Bizarre and Beautiful

Objective:

1. Students will demonstrate an understanding of adaptations among specific marine species.

2. Students will analyze diversity and behavior related to species being discussed.

3. Students will identify marine vertebrates and invertebrates.

4. Students will be able to hypothesize about changes in marine life environments due to pollution.

Grade 3 – 5

Key Vocabulary:

- **Vertebrate**
- **Invertebrate**
- **Camouflage**
- **Cephalopod**

Related Literature:

Ocean
Seymour Simon

Life in the Ocean: The Story of Oceanographers
Sylvia Earle

Sea Life Funny & Weird
P. T. Hersom

Fish are Fantastic
Selena Dale

Performance Objectives:

Grade 3: Strand 4: Concept 4 – PO 1-3
NGSS: 3-LS4-3-C
Grade 4: Strand 4: Concept 1 – PO 1-2; Concept 4
NGSS: 4-LS1-1-A
Grade 5: Strand 4: Concept 3 – PO 1
NGSS: 5-LS2-A

Background Information:

The ocean is filled with bizarre-looking creatures that have found a way to survive in a challenging environment. These creatures have developed specialized features to adapt to their habitat. Their body and function has changed over time to sustain their species in the ocean world.
The seahorse is an interesting and unusual creature of the ocean. Seahorses are one of the smallest species of **vertebrates**, which means they have a bony skeleton. A vertebrate is any animal with a backbone (fish, seahorses, people, mammals). These tiny creatures can range in size from 0.9 inch, smaller than your pinky

finger, to 12 inches, which is the same length as a ruler. The smallest sea horse is the pygmy sea horse, while the largest sea horse is the pot-bellied sea horse They live their lives in tropical waters around the world and can be found in reef areas with an abundance of food.

Seahorses have a very specialized type of skin that allows them to change colors to copy their surroundings. The seahorse can **camouflage** (an animal's ability to make itself look like it's environment) itself on pieces of sea grass to stay protected from predators. Both tiny and difficult to see, the seahorse can live up to 6 years.

The most distinct trait of the seahorse is the shape of the head. The long nose, which looks like that of a horse, is used to suck up food. The sea horse has the fastest strike of any predator on earth. Seahorses are **omnivores** who eat brine shrimp, plankton, and algae. Their eyes can move in all different directions at the same time like that of a chameleon. The long **prehensile** (able to grasp or flex) tail of a seahorse is used to glide through the water and to cling onto marine plants and coral.

The male seahorse is the one who gives birth to its young making far different from other animals. The female lays eggs, but the male seahorse stores them in a special pouch (brood pouch) on the front of its body. In about 3 weeks, the dozens to hundreds of eggs hatch and the seahorse pushes the babies out of the pouch. Baby seahorses look just like the adults, except they are very tiny.

Just like their parents, the baby seahorses use their dorsal (fin on the back) and pectoral (on the side of the head) fins to move themselves through the water. Near their pectoral fins are where their gills are located. They will wrap their tails around a piece of sea grass and begin life on their own.

There are about 47 species of seahorses found in the world. They are considered highly endangered because of loss of habitat, pollution, and over-fishing.

Seahorses prefer the shallower waters for coral and food. Due to corals sensitivity

to changes in the water quality this causes profound impact on all animals within coral reefs. **Conservation** and education may be the most important ways to protect these bizarre and delicate creatures.

The seahorse has bony plates around its body that protect it from predators. The plates cause the seahorse to move by gliding. On top of the seahorse's head is the 'coronet.' Resembling a crown, the coronet is as unique to the seahorse as a fingerprint is to a human.

Octopus

An **invertebrate** is an animal that does have a bony skeleton, rather the body is held together through other means. What is the most intelligent invertebrate in the ocean? You guessed it, the octopus! This eight-legged bizarre creature is known as a **cephalopod** (squids, octopus, cuttlefish, and nautiluses) and is part of the family of creatures that has flexible movement. The word cephalopod broken down in Latin means head/foot. They have a body structure where the body appears to be head attached to tentacles or arms. Like their friends the jellyfish, octopus move by using propulsion, which means they move in the opposite direction as the water being pushed out of their body. Living mainly on the ocean floor, the octopus can shoot itself quickly through the water or into a small crack in the rock to hide. The soft body allows the octopus to fit its entire body into spaces the size of its eye or beak and escape a predator.

There are about 300 different species of octopuses each species has adapted to different habitats. The largest, the giant octopus, can grow up to 23 feet from arm to arm and weigh about 400 pounds, while the smallest is only less then inch long. Known for its building skills, the octopus often collects shells to construct a home where it can hide from larger creatures. Oceanographers refer to this type of home as an octopus garden. Female octopuses lay their eggs in these homes for protection.

The octopus has suction cups are on the underside of its arms. There are two rows of suction cups that go all the way to the tip of each arm. These help it grip tightly to almost any surface. The 'beak' is the mouth of the octopus and is located at the center under the body. The beak is used to break apart the food such as crabs, shrimp and clams.

The eyes of the octopus are located on each side of its head and provide a great view of the surroundings. Octopuses cannot hear so in place they very good eyesight. An octopus has three hearts and each serves a purpose. Two hearts pump

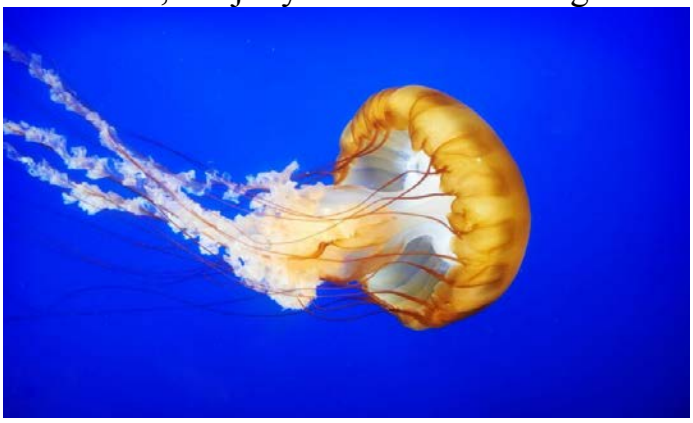
blood through the gills so the octopus can breathe and the other heart pumps blood through the rest of its body.
If an octopus feels threatened, it can shoot out black ‘ink’ to cloud the water and make a fast getaway. A master of disguise, the octopus can mimic its surroundings by altering its shape and color.

Chromatophores are the cells in the skin of octopus and other Cephalopods that help them change color and texture.

Jellyfish

Jellyfish are invertebrate creature that have the ability to live in the ocean without a brain, skeleton, or respiratory system. So what does a jellyfish have in its body? These creatures are filled with a jelly-like substance called mesoglea. The body of a jellyfish can float and bob around the water using a simple set of nerves. They can smell and detect light and are part of the phylum, Cnidaria, of creatures that also includes sea anemones and corals. Because they are an invertebrate they do not have backbone, this means even though they are called jelly “fish” they are not true fish. Jellyfish have a central body with long and short tentacles. Most jellyfish have stinging cells on the tentacles called nematocysts. These cells allow the jellyfish to catch prey. Its mouth located under the center of the body.
The preferred diet for a jellyfish is fish eggs, fish larvae, plankton eggs, small plants, and even other jellyfish. Natural predators of jellyfish are large fish and turtles.
In the wild, jellyfish live about a year, depending on the species. In the medusa (adult) stage of the life cycle, the jellyfish can float with currents as its tentacles hang down into the water. The young produced by both male and female jellyfish

float down to the ocean floor landing on rocks or shells and begin to grow quickly. As an adult, the jellyfish will drift along in the ocean.

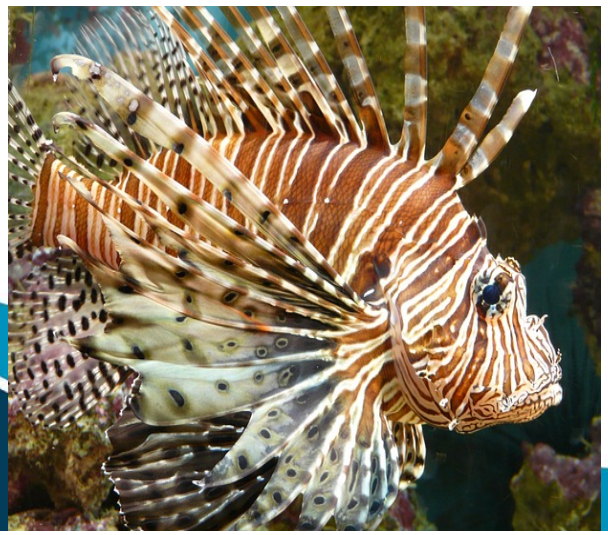


Jellyfish can be found around the world and have been seen in some areas floating in large groups of thousands, which scientists call a 'bloom.' It is believed that blooms occur when ocean currents come together. While no one is completely sure what causes blooms, scientists are studying them. Scientists are also studying the impact of changes in the ocean. Jellyfish population is affected by the overfishing of natural predators.

Moon Jellies

Lionfish

Among the bizarre marine creatures that swim in the deep are the often-controversial lionfish. These beautifully colored fish are a species to stay away from. These lionfish have venom on the tips of the top fins used for self-defense. Their warning coloration (brightly colored) can also attract prey. These carnivores eat fish and crustaceans, often using a surprise attack to catch prey while swimming and hunting during the day. Lionfish can grow up to 16 inches long and are known for their beautiful stripes. Lionfish prefer being alone and defending their personal territory. Which may be a small patch or coral or cervices, they will defend it by ether biting or stinging. In the wild, lionfish can live up to 15 years.



Once native to the South Pacific and Indian Ocean, lionfish are now found in many other warm water areas of the ocean like the Caribbean. These slow movers rely on their venom to keep them safe from predators like eels and bigger fish.
Scientists have reported that lionfish produce young rapidly and in large numbers, which can have a negative impact on habitats. Since they have few natural predators, large numbers of lionfish can consume the food supply in a habitat very quickly. For example, lionfish were introduced to the Atlantic Ocean when people released their aquarium pets, and now there are thousands of lionfish that are eating the food supply of other types of fish. Lionfish are not currently considered endangered or threatened.

Crabs and Lobsters

Meet one of the members of the Arthropod family. Arthropod translates to "jointed foot" as they are known for their jointed appendages, or legs. Arthropods are also known to have an exoskeleton that they molt, or shed, as they grow. You may think of arthropods as being spiders, and that would be accurate; however, the phylum includes crabs and lobsters too! There are numerous species of crabs and lobsters living in the oceans of the world.

Crab and lobster shells are an exoskeleton, or outside skeleton, that is used for protection. The exoskeleton is made mostly of calcium will be shed as the crab grows. The process is called molting, and it takes place often in young crabs and less often as adults. Crabs have walking legs and claws called chelipeds to move them along and assist them in catching food.
The red king crab is one of the larger species and is known for its dark red color. They can grow to have a five-foot leg span and are closely related to the king crab found in the Southern Hemisphere where the water is warmer. Scientists believe that the king crab is a descendant of the hermit crab; what a size difference!
Both the red king crab and the king crab are a food source for humans. Popular for their taste, crabs are fished and supplied as food all around the world. Their cousin the lobster is much the same. Lobster is a food found on many fine dining menus. Lobsters are crustaceans that live on the ocean floor. Their natural habitat can be the open sandy floor or in rocky crevices where they can tuck their body away from predators. Characteristic of lobsters are their ten legs and poor eyesight. Some lobsters like Maine lobster are known for their very large claws, or chelipeds, but California Spiny Lobsters do not have chelipeds and instead have spines covering their body for protection. Using a keen sense of smell, lobsters

locate their favorite food, fish, and mollusks. Lobsters also shed their shell to grow and can live in the wild for as long as 50 years.

For many years, lobsters have faced the fate of the dinner plate. Being considered a delicacy, lobsters have been fished and provided as food for humans around the world. The commercial lobster trade may have contributed to the decline in certain species of lobster.

As with any marine species, humans must continue conservation efforts to manage clean oceans and clean air for the balance of life on earth to be maintained.

California Moray

California Moray Eels live in the Pacific Ocean off the coast of California in the reef rocks and crevices. While you may only see the moray's head, he has a long snake-like body with no fins or scales. The moray has sharp, pointed teeth that come in handy as he dines on fish, shrimp, and octopus. In the wild, the moray can live about 30 years. They can grow up to be about 5' long.

Spending most of the day in a cave or rock crevice, the moray has adapted to life in the ocean with no fins to get in his way as he quickly swims into the rocks, moving backward at times. His skin provides a protective film of mucus to help the moray avoid being injured as he swims in and around rocky areas. These morays share their homes with red rock shrimp that live in a mutually beneficial relationship with the eel. The shrimp crawl inside the moray's mouth to eat bits of food stuck to his teeth. The moray eel gets his mouth cleaned while the shrimp gets bites of food. Both creatures benefit, unless the eel bites down too quickly!

Cleaner Shrimp

Sea Anemone

If you look at a Sea anemones you may think it is a plant when it is actually an animal. They are related to jellyfish, because they have stinging tentacles around a mouth. Sea anemones attach themselves to the ocean floor, reef rocks, and corals. Their beautiful tentacles wave in the water attracting prey that will fall victim to the sting of their venom. The venom itself is found within their stinging cells that are called nematocysts. There are over a thousand varieties of sea anemone that all have a stinging touch to paralyze prey before the prey is carried into the anemone's mouth.

Even though they are capable of stinging with their nematocysts, anemones have formed a symbiotic relationship with clown fish. Clown fish are immune to the sting of the anemone and can swim freely in and within the tentacles. The clown fish help keep the anemone clean while the anemone provides protection for the clown fish.

Sources: National Oceanic and Atmospheric Administration (NOAA); U.S. Fish and Wildlife Services; Alaska Department of Fish and Game; Jellywatch.org; National Geographic; South Carolina Department of Natural Resources; Aquarium of the Pacific; A-Z Animals. Photos: OdySea Aquarium; Public Domain.

Additional Resources:
Sea Horse Birthing Video: https://www.youtube.com/watch?v=b_nEA3dtOZs
Pygmy Seahorse Camouflage Video:
https://www.youtube.com/watch?v=Q3CtGoqz3ww
Mimic Octopus: https://www.youtube.com/watch?v=os6HD-sCRn8
Octopus Squeezing through Hole:
https://www.youtube.com/watch?v=949eYdEz3Es
Jellyfish Life Cycle: https://www.youtube.com/watch?v=U7aqO1L8gXA
Lionfish Hunting: https://www.youtube.com/watch?v=JxSPWOxYu7Y
Crab Molting: https://www.youtube.com/watch?v=4QIgW639Oog
Eel Feeding: https://www.youtube.com/watch?v=taguVjkRXtI

Procedures and Activities:

1. State the learning objective. Review previous instruction as it relates to the topic.
2. Review vocabulary and additional words as needed.
3. Read related literature and follow-up with discussion and open-ended questions.
   Ask students about their experience with the ocean or aquariums.
4. Discuss marine life and have students suggest different marine animals. Review the concept of a habitat and the relationship with certain marine animals.
5. Discuss how aquariums offer an opportunity for people to see marine life and how aquariums are protecting marine species.
6. Discuss the difference between vertebrate and invertebrates as it relates to marine animals. Ask students to give examples of each.
7. Review the terms, adaptations, diversity, mimic, and camouflage as they relate to the topic. Ask students to give examples in the animal world.

 **Indicates 'take along' activity**.

 **Activity:** 'Can you Sea me' is a take-along activity that student's complete while on the fieldtrip. Students observe animals' adaptations and how they can use them.

Activity: 'Label the Seahorse' can be an activity or a quiz to check for understanding.

Activity: Students enjoy being creative and using their imagination. 'Bizarre Creature Creation' gives students an opportunity to apply knowledge of a habitat and create their own species in that habitat.

 **Activity:** 'Find the Creature' is designed to take along on the fieldtrip. Students look for species and complete the chart. After the field trip is a great time to compare the findings and discuss them.

Activity: As a follow-up to the field trip, students can select a marine animal and do some investigation. Using technology, students demonstrate their understanding of the animal and its relationship to the environment. Students apply knowledge and writing skills to complete this activity. An 'Expository Writing Planner' is included.

Activity: Students become creative as they draw a seahorse in its habitat creating a 'Home for a Seahorse'.

Activity: To check for understanding and clarify the terms, vertebrate and invertebrate, students complete 'Got Bones'.

Activity: Following the visit to the aquarium, students use technology to investigate the career of an animal trainer. 'So you want to be a Trainer' is a career focused writing assignment for students to enjoy and share with the class.

Reflections and Assessments:

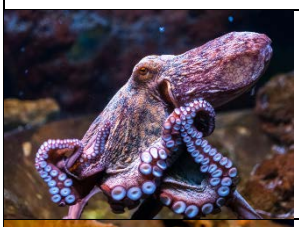
Students are assessed on varied levels depending on the activity. Participation, grade standards, and percentages may be applied to each activity. Activities are designed for flexibility and use pre-visit or as a follow-up to the visit.

Most activities meet the STEM guidelines.

Can you Sea me?

While touring the aquarium, look for these marine animals. Write down what you find.

- No fins or scales _____
- Prehensile tail _____
- A carapace _____
- A body made of cartilage _____
- Eight legs and a beak _____

Animal	Adaptation	Use
		
		
		
		

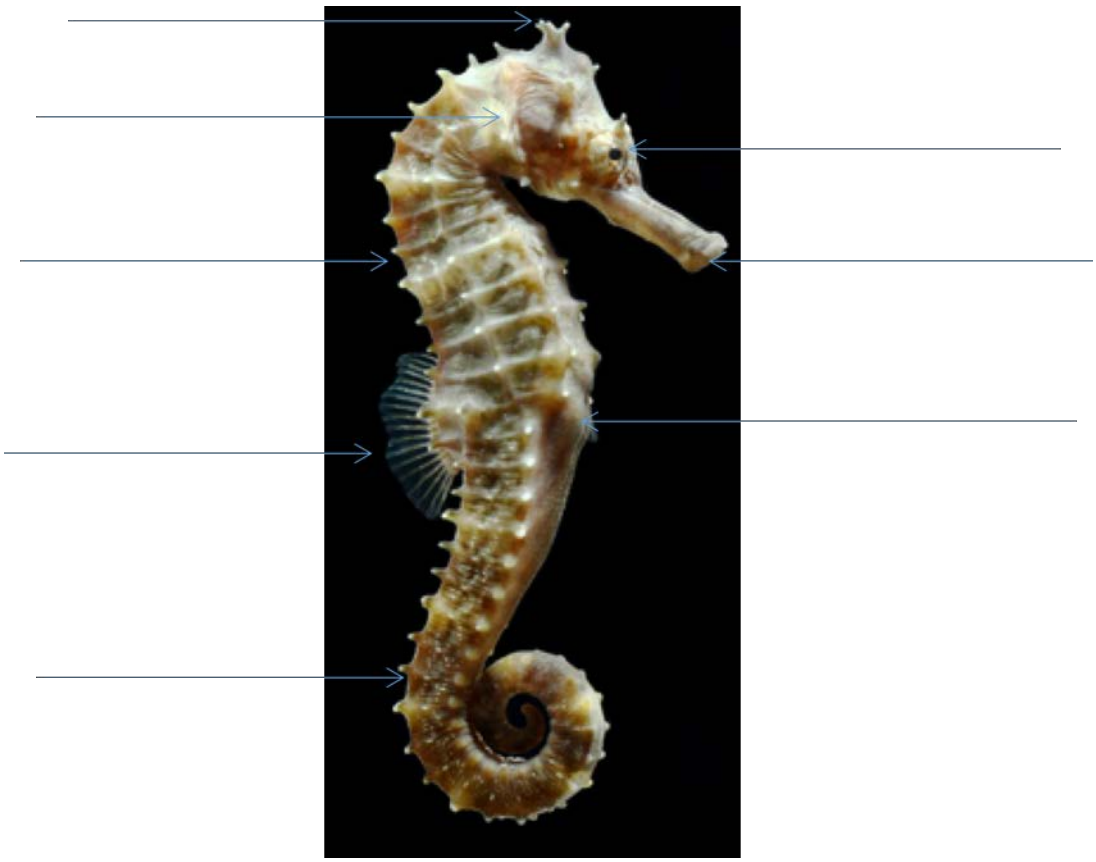
Can you Sea me?

While touring the aquarium, look for these marine animals. Write down what you find.

- No fins or scales: Crab, octopus etc.
- Prehensile tail: Seahorse
- A carapace: Crab, lobster, sea turtle
- A body made of cartilage: sharks and rays
- Eight legs and a beak: octopus

Animal	Adaptation	Use
Octopus	Suction cups, beak, arms, camouflage	Grabbing fish, eating things with shells, moving, protection
King Crab	Spines, shell	Protection
Lionfish	Venomous spines, coloration	Protection, warning color
Moray Eel	Long body, sharp teeth, no fins	Protection, eating, hiding, moving

Label the Seahorse



Word Bank:

Pectoral fin	Coronet	Trunk rings	Snout
Eye	Tail rings	Dorsal fin	Pouch (males only)

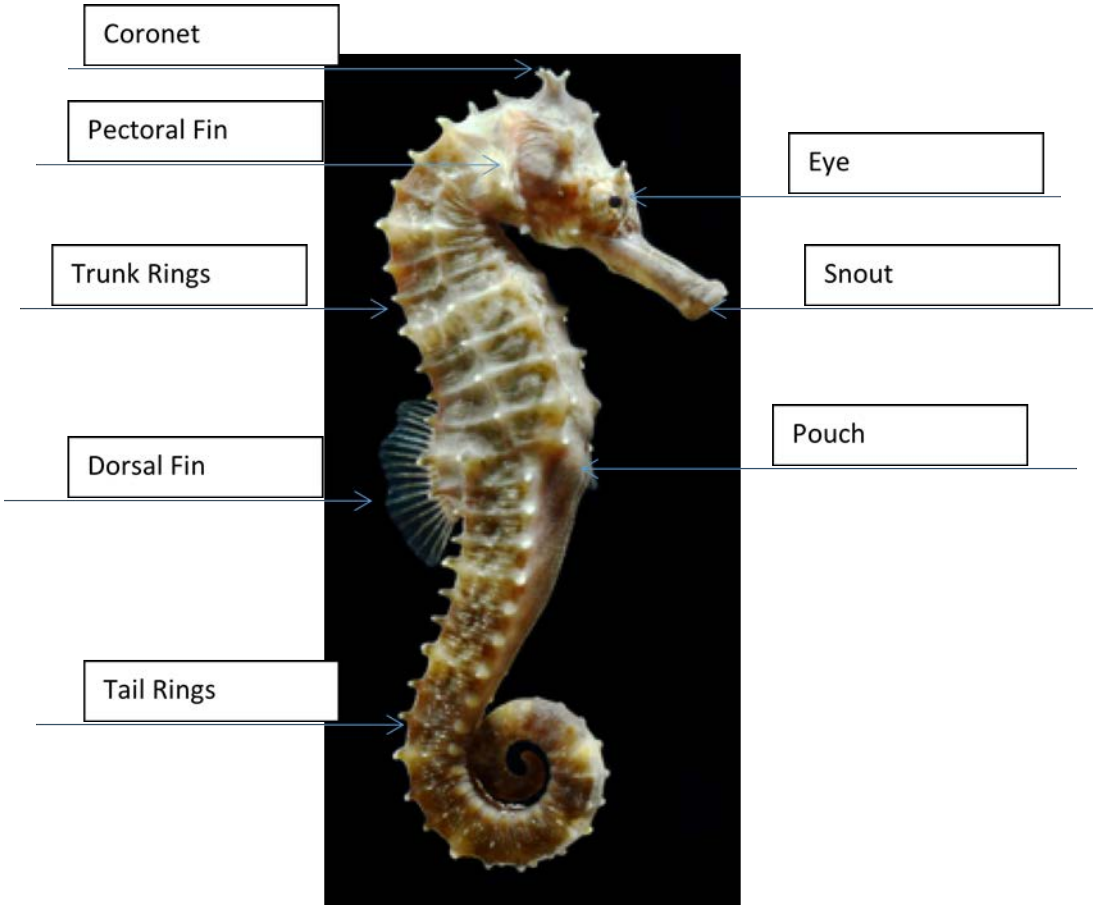
What are some *adaptations* of a sea horse? (What body parts help a sea horse survive and how)

_____

_____

_____

Label the Seahorse



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What are some *adaptations* of a sea horse? (What body parts help a sea horse survive and how)

_____

_____

_____

Bizarre Creature Creation

Draw and create a *bizarre* creature to live in this ocean habitat.

Name of animal _____

Habitat _____

Location _____

Diet _____

Protection _____

Predators _____

Find that Creature

At OdySea Aquarium, look for these ocean animals and fill out the chart below.

Animal	Species	Adaptation	Protection
Shark			
Fish			
Crab			
Cephalopod			
Jellyfish			

The most unusual _____

The most interesting _____

The scariest _____

My favorite _____

Expository Writing Planner

Title _____

Main Idea _____

Detail _____

Detail _____

Detail _____

Detail _____

Detail _____

Main Idea _____

Detail _____

Detail _____

Detail _____

Detail _____

Detail _____

Main Idea _____

Detail _____

Detail _____

Detail _____

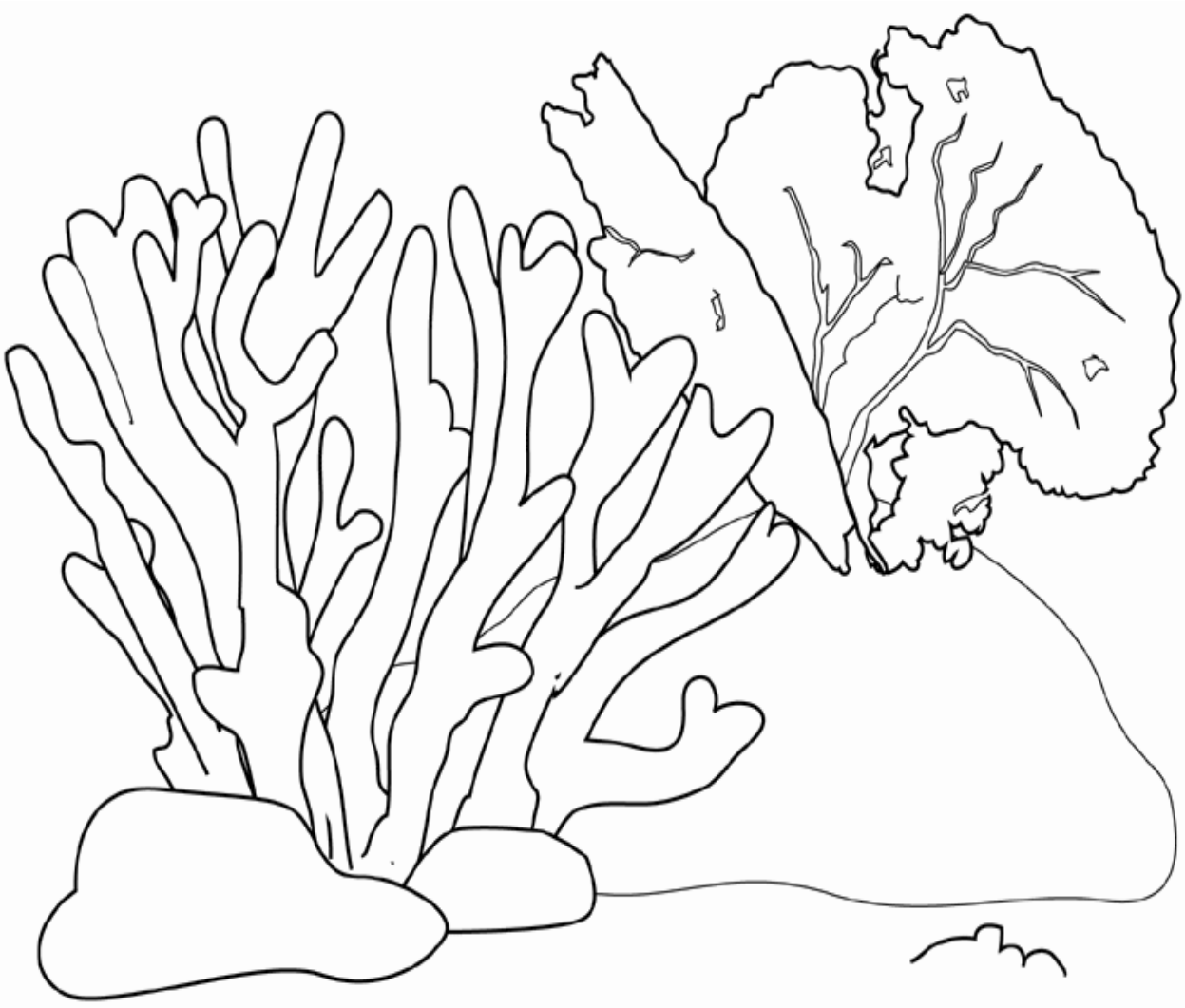
Detail _____

Detail _____

Conclusion _____

Home for a Seahorse

Draw a sea horse to *camouflage* into this habitat.



Got Bones?

A *vertebrate* is an animal _____ bones.

An *invertebrate* is an animal _____ bones.

Match the animal as an invertebrate or a vertebrate

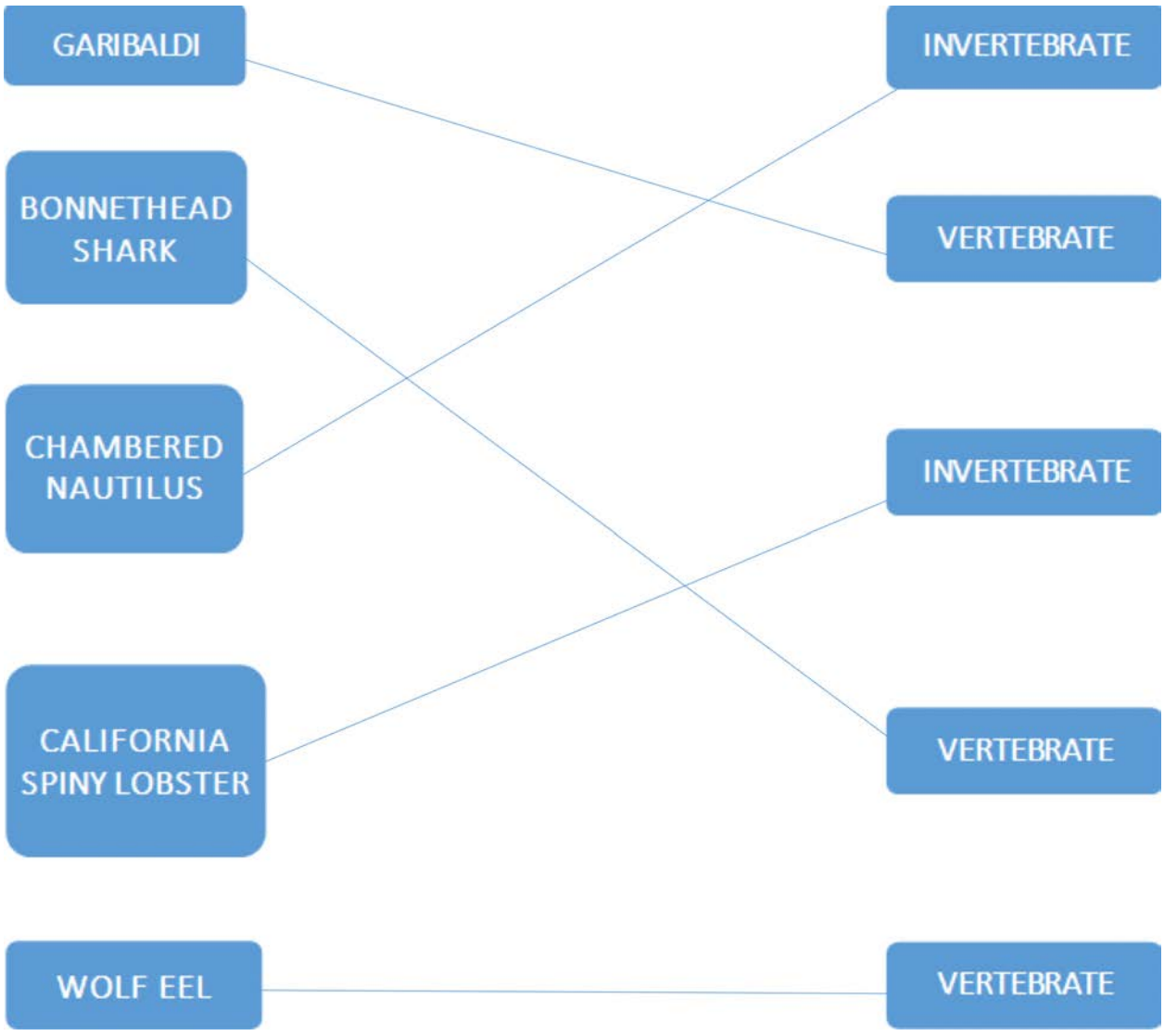
GARIBALDI	INVERTEBRATE
BONNETHEAD SHARK	VERTEBRATE
CHAMBERED NAUTILUS	INVERTEBRATE
CALIFORNIA SPINY LOBSTER	VERTEBRATE
WOLF EEL	VERTEBRATE

Got Bones? (Key)

A *vertebrate* is an animal _____WITH_____ bones.

An *invertebrate* is an animal _____WITHOUT_____ bones.

Match the animal as an invertebrate or a vertebrate



So, you want to be a trainer?

Animal trainers have an exciting and challenging job. First, they have to love all types of animals. Next, they need to be especially good at understanding how animals behave. Finally, they need a specialized background to make a career of animal training.

So, you want to be a trainer? Well, find out what it takes to be one of the following:

- Animal trainer at a zoo
- Marine animal trainer
- Animal trainer at an aquarium
- Veterinarian
- Animal trainer at a theme park

You may have an idea of a specialty you would like, for example, you might like to train or work with penguins. What does it take to be a penguin trainer? Use technology to find out. Investigate a career in animal training and write a paper about the facts. Be sure to include the following:
Education – degree
Job experience needed
Apprenticeship
Career options
Where are the jobs
Competition for the jobs

Share your findings with the class. Your information just may inspire one of your friends.