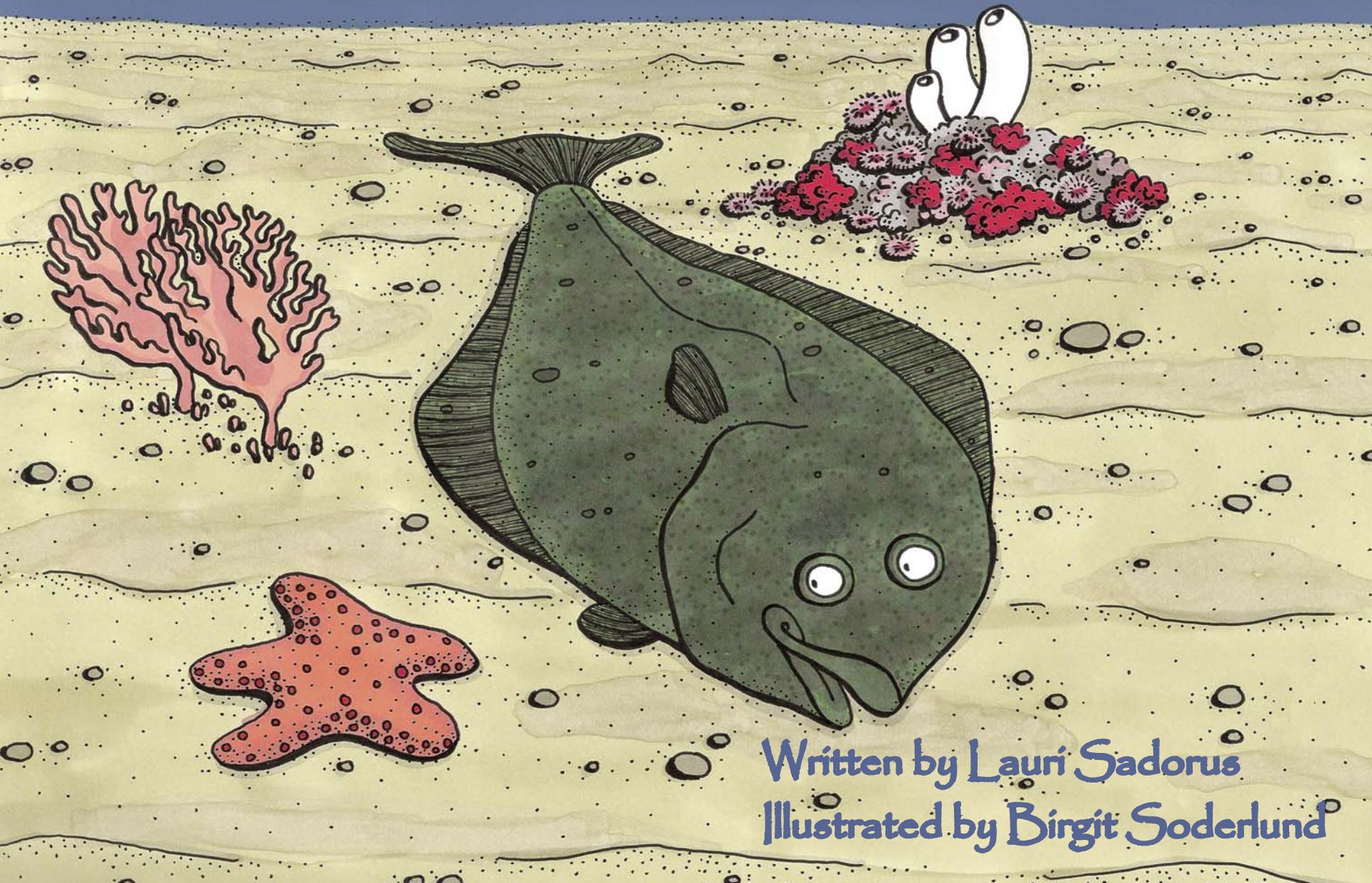
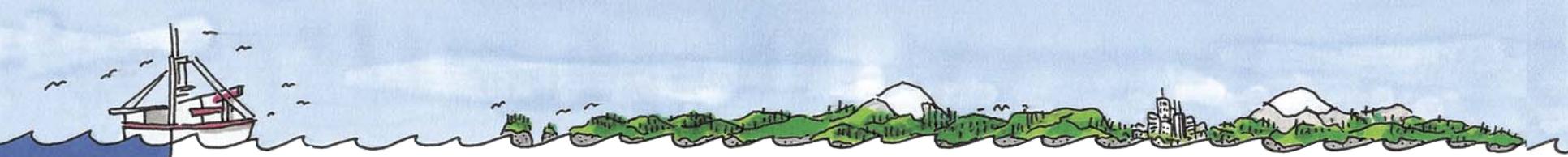


Pacific Halibut Flat or Fiction?



Written by Lauri Sadorus
Illustrated by Birgit Soderlund



International Pacific Halibut Commission

Established by a convention between
Canada and the United States of America

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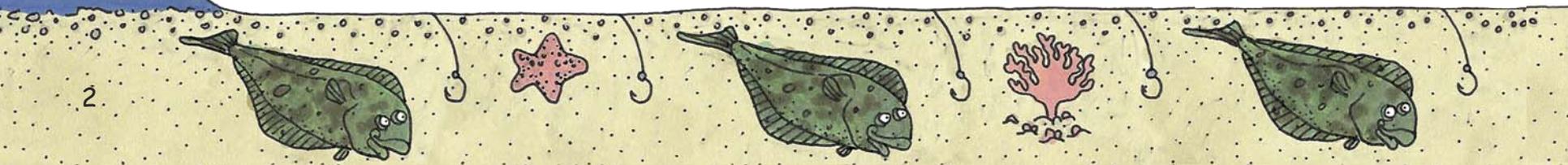
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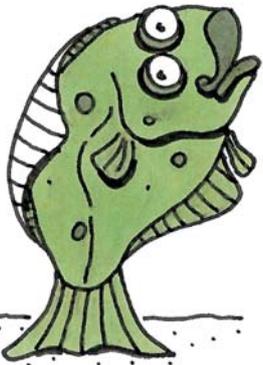
2005

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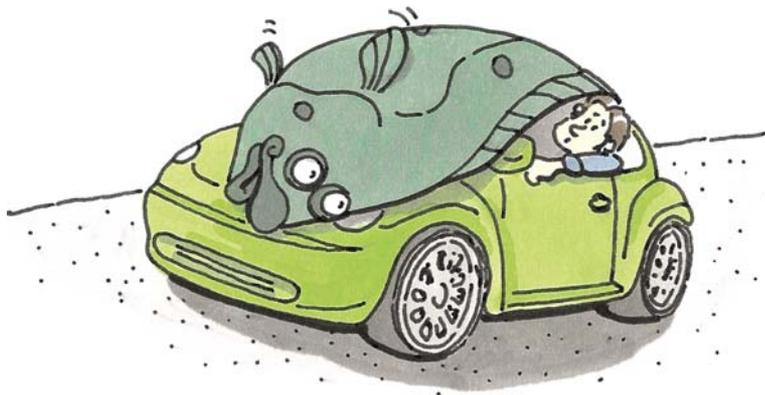
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Flat or Fiction?

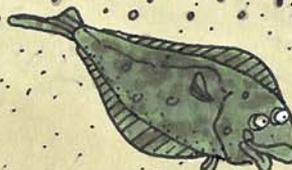
What would you say if I told you that there is a fish at the bottom of the Pacific Ocean that can grow to be as long as a car, and can weigh as much as 10 first graders?



Let me tell you about Pacific halibut!



Look for this glossary symbol on the pages ahead, then find out what the words mean on page 23.





What Do Halibut Look Like?

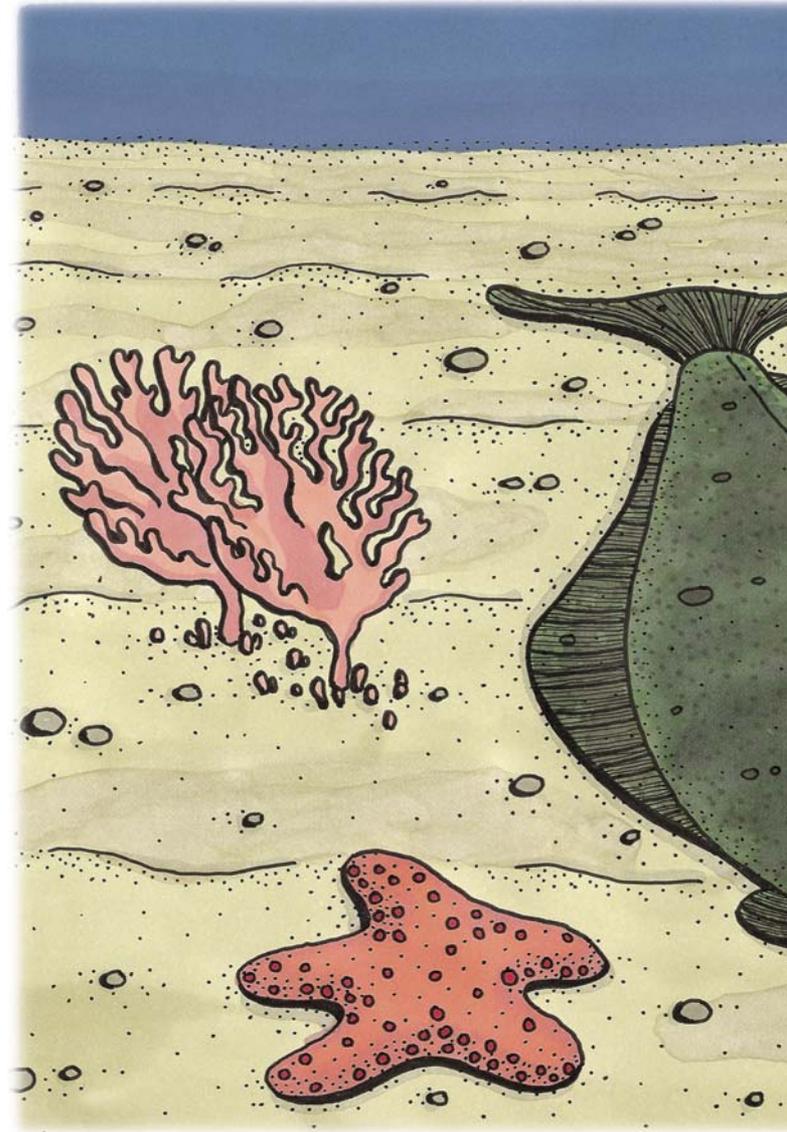
Pacific halibut are in the flounder family. Their scientific name is *Hippoglossus stenolepis*. Hippo-gloss-us, means “horse tongue”, and refers to a halibut’s large mouth and tongue. Sten-o-lep-is means “narrow scale” and refers to the deeply embedded, almost invisible scales on the halibut’s body.



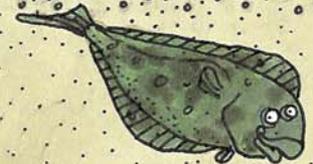
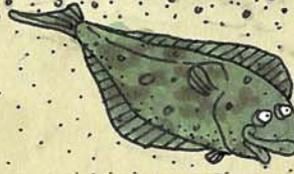
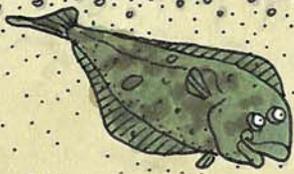
Flat Fact!

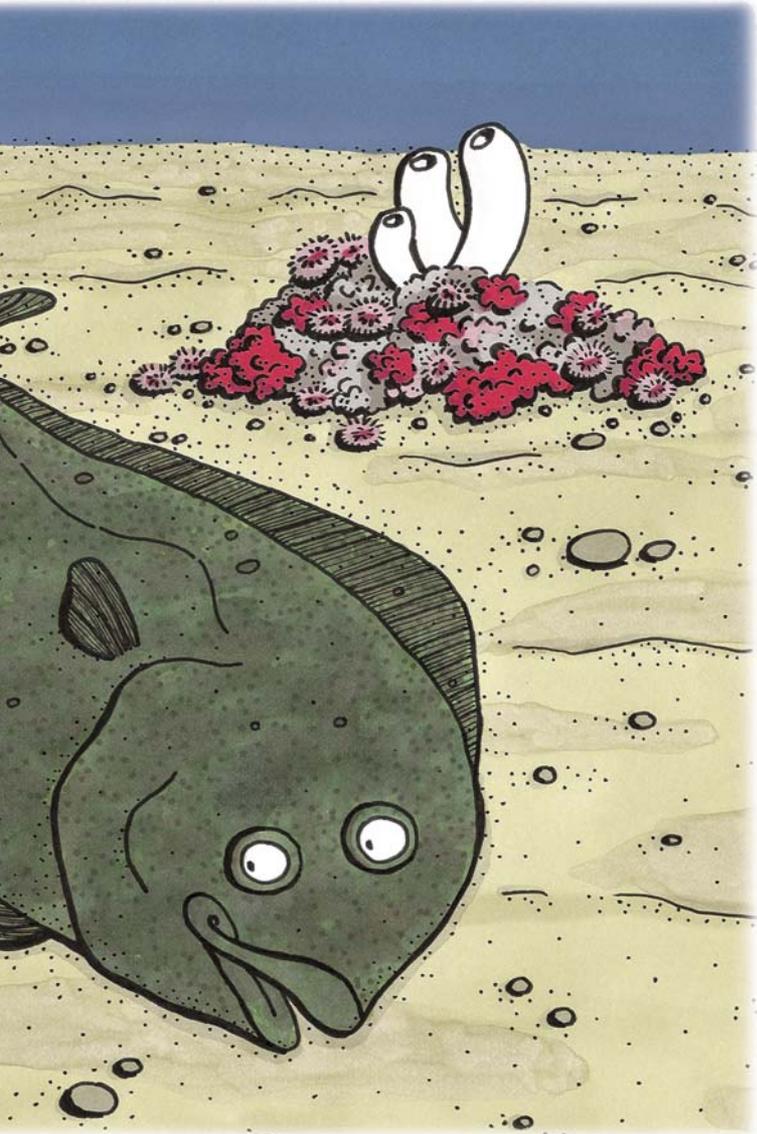
A layer of slime that feels a little like dish washing liquid covers a halibut's whole body. The slime is important to keep infection out.

Like all flounders, halibut are flat and spend most of their lives on the ocean floor. Don't let “flat” fool you though. While halibut may be only as thick as a book, they can reach weights of 500 pounds or more!



Pacific halibut laying

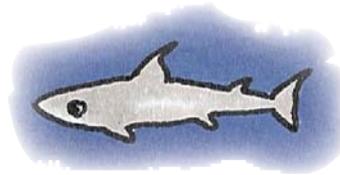




on the ocean bottom.

How do halibut protect themselves from predators?

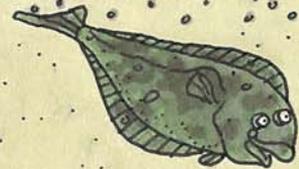
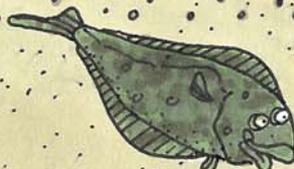
The ocean is full of many different kinds of animals. Although halibut can grow pretty big and are hearty swimmers, there is sometimes a bigger animal waiting in the depths. As it turns out, protection for halibut comes by hiding — in plain sight!

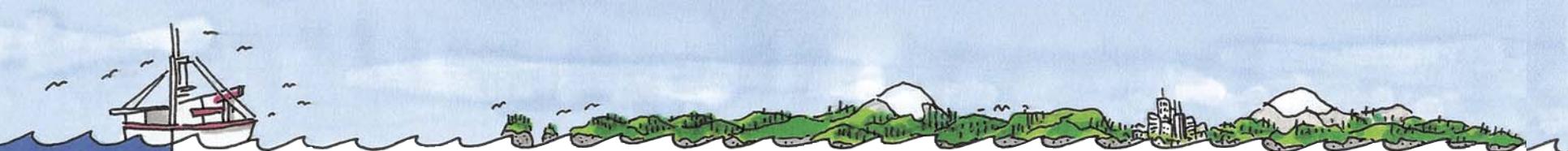


Shark - a predator of halibut

Halibut nestle into just about any type of ocean bottom such as sand, mud, and rocks. The top of their bodies are brown and green and sometimes a mix of colors to match the color of the different types of ocean floor. By blending into their surroundings (also called camouflage), they are almost invisible to predators.

G predator, camouflage

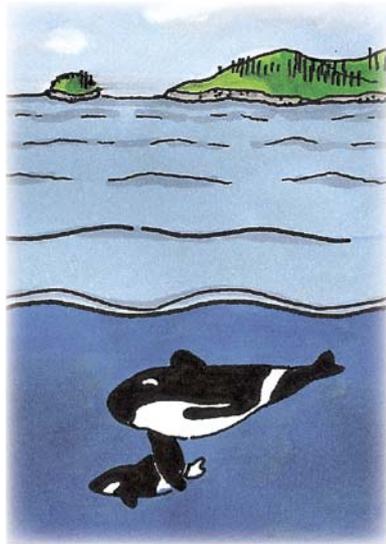




Blending In and Standing Out

What happens when halibut decide to swim?

The underbelly of a halibut's body isn't brown and dark like the top, but rather white and bright. So when a predator looks up at a swimming halibut, the white underside blends in with the light from above.



Orca whales sometimes prey on halibut.

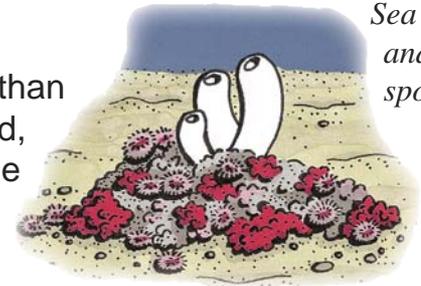
Flat Fact!

Pacific halibut are found off the coasts of northern California, Oregon, Washington, British Columbia, Alaska and as far west as Japan and Russia. Can you find these places on a map?



Habitat

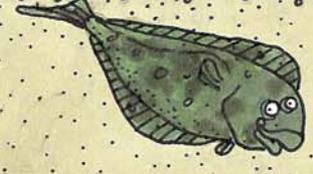
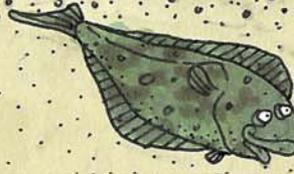
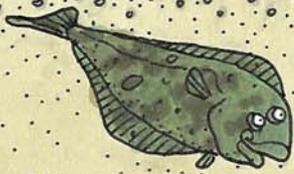
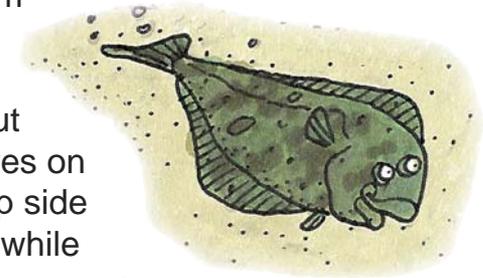
There's more to a halibut's neighborhood than just rocks, sand, and mud. Some of the animals that share the ocean floor stay in one place like sea anemones and tree coral. Other animals move around such as different kinds of fish, crabs, shrimp, and sea stars.



Sea anemones and deep sea sponges.

What about those eyes?

It's true, from about six months of age a halibut has both eyes on the dark, top side of its head, while there are no eyes on the white, bottom side.



Travelling the Ocean



Flat Fact!

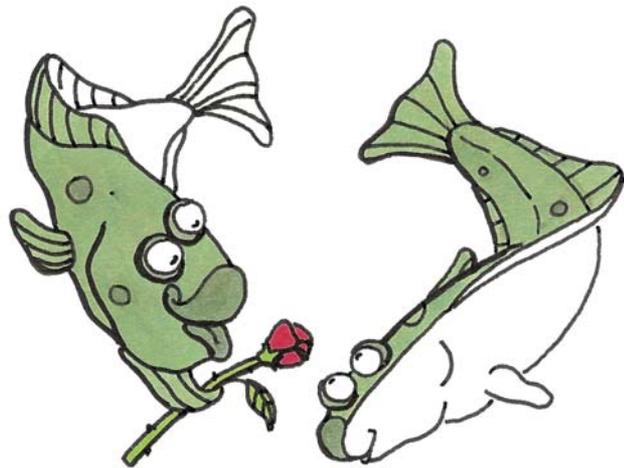
Scientists believe that halibut have a very good sense of smell, which leads them to food - even in the dark.

In the winter, halibut migrate from their summer feeding grounds on the continental shelf to the deeper water of the continental slope. When young fish make this migration, scientists believe they are guided by layers of water that are all the same temperature.

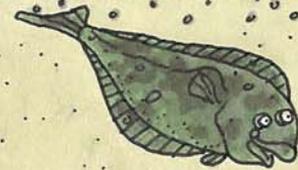
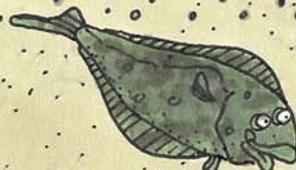
The top layer of water in the north Pacific Ocean and Bering Sea can become very cold and even frozen

in places, so by going deeper, the fish are staying warm. The perfect climate for a halibut is about the same temperature as a glass of cold tap water.

Older halibut also migrate to deeper water in winter, but for more than one reason. It's spawning season. You've got it...the "season of love!"



G spawning, continental shelf, continental slope, migration



The Reason for the Season

From about the time male halibut are eight years old and female halibut are twelve, they travel once a year to the continental slope to reproduce. There, the females lay their eggs which are then fertilized by the males.

Remember that halibut can reach weights of 500 pounds?

Well, that's only partly true. While male halibut top out at about 100 pounds — or the size of one 11-year-old human — female halibut keep growing, and they do it faster than the males too.

Why are females bigger?

The bigger the female halibut, the more eggs she can lay. So while a 50-pounder will lay about 500,000 eggs, a 250-pounder might lay 4 million eggs!



Flat Fact!

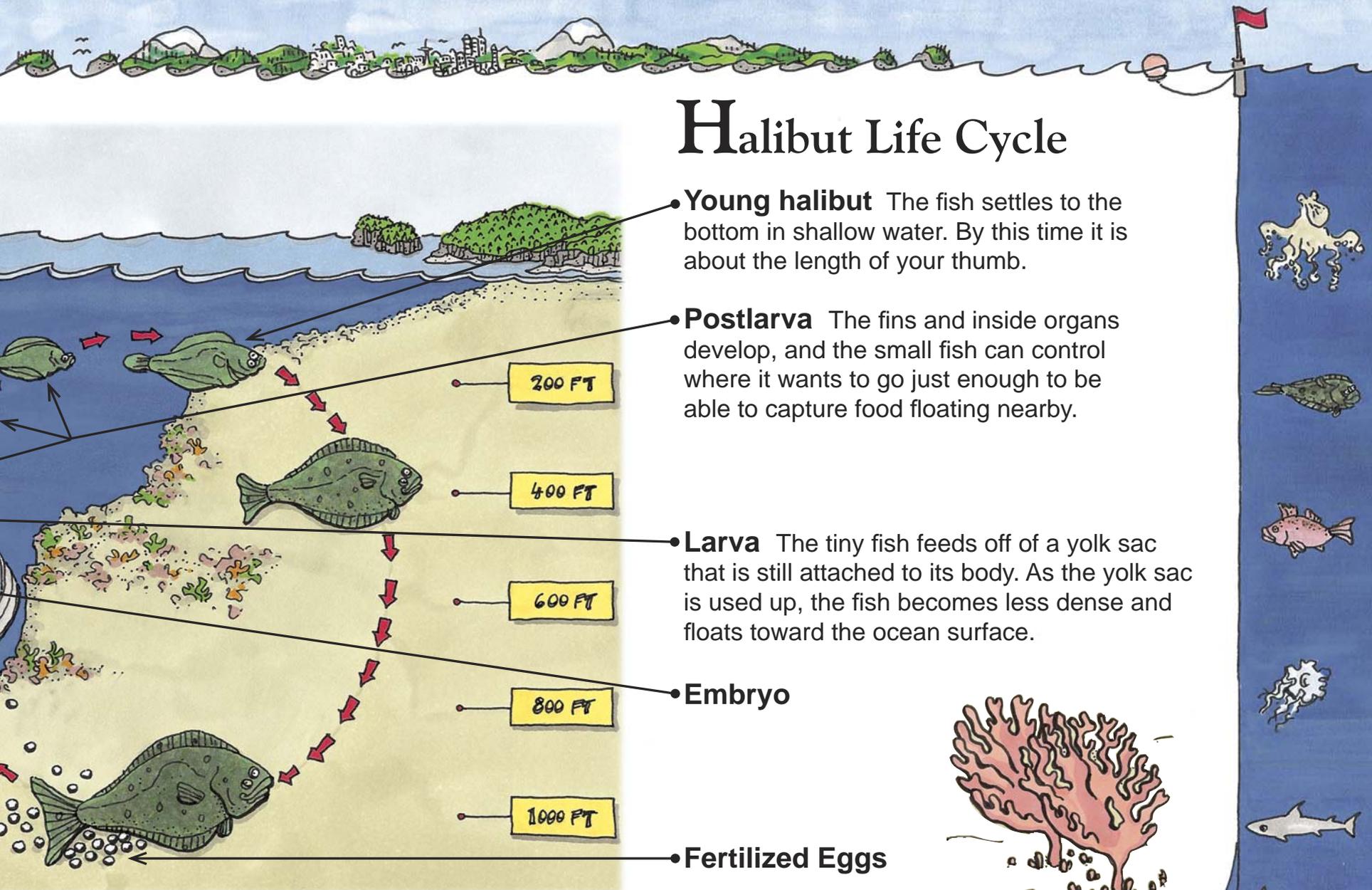
It takes about 6 months for a halibut to grow from a fertilized egg to a young fish just settling to the bottom.



G continental slope

Pacific halibut

Halibut Life Cycle



• **Young halibut** The fish settles to the bottom in shallow water. By this time it is about the length of your thumb.

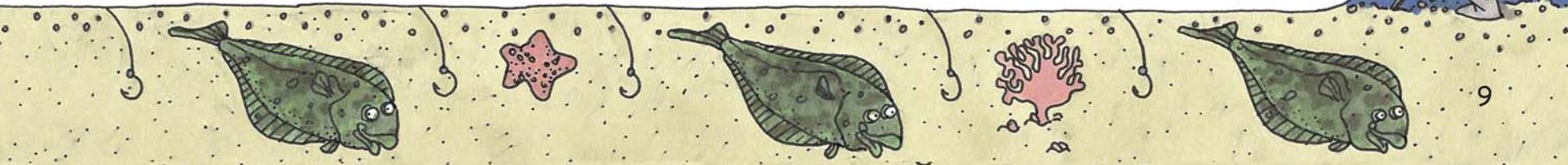
• **Postlarva** The fins and inside organs develop, and the small fish can control where it wants to go just enough to be able to capture food floating nearby.

• **Larva** The tiny fish feeds off of a yolk sac that is still attached to its body. As the yolk sac is used up, the fish becomes less dense and floats toward the ocean surface.

• **Embryo**

• **Fertilized Eggs**

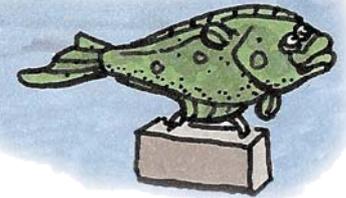
but life cycle from egg to adult.



Striking Out On Their Own

Adult halibut that have spawned don't stick around afterward to see their little ones hatch. The fertilized eggs are entirely on their own.

Each fertilized egg, or embryo, is about the size of a pea. The embryo floats through the water and hatches after 10 to 20 days. The hatched animal is called a larva. The larva uses its yolk sac for food while it drifts with the currents.



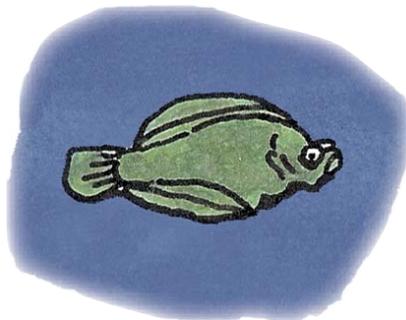
On this larva, you can see the yolk sac bulging out just beneath its head.



Life after larva

About the time the yolk sac is all used up, the postlarva — that's what it is called after it's a larva — has lost enough weight to have floated almost all the way to the surface to join the plankton layer. There is plenty of food swimming around in the plankton layer for the hungry postlarva.

This postlarva has grown fins but still has one eye on each side of its head.



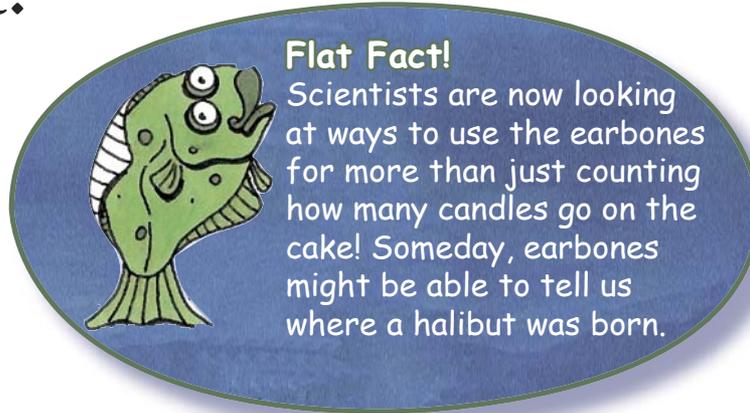
Migrating eye

The postlarva feeds on tiny animals called zooplankton. It eats and grows for a few months. Then the left eye slowly moves over the top of the head to the right side of the fish. The small halibut settles to the bottom.

G plankton layer, zooplankton, otolith, spawning

How Old Do Halibut Get?

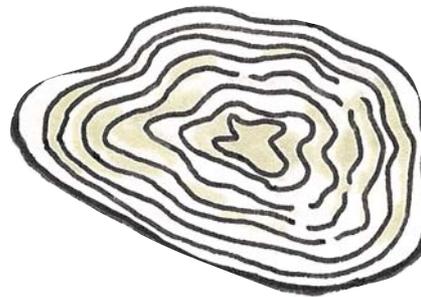
You now know how big halibut can grow. So you may have guessed already, that they can get pretty old too.



The oldest halibut on record — both females and males — are 55 years old. That means those fish are probably older than your parents and maybe even as old as your grandparents!

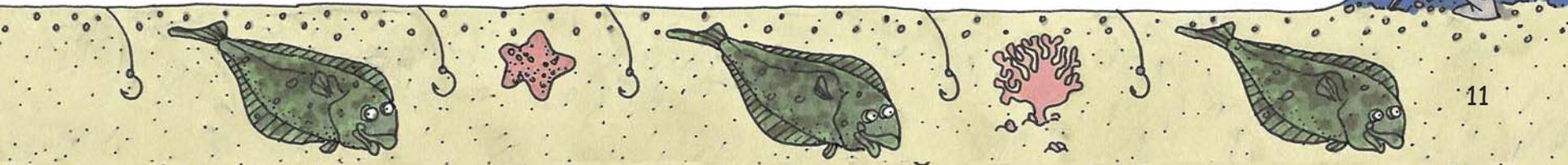
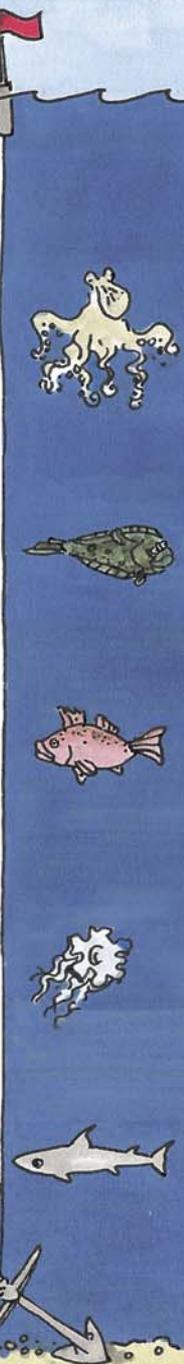
Can scientists tell how old a halibut is just by looking at it?

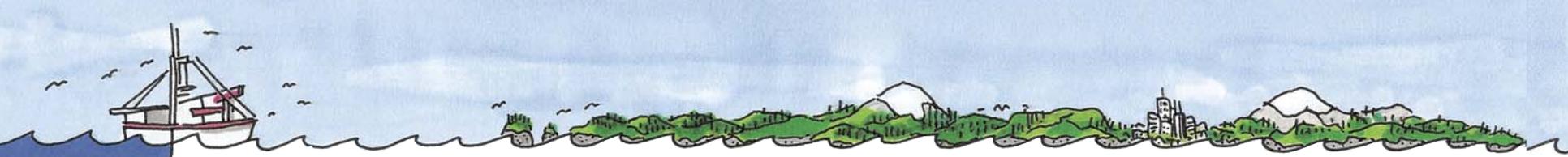
Well, not exactly, but close. All fish have earbones, called otoliths. Halibut otoliths are about the size of a small coin, and grow one ring each year, like a tree. Biologists can look at the earbones under a microscope, count the rings, and determine the age of the fish.



This is a drawing of a halibut otolith. Can you tell how old this halibut is? Look below for the answer.

Answer: 8 years old





Life in the Ocean

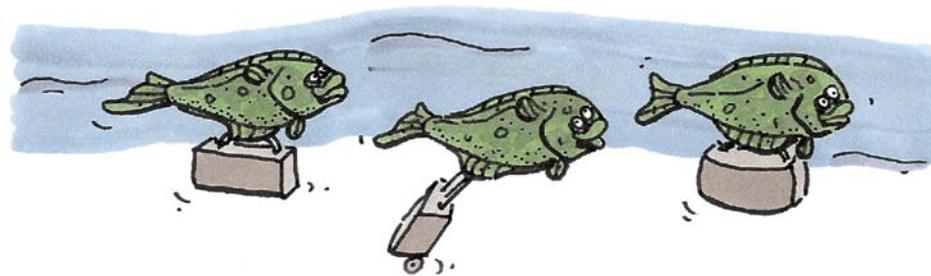
What do halibut do with their time?

As larvae and postlarvae, they are carried by strong surface currents sometimes hundreds and even thousands of miles before they settle to the bottom. There they eat and grow for two to three years in the shallow waters near to shore.



Settling down

Once halibut grow into adults, most seem to lose their sense of adventure and stay in one general area. They still travel longer distances during the winter spawning season and perhaps to look for food.



Young and adventurous

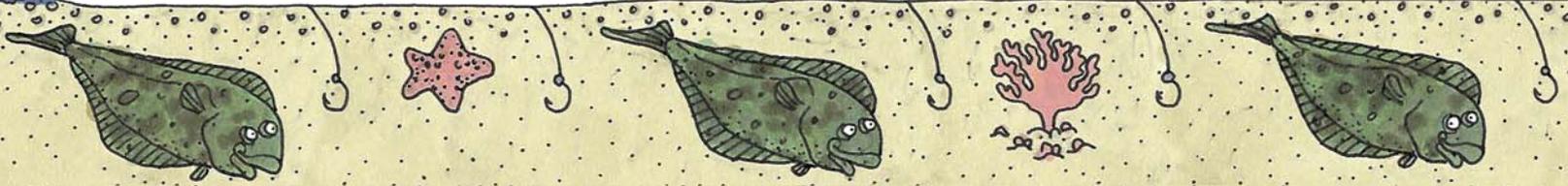
At about three years of age, halibut begin what biologists call a counter-migration. This means that they begin traveling in the opposite direction to the currents that carried them as larvae. It's not clear whether young halibut return to the place where their parent's lived, or are following some mysterious cues that scientists have yet to discover.



Flat Fact:

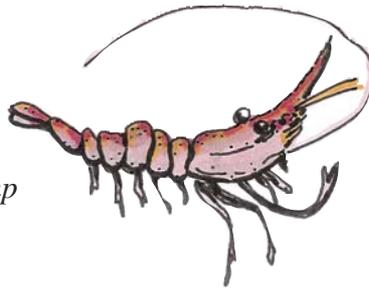
Halibut have sharp teeth they can use for grabbing, but they don't use them for chewing dinner. Instead, halibut suck in their prey and swallow it whole!

G migration, prey



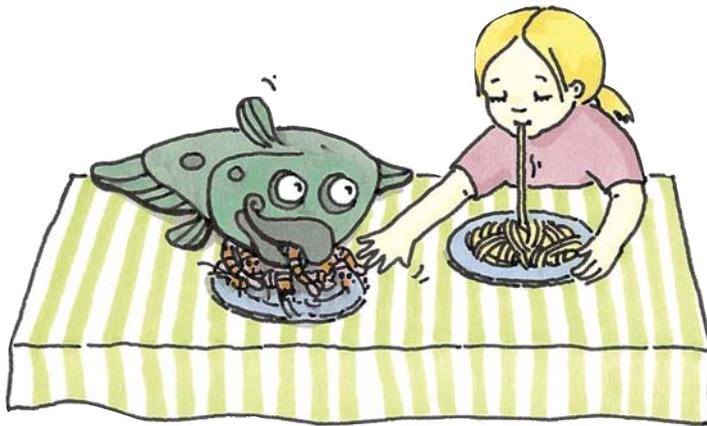
What's for Lunch?

Halibut are eager eaters and will nibble on just about anything smaller than themselves.

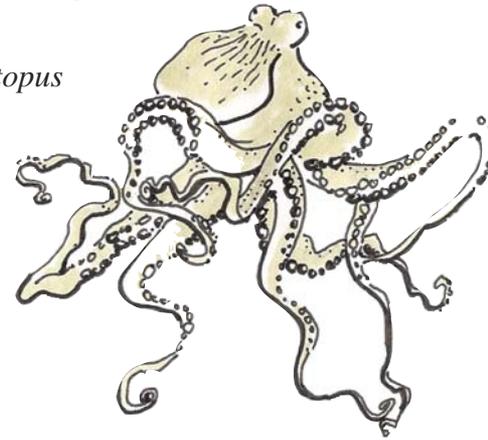


Shrimp

As halibut get bigger, so does their food. Small crabs and shrimp are fair game for the halibut youngster.

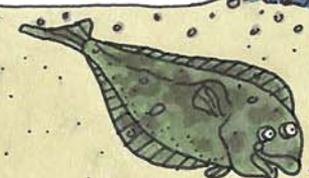
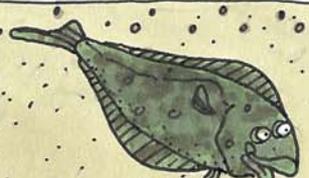
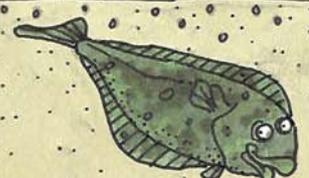
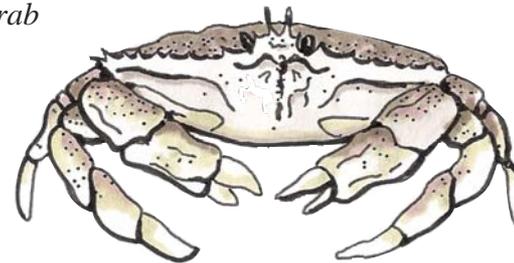


Octopus



After a few years and a few hard-earned pounds on their bodies, halibut can move on to bigger prey. They are strong swimmers and can go after other fish, squid, and octopus, or they may choose to snack on the tasty crabs and shrimp that they discover.

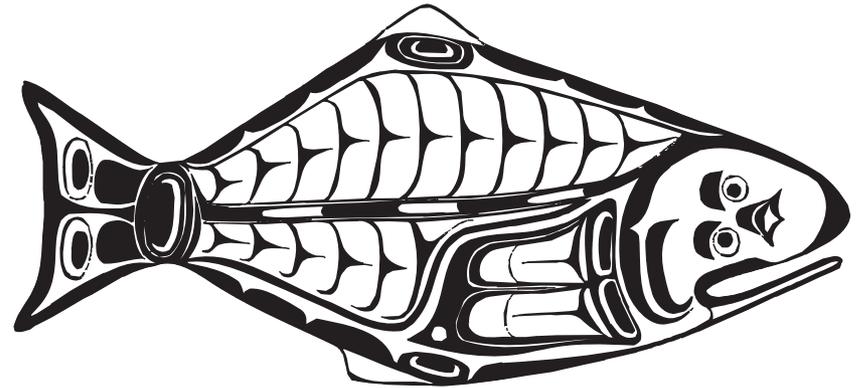
Crab



Nations Working Together

If halibut live at the bottom of the ocean, how do biologists know so much about them?

In 1923, the governments of the United States and Canada signed an agreement — called a treaty — to protect Pacific halibut, and to make sure there were enough fish out there for harvesters to catch and sell.



Halibut Commission crest

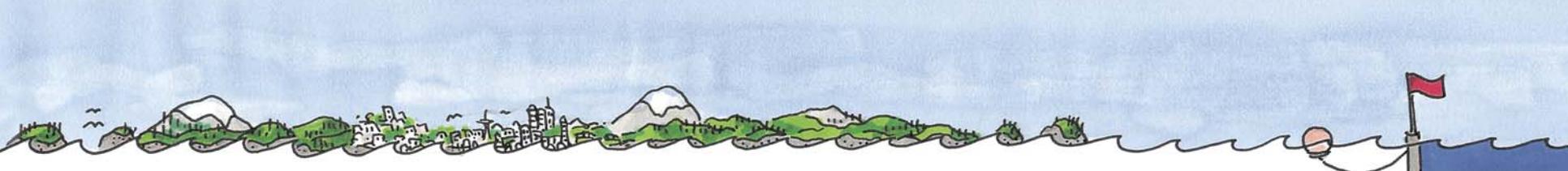


The Halibut Commission
People from each country got together to form what is now called the International Pacific Halibut Commission. The Commission has an office in Seattle, Washington, where scientists and policy makers from both countries have worked for decades to understand Pacific halibut.



Flat Fact!

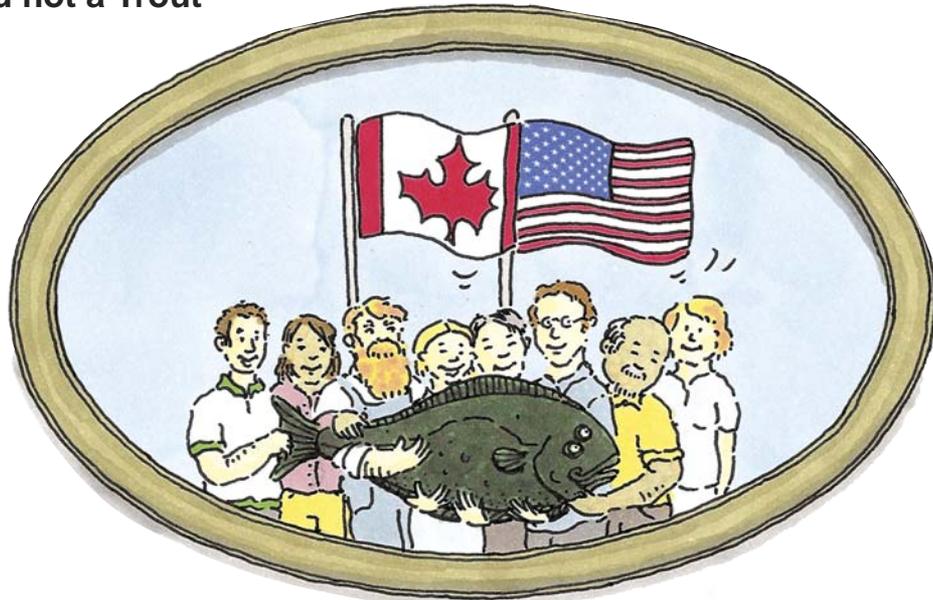
The treaty that formed the Halibut Commission was the first international treaty in the world for the protection of a marine resource.



Why is there a Halibut Commission, and not a Trout Commission or Clam Commission?

Like halibut, clams and trout are important food fish, but they tend to stay in one place and can be managed without an international agreement.

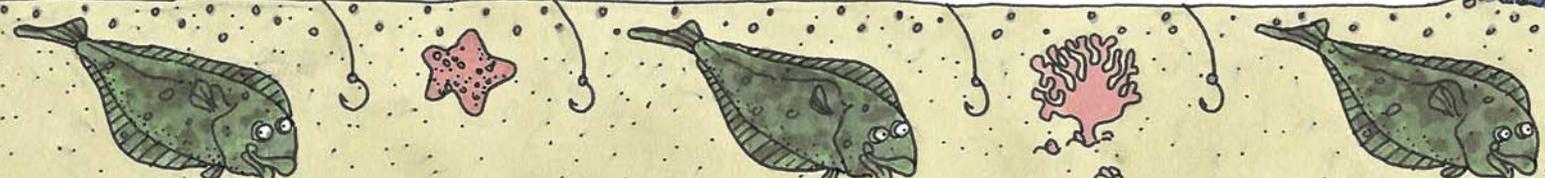
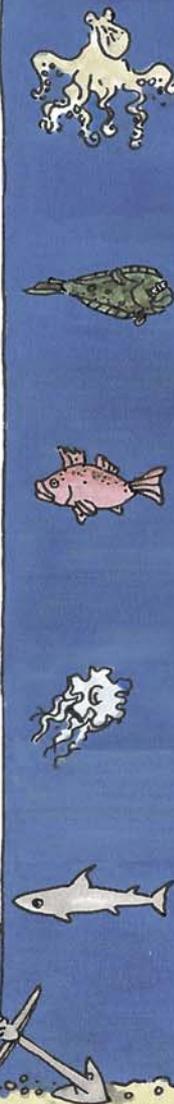
On the other hand, halibut are travelers and don't know where the boundaries are between the United States and Canada, so they swim between the two countries without a care.



Flat Fact!

Salmon and tuna are two other types of fish that refuse to pay attention to the boundaries between countries. There are international commissions for those fish too.

In order to give harvesters in both countries a fair try at catching halibut, biologists work together to gather important information about how many halibut are out there and how old they are.



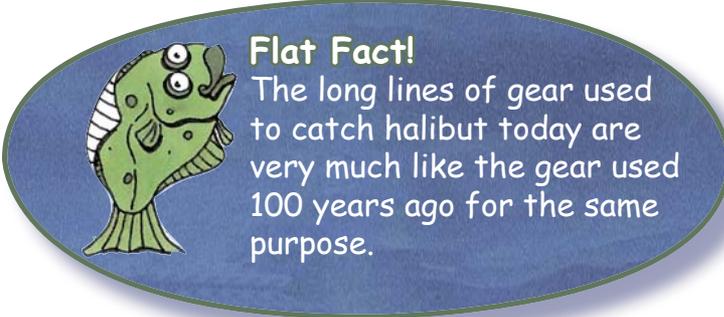


From the Depths to Dinner

How does halibut end up on your dinner plate?

From the deep ocean to your warm kitchen is quite an adventure!

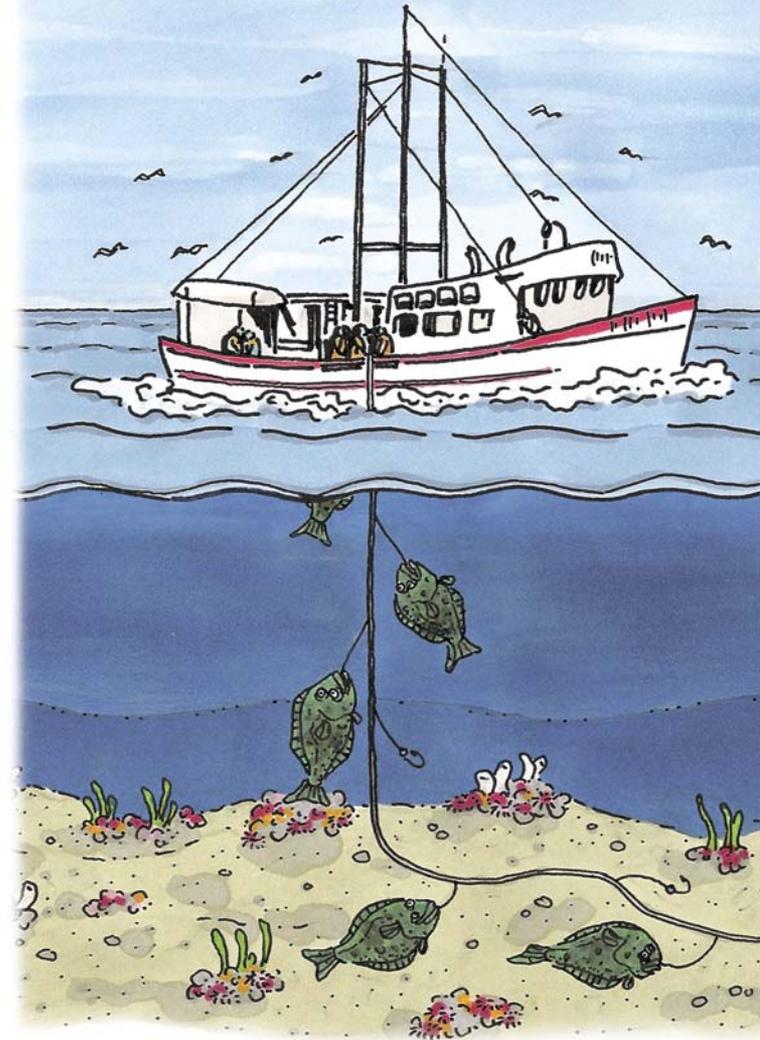
When fish are caught for sale, it's called "commercial" catch. Commercial halibut fishing is usually accomplished with a sturdy boat, five or six crew including a captain, and a long line of gear that has hooks attached every few feet.



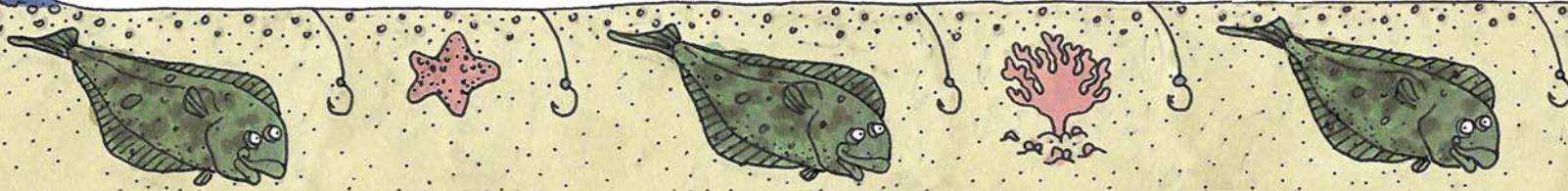
Flat Fact!

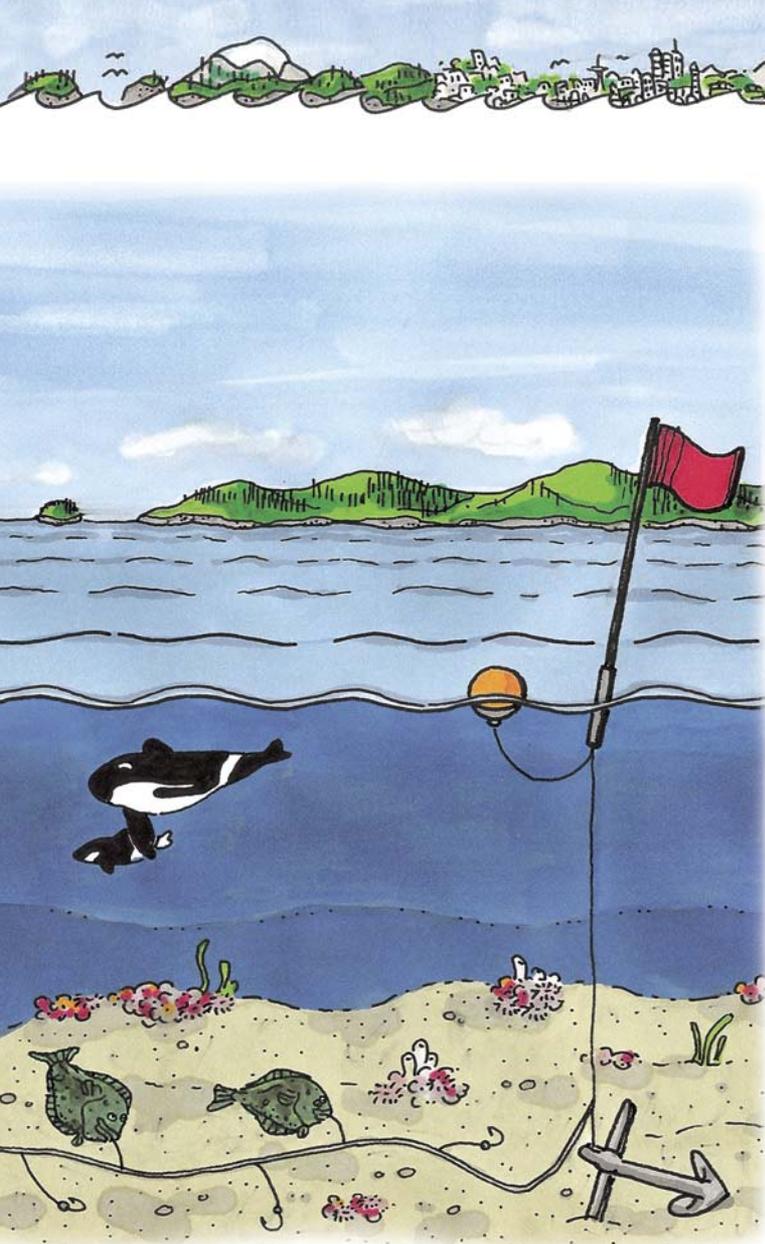
The long lines of gear used to catch halibut today are very much like the gear used 100 years ago for the same purpose.

The hooks are baited with salmon, squid, herring, or a mixture of tasty treats that appeal to halibut. The crew marks the ends of the line with a flag and buoy, then lays the rest of the line out behind the boat. The line sinks to the bottom where halibut bite the hooks and are caught.



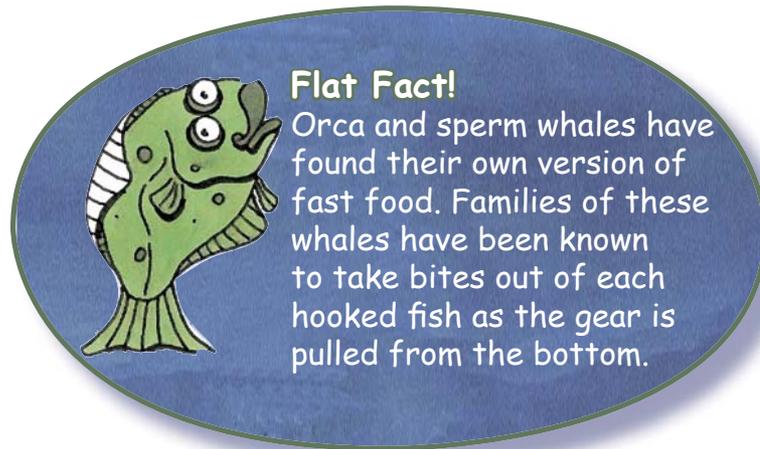
A halibut boat hauling in fishing gear. Can you find





the anchor, buoy, flag, and longline with hooks?

The captain finds the flag a few hours later, and the crew hauls the line aboard one hook at a time, using a powerful winch called a gurdy. Most of the halibut are still alive, so the ones that are too small to keep are thrown back to live another day. The “keepers” are cleaned and stored on ice.

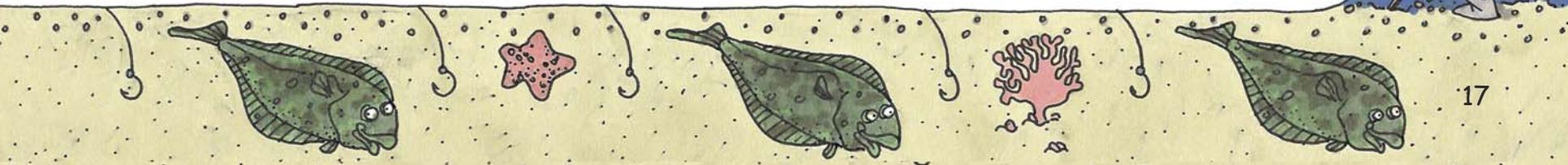


Flat Fact!

Orca and sperm whales have found their own version of fast food. Families of these whales have been known to take bites out of each hooked fish as the gear is pulled from the bottom.

After a few days of fishing, the vessel heads for shore. The fish are delivered to a processing plant, where they are washed, iced, and boxed. The halibut are then shipped fresh or frozen from the plants.

You may see halibut steaks or fillets in your market or favorite restaurant.





More Than One Way to Catch a Halibut!

Can anyone besides commercial fishers catch a halibut?

Yes! Halibut are caught other ways and by a variety of people, some just like you.

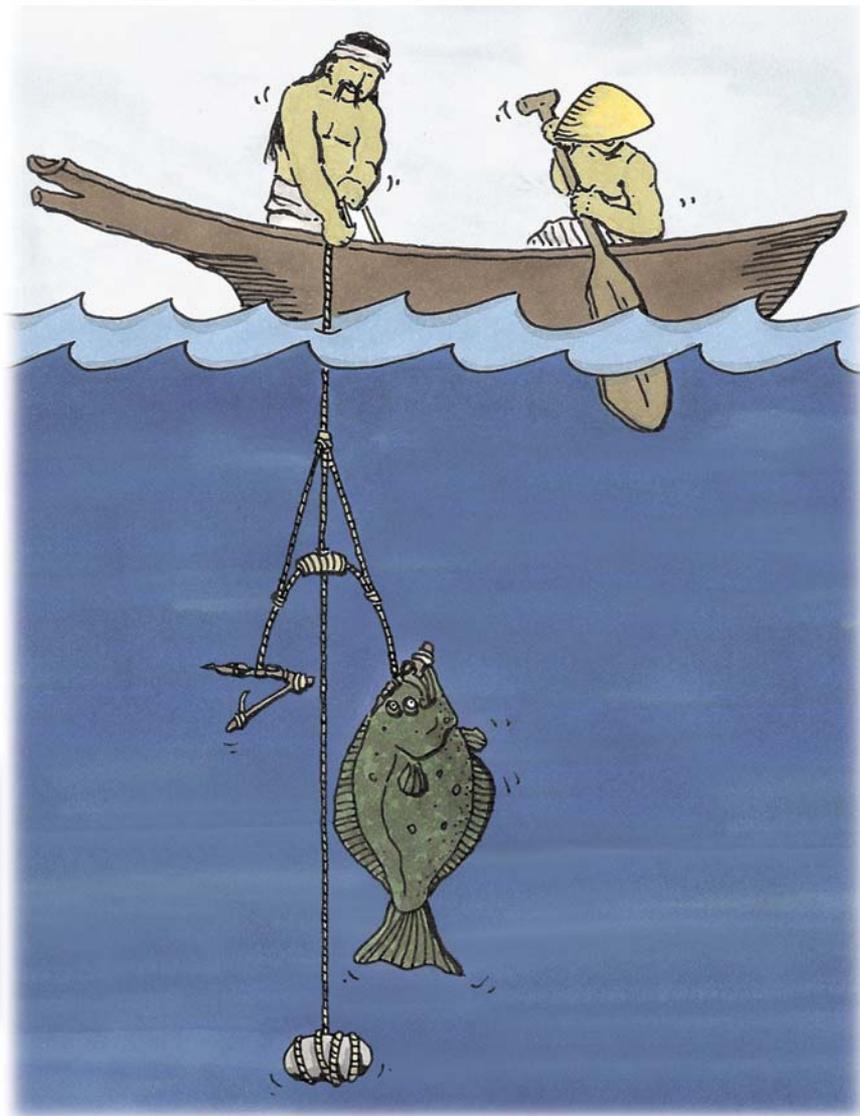


Sport fishing for halibut is very popular. Most of the time, sport harvesters hire a boat or take their own, and travel out into the ocean. There they put bait on a hook at the end of a fishing pole and try their luck.



Flat Fact!

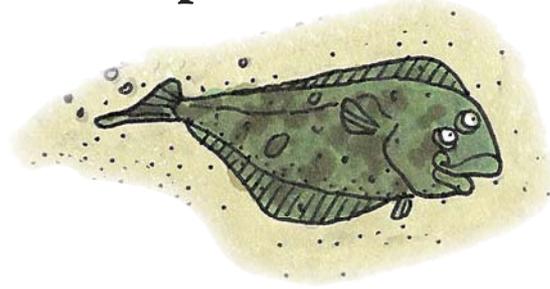
For hundreds of years, many native groups along the coast caught halibut using canoes and carved, wooden hooks. Today, they use modern boats and gear.





Are Pacific Halibut an Endangered Species?

Pacific halibut are not endangered. In fact, the population is healthy. What that means is that commercial, sport, and subsistence users can fish for halibut and there will still be enough leftover for future years.



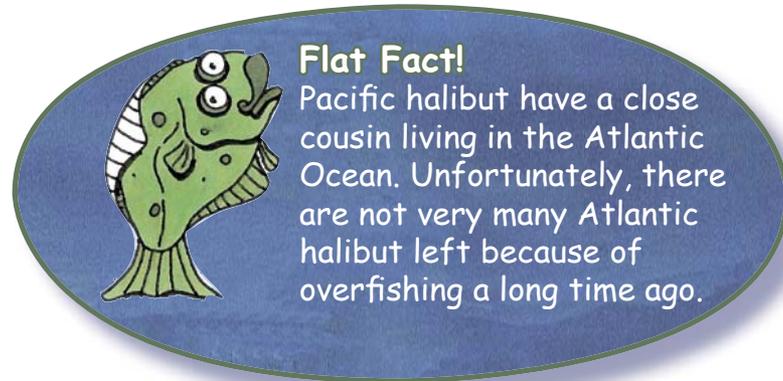
The number of halibut in the ocean, like many animal populations, naturally goes up and down. When the numbers are lower, the Halibut Commission makes rules to keep them from dipping too low. This may mean that harvesters are not allowed to catch as many fish as in some other years.

Weather report

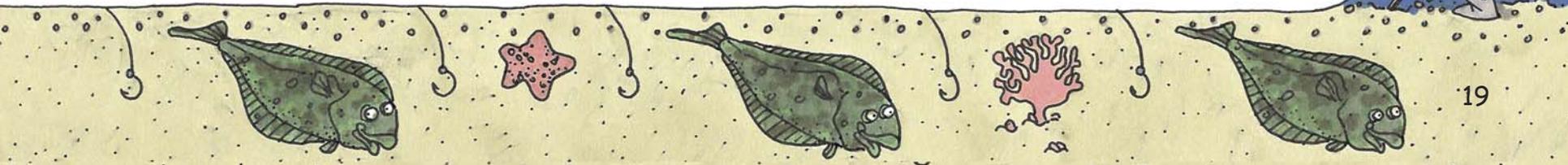
It's clear from research that halibut growth and numbers are connected in some way to large environmental shifts, or more simply, the weather. It will take a lot more study to understand how and why.



Another question scientists are working on is how halibut numbers might change with global warming and pollution.



G subsistence fishing, population





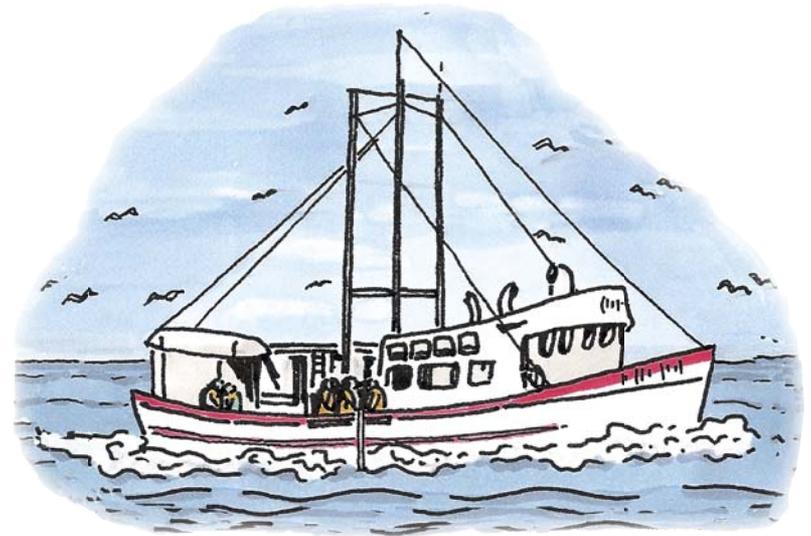
Ask a Simple Question

Sometimes asking a simple question can get you a lot of answers. The more scientists know about halibut, the better the chance of helping to keep the population healthy.

In the ports

One way to gather information is to ask the folks who use halibut. Commission biologists work closely with halibut fishers and plant processors to get an idea of where the fish are caught, how big, and how old they are.

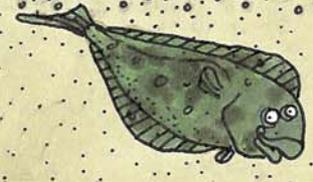
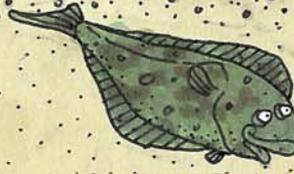
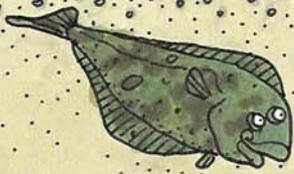
Aboard the survey, scientists collect earbones and other information about halibut such as its length and whether it's male or female.



On the boats

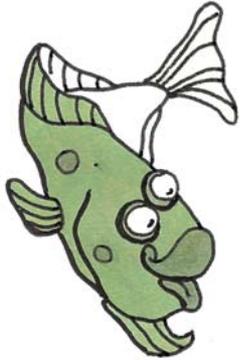
Another way to gain information is to conduct Halibut Commission surveys. Each summer the Commission hires commercial fishing boats and crews to set gear in a specific pattern. Comparing information from one year to the next tells scientists a lot about how fast halibut are growing and the size of the population.

G population



Tag, You're It!

Commission scientists have found that one of the best ways to learn about halibut is by tagging them. Tagging is when biologists mark a halibut in some way so it can be identified later, then release it back into the wild.



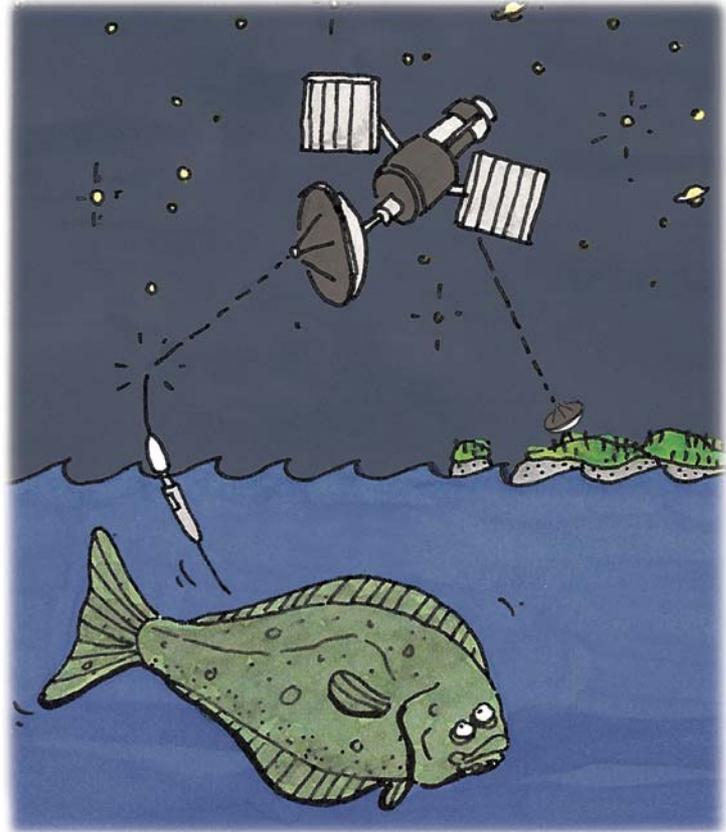
There are different kinds of tags. Some are put on the outside of the fish. Others are put under their skin, like the tags your dog or cat might get at the vet in case they become lost.

Another kind of tag — called a satellite tag — is about the size of a hotdog and records information about the fish's behavior. This high tech gadget gives researchers a glimpse of what a halibut does morning, noon, and night.

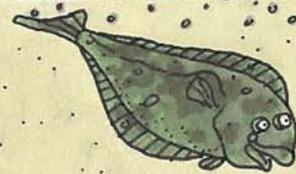
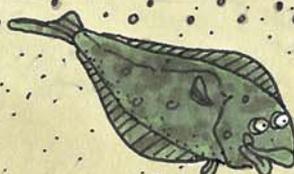
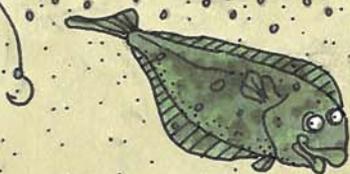


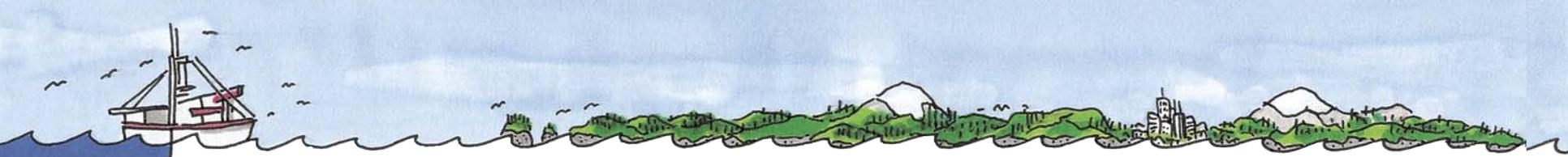
Flat Fact:

Scientists discovered that halibut like to travel when the fish they had tagged in one place showed up hundreds of miles away the next time they were captured.



Satellite tags release from the fish and send information to the Halibut Commission office in much the same way a television show can be broadcast around the world.





Pacific Halibut Are Worth Keeping

What can you do to make sure these magnificent fish are around for a long time?

Taking care of the environment in your home town helps to keep the oceans clean. So, the same things you are probably already doing will also help to keep halibut healthy: conserve water, recycle, ask your parents to use non-toxic cleaners and organic fertilizers whenever possible, and maybe even plant a tree.

Contact us

If you would like to find out more about anything you've read here, please write to:



International Pacific Halibut Commission
P.O. Box 95009
Seattle, WA 98145-2009

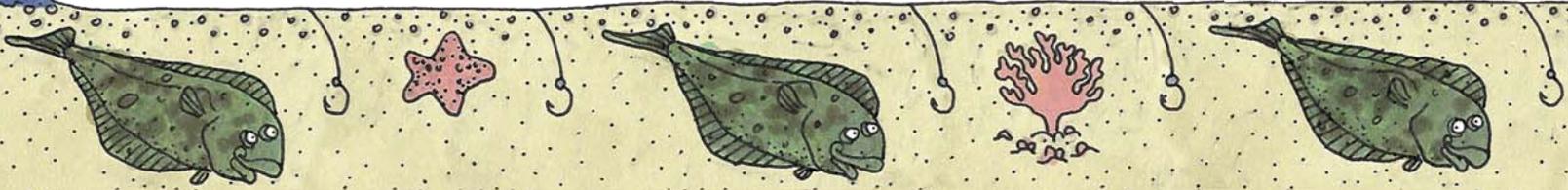
Or visit our website at www.iphc.washington.edu

The scientists and commissioners of the International Pacific Halibut Commission hope you have enjoyed this book. When it comes to science - Keep Fishing!



Note to parents and educators

Please feel free to reproduce the last page of this book as desired for creative classroom or at-home projects. Some ideas might be to have students describe (in pictures or words) the halibut life cycle, harvest, habitat, or behavior.





Glossary

Camouflage

The colors and markings on an animal that help it blend in with its environment. (kam-oh-flogh)

Continental shelf and slope

The shelf is the shallow, underwater plain that borders the continent. The shelf generally ends in a steep drop-off to the deep ocean floor, called the slope.

Migration

Moving from one place to another.

Otolith

The small bone found in the head of a fish and used to tell how old the fish is. (oh-tow-lith)

Plankton layer

A layer in the ocean where the water has lots of nutrients that help tiny plants called phytoplankton (fy-tow-plank-ton) grow. Tiny shrimp-like animals, called zooplankton (zoe-plank-ton) come to eat the plants, and many small fishes and even some whales eat the zooplankton. It's a busy place.

Population

A word used to describe all the individual halibut as one group.

Predator and Prey

An animal that eats another animal is called the predator. The animal being eaten is called prey.

Spawning

A female halibut lays her eggs and a male halibut then fertilizes them.

Subsistence fishing

Fishing for only the amount needed to feed your family and sometimes others in the community.

