

# Fins, Beaks and Flippers



## Theater Program Curriculum Grades 1-3



# Program Description

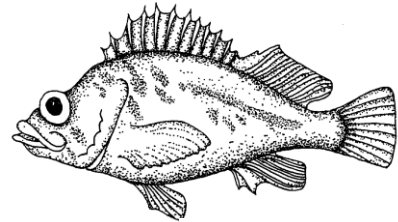
During this 30 minute theater program, one of our education staff members will introduce students to the variety of sizes, shapes and colors of ocean animals and some of the reasons for these variations. This program will focus on the adaptations of marine birds, fish and mammals using a PowerPoint presentation and costumes. Participating in this program and using the enclosed activities will help your students meet ODE Science Content Standards and national Ocean Literacy Principles.

## Chaperones

We ask for the chaperone's help to monitor the students' behavior during the theater program.

### Before your visit:

- Using pictures from magazines or drawings make ocean plant and animal cards. Use these and the enclosed **Flash Card Notebook activity** to familiarize students with organisms they may see at the Aquarium. Incorporate appropriate vocabulary, play a memory card game or use them as flash cards for plant and animal identification.
- Have your students complete the enclosed **Fins, Beaks and Flippers Word search** to familiarize them with the words they will be hearing in their lab program.
- Use the **Trying Out Taxonomy** activity to introduce your students to classification.



Rockfish

### During your visit:

- Provide your students and chaperones with copies of the **Oregon Coast Aquarium Self Guided Materials**. A master copy of the pages needed to create this booklet can be found on the Teacher Resources page at the Aquarium website, [www.aquarium.org](http://www.aquarium.org)

### After your visit:

- Have each student draw their favorite animal from the Aquarium and list some of the characteristics of their animal. For example, if it is a sea bird they might list beak, feathers and webbed feet.
- Use the animal flash cards to review characteristics of the animals they saw at the Aquarium.
- Use the **How Big Is It? Measuring activity** to review the sizes of the animals they saw at the Aquarium. Have your students research the sizes of other animals they encountered on their fieldtrip. Add them to the ropes.

## **Fins, Beaks and Flippers** addresses the following:

### **ODE Science Content Standards:**

- 1.1** Structure and Function: Living and non-living things have characteristics and properties.
  - 1.1P.1** Compare and contrast physical properties and composition of objects.
  - 1.1L.1** Compare and contrast characteristics among individuals within one plant or animal group.
- 1.2** Interaction and Change: Living and non-living things interact.
  - 1.2L.1** Describe the basic needs of living things.
- 2.1** Structure and function: Living and non-living things vary throughout the natural world.
  - 2.1L.1** Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.
- 3.1** Living and non-living things vary in their characteristics and properties.
  - 3.1L.1** Compare and contrast the characteristics of offspring and parents.

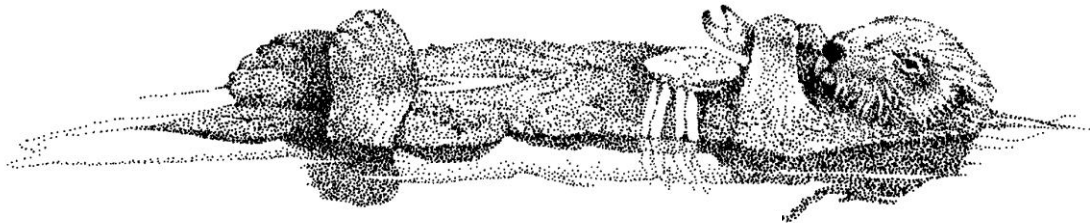
### **Ocean Literacy Principles:**

**Principle 5:** The ocean supports a great diversity of life and ecosystems.

**A:** Ocean life ranges in size from the smallest virus to the largest animal that has lived on Earth, the blue whale.

**C:** Some major groups are found exclusively in the ocean. The diversity of major groups of organisms is much greater in the ocean than on land.

**D:** Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.



Northern sea otter

## Creature Classification Background Information

**Classification** is the science of grouping organisms according to their form, structure and behavior. To do this, scientists identify characteristics, or adaptations. To classify an organism, we start with the most general characteristics and narrow down the categories to the most specific characteristics.

### Magnificent Mammals

Mammals come in all shapes and sizes, from the biggest whale to the tiniest vole. They all have certain characteristics in common, no matter what their size or shape. All mammals nurse their young with milk that the mother's body produces. Also, mammals all have hair, although some mammals, like some kinds of whales, lose their hair after they are born. Mammals are also warm-blooded, which means they must eat enough food to produce energy to keep their body temperature constant. Most mammals have teeth that come in different shapes and sizes and do different jobs. Finally, mammals are vertebrates (they have a backbone), and breathe air.

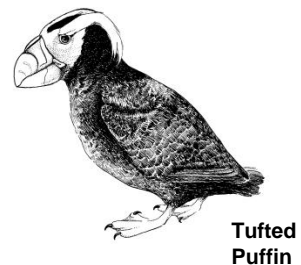


**Cetaceans** (whales and dolphins) are marine mammals with streamlined bodies, which they propel forward with their strong flukes, or tails. These flukes are supported by cartilage rather than bone. Cetaceans breathe at the water's surface through blowholes—modified nostrils—located on top of their heads. Two kinds of whales seen off our coast are killer whales and gray whales.

**Pinnipeds** are another group of mammals that includes seals, sea lions and walruses. Pinniped means “feather-footed”; their broad, paddlelike flippers are shaped like feathers. Two pinnipeds off our coast are California sea lions and harbor seals.

### Beautiful Birds

From the largest bird, the ostrich, to the smallest bird, the bee hummingbird, birds share common characteristics that separate them from all other groups of animals. Like mammals, birds are warm-blooded and care for their young, although they don't produce milk to feed them. Birds are vertebrates and the only animals that have feathers. Birds lay eggs and breathe air. All birds have wings, although some, like penguins, cannot fly.

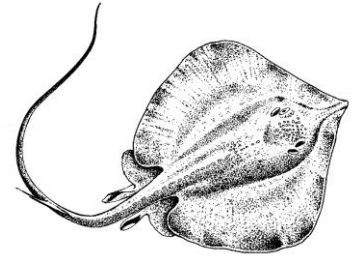


**Seabirds** found off our coast include tufted puffins, rhinoceros auklets, common murre and pigeon guillemots. These birds are generally plain colored. During breeding season, however, seabirds often grow brightly colored feathers and the skin on their feet and faces may become brilliant orange or red. Because they spend most of their life at sea, only coming ashore to find a mate and build a nest, their bodies are compact and look short or stubby when compared to other birds. Though awkward on land, under water they are more streamlined, and as they swim with their wings they appear to fly, steering with their feet.

**Shorebirds**, or waders, like the black oystercatcher, have long slender legs for wading, and long slender necks and bills for feeding. Shorebirds often have wings that are long and narrow for fast flight. An oystercatcher has a heavy build and a long bill with a blunt, laterally flattened tip that opens shellfish and chips limpets off the rocks.

## **Fabulous Fishes**

Fishes share the characteristics of having a backbone and fins. Some fish are jawless, like hagfishes and lampreys; some are bony fishes, like flounders, salmon and rockfishes; and some are cartilaginous fishes, like sharks, skates and rays. All fishes take oxygen from the water with gills and most are protected by scales. They have a backbone to support their body, and they move and balance themselves with fins.



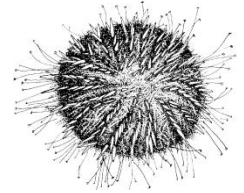
**Sting ray**

**Bony fishes**, such as sculpins, have an operculum that covers their gills, a skeleton made of bones, flexible fins, and most have scales that get bigger as the fish grows.

**Cartilaginous fishes**, such as sharks, have five to seven visible gill slits, a skeleton made of cartilage, rigid fins, and scales that increase in number as the fish grows.

## **The Invertebrates: Spineless Wonders**

Invertebrates are animals without backbones. Some common invertebrates along our coast are sea stars, sea urchins, sea cucumbers and sand dollars. These particular invertebrates are classified as echinoderms. Echinoderm means ‘spiny skinned.’ Most echinoderms have body plans with their mouth on the bottom and parts that come in fives—most sea stars have five arms, urchins have five rows of spines and sand dollars have a five-point pattern on their back. Echinoderms have a simple nervous system and no clear head. They also have a water-vascular system with tube feet for locomotion. Echinoderms have an internal skeleton composed of calcium.



**Sea urchin**

Other types of invertebrates include arthropods, such as shrimp and crabs, which all shed their exoskeleton to grow larger; cnidarians, such as jellyfish and anemones, which all have a ring of tentacles with stinging cells called nematocysts; and mollusks, like snails and chitons, which have a soft body, a foot for movement and a shell for protection.

## Vocabulary

**adaptation** (*A-dap-TAY-shun*): a characteristic, such as a body part, color pattern or behavior, that helps an organism survive in its environment.

**bird**: a member of the class Aves (*AY-veez*), a group of vertebrates that are warm-blooded, have feathers and lay eggs. Puffins, ducks and eagles are all birds.

**cetacean** (*she-TAY-shun*): a member of the order Cetacea (*she-TAY0shuh*), a group of marine mammals that includes whales, dolphins and porpoises.

**cnidarian** (*nie-DAIR-ee-un*): a member of the phylum Cnidaria (*nie-DAIR-ee-ah*), a group of invertebrates with baglike bodies, stinging cells and often with tentacles. Cnidarians include hydroids, sea anemones, jellyfishes and corals.

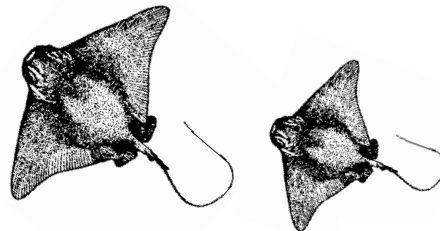
**echinoderm** (*ee-KIE-nuh-derm*): a member of the phylum Echinodermata (*ee-KIE-nuh-dur-MAH-tah*), a group of invertebrates with hard, spiny skeletons, radially symmetrical bodies and a water vascular system. Sea stars, sea urchins, sand dollars and sea cucumbers are echinoderms.

**fish**: a common name for an aquatic animal belonging to any of the four classes of fishes: Mixini (hagfishes), Cephalaspidomorphi (lampreys), Chondrichthyes (sharks, rays and relatives), and Osteichthyes (bony fishes). Fishes are vertebrates that are cold-blooded and have scales and gills. Leopard sharks, canary rockfish, wolf-eels and starry flounders are all fishes.

**mammal**: a member of the class Mammalia (*ma-MAY-lee-ah*), a group of vertebrates that are warm-blooded, have hair and nurse their young. Sea otters, whales and humans are mammals.

**marine mammal**: a mammal adapted to survive in a marine environment and dependent on it for food

**pinniped** (*PIH-nih-ped*): a member of the suborder Pinnipedia (*pih-nih-PEH-dee-ah*), a group of marine mammals with streamlined, torpedo-shaped bodies and long, paddlelike feet. Seals, sea lions and walrus are pinnipeds.



Bat rays

# Flash Card Notebook

## Lesson at a glance:

This activity will allow students to identify some of the animals they will see at the Aquarium.

## ODE Science Content Standards:

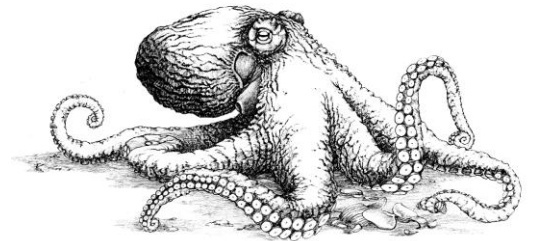
- 1.1 Structure and Function: Living and non-living things have characteristics and properties.
  - 1.1L.1 Compare and contrast characteristics among individuals within one plant or animal group.
- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 compare and contrast characteristics and behaviors of plants and animals and the environments where they live.
- 3.1 Structure and function: Living and non-living things vary in their characteristics and properties.

## Ocean Literacy Principles:

**Principle 5:** The ocean supports a great diversity of life and ecosystems.

## Materials:

- A copy of the flash cards for each student
- 25 solid colored 3x5 inch index cards for each student
- Crayons
- Glue for each student
- Scissors for each student (or pre-cut the flashcards)
- A hole punch
- Yarn or a binder ring



Giant Pacific Octopus

## Background information:

This activity will introduce the students to some of the animals they will see at the Aquarium during their visit.

## Activity:

1. Hand each student a set of flashcards, index cards, glue and scissors (if appropriate).
2. Have the students attach their flash cards to the index cards with the picture of the animal on one side and the information on the opposite side.
3. Have the students color the pictures of the animals.
4. Have the students decorate two of the remaining index cards. These will be the cover of their notebook.
5. Place the remaining six index cards at the back of the picture cards and inside the cover.
6. Punch a hole in the left hand corner of each animal card. Tie the cards together using either yarn or a binder ring to complete the notebook.
7. Have the students share their notebooks with their classmates.

**Summary:**

1. During or following their visit to the Aquarium, have your students draw some of the other animals they saw at the Aquarium.
2. Review what the students learned about the animals at the Aquarium.
3. Have the students write interesting facts they learned on their trip on the opposite side of their picture.

**Continuation:**

1. Have the students identify which animals are predators and which animals are prey animals. Can they create a food chain using the animals in their notebooks?

**Assessment:**

1. Have the students write a story about the animals in their notebook.
2. Have the students draw a picture of the animals in their notebook. Are they able to place the animals in their correct habitats? Are they able to label the animals in their drawing?

## Flash Cards

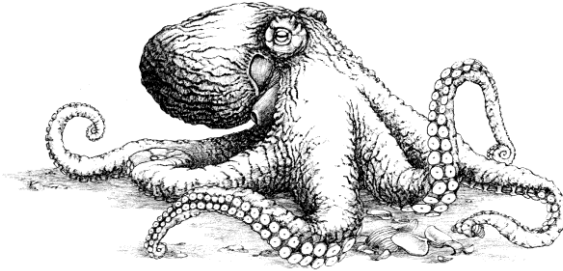
### Giant Pacific octopus

**Size:** Arm span to about 16 feet; weigh from 10 to 200 pounds. The largest Giant Pacific octopus recorded had an arm span of over 27 feet – about as long as a classroom!

**Color:** Red to reddish-brown. They can change their skin color and texture to help them blend in with their environment.

**Diet:** Shrimps, crabs, scallops, abalones, clams, smaller octopuses and fishes.

**Did you know?** Researchers consider the octopus to be the smartest of all invertebrates, with about the same intelligence as a house cat.



 OREGON COAST  
AQUARIUM

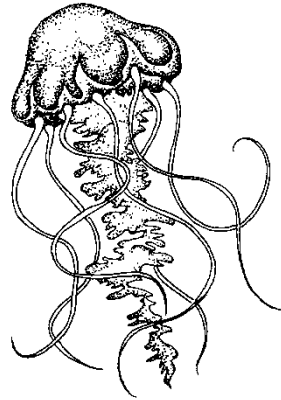
### Sea nettle

**Size:** The bell may grow to 11 inches in diameter. The tentacles may reach a length of 7 ½ feet.

**Color:** The bell of the sea nettle is brown or tan in color with a ring of reddish tentacles at the edge. Their four ribbon-like oral arms are also reddish in color.

**Diet:** They consume small fishes, crustaceans, and plankton.

**Did you know?** Sea nettle tentacles have powerful stingers called nematocysts.



 OREGON COAST  
AQUARIUM

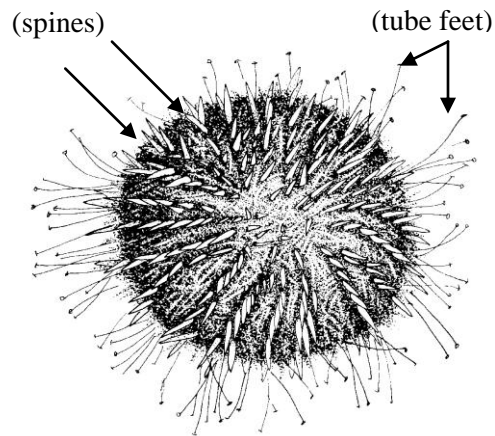
## Purple sea urchin

**Size:** Grow to about 4 inches across.

**Color:** Purple.

**Diet:** Urchins eat mostly kelp and other brown and red seaweeds. They will sometimes catch small animals with their tube feet.

**Did you know?** A sea urchin's jaw is called Aristotle's lantern. The jaw has five teeth, and they are strong enough to scrape holes in the rocks for urchins to sit in. The holes also allow for the urchin to stay cool and wet when the tide goes out.



 OREGON COAST  
AQUARIUM

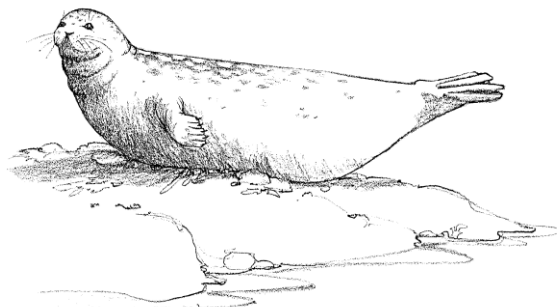
## Harbor seal

**Size:** Males: about 6 feet long and 370 pounds. Females are slightly smaller.

**Color:** Tan to silver with dark spots or dark with light spots or rings.

**Diet:** A variety of fish and squid.

**Did you know?** Harbor seals use their back flippers in a side-to-side motion to swim. They use their pectoral (front) flippers to steer and slow down. Since harbor seals cannot stand up on their flippers, they move in a caterpillar-like motion when on land.



 OREGON COAST  
AQUARIUM

## Northern sea otter

**Size:** Grow to about 5 feet long and up to 100 pounds.

**Color:** Dark brown; blond to light brown head.

**Diet:** Sea urchins, abalone, crabs, clams, squid, shrimp, mussels, fish and sea stars.

**Did you know?** A sea otter's body is covered with a very thick fur having up to one million hairs per square inch -- humans only have about 100,000 hairs on their whole head! Sea otters eat 25 percent of their body weight a day. Sometimes they use a tool, such as a rock, to break open the hard shells of prey.



 OREGON COAST  
AQUARIUM

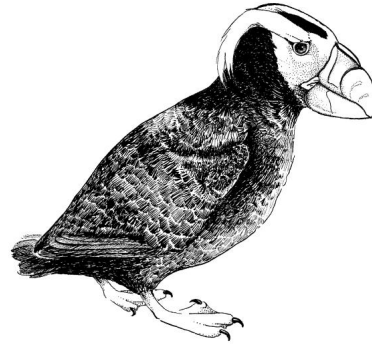
## Tufted puffin

**Size:** About 15 inches long

**Color:** They are black with orange bills and feet. In the spring and summer, their faces turn white, yellow feather tufts grow above their eyes and their beaks turn red-orange with an olive-green bill plate.

**Diet:** They dive and swim under water to catch small fishes and invertebrates especially squid.

**Did you know?** These seabirds spend most of their lives out on the ocean



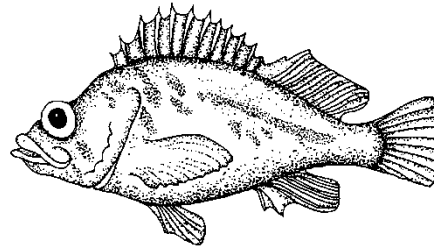
## Yelloweye rockfish

**Size:** Up to 3 feet long

**Color:** Yelloweye rockfish are reddish orange in color with black edges on their fins. They have bright yellow eyes.

**Diet:** They feed on smaller fish, shrimp and crabs.

**Did you know?** They are one of the largest kinds of rockfish. A female yelloweye rockfish may give birth to 3 million young.



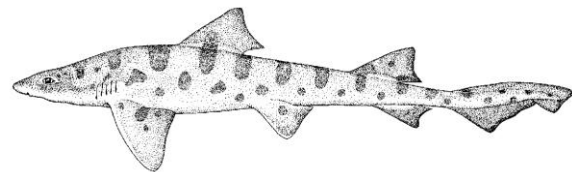
## Leopard shark

**Size:** Up to 6.5 feet long

**Color:** Silvery gray or brown with black spots and wide black stripes.

**Diet:** Worms, shrimps, crabs, fishes, fish eggs and clams.

**Did you know?** Leopard sharks are shy, slow swimming sharks. They have been seen burrowed face first into the sand and mud in search of food. Leopard sharks live close to the shore and often visits bays.



## Fins, Beaks and Flippers Word Search

### Lesson at a glance:

By completing a word search and fill-in-the blank questions, student will become familiar with the characteristics of four animal groups. They will also become familiar with the spelling and meanings of many of the vocabulary words they will use during their lab program.

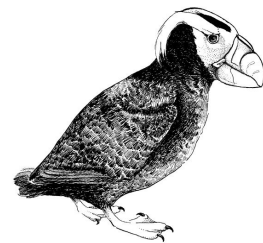
### Oregon Content Standards:

#### SCIENCE

- **Third Grade:** 3.1 Structure and Function: Living and non-living things vary in their characteristics and properties.

#### OTHER CONTENT AREAS

Nonfiction reading and vocabulary



Tufted puffin

### Ocean Literacy: Essential Principles and Fundamental Concepts

#### 5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

### Materials:

- One **Fins, Beaks and Flippers Word Search** activity sheet per student
- A pen or pencil per student

### Background:

Classification is the science of grouping organisms according to their form, structure and behavior. To do this, scientists identify characteristics, or adaptations. To classify an organism, we start with the most general characteristics and narrow down the categories to the most specific characteristics.

For example, like all groups of animals, mammals all share certain characteristics, no matter what their size or shape. All mammals nurse their young with milk that the mother's body produces. Also, mammals all have hair, although some mammals, such as some kinds of whales, lose their hair after they are born. Mammals are also warm-blooded, which means they must eat enough food to produce energy to keep their body temperature constant. Most mammals have teeth that come in different shapes and sizes and do different jobs. Finally, mammals are vertebrates (they have a backbone), and breathe air.

By completing this activity, your students will become familiar with characteristics of mammals, birds, fish and echinoderms.

### Activity:

1. As you review the material in the Creature Classification Background sheet with your students, introduce them to the vocabulary words in the activity.
2. Give each student a copy of the Sea Sleuth Word Search worksheet and have them find the words and name the animal groups.

**Summary:**

- Go over the answers to the word search with your students. Review the characteristics of each animal groups as you go through each section of the worksheet.
- Have your students practice classifying other animals, plants and objects by their characteristics.
- Have your students cut out five animal pictures from a magazine and bring them in to class. As a group, have your students work together to classify their pictures based on the animals' characteristics.

## Fins, Beaks and Flippers Word Search

**Directions:**

- Find and circle the words hidden in the word searches below.
- Look at the words listed next to each puzzle and decide which group of animals has these characteristics.
- Finish the sentence below each puzzle by selecting the name that scientists give that animal group. Your word choices are mammal, fish, echinoderm and bird.

**1. Find the words: BEAK, EGGS, FEATHERS, WINGS, VERTEBRAE**

F	E	A	T	H	E	R	S	S
F	O	O	D	S	G	A	G	M
H	I	W	I	N	G	S	B	I
A	B	D	C	J	S	P	E	L
V	E	R	T	E	D	R	A	E
Q	O	L	E	R	S	E	K	S
W	E	P	U	F	F	I	N	M

An animal with these characteristics is called a \_\_\_\_\_.

**Bonus:** Find the name of a black animal with yellow tufts and a white face. Write it here: \_\_\_\_\_.



2. Find the words: FUR, MILK, TEETH, WARM BLOOD, LIVE BIRTH, BREATHE AIR, VERTEBRAE

F	U	R	T	H	E	R	S	O	V	B	H
G	B	M	E	J	K	Y	J	P	E	R	A
F	O	I	E	S	G	A	G	A	R	E	R
H	I	L	T	N	G	S	B	I	T	A	B
A	B	K	H	J	S	P	E	D	E	T	O
W	A	R	M	B	L	O	O	D	B	H	R
L	I	V	E	B	I	R	T	H	R	E	S
Q	O	L	E	R	S	E	K	S	A	A	E
A	S	D	F	G	H	J	K	L	E	I	A
G	O	O	D	L	U	C	K	T	O	R	L

An animal with these characteristics is called a \_\_\_\_\_.

**Bonus:** Find the name of a furry animal with spots that can not walk on land. Write it here: \_\_\_\_\_.



3. Find the words: SCALES, FINS, GILLS, LAY EGGS, COLD BLOODED, VERTEBRAE

F	U	R	T	H	E	R	B	O	V	S	H
G	I	L	L	S	K	Y	R	P	E	C	A
F	V	E	R	T	E	R	E	A	R	A	P
H	I	L	T	N	G	S	A	I	T	L	P
A	B	L	A	Y	E	G	G	S	E	E	Y
F	I	N	S	B	L	O	S	D	B	S	D
L	I	V	E	B	I	R	T	H	R	A	A
Q	O	L	E	R	S	E	K	S	A	I	Y
C	O	L	D	B	L	O	O	D	E	D	S
F	L	A	T	F	I	S	H	H	A	R	K

An animal with these characteristics is called a \_\_\_\_\_.

**Bonus:** Find the name of an animal with both its eyes on the same side of its head. Write it here: \_\_\_\_\_.



## Fins, Beaks and Flippers Word Search Answer Key

1. Find the words: BEAK, EGGS, FEATHERS, WINGS, VERTEBRAE

F	E	A	T	H	E	R	S	S
F	O	O	D	S	G	A	G	M
H	I	W	I	N	G	S	B	I
A	B	D	C	J	S	P	E	L
V	E	R	T	E	B	R	A	E
Q	O	L	E	R	S	E	K	S
W	E	P	U	F	F	I	N	M

An animal with these characteristics is called a **bird**.

**Bonus:** Find the name of a black animal with yellow tufts and a white face. Write it here: **puffin**.

2. Find the words: FUR, MILK, TEETH, WARM BLOOD, LIVE BIRTH, BREATHE AIR, VERTEBRAE

F	U	R	T	H	E	R	S	O	V	B	H
G	B	M	E	J	K	Y	J	P	E	R	A
F	O	I	E	S	G	A	G	A	R	E	R
H	I	L	T	N	G	S	B	I	T	A	B
A	B	K	H	J	S	P	E	D	E	T	O
W	A	R	M	B	L	O	O	D	B	H	R
L	I	V	E	B	I	R	T	H	R	E	S
Q	O	L	E	R	S	E	K	S	A	A	E
A	S	D	M	A	M	T	A	L	E	I	A
G	O	O	D	L	U	C	K	T	O	R	L

An animal with these characteristics is called a **mammal**.

**Bonus:** Find the name of a furry animal with spots that can't walk on land. Write it here: **Harbor Seal**.

2. Find the words: SCALES, FINS, GILLS, LAY EGGS, COLD BLOODED, VERTEBRAE

F	U	R	T	H	E	R	B	O	V	S	H
G	I	L	L	S	K	Y	R	P	E	C	A
F	V	E	R	T	E	R	E	A	R	A	P
H	I	L	T	N	G	S	A	I	T	L	P
A	B	L	A	Y	E	G	G	S	E	E	Y
F	I	N	S	B	L	O	S	D	B	S	D
L	I	V	E	B	I	R	T	H	R	A	A
Q	O	L	E	R	S	E	K	S	A	I	Y
C	O	L	D	B	L	O	O	D	E	D	S
F	L	A	T	F	I	S	H	H	A	R	K

An animal with these characteristics is called a **fish**.

**Bonus:** Find the name of an animal with both its eyes on the same side of its head. Write it here: Flatfish

# How Big Is It?

## Lesson at a glance:

Students will measure out the maximum lengths of a variety of ocean animals.

## Oregon Content Standards:

### SCIENCE

- **First Grade:** 1.1L.1 Compare and contrast characteristics among individuals within one plant or animal group.
- **Second Grade:** 1.1 Structure and Function: Living and non-living things have characteristics and properties.
- **Third Grade:** 3.1 Structure and Function: Living and non-living things vary in their characteristics and properties.

### MATH

- **Kindergarten:** K.1.2 Connect numbers, including written numerals, to the quantities they represent, using various physical models and representations.
- **Second Grade:** Use rulers and other measurement tools to estimate and measure length in common units.

## Ocean Literacy: Essential Principles and Fundamental Concepts

### 5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.a. Ocean life ranges in size from the smallest virus to the largest animal that has lived on Earth, the blue whale.

## Materials:

- ❑ Two 60-foot lengths of clothesline
- ❑ Cable ties
- ❑ Laminating materials
- ❑ Permanent markers
- ❑ A measuring tape for each small group of students
- ❑ Two copies of the attached animal pictures with their lengths



Leopard shark

## Background:

Lined hermit crab	¾ inch
Ochre star	12 inches
Tufted puffin	26 inches
Sunflower star	52 inches
Wolf-eel	5 feet
Leopard shark	6 feet
Brown pelican (wingspan)	8 feet
California sea lion (adult male)	10 ½ feet
Killer whale (adult male)	27 feet
Whale shark	49 feet
Gray whale (adult female)	50 feet
Sperm whale (adult male)	60 feet

### **Activity:**

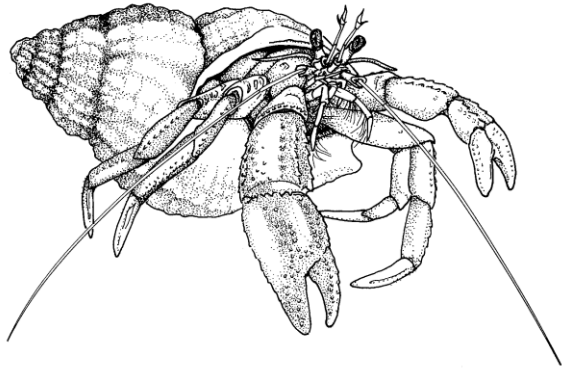
1. Before class, cut apart the pictures, laminate them (this should prevent them from tearing when they are attached to the rope), and punch a hole near the top for attachment to the rope.
2. Divide your class in half (each half will be working with a separate rope).
3. Divide the students from each half into groups of two or three.
4. Give each small group a laminated, punched picture and a marking pen.
5. Ask each small group of students to measure out the length of their animal, all using the same end of the clothesline as a starting point.
6. When they reach their point on the clothesline, have them mark it with permanent marker and then attach their picture with a cable tie.
7. Ask each small group of students to stand at the length of their animal.

### **Summary**

- Have the students share with their classmates the name of their animal and how long it is.
- Did the two sets of measurements match? Why or why not? Relate this question to why scientists do the same experiment many times before they are satisfied that their results are accurate
- Have the students record how many of their footsteps equal the various lengths.
- Have your students design a bar graph with all of the animals.

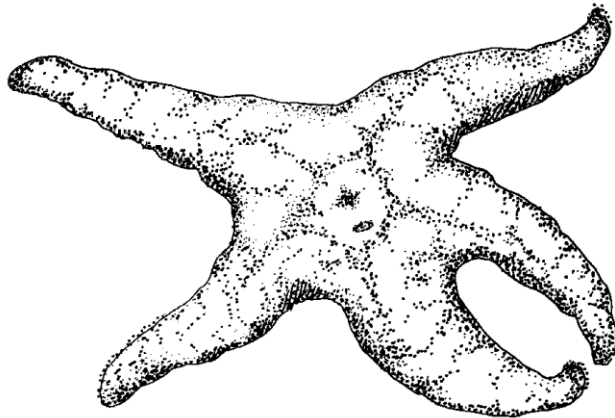
### **Extensions:**

- Have the students write a research report on their animal. Have them include where the animal lives, what and how it eats and other interesting information. Have them share it with the class.
- Once the animals are researched, have the students create a mural showing where their animals live. Use the pictures again and create food chain based on the research your students completed on food choices.
- Have your students measure their height. How many of them does it take to equal the length of a wolf-eel, a killer whale, a gray whale or a leopard shark? How many hermit crabs would it take to equal their height?



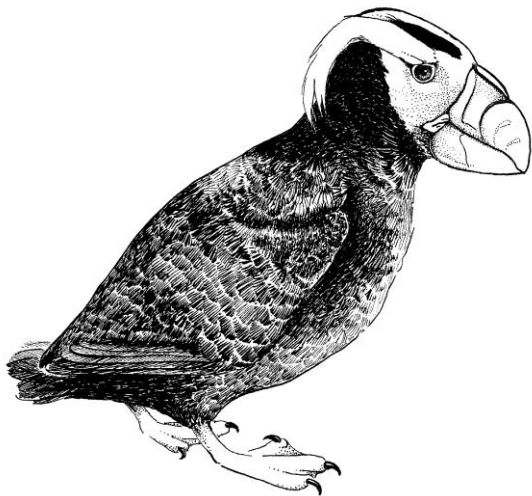
**Lined Hermit Crab**  
 **$\frac{3}{4}$  inch**

---

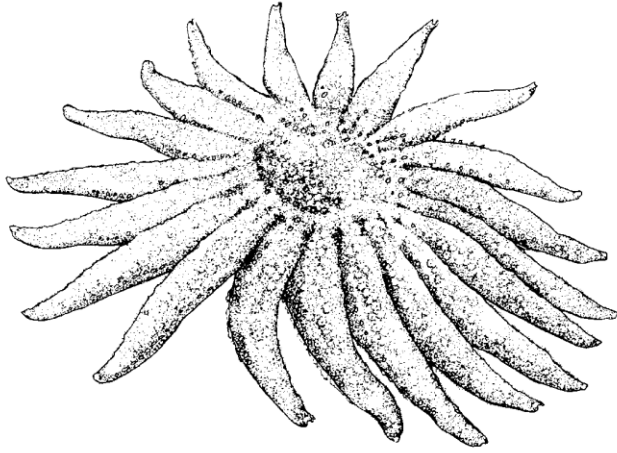


**Ochre Star**  
**12 inches**

---

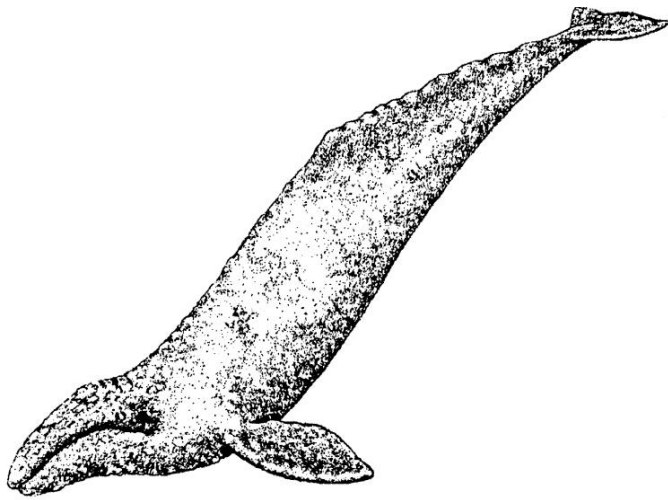


**Tufted Puffin**  
**(wingspan)**  
**36 inches**



**Sunflower  
Star  
52 inches**

---

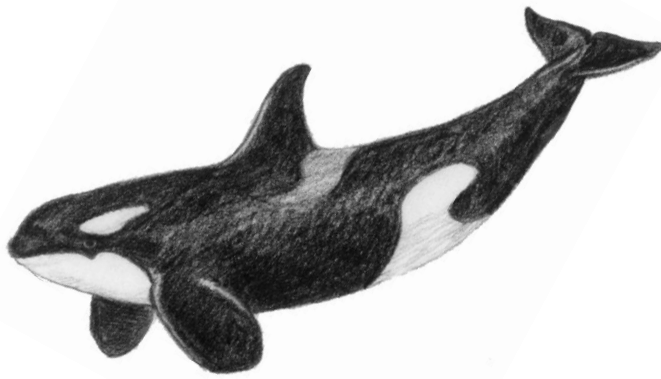


**Gray Whale  
(adult female)  
50 feet**

---

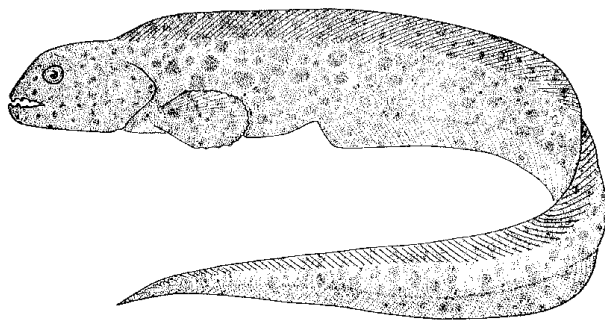


**Leopard Shark  
6 feet**



**Killer Whale**  
**(adult male)**  
**27 feet**

---

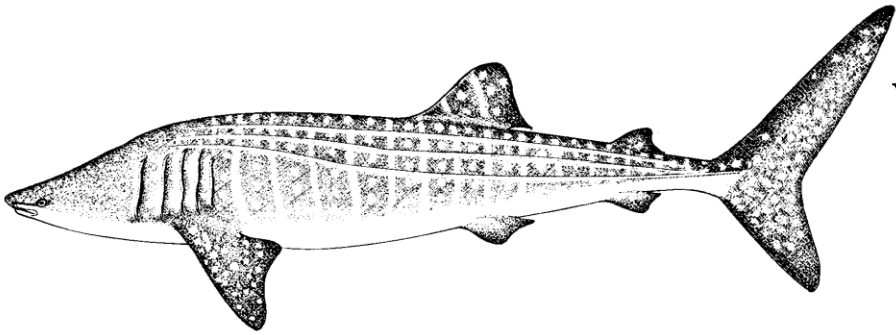


**Wolf-eel**  
**5 feet**

---

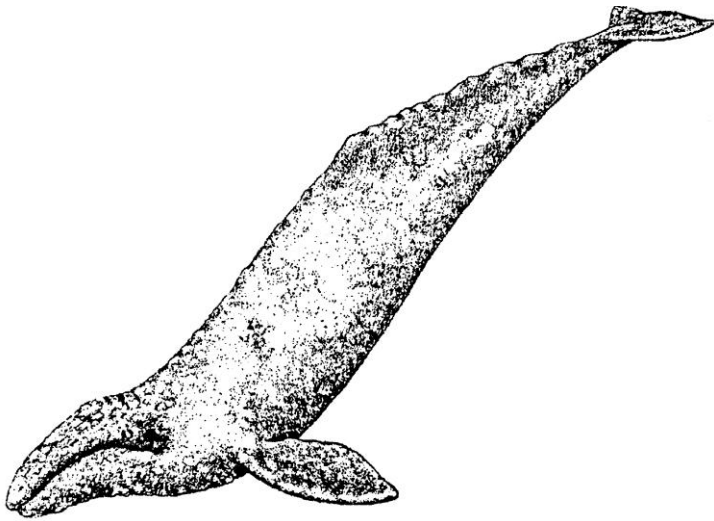


**California Sea Lion**  
**(adult male)**  
**10 ½ feet**



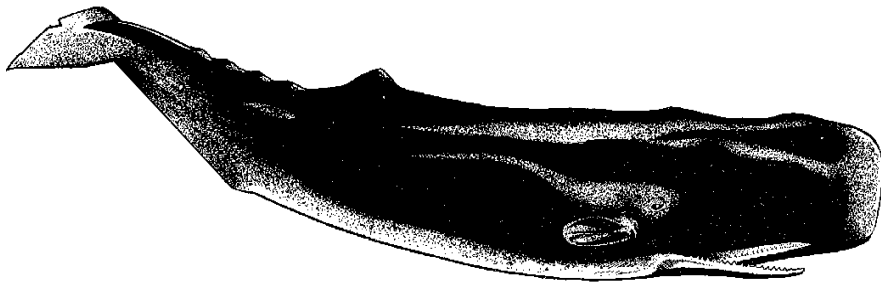
**Whale shark**  
**49 feet**

---

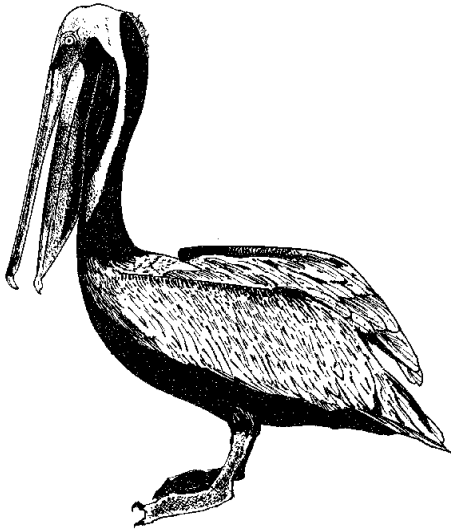


**Gray Whale**  
**(adult female)**  
**40 feet**

---



**Sperm Whale**  
**(adult male)**  
**60 feet**



**Brown Pelican**  
**(wingspan 8 feet)**

# Trying Out Taxonomy

## Lesson at a glance:

Students will demonstrate basic observation and classification skills as they sort objects by their characteristics. The primary objective of this activity is to prepare students to learn about taxonomy, the scientific classification of organisms.

## ODE Science Content Standards:

- 1.1 Structure and Function: Living and non-living things have characteristics and properties.
  - 1.1L.1 Compare and contrast characteristics among individuals within one plant or animal group.
- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 compare and contrast characteristics and behaviors of plants and animals and the environments where they live.
- 3.1 Structure and function: Living and non-living things vary in their characteristics and properties.

## Ocean Literacy Principles:

**Principle 5:** The ocean supports a great diversity of life and ecosystems.

## Materials:

*Step one:*

- Inanimate objects for classification

*Step two:*

- Pictures of vertebrates that your students will be familiar with (be sure to include animals from each group: mammals, birds, reptiles, amphibians and fish)

*Step three:*

- Pictures of invertebrates from some of the major phyla: Arthropoda, porifera, Mollusca, Echinodermata and Cnidaria (include Annelida [major worm group] and Porifera [sponges] as well, if possible)
- Age-appropriate handout describing the major invertebrate phyla (included in this binder)

## Background Information:

Taxonomy is the science of grouping organisms hierarchically according to similar structural characteristics. The broadcast category of organisms is the kingdom, of which there are five: Monera, Protista, Fungi, Plantae and Animalia. A kingdom is further divided into phyla (singular: phylum), each phyla is broken into classes, classes are broken into orders, orders into families, families into genera (singular: genus), and genera into species (singular: species). Sometimes taxonomists have felt the need for categories between these standard ones, giving rise to groups such as superclasses and subfamilies.

Taxonomy began as a way for scientists to better understand the relationships between the organisms they studied. This has been an ongoing process. As scientists continue to explore the natural environment they continue to learn more about currently described organisms and discover new organisms each day. While one goal of developing a taxonomic system may have been to simplify our understanding of the life we

study, an absence of consensus among scientists as to exactly how things should be grouped has created much confusion.

### **Activity:**

*Note:* Explain to your students that as they work in their groups they may not always completely agree about how to classify their organisms (scientists have been disagreeing about the taxonomy [scientific classification] of organisms for centuries). Students will find many different ways to classify each item and one way isn't always better than another. However, they will need to agree on how they will present their groups to the class.

#### ***Step one:***

1. With younger students, you may want to begin this lesson by leading a class activity in which students classify different colored and sized shapes. This can be done on the board as a class or in small groups.
2. Define and discuss characteristics as a class. Use an inanimate object (such as a desk) as an example (compare the teacher's desk to the students' desks). Then carry the discussion a step further by discussing human characteristics and the characteristics that we share with other mammals (Mammalia is a class in the phylum Chordata, which includes all of the vertebrates).
3. When you are ready to begin the classification activity, divide your students into groups of a least three students each.
4. Give each group 10 to 20 objects and ask them to sort (classify) their objects into groups by their common characteristics. Characteristics for students to look for include: shape, size, color or function (ie. pens and pencils could be grouped together because they are both used for writing). *Object suggestions:* classroom supplies, candy or other food items, clothing, household tools (silverware, frying pan, Scotch tape, soap, etc.).
5. As the students group their items, have them write down the shared characteristics of the objects in each of their groups.
6. Tell students that they must be able to give reasons why they grouped their items the way they did.
7. Have students present and defend their classification system to the class.

#### ***Step two:***

1. Give each group of students 15 or more pictures of familiar animals.
2. Ask them to list characteristics for each animal. They should list obvious visual characteristics, but they should also be able to draw from prior knowledge about each animal. For example, students may know how each animal moves, what it eats (herbivore or carnivore) or other adaptations for survival such as being warm or cold-blooded or having hair, scales or feathers.
3. Have them classify their animals based on their existing knowledge.
4. Conclude the activity with a discussion of the characteristics of each vertebrate group (fish [bony and cartilaginous], mammals, birds, reptiles, amphibians), so students can compare how they classified their organisms versus how scientists have classified them.
5. Define taxonomy (for older students) and discuss the advantages of classifying organisms by the characteristics.
6. Discuss taxonomic groups:
  - a. For younger students you may only want to discuss the how plants and animals are divided into two kingdoms. Inside each kingdom there are many smaller groups. We belong to the group of animals that have backbones. Animals without backbones are divided up into lots of different groups. For example, insects are one group of invertebrates (animals without backbones).

- b. For older students introduce the major taxonomic groups: Kingdom, Phylum, Class, Order, Family, Genus, Species. A giant Pacific octopus is classified below as an example:

Kingdom: Animalia

Phylum: Mollusca (means “soft body”)

Class: Cephalopoda (means “head foot”)

Order: Octopoda (means “eight feet”)

Family: Octopodidae

Genus: *Octopus*

Species: *dofleini* (a “Latinized” version of the name of the scientist who is credited with describing the giant Pacific octopus)

***Step three:***

1. Begin by asking students to define “invertebrate.”
2. Tell them that unlike the animals they just classified, invertebrates have no backbone (some don’t even have a brain) yet they still move, eat, reproduce and protect themselves from predators or harsh environmental conditions.
3. Give each group 25 or more pictures of invertebrates. They don’t all have to be marine – land animals (snails, slugs and earthworms) and arthropods (insects, spiders . . .) could also be included. There are many images of the various marine phyla included with this activity and throughout this binder.
4. Explain to students that even scientists don’t all agree about exactly how some of these animals should be grouped together, and that for this activity you are not looking for them to come up with the actual scientific groups, but rather recognize similarities among the animals.
5. Have students list visible characteristics for each group they’ve classified.
6. Have students present their groupings to the class by taping their pictures to the wall or a poster board.
7. Once all the groups are finished classifying their organisms and have come up with a list of characteristics for each group, go over the major invertebrate phyla and their characteristics.

**Extensions:**

1. Have students create collages of animals in their correct taxonomic groups.
2. Have older students research an animal and find its phylum, class, order, family, genus and species.
3. Have students come up with a mnemonic device to help them remember the taxonomic groups.

For example:

Kingdom – *King*

Phylum – *Philip*

Class – *came*

Order – *over*

Family – *from*

Genus – *Germany*

Species – *swimming*

4. Discuss how over the years scientists have had to add groups in between the main taxonomic groups to accommodate new knowledge and new animals. For example, subphylum, superclass, subclass, infraorder, suborder, etc.

## Collaborative Work Skills: Trying Out Taxonomy Assessment

Student Name: \_\_\_\_\_

CATEGORY	4	3	2	1	Score
<b>Contributions</b>	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.	
<b>Quality of Work</b>	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked/redone by other group members to ensure quality.	Provides work that usually needs to be checked/redone by others to ensure quality.	
<b>Problem-solving</b>	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest or refine solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.	
<b>Attitude</b>	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is publicly critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).	
<b>Focus on the task</b>	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.	
<b>Working with Others</b>	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares, with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.	