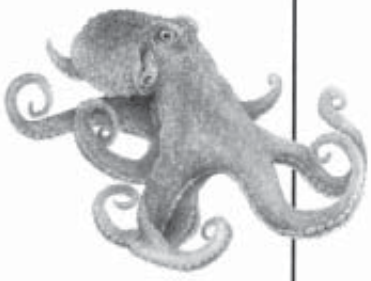
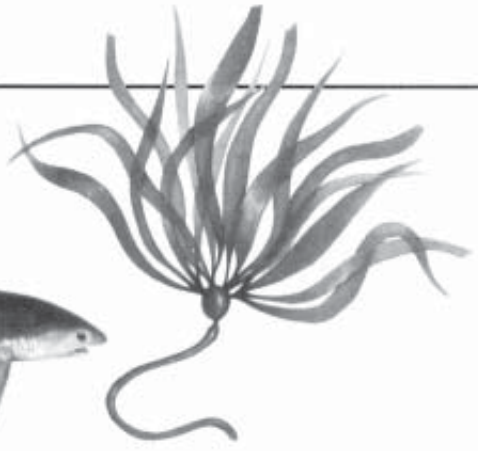
SEARCHING FOR SEA LIFE

Fishes





What Is a Fish?

Beneath the water's surface lives and animal that's adapted to a purely aquatic life: the fish. Like other animals, a fish breathes, feeds, moves, reproduces and senses its surroundings, but it is designed to do all these in water.

Next time you're in a swimming pool or at the beach, try walking through the water. Because water is 800 times denser than air, your legs have to push the water aside, making it hard for you - or any animal - to move through it. But a fish's torpedo-shaped body is adapted to slice through water with minimal resistance.

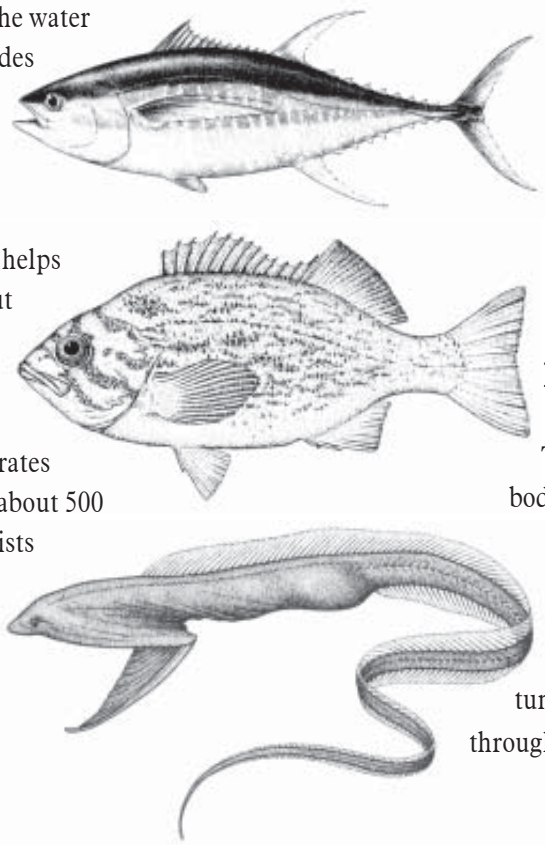
Fishes propel and balance themselves with fins and take dissolved oxygen out of the water using gills. A backbone provides a place of attachment for swimming muscles. Most fishes have scales for protection, and some have a balloonlike swimbladder that helps them stay at any depth without sinking or rising.

The first vertebrates, fishes evolved from marine invertebrates (animals without backbones) about 500 million years ago. Ichthyologists (people who study fishes) have identified more than 20,000 species; that's more than all the other species of vertebrates put together. New species are discovered every year, and there are many more we don't even know about.

Three main groups of fishes are living today: jawless fishes, like lampreys and hagfishes; cartilaginous fishes, like sharks, skates and rays, and bony fishes, like rockfishes, tunas and eels. Most fishes are bony fishes, the same kind that comes to many people's minds when asked to picture a typical fish.

Adaptations to aquatic life

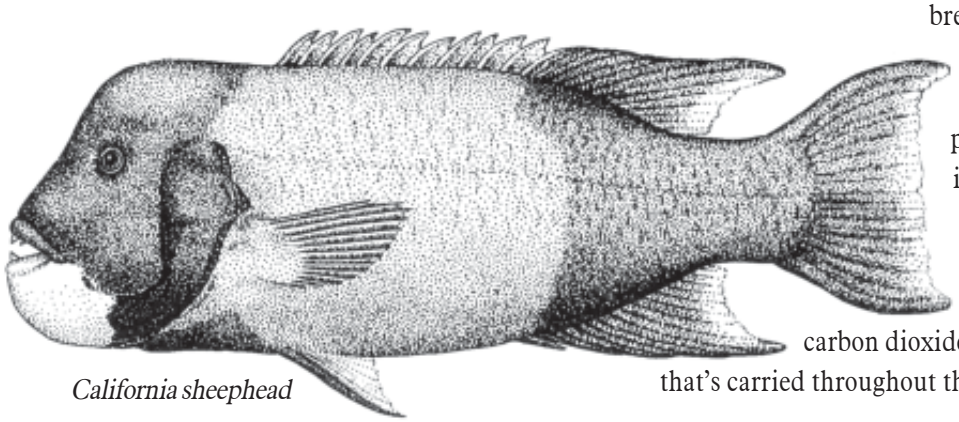
Take a look at two or three different fishes and you'll see how each is specially adapted to its surroundings. Each species is the result of evolution over millions of years and has its own body shape, color, body parts (like fins and mouth) and even behaviors. The designs we see today reflect each fish's habitat: the substrate, properties of water and availability of food.



Body shape

The basic torpedo-shaped body varies according to where in the ocean the fish lives and how it makes its living. The sleek bodies of fast-swimming fishes like tunas and mackerel can zip through the open sea at 50 miles

per hour with little resistance. Less streamlined fishes depend on other ways to catch food and avoid being eaten.



California sheephead

The scorpion fish, with its poisonous spines and camouflages coloration, lies motionless among rocks to escape detection.

Some fishes, like the flounder, halibut and sanddab, are adapted to live on the seafloor. These flatfishes start life with bodies shaped like a typical fish. But as the young flatfish grows, one eye migrates to the other side of its head and its body flattens side-to-side. The adult flatfish lies on one side of its body with both eyes on the other side to see what's going on above.

Swimbladder

Many bony fishes have a balloonlike swimbladder that makes them weightless in water. By regulating the amount of gas in this air-tight sac, a fish can stay at any depth without sinking or rising. Most bottom-dwellers don't have swimbladders because they stay on the bottom.

Gills

Unlike marine mammals that surface for air, fishes breathe under water. A fish absorbs the water's dissolved oxygen by passing water through its mouth and across tiny gill membranes containing blood vessels. The blood releases carbon dioxide and takes up oxygen that's carried throughout the fish's body.

Scales

Tough, flexible scales overlap one another, serving as a coat of armor to protect most fishes. A layer of slime covers the scales, helping the fish move more smoothly through the water and protecting it from infection. Some fishes, like the wolf-eel that hides in caves, have no scales at all and protect themselves in other ways.

Fins

A fish's fins are specialized according to where and how the fish lives. Operated by muscles, all fins have a particular job. Some fishes have modified fins, and adaptation that helps the fish survive. The anglerfish lures its prey with a modified dorsal fin: it dangles the fin like a fishing line with bait in front of its large mouth.

Lateral line

A fish's lateral line detects the slightest water movements. Special sense organs lie in tiny pits along the fish's side, forming a visible line. These organs give fishes a sense of distant touch that may help them detect approaching predators or prey and stay close together when schooling.

Mouth

The size, shape and position of a fish's mouth depend on the size of food eaten and where it finds its food. Most fishes, like a rockfish, salmon and surfperch, have mouths in front of their heads to pick at or chase food that's in front of them. Others, like the hatchetfish, have upward-pointing mouths to catch prey swimming above. In the deep sea where food is scarce, a fish like the gulper eel, with its huge mouth and unhinging jaw, can swallow a fish larger than itself.

Dorsal and anal fins

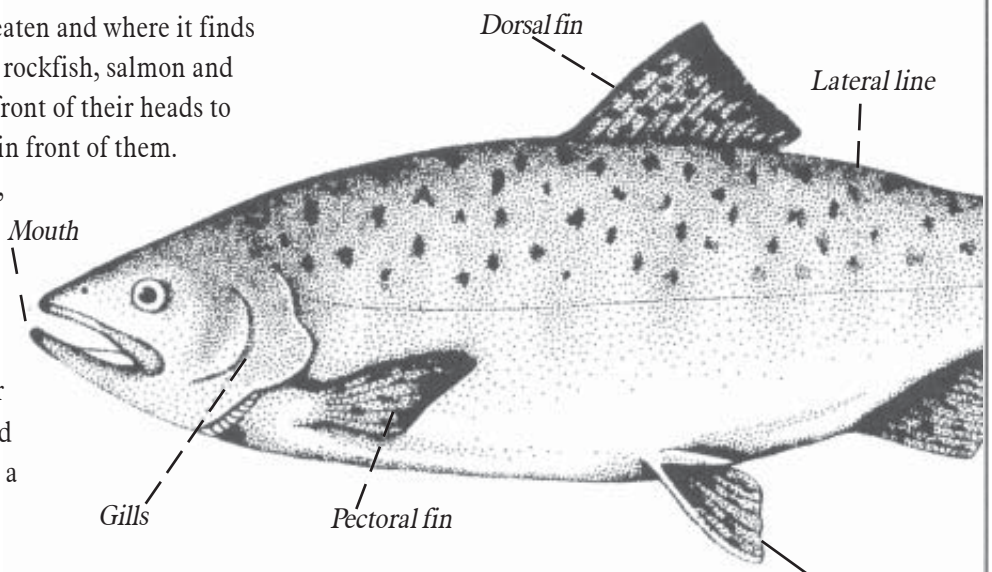
The dorsal and anal fins on most fishes work together like a boat's keel, keeping the fish from rolling over. On other fishes, like the pipefish and ocean sunfish, these fins propel.

Pectoral fin

Some fishes use their pair of pectoral fins to stabilize and steer, while others, like the sheephead, proper themselves with these fins.

Caudal fin

The square caudal fin of this rockfish helps it move with short, quick bursts, while the forked caudal fin of a mackerel propels it faster over greater distances.



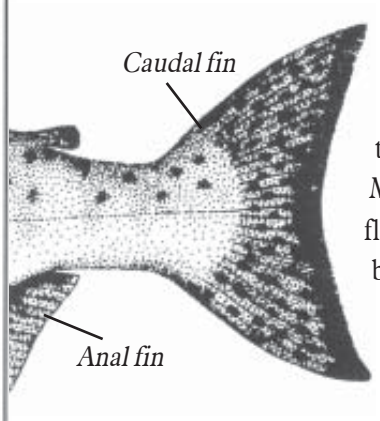
Protection

Fishes have a variety of adaptations that protect them from predators. Many are camouflaged: their body shapes, patterns and colors help them blend in with their surroundings. A wolf-eel's ribbonlike body shape helps it hide in crevices. A flatfish, living on the seafloor, can change its patterns to match the seafloor's variety of colors. Open sea fishes, like tunas and sardines, have countershaded

coloring, dark-colored on top to help them hide from predators looking down, but light on the underside to blend in with light streaming from above. Other fishes can be venomous, like the scorpionfish with its poisonous spines.

Behavioral adaptations also protect fishes. Some fishes school: a mackerel swimming in schools with several thousand individuals may be harder for a predator to catch than when it's alone. The mass of darting fishes may confuse the predator.

Reproduction



King salmon

Fishes must successfully reproduce to help keep their populations healthy. Most fishes, like the flounder and mackerel, broadcast thousands of eggs and sperm to drift in the ocean's currents. Some, like most sharks and rays, bear a few live young. Others, like the lingcod, guard a nest of eggs on the seafloor until they hatch. Still others, like the pipefish, reverse the male and female roles: the males raise their young in a pouch. The sheephead has an unusual adaptation: all are born as females. When they reach a foot in length, they can change their sex to male if no other males are around.

People and fishes

For thousands of years, people have fished the ocean's waters, mainly for food. In Monterey Bay, California, a booming sardine industry lasted nearly half a century, providing food and a living for many people. But a combination of factors, including overfishing, caused the industry to collapse in the 1940s.

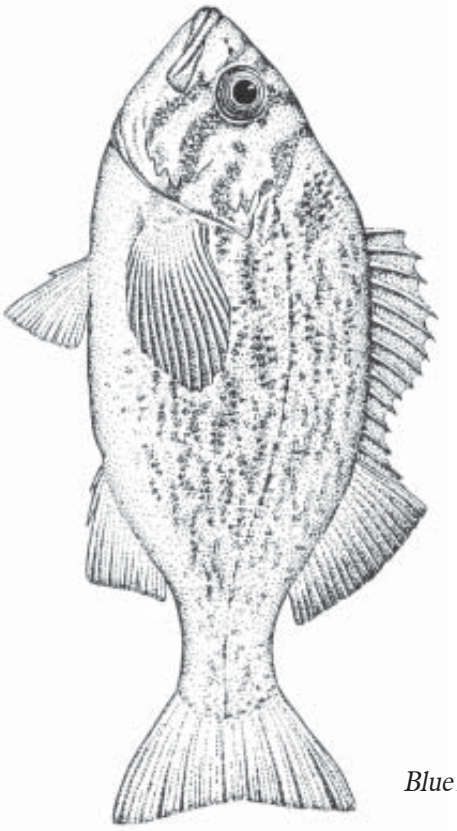
Throughout time, many waters worldwide have been overfished. Today, we continue to struggle with finding and maintaining a balance between how many fishes can be taken and how many need to remain in the sea to keep the populations healthy. Some countries have laws that govern the size and number of fishes that can be taken and where they can be fished. Other laws regulate the amount and kinds of waste that can be released into the ocean, rivers and lakes.

Scientists continue to study fishes, learning how they interact with each other and with their environment. Such research helps determine how many fishes can be taken without damaging their populations. High levels of pollutants and an ever-growing world population still threaten the world's fishes. With continued protection and research, perhaps fish populations can remain healthy while providing food and resources for people. The future of the sea's fishes depends on management and lifestyle decisions people make today.

A Fish Is a Fish

MATERIALS
• Paper and pencil or chalkboard and chalk

Draw a blank fish body on a piece of paper or chalkboard and label the body parts. What body parts does a fish use to swim? What does it need to breathe? How does it protect itself? How does it sense its surroundings? What body parts does it use to catch and eat its food? Design and draw an imaginary fish, then explain the way it swims, catches its food and hides from predators.

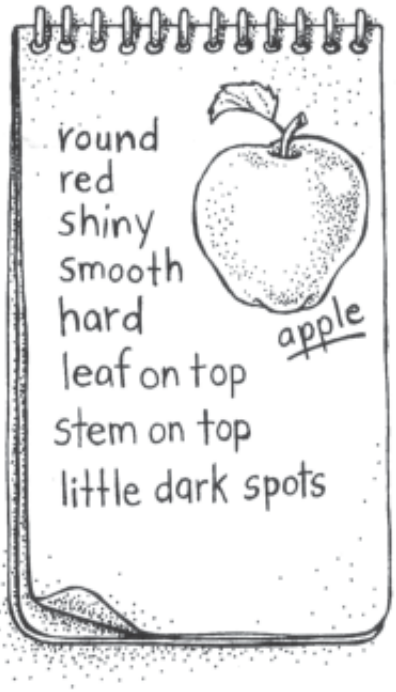


Blue rockfish

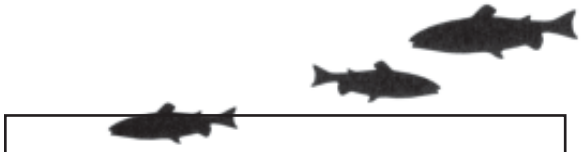
A Scientist's Clues

MATERIALS
• Yourself and a friend
• Pictures of several different kinds of fishes

Why do scientists describe animals in detail to help them with their studies? To begin, pretend you're a scientist. Choose an object and describe its color, shape, size and your feelings about it to a friend. Have your friend try to guess the object. Switch roles to let your friend describe an object while you guess. Do this several times until you both feel comfortable knowing the kinds of details and the level of detail that's needed to accurately describe an object to someone else. Now, compare pictures of two different fishes. Describe several ways the fishes are similar. How are they different?



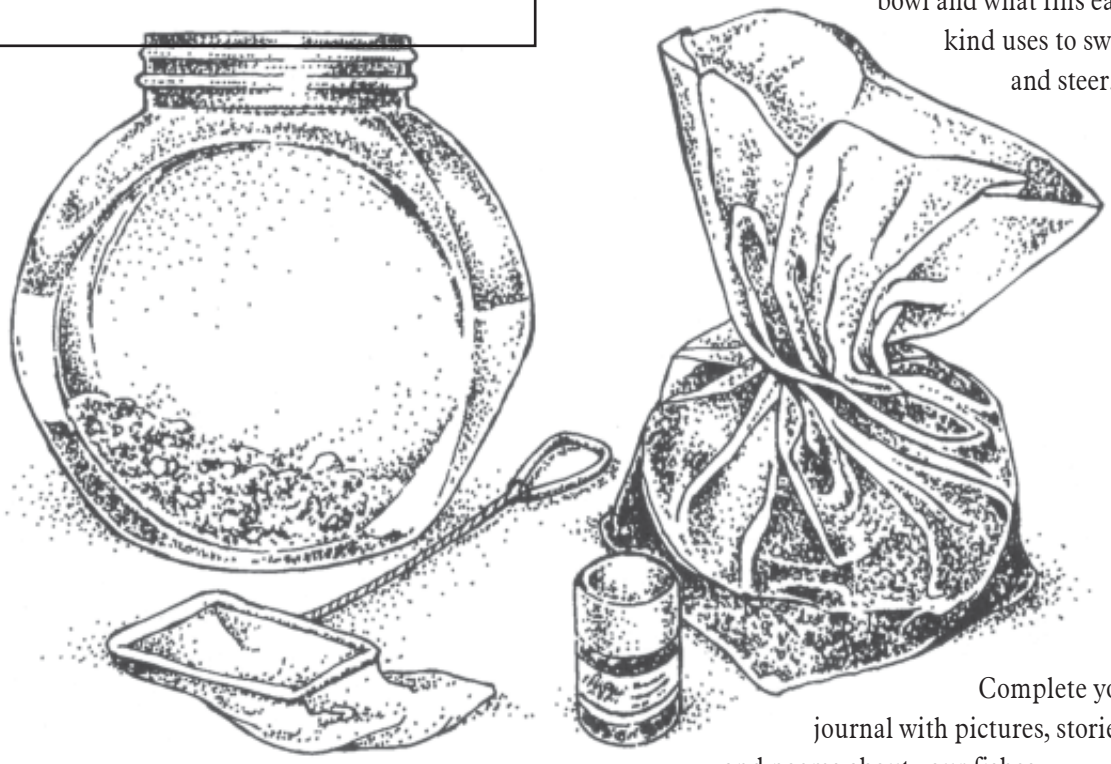
Raising Fish



MATERIALS

- Fish
- Fishbowl
- Gravel
- Small fish net
- Fish food
- Freshwater plants

Raise goldfish or guppies in a bowl at home or at school. What do you think they need to survive? Check with your pet store to see what your fish needs, how many fishes your fishbowl can hold and what kinds of fishes can live together. Keep a journal to record observations like what time of day the different fishes are most active, where in the bowl each kind lives (near the surface or bottom), how each one responds to motions outside the bowl and what fins each kind uses to swim and steer.



Complete your journal with pictures, stories and poems about your fishes.

Design an Aquarium

MATERIALS

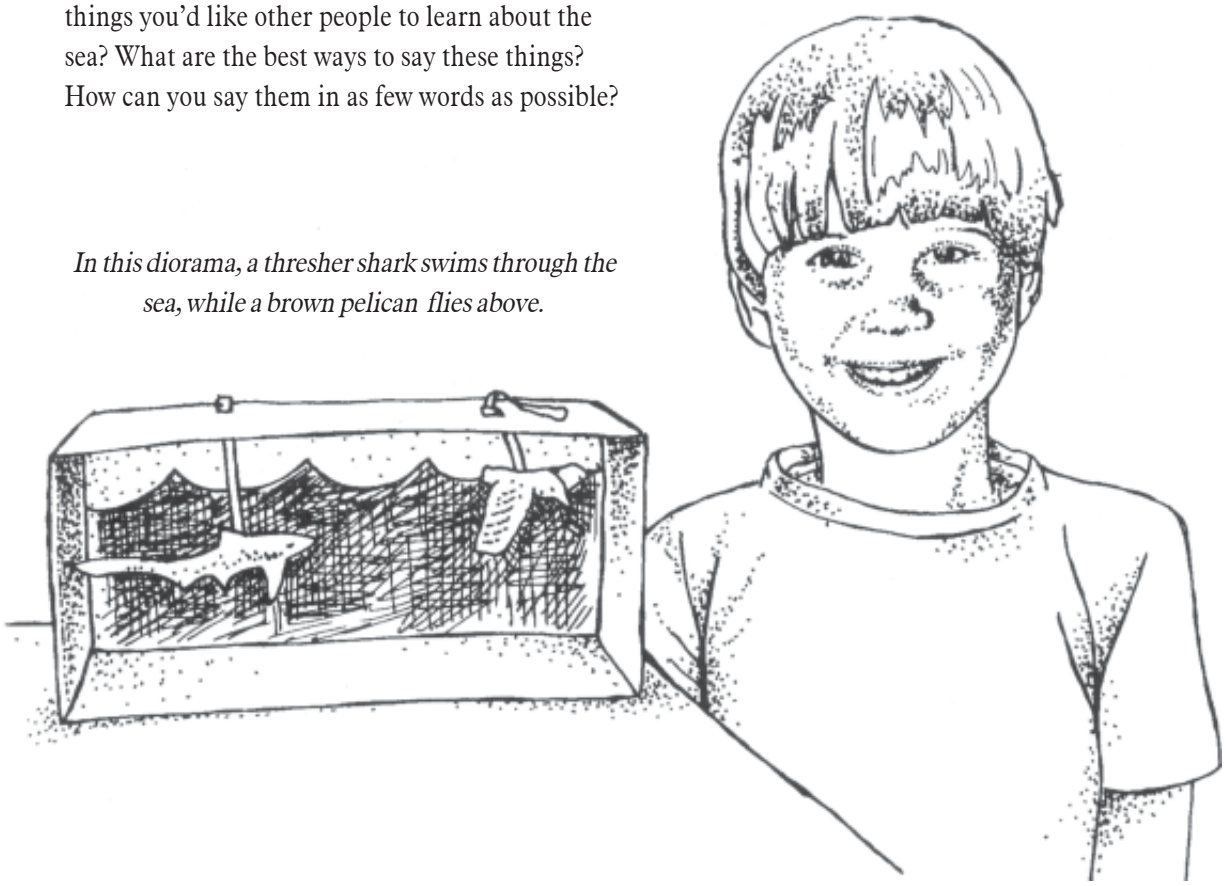
- Shoe box or other cardboard box
- Construction paper
- Favorite arts and crafts materials
- Scissors
- Glue

Here's your chance to design your own aquarium exhibit! Make a diorama (in a shoe box) or draw a picture of an ocean habitat. Create plants and animals for the habitat, and write labels to describe your exhibit. As you write your labels, think about how much time a person might spend reading each one. What are the most important things you'd like other people to learn about the sea? What are the best ways to say these things? How can you say them in as few words as possible?

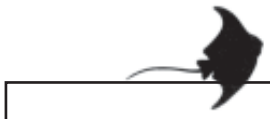
FISH FINGER PUPPETS

Use pieces of felt and fabric to create fish finger puppets (and other sea life!). Put on a puppet show in front of your exhibit, teaching your friends and family about fishes and the ocean.

In this diorama, a thresher shark swims through the sea, while a brown pelican flies above.



To Market, To Market!

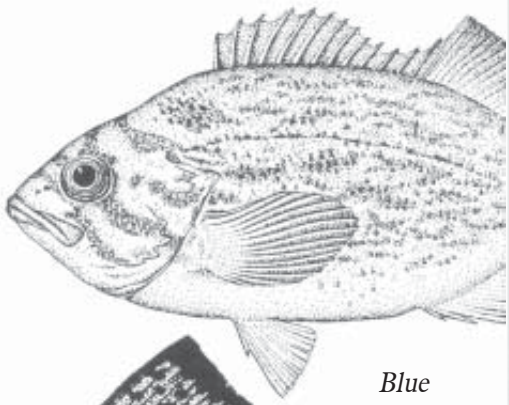


MATERIALS
• Yourself

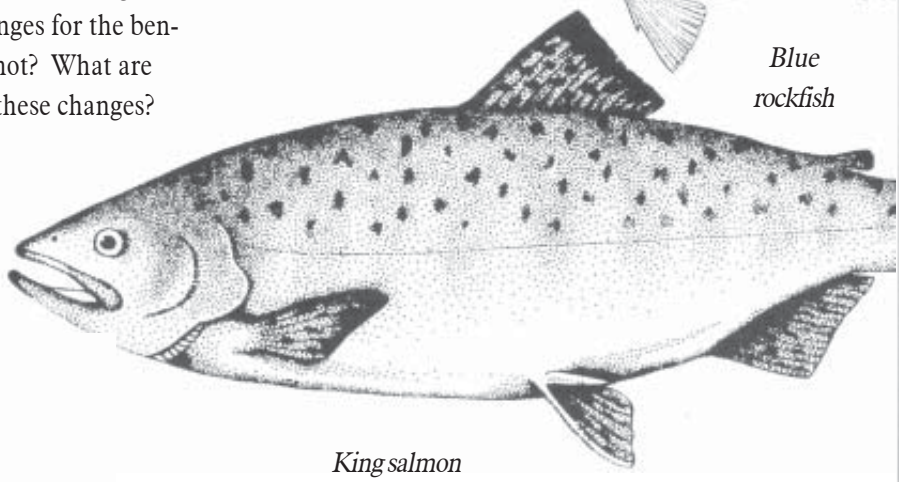
Visit a fish market and choose something you'd like to eat. Find the fish's name, where it was caught and what kind of fishing method was used to catch it. Talk to at least two restaurant fish buyers, fish market keepers, other fish buyers or fishermen and ask them how the numbers and kinds of seafood have changed over the last year. How have numbers and kinds of seafood changed year-to-year during their careers? What do you think is causing these changes? Are those things still occurring and causing more change? Are the changes for the benefit of the ocean and the planet or not? What are some ways people could influence these changes?

What Do You Think?

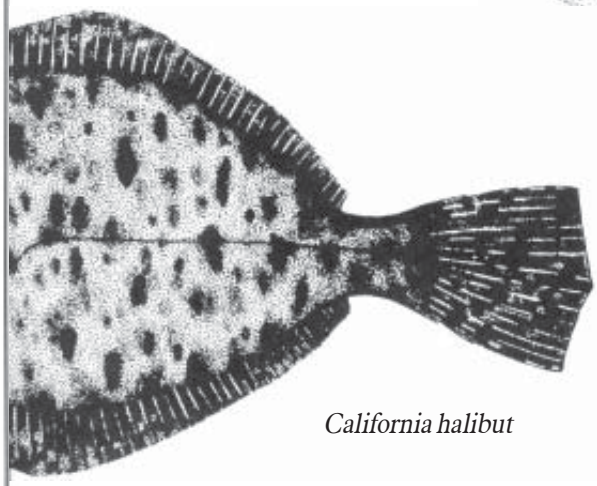
How would you feel if your favorite kind of fish were threatened by overfishing or pollution? How could you help save it? How is the fish important to the sea? How is it important to people? How can the species be safe in its sea home and fished at the same time?



Blue rockfish



King salmon



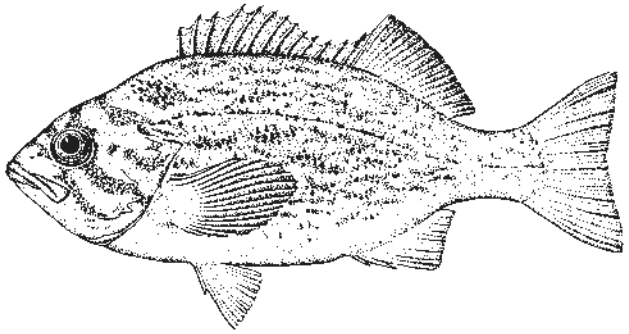
California halibut

Fish Bingo

Take this with you on your next visit to an aquarium!

The sea is home to hundreds of different kinds of fishes, each with its own shape, size and color. To explore this wonderful world of animals, look for the fishes that these clues describe. When you find a fish, draw its picture or write its name in the box with its clue. Three in a row makes Bingo! Can you find all the fishes?

A fish chasing another fish.	A fish that blends in with where it lives.	A fish with coloration that helps it hide in the open sea. (Hint: dark on top, light on its belly.)
A fish hiding in kelp or other seaweed.	A school of fishes.	A fish that rests on its fins.
A flat fish living on the sandy seafloor.	A snakelike fish that can escape into rock crevices.	A fish with a body shaped for fast swimming.

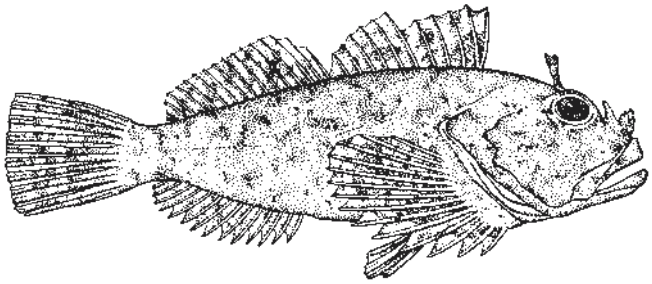


Blue rockfish

Blue rockfish
Sebastes mystinus [size: to 21 in. (53 cm)]

Schools of blue rockfish swim among the kelp plants. Sport fishers often catch these fish, but they must be careful when they do: rockfishes have poisonous spines on some of their fins.

Blue rockfish eat small floating animals like shrimps and jellyfishes.

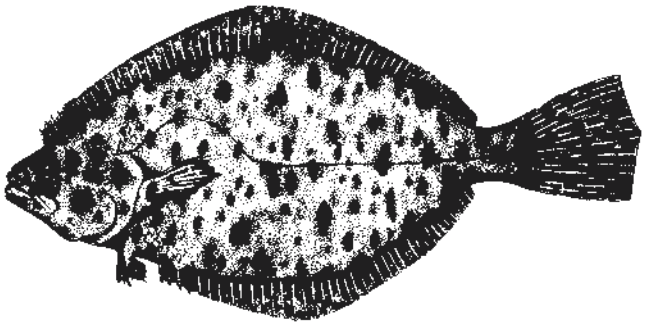


Cabezon

Cabezon
Scorpaenichthys marmoratus
[size: to 3.25 ft. (99 cm)]

Like their relatives, the small tidepool sculpins, cabezons live on the bottom in rocky areas. When they sit still, their waving fins and mottled color blend in with the surrounding seaweed.

Cabezons eat invertebrates like crabs and snails, and some fishes. They swallow abalones whole, then spit out the shells. "Cabezon" means "big head" in Spanish. This fish has a big mouth, too—it can gulp large prey.



California halibut

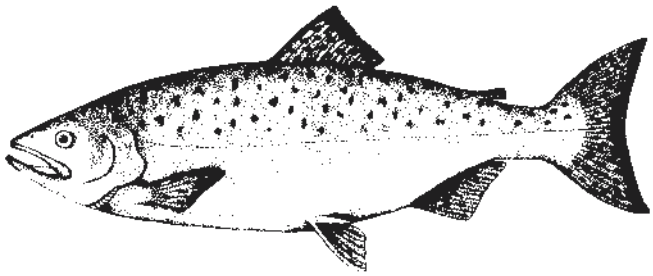
California halibut
Paralichthys californicus [size: to 5 ft. (152 cm)]

A halibut has both eyes on the same side of its head. It lives on the sandy seafloor, always lying on one side of its body. The halibut wriggles its flat body into the sand; its two eyes stick out above the sand to watch for approaching predators and prey.

Lanternfish

Lanternfish
Stenobrachius leucopsarus [size: to 5 in. (13 cm)]

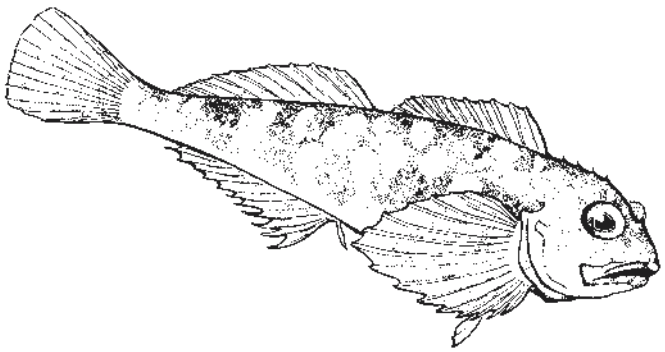
Each species of lanternfish has its own pattern of light-producing photophores. Lanternfishes may use these patterns to find mates of their own species. Some males may attract mates by flashing a large photophore near their tails. Or maybe this light confuses predators, causing them to attack the male's bright tail instead of his darker head. What do you think the lanternfish uses its taillights for?



King salmon

King salmon
Oncorhynchus tshawytscha
[size: to 5 ft. (1.5 m)]

Salmon are born in freshwater rivers, then swim to the salty sea where they spend most of their lives. As adults, they must return to the river to lay eggs. Salmon can find the way to their home streams from thousands of miles out in the ocean.



Tidepool sculpin

Tidepool sculpin
Oligocottus maculosus [size: to 8 in. (20 cm)]

A tidepool sculpin is hard to see because its colors match the rocks and plants it lives on. A sculpin on sea lettuce won't look like one living on gray rocks.

At high tide, this fish travels about looking for small animals to eat. At low tide, it hurries back to its tide pool. Even if it explores nearby pools, a sculpin can find its way back home.