

MAMMALS

Grades 7-8

STUDENT JOURNAL

This journal belongs to:



THE GOOD AND THE BEAUTIFUL



INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Mammals* science unit. It contains all the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the science journal.

The lesson extensions are also found here. These extensions are optional for older students (grades 7–8) to complete on their own. Each extension is accompanied by lined paper so the student can keep his or her work in one place.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.



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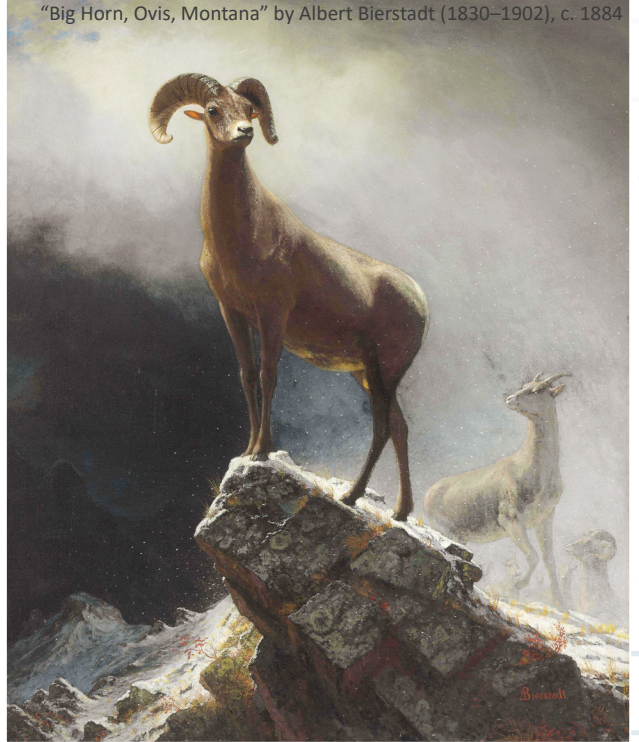


MAMMALS IN ART

"Deer in Forest Landscape" by Sándor Brodsky (1819–1901), 1876



"Big Horn, Ovis, Montana" by Albert Bierstadt (1830–1902), c. 1884



"White Horse in Pasture" by Jacques-Laurent Agasse (1767–1849), c. 1806



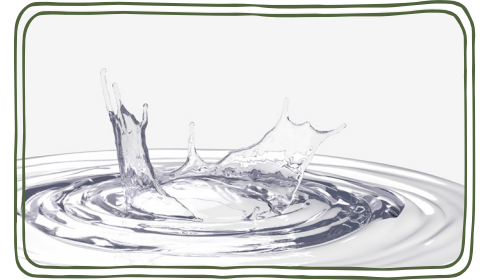
EXTENSION

Instructions:

1. Read each section and study the diagram of the ear.
2. Write a paragraph explaining how sound is transferred through the ear, using the vocabulary words (which are in bold italics). In your paragraph underline the vocabulary words.

The Mammalian Ear

One of the unique characteristics of the mammalian ear is that it contains three bones in the middle ear. Just as waves ripple through the water, sound waves move through the ear, hitting these three bones. These bones act like links in a chain, transmitting the waves that enter the ear to the inner part of the ear. So how does this process work, and how does this translate into sound?



1. External Ear

The **external ear** (outer ear) is composed of the fleshy part on the outside of your body and the **ear canal** (the passageway leading to the inside of the ear). As sound waves hit the external ear, they travel through the ear canal until they meet the **eardrum** (also called the tympanic membrane). The eardrum divides the external and middle ear.

2. Middle Ear

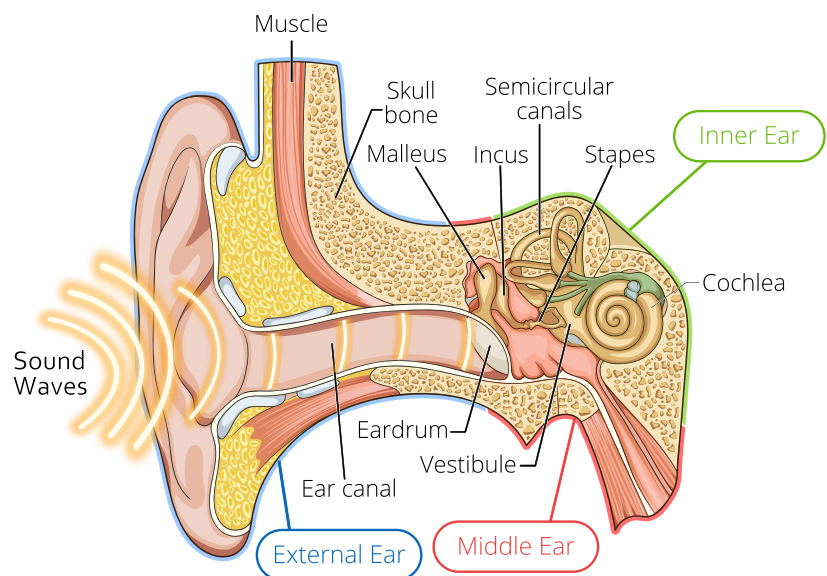
When sound hits the eardrum, this thin piece of tissue vibrates, passing the sound waves to the three ossicles (which literally means “tiny bones”). These three **middle ear** bones are the smallest bones in the body, and vibrations hit these bones in this order: the **malleus**, the **incus**, and then the **stapes**. The function of these bones is to conduct (or pass on) the sound to the inner ear.

3. Inner Ear

Sound waves move to the **inner ear**, which contains a snail-shaped organ called the **cochlea**. This organ is filled with liquid and has nerves for hearing. The nerves sense inner-ear vibrations and convert them to electrical impulses that our brains can interpret as sound. Two other organs found in the inner ear are the oval-shaped **vestibule** and the **semicircular canals**; these both help with balance.

Did you know?

World-famous musical composer and pianist Ludwig van Beethoven suffered damage to his inner ear, and yet he was still able to compose music during the time when his hearing dwindled. How was this possible? One factor was his mastery of understanding how instruments and voices blend together. Second, it was said that Beethoven would place a pencil in his mouth and touch the other end of the pencil to the piano to feel the vibration of the note as he played it. The well-known song “Ode to Joy” was Beethoven’s last symphony, written after complete hearing loss.



My Ungulates BOOKLET



PERISSODACTYLA: Odd-Toed Mammals

Features of Perissodactyls

- They bear their weight on one toe.
- They are herbivores.
- They have hooves.
- They have long faces.

TAPIR



Number of Toes Per Foot

Partial or Full Hoof

HORSE



Number of Toes Per Foot

Partial or Full Hoof

RHINOCEROS



Number of Toes Per Foot

Partial or Full Hoof

ARTIODACTYLA: Even-Toed Mammals

Features of Artiodactyls

They bear their weight evenly between two main toes.

They are herbivores.

They have hooves.

Most of them have four-chambered stomachs.

Most of them have powerful, elongated legs.

Many families in this order have horns, antlers, or tusks.

HORNS



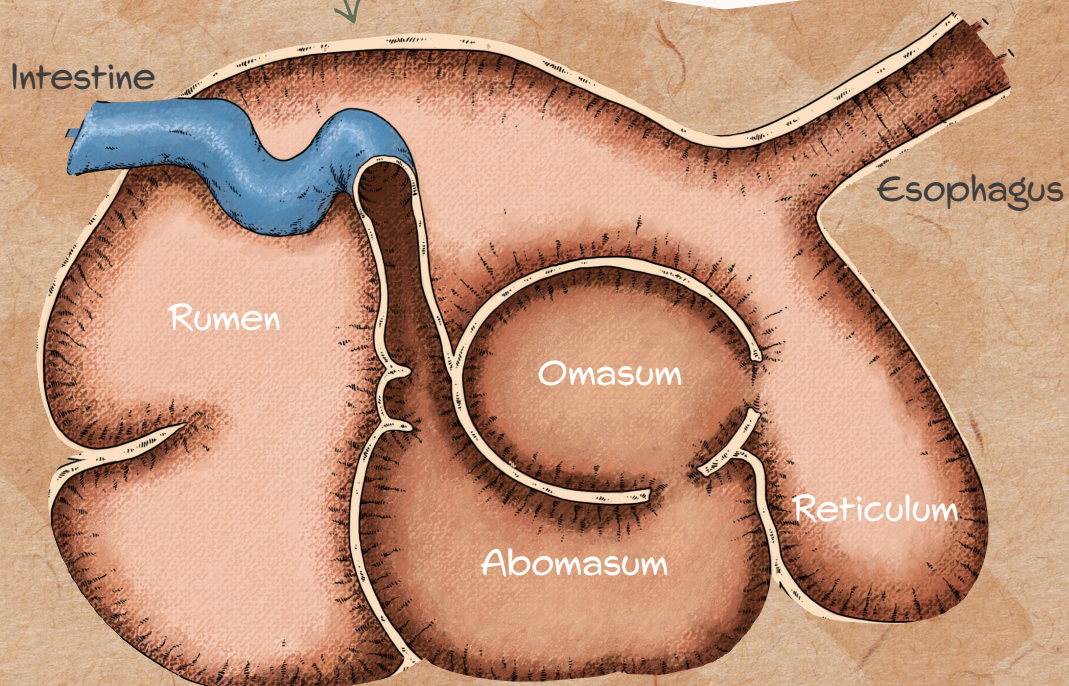
ANTLERS



branch	do not branch
fall off	do not fall off
replaceable	not replaceable
velvet covering	never covered with velvet

branch	do not branch
fall off	do not fall off
replaceable	not replaceable
velvet covering	never covered with velvet

RUMINANT DIGESTIVE SYSTEM



Instructions:

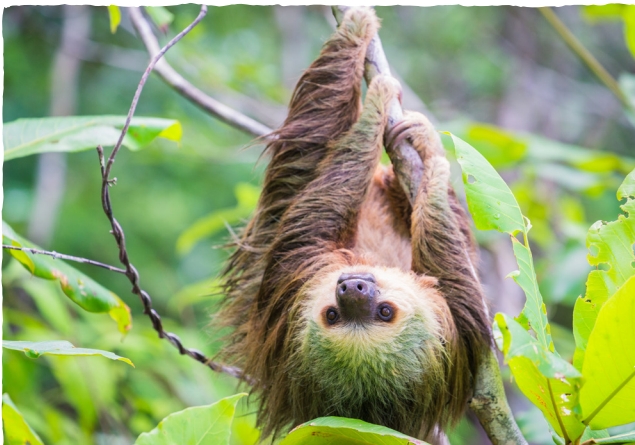
1. Read the information below.
2. List 5–7 facts about sloths that you found most interesting.
3. Present what you learned to a family member or draw a picture based on one of the scenes from the text.

EXTENSION

The Sloth—Another Marvelous Mammal

In this lesson you learned about elephants—one of God’s incredible creations. In this extension we will highlight another marvelous mammal—the sloth. You may already be familiar with the sloth’s reputation of being sluggish and hanging around in a carefree manner, and there is a lot of truth to that. Sloths are the slowest-moving mammal in the world, typically traveling only about 38 meters (125 feet) per day. So why are they so slow? Sloths have an unusually low **metabolic rate** (the rate at which energy is used over time), so they move slowly to conserve energy. Aside from their sleepy, sluggish demeanor, there are many characteristics of sloths that make them truly marvelous.

Sloths make their homes in the trees of the tropical rainforests of Central and South America. A sloth will spend its day creeping along the branches of trees, munching on the buds, leaves, and shoots. Since sloths are omnivores, they will sometimes snack on insects, lizards, and birds. Occasionally, they’ll drop from these branches and crawl along the ground, and when they do so, their rate of movement decreases even more—to only about one foot per minute. This could partly be because their claws are so long that walking on land is difficult. Can you guess one other place a sloth is found aside from in trees or on land? Sloths can also be found in water—swimming. Not only are they good swimmers, but they also move up to three times faster in water.



Just as sloths have made the forest their home, they themselves are the home to an organism—algae. Sloths have a **symbiotic relationship** with algae. This means that algae and sloths coexist. Algae benefit from living on sloths because sloths provide the algae with water and a home. The sloths’ fur absorbs a lot of water, which becomes a resource for the algae. In exchange, the algae benefit sloths by providing nutrients and giving sloths a tint of camouflage—hiding them from predators. (After all, algae are green, and sloths live in green forests.)

When we said that sloths “hang around,” we meant this literally—they spend about 90% of their lives hanging upside down. If we tried doing this, we’d probably get dizzy or find it hard to breathe after a while. Sloths can handle an upside-down life because their organs are attached to their rib cage, so their organs don’t weigh on their lungs and have no impact on their breathing.

Sloths are important to the ecosystem of the rainforests, and their survival depends on us preserving their habitat. Without trees, they become more prone to predators that live on the forest floor. Some species of sloths are endangered, so communities and organizations are working hard to promote sustainable forestry.



Instructions:

1. Read the information below.
2. It's impossible to know what animals are thinking, so scientists carefully design experiments to determine how much animals understand. Imagine you are studying one of the primates below. Describe an experiment you would do to test how much your chosen primate knows.

EXTENSION

Intelligent Primates

Gorillas: The idea of being able to communicate with animals has always intrigued humans. People have attempted to teach animals to talk to us, and one of the most successful experiments has been with a western lowland gorilla named Koko.

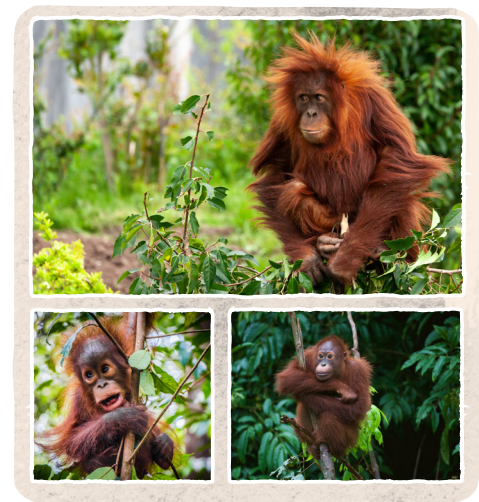
Koko was born in a San Francisco zoo and attracted the attention of researcher Francine Patterson, who noticed that the young gorilla seemed to have picked up a few gestures on her own. Patterson began working with Koko to teach her a modified version of American Sign Language. Eventually, Koko had a vocabulary of about 1,000 words, comparable to that of a three-year-old human.

Koko helped scientists understand more about what gorillas are capable of learning. Koko even appeared to comprehend abstract concepts, such as “death” and “birthday.” Koko expressed sadness when looking at pictures of her kitten that had died and draped herself with fabric to dress up for her birthday party. Koko’s abilities were impressive but not unique. Researchers have now observed both captive and wild gorillas using gestures to communicate with each other.



Orangutans: If you go to the island of Sumatra and watch orangutans on the west side of the Alas River, you will see them using sticks to poke logs, looking for honey, and then removing it. Researchers call this activity “honey-dipping.” However, if you are watching orangutans on the east side of the Alas River, you won’t see this behavior. Why? Orangutans are social learners—scientists believe an orangutan from the west side of the river figured out how to use a stick to extract honey, and then the group passed this behavior on to each other and their young.

Researchers gained more evidence for this theory when they took young, orphaned orangutans from both sides of the river and gave them two tasks to do with sticks. All the orangutans used sticks to rake food into their enclosures, but the west-side orphans also easily used the sticks to dip honey, while fewer of the east-side orphans figured this out. Scientists believe the west-side orphans had learned the behavior by watching their mothers and other adults. Learning by watching is a sign of high intelligence.



Monkeys: Did you know that monkeys can do math? Scientists have done experiments with rhesus macaques, Old World monkeys from Asia. Researchers taught the monkeys numbers and tested them. The monkeys demonstrated that they understood which numbers were larger by choosing the one that would give them more treats.

The monkeys were even able to add—they would choose a sum that added to a bigger number over a single, smaller number. Monkeys may not be able to help you with your algebra, but scientists hope that learning how their brains process numbers will help them understand human brains better, including what causes learning disabilities like dyscalculia.



FEROCIOUS FELINES

Match the descriptions on the next two pages with the pictures on the third page by writing the number by each name in the correct circle. If desired, write or draw an interesting fact about each species on the fourth page.

1 LIONS

- Lions live with about 30 others in a group called a *pride*, with about four lionesses for every male lion.
- The size of a pride is determined by food and water availability; where there is more food and water, there are more lions.
- The small, agile adult lionesses hunt for dinner while the larger male leaders stay behind to protect their young and territory.
- A lion's thick mane protects its neck from attack.

2 TIGERS

- The tiger is the largest feline, with Siberian tigers weighing around 300 kilograms (660 pounds).
- Their long hind legs for making great leaps and padded feet for sneaking up on prey help them hunt.
- A tiger can single-handedly kill a young elephant and eat more than 36 kilograms (80 pounds) in one sitting.
- A tiger's stripes are on its fur and its skin.
- White tigers are not albino or a separate species, but have a rare genetic anomaly known as *leucism*. Genes from both parents cause them to have pigmentation only in their eyes, not their hair or skin.

3 CHEETAHS

- A cheetah's paw pads are like football cleats, rough with semi-retractable claws for traction.
- Their eyes are outlined with black to reflect the sun's glare so they can zero in on their prey.
- Going from 0 to 113 kilometers per hour (0 to 70 miles per hour) in just three seconds, or three paces, the cheetah is well known as the fastest mammal on Earth.
- A small head, a sleek body, low weight, and a flat rib cage make a cheetah's body aerodynamic.
- Long legs and powerful muscles allow a cheetah to take strides of 7.62 meters (25 feet) at a time.

4 LEOPARDS

- Found in Africa, the Middle East, and Asia, leopards are not fussy about their habitat as long as they live alone.
- They love to rest in trees and will even drag their prey (including gazelles, baboons, and antelope) up into the tree with them.
- Most leopards can live for 12–17 years.
- When leopards are calm and happy, they can be heard purring like a house cat, but you don't want to get too close and upset a leopard. When they are angry, they have a loud roar.

Instructions:

1. Read the information below.
2. In a paragraph at least three to five sentences long, describe some of the ways canines can help humans. If desired, you could also include some information about a canine in your own life.

EXTENSION

Training Canines

The Canidae [CAN–uh–dee] family has 34 species, including the fox, wolf, coyote, and domesticated dog. Within the dog species are a vast variety of breeds, which you might have assumed were different species based on their great differences. However, the species *Canis familiaris*, commonly called dog, is one species that has been bred by humans to serve many purposes and therefore displays many unique features, sizes, and abilities. One thing all dogs and other canines have in common is their intelligence. **Read through the boxes at the bottom.**

Wild canines use their intelligence to survive, hunt, and protect their young. Domesticated canines have been trained to be useful at home and on the job. It is estimated that up to 47% of people in the United States have a dog as a pet. We are going to learn about just a few of their trained abilities.

In a home setting, dogs can be trained to fetch, detect medical emergencies, provide emotional support, do tricks, and much more. A border collie named Chaser has set the record for learning the most words or commands. Through careful training, Chaser has learned to respond correctly to 1,000 words or commands. Other dogs such as the golden retriever Copper have learned to communicate with their

owners through sound buttons. Each button says a different word, such as “outside” or “hungry,” and the dog can press a button to communicate what it wants or needs. Service dogs are trained to guide those who are blind, detect smells that mean a person is about to have a seizure, or even give an alarm to those with diabetes that their blood sugar is too high or too low through the dog’s amazing sense of smell.

Dogs can even be found in a variety of work settings ranging from mountain search and rescue to Hollywood movie sets. St. Bernard dogs can find people trapped in avalanches, smelling them up to 4.5 meters (15 feet) under the snow! Police dogs such as German Shepherds, often called K9s, are used to detect explosives, illegal drugs, and alcohol. On the farm many dogs have been trained to herd sheep and cattle. The Great Pyrenees breed is not only smart enough to care for a herd of sheep on its own, leading them to green pastures, but it is also large and strong enough to protect the herd from bears!



It is easy to see how these amazing and loyal creatures are often called “man’s best friend.” Their abilities make them useful, if not invaluable, to humans around the world.



The black-backed jackal (*Canis mesomelas*) can only be found in Africa and is often seen scavenging in the dry savanna. Careful and crafty, they are able to steal food from lions and keep predators away. Families tend to stay together, but jackals may hunt with others in large packs.

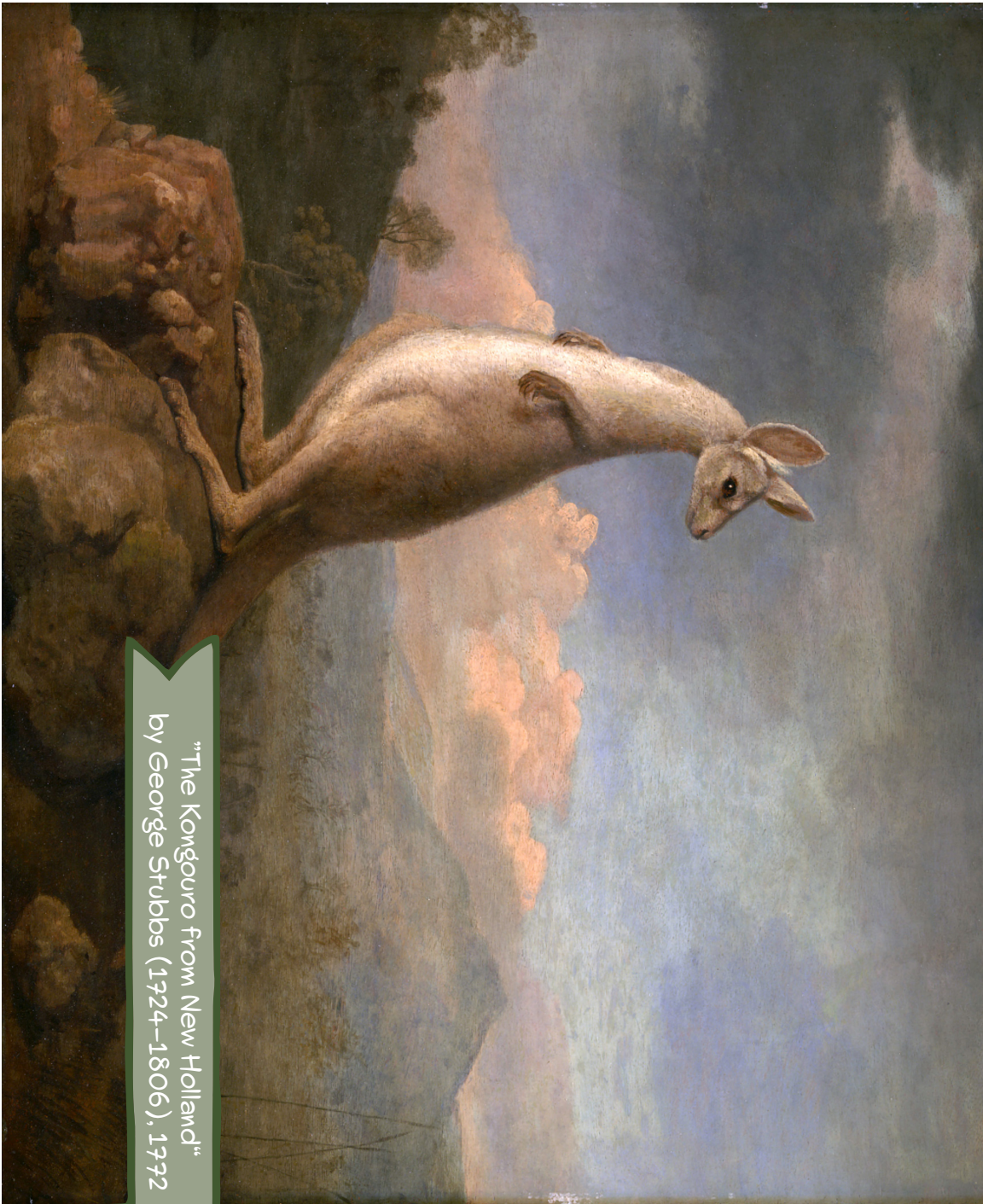


You may have heard the saying “cunning as a fox.” This is because foxes are very intelligent; they are good at outsmarting their prey and protecting their young. With a watchful eye, they will wait and sneak in to snatch prey. They will often steal food from hunters’ traps.



The coyote (*Canis latrans*) derives its name from the Aztecs, implying a crafty and tricky demeanor. Coyotes generally are smaller, smarter, and have bushier tails than wolves. Coyotes consume almost anything and are adept at capturing prey; they will dig tunnels to trap, leap into the air or trees, and even scale six-foot walls.

ART STUDY



"The Kongouro from New Holland"
by George Stubbs (1724–1806), 1772

Instructions:

1. Read each section and the case study.
2. Do one or both of the following assignments:
 - a. List 5–7 interesting facts about marine mammals.
 - b. Briefly summarize how rescue teams are able to disentangle a trapped whale, based on what you read in the case study.

EXTENSION

Marine Mammals

Throughout this unit, you explored the fascinating features of land mammals, but did you know there are mammals that live in the ocean too? If you completed *The Good and the Beautiful Marine Biology* science unit, then you have already learned about marine mammals. Marine mammals live in aquatic environments. In this lesson extension, we're going to learn the basic characteristics of marine mammals, how they are classified, how their ecosystems are being threatened, and what is being done to help God's creations that live in the ocean.

Characteristics

To be classified as a marine mammal, scientists look for the characteristics that are shared with land mammals—the characteristics that you learned about in this unit. At least at some point in their lives, they also have hair, and they, too, produce milk to nurse their young. They also give birth to live young and have the distinguishing three bones in the middle ear. Unlike other oceanic creatures, marine mammals are endothermic, which is commonly referred to as warm blooded. With that in mind, you may be wondering how these mammals survive the frigid temperatures of the ocean. Most marine mammals have blubber to help them keep warm. Their bodies are so incredibly fascinating because they must survive extreme changes in temperature, pressure, depths, and light availability.

How do these mammals live underwater if they, like other mammals, have lungs instead of gills? Marine mammals have the ability to hold their breath for a really long time! When they dive down, they can slow their heart rate in order to consume

less oxygen. A reserve of oxygen is kept in their blood and muscles, and they can control where their blood goes. For example, they can send their blood to main organs (like their hearts and lungs) to ensure there is oxygen in these body parts. These features enable them to stay underwater for quite some time, but eventually, they do have to return to the surface to breathe again.

Classification

Aquatic mammals live in the water permanently, and semiaquatic mammals spend time on land and in the ocean. There are four main taxonomical groups of marine mammals. See below.



CETACEANS

whales, dolphins, porpoises



PINNIPEDS

seals, sea lions, walruses



SIRENIANS

manatees, dugongs



MARINE FISSIPEDS

polar bears, sea otters



Marine Ecosystems & Protection

Marine animals are vital to oceanic ecosystems. All of Earth's water is connected through the water cycle. As precipitation (through rain, snow, etc.) falls to the ground and collects in oceans, lakes, streams, and on land, it moves, cycling this precious life-giving asset. Within the ocean, animals fulfill different ecological roles—herbivores (such as the manatee), filter feeders (such as the baleen whale), and top predators (such as the killer whale) are all essential. People have begun to realize the importance of caring for our environment, and we can go forward making better efforts to keep our water clean and protect life in the water.

Within the United States, there are laws such as the MMPA (Marine Mammal Protection Act) that protect marine life. Internationally, treaties have been formed to ensure the safety of these beautiful and important creatures. Many marine animals (not just mammals) are endangered because of poaching, trapping, pollution, climate change, harassment, accidents, and habitat loss. One organization that is working to help marine animals is NOAA, which stands for National Oceanic and Atmospheric Administration. Let's take a look at some of the things that NOAA, pronounced "NOAH," does to help these amazing animals.



Case Study

Unlike humans, marine mammals do not have opposable thumbs. So when they get stuck in something, they cannot just pull the thing off and free themselves. This poses quite the problem when they get entangled in fishing gear.

Organizations like NOAA have people that work to find animals trapped in fishing gear and to free them. However, this isn't an easy task. In this case study, you'll see how rescuers disentangle a humpback whale.

An average humpback whale has remarkable strength and measures about 15 meters (50 feet) long and can weigh 40 tons! When one gets entangled in fishing gear, it becomes panicked and stressed.

Since rescuers do not want to harm themselves or cause further harm to the whale, they will not get into the water with the whale. Instead, they follow behind in a boat, and they use a grappling hook to catch and hold on to the tangled-up fishing lines. Next, they attach a series of buoys to try to keep the whale at the surface (to prevent it from diving down) and to help it slow down.

The rescue team will get into a small inflatable boat to try to catch up with the entangled whale. This isn't easy

because the powerful whale is still moving, but eventually it tires from swimming and slows down.

At this opportune moment, the disentangling team will use a special tool that is attached to a pole. This tool is designed to cut away at rope without harming the whale. Once the team is able to cut away the rope and all associated fishing gear, the whale is free. Afterward, the team will clean up any remains of rope so it won't entangle another sea creature.

The Hawaiian Islands Humpback Whale National Marine Sanctuary has seen around 100 cases of entangled whales since 2002—and these are only the cases that people reported, so there could be more! While organizations make efforts to rescue, prevention is one of the best ways to protect these amazing sea creatures. Raising awareness of potential dangers and using safe, responsible fishing methods are just two ways that harm can be prevented, and in these ways, we can be better stewards of the earth.





ARCT

United Kingdom

EUR

NORTH AMERICA

Rocky Mtns

United States

CENTRAL AMERICA

Sahara D

AFR

Equator

SOUTH AMERICA

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Mammals of the World Map

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EOPE

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ICA

Russia

ASIA

China

India

SOUTHEAST ASIA

Borneo

Madagascar

AUSTRALIA

Tasmania

ANTARCTICA

