



## **Reading Handout: All About Pinnipeds**

### **What is a marine mammal?**

The colossal blue whale, active sea otter, barking sea lion, plant-eating manatee and even the polar bear are all marine mammals. They share a number of characteristics with their land-dwelling relatives: they are warm-blooded, give live birth, nurse their young with milk, have hair at some time in their lives, and breathe air.

But marine mammals differ from land mammals in that their livelihood depends upon the ocean. They have bodies that are particularly well suited to life at sea. Ears, limbs, and body shape have all been streamlined to reduce drag as these animals swim through the ocean. Except for sea otters, marine mammals have a thick layer of fat called blubber under their skin. This aids buoyancy, provides insulation and serves as a reserve energy source for most marine mammals.

### **The Pinnipeds**

Seals, sea lions and walruses are carnivorous marine mammals that belong to the suborder Pinnipedia (*PINN-ih-PED-ee-ah*). The word pinniped means “feather-footed” or “fin-footed.” There are three families in this suborder:

- 1-The family Phocidae (*FOE-sih-day*) includes the “true” or “earless” seals. The true seals have tiny ear holes but no external ear flaps.
- 2-The family Otariidae (*O-TAR-ih-day*) are known as the “eared” seals and include sea lions and fur seals.
- 3-The family Odobenidae (*O-doe-BENN-ih-day*) includes the walruses and are the largest pinnipeds. Walruses are neither a seal nor sea lion, but share characteristics with each.

### **What do seals and sea lions have in common?**

They are both mammals, have live young, produce milk, have hair or fur on their bodies, are air breathing, and are “endothermic” or able to control their body temperature. Both types of animals are also semi-aquatic, which means that they spend part of their lives on land, and part of their lives in the ocean. They also have similar diets and they use their specialized whiskers to feel the movement of their prey in the water.

The major distinction between the two is that seals lack external ear flaps (called pinnae). Sea lions can also “walk” on land by standing up on their front flippers and by rotating their back flippers forward, while seals cannot.

There are three common pinnipeds in southern California: The Harbor Seal, Elephant Seal, and the California Sea Lion. No walruses are found this far south.

## **Harbor Seal**

Harbor seals are “true” or “earless” seals (Family Phocidae). They can be silvery gray with dark spots or black with white spots or rings. Their bodies are torpedo-shaped, which helps them to move quickly and easily through the water. On land they look a lot like giant sausages. Unlike sea lions, seals don’t have ear flaps. Instead they just have a tiny ear opening. A seal’s flippers are not long enough to allow them to “walk” on land like a sea lion. Instead they bounce along on their bellies.

### **How big are they?**

Males can grow to be about 6 feet long and weigh 370 pounds. Females are only slightly smaller.

### **Where do they live?**

Harbor seals live along the Pacific coast, from Alaska to Mexico. There are also harbor seals that live on the Atlantic coast. They will often haul out onto rocks or sandy beaches to rest, molt (shed their fur) or give birth to their pups.

### **What do they eat?**

They eat fish, squid, octopuses, mussels and crabs.

### **Did you know?**

Harbor seals don’t bark like sea lions do. Instead they make quiet grunts, growls, snorts and hisses. Most harbor seals are darker on their backs than they are on their bellies. Like most marine mammals, harbor seals have thick slimy tears to protect their eyes while they are swimming. These tears are like built-in goggles.

## **Elephant Seal**

Elephant seals are “true” or “earless” seals (Family Phocidae). They have large sausage-shaped bodies. When they bounce along the sand on their bellies, their blubbery bodies jiggle like *Jell-O*. Adults are tan or brown. Their fur is short and bristly. Males grow the large trunk-like noses when they are three to five years old.

### **How big are they?**

Northern elephant seal males can grow to be 14 feet long and weigh up to 4,400 pounds. Northern elephant seal females can grow to be 10 feet long and weigh about 800 pounds. Male Southern elephant seals are the largest of all the pinnipeds (seals, sea lions and walruses) and can grow to over 16 feet long and weigh up to 11,000 pounds.

### **Where do they live?**

Northern elephant seals can be found from the Aleutian Islands in Alaska to Baja California, Mexico. All elephant seals come to shore to molt (shed their fur) and rest twice a year. They also spend time on land during the breeding season.

**What do they eat?**

They eat a variety of fish, squid and slow-moving sharks, skates and rays.

**Did you know?**

These seals can dive to depths of 5,000 feet or more and hold their breath for up to two hours. Males spend about 250 days a year out in the ocean, without ever coming to shore. During this time they are known to travel at least 13,000 miles. Females spend about 300 days out to sea during the year and travel over 11,000 miles.

**California Sea Lion**

California sea lions are “eared” seals (Family Otariidae). They are usually a milk-chocolate brown. Their bodies are torpedo-shaped, which helps them to move quickly and easily through the water. Sea lions are eared seals and have small ear flaps on either side of their heads. Male sea lions have a “bump” on the top of their heads called a sagittal crest. This makes them look bigger and stronger when facing other males.

**How big are they?**

Males can grow to be 8 feet long and weigh 850 pounds. Females can grow to be 7 feet long and weigh about 240 pounds.

**Where do they live?**

California sea lions live along coasts in the North Pacific, from Alaska to California and Mexico. Sea lions come to shore to rest, molt (shed their fur) and have their pups.

**What do they eat?**

They eat a variety of fishes, squid and even octopuses.

**Did you know?**

Sea lions can “walk” on land by standing up on their front flippers and rotating their back flippers forward. Sea lions bark to communicate with other sea lions. Scientists believe that seals and sea lions can echolocate to find their food just like toothed whales (dolphins, porpoises, etc.). When a seal or sea lion is relaxed, its nostrils are closed. They have muscles around their nose used to push their nostrils open when exhaling and taking a breath.

**Fun Fact!**

The relative ancestry between all pinnipeds is still uncertain, but they all are thought to be descendants of bear-like animals.



## **Cabrillo Marine Aquarium Lesson Plan**

**Grade Level:** Fifth Grade

**Title:** Pinniped Races: A Lesson on Seals & Seal Lions

**Objective:** Students will learn about pinniped characteristics as they participate in a relay race.

**California Science Standards:** 5th: 6a-f

**Time to Complete:** approximately 30 minutes

**Materials provided by CMA Ocean Discovery Kits:** *Reading Handout: All about Pinnipeds, Worksheet: Sea Lion Coloring Sheet, Worksheet: Sea Lion Skeleton Coloring Sheet* Seal and Sea Lion specimens, posters, books and DVDs

**Materials provided by Teacher:** Photocopies of Reading Handout, Adaptation props: dive mask or swim goggles (two sets), snorkel (two sets), heavy coat or wet suit (two sets), swim fins (two sets), fake teeth (few sets), pipe cleaners twisted and taped together (two sets). Substitutions may be made depending on availability (i.e. paper towel tube instead of a snorkel, rain gear instead of wet suit, mittens instead of swim fins).

- ❖ **NOTE:** All Marine Mammals are protected by Federal Law. It is illegal to collect or possess marine mammals or any parts of a marine mammal (bones, baleen, etc.).

**Vocabulary:** Mammal, pinniped, endothermic, carnivorous, semi-aquatic, sagittal crest

### **Lesson Outline:**

- **Part 1 - Reading Handout: All about Pinnipeds**
- **Part 2 - Pinniped Races - Outside Activity**

**Background:** What makes a mammal a mammal? Mammals share the following characteristics: hair or fur, breathe air, warm-blooded, live birth, and nurse their young with milk. There are exceptions, however, like the egg-laying echidna and platypus. We share each of these characteristics with marine mammals, but our habitat is extremely different. Marine mammals spend all or most of their life in the ocean. Seals, sea lions and walruses are carnivorous marine mammals that belong to the suborder Pinnipedia (*PINN-ih-PED-ee-ah*). The “pinniped” means “feather-footed” or “fin-footed.” There are three families in this suborder. The family Phocidae (*FOE-sih-day*) includes the “true” or “earless” seals. The true seals have tiny ear holes but no external ear flaps. Members of the family Otariidae (*O-TAR-ih-Day*) are known as the “eared” seals and includes sea lions and fur seals. Walruses are the

largest pinnipeds and belong to the family Odobenidae (*O-doe-BENN-ih-day*). Walruses are neither a seal nor sea lion, but share characteristics with each. Like sea lions, walruses have long front flippers that they can use to “walk” on land and hind flippers that rotate underneath their body. Like seals, walruses lack earflaps and use their hind flippers in a side-to-side motion for swimming. To survive in this environment, all three groups have developed many successful adaptations. Adaptations are body parts of an animal that make it more suited to live in its environment. Some pinniped adaptations including fins and/or flippers for swimming, nostrils high on their head for breathing, blubber for keeping warm, slimy tears for eye protection, whiskers to help explore their surroundings and find food, and specialized pointed teeth to catch prey and swallow it whole. There are three common pinnipeds in southern California: The Harbor Seal, Elephant Seal, and the California Sea Lion. No walruses are found this far south.

**Activity 1:** Read as a class and discuss *Reading Handout: All about Pinnipeds*

**Activity 2:** Pinniped Races - Outside Fun!

Discuss mammal characteristics and adaptations. Show each **adaptation prop** and explain the function it represents. Divide the class into two teams, explain the rules and play!

- Dive mask or goggles - sight and slimy protective tears for the eyes
- Snorkel - nostrils to breathe above the surface
- Heavy coat or wet suit - blubber and fat to keep warm
- Ear muffs - sea lion ear flaps ( distinguishes it from seals)
- Fake teeth - specialized pointy teeth to grab prey
- Swim fins - front and hind flippers for swimming, steering and walking
- Twisted pipe cleaners - whiskers to explore surroundings

**Game Guidelines:**

- The first student in line from each team, runs to the adaptation props pile, picks up an “adaptation” and puts it on.
- They must shout out the pinniped adaptation before they can leave the pile. (i.e. student should call out “goggles for eye sight and slimy tears for protection”)
- They run to their team, take off their adaptation, give it to the next person and sit at the end of the line.
- The next student puts on the "adaptation" that was given to them, runs to the adaptation props pile, picks up a second adaptation, puts it on, shouts out the adaptation, runs back, takes off both of their adaptations and gives them to the next student, then sits at the back of the line.
- Play continues, adding adaptations, until each team has all players sitting down or all "seven (7) adaptation props" on a team member.
- The first team to have all players sitting down wins!

**Note:** When the pile is empty, players may continue to relay, putting on and taking off adaptations, or add as many adaptations as there are players, depending on class size.

**Lesson Extension:**

- Add the *Worksheet: Sea Lion Coloring Sheet* and *Worksheet: Sea Lion Skeleton Coloring Sheet* to the lesson.
- Read the book “*Zoobooks Seals & Sea Lions*” (provided in the kit)

**References:**

- Oregon Coast Aquarium: Newport  
<http://aquarium.org/education/teacher-resources>



## **Cabrillo Marine Aquarium Lesson Plan**

**Grade Level:** First Grade

**Title:** How Do Whales Eat?

**Objective:** Students learn different ways whales eat by comparing baleen and teeth

**California Science Standards:** 1<sup>st</sup>: 2c, 2d

**Time to Complete:** 30 minutes

**Materials provided by CMA Ocean Discovery Kits:** *Worksheet: Whale Coloring Sheet, Whale: "Do-it, Do-its"*, Gray Whale baleen, Cetacean teeth (Sperm Whale tooth (replica), Orca tooth (replica), Dolphin and Fossil Dolphin teeth), Baleen Whale feeding demonstration (plastic "krill" and plastic "comb"), Toothed Whale feeding demonstration (tweezers)

**Materials Provided by Teacher:** Water in two wide-mouth, medium-sized bowls; a handful of rice that will replicate fish that toothed whales eat. Crayons and photocopies.

- ❖ NOTE: All Marine Mammals are protected by Federal Law. It is illegal to collect or possess marine mammals or any parts of a marine mammal (bones, baleen, etc.).

**Vocabulary:** Baleen, teeth, plankton, prey, keratin

**Teacher Preparation:** Have the baleen and toothed whale feeding experiments ready to use after the discussion.

1. Baleen whale feeding demonstration: Plastic spiders (pretend they are krill) floating in the water; comb (to replicate baleen) ready to filter large volumes of "prey" from the water.
2. Toothed whale feeding demonstration: Rice (pretend they are fish) and tweezers (to replicate a toothed whale) as the second experiment. Students will try to pick up one piece of rice at a time, just as toothed whales, such as dolphins, are only able to grab and swallow one fish at a time. Add rice just before students begin experiment (otherwise it will expand).

### **Background Information:**

There are approximately 88 species of whales divided into two suborders based on their primary feeding mechanisms: toothed whales and baleen whales.

Baleen whales use keratin plates suspended from their upper jaw to filter food from seawater. These plates of baleen look like a large brush that traps prey, such as plankton (microscopic plants and animals) or small fish.

The most well-known of the filter feeding whales are the "rorqual" whales. "Rorqual" is a Norwegian word meaning "furrowed or grooved whale". This is referring to the large number of throat grooves, or "pleats" these whales have on their lower jaw, typically extending from the chin to the mid-body. These whales are casually referred to as "gulp feeders".

These "gulp feeding" whales open their mouth extending these pleats wide open, creating a large cavern inside their mouth. Then they engulf a mouthful of water along with all of the prey encompassed in the water. As the mouth closes, the muscular pleats squeeze shut forcing water out through the baleen plates. The baleen catches the tiny prey along the inside of mouth, then the whale swallows the whole mouthful of food. Through this type of filter feeding, whales can eat large volumes of prey in one gulp.

Toothed whales feed on a variety of sea animals, including many species of fish (ranging from small bait fishes to larger species such as mackerel) and squid. The teeth are used to grab their prey so it doesn't swim away. They grab and swallow their food, and do not tear or chew food as we do.

Some killer whales (also known as orcas) are an exception to the rule. Some killer whales eat large fish, such as salmon; others eat sharks; and still others eat small marine mammals such as sea lions, dolphins and even small whales. They have very strong jaws, instead of specialized cutting teeth, that are used to tear pieces of larger prey into small manageable sized pieces.

### **Lesson Outline:**

**Activity 1: Becoming a Whale**

**Activity 2: Eat Like a Whale**

**Activity 3: Color a Whale**

### **Lesson Procedures:**

#### **Activity 1: Becoming a Whale**

1. Follow the steps outlined in the *Whale: "Do-it, Do-its"* allowing the kids to act out the functions of whales' body parts and how they are different from ours.

#### **Activity 2: Eat Like a Whale**

1. Discussion: Tell students they are going learn how different animals eat. First, have students discuss how they eat, using their mouth, teeth and tongue. Then, ask if they have they seen other animals eat and how does it compare?
2. Discussion: What is the largest animal in the world? Whales. Yes, whales are the largest animal on earth, even larger than any dinosaurs discovered (so far!). Baleen whales include the largest of all animals in the world and they don't have teeth to



eat. Show photos and discuss how the baleen grows from the top of their mouths, instead of teeth.

3. Discussion: Baleen is made of keratin which is the same material as our hair and fingernails. Ask students to talk about the similarities in the way their nails and hair grow (continuously growing, breaking at the ends). Do baleen whales "lose" their baleen, like we lose teeth, or does it continue to grow? It continuously grows from the top, wearing at the ends.
4. Hands-on with specimens: Show students the sample of grey whale baleen. This sample has 10-15 plates. An adult gray whale will have 130-180 plates, per side of the mouth. Ask students to think about the quantity of prey the baleen will catch using this filtering method.
5. Now have the students use the comb to try and scoop up as many krill (plastic spiders) as they can. Then they can use the tweezers to pick up a piece of rice, one piece at a time. You can do these experiments in small group situations; try to allow all students to do the experiment.
6. Discuss the difference between the two types of eating, baleen versus teeth.

### **Activity 3: Color a Whale**

1. Use the *Worksheet: Whale Coloring Sheet*

### **References:**

DK Eyewitness Books: Whale: Pages 23 – 25

Book National Geographic Kids Great Migration Whales