glitter

Activity Outline

1. Hand out an egg carton to each student. They may need to be cut, as each student should have no less than four egg slots. These will be considered the tide pools. They may need to be cut into halves in order to have enough. (If possible, have students bring in egg cartons from their house. This is a great way to explain reusing recyclable items.)
2. It is necessary to paint the egg cartons before adding anything inside. Have the students paint their cartons blue, and wait for them to dry. Only a thin layer is necessary.
3. While waiting for the paint to dry, students can begin collecting their items for their tide pool and creating their sea grass out of felt. If miniature sea animals are provided, let them choose 2-4 animals. Otherwise, students can create their animals out of cardstock. Encourage them to think about the animals you would find in a tide pool. This can

include hermit crabs, fish, octopuses, horseshoe crabs, sea stars, sea urchins, sea snakes, and more.

4. Once the paint has dried, the students can begin adding in their items. If glitter is involved, add it before anything else. Next, add in the animals, sea grass, rocks, shells, and any other tide pool items. (NOTE: The miniature sea animals, rocks, and shells may need to be hot glued. Hot glue should be handled by teachers only.)
5. Explain to the students that each egg compartment is a tide pool. When the tide is high, each pool would be completely filled with water. When the tide is low, the pools may lose water as it retreats back to the ocean. Encourage them to think about this when placing their animals.
6. Remember, students are meant to make this their own, and each tide pool will be different. This reflects real tide pools. As the tide rises, new animals inhabit those tide pools. Once the tide lowers, those animals may return to sea. The next time the tide rises, a completely new set of animals will take over the tide pool.
7. Once each student has completed their tide pool, set them all up next to each other. Encourage students to write their name on the bottom first.

<u>Post-Activity Discussion</u>

Have the students walk around and look at each tide pool that their fellow students made. How are they all alike? How do they all differ? These can be kept in the classroom as a tide pool decoration, or students can take them home at the end of the day.

PENGUIN PALS

Goal: Discover where penguins are found and explore their biggest threats in the wild.

Useful vocabulary terms:

Adaptation: behavior characteristic or body structure produced over millions of years of evolution developed to increase survival and reproduction rates.

Camouflage: also known as cryptic coloration, a defense mechanism that animals use to disguise their appearance.

Countershading: a form of camouflage; the animal's dorsal side is dark and its underside is light. Countershading is found in alligators, penguins, sharks, and many other aquatic animals.

Crustacean: a mostly aquatic arthropod with a chitinous exoskeleton, such as crabs, lobsters, shrimp, or barnacles.

Endangered: a species that is at serious risk of extinction.

Habitat destruction: also known as habitat loss; the process by which natural habitats become incapable of supporting its native species.

Hatching: the process of the breaking of the egg shell in which the animal will exit the egg.

Human intervention: Changes to the environment, ecosystems, biodiversity, and natural resources which are indirectly/directly caused by humans.

Incubation: the process of keeping eggs warm and safe while the embryo develops until hatching occurs.

Monogamy: a mating system in which an animal will have a single partner throughout their reproductive season.

Oil spill: the escape of oil into the sea or other body of water.

Overfishing: the depletion of fish populations in a body of water due to an unnecessary and excessive amount of fishing.

Piscivore: a carnivorous animal that primarily feeds on fish.

Pollution: the introduction of a toxic substance into the environment that has harmful effects.

Predator: an animal that eats another animal for food.

Preening: a bird straightening or cleaning feathers with its beak.

Prey: an animal that is eaten by another animal for food.

Uropygial gland: also known as the preen gland, is an organ located on the back of the tail that secretes an oily substance. Penguins will spread the oil on their feathers to make themselves waterproof.

Activity #1

Oil Spill Kit

- How do oil spills negatively affect penguin species?
- Skills: cooperation, trial and error, using tools

Adapted from: Cynthia Cudaback, Ocean and You, www.oceanandyou.com

Pre-Activity Discussion

Whether your students have been learning about penguins in class or had a visit from WAVE Foundation with an African penguin, they are most likely aware of what the word endangered means, and how humans are negatively affect penguin populations. Before beginning the activity, ask a student to reiterate the definition of *endangered*. Endangered is when a species is at a high risk of extinction in the wild. African penguins, found in South Africa at the tip of Cape Town, are critically endangered. Can your students think of any reasons why African penguins are endangered? These reasons include overfishing, pollution, habitat destruction, human intervention, and more. However, one of the top causes for African penguin endangerment is oil spills. Oil is a fossil fuel that is used by humans for heat, electricity, and other necessities. An oil spill occurs when the oil is released into marine environments, usually coastal waters. Do your students have any idea how oil spills occur? Because oil is drilled and transported, oil spills are fairly common. Most spills are small, and are caused by refueling a ship. However, larger spills are detrimental, and are commonly caused by pipelines breaking, the sinking of oil tanker ships, or drilling operations. This oil tends to cause extreme harm to marine life, such as fish, turtles, birds, and more. The oil is toxic to consume. In addition, oil tends to stick. If oil sticks to the fur of a sea otter or the feathers of a penguin, they may be unable to properly swim or eat. So, how do we clean them? There are many different tactics to help remove oil from water. Many times, it is a process of trial and error and figuring out what works best. African penguins spend about 50% of their time in the water in the wild, hunting and swimming. These activities are nearly impossible when oil is accumulating in their ecosystem. The goal of this activity is to simulate an oil spill and try various tactics and "equipment" to help save marine animals, specificly African penguins, who are commonly affected by oil spills. Check out *Oil Spills* at *National Oceanic and Atmospheric Administration (noaa.gov)* for more information.

Materials

- Large aluminum pans, one per group
- Vegetable oil

- Cocoa powder
- Miniature plastic fish figurines (or any small plastic items to represent fish)
- Feathers (represents penguins)
- Pompoms (represents pompoms)
- String
- Aluminum foil
- Cotton balls (or paper towels)
- Pipets
- Spoons
- Containers for used items
- Optional: dish detergent

Teacher Prep

- Create the "oil" by mixing the vegetable oil and cocoa powder together to create a 2 oz oil spill.
- This is easier done in small groups rather than one large group. Set up separate tables for each group. It is recommended to have no more than five students to a group. Each table should get each item listed in the *Materials* section. Previous to the activity, fill each aluminum pan with water.

Activity Outline

1. Have the students begin setting up their oil spill. Explain that the pompoms represent mammals with fur, the feathers represent birds (penguins and other sea birds), and the small plastic items or small fish figurines represent fish. The students should place these items in the water.
2. Make sure a cleaning station at their table is set up (paper towels, container for used and dirty items, etc.)
3. Have the students examine the different items in their cleanup kit. Explain that some items are good for trapping oil, some are good at soaking up oil, and some items are good at moving oil. Talk with your students about how to best use these items. Remember, the items can be used together.
4. Have each group develop an oil spill response plan. This is something they can write out on a piece of paper. Remind the students that their job is to contain the oil and remove it. In addition, they should try and protect the animals.

5. Spill the oil into the water and have the students begin their cleanup plan. It is best to walk around and observe as each group begins working. By dropping a feather into each oil spill, remind that students that “birds don’t stay where you put them.”
6. Give the students 15 or so minutes to clean up their oil.

Post-Activity Discussion

After the cleanup, have each group explain what their cleanup plan was, and how it worked. Which items worked? Which items did not work? Which items were best at soaking up the oil, and which items helped move the oil and scoop it up? Did the dish soap help with cleaning the feathers or the pompoms?

Here are a few great follow-up educational videos about oil spills:

Impacts of Oil Spills- A Marine Conservation Documentary - YouTube

What Happens After An Oil Spill? - YouTube

Activity #2

Interactive Map

- Where do penguins live in the world?
- Skills: mapping, geography

Adapted from: Easy Make & Learn Projects: Penguins (Scholastic Teaching Resources)

Background

Penguins are birds found in the Southern Hemisphere. There are around 18 species and they all live south of the equator. Penguins are famous inhabitants of frigid Antarctica, but some penguins also live along the warm sandy shores of Peru and the Galapagos Islands as well as around the coasts of southern Africa, New Zealand, and Australia. Regardless of the air temperature, all penguins live near cool waters. Cooler waters are more nutrient-rich and support penguin food. Currents carry cold waters north from Africa, Australia, and New Zealand, where penguins hunt.

Gentoo, chinstrap, Adelie, emperor, macaroni, king, and rockhopper penguins live in the Antarctic region, which includes the surrounding ice sheet and nearby islands. But only emperor and Adelie penguins breed the frozen continent itself. It's a harsh environment, nearly completely covered in ice that never melts. In places the ice is more than a mile thick and winter temperatures reach -76 degrees Fahrenheit with winds of 125 miles per hour.

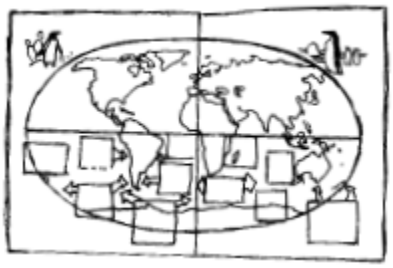
Materials

- Scissors
- Markers and crayons
- Lift & Look maps printed from pages 24, 25, and 26, one per student
- Optional: inflatable globe

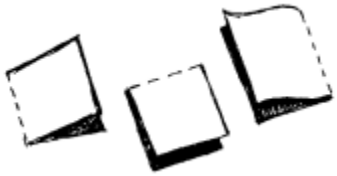
Activity Outline

1. Explain the background information to the students. When they think of penguins, what do they think of? What words come to mind? Write these up on the board for the students to see.
2. Hand out the pages to each student. Give them some time to color in the map and the penguins. Explain that this is a flip map that will help them discover where penguins live around the world.

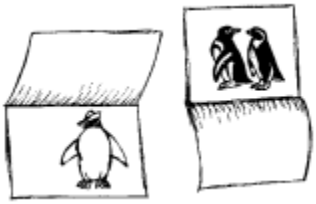
3. Hand out kid-friendly scissors to each camper. You may need to walk around and help them with this part.
4. Cut the right-hand border off page 24 along the outer solid lines. Tape the edge of page 13 along the solid black line on page 25. This is the map page.



5. Cut the penguin page (on page 26) in half along the solid black lines.
6. Cut open each of the 11 flaps on the map page along their three solid black lines. Do not cut along the dotted lines.



7. Place penguin page A on the left and page B on the right. Place the map pages on top of the penguin pages. Line up the penguins with the flaps and tape the pages together along the edges in a number of places.



<u>Post-Activity Discussion</u>

Use the inflatable globe for this part. Focus on Antarctica and its position relative to South America, Africa, Australia, and New Zealand. Point out the equator and explain that it is an imaginary line that divides the northern half of the earth from the southern half. Invite the students to read their mays and life the flaps. Ask questions to check their understanding of the map, such as:

- Do penguins live above the equator? (no) Which penguin lives the farthest north? (Galapagos)

- Which penguins live on or near New Zealand? (erect-crested, fiord-land, Snares Island, yellow-eyed, and royal) Which live off Africa? (African) On Australian islands? (little blue)
- Which penguins live on or near Antarctica? (emperor and Adelie penguins live near Antarctica; Gentoo, king, rockhopper, chinstrap, and macaroni penguins live around it) What is Antarctica like? (coly, icy, and barren)

Show the students where they live in the globe and invite them to point to their home on the map. Ask: Which penguin lives closest to you?

Where Do Pen

Galápagos

Arctic

North America

Atlantic Ocean

Pacific Ocean

Equator

South America

On islands near New Zealand

Near the equator and on the west coast of South America

On the east coast of South America

On islands off South America and Antarctica

On islands around Antarctica

On Antarctica and the islands around it

guins Live?

king

Ocean

Europe

Asia

Pacific Ocean

Africa

Equator

On islands off Africa

On Australian islands

Australia

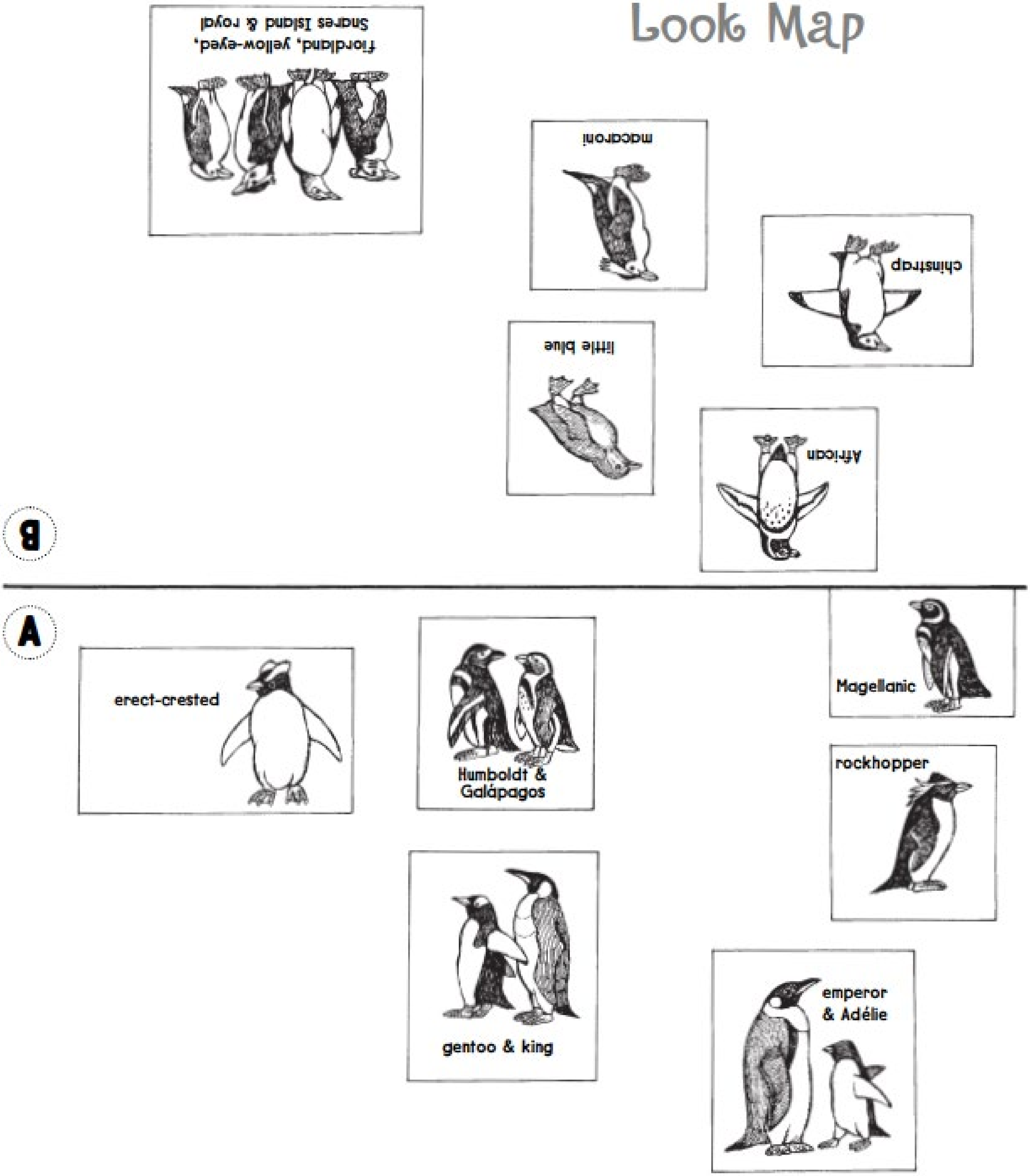
On islands around Antarctica

On Antarctica and islands around it

Antarctica

On New Zealand and islands near it

Penguin Lift & Look Map



Activity #3

Pledge to Penguins

- Make a pledge to protect penguins!

This activity is a great way to help students expand their penguin knowledge and have a mini research experience. Your students may have met an African penguin, but they are more than just one type! There are about 18 species of penguins. Have your students pick a penguin from the list and do research on this species guided by the questions below (page 29 and 30). Feel free to shorten the list and/or put students into groups and do the research on one penguin species together. At the end, the students can make a pledge to help protect penguins and their natural environment (page 31)!

1. King penguin – *Aptenodytes patagonicus*
2. Emperor penguin- *Aptenodytes forsteri*
3. Gentoo penguin- *Pygoscelis papau*
4. Adelie penguin- *Pygoscelis adeliae*
5. Chinstrap pemguin- *Pygoscelis antarcticus*
6. Southern Rockhopper- *Eudyptes chrysocome*
7. Northern Rockhopper- *Eudyptes moseleyi*
8. Fiordland penguin- *Eudyptes pachyrhynchus*
9. Snares Penguin- *Eudyptes robustus*
10. Erect-crested penguin- *Eudyptes sclateri*
11. Macaroni penguin – *Eudyptes chrysolophus*
12. Royal penguin- *Eudyptes schlegeli*
13. Yellow-eyed penguin- *Megadyptes antipodes*
14. Little penguin- *Eudyptula minor*
15. Humboldt penguin- *Spheniscus humboldti*
16. Magellanic penguin- *Spheniscus magellanicus*
17. Galapagos penguin- *Spheniscus mendiculus*

<u>Teacher Guide</u>

The answers to 1-6 may vary greatly per penguin species, but questions 7-8 will often have similar answers.

7. What threats do they face? List at least three (natural and human threats):

Most penguins face similar threats such as marine pollution (trash, plastic, oil spills etc.), climate change, natural disasters, overfishing, habitat destruction and more. The severity of these threats may vary per species, but these generally affect most species.

8. If humans have a negative impact on penguins, how can we lessen that impact or make a positive impact?

There are many ways to help conserve penguin species from home that are easy and affordable with small lifestyle changes: throw trash away, pick up trash that is safe to pick up, turn off lights that aren't being used, take shorter showers, recycle when possible, use reusable water bottles and bags, eat sustainable seafood, learn more, and spread awareness.

Penguin Research Guide

1. Penguin's common name: _____

2. Penguin's scientific name: _____

3. Where can these penguins be found? Where are they in the world?

_____
_____
_____

4. List three food items they eat:

_____
_____
_____
_____

5. List three predators of this penguin:

_____
_____
_____
_____

6. What is their conservation status?

_____
_____

7. What threats do they face? List at least three (natural and human threats):

_____
_____
_____
_____
_____

8. If humans have a negative impact on penguins, how can we lessen that impact or make a positive impact?

_____
_____
_____

_____

_____

9. Are there any conservation steps that you are already taking?

_____

_____

_____

There are more warm-weather penguins than cold!

Penguins have 2 pairs of eyelids!

Penguins have webbed feet!

My Penguin Pledge

I pledge to do my best to protect our penguins! I will treat my environment with respect because I know it affects the rest.

Name: _____

Thumb Print Here!

There are around 18 species of penguins!

A penguin's diet mostly consists of fish!

All penguins live in the Southern Hemisphere!

Penguins' wings are called flippers!

Penguins poop every 10-15 minutes!

AQUATIC

Includes: Shark Conservation and Stingray Studies

Goal: Discover the unique adaptations of sharks and rays and understand why sharks are considered apex predators.

Adaptation: behavior characteristic or body structure produced over millions of years of evolution developed to increase survival and reproduction rates.

Ampullae of Lorenzini: sensory receptors in the head of sharks and other cartilaginous fishes that detects electrical pulses in the water.

Apex predator: a predator at the top of the food chain, rarely preyed upon by other animals.

Buoyancy: the force that allows an object to float or ruse when submerged in a liquid.

Camouflage: also known as cryptic coloration, a defense mechanism that animals use to disguise their appearance.

Carnivore: an animal that solely relies on meat for food.

Cartilage: connective tissue forming the skeleton of sharks, rays, and skates.

Countershading: a form of camouflage; the animal's dorsal side is dark and its underside is light. Countershading is found in alligators, penguins, sharks, and many other aquatic animals.

Filter feeder: an aquatic animal that feeds on suspended nutrients in the water, such as plankton.

Herbivore: an animal that feeds on plants.

Hypothesis: a proposed explanation of a phenomenon.

Lateral line: a system of tactile sensory organs that is unique to aquatic vertebrates; detects movement and pressure changes in the water.

Omnivore: an animal that eats both plants and meat.

Predator: an organism that obtains food by the capture and killing of other organisms.

Prey: an animal that is hunted or killed by another for food.

Venomous: an animal that is capable of injecting venom by a bite or sting.

Activity #1

Fact or Fiction?

- Bust some myths about the top predators of the ocean.

Teacher Background

How well do your students know sharks? Test their knowledge with this fact or fiction activity. Read off each statement and have the students raise their hand for fact or fiction. If you are wanting to do an activity to get your students moving, have them stand in the middle of the gym or playground. Put a red cone on one side and a green on the other. If the students think the statement is a fact, they should run to the green cone. If they think the statement is fiction, they should run to the red cone. This can be tallied on the board, or the students can keep track of their own answers. At the end, go over the answers with your students and read the descriptions. See how well they know sharks!

Shark: Fact or Fiction?

1. All sharks attack humans.
2. Sharks are not attracted to human blood.
3. If you go swimming, you have a high chance of being attacked by a shark.
4. Sharks eat continuously and are always on the lookout for something to eat.
5. Sharks can be found in freshwater/brackish water.
6. *All* sharks must swim constantly in order to stay alive.
7. Sharks must roll on their side to bite.
8. Sharks have good eyesight.
9. Whale sharks, the largest of all living sharks, are vicious killers.
10. Not all sharks can swim fast.
11. Sharks are fish.
12. Sharks have tiny brains and are incapable of learning.
13. All sharks are the same; if you've seen one, you've seen them all.
14. Sharks have no value to humans, so we shouldn't worry about protecting them.

Shark: Fact or Fiction?

ANSWER KEY

1. All sharks attack humans.

FICTION: They are over 500 species of sharks, and only around 30 species have been known to attack humans. Only a few species have repeatedly attacked humans. Sharks typically only attack if they feel threatened, or if it's a case of mistaken identity.

2. Sharks are not attracted to human blood.

FACT: Humans are not on their menu. Human blood contains a lot of iron which tastes bad to a shark. Sharks prefer prey items such as fish, turtles, and more.

3. If you go swimming, you have a high chance of being attacked by a shark.

FICTION: There are less than 65 reported shark attacks each year globally.

4. Sharks eat continuously and are always on the lookout for something to eat.

FICTION: Sharks eat periodically depending upon their metabolisms and the availability of food. For example, the shark rays here at Newport Aquarium eat only about 1% of their body weight and are only fed once a week.

5. Sharks can be found in freshwater/brackish water.

FACT: Some shark species have an *osmoregulatory* system that allows them to cope with drastic salinity changes and handle freshwater rivers *and* ocean waters. The bull shark is most commonly known for making their way into estuaries and rivers to give birth.

6. *All* sharks must swim constantly in order to stay alive.

FICTION: While it is true that most sharks need to swim constantly in order to breathe, some species, such as the coral cat shark, are capable of pumping water over their gills while resting on the ocean floor.

7. Sharks must roll on their side to bite.

FICTION: Sharks attack their prey in whichever way is most convenient. They have a muscle that lifts their nose up and out of the way so they can protrude their jaws and bite prey items in front of their snouts.

8. Sharks have good eyesight.

FACT: The lens of a shark eye is seven times more powerful than that of a human eye and can even distinguish contrasting colors.

9. Whale sharks, the largest of all living sharks, are vicious killers.

FICTION: Despite their size, whale sharks are not a threat to humans. They are filter feeders, and only feed on small plankton. They are truly gentle giants!

10. Not all sharks can swim fast.

FACT: Although some sharks may swim at bursts of over 23 miles per hour, most sharks swim very slowly at cruising speeds of less than 5 miles per hour. Mako Sharks are the fastest swimming sharks and are believed to be able to reach speeds near 45 miles per hour.

11. Sharks are fish.

FACT: Sharks are a type of fish and do not possess mammary glands for nourishing their offspring like mammals do. They are cold-blooded (for the most part) and have scales that cover their entire body.

12. Sharks have tiny brains and are incapable of learning.

FICTION: Sharks have relatively large and complex brains which are comparable in size to those of supposedly more advanced animals like mammals and birds. In fact, research indicates that sharks can be trained.

13. All sharks are the same; if you've seen one, you've seen them all.

FICTION: There is no such thing as a "typical" shark. Of the more than 500 species, every single one differs in habitat, physical appearance, and lifestyle.

14. Sharks have no value to humans, so we shouldn't worry about protecting them.

FICTION: Sharks play an important role in our world-wide ecosystem. As top predators in the food chain, they feed on the weak or injured which helps keep our oceans clean and the gene pool strong.

Activity #2

Know, Wonder, Learn

- Form of assessment

Teacher Information

There are many different ways to assess if your students have achieved the goals that were set for a lesson or activity. Listed below are the various types of assessments:

Diagnostic: to identify preconceptions, lines of reasoning, and learner difficulties

Formative: to inform instruction and provide feedback to students on their learning (usually an ongoing assessment).

Summative: to measure and document the extent to which students have achieved a learning target.

Listed below are a few examples of post-activity assessments:

- Four Corners
- Think/Ink/Share
- Fist to Five
- Write for One Minute

What is a KWL Chart?

A KWL chart is a method of assessment to understand how well students are grasping the information they are learning. The goal is to gain an idea of the information retained by the learners and give the educator feedback on the lessons to make any necessary changes for the future. KWL charts are both formative and summative assessments.

In KWL, the **K** stands for *know*, the **W** stands for *wonder*, and the **L** stands for *learn*. On the first day of a unit or lesson, ask the students what they already know. This could be anything related to the lesson or what they will be learning about throughout the unit. This is to assess where the students are at, and will help the educator with talking points throughout the unit. Next, ask the students what they are wondering. These “I wonder” questions can be as complex as, “Which animals are affected the most by climate change?” to as simple as, “What is the smallest species of penguin?” Throughout the unit, try to see if all the wonder questions

can be answered! If a student says they learned an answer to one of the “wonder” questions, write it under the learn section. The learn section is an accumulation of what they have learned during the week, whether it was from an activity or it answers a “wonder” question. This assessment also works well for during and after WAVE Foundation comes to your classroom for an outreach program. If we are bringing a penguin to your classroom, begin the KWL chart before our arrival. After your students learn all about penguins, complete the chart post-program!

Activity #3

Shark Teeth

- How do the different types of shark teeth determine what they eat?

Did you know there are over 500 species of sharks? All sharks eat a variety of different things based on the type of teeth they have. Let's explore why sharks have different types of teeth!

Materials

- Large bowls of water (1 per group)
- Toothbrushes (1 per group)
- Tweezers (1 per group)
- Pliers, safe for kids (1 per group)
- Pepper
- Gummy candy (fish-shaped if possible)
- Skittles

Procedure

1. Split the students into small groups. It will be easier to do this experiment with no more than four at one station. Make sure that each group has all of the above supplies.
2. Fill the bowls with water and sprinkle the pepper, gummies, and skittles inside.
3. Now, use the "tools" provided to try and get the food out. Ask the students which tool works best with each food. They can write this down on a piece of paper, or a teacher can write out the findings on the board. Can one tool pick up more than one type of food?

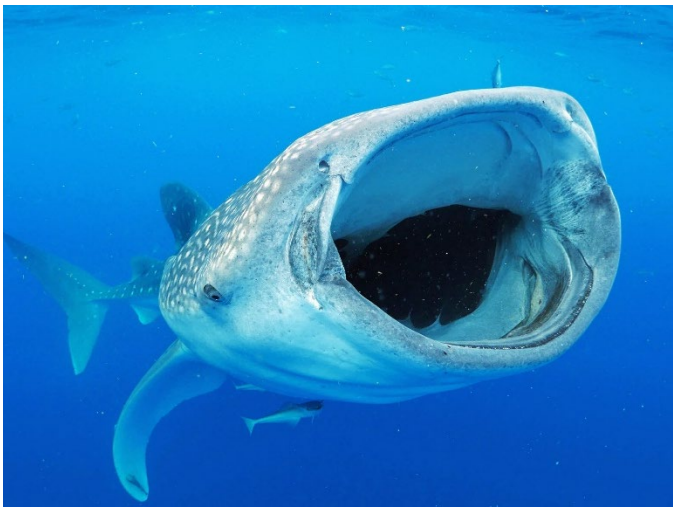
Post-Activity Discussion

Sharks have different types of teeth to each different types of food – just like we used different utensils for different types of food. For example, would you use a fork to eat soup?

- The largest shark species, such as whale sharks and basking sharks, eat some of the smallest foods such as plankton. They have gill rakers that act like the toothbrush to filter through the water and pick up these small animals (pepper).
- Many sharks like hammerheads, sand tigers, and great whites have pointy teeth just like the tweezer. Pointy teeth are useful in grabbing food, but not so good with chewing. These sharks swallow their food whole.

- Some sharks, like the nurse shark and Port Jackson shark, have small flat teeth meant for crushing crabs or lobsters. Your pliers can crush the skittles just like a nurse shark can crush his or her crustaceous meal.

No matter what type of teeth a shark has, they always have enough! A shark never needs to go to the dentist because his or her teeth will fall out and are replaced by the ones behind. A shark's mouth is like an escalator with teeth growing in the back and continually moving forward. One lemon shark can lose up to 30,000 teeth in a lifetime!



The mouth of a whale shark

Hundreds of tiny whale shark teeth

The mouth of a white shark

The mouth of a nurse shark

Nurse shark tooth

Activity #4

How Well Can Sharks Smell?

Sharks have very strong senses – one of those being their sense of smell! This is what makes them such great predators. They use their smell to sense their prey and to navigate through the water column. In fact, they have TWO more senses that humans don't have in order to survive and thrive. During this experiment, students will be exploring just how great a shark's sense of smell is.

Materials

- 5 cups (same size)
- Lemon juice
- Water
- 1 mL pipet

Procedure

1. Talk to students about shark senses. Can they name all 7? (touch, sight, smell, hearing, taste, electroreception, spatial awareness with lateral line)
2. If they did not get the last two, use these explanations to help them understand.

Electroreception: Sharks are able to detect electrical currents. This means that they can detect any muscle movement or twitches in fish and other animals. The salt found in salt water contains sodium and chlorine ions, and the ions have an electrical charge. Because the ions separate and move freely, which transports electricity. Sharks have pores on their snout called Ampullae of Lorenzini, which is filled with an electrically conductive jelly. The electrical pulses pass through the jelly and travel to the brain.

Lateral line: The lateral line is a sensory organ along the side of a shark. The Ampullae of Lorenzini runs all the way across the line to the tail. Sharks can therefore sense their own body movements and create waves that bounce off of reefs and other obstacles. This creates a pressure map.

3. Each cup will get water and lemon juice with various dilutions for each cup. When adding each portion into the cups, explain to the campers what you are doing, and even

have a few of them come up and help. This can be related to chemistry and creating solutions. Record each mixture on the board so the students can see what is in each cup. This will be useful for observations.

4. Fill one of the cups with 10 mL of lemon juice. This will be Cup 1 (write this on the cup).
5. Label the others: Cup 2, 3, 4, and 5. Add 9 mL to each.
6. Follow this procedure for the other 4 cups:
   Cup 1 – 100% lemon juice
   Cup 2 – 10% lemon juice (add 1 mL of lemon juice to Cup 2 and stir)
   Cup 3 – 1% lemon juice (take 1 mL from Cup 2 and add it to Cup 3, stir)
   Cup 4 – 0.1% lemon juice (take 1 mL from Cup 3 and add it to Cup 4, stir)
   Cup 5 – 0.01% lemon juice (take 1 mL from Cup 4 and add it to Cup 5, stir)

Write each number on the cup, but then cover the numbers and mix up the cups so the students do not know which is which.

7. Have the students start with Cup 5. Ask them to smell the contents of the cup. They can either smell directly or "waft"; let them know this is something that chemists do so they are not directly smelling dangerous chemicals. Have students make observations of each cup. Challenge them to see if they can put the 5 cups in order based off of the smell. This is hard to do! Give them 10 minutes or so to continue smelling, making observations (teacher writing these on the board), and more.
8. Once students are content with their order, reveal the numbers. Did they guess correctly?

<u>Post-Activity Discussion</u>

Guess what? Sharks are able to smell all 5 concentrations- even the cup with 0.01% lemon juice! In fact, sharks would be able to smell *one* drop of lemon juice in an entire swimming pool. Ask the students:

- How does this make sharks the ultimate predator?
- Does this have anything to do with why sharks are so important to our ocean?

After the students have a chance to answer these questions, explains that these two extra senses allow sharks to determine when a fish is sick or injured. Contrary to popular belief, sharks are fairly lazy, and prefer not to work too hard for their food. By eating those sick and injured fish, they are keeping fish populations healthy.

REPTILE ROUNDUP

Goal: Learn how to identify reptiles and understand their behavior.

Useful vocabulary terms:

Endangered: a species that is at serious risk of extinction.

Ethogram: a list of behavior that are specific to a species used to understand the better.

Camouflage: also known as cryptic coloration, a defense mechanism that animals use to disguise their appearance.

Carnivore: an animal that feeds on flesh.

Countershading: a form of camouflage; the animal's dorsal side is dark and its underside is light. Countershading is found in many reptiles, as well as sharks, penguins, and other aquatic animals. The colors are meant to counter the shade of the water.

Ectothermic: also known as cold-blooded, an animal that relies on its external environment for body heat.

Endothermic: also known as warm-blooded, an animal that is dependent on the internal generation of heat.

Herbivore: an animal that feeds on plants.

Omnivore: a person or animal that eats both plants and meat.

Plastron: the bottom of a turtle's shell structure.

Predator: an organism that obtains food by the capture and killing of other organisms.

Prey: an animal that is hunted and killed by another for food.

Reptile: air-breathing vertebrates covered in special skin made up of scales, bony plates, or a combination of both. Reptiles include turtles, snakes, crocodilians, and lizards. They are cold-blooded and lay eggs.

Semiaquatic: an animal living partly on land and partly in water.

Terrestrial: of or relating to the earth and its inhabitants.

Tortoises: a type of turtle, typically an herbivore that is found on land.

Activity #1

Let's Talk Reptiles

- Get to know our scaled friends a little bit better!

The goal of this activity is to facilitate a conversation with your students about all things reptiles. The questions provided are a great way to get students thinking about why reptiles are important, and what reptiles mean to them. Sit in a circle with your students and read each question off one by one. Have the students raise their hand if they have a question, comment, or remark. Alternatively, print out pages 46-48 and give the students 15 or so minutes to jot down their responses to each question. Therefore, when it comes time to talk about the questions, they have their responses ready to go.

Reptile Conversation Starters

1. Describe reptiles in one or two sentences.

2. Do you like reptiles? Are you afraid of reptiles?

3. Can you name the four basic groups of reptiles?

4. Which reptiles live around you? Which reptiles do you see when you go outside?

5. Do you think reptiles have emotions?

6. Would you like to have a reptile as a pet? If so, which reptile would you choose? What would you feed it?

7. What materials and supplies would you need to take care of a reptile?

8. Have you ever heard of a Komodo dragon?

9. If you saw a crocodile or alligator in person, how close would you get?

10. Have you ever touched a snake? What are your thoughts about snakes?

11. Why do you think reptiles like to sit on rocks?

12. What does endangered mean, and can you think of any endangered reptiles? Why might they be endangered?

13. What can humans do in order to protect reptiles?

14. How do you think reptiles communicate with each other? Do you think reptiles try to communicate with humans?

15. What do you think is the most dangerous reptile in the world?

16. How can reptiles be helpful to humans?

Teacher Input

As your students discuss these questions, here are some pointers you can add to keep the conversation glowing.

1. Describe reptiles in one or two sentences.

Vertebrates, air-breathing, have scales, lay eggs, cold-blooded, dry and thick skin, found all over the world

2. Do you like reptiles? Are you afraid of reptiles?

Remind your students to be honest with this question. Often times we are scared of reptiles because we don't know much about them. This activity is meant to spark interest!

3. Can you name the four basic groups of reptiles?

The four groups of reptiles include crocodilians, turtles, lizards, and snakes. Crocodilians include alligators, crocodiles, gharials, and caimans. Turtles include tortoises, terrapins, and other types of turtles such as sea turtles and snapping turtles. There are around 3,000 species of snakes. There are more than 5,000 species of lizards, including legless lizards which resemble a snake but are in fact, lizards!

4. Which reptiles live around you? Which reptiles do you see when you go outside?

Different types of lizards, snakes, and turtles can be found in every state of the US. They often range is size, and each species can be specific to each state. For example, you are only going to find American alligators in the southeastern United States, however box turtles can be found in multiple different states, especially in the eastern United States! Let students talk about what they have seen, and possibly what they have not seen. Why might you not find an iguana in Ohio? Does environment affect where certain reptiles are found?

5. Do you think reptiles have emotions?

Reptiles do in fact have emotions. While they are not as in depth as human emotions, they can feel fear, pleasure, aggression, etc. They are intelligent creatures. Reptiles often experience "fight or flight." If a reptile feels as though it is in a dangerous situation, they will often make a quick decision on whether it is better to run away or to fight back.

6. Would you like to have a reptile as a pet? If so, which reptile would you choose? What would you feed it?

This is a discussion point to let students talk about which reptiles they would feel safe around and enjoy having as a pet. Some reptiles are carnivores, some are omnivores, and some are

even herbivores. Talk about what these words mean and why reptiles are different in this way. Do all reptiles have teeth? Are some stronger than others? What are different ways reptiles catch their prey?

7. What materials and supplies would you need to take care of a reptile?

Proper sized cage, heat lamp (talk about warm-blooded vs. cold-blooded), humidity levels (correct temperature), correct food, enrichment, and more. Reptiles are high maintenance and require a lot of education and work as pets. It is best to do a good amount of research before even considered a reptile as a pet.

8. Have you ever heard of a Komodo dragon?

A Komodo dragon is the largest species of lizard on Earth. They can get up to 10 feet long. They are commonly found in Indonesia. They eat birds, large and small mammals, and other reptiles.

9. If you saw a crocodile or alligator in person, how close would you get?

This is a great time to talk about preservation of wildlife. If you see a wild animal outside, the best thing to do it *leave it alone*. This is safe not only for you, but for the animal. It is possible to appreciate the beauty of wildlife while simultaneously caring for it and letting it be. In addition, crocodiles are quiet aggressive and territorial, as for many types of lizards. Another reason to leave them alone and keep a safe distance!

10. Have you ever touched a snake? What are your thoughts about snakes?

Snakes are one of the most misunderstood animals on Earth. Their appearance, physical ability, and high energy often instill fear in people. Snakes have historically been painted as evil, which is far from the truth. The more people learn about them, the more they grow to understand that, for the most part, they mean no harm. In fact, snakes usually only bite if they feel threatened, are scared, or feel as though they need to defend themselves. This is a great time to talk about preservation of species. Many snakes are killed because of this misunderstanding and misdirected fear, and there are species that are endangered and close to extinction because of it. Snakes are very important to various ecosystems.

11. Why do you think reptiles like to sit on rocks?

Rocks have the ability to retain warmth from the sun. Because reptiles are cold-blooded, they rely on external heat to keep themselves warm. This is known as “basking”, and is another reason it is crucial to have a heat lamp if you ever decide to own a reptile as a pet.

12. What does endangered mean, and can you think of any endangered reptiles? Why might they be endangered?

Endangered means a species is seriously at risk of extinction. Some endangered reptiles include sea turtles, Cuban Crocodile, Chinese Alligator, Green Iguana, and more. Their main threats include water pollution, habitat loss, hunting and fishing, and aquaculture/agriculture.

13. What can humans do in order to protect reptiles?

To help protect lizards, we can recycle, avoid littering, help pick up trash, attend river sweeps, leave wildlife alone, educate yourself and others, donate if you are in the position to do so, volunteer, reduce environmental impact, consume responsibly, read, etc.

14. How do you think reptiles communicate with each other? Do you think reptiles try to communicate with humans?

As solitary creatures, turtles don't do much to communicate with each other. To attract a mate, however, they will bob their heads up and down, bite each other's legs, or use different leg motions. Head bobbing is the main way that lizards communicate. Sometimes they push up their front legs to make themselves look larger. In addition, they wave their tail, open their jaws wide, change colors, or stick out their dewlaps. Snakes communicate with vibrations and with their sense of smell. Interestingly enough, alligators communicate by slapping the water! Baby alligators make a "chirping" sound, which is their way of calling for their mom.

15. What do you think is the most dangerous reptile in the world?

There are many species of reptiles that are venomous and/or poisonous. The Inland Taipan is the most venomous snake in the world. In addition to venom, reptiles can be extremely strong. Saltwater crocodiles, alligators, and alligator snapping turtles has some of the strongest bite forces in the world.

16. How can reptiles be helpful to humans?

- Many reptiles are carnivores and omnivores, and eat animals that are "undesirable." Farmers welcome reptiles and amphibians for their natural desire to eat insects that destroy crops. In addition, reptiles eat invasive plants, keeping our plant population healthy.
- In some developing countries, reptile is the main source of protein. Some are even important in the medical world.
- Snake venom has been used to create vaccines and medicines.
- Reptiles are very useful in research. Because they are so sensitive to temperature changes, scientists have been able to use reptile populations to detect a change in temperature in many regions. Reptiles can live in both water and land, so they can be used to detect slight temperature change on both land and in wetlands.

- As reptiles move around plants, they help collect and transfer pollen! Just like insects, reptiles are natural pollinators. Some species of plants rely on reptiles for survival. For example, the blue-tailed gecko in the Island of Mauritius is the reason that the Trechetia Blackburniana plant is still around and not extinct.

Activity #2

Where Do I Belong?

- What are the four major groups of reptiles?
- Skills: identification, observation

Adapted from: Using Reptile and Amphibian Activities in the Classroom, by Terry Tomasek and Catherin E Matthews

This activity is useful when teaching students how to identify reptiles. Students can focus on key identification features of not only the major groups of reptiles, but specific species as well.

Materials

- ID cards, one per student (pages 55-60)
- Yarn
- Post-it notes
- Hole punch
- Dry erase board and marker OR something large to write on (projection screen, chalkboard, etc.)

Teacher Prep

- Print off the ID cards and fold over the line in the middle. Laminate if needed.
- Create ID necklaces by punching holes into either side of the ID cards and looping yarn through.
- Place post-it notes over the pictures of reptiles on each ID card.

Activity Outline

1. Start off by going over the four groups of reptiles with your students. First, ask your students if they know the four major groups. Once they name them, write out the four groups on the board (snakes, lizards, turtles, and crocodilians). One group at a time, have the students name key identification features for each group. When they think of that group, what characteristics come to mind? See pages 61 and 62 for the major key characteristics of each group.
2. Next, give each student an ID necklace. The card should be hanging down the student's back, not the front. Make sure that the photo is covered with a post-it, and remind them not to look at it. The goal is for them to use physical features to try and identify the

group their reptile belongs to, and learn about the species they have. (NOTE: Depending on the number of participants, some students may have the same reptile.)

3. Have the students to walk around and find three other students to look at the picture on their back. Once a student has looked at the picture on the other student's back, they must write an identification feature on the back of the ID card. For example, if Student A has a box turtle, Student B should write something on the back of Student A's card such as "this reptile has a domed shell." Each student should have at least three features written on their cards at the end. Remind the students that all three or more features should be different. If the card already mentions that the species has a shell, they should write about something else (color, appendages, etc.).
4. Once the students have their three or more observations, they must try and decide which group their animal belongs to. Is it a type of turtle? Maybe an alligator?
5. Once the students predict which group they think their reptile belongs to, they must come up and tell the teacher. Remove the post-it to see if they got it correct. Give your students 15-20 minutes to research their animal.
6. Once the students know some more about their animal, have them find students with animals in the same groups. Turtles find other turtles, snakes find other snakes, etc. They should talk about the similarities and differences of their animals and where those animals are generally found.

<u>Post-Activity Assessment and Discussion</u>

Have each group share what they have learned about their group of reptiles with the class. What similarities did they find among their species? What differences? Are they all found in the same place? What is something they learned about that group of reptiles that they didn't know before?

ID Cards

Eastern Box Turtle

Key Identification Features

Pancake Tortoise

Key Identification Features

Diamondback Terrapin

Key Identification Features

Eastern Rat Snake

Key Identification Features

Ball Python

Key Identification Features

Eastern Indigo Snake

Key Identification Features

Blue-tongued Skink

Key Identification Features

Russian Legless Lizard

Key Identification Features

Black and White Argentine Tegu

Key Identification Features

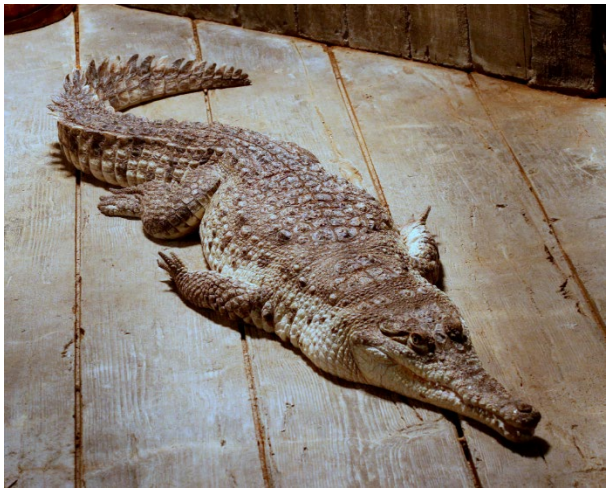
American Alligator

Key Identification Features

Saltwater Crocodile

Key Identification Features

Orinoco Crocodile



Key Identification Features

Key Physical Characteristics of Each Reptile Group

Turtles:

- A shell, which their ribs and spine are attached to (a turtle's shell is made of bone and cartilage; the top of the shell is called the carapace, and the bottom is called the plastron)
- Toothless, with a hard beak and jaws to capture and cut their food apart
- Either flippers, webbed feet, and/or claws to help with swimming, burrowing, and digging
- There are 300 species, ranging from 4 inches to more than 5 feet.
- Eyes and nostrils on the top of their head
- The scales on their shells are called scutes, and shed similar to the scales of other reptiles.

Lizards:

- Scales that shed in pieces; the number of times they shed a year is dependent on the species and a variety of factors.
- Relatively cylindrical body
- Long tail, that is slightly longer than the body
- 4 well-developed legs, although some lizards are legless
- Clawed fingers and toes
- There are over 6,000 lizard species, ranging from half an inch to 10 feet
- Long tongue, some have forked tongues and Jacobson's organ

Snakes:

- Legless, although some possess spurs, which are vestigial limbs where legs once were millions of years ago
- No eyelids
- Forked tongues with Jacobson's organ
- Long, cylindrical body with short tail at the end
- Covered in scales that shed in one large piece
- No external ear openings
- Flexible jaws that can unhinge during feeding and hunting
- There are around 3,000 snake species, ranging from 3 inches to 30 feet

Crocodilians:

- Semi-aquatic

- Elongated body with 4 well-developed legs
- Long, muscular tail, somewhat longer than the body and head combined
- External nostril openings
- Long, sharp teeth, visible when mouth is closed
- Elongated snout
- Thick, leathery skin (scutes)
- Eyes and nostrils on the top of the head to be above the water surface
- Clawed, webbed toes

Activity #3

Clever Constrictor

- Form of assessment

Teacher Information

There are many different ways to assess if your students have achieved the goals that were set for a lesson or activity. Listed below are the various types of assessments:

Diagnostic: to identify preconceptions, lines of reasoning, and learner difficulties

Formative: to inform instruction and provide feedback to students on their learning (usually an ongoing assessment).

Summative: to measure and document the extent to which students have achieved a learning target.

Listed below are a few examples of post-activity assessments:

- Four Corners
- Think/Ink/Share
- Fist to Five
- Write for One Minute

Clever Constrictor is an assessment that can be adapted to a specific learning topic. It is both formative and summative. Here is how you can apply this assessment to reptile lessons and units:

Dedicate a spot in the classroom where your paper snake will live. Cut out long strips of paper (multiple colors is encouraged) and set them over at the designated spot, along with pens or markers. You will also need a tape or glue.

As your students are learning about reptiles, encourage them to write a reptile fact on a slip of paper and add it to the paper snake by interlocking the strips and gluing/taping to secure. As the lesson continues, the snake will continue to grow with new facts about these amazing creatures. It is encouraged that the snake has a face – googly eyes and scissors will be needed for this! Make your snake unique. However, here is a reference photo if needed:

General Activity

Behavioral Ethogram

Teacher Information

Often times, our biologists and animal care team members here at Newport Aquarium will perform an ethogram in order to record behaviors demonstrated by various species of animals. Ethology is a great way to understand what each specific behavior means in an animal, and why that behavior is occurring. It can be used to determine abnormal mannerisms and actions. Or, ethology is used just to learn more about an animal! In this case, students will be observing an animal of their choice. However, feel free to use this for other species as well! Print off pages 66-69 so that each of your students have their own copies. Below are various options of zoo/aquarium live cam videos to use for your ethogram. However, feel free to find your own live cam or even use a class pet! Students can either pick the animal of their choice, or this can be done together as a class. This activity can also be done on a field trip to the Newport Aquarium or any event where your students have access to observing a live animal in a safe manner. Before starting the video for your students, go over what an ethogram is, and how it works.

Ethogram Options

Live Webcams with Reptiles: Live Streaming Webcams | Reptiles | Around the World (mangolinkcam.com)

Panda Cam: Giant Panda Cam | Smithsonian's National Zoo (si.edu)

Gorilla Cam: Gorilla Habitat Cam - The Houston Zoo

Live Penguin Cam: Penguin Cam | San Diego Zoo

Sea Otter Cam: Sea Otter | Live cam | Monterey Bay Aquarium

California Sea Lion Cam: California Sea Lion Webcam | Live from Georgia Aquarium | Visit Today

Ethogram Introduction

What is an ethogram?

An ethogram is a list of behaviors that are specific to a species. This information is usually recorded via a data table and help animal care teams and veterinarians study the behaviors of the animals they work with. You may have heard of ethology before, which is the study of animal behavior.

Which animal will you be studying? _____

Can you list any interesting facts about this species?

_____
_____
_____
_____

What would you like to learn about this species?

_____
_____
_____
_____

Predict what you will find by performing an ethogram on this species:

_____
_____
_____
_____

Ethogram Introduction

To obtain accurate results, choose one animal to focus on during the study. The animal will be observed for five minutes. Every 30 seconds, record the behavior the individual is demonstrating. Use the chart below to determine what that specific behavior is. If the animal is performing that specific behavior, put a ☑. If the animal is not performing a specific behavior, put a ☒.

Observable behaviors:

Inactive: includes sleeping, laying down, resting, no movement

Passive standing: standing without movement or interacting with other animals

Active: walking or running without interaction with other animals

Social: interacting with another animal

Swimming: the animal is submerged in water and/or is swimming around

Not visible: the animal is no longer in view, either in the video or in the exhibit

Grooming: the animal is cleaning, grooming, or taking care of themselves

Feeding: the animal is eating or drinking

Record the start time and end time here:

Start time: _____

End time: _____

Ethogram Data Sheet

Time Elapsed	Inactive	Passive Standing	Active	Social	Swim	Not visible	Grooming	Feeding
0:30								
1:00								
1:30								
2:00								
2:30								
3:00								
3:30								
4:00								
4:30								
5:00								

Ethogram Conclusions

How does the recorded data align with your before prediction?

_____
_____
_____
_____
_____

What behaviors did the animal demonstrate that you were not expecting? That you were expecting?

_____
_____
_____
_____
_____

What can this information tell us about this specific animal?

_____
_____
_____
_____
_____

How can we use ethogram data to contribute to conservation efforts?

_____
_____
_____
_____
_____