

# Unit One

## Fish: Their Appearance, Behavior and Classification

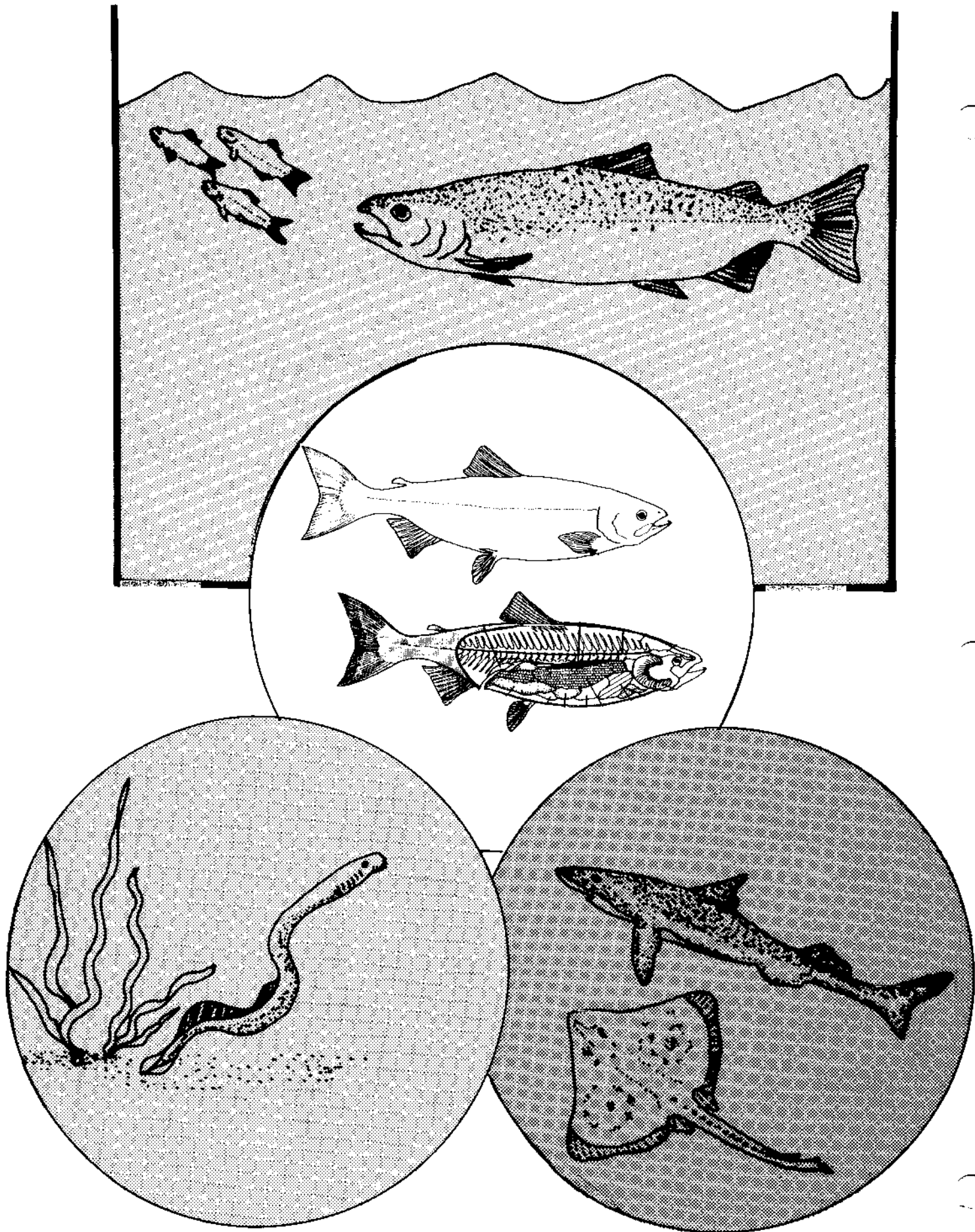
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### Objectives:

To help students:

- Record the behavior of live fish (Activity 1).
- Observe functions of different fish fins (Activity 1).
- Design a simple experiment with live fish (Activity 1).
- Define what a fish is (Activity 2).
- Sort and classify the three main types of fish (Activity 3).
- Identify external fish features and explain their functions (Activity 4).
- Identify internal fish features and explain their functions (Activity 5).
- Compare the internal anatomy of a fish with that of the human body (Activity 5).
- Make fish prints (Activity 6).
- Share fish poetry (Activity 7).
- Write a fish poem (Activity 7).



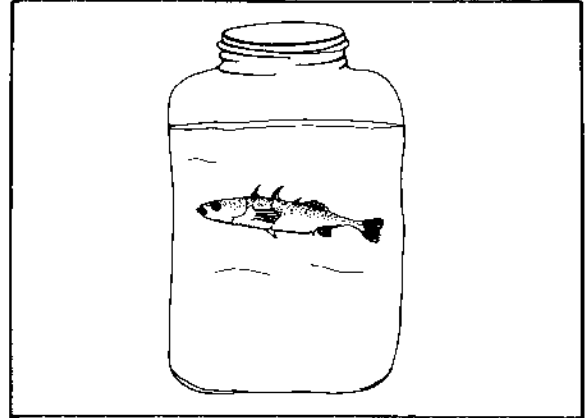
**Unit One:** The three major fish groups: bony fish (represented by salmon, top and center); hagfish and lamprays (represented by lamprey, lower left); and sharks, skates and rays.

Alaska's waters often teem with fish. Salmon can fill streams from bank to bank as they ascend to spawn. Herring sometimes school by the hundreds of millions, forming vast finny clouds just beneath the surface of coastal waters. And interior lakes and streams are an angler's paradise filled with grayling, char, pike, trout, burbot, and whitefish.

This unit covers the characteristics of these fish and their basic biology.

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## Activity 1 Fish Watching

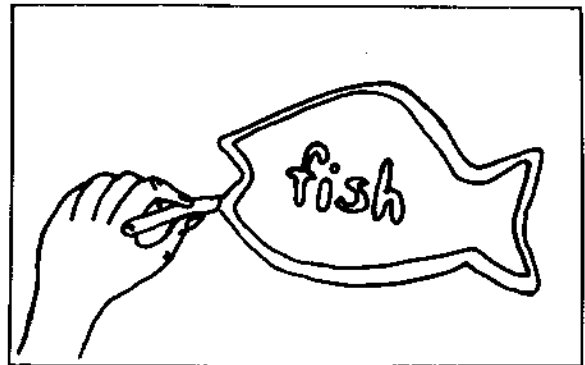


### Vocabulary:

- habitat
- conservation
- renewable
- resource

### Materials:

- live fish in a jar of water or an aquarium
- worksheet:  
...Watch That Fish (1A)



### Procedure:

1. Write the word "fish" on the board. Ask students what they already know about fish. Write their answers in a circle around the fish. Then ask what they would like to know about fish. Write these

questions about the fish in a larger circle.

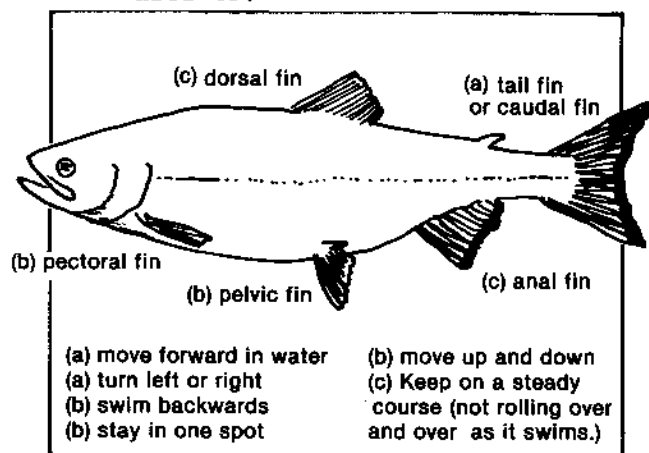
Discuss where to find the answers: from books, fishermen, elders, fisheries biologists, and field trips. You might want to record the questions in a notebook; and as you proceed through this book, add to the questions and use them to guide your study.

2. You will need live fish for this activity; one fish for each group of four to five students. (Parents, students, pet stores, fishermen, or biologists may be of help in obtaining specimens. Check with Alaska Department of Fish and Game officials in your area to obtain permits to hold native fish.) Fish need ample oxygen, so keep their numbers low and the water cold, as water of a lower temperature holds more oxygen. You'll probably need an aerator filter and pump. If you're using jars, one pump can supply the oxygen by hooking the jars in series. Alaska blackfish are ideal for this study because of their low oxygen requirements.

Encourage students to observe their fish carefully. Emphasize care for the fish. Discuss the term "habitat" as the natural home of an animal or plant. Mention the basic requirements for life: food, cover and water. In addition to water and food, fish like other animals need cover, or places to hide--either to protect them from bigger fish or so that smaller fish will not see them coming!

"Conservation" is the wise use of our resources. Fish are a "renewable resource" which means that if we are careful and protect their habitats and don't harvest too many, Alaska's fish will continue to provide food and enjoyment for generations to come.

3. Distribute the worksheet Watch That Fish. After students have had time to watch their fish, discuss how they think a fish swims. Have students use their fish drawing on the worksheet to point to the fin that the fish uses to:



Discuss any differences of opinion. It may be necessary to watch the fish again to confirm specific functions. Have students concentrate on observations at this point. Names of the fins will be covered later in this unit.

4. Have each group of students design simple experiments with their fish. Students may want to feed their fish, be quiet or noisy, place a mirror in the jar, place one fish jar near another one, place paper of different colors behind the fish to note camouflage abilities, or place one

jar in the light and one in the dark. Remind them they will need a control fish or jar for comparison and they will need to run several trials to see if the fish behaves the same way every time. Ask students to record what happens and work up a brief report for the class.

### Additional Activities:

1. Language Arts: Encourage students to read books about fish. Check the bibliography at the end of this volume for suggestions. Also, be sure students have a chance to read the fish descriptions in the Alaska Department of Fish and Game's Wildlife Notebook Series. Students can prepare oral or written book reviews for the class.
2. Art: Decorate the classroom with fish nets and floats, fishing gear, paper fish, fish pictures, drawings and paintings to set the atmosphere for your studies.
3. Science: Individual students may want to conduct long-term experiments with live fish, keeping records of temperature, behavior, and feeding patterns.
4. Art: Make dough fish out of bakers clay (which doesn't require firing in a kiln). To make the clay, mix 1 cup

flour,  $\frac{1}{4}$ -cup salt, and a scant  $\frac{1}{2}$ -cup water. Mix with your hands for 5 minutes. (A heavy duty mixer and bread hook will work for larger quantities.) Make only the amount you need; the dough does not store well.

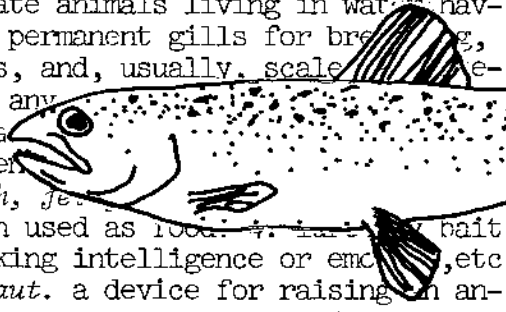
Have students sculpt the clay into fish shapes, and criss-cross them with designs. Bake in an oven at 250-275° for 10-15 hours. Then have students paint their creations with watercolors or brushes. When the fish are dry, dip them in varathane or spray them with varnish to prevent them from softening (bakers clay tends to absorb moisture from the atmosphere).

-suggested by Mazie Van Den Brock, art teacher, Cordova

4. Art, Science: Cut a large fish and several smaller fish out of construction paper. Staple the large fish to a bulletin board with its mouth open and body puffed, so small fish can be fed in. Have students write down things they learn on the smaller fish and feed them to the large fish. At the end of the study, the large fish can be opened up and the small fish can be used for review!
5. Language Arts: Have students write creative stories about what it feels like to be a fish in an aquarium or jar, looking out.

## Activity 2 What is a Fish?

Fish (fish) *n., pl.* in referring to different species, **fishes**. 1. any of a large group of cold-blooded vertebrate animals living in water, having permanent gills for breathing, fins, and, usually, scales. 2. any of a large group of cold-blooded vertebrates, especially, any of the bony fish, as a cod, salmon, etc. 3. a fish used as food. 4. a fish used as bait. 5. *Naut.* a device for raising an anchor.



### Background:

Scientists define fish as cold-blooded aquatic, gill-breathing vertebrates equipped with fins and usually scales. It's a definition that entails a lot of concepts, which we'll try to simplify in this activity.

### Vocabulary:

- cold-blooded
- aquatic
- gill-breathing
- vertebrate
- gill filaments
- gill rakers
- caudal fin
- pelvic fin
- pectoral fin
- dorsal fin
- anal fin

### Materials:

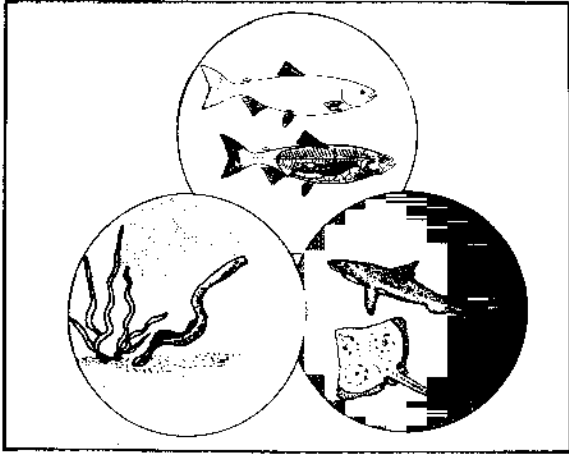
- red and blue pencils or

- felt-tip markers
- dictionaries
- encyclopedia
- worksheet:  
...A Fish Is A What? (1B)

### Procedure:

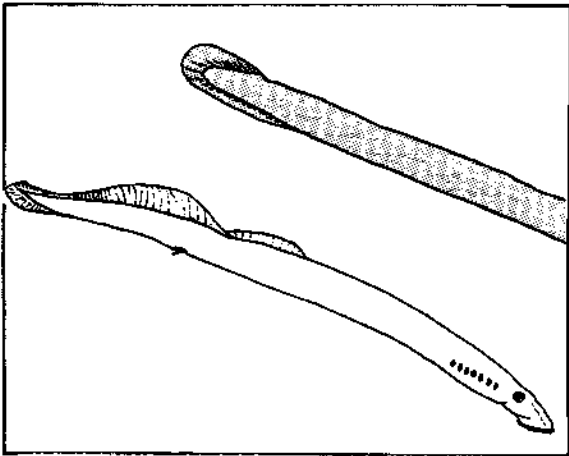
1. Ask students to come up with a class definition of fish. Record this definition on the board for later reference.
2. Distribute the worksheet A Fish Is A What? Students will need dictionaries, an encyclopedia, and red and blue pencils or felt-tip markers to complete the worksheet.
3. Compare the class definition with the scientific definition of fish. Discuss the worksheet answers and what makes fish unique. There are other cold-blooded vertebrates (snakes, frogs) and other aquatic animals with fins (whales, dolphins). There are also other animals that breathe with gills (crab, shrimp). But only fish have all the characteristics included in the definition. Not all fish have scales as students will find out in the next activity. But the scale shown on the worksheet is from a four-year-old winter-caught fish. The slower winter growth results in the dark rings which the students should have colored blue.

### Activity 3 Classifying Fish

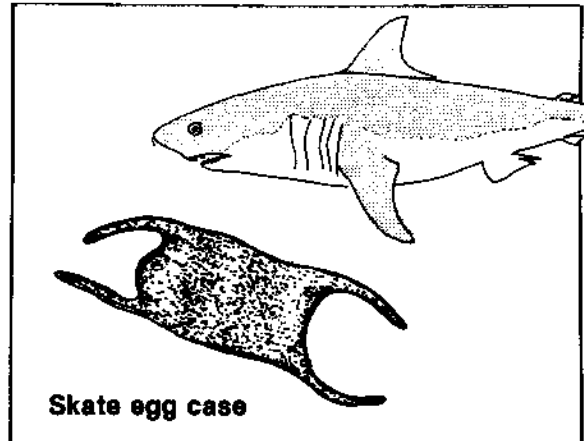


#### Background:

All fish belong to one of three major groups and all three of these groups are present in Alaskan waters:

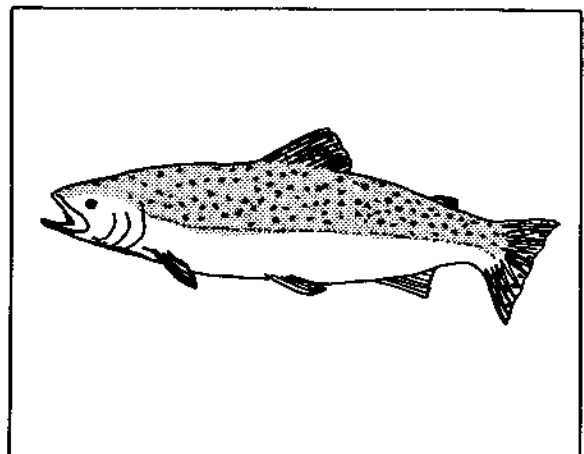


- I. Hagfish and lampreys: These fish have no jaws, no paired fins, and no scales. The opening to the gills is a round hole. The skeleton is entirely of cartilage, not bone. Two species of hagfish and four species of lampreys occur in Alaska. Arctic lampreys are locally abundant in northwest Alaska.



Skate egg case

- II. Sharks, skates and rays: Members of this group have jaws and some paired fins, but no scales. The openings to the gills are five to seven slits either on the sides of the body or on the underside of the fish. The skeletons of these fish are made of cartilage, not bone. Seven species of sharks and five species of skates occur in Alaska. There are no rays here. Skates leave their eggs in curious cases that are sometimes washed ashore.



- III. Salmon, herring, blackfish and many others are called the "bony fish"

because their skeletons, unlike those of sharks and skates, are made of bone. Bony fish have jaws, some paired fins, and one gill slit on each side of the head. They are the only fish with scales, but most fish are bony fish. Alaska's fresh and marine waters include many species.

### Vocabulary:

- genus
- species
- hagfish
- lamprey
- skate
- ray
- shark
- cartilage

### Materials:

- scissors
- glue or tape
- worksheets:
  - ...Fish to Classify (1C)
  - ...The Three Major Groups of Fish (1D)

### Procedure:

1. Explain that when scientists study plants and animals, they put them in groups based on their similarities. Pass out the Fish to Classify worksheet and have students cut out the fish and sort them into groups based on their observable characteristics. Have students discuss the group similarities. Then challenge students to sort their fish into just three groups.
2. Distribute The Three Major Groups of Fish worksheet. Explain to students that

scientists have classified fish into three major groups. The main characteristics of each group are listed at the bottom of each column. Have the students place the cutout fish from the previous worksheet into one of these three groups. Write on the board the names of the three groups: (1) hagfish and lampreys; (2) sharks, skates and rays; and (3) bony fishes.

Have the students label each column and figure out which names go with which column. Discuss their choices. Have them glue or tape the fish in the proper column. (Suggested by Laurie Dumdie, Science Resource Teacher, Anchorage School District)

3. Introduce the term "species." Each of the fish is a different type or species. In addition to common names such as "king salmon," scientists have given each species a scientific name such as Oncorhynchus tshawytscha. The first term Oncorhynchus refers to the fish's family. All scientific salmon names begin with Oncorhynchus, or the fish's "genus." The "species" name, tshawytscha belongs only to that particular type of salmon. Students might run across some of these scientific names as they research reports. Scientific names are the same all over the world, generally derived from Latin or having Latin roots. Japanese and Russian fisheries biologists use the same scientific names as we do. Yet common names vary from place to place. Sometimes Oncorhynchus are called



"kings" and other times are "chinooks."

### Additional Activities:

1. Science: Students might want to try to identify and find out more about the fish on the Fish to Classify worksheet by looking through various Freshwater Fishes of Alaska, Pacific Fishes of Canada, or other reference books listed in the bibliography. Here are the answers:

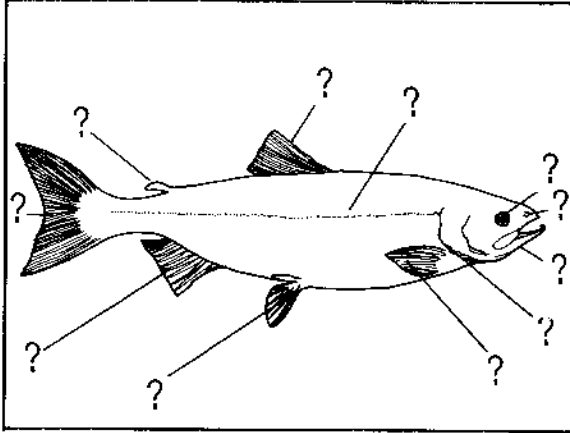
1. king salmon,  
Oncorhynchus tshawytscha
2. sheefish,  
Stenodus leucichthys
3. salmon shark,  
Lamna ditropis
4. threespine stickleback,  
Gasterosteus aculeatus
5. white sturgeon,  
Acipenser transmontanus
6. Alaska blackfish,  
Dallia pectoralis
7. arctic lamprey,  
Lampetra japonica
8. humpback whitefish,  
Coregonus pidschian

9. basking shark,  
Cetorhinus maximus
10. big skate,  
Raja binoculata
11. stingray, Dasyatis sp.
12. Pacific hagfish,  
Eptatretus stouti
13. slimy sculpin,  
Cottus cognatus
14. spiny dogfish,  
Squalus acanthias
15. Pacific herring,  
Clupea harengus pallasii

2. Science, Art: Have students research and draw fish oddities from around the world. How many are bony fish? How many are in the other two groups?
3. Science, Language Arts: Research the Lake Illiama monster story. See Tide-lines, Vol. 1, No. 2, Oct. 1978, "Does Alaska Have a Monster"; and Alaska magazine, Jan. and Feb. 1978, "A Monster Mystery;" and "The Lakes: Magnificent Gap on the Map." Then have students write their own creative monster stories.

## Activity 4

### The Outside of a Fish



#### Background:

There are good reasons to learn the names of the external features of a fish. In order to talk to each other about fish, we need to know the words that describe them. As students begin to distinguish one kind of fish from another, they will need words to describe the shapes, colors, differences and similarities they find. In writing or reading descriptions of individual fish species, vocabulary is important; sometimes even small differences in external features mark the difference between one species and another.

Students who enjoy fishing will quickly notice abnormal external features on fish if they have learned how the fish usually looks. For example, one kind of abnormality may be a missing adipose fin on a salmon, a sign that biologists may have tagged that fish with a coded wire tag in its head which when recovered reveals from where the fish came. Return of such a fish aids scientific studies and may bring a reward to the captor.

For this activity, you will need a

whole fish. The best fish for the activity would be one caught locally. Ask a commercial or sport fisherman to save a scrap fish for you, or catch the fish yourself, or ask a student who enjoys fishing to bring one. Alternatively, the whole class could go on an expedition to secure a biological specimen. If you get a local fish ahead of time, it could be frozen whole and then thawed the day before you want to use it.

If you cannot get a fish locally, preserved specimens can be ordered from a biological supply house, but be sure to order well in advance of your planned activity.

#### Vocabulary:

- lateral line
- nostril
- gill cover
- adipose fin
- dorsal fin (review)
- pectoral fin (review)
- pelvic fin (review)
- caudal fin (review)
- anal fin (review)

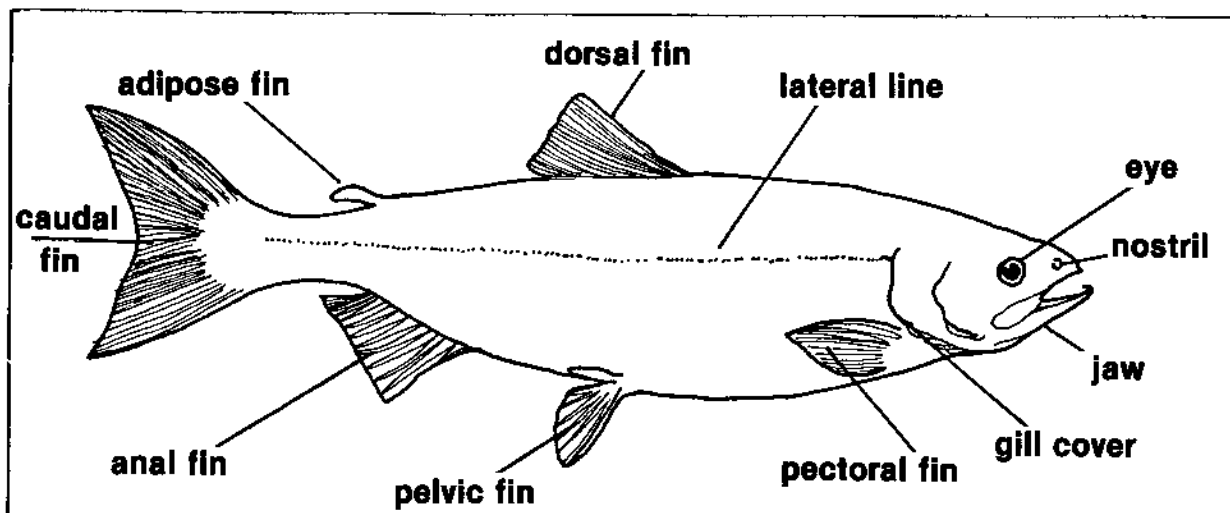
#### Materials:

- a whole fish (ideally one for every 2-3 students)
- magnifying lenses or microscopes
- ruler
- scales to weigh the fish
- worksheet:  
...Outside of a Fish (1E)

#### Procedure:

1. Distribute the fish to students, directing them to carefully look at and touch the fish. Distribute the worksheet Outside of a Fish.

Notice that this worksheet

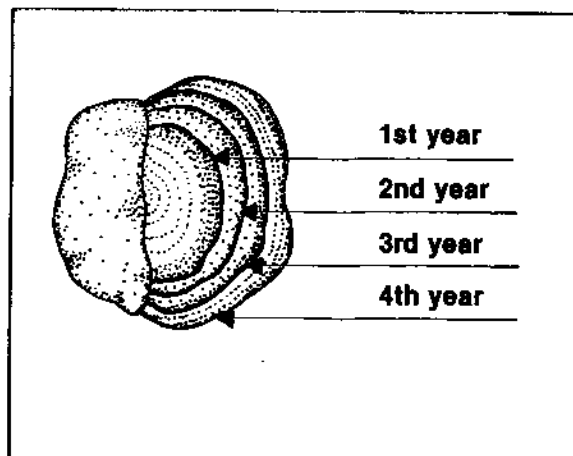


illustrates a salmon. If your fish is not a salmon, you or your students may want to make up a worksheet for it. Except for the adipose fin, fins found on a salmon also occur on all other bony fishes, but the shapes and numbers of fins may vary. Sculpins, for example, have two dorsal fins instead of one.

As you and the students describe and talk about the fish, have the students label each part on the worksheet.

**FEEL THE SIDE OF THE FISH.** If the specimen is fresh or frozen rather than preserved, it may feel slimy. The slime actually is mucus secreted by single-cell glands in the fish's skin. Mucus protects the underlying skin and may keep bacteria away from the living tissue. It also acts as a lubricant to help the fish slip through the water. Mucus protects fish from predators by making them more difficult to grasp. In some species, the mucus is a barrier between the fluids of the fish's body and the

surrounding water. (When two solutions of unequal strength are separated by a semipermeable membrane, the solutions tend to equalize by passage of the weaker solution to the stronger. The fluids of a fish are less salty than sea water but are saltier than fresh water. Thus, the fish may need a barrier to prevent it from losing fluid in salt water or gaining fluid in fresh water.)



**LOOK AT THE SCALES.** They give the fish a form of exterior armor, but at the same time allow complete freedom of movement. Use a hand lens or microscope to look at individual scales.

Like the growth rings on a tree, the rings on a fish scale often can be used to read its age. A series of fine rings are formed on the scale each year. In summer, when growth is more rapid, the rings are further apart; in winter, when growth slows, the rings have only narrow separations. By counting the number of bands that represent winter growth, students can decipher the age of their fish.

**NOTE THE EYE AND HOW SIMILAR IT IS TO OUR OWN.** Like the human eye, the eye of a fish has a pupil and a cornea. See if students notice the fish's eye has no eyelid. Because the lens of the fish's eye bulges through the pupil opening, the eye can gather light from the eye's entire hemisphere, resulting in "wide angle" vision. If you have or can find a picture taken with a fish-eye lens, it will give students an idea of what a fish's vision might be like. Fish probably can see color, but because water filters out light of certain wave lengths, color that can be seen above water may not be visible under water.

**LOOK IN THE MOUTH.** Feel and describe the teeth. Ask students what they think the fish eats. Most species of fish have rather specific diets. Many feed on smaller fish, but they may eat plants, clams, worms, squid or other animals. Some fish, such as herring, feed mainly on zooplankton, tiny drifting or weakly swimming animals. If the fish you are examining

is a fresh local fish, you may want to take guesses about what it has eaten and later open its stomach to see what it contains.

**EXTEND AND FEEL THE FINS OF THE FISH.** Count the bony rays in each fin. Note the membrane connecting them. The supporting structures of the fins may be either rays, which are segmented and flexible, or spines, which are unsegmented and rigid. Ask students which fins are paired (pectoral, pelvic) and which are not (dorsal, caudal, anal). Review with students the function of each fin:

- Dorsal and anal fins help keep the fish upright and prevent it from rolling over.
- Pectoral fins may help the fish stop or may slow its forward motion. They are used for fine maneuvering, for resting or walking on bottom, and in some cases for slow propulsion.
- Pelvic fins help the fish control a tendency to veer upward as it slows down.
- The caudal fin moves from side to side to propel the fish.

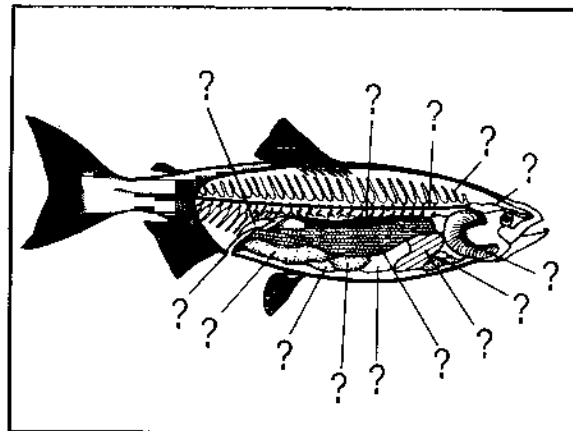
**LOCATE THE GILL COVER.** If it is still flexible, bend it forward to reveal the gills. To breathe, the fish opens its mouth, takes in water, then closes its mouth. The water moves from the fish's mouth, past its gills, and out from beneath the gill cover. As the water moves over the gills, oxygen from the water is absorbed into blood vessels in the gills.

MANY FISH HAVE AN OBVIOUS LATERAL LINE THAT RUNS FROM THE GILL COVER TO THE CAUDAL FIN. The lateral line is a complex of sensory receptors. It enables the fish to detect changes in water pressure and thereby helps it detect the presence of predators or prey, orient to the current, keep its position in a school of fish and avoid obstacles.

SEE IF STUDENTS CAN FIND THE FISH'S NOSTRILS ON ITS HEAD. A sense of smell is important to fish. Many species rely heavily on this sense to find food. Biologists believe that a salmon's sense of smell is important to the fish's ability to return to the stream where its life began.

2. Have the students guess the weight and length of their fish. Then measure and weigh them. Fisheries biologists often collect data on sex, weight, length and age of fish to help decide on the number of fish that should be harvested. Age can be determined by counting the growth rings on scales. Sex ( $\sigma$ =male,  $\text{♀}$ =female) is difficult to discern from the outside of the fish, except in spawning salmon among which the males have hooked snouts.

## Activity 5 What's Inside a Fish?



### Background:

If students already have studied the human body, they will encounter many familiar organs in fish. They will be able to make comparisons and reinforce what they have already learned about anatomy.

If the fish you used to examine external structures was a whole, uncleaned fish, use it for this activity too. If you keep it from one day to the next, be sure to refrigerate it overnight. A preserved fish can be obtained from a biological supply house if you have no local specimens. Wash preserved specimens thoroughly with water to lessen the smell of the preservative (many of which are health hazards).

One fish will suffice to show the class what's inside, but it's better to have enough fish for students to work in small groups.

### Vocabulary:

- gonads
- esophagus
- spinal cord
- gas bladder
- swim bladder

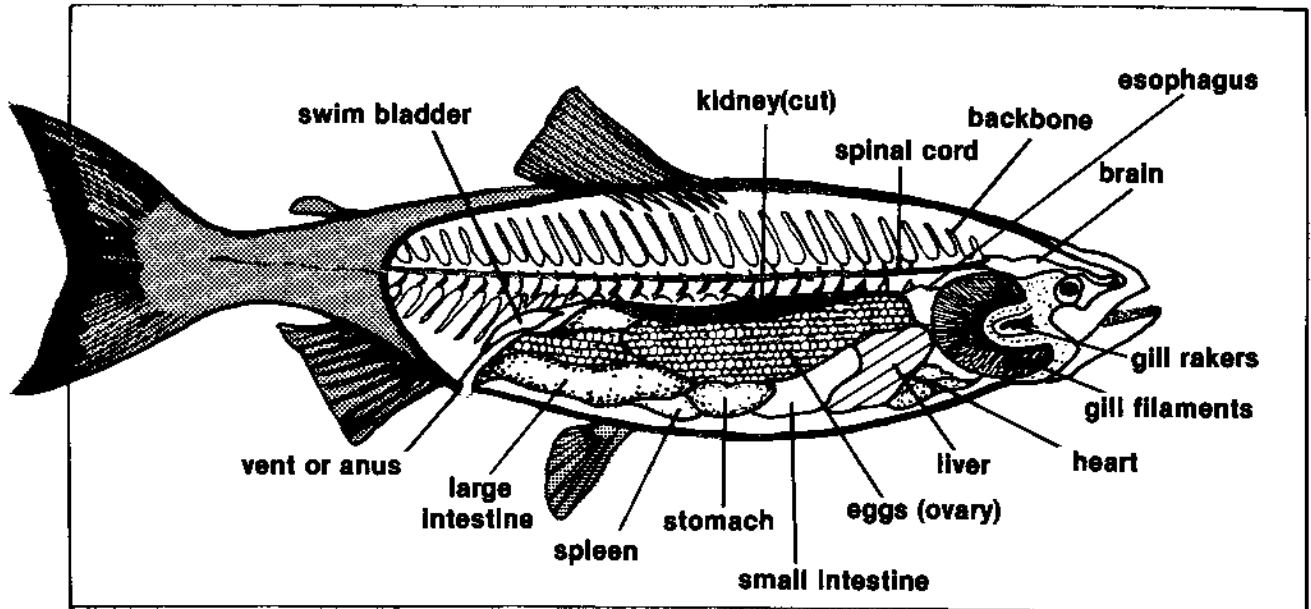
- vent
- spleen
- testes
- ovaries

**Materials:**

- a whole fish (ideally one for every 2-3 students)
- glue
- scissors
- colored pencils or felt-tip markers
- knife or scalpel
- dissecting needle or other pointed probe
- worksheets:
  - ...The Inside of a Fish (1F)
  - ...Body Parts and Their Functions (1G)

and cutting a straight line forward up the belly until you reach the point where the gill covers almost meet. This cut is the same one that anglers make as they begin to clean fish; it will enable you to lay open the body cavity and examine the organs inside.

THE HEART LIES NEAR THE FORWARD END OF YOUR INCISION. Pyramid, or fist-shaped, it serves, as does the human heart, to circulate blood through the body. Like people, fish have a system of veins and arteries to transport blood.



**Procedure:**

1. Distribute worksheet The Inside of a Fish. Have the student label and color the fish parts as they are identified and discussed.
2. Place the fish on a flat surface. Begin the dissection by inserting a knife or scalpel in the vent (anus) of the fish

JUST BEHIND THE HEART IS THE LIVER. The liver a blood storage organ and filters poisons from the blood. Students may have heard of cod liver oil, a codfish liver extract rich in vitamins A and D.

LIKE OUR DIGESTIVE SYSTEM, the digestive system of a fish consists of several

parts. The whole of this system can be removed from the fish and laid out in a pan for better examination. The digestive system begins with an ESOPHAGUS that carries food from the fish's mouth to its STOMACH. Behind the stomach are the PYLORIC CAECA (pronounced see'-ka), finger-like projections that secrete enzymes which help the fish digest its food. The pyloric caeca are attached to the intestines. The number of pyloric caeca varies with the kind of fish. Salmon may have as many as 200 but flatfish usually have fewer than five.

With your scalpel or knife, open the stomach of the fish. It may contain a sample of the food the fish ate. When cleaning fish, many fishermen routinely open the fish's stomach to help themselves learn more about the fish and its food, and to give themselves a better idea of what kind of bait might attract the fish.

THE GAS BLADDER, OR SWIM BLADDER, is a thin-walled sac that usually lies high in the body cavity. The gas bladder may be collapsed in your fish, but if students have ever cleaned a fresh fish, they may have seen a gas bladder when it is still expanded like a small, thin balloon or like a bubble blown from bubble gum. The bladder regulates pressure by releasing or reabsorbing gas. In this way it enables the fish to adjust to changing water pressure at varying depths and to maintain neutral buoyancy. It also func-

tions in respiration and helps the fish make and receive sounds.

THE GONADS are the structures that produce either eggs or sperm. In bony fishes, the sperm-producing gonads (testes) are white. The egg-producing gonads (ovaries) are usually yellow or red-orange. The gonads lie along the gas bladder. Fish are either male or female and thus have either white sperm-producing testes or egg-producing ovaries. The gonads may be quite large if spawning time is near and large eggs may easily be seen in the ovaries. The unspawned eggs of both herring and salmon are highly prized for food by Alaskan Natives, and by Japanese and other Asian peoples. Salmon roe (eggs) from commercially caught salmon are a valuable cash crop that is carefully boxed and exported to Asia.

THE FISH'S KIDNEYS are long, slender, dark organs that lie along the top of the body cavity just under the vertebrae and above the gas bladder. They can be easily seen when the other internal organs have been removed. There are two kidneys in each fish; like ours, they function in removal of waste products from the body.

THE BRAIN of the fish is located on the back of its head behind its eyes. By making several lengthwise, parallel cuts behind the eyes, you will be able to expose cross-sections of the brain for examination.

THE SPINAL CORD may be seen by cutting through the center of the column of vertebrae that are exposed in the central body cavity. The spinal cord is part of the nervous system through which messages travel from the brain to the other parts of the body. The BACKBONE protects the spinal cord and provides support for the fish.

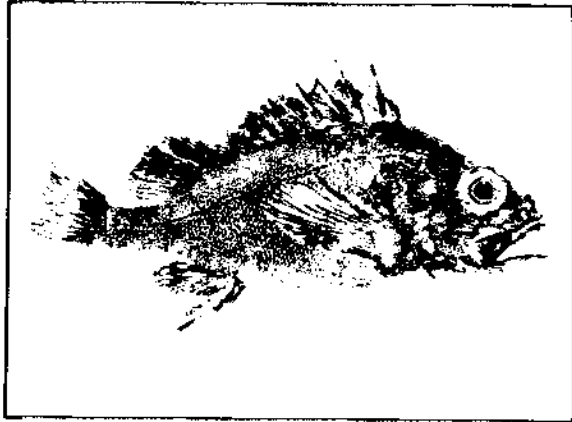
GAIN ACCESS TO THE GILLS by raising the gill cover. You can remove the gills by making two cuts with a knife, severing the gills at their points of attachment. Bony fishes have four curved gill arches on either side of the head. On the insides of the gill arches are short projections called gill rakers. These help in gathering food. If the fish feeds on large prey, the gill rakers may be few in number and may have

rough structures that aid in holding their captives. Fish that feed on plankton usually have long slender gill rakers that help strain the plankton from the water. Herring, for example, have gill rakers of the second type, while the gill rakers on some salmon are less prominent. On the outside of the curve of the gill arch are the gill filaments which let the fish absorb oxygen from the water.

3. Distribute the worksheet Body Parts and Their Functions. Have students cut out the sections and glue or tape them to another paper so the correct functions are opposite the appropriate body parts. Compare fish organs to those of humans. (Most are similar, but humans lack swim bladders, and have lungs instead of gills.)



## Activity 6 Fish Printing



### Background:

Down through the ages, fish have inspired artists and craftsmen. Museums throughout the world have fish art objects and paintings. Here in Alaska, Natives use fish designs in their art work.

Japanese fish printing (gyotaku) is a great way for every child to be a successful artist. In Japan, fisherman often do gyotaku (pronounced ghio-ta-koo) as a record of their catch. Fish printing began in Japan or China in the early 1800s, spreading to this country during the present century.

### Vocabulary:

- gyotaku

### Materials:

- a whole fish
- watercolor, oil paint, or ink (especially linoleum block printing ink)
- rice paper, construction paper, newsprint, or linen
- clay
- straight pins
- paper towels
- small paint brush

- 1/2-inch wide paint brush or small brayer (roller)

### Procedure:

1. Obtain a whole fish (the one from the proceeding activities would work fine). Wash it thoroughly using detergent. Rinse and dry the fish to remove all cleanser and any blood or mucus. Place the fish on a good working surface. If your fish is gutted, stuff the body cavity with paper towels. You may want to fill a bag with wet sand and cradle the fish on top of it. Place clay under the fins to hold them out. A pin inserted in the muscular base of one of the first spines of each fin will help keep the fins erect. Stuff part of a paper towel under the gill to sop up excess water.
2. Use a large brush or brayer to apply paint or ink. Stroke consistently from front to back or vice versa so that scales are accentuated. Carefully place a piece of paper over the fish and with your fingers rub gently but firmly over the fish. Remove the paper and hang it up to dry. The eye of the fish can be painted on later with a small paint brush.
3. Then if the fish is fresh, you can eat it! Just clean and wash it thoroughly.

### Additional Activities:

1. Art, Social Studies: Sign your fish prints with Japanese or Chinese characters. Make a small stamp out of a wood or a linoleum block and dip it in red ink. Use a



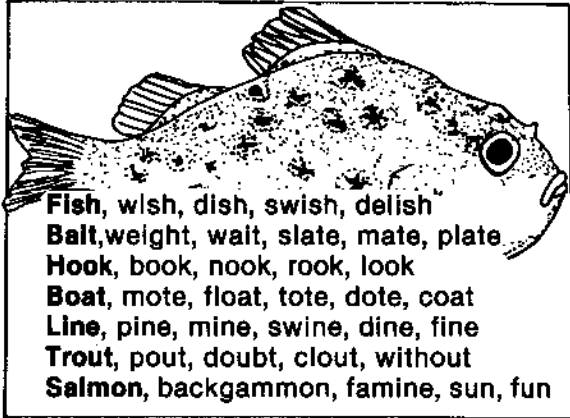
Japanese or Chinese dictionary to figure out which character to use. When you're carving the stamp, do not forget to carve it backwards so it will print the right way. Then add a cardboard or paper frame to your picture and some yarn on the back to hang it on the wall.

2. Art, Social Studies: Another famous Japanese art form is paper folding, origami (pronounced or-i-gah-mee). Make

fish by folding colorful square sheets of tissue paper. Then tie string or thread through the centers of their dorsal fins and hang them throughout the room.

3. Art, Social Studies: Have students look around their own homes or in local business for examples of fish art. Bring them to school and discuss their origins, histories, and the artists' techniques. Local artists might be willing to demonstrate their skills and assist the students in making similar art projects.
4. Art: Have students fill a bulletin board aquarium with thumbprint fish. To make the fish, have students stick their thumbs on an ink pad, and then press it on the aquarium paper. Add fins with magic markers. (Suggested by Nanette Thomas, Sunnyland School, Bellingham, Washington)

## Activity 7 Fish Poetry



### Materials:

- poems about fish or fishing
- pencils
- paper

### Procedure:

1. Share some of your favorites and the following poems about fish. Talk about the students' feelings toward fish and some of their favorite fish stories.

#### FISHING

I'm wearing old clothes,  
My favorite kind.  
They're faded and tattered,  
But fish never mind.

My line's in the water  
With squirming live bait.  
I like to go fishing  
And dream while I wait.

--Vivian G. Gould

#### The Fish

I caught a tremendous fish  
and held him beside the boat

half out of water, with my hook  
fast in a corner of his mouth.  
He didn't fight.

He hadn't fought at all.

He hung a grunting weight,  
battered and venerable  
and homely. Here and there  
his brown skin hung in strips  
like ancient wall-paper,  
and its pattern of darker brown  
was like wall-paper:

shaped like full-blown roses  
stained and lost through age.  
He was speckled with barnacles,  
fine rosettes of lime,  
and infested

with tiny white sea-lice,  
and underneath two or three  
rags of green weed hung down.  
While his gills were breathing in  
the terrible oxygen

--and frightened gills  
fresh and crisp with blood  
that can cut so badly--

I thought of coarse white flesh  
packed in like feathers,  
the big bones and the little bones,  
the dramatic reds and blacks  
of his shiny entrails,  
and the pink swim-bladder  
like a big peony.

I looked into his eyes  
which were far larger than mine  
but shallower, and yellowed,  
the irises backed and packed  
with tarnished tinfoil  
seen through the lenses  
of old scratched isinglass.  
They shifted a little, but not  
to return my stare.

--It was more like the tipping  
of an object toward the light.

I admired his sullen face,  
the mechanism of his jaw,  
and then I saw  
that from his lower lip  
--if you could call it a lip--  
grim, wet, and weapon-like,  
hung five old pieces of fish-line,  
or four and a wire leader  
with a swivel still attached,  
with all their five big hooks  
grown firmly in his mouth.

A green line, frayed at the end  
 where he broke it, two heavier lines,  
 and a fine black thread  
 still crimped from the strain and snap  
 when it broke and he got away.  
 Like medals with their ribbons  
 frayed and wavering,  
 a five-haired beard of wisdom  
 trailing from his aching jaw.  
 I stared and stared  
 and victory filled up  
 the little rented boat,  
 from the pool of bilge  
 where oil spread a rainbow  
 around the rusted engine  
 to the bailer rusted orange,  
 the sun-cracked thwarts,  
 the oarlocks on their strings,  
 the gunnels--until everything  
 was rainbow, rainbow, rainbow!  
 And I let the fish go.

-Elizabeth Bishop

2. Then let students try writing  
 some of their own poetry.  
 Here are some sample formats  
 to follow and some sample  
 poems contributed by Mary  
 Couche's fifth and sixth  
 grade class in Kivalina.

Haiku - This an unrhymed  
 Japanese verse consisting of 3  
 lines containing 5, 7, and 5 sylla-  
 bles, respectively.

The fish go away  
 And it take my hooks away  
 Then I swim for it.

--Albert Norton

Limerick - These are light humor-  
 ous poems consisting of five lines  
 of verse. Lines 1, 2, and 5  
 consist of three anapestic feet (two  
 short syllables followed by one  
 long syllable) while lines 3 and 4  
 contain two feet. Lines 1, 2, and  
 5 rhyme with each other, and lines  
 3 and 4 rhyme together.

There is a big fish who eat pies,  
 After he eats them he dies,  
 Because inside the pies  
 There are too many flies.  
 And his mother gets sad and she  
 cries.

--Mary Couche's whole class

Cinquain - These are five-line  
 stanzas. The first line consists of  
 one word, the second line two  
 words, and so on until the 5th line  
 which again contains one word.  
 Have your students use the name  
 of a fish for the first line.  
 (Aqaluk means "fish" in Inupiaq.)

Aqaluk  
 Big, strong  
 Fast, fighting, jumping  
 It's a big one  
 Trout.

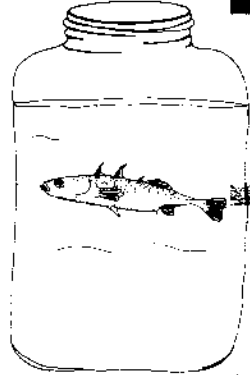
--Antonio Sage

Salmon  
 Scaly, strong  
 Leaping, making waves  
 It's a very big  
 fish.

--Harold Koenig

# Watch that Fish!

1. Draw a picture of your fish. Include as much detail as possible.



2. Describe how the fish moves forward.
3. Describe how it turns.
4. Can the fish swim backwards? Which fin does it use?
5. Can the fish swim in one spot? Which fins does it use?
6. Which fins does it use to move up and down?
7. Which fin does the fish use to keep on a steady course?
8. As the fish swims, does it keep its mouth open or closed?
9. What else do you notice about your fish?

# A Fish is What?

Fish are defined by scientists as cold-blooded, aquatic, gill breathing vertebrates equipped with fins and usually scales. That is a mouthful! Let's explore what this definition means.

## A. Cold blooded

Some animals are cold-blooded. That means the temperature of their bodies is the same as the temperature of the air or water in which they live. Some animals are warm-blooded. That means that the temperature of their bodies is always the same warm temperature, and does not change with the temperature of the air or water around them. Try naming...

Three cold-blooded animals

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Three warm-blooded animals

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Check your guesses with an encyclopedia.

Is a fish warm-blooded or cold-blooded? \_\_\_\_\_

## B. Aquatic

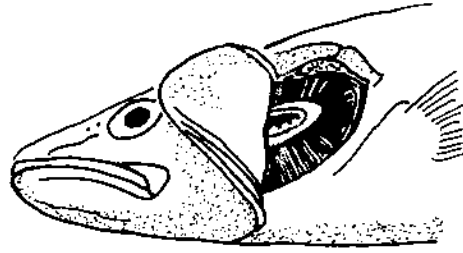
What does "aquatic" mean? \_\_\_\_\_  
(Hint: Where do fish live?)

List three other aquatic animals:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

## C. Gills

Fish, like people, need oxygen to live. They take their oxygen from the water around them. Oxygen is taken from the water through fine filaments on the fish's gills. Gills are located at the back of the fish's mouth cavity and are under a gill cover that protects them. The fish make water pass over its gills by opening its mouth to take in water, then closing its mouth and forcing the water over the gills and out from beneath the gill cover.



Locate the gill filaments in the picture. As water passes over the gill filaments, which are long and slender, oxygen is taken from the water for the fish to use.

Locate the gill rakers in the picture. The gill rakers, fewer and shorter than the filaments, strain food out of the water for the fish to use. Color the part of the gill used to breathe blue. Color the part of the gill used to strain the food from the water red.

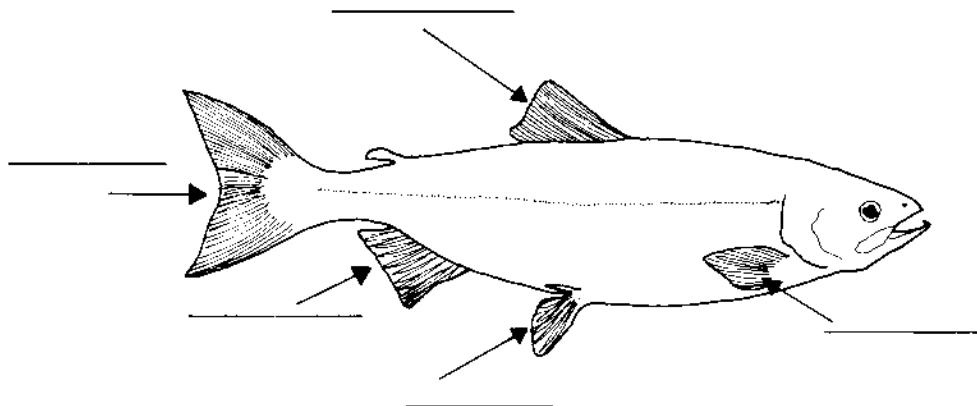
#### D. Vertebrates

A fish is a vertebrate. Look up the word "vertebrate" in the dictionary. Name three other animals that are vertebrates.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

#### E. Fins

The fins on a fish all work together. Remember your observations of a live fish in the last investigation? Color the fin the fish uses to move forward in the water blue. This fin is called the caudal or tail fin. Label the caudal fin in the drawing below.

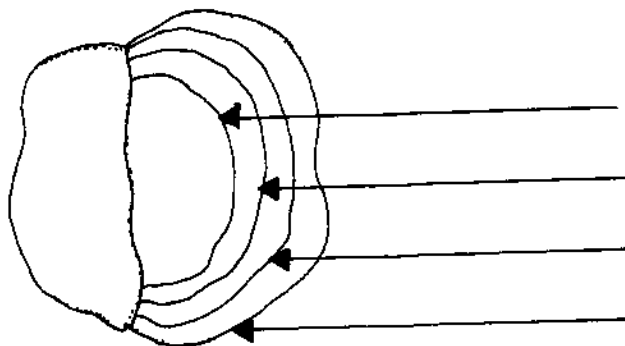


Color the fins the fish uses to go up and down red. These are the pelvic and pectoral fins. They also act as brakes for the fish.

The fin on the back is called the dorsal fin. Label the dorsal fin in the drawing below. Locate the anal fin. The dorsal and anal fins help to balance the fish in the water. These fins keep the fish from rolling over and over as it moves.

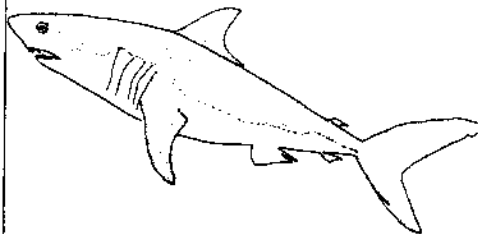
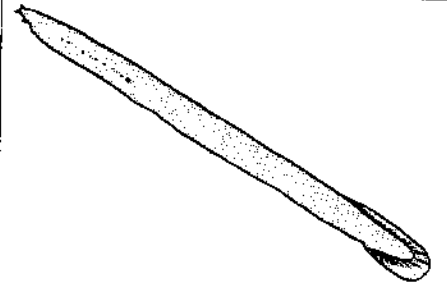
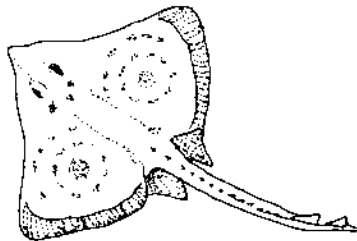
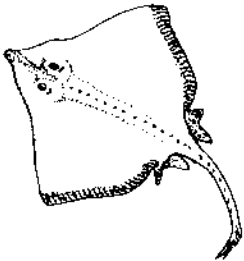
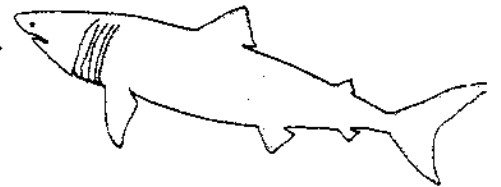
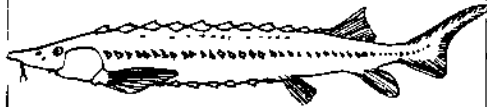
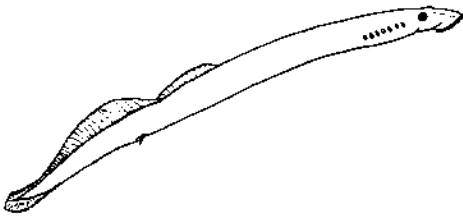
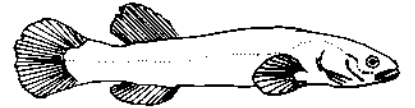
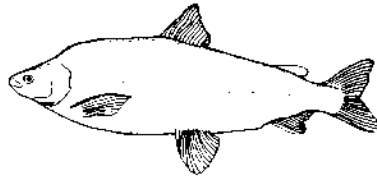
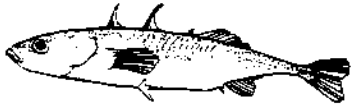
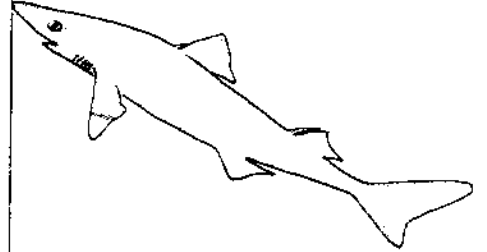
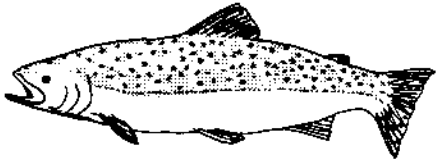
#### F. Scales

A fish is usually covered from head to tail by a coat of scales. These scales are a type of bone. Scales increase in size as the fish grows. Rings, like the ones that form in tree trunks, also form on growing scales. Each ring represents one year of the fish's life. The tiny scale in the center is just the start of the growth. How old was this fish? \_\_\_\_\_





# Fish to Classify



# The Three Major Groups of Fish

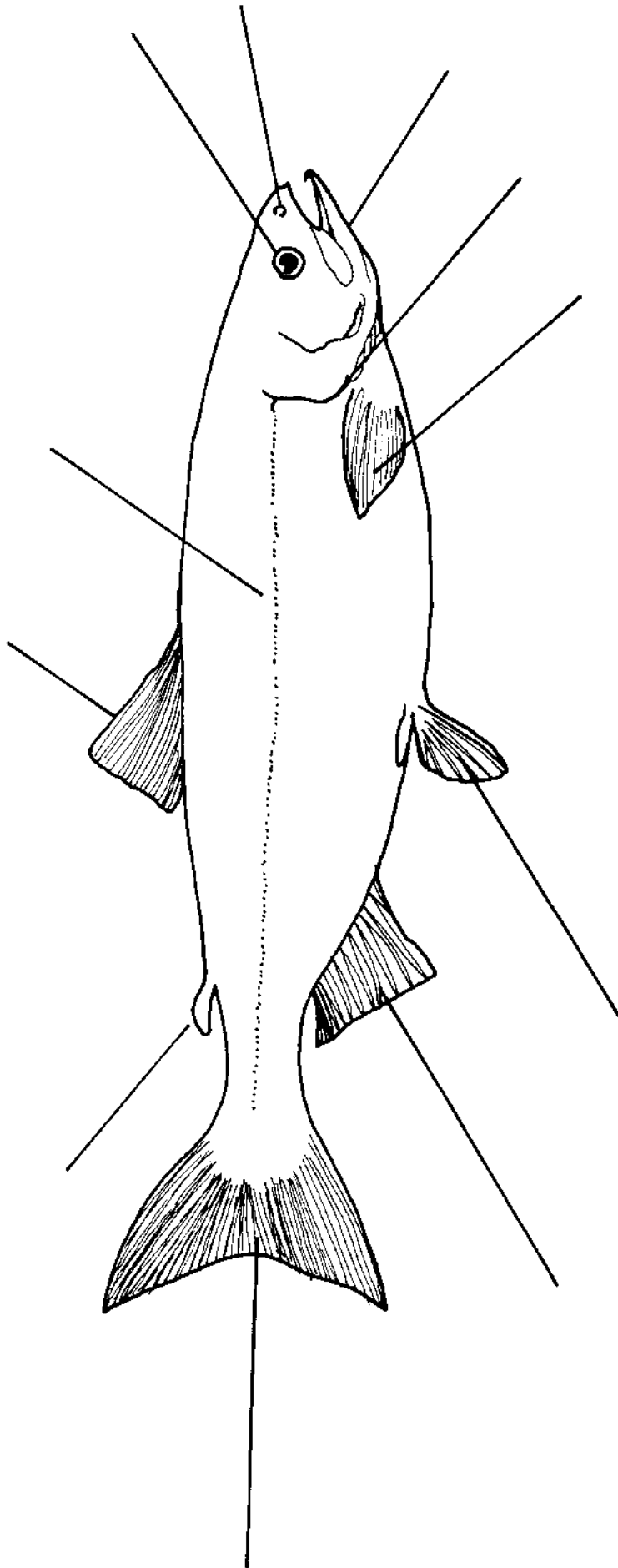
- no jaws
- no paired fins
- gill opening is a round hole
- skeleton of cartilage, not bone
- no scales

- jaws
- some paired fins
- gill openings are 5-7 slits on either side of the body
- skeleton of cartilage, not bone
- no scales

- jaws
- some paired fins
- single gill opening on either side of the body
- skeleton of bone
- scales

# The Outside of a Fish

Label the parts of this fish.



Your labels will include:

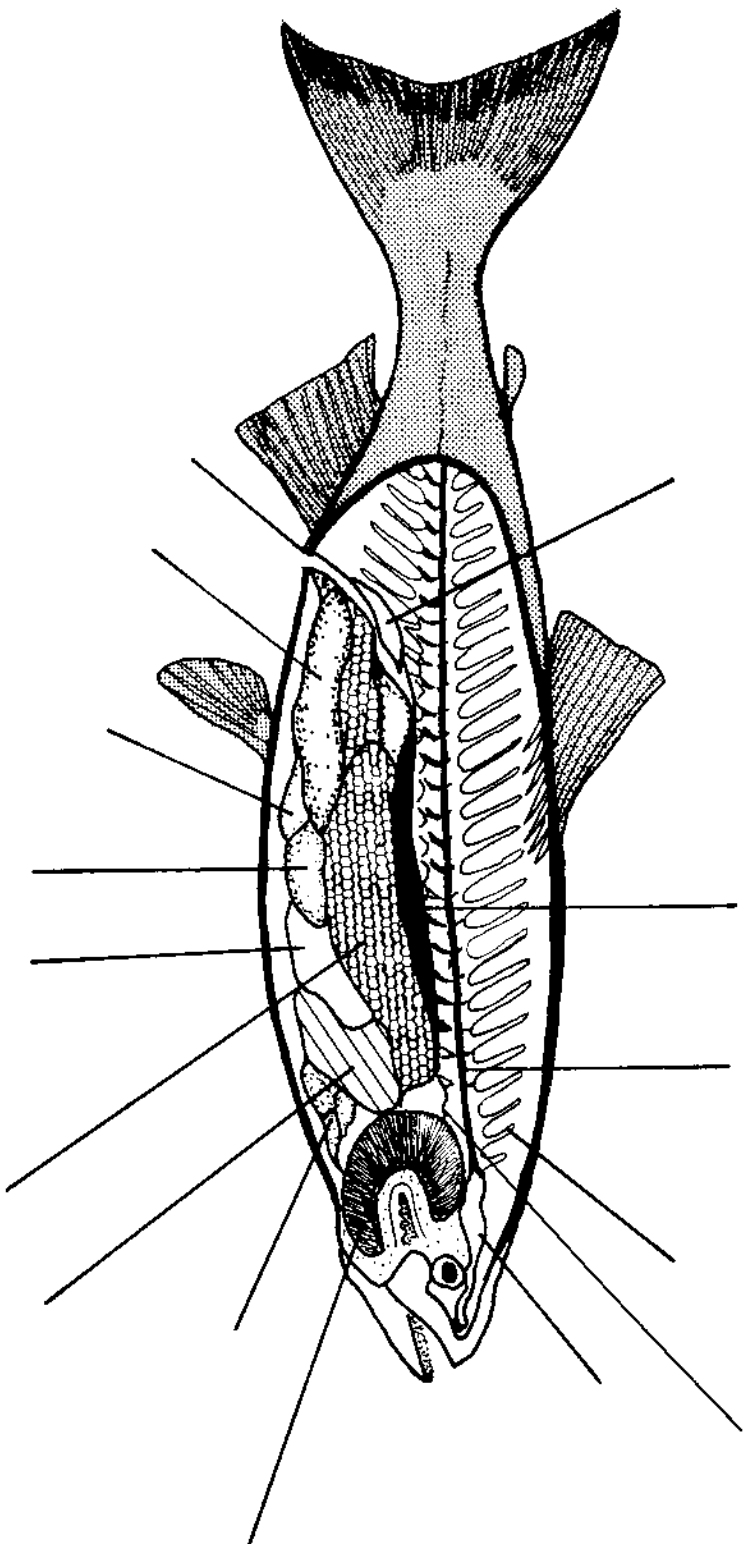
- eye
- nostril
- jaw
- gill cover
- lateral line
- pectoral fin
- dorsal fin
- pelvic fin
- anal fin
- caudal fin
- adipose fin

Record the length \_\_\_\_\_ and weight \_\_\_\_\_ of your fish.

How old is your fish? \_\_\_\_\_ years. Is it ♂ or ♀ \_\_\_\_\_?

# The Inside of a Fish

Label the internal parts of this fish.



Your labels will include:

- |           |             |                             |                 |
|-----------|-------------|-----------------------------|-----------------|
| brain     | liver       | kidney                      | backbone        |
| heart     | stomach     | vent or anus                | small intestine |
| eggs      | spinal cord | spleen                      |                 |
| esophagus | gills       | gas bladder or swim bladder |                 |

(If your fish is a ♂, instead of eggs, you'll see white milky testes.)



# Body Parts and Their Functions

Directions: Cut apart these body parts and their functions. Correctly match them and glue or tape them to another sheet of paper.

Body Parts	Functions
gills	pumps blood through the body
gonad	digests food
swim or gas bladder	stores blood and filters out poisons from the blood
kidney	produces eggs or sperm
heart	carries food from mouth to stomach
liver	remove waste from the body
spleen	provides body support and protects the spinal cord
stomach	carries messages from the brain to other parts of the body
esophagus	controls the fish's activities
spinal cord	absorbs oxygen from the water, gathers food from the water
brain	maintains buoyancy, regulates pressure by releasing or absorbing gas
backbone	breaks down red blood cells