

Topics

Fish, Adaptations

Grades

3-5

Site

Indoors

Duration

30 minutes

Materials

- **Habitat Photos**
- **Fish ID Cards** (1 set per student pair)
- **Decode a Fish Key** (at least one key per student pair)
- Nonfiction fish resources (books, magazines and web sites)
- Science notebooks or paper

Vocabulary

adaptations, habitat, caudal, dorsal, pectoral

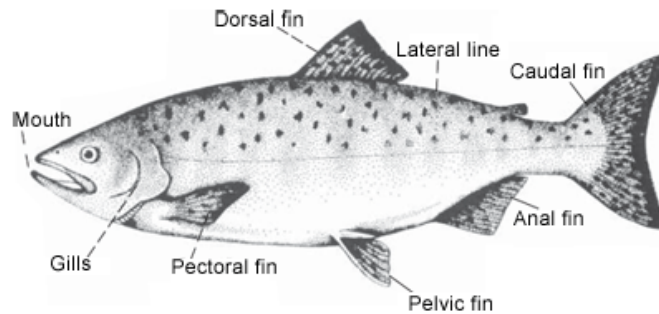
National Science Education Standards

Science as Inquiry (K-4)
Ability to do scientific inquiry
Understanding of scientific inquiry

Life Science (K-4)
The characteristics of organisms
Organisms and their environments

Life Science (5-8)
Diversity and adaptations of organisms

Decode a Fish



Overview

What is a fish? Where does it live? How does it survive in its habitat? Students become detectives to decipher how the body parts of a fish impact its ability to move, find food and protect itself.

Objectives

Students will be able to:

- Define a fish as a vertebrate with scales and fins that lives in water and breathes with its gills.
- Identify specific fish adaptations.
- Describe how the size and shape of a fish's body and fins determine how it moves and where it lives.

Background

Fish are vertebrates, or animals with backbones. They have many **adaptations** that help them survive in their aquatic **habitats**. Most fish are cold-blooded animals. Fish have skeletons made of different materials. The skeletons of most fish are made of bone. Sharks and rays have cartilaginous skeletons made of calcium phosphate and other minerals.

Instead of lungs, fish have gills for breathing. Fish take water in through their mouths. As the water passes over the gills, oxygen from the water is absorbed into the fish's blood stream. Most bony fish have gas-filled swim bladders for buoyancy. In contrast, sharks have very large livers filled with fatty oil that help keep them from sinking.

Fins serve many functions. **Pectoral** and pelvic fins are used for steering, balance and braking. **Dorsal** fins (located on the back) keep fish stable and prevents them from rolling over in the water. The tail or **caudal** fin helps fish move in their habitats. Fast swimming fish have narrow forked tails that provide the thrust needed to speed through the water.



VOCABULARY

Adaptations: body parts and behaviors that help an animal survive

Caudal: the tail or posterior end of an animal

Dorsal: the back or “top” of an animal

Habitat: a home for plants and animals that provides food and protection

Pectoral: the chest or breastbone area of an animal

Slower swimming fish have a wide, square shaped tail that helps them swim around rocks or reefs and catch prey.

The various colors and patterns of fish help disguise them in their habitats. Stripes, spots and coloration can help fish camouflage and avoid predators. Some colors, such as yellow or orange, are a warning that the animal is poisonous. In addition, as light travels deeper into the water, bright colors seem to disappear. This also allows brightly-colored fish to blend in with their surroundings. False “eyespot” located on a fish’s body might confuse potential predators. Fish with counter-shading are dark on the top or dorsal side of their bodies and lighter underneath on the ventral side. This makes them more difficult for predators to see when looking down on them from the surface or looking up from the ocean depths.

The shape of a fish helps it hunt for prey and avoid predators. A torpedo-shaped body increases a fish’s swimming speed. Most fish with this shape live in open water and are excellent swimmers. Elongated-shaped fish hide under or wrap around rocks or coral. Flatfish have flattened bodies. They lie on their sides on the seafloor with only their eyes protruding from the sand, hiding until their prey swim nearby.

The position of a fish’s eyes identifies where it spends most of its time. When a fish has one eye on each side of its body, it usually swims in the water column and above the seafloor. If both eyes are on top of its head or if both eyes are on one side of its head, it stays on or near the bottom. The eyes of some species look upward while others look downward. This helps them find prey or sense predators above or below their body. Some fish living in deeper water have very large eyes to give them maximum light-collecting ability in low-light areas. Other pelagic fish have very small or no eyes because they live in permanent darkness.

The design and location of a fish’s mouth indicates how it obtains food. If the mouth is on the underside of its body, it feeds on the bottom in sand or mud. When a fish’s upturned mouth is slanted toward the top of its body, it’s a surface feeder. If it has a big, wide mouth, it gulps its food. Reef fish with long, skinny “noses” probe the coral crevices for prey items.

Some fish have teeth of various shapes and sizes. Fish with tiny teeth nibble while some shark species have rows of sharp teeth that bite and tear. Parrotfish have strong jaws that scrape and crunch coral to consume the zooxanthellae (algae) within.

Teacher Preparation

1. Make copies of the **Fish ID Cards, Decode a Fish Key** and **Habitat Photos**.
2. Gather other fish images and nonfiction resources.
3. Choose a mystery story to read to your class.



ELL TIPS

Some of the vocabulary may be challenging for English language learners. Use the new vocabulary in a familiar context, such as comparing what the students’ adaptations or body parts help them to do. Taller students can reach objects on the top shelf and shorter students are more comfortable on airplanes.

Procedure

1. SET THE SCENE FOR SOLVING A MYSTERY.

Read a mystery story as a class and briefly discuss the plot and setting. *What clues did you use to solve the mystery? Scientists use clues to solve mysteries in nature, too.* You may tell students that they will investigate a fish and “solve a mystery” by decoding its structural and behavioral adaptations.

2. STUDENTS COLLECT INFORMATION ABOUT FISH.

Students can visit Monterey Bay Aquarium’s website to view live fish on several web cams. If you have a pet fish in your classroom, have the students observe it and write their observations in a notebook or on loose leaf paper. *What do you notice about the shape and size of fish bodies, fins and mouths? Where are the mouths located and what shape are they? How do they move? Where are the eyes located and what shape are they? How do fish breathe? How and what do they eat?*

3. AS A CLASS, DISCUSS OBSERVATIONS ABOUT FISH USING THE FISH ID CARDS.

Use some pictures or a few of the **Fish ID Cards** with the whole class to compare various body and fin shapes and sizes. What similarities and differences do students notice?

4. OBSERVE AND DISCUSS FISH HABITATS WITH THE CLASS.

Look at some of the **Habitat Photos**. What do students notice about different habitats? Are there rocks or algae? Is it dense and crowded with inhabitants? What shape and size are some of the animals?

5. AS A CLASS, USE THE DECODE A FISH KEY TO REVIEW SOME FISH CHARACTERISTICS.

Use the **Decode a Fish Key** to look at some of the characteristics that help fish survive, i.e., torpedo-shaped body and forked shaped tail for fast swimming, flat, round or long body shape to help it hide or a long probing mouth to reach food in crevices. Refer to fish behaviors, such as the ways they move and protect themselves. Many blend into their surroundings (camouflage), some can rapidly swim away from a predator, while others are bottom dwellers that lie immobile until prey appears.

6. WORKING IN PAIRS, STUDENTS BECOME FISH DETECTIVES TO INVESTIGATE A FISH AND RECORD THEIR INTERPRETATIONS.

Have the students select one **Fish ID Card** and find out everything they can about that fish using the **Decode a Fish Key**. (You may choose to either cut or fold the **Fish ID Cards** so only the illustration and not the written information is showing.) Have a few sets of **Habitat Photos** available for students to reference. Challenge students to match the clues on the cards with their illustration to infer which habitat their fish lives in, how or what it eats and how it moves and protects itself. Encourage the use of deductive reasoning to eliminate guesses and de-code their fish’s physical characteristics. They should look closely at its body shape and size; coloration; fin shape and position; plus its eye and mouth shape, size and location. Then have them record what they find in their notebooks and try to solve the mystery of their fish!

7. STUDENTS CONFIRM THEIR INTERPRETATIONS AND FIND OUT THE REAL FACTS ABOUT THEIR FISH.

Using books, web sites and the written information on the **Fish ID Cards**, have students research their fish to confirm their findings. Did they guess the correct habitat, how it eats and how it moves and protects itself? What clues did they use to solve the mystery?

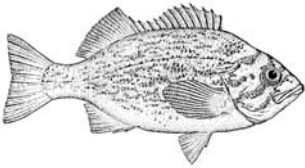
**THE MISSION OF THE
MONTEREY BAY
AQUARIUM
IS TO INSPIRE
CONSERVATION OF THE
OCEANS.**



CONSERVATION TIPS

Use Monterey Bay Aquarium’s Seafood Watch guide to make sustainable seafood choices. Fish in the green column are best choices. If possible, avoid eating fish in the red column.





Extensions

- Students write descriptive paragraphs with clues about their fish and play a fish mystery game. They try to match the fish images with the descriptions.
- After doing their research, have students become an “expert” on one fish. The “detectives” take turns interviewing the “experts” (each other). They ask one another yes or no questions to deduce the identity of each fish.
- Make Venn diagrams that compare two fish.

Resources

Websites

Monterey Bay Aquarium. www.montereybayaquarium.org

Watch and observe many different kinds of fish on live web cams and in a video library; print animal fact cards; find information in the online field guide or read through the *Sea Searcher's Handbook*.

FishBase. www.fishbase.org

A global information system on fish, this web site has information about 28,500 fish, including common and scientific names and photos. Take a Fish Quiz!

Books

Amazing Fish. Ling, Mary. Alfred A. Knopf, 1991.

Eyes on Nature: Fish. Resnick, Jane P. DDL books, 1994.

Eyewitness: Fish. Parker, Steve. Alfred A. Knopf, 1990.

Peterson's Pacific Coast Fishes. Eschmeyer and Herald. Houghton Mifflin, 1983.

Standards

Ocean Literacy Standards

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

California Science Standards

Grade 3: 3a, b, c, d; 5b, e

Grade 4: 2b; 3a, b; 6a, f

Grade 5: 2a, b; 6a, g, h

California Language Arts Standards

Reading

Writing

Written and Oral English Language

Conventions

Listening and Speaking

www.cde.ca.gov/re/pn/fd/documents/elacontentstnds.pdf

Habitat Photo: Coral Reef



©Monterey Bay Aquarium

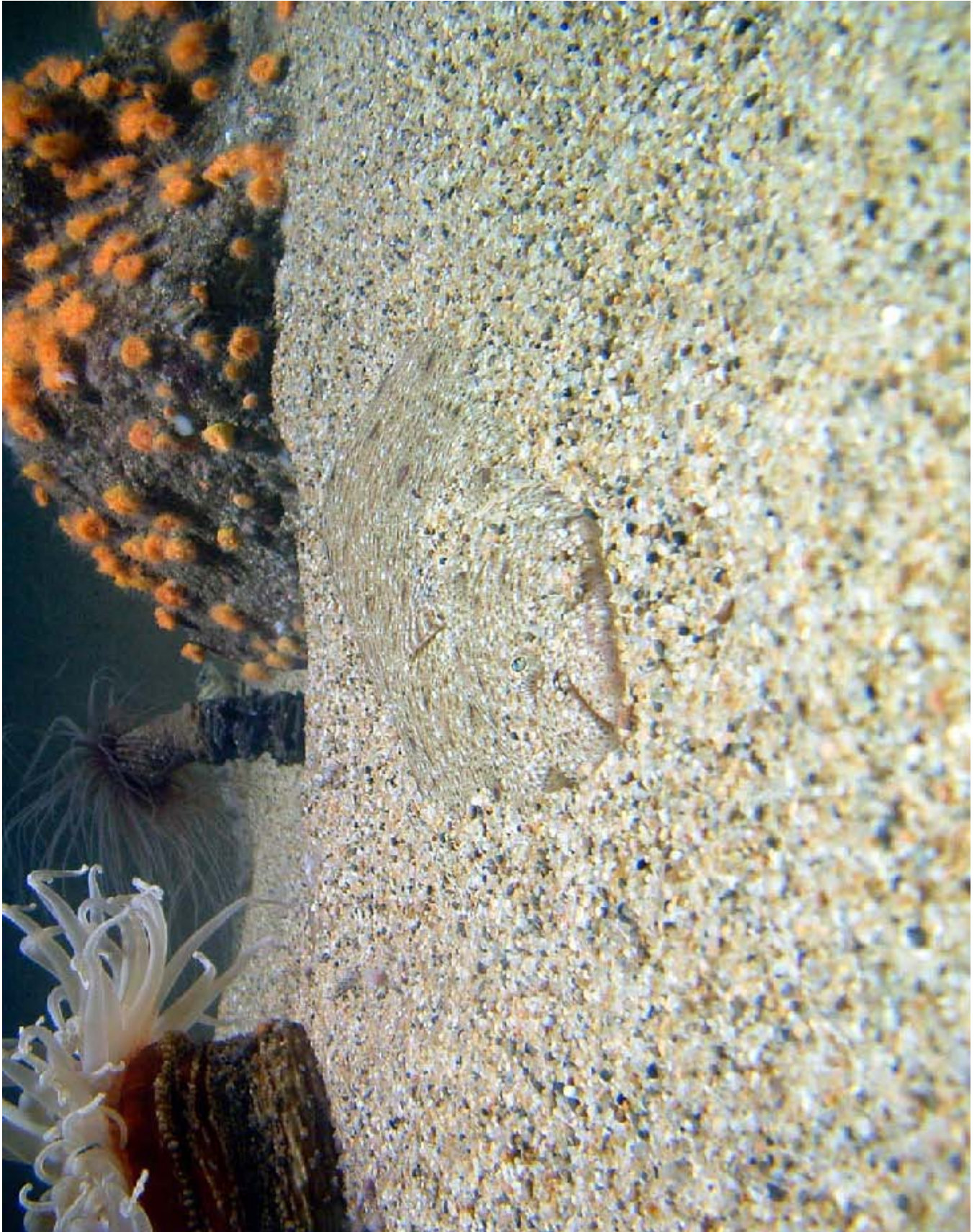
Habitat Photo: Kelp Forest



Habitat Photo: Rocky Shore



Habitat Photo: Sandy Shore



Habitat Photo: Open Ocean

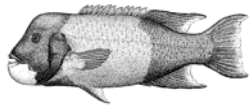


Decode a Fish Key (1 of 2)

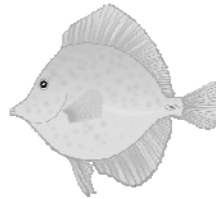
Body Shapes (where it lives)



Torpedo
(open waters)



Boxy
(among coral or rocks)



Round
(tight places)

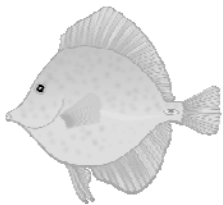


Flat
(sandy bottom)



Elongated
(around or under rocks)

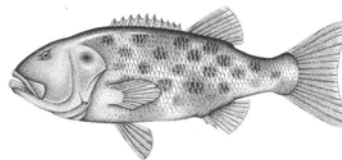
Mouth Shapes (how or where it eats)



Long skinny
(probes in crevices)



Mouth on underside
(bottom feeder)



Big wide mouth
(gulps prey)

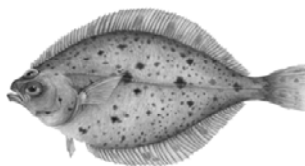


Mouth with teeth
(catches prey)

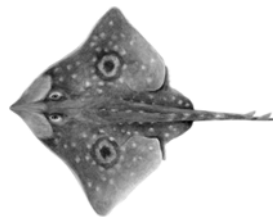
Eye Shapes (where it spends most of its time)



One eye on each side
(usually swims above the seafloor)



Both eyes on same side of head
(stays on or near the bottom)



Both eyes on top of head
(stays on or near the bottom)

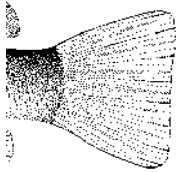


Large eyes
(light gathering in deep water)

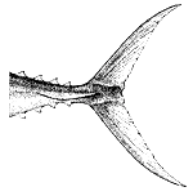
Decode a Fish Key

(2 of 2)

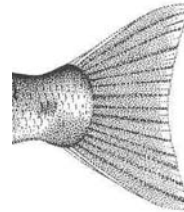
Caudal (tail) Fins (the speed it swims)



Squared
(moderate)



Forked
(very fast)

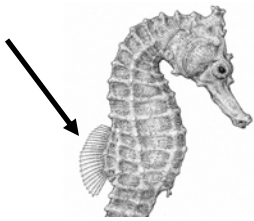


Truncated
(sprints)



Pointed
(fast)

Dorsal Fins on back (for steering and to prevent rolling)



Tiny fins



One long fin



Large fins



Small fins

Pectoral Fins on sides (for balance, turning and braking)



Pointy fins
(sharp turns and fast stops)



Short and square fins
(maneuvers quickly)

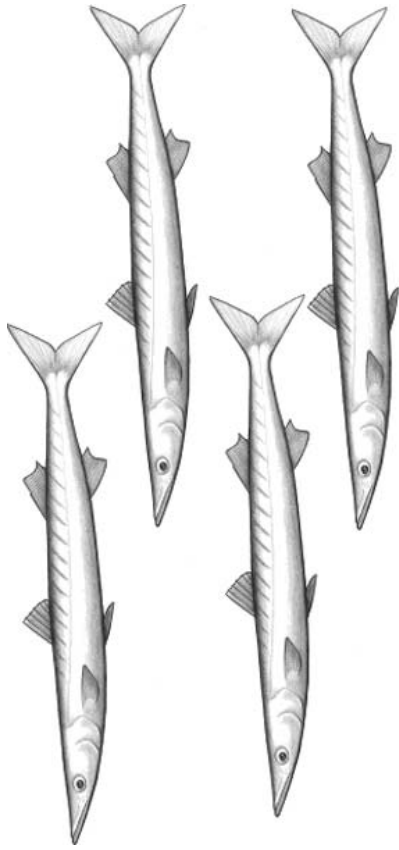


Irregular fins
(balances, hops or sits on fins)



Triangular fins
(stabilizer)

California Barracuda



Habitats: Open ocean, near shore in surface waters, in the outer edges of kelp forest beds

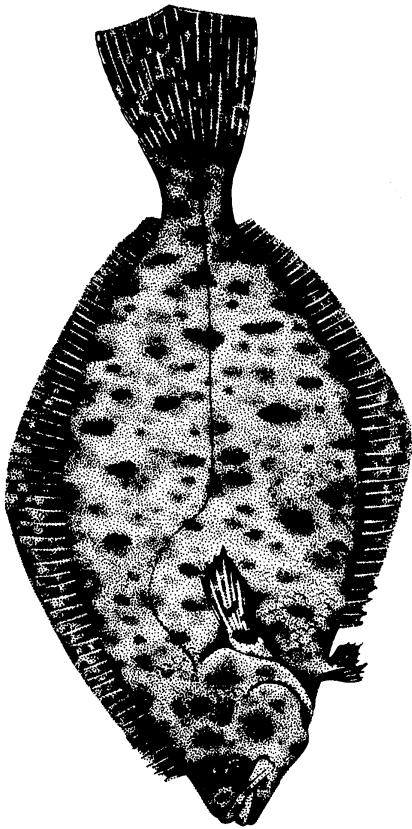
Adaptations:

- Barracudas have counter-shading. Their bodies are bluish to brownish above and silvery underneath. The darkish color on top (dorsal side) makes it more difficult for predators to see them when looking down from the surface. The lighter coloring underneath on their ventral side may confuse predators looking up from the ocean depths and helps protect barracudas.
- Sharp teeth, large canines and long pointed snouts make barracudas fierce predators. The tip of their lower jaw extends beyond the upper one.
- Their sleek body shape makes them fast swimmers.

Size: Up to 4 feet (1.2 m) long

Diet: Fishes

California Halibut



Habitat: Sandy shore

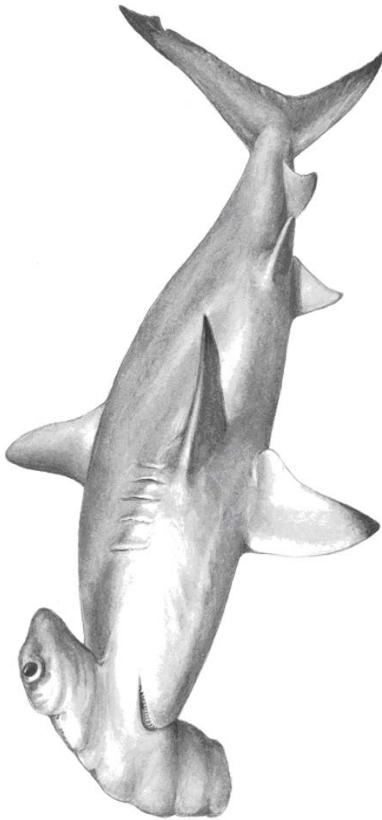
Adaptations:

- Halibuts have a large mouth. Both eyes are on one side of their head and point upward. Their eyes are sensitive to patterns.
- A flatfish begins life as a normal-looking fish larva with an eye on each side of its head. In about 13 days one eye starts roving and migrates around the head to take its place next to the other eye. When the change is complete, the halibut is still less than one inch (2.5 cm) long, but it is ready to live life sideways.
- The topside of the fish is brown or blackish with light and dark splotches. The underside is usually white. Its coloration matches with the sandy or pebble bottom where it rests. It also hides by burying itself up to its eyes in the sandy seafloor.

Size: Up to 5 feet (1.5 m) long, weigh up to 72 pounds (32.7 kg)

Diet: Anchovies and other small fishes, squid

Scalloped Hammerhead Shark



Habitat: Open ocean in temperate waters

Adaptations:

- The hammerhead shark's eyes and nostrils are located at the extreme ends of its head. Perhaps this unusual shape gives the shark added lift and lets it make sharper turns than other sharks.
- Hammerheads have uncommonly small mouths. Scalloped hammerheads usually prey on stingrays. Scientists don't know much about how the stingrays' venomous barbs that get imbedded in the sharks' mouths and jaws affect them or how the sharks get rid of them.
- Their pups are born in warmer, shallower coastal lagoons. They migrate offshore later in life.

Size: Up to 14 feet (4 m) long, weigh up to 350 pounds (160 kg)

Diet: Fishes, squid, crustaceans, stingrays

Leopard Shark



Habitat: Kelp forest, slough, rocky shore

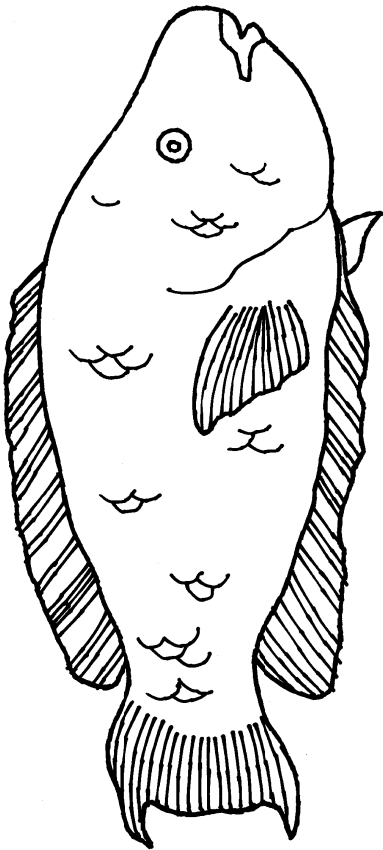
Adaptations:

- Leopard sharks have electroreceptors in their snouts that help them locate buried prey in shallow water along sandy or rocky bottoms.
- They nip off clam siphons and suck worms from the mud.
- They bear live young.
- When young, their spotted and barred coloring camouflages them against the seafloor. When they are large enough to live in deep water, their spots disappear.

Size: Up to 6.5 feet (2 meters)

Diet: Fish, fish eggs and invertebrates; such as crabs, worms and clams

Parrotfish



Habitat: Coral reefs

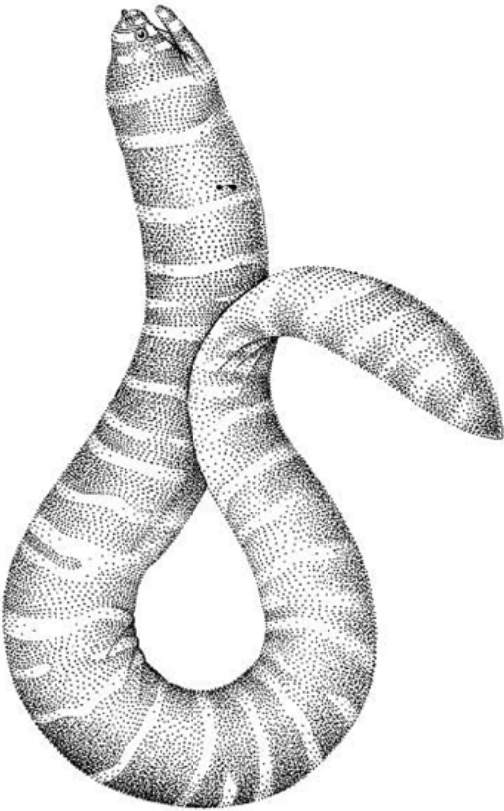
Adaptations:

- Parrotfish have fused teeth that form beaklike plates, giving them a parrotlike appearance. They have strong jaws for crunching and scraping coral. Some species have large thick scales that are strong enough to stop a spear.
- There are about 60 species. Most are brightly colored to blend in with colorful and crowded coral reef communities. Males and females generally look quite different. Females may change into males.
- These fish produce tons of coral reef sand each year! The sand-making process begins as the fishes graze on the algal film that grows on coral. As they feed, molarlike teeth in their throats grind the coral. The coral then travels through their digestive systems and is deposited in the reef as white coral sand.
- These daytime creatures burrow in the sand or hide in crevices at night. Some species even secrete a clear mucous cocoon around themselves at night, which probably masks their scent and helps protect them from predators, such as sharks and moray eels.

Size: 1.5–4 feet (.5-1.2 m)

Diet: Algae that covers coral and the reef bottom

Zebra Moray



Habitat: Coral reefs

Adaptations:

- Zebra morays hole up in crevices and under ledges on the wave-swept outer edges of coral reefs.
- They come out to hunt at night, prowling the reefs in search of crabs, clams and other hard-shelled prey.
- Zebra morays have flat, plate-like teeth, perfect for crunching hard shells. Their teeth tell the tale of their diet. (Other kinds of morays have sharp, pointed teeth for grabbing and holding on to fishes and other slippery prey but not zebra morays.)
- Moray eels look menacing as they constantly open and close their mouths, but they're not making threats. That's just how they breathe!

Size: Up to 5 feet (1.5 m)

Diet: Sea urchins, crabs and other crustaceans, clams and other molluscs

Coralline Sculpin



Habitat: Rocky shore

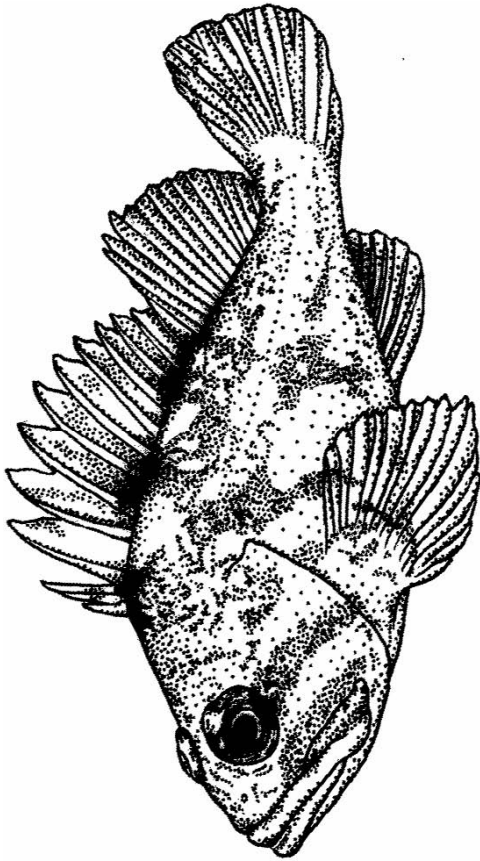
Adaptations:

- Sculpins commonly hug the bottoms of Pacific coast tide pools.
- These tiny fishes can be hard to see. Their colors blend in well as they hide among seaweeds and rocks.
- Their camouflage makes it hard for bigger fishes and hungry birds to find them.
- As the tide comes in, coralline sculpins often leave their home pools and follow the incoming water to hunt in pools higher up.
- When the tide falls again, they head straight back to the pool in which they started.

Size: Up to 5.5 inches (14 cm)

Diet: Small fishes, shrimp, crabs and other crustaceans

Rockfish



Habitats: Rocky shore, kelp forest

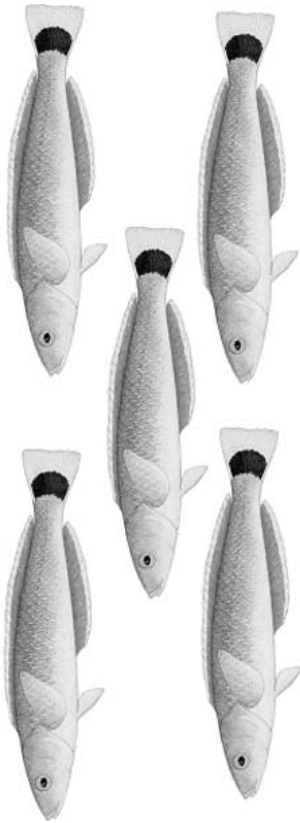
Adaptations:

- Rockfishes come in more than 100 species and many different shapes, sizes and color patterns. Colors vary from black and drab green to bright orange and red. Some may have stripes or splotches.
- Their heads feature large eyes and thick, broad mouths that dip downward at the corners.
- They are known for the bony plates on their heads and bodies and the heavy spines on their fins.
- In giant kelp forests, rockfishes hover motionless under the kelp canopy, buoyed by their air bladders. Some species rest on rocks at the bottom of the kelp forest. However, other rockfish live on rocky reefs, seafloors or in the water column.
- They are one of the longest-living fishes. Some species live 100 years or more.
- Some rockfish don't reproduce until they're 20 years old and they only have a few young. Rockfish can't reproduce quickly enough to keep up with demand and are overfished.

Size: Five to 41 inches (12-104 cm) depending on the species

Diet: Small crustaceans, fishes, plankton

Señoritas



Habitats: Kelp forest and reefs up to 240 feet (1.5 m-76 m) deep

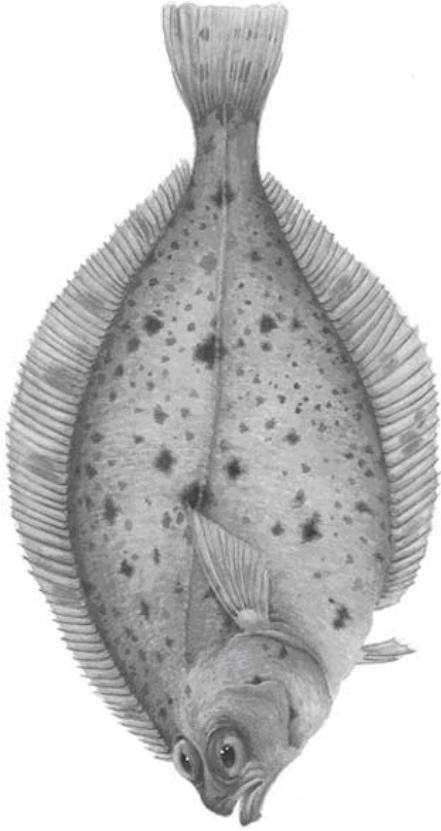
Adaptations:

- Señoritas feed during the day.
- At night they bury themselves in sandy bottoms with only their heads exposed. When threatened by predators in the daytime, señoritas dart to the seafloor and hide by burrowing in the bottom sediment. Sea birds and California sea lions prey on señoritas.
- A señorita is little, cigar-shaped and orange with large black spots on its tail. It has large scales, a small mouth and protruding teeth that are ideal for picking plankton from algae.
- They swim in loose schools.
- Known as "cleaner" fish, they pick external parasites and copepods from the skin of other fishes. They clean until they lose interest and then swim away, leaving behind disappointed fishes.

Size: Up to 10 inches (25 cm)

Diet: Small invertebrates; like hydroids, bryozoans, amphipods, parasitic copepods, isopods

Sanddab



Habitat: Sandy shore

Adaptations:

- Sanddabs are masters of camouflage. They are quick-change artists that change color and pattern to match their surroundings.
- Like other flatfish, sanddabs spend their lives lying on their sides.
- They shuffle into the sand and cover themselves until only their eyes protrude. They are often so well hidden that predators and prey overlook them.
- Both eyes are on one side and pointed upward. A sanddab begins life as a normal-looking fish larva with an eye on each side of its head. In about 13 days, one eye starts roving and migrates around the head to take its place next to the other eye.

Size: Some species grow to 16 inches (40.6 cm) long while others rarely reach 6 inches (15.2 cm).

Diet: Worms, shrimp, squid and fishes