

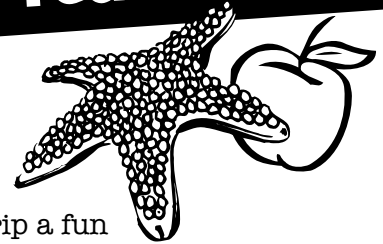
Scavenger Hunt



Teacher Page

Thank you for choosing the Aquarium of the Pacific as your field trip destination! We are excited to share the wonders of the Pacific with you and your class. We have so many educational opportunities that we would like to share with you.

Use this scavenger hunt to make the most of your visit to the Aquarium. Inside this packet are vocabulary words, activities, and background information to make your field trip a fun and educational experience for your students. Make a photocopy of the following pages (double sided please!) and hand out one copy to each student the day of the field trip. All of the answers to the questions can be found in the galleries on signs, from our knowledgeable volunteers, or in our informative presentations. We also have a helpful answer key available on our website at www.aquariumofpacific.org. In the meantime, here are a few hints to keep in mind before your visit.



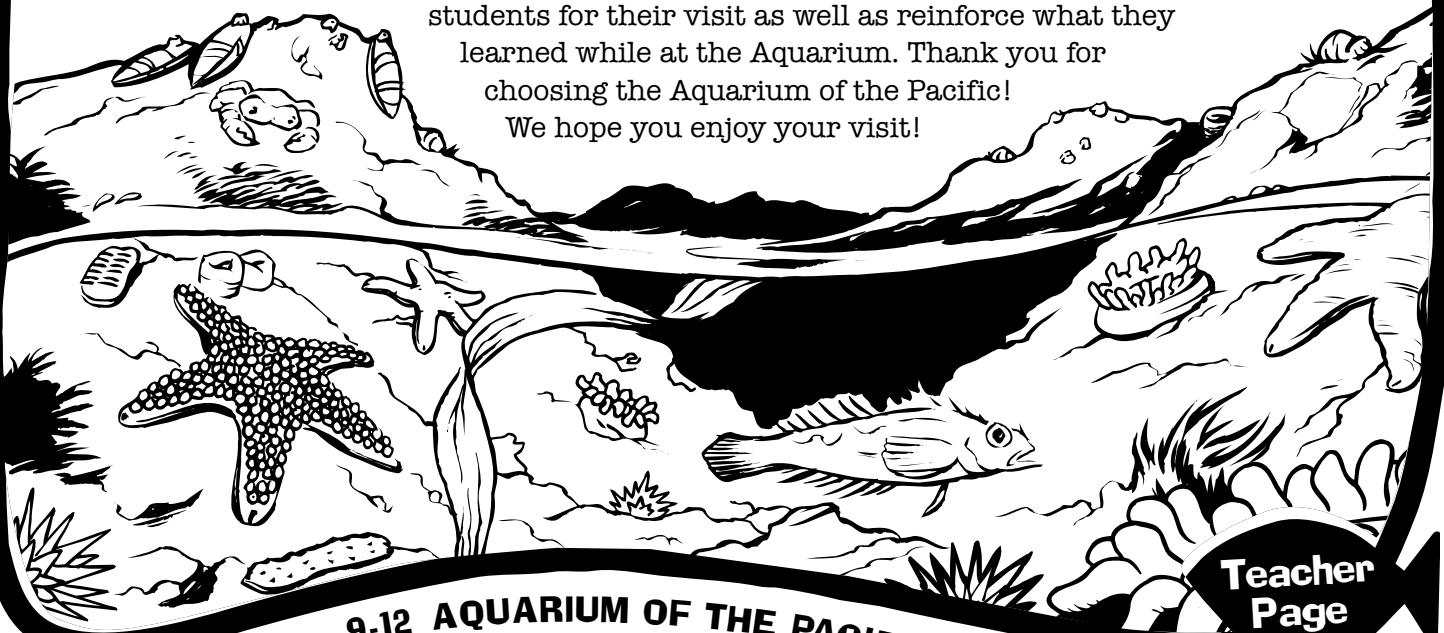
● You may want to review the vocabulary page (page 1) before your Aquarium visit. This activity will be a fun way to introduce your student to the Aquarium and prepare them for all that they will experience.

● The tile rubbings pages are for the brass tiles that you will find in front of the preview exhibits in the Great Hall. Let the students choose a few of their favorites and make a rubbing with a crayon or pencil. Bring along a few old crayons without the wrappers to make the rubbings.

● The gallery pages will guide you to some of our key exhibits and give your students activities to make their visit more interactive and educational.

● The final pages in this packet contain some pre-post activities for your students.

These standards-based activities are a great way to prepare your students for their visit as well as reinforce what they learned while at the Aquarium. Thank you for choosing the Aquarium of the Pacific!
We hope you enjoy your visit!



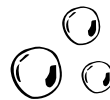
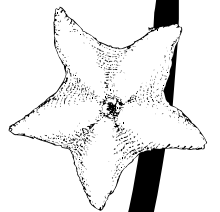
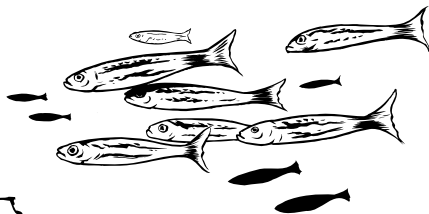
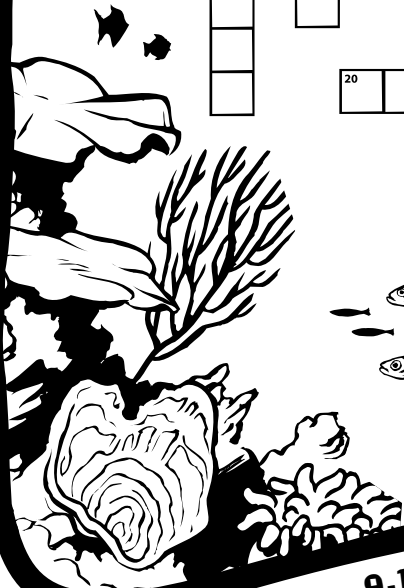
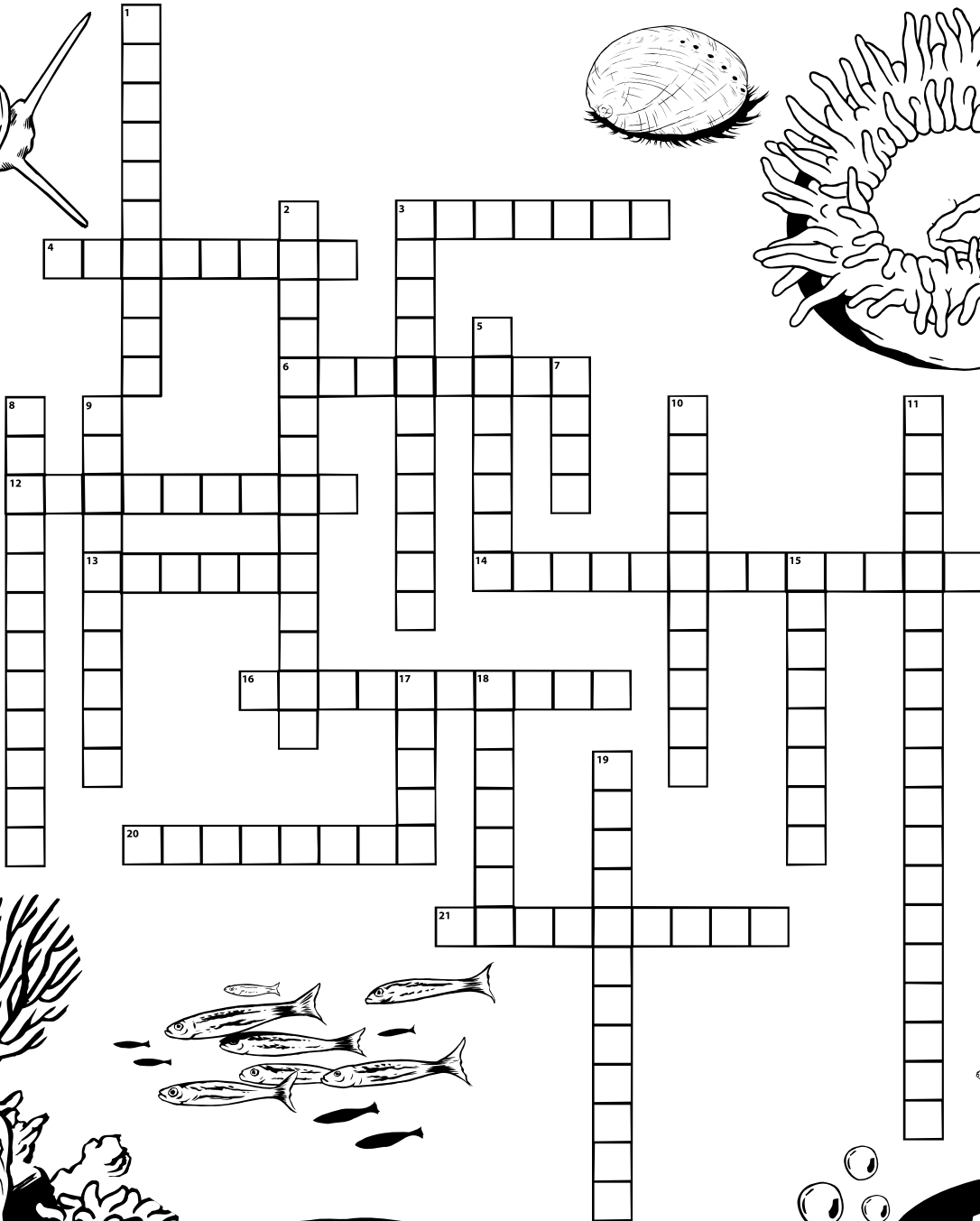
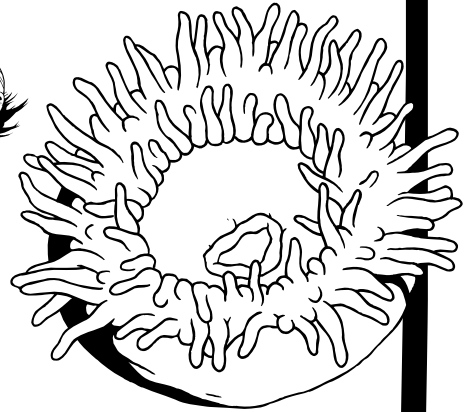
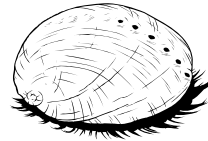
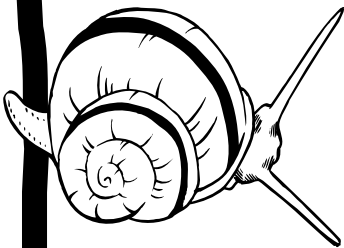
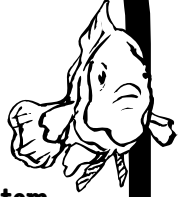
Vocabulary



Complete the crossword puzzle below using the clues on the following page and the words from the word bank below.

Word Bank:

- Cephalopod
- Countershading
- Intertidal
- Niche
- Symbiosis
- Echinoderm
- Madreporite
- Parasite
- Tide
- Tide pool
- Benthic
- Chromatophore
- Ecology
- Mollusc
- Pinniped
- Tube feet
- Biodiversity
- Commensalism
- Endangered
- Mutualism
- Radula
- Water vascular system



Vocabulary

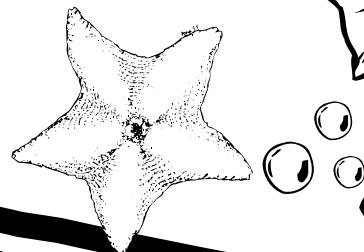
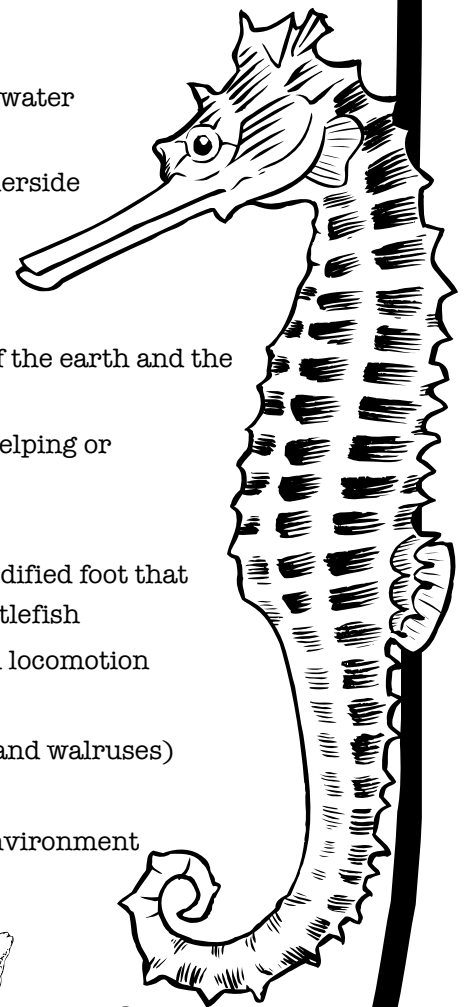


Across

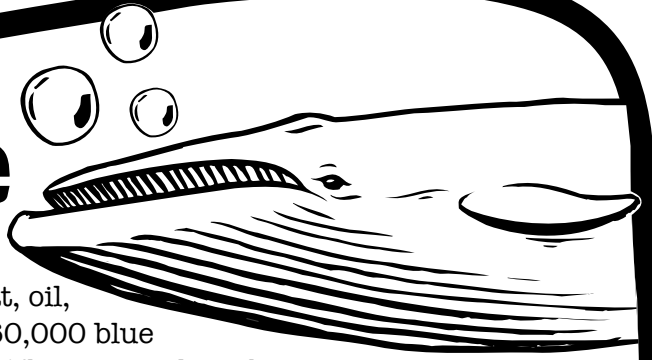
3. an invertebrate with a soft body, often somewhat covered by a shell
4. a pool of water left along the shore as the tide level falls
6. a suction cup-like structure in echinoderms that aids in locomotion, grasping, and feeding
12. a close association between two organisms benefiting both
13. a tongue-like band of teeth used by many molluscs to scrape, tear or bore
14. special pigment cells that an animal, such as an octopus, uses to camouflage itself
16. a plant or animal whose prospects for survival and reproduction are in immediate jeopardy
20. a close association between two organisms benefiting one and harming the other
21. a close relationship between two organisms of a different species

Down

1. invertebrates that usually have a hard, spiny skeleton, radial body and water vascular system; includes sea stars, sand dollars, and sea urchins
2. coloration in which an animal is dark on its top side and light on its underside
3. a stony plate on top of a sea star that pulls water in and out of the water vascular system
5. near or on the bottom of a body of water
7. the daily rise and fall of sea level along a shore caused by the rotation of the earth and the gravitational pull of the sun and moon
8. a close association between two organisms benefiting one and neither helping or harming the other
9. the area of the shore between the highest and lowest tidal levels
10. a class of molluscs that have tentacles attached to their heads and a modified foot that is used to propel them through the water, i.e. octopuses, squids, and cuttlefish
11. a system of fluid-filled canals and structures in echinoderms that aid in locomotion and food gathering
15. a group of marine mammals that have fin-like feet (i.e. seals, sea lions, and walrus)
17. the particular role of an organism in its environment
18. the study of the relationships of organisms to each other and to their environment
19. a measure of the variety of animal and plant life in a particular habitat



Blue Whale



Beginning in 1864 with the invention of the steam-powered boat, blue whales were hunted for their meat, oil, and other body parts. In 1967, after an estimated 360,000 blue whales were killed, hunting blue whales was banned. The currently unknown population may never recover. In the following exercise, assume the current whale population to be 10,000.

- If half of these are females, how many females are there? _____
- If half of those are adult pregnant females, how many babies will be born this year? _____
- What will the population of whales be at the end of the year? _____
- It seems the blue whale population is growing! But each year many of these animals die by mistakenly eating our improperly discarded trash. If 500 blue whales die this year from eating trash, how many will we have left? _____

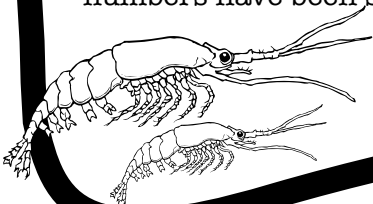
Female blue whales reproduce once every two years. If the same number of whales are born every two years and 500 whales die each year from eating trash, how long will it take to double the whale population? _____

Use the table below to find your answer. The first two years are done for you.

Years	Beginning Population	Whales Born	Whale Mortality	Ending Population
Now	10,000	2,500	500	12,000
Year 1	12,000	0	500	11,500
Year 2				
Year 3				
Year 4				
Year 5				
Year 6				
Year 7				
Year 8				
Year 9				
Year 10				
Year 11				
Year 12				



In the above fictitious situation, the population doubled in a fairly short amount of time. In real life, this process would take much longer for a variety of reasons: declining birth rate due to lower population size, entanglement, habitat destruction, toxins, and competition with other krill-feeders such as Minke whales. Even with the end of commercial whaling, blue whale numbers have been so severely depleted that they are extremely vulnerable to these threats.

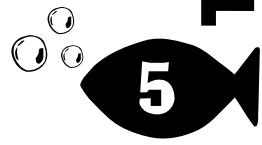


Krill





4 Tile Rubbing Page



Southern California Baja Kelp Forest

Kelp forests consist of several different layers: the canopy, midwater, and holdfast sections. Just as in a land forest, animals in a kelp forest inhabit specific sections almost exclusively. Birds have a usual spot in the treetops and deer stay on the forest floor. Fish too have sections in a kelp forest that they typically stay in.

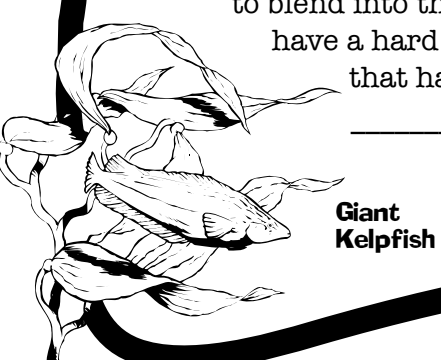
Look in the Blue Cavern and Amber Forest exhibits for each of the fish below and determine where it is located in the kelp forest. Then draw a line from the fish to where it would live in the kelp forest below.

The diagram shows a kelp plant with three main sections: the **CANOPY** at the top with blades, the **MIDWATER** section with pneumatocysts (air bladders), and the **HOLDFAST** at the bottom. To the right, six fish are listed with their corresponding illustrations:

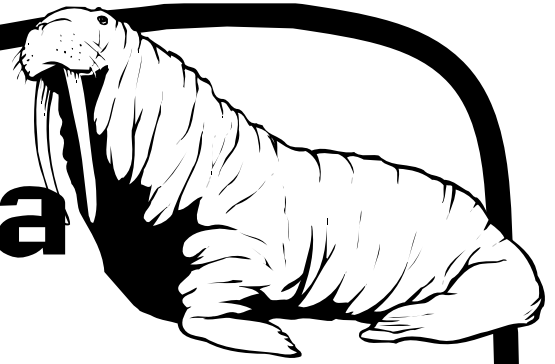
- Bat Ray**: A flat, ray-like fish.
- Giant Sea Bass**: A large, spotted fish.
- Kelp Bass**: A smaller, patterned fish.
- White Sea Bass**: A fish with a light-colored body and dark spots.
- Barracuda**: A long, slender, fast-swimming fish.
- Pacific Mackerel**: A fish with a dark, striped pattern.

Hiding in Plain Sight

Since there is an abundance of life in a kelp forest, it attracts many predators. Many fish have adapted to hide in the forest. The giant kelp fish is a good example. It looks like a blade of kelp and sways back and forth with the kelp, perfectly blending in. Other fish use countershading to hide. These fish have a dark back to blend into the rocky bottom of the forest and a light belly to blend into the sunlit waters of the surface. Fish that swim above and below them will have a hard time spotting them because of this coloration. Find at least three fish that have this adaptation and list them below.



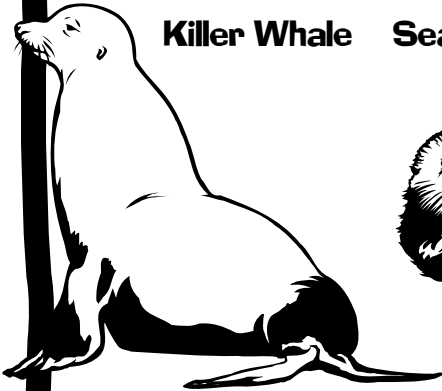
Southern California Baja



Key in on Mammals

A dichotomous key is a tool for determining the identity of a plant or animal. By choosing "a" or "b" the key guides you to the correct organism name. The following dichotomous key is missing the correct mammal names. Can you fill it in? Choose a mammal from the list below and start at number one. Decide whether "a" or "b" best represents that mammal, then follow the directions to the next number and so on. When you come to a blank spot that best represents your mammal, write in the mammal name. Continue with the next mammal until you have filled in the key.

Killer Whale Sea Lion Sea Otter Blue Whale Seal Walrus



1. **A** Caudal fin present Go to number **2**
B Caudal fin absent Go to number **3**

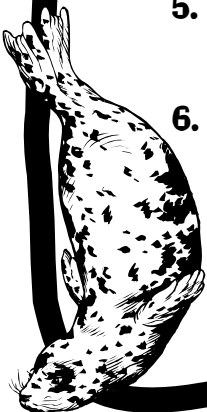
2. **A** Uses baleen to eat
B Uses teeth to eat Go to number **4**

3. **A** Uses blubber to keep warm Go to number **5**
B Uses a thick fur coat to stay warm

4. **A** Has a large dorsal fin on its back
B Lacks a dorsal fin on its back Go to number **6**

5. **A** Has tusks
B Lacks tusks Go to number **6**

6. **A** Has external ear flaps
B Lacks external ear flaps

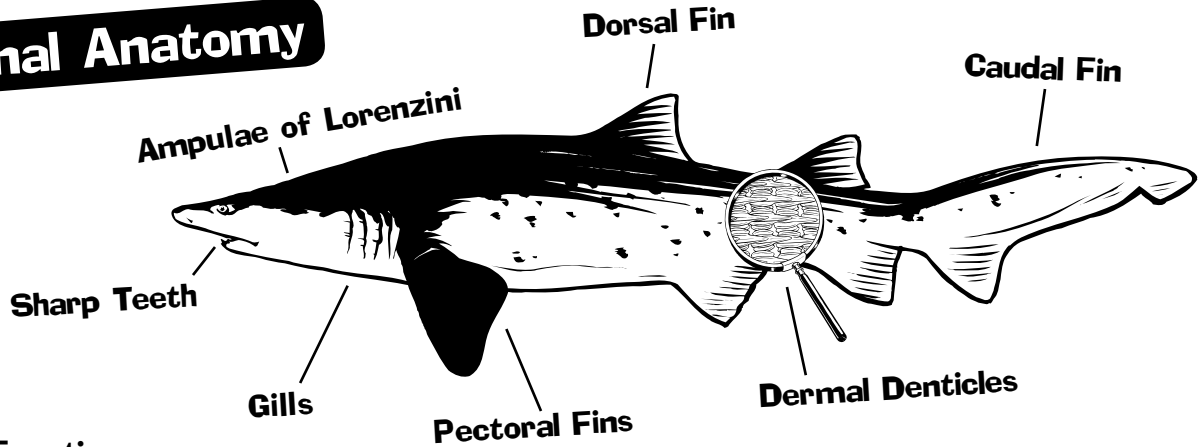


Shark Lagoon



Sharks have many adaptations that make them amazing predators. Many of these adaptations are labeled on the sharks below. Can you match these adaptations with their functions?

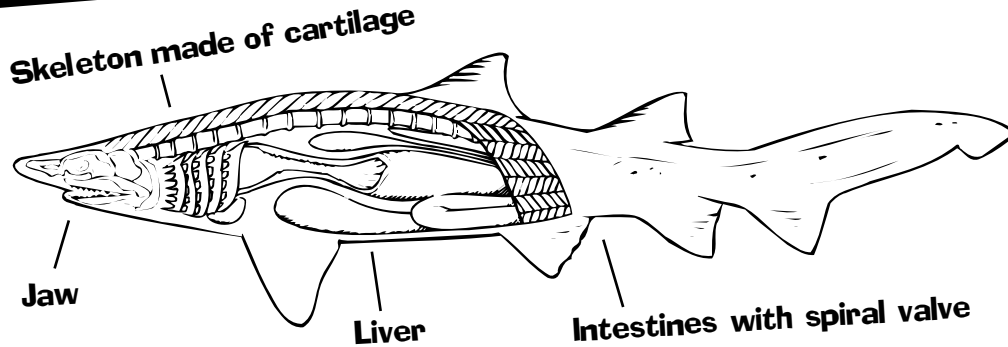
External Anatomy



Functions:

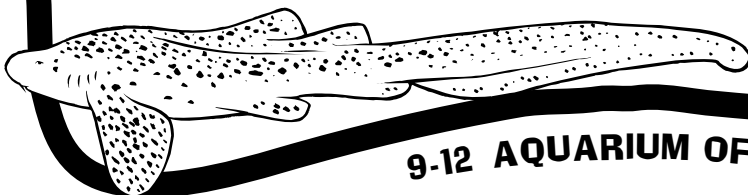
1. Water passes over this body part so the shark can breathe. _____
2. Sharks push through the water with this body part. _____
3. Sharks use this body part to grab slippery, slimy fish. _____
4. This body part allows sharks to detect electricity. _____
5. These create a coat of armor to protect the shark. _____
6. Sharks need this body part to stay balanced and to turn. _____
7. Sharks would spin as they swam if not for this body part. _____

Internal Anatomy

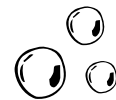


Functions:

1. Sharks have this large, oily body part to help them stay buoyant. _____
2. This body part is lighter than bone and also aids in buoyancy. _____
3. This body part is packed with surface area for maximum nutrient absorption. _____
4. Sharks teeth are held in place by this body part. _____



Zebra Shark



Northern Pacific



Build a Sea Star

Sea stars are echinoderms (spiny-skinned animals). They have a very simple but fascinating anatomy. Using the description of the body parts of the sea star on the left, draw and label the body parts on the sea stars on the right. Look for real sea stars in the gallery to help you.

Water Vascular System - located inside the sea star and used by echinoderms for locomotion, food gathering and breathing. This system is made up of an internal circular canal in the center of the sea star (the ring canal) and has a canal running out from here through each of the arms (the radial canals).

Madreporite - a pore located on the topside of a sea star that pulls water in and out of the water vascular system. The spot is located slightly off center on the topside of a sea star.

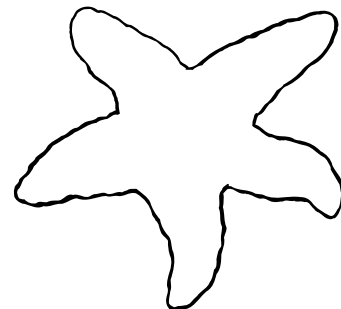
Tube Feet - located on the underside of the sea star, these suction cup-like tube feet are an extension of the water vascular system. On the tip of each arm, the sea star has specialized tube feet that act as the eye spots of the star. Draw ten feet and one eye spot on each arm.

Mouth - located on the underside of the sea star in the center of the ring canal.

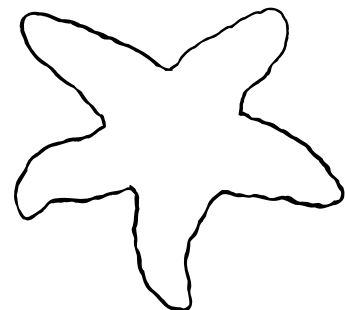
Spines - used by the sea star for protection. The spines are found all over the top of the sea star and on the sides of the arms.

Pedicellariae - small pinchers in between each spine to keep settling organisms off of the sea star.

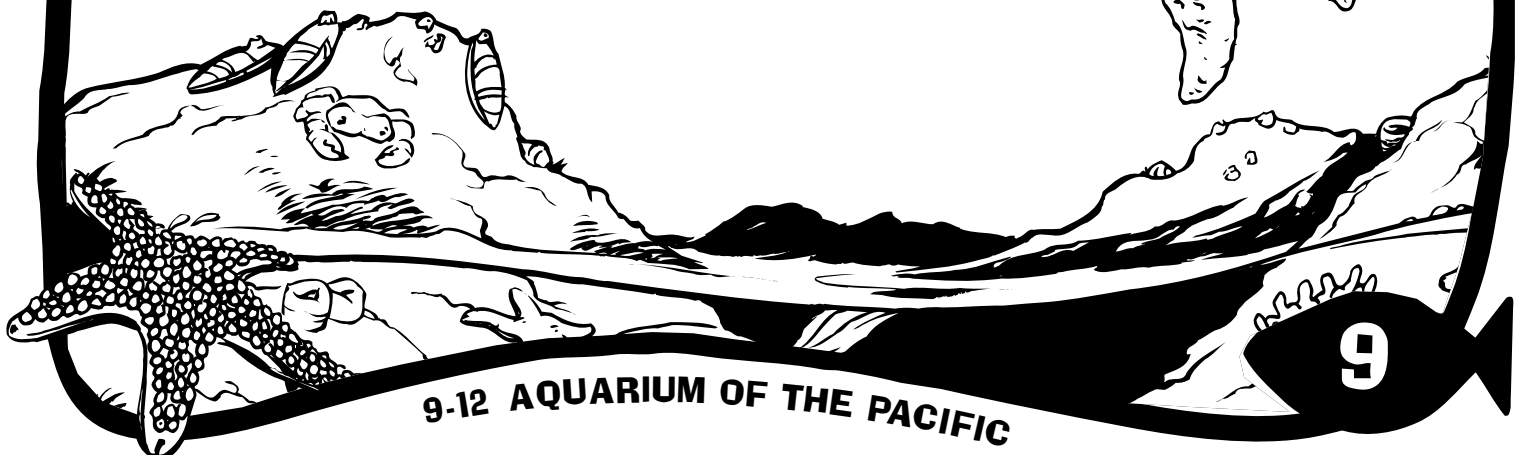
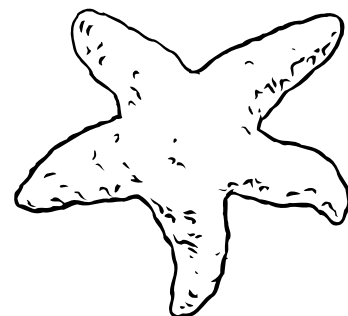
Inside of a Sea Star



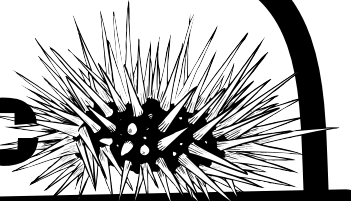
Underside of a Sea Star



Topside of a Sea Star



Northern Pacific



Invertebrate Name Decoder

Taxonomic or scientific names are usually derived from Latin or Greek and are used by scientists around the world instead of common names to avoid confusion. A decoded taxonomic name can provide a clue to the identity of an animal by describing a prominent characteristic or adaptation.

Translate the scientific names in Table 1 using the glossary of Latin (L) and Greek (G) word parts in Table 2 (word parts are in bold and followed by alternative endings). Then match the scientific term to the appropriate description in Table 3 to find common names for these invertebrates.



Table 1: Scientific Term	Translation	Description
1. Cephalopoda _____		
2. Cnidaria _____		
3. Mollusca _____		
4. Arthropoda _____		
5. Echinodermata _____		

Table 2: Glossary

- arthr**, -o -um (G) a joint (like a knee or elbow joint)
- cephalo**, (G) head
- cnid**, -a,-o (G) a nettle (a stinging or prickly plant) Note: the "c" is silent.
- derm**, -a,-ato,-o .. (G) skin
- echin**, -o,-us (G) a hedgehog; spiny
- mollusc** (L) soft bodied
- pod**, -o,-y (G) a foot

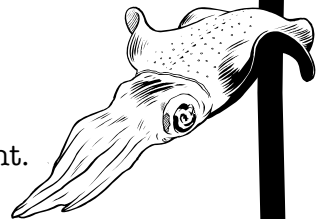
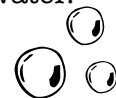
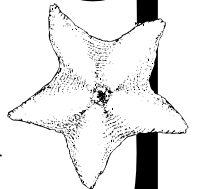
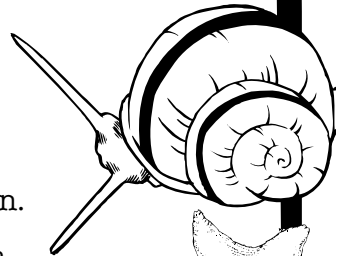
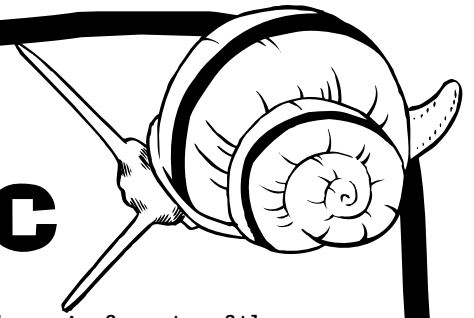


Table 3: Descriptions

- A.** Sea Stars, sea urchins, and sand dollars all have spiny skin for protection.
- B.** Crustaceans- including crabs, shrimps, and lobsters- belong to this phyla characterized by jointed appendages and a hard exoskeleton.
- C.** Clams, snails, octopuses, and squid all have three soft body regions, head, foot, and visceral mass (internal organs).
- D.** Jellies, corals, and anemones have nematocysts, stinging cells that are used to catch food to provide protection.
- E.** Octopuses, squids, and cuttlefish are in this class because they have a modified foot in their heads that is used to propel them through the water.



Tropical Pacific



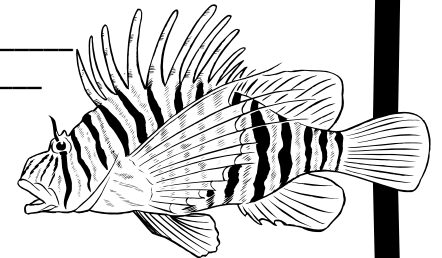
Diversity on a Reef

Coral reefs are thought of as the rain forests of the sea. Like rain forests they have a great biodiversity of animals including fish, reptiles, and invertebrates. As you walk through the Tropical Pacific Gallery, you will observe many diverse animals. Find something...



- ...with a shell _____
- ...with stripes _____
- ...with a prehensile tail _____
- ...with a big eye _____
- ...with tentacles _____
- ...that changes color _____
- ...that changes sex _____
- ...that is venomous _____
- ...that is endangered _____
- ...with a backbone _____
- ...without a backbone _____
- ...that lives in a colony _____
- ...that has a false eye spot _____
- ...that lives with a friend _____
- ...with sharp teeth _____
- ...with countershading _____

Also like rain forests, coral reefs are in danger of disappearing due to human activities. How do you think actions of humans threaten coral reefs?

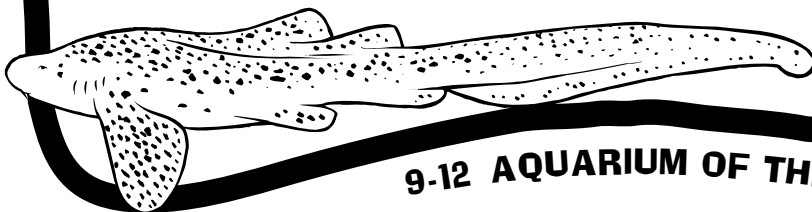


Shrinking Shark Populations

A fin cutting through the water, sharp teeth gleaming, and people screaming. This sounds like a scene straight out of a movie, and a scene like this is exactly why sharks have gotten a bad reputation. The majority of sharks are not the man-eaters that media and movies have made them out to be. In fact, sharks are more misunderstood than man-eaters, more hunted than the hunter, and more at risk of becoming endangered than you might think.

What are three ways that sharks are threatened by humans?

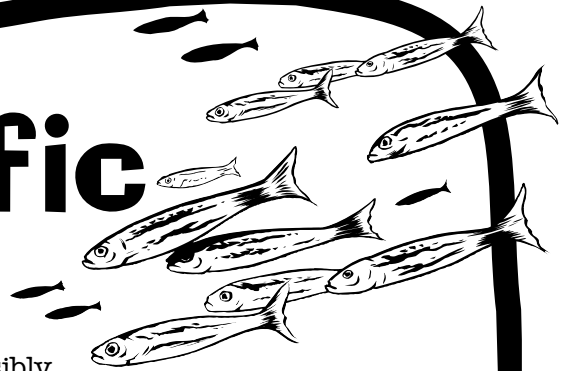
- 1 _____
- 2 _____
- 3 _____



Zebra Shark



Tropical Pacific



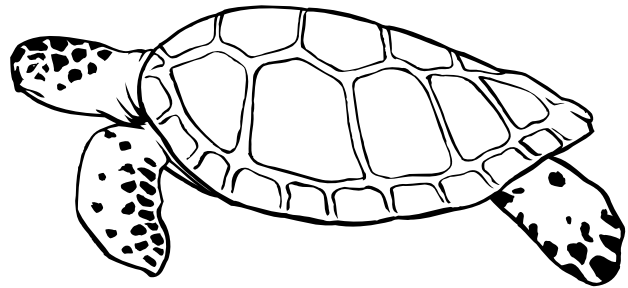
Separation of the Sexes

Sexual dimorphism

is the term used when males and females in a species are visibly different in external appearance or behavior. For example, the sea lions that you saw in the Southern California gallery are very sexually dimorphic. Males have a large bump on their heads called a sagittal crest, and they can weigh up to 880 pounds (399 kg). Females do not have this bump and weigh only up to 242 pounds (110 kg)! Sexual dimorphism is not just apparent in sea lions. Turtles and some fish also exhibit this.

Turtles

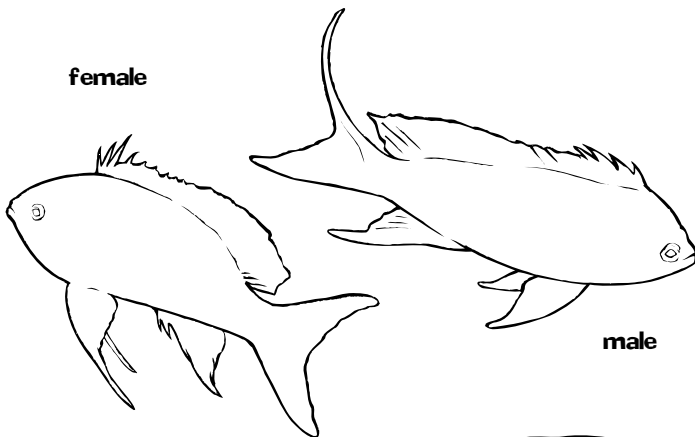
The turtle on the right is a female. Look for other turtles in the **Tropical Reef** and see if you can find the difference between males and females. What physical feature separates the sexes?



Female Turtle

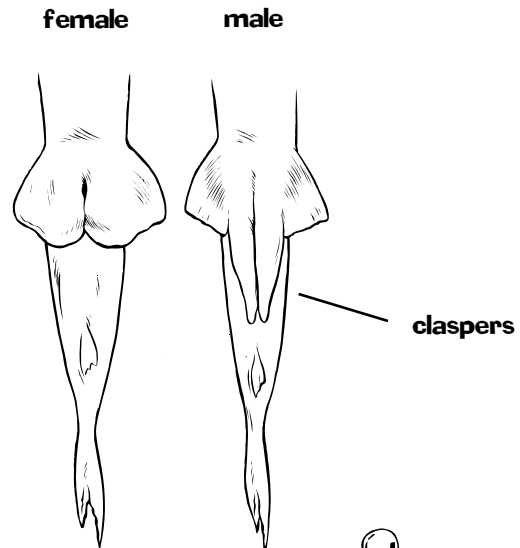
Sex Change

Look in the Sex Change exhibit. These fish have bright beautiful colors that express whether they are male or female. Fish that look very different can actually be the exact same species, just different in color because of their sex. Find an example of this in the exhibit and color the two fish below to reflect a male and female anthias of the same species.



Sharks

Sharks are also sexually dimorphic. Males have a set of claspers on their undersides that females do not have. Be on the lookout for male and female sharks.



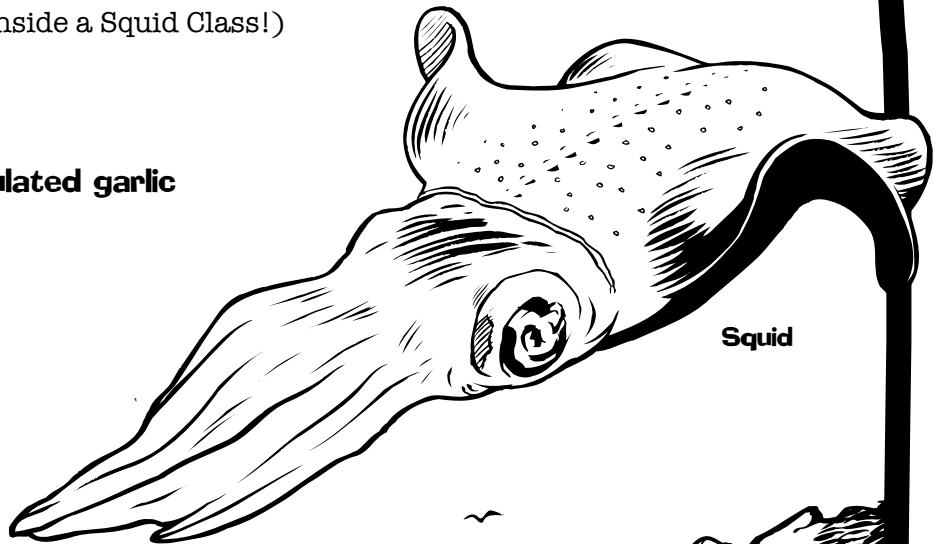
Pre-Post Activities

Squid Fry

(Great for after an Inside a Squid Class!)

Materials:

- Cooking oil
- Squid
- Salt, pepper, and granulated garlic
- Two eggs
- 1/2 cup milk
- Bread crumbs
- 2 bowls
- Frying pan
- Paper towels
- Cocktail sauce
- Lemon



Squid



Procedure:

1. Heat one to two inches of oil in a frying pan, or if you have a deep fryer, fill with oil and heat. If the oil is hot enough a one-inch cube of bread dropped into it will turn brown in 30 seconds.
2. While the oil is heating, prepare the squid. Cut open the squid and remove the organs. You may want to review the body parts before you remove them. Make sure to remove the pen, fins and beak as well as to scrape any pigment off the mantle. Cut the squid into thin strips and remove the head. (You can cut off and fry the arms as well.)
3. Beat 2 eggs and 1/2 cup of milk in a bowl.
4. Pour store-bought bread crumbs in a separate bowl. Add salt, pepper, and granulated garlic to taste. Mix.
5. Dunk squid strips in the milk and egg mixture then coat them in the bread crumb mixture.
6. Carefully drop the prepared squid in the oil and fry until it turns a golden brown color (a few minutes). Don't add too many at once as this will bring down the temperature of the oil.
7. Place the cooked squid on a paper towel to dry. Enjoy with cocktail sauce and lemon!



Pre-Post Activities

Sand Flea Jump

Materials: ● Tape measures ● Masking tape

Procedure:

1. Sand fleas are actually not fleas at all. They are tiny amphipods (small crustaceans) that feed on plants. You will often find them swarming on piles of beached kelp. These tiny creatures are less than 0.125 inch (0.32 cm) and are known to jump up to 20 inches (50.8 cm)! Explain to students that they will be comparing their jumping capacity to the sand fleas.
2. Measure the height of each student and record it on a piece of paper.
3. Either in your room or outside, mark a line from which students will jump.
4. Have each student, one at a time, stand behind the line and jump as far as he or she can. Place a small piece of masking tape just behind the heel of the student's shoe to mark his or her spot and write the student's name on the tape.
5. Once each student has jumped, measure the length of the jump and record the distance on the masking tape and on the paper next to each student's height.
6. Use the following problems to have students determine their jumping abilities in relation to that of the sand flea.
 - A sand flea is 0.125 inch (0.32 cm) tall and can jump 20 inches (50.8 cm). How many times its height can a sand flea jump? What percentage of its height is that?
 - What percentage of your height can you jump?
 - If you were a sand flea, how far could you jump?

Water Use

Everyday the average Southern California home uses 450 gallons (1,700L) of water in their daily activities. The average Southern Californian uses **140** gallons (530 L) of water per day. Add in the water used by industry to make the products we use and the number soars to 1,000 gallons (3,785 L) of water per day! You may not realize it, but your normal everyday activities use a lot of water. Look at this list to see just how much water you might use per day.

Taking a shower	40 gallons every 10 minutes
Taking a bath	20 gallons
Watering the lawn	180 gallons
Washing the dishes	15 gallons per load
Washing clothes	35- 50 gallons per load
Washing the car	150 gallons
Brushing your teeth	2-5 gallons
Cooking	5- 10 gallons
Drinking	12 gallon
Flushing the toilet	4- 7 gallons per flush

Use the chart above as a guide to keep track of the amount of water that you use per day.

What can you do to reduce the amount of water you use everyday?

Discuss your findings with the class.