

Salmon

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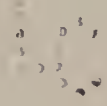
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Writers' program. Pennsylvania

SALMON



COMPILED BY WORKERS OF THE
WRITERS' PROGRAM OF THE WORK
PROJECTS ADMINISTRATION IN THE
COMMONWEALTH OF PENNSYLVANIA



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FOREWORD

Salmon is the fifteenth of thirty booklets in the Elementary Science Series. It was prepared by the Philadelphia Unit of the Pennsylvania Writers' Project, sponsored by the Pennsylvania Department of Public Instruction.

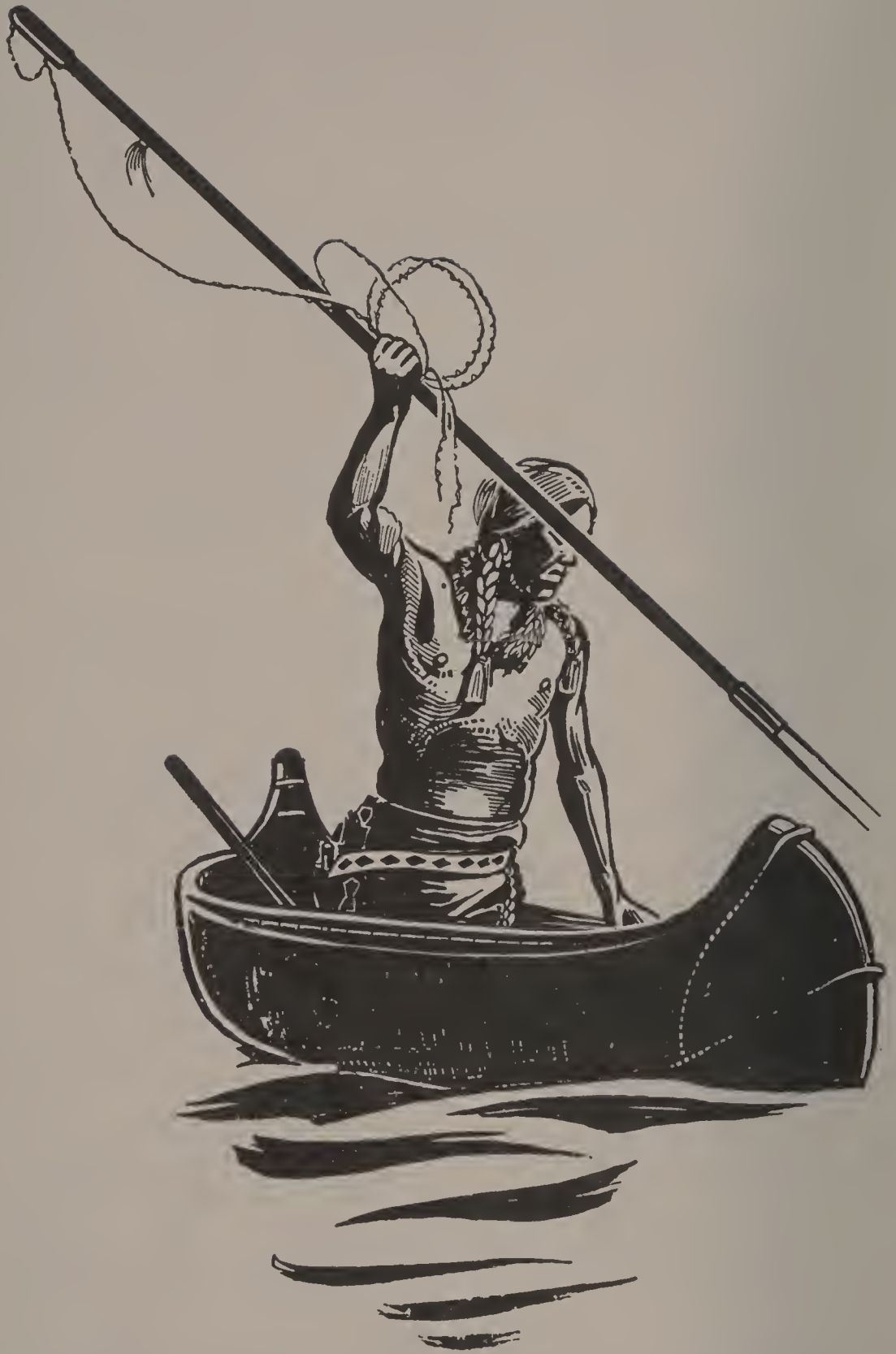
This booklet, written by Mark Bartman, was edited by Katharine Britton of the Editorial office.

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C. C. LESLEY
State Supervisor

728.15



FOR HUNDREDS OF YEARS THE INDIANS HAVE CAUGHT SALMON
BY SPEARING THEM.

SALMON

KING OF THE RIVER

To many people salmon is simply something that comes out of a can. Yet first it is a living, breathing, leaping fish, so handsome and strong that it is called the "King of the River."

The salmon is one of the swiftest, the mightiest, the bravest of all the fish that dart through the northern waters of America. It looks like a king of fishes, too. In its sleek coat are the colors of a summer evening when the sun goes down and the sky is a silvery blue.

There's a true story about the salmon's strength and bravery. Once an eagle was circling overhead, and far below in the river he spotted a salmon. Down,

down the eagle swooped. As the king of the river rose to the surface — swish! The strong claws of the eagle had seized him.

The salmon squirmed and battled madly. The eagle could hardly keep his hold. Digging his claws deeper into the fish's back, he tried to rise into the air. The salmon struggled so hard that the load was too much for the eagle. Unable now to tear his claws free, the great bird was drawn under the water and drowned.

FISH FAMILIES

A man named Pliny, who lived long ago in Italy, gave the salmon its name. He called it *salmo*. That was a name he made from a Latin word, *salire*, which means *to leap*. The salmon is a real jumper. It is a thrilling sight to watch a run of salmon making their way up a river, flinging themselves high into the air to pass rocks, rapids, or even falls.

Men who study fish call a number of different fishes by the name *Salmonidae*. This means *the salmon family*. The *Salmonidae* are the very highest type of fish. All are alike in certain ways, though they may be different in other ways. They have soft fins, a long body, and a special kind of fin on their backs. And all of them are found only in the northern waters of the world.

The trout belongs to this family, so he is a cousin of the salmon. The Indians, who watched nature very closely, knew that the trout and the salmon were related. They even made up stories about trout that turned into salmon.

Many of the *Salmonidae* are such distant cousins and look so different that it is hard to believe they belong to the same family. But all salmon are closely related, and so all look very much alike. Their heads are shaped somewhat like ice cream cones. They have good strong

teeth. Their bodies are covered with scales and speckled with black spots.

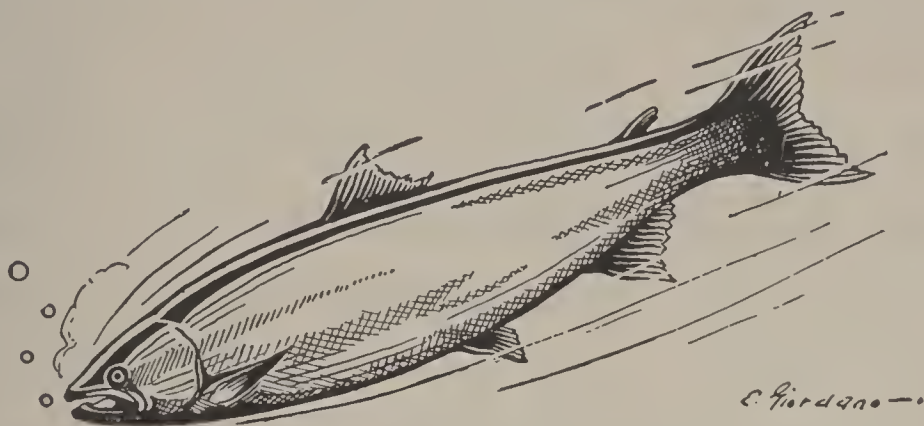
Yet there are differences among them just as there are differences among people. There are white, black, red, and yellow people, and each kind comes from a different part of the world. In the same way, there are many kinds of salmon. Each is different in size and color, and has its home in special waters.

ATLANTIC SALMON

The salmon of the Atlantic Ocean has a slender, graceful body. Its head is rather small and so is its mouth. Its body, covered with large scales, is silvery on the bottom, brownish on the back. On a grown-up, the black spots that speckle the body are usually shaped like an X.

Although these kings of the Atlantic feed only on small things — fish eggs and little creatures of the sea, such as

shrimps and young crabs, some of them have been known to grow heavier than eighty pounds. That's as much as a big boy. Most of those caught, however, weigh only about ten pounds.



ATLANTIC SALMON

There was a time when the shore waters of the Atlantic were the home of great numbers of salmon. The writings of the people of Europe tell us how much these fine fish were valued there for hundreds of years. And when the first settlers came to America, they found that salmon was the chief food of the Indians of the coast. Soon it was one of the chief foods of the settlers, too.

So many salmon were caught in those days that many people tired of eating this tasty food. Today there are few Atlantic salmon left. This is partly because enough salmon were not born each year to replace those that were caught. Besides, the Atlantic coast and the streams flowing into the ocean became so busy with trade and industry that it was hard for the salmon to live there.

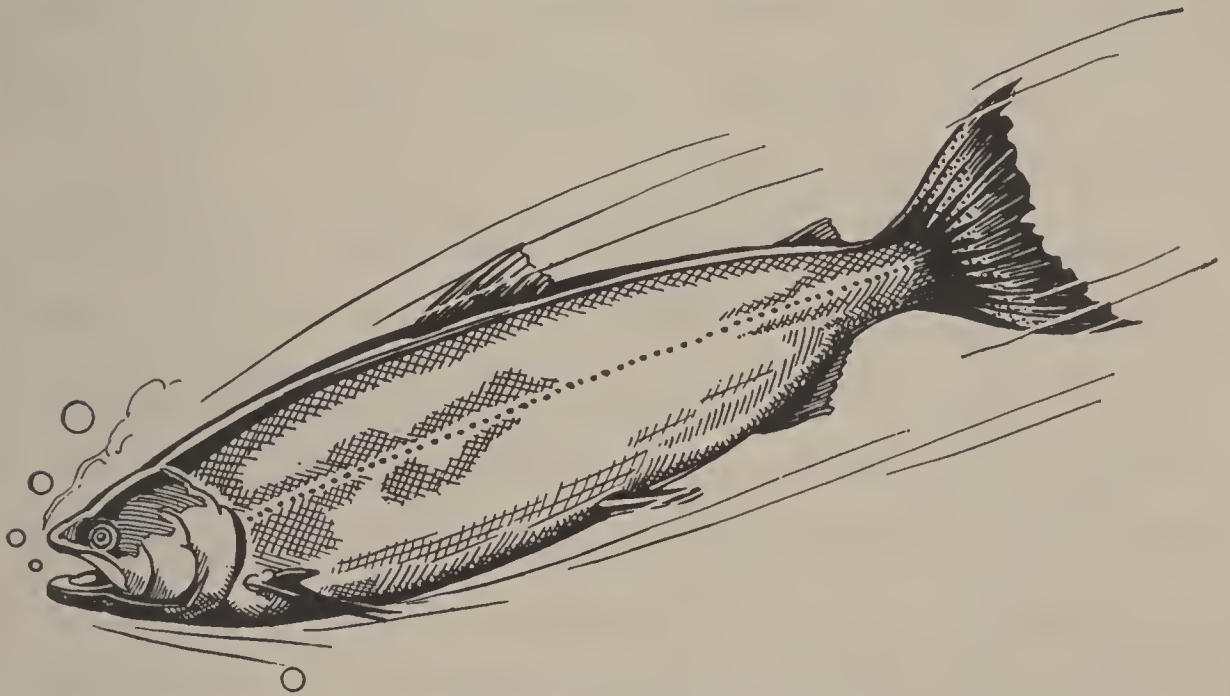
Now there are not enough Atlantic salmon to make fishing for them a good business. There are some around the British Isles, because the people of Great Britain have tried to protect their salmon. They can be found too up around Greenland, Iceland, Russia, and the Scandinavian countries. And farther north, perhaps even up toward the North Pole, salmon may be running free in numbers great enough to make food for many people.

In American waters Atlantic salmon

means one thing. Sport! Up along the coast of Maine and north to Labrador, the fishermen go after the fighting fish with line and rod. And to them the fact that there are not so many salmon left just makes the game more exciting.

PACIFIC SALMON

There is good sport fishing in the coastal waters and the rivers of the



CHINOOK OR KING

Pacific Ocean too. But Pacific salmon have a much greater importance than

that. They supply millions of dollars' worth of food to the world every year.

There are five kinds of Pacific salmon found in American waters — chinook, sockeye, silver, pink, and dog salmon.

The chinook is also called quinnat, tyee, spring, sacramento, and king — all according to the place where it is found. No other salmon compares with it in size and strength. The biggest chinooks weigh more than 100 pounds, and most of those caught weigh no less than twenty-two.

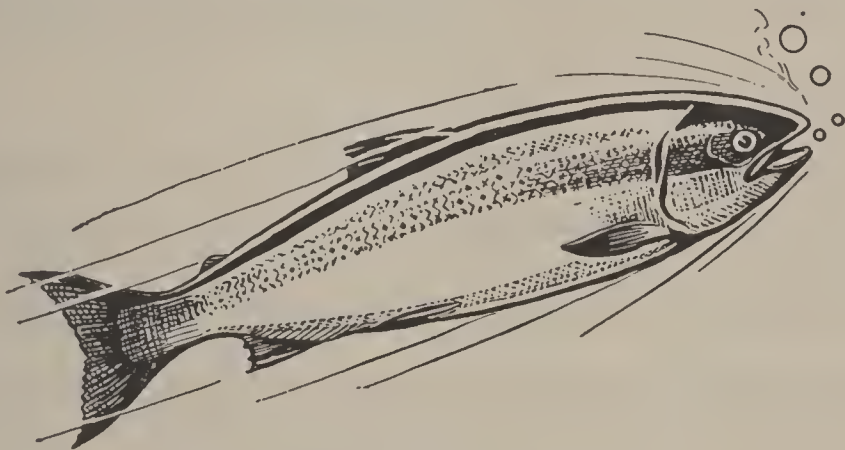
In the spring the chinook is silvery all over, with round black spots, and the sides of its head shine like metal. In the fall the back turns dusky or dull red, the sides are tinted with blue, while the lower part remains silvery.

The rich salmon color of its flesh makes the chinook one of the best-liked of all the salmon. Once in a while this fish plays a trick on the fisherman and turns

out to be red on one side and white on the other. No one knows why this happens.

Down around Monterey Bay, great numbers of chinooks can be seen in the spring feeding on the large schools of herring and sardines near the coast of California. But in most places there are not enough of them to be worth much for trade.

It is the sockeye — the beautiful blue-back or red salmon — that is most im-



SOCKEYE OR BLUEBACK

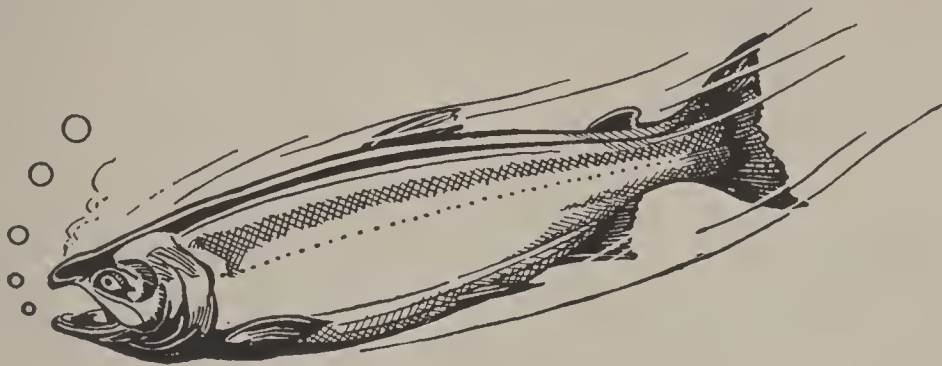
portant of all salmon as a food fish. One reason is that, like the chinook, it remains a bright red when it is canned. Besides, it is caught easily in very large

numbers. During egg-laying time sock-eyes can be seen by the million in certain rivers of the coast, crowding and leaping, on their way back to the place where they were born.

The sockeye is smaller than the chinook. Even the largest sockeye does not grow longer than three feet or heavier than about twelve pounds. Usually it is about two feet long and weighs from three to seven or eight pounds. Its back is a clear bright unspeckled blue, and its sides are silver.

The silver salmon is not so important for food, mostly because its flesh is not such a bright and pleasing color as the sockeye or the chinook. There's another reason too why fishermen don't depend much on this fish for trade. It's a smart fish, and so when the fishermen spread nets for it at the mouths of streams, the silver salmon just don't go into those nets.

The silver salmon has a number of other names. It's called the coho, hooped, kisutch, silverside, or white salmon. These names tell us something about its looks. Most of its body is silver, though the upper parts are bluish-green with a few faint black spots. It is a

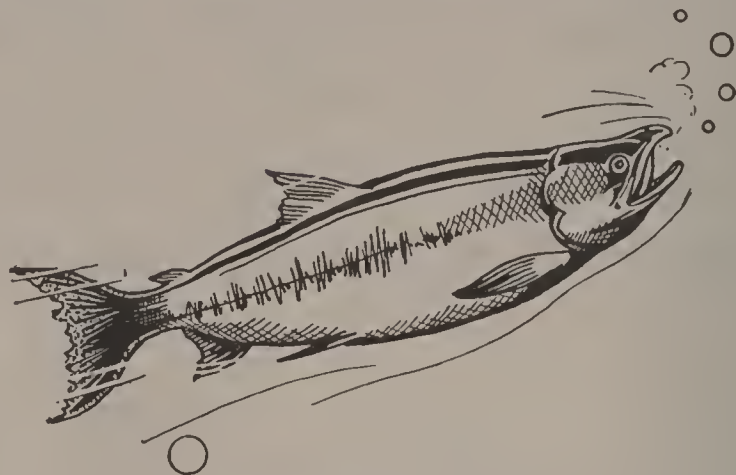


SILVER OR COHO

little larger than the sockeye, and sometimes weighs thirty pounds. Most silver salmon never grow heavier than twelve pounds, however.

The chum or dog salmon is usually about the same size as the silver salmon, though a few chums grow as heavy as forty-five pounds. But the chum is not very pretty nor very good to eat. Its

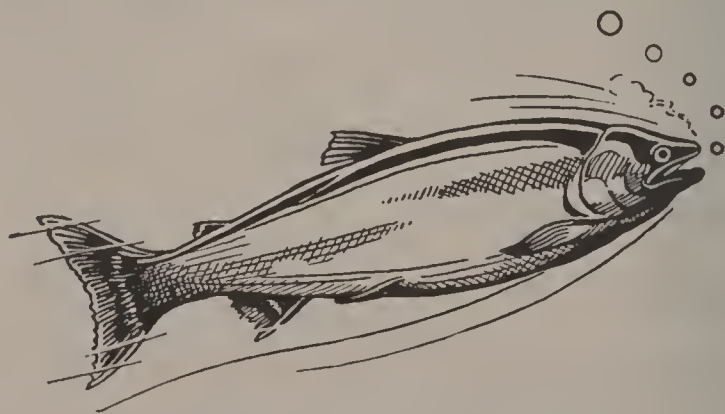
body is dirty silver in color and its flesh is pale yellow. Up around Alaska, where it is caught in greatest numbers, only



CHUM OR DOG

the natives use it and they dry it to feed to their dogs in winter.

The pink, or humpback, salmon is the smallest of the Pacific salmon, but it is



PINK OR HUMPBACK

very important today as a food. Its flesh is not so tasty-looking as that of the

sockeye, and so pink salmon costs much less. Humpbacks were given their strange name because in the fall of the year the males are very much out of shape, and have a real hump on their backs. Still they are pretty to look at, with their blue, speckled backs and silvery sides.

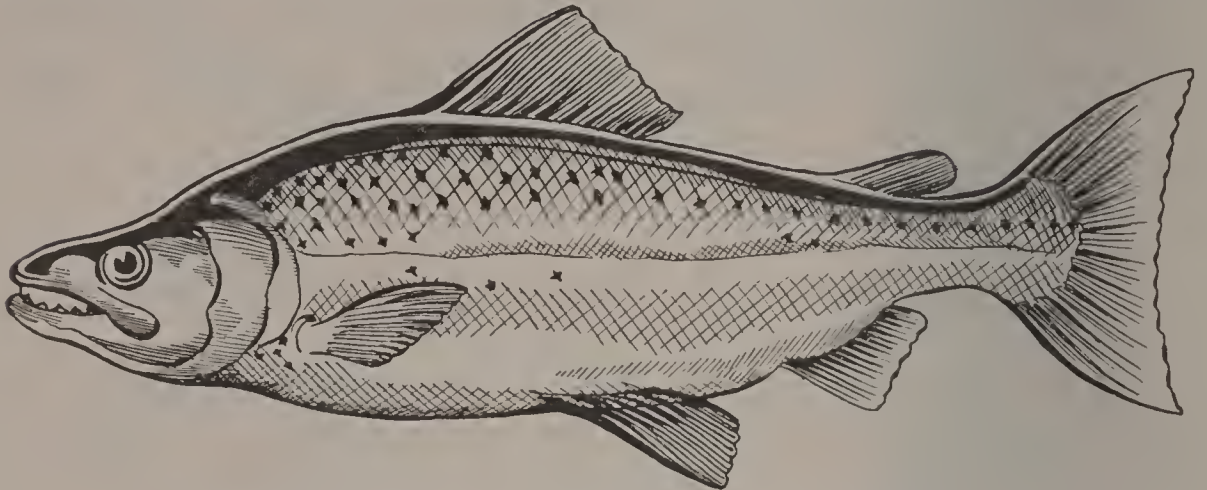
SALMON OF INLAND WATERS

Not all salmon live in the ocean or in rivers that empty into the sea. Some live in inland waters of the north, especially in New England and Eastern Canada. Here there are two kinds of salmon, Sebago and Ouananiche. Both are relatives of the Atlantic salmon. But these landlocked salmon are smaller and plumper than ocean salmon, with harder heads, larger scales, and different coloring.

The Ouananiche is a real favorite with sportsmen. They say no other fish of

any kind puts up so good a battle when hooked. In fact, they often call it "the leaping fighter."

Even the name Ouananiche tells something about the fish. It is an Indian



OUANANICHE OR LEAPING FIGHTER

word, and it means *Look there! What is that?* Surely this must have been named when some Indian braves were startled to see the strong, active little fish leaping high out of the water.

THE RUN

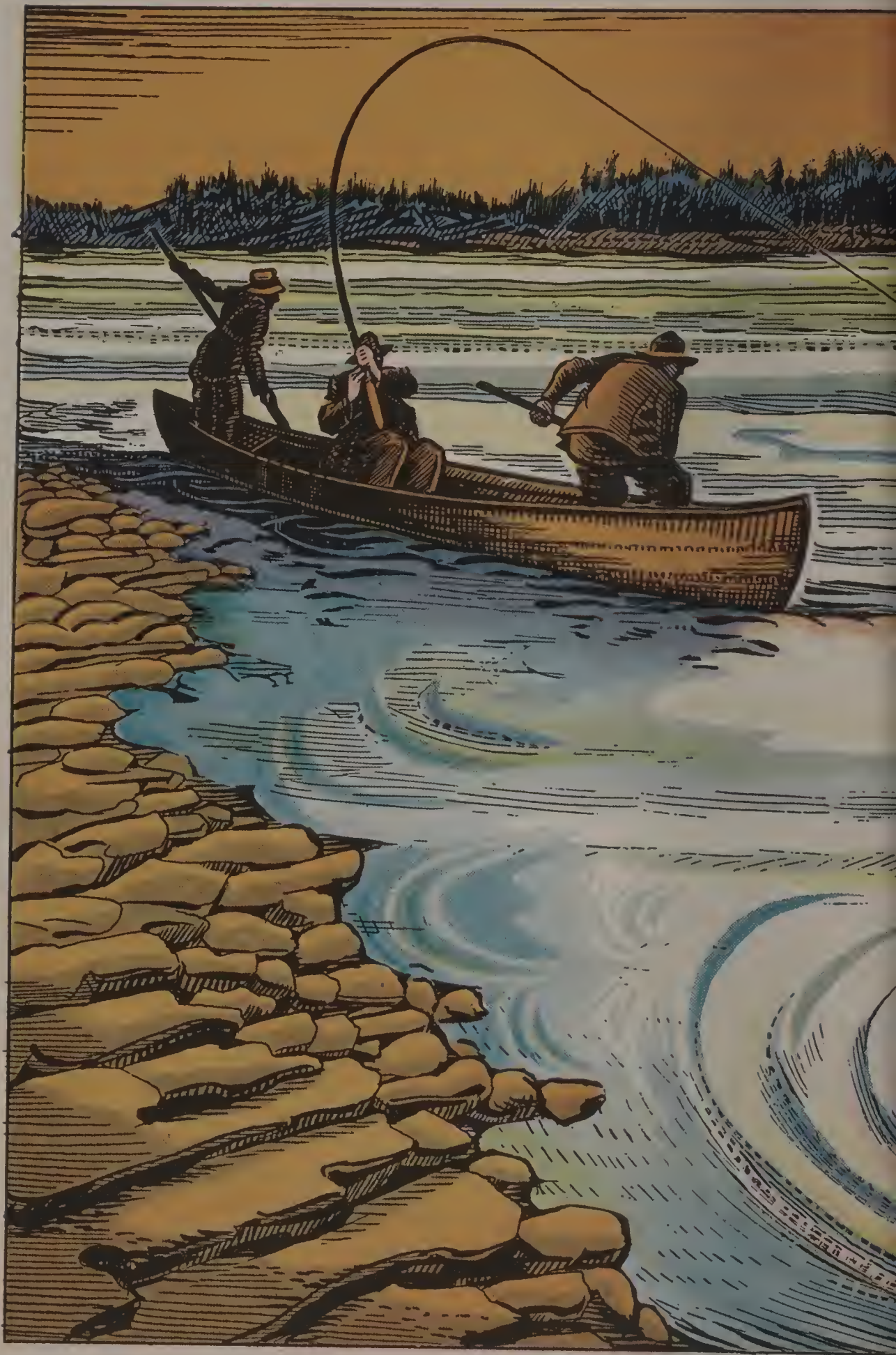
All kinds of salmon live in much the same way. They are born in the beds of creeks and rivers, stay there for a

while, and then swim down to the sea, or into a large lake if they are landlocked salmon. When the time comes to lay eggs, or spawn, they go back up the stream from which they came.

Salmon do not live in this way because they think it the best way. They cannot think. Nature has made them in such a way that when they reach the right age, when their spawning time comes, some unknown call leads them, even from great distances, back to the place of their birth. Often they return even to the very branch of the stream in which they were born. And year after year each kind of salmon in each stream begins its run at exactly the same time.

When the time for the run comes, the salmon begin to move in from many directions toward the mouth of the stream which was their first home.

At first they go slowly. They swim about as if they were playing. Some





of them may even turn and go out to sea again, not ready for the run this year. But more and more keep coming in. They stop playing and move forward in earnest. Nothing can stop them now.

The salmon that run in the fall go only a little way upstream. Sometimes they seem to be in such a great hurry to reach their spawning ground that they go up tiny brooks only a few inches deep and die from lack of water. But the salmon that run in the spring sometimes go one or two thousand miles upstream.

During the whole long trip, all the salmon's strength and all their time is spent on only one thing — reaching their goal. They do not even eat. And nature has prepared them well for the hard journey. When they leave the ocean they are husky, sleek, well-fed fish, with dark backs and silver black-spotted sides.

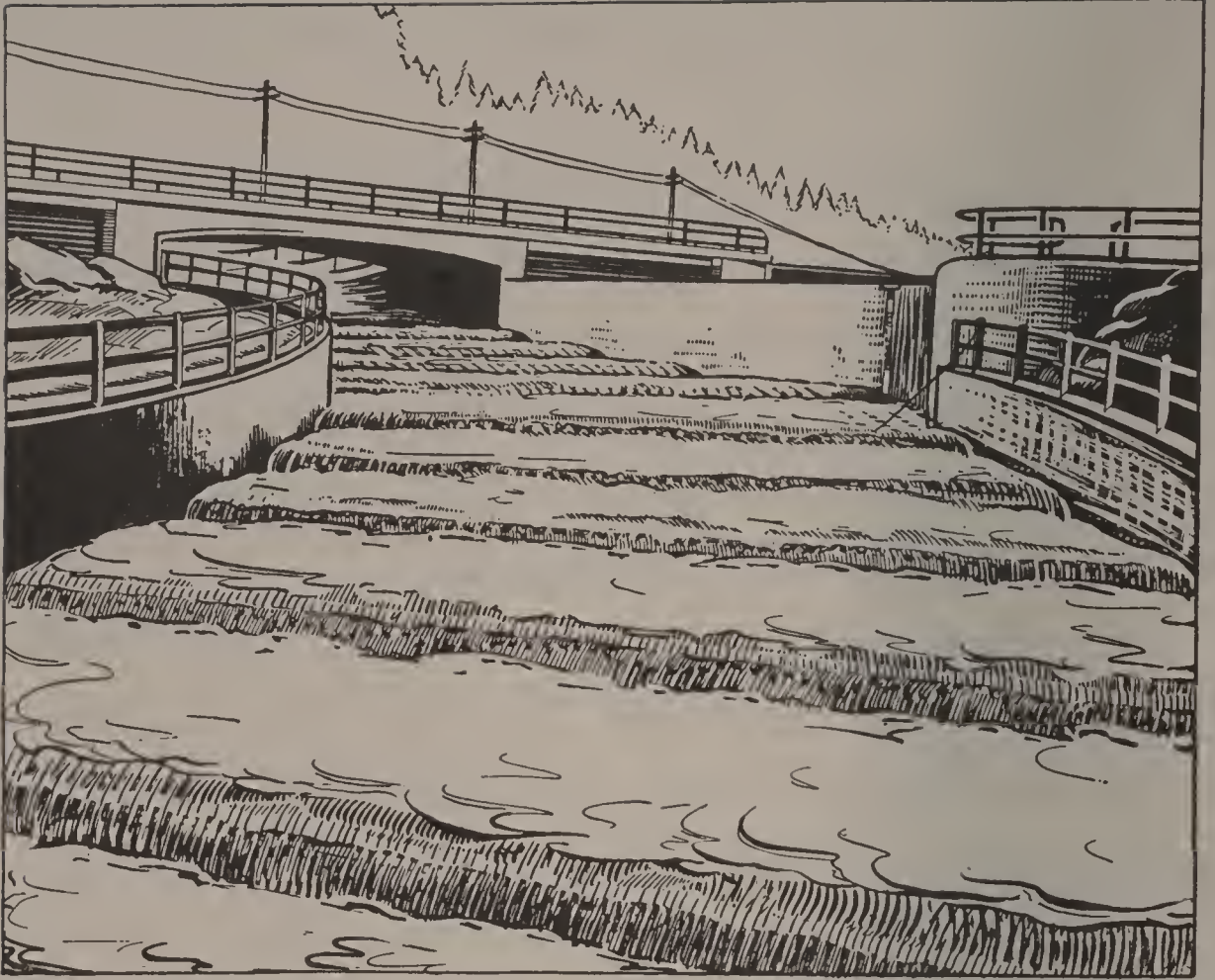
They are at the very peak of their weight.

Thousands of them move upstream together. When they come to a narrow channel, they float in place, each waiting his turn to go on. They may be so closely packed here that they make a bridge over which a man could walk.

Against strong currents and swift rapids the salmon make their way.

Sometimes they must leap almost straight up over falls a dozen feet high.

No one knows exactly how the salmon makes its great leaps. One idea is that it begins by moving its tail and fins very fast. Suddenly it bends its body, just as a man bends a bow to shoot an arrow. Then — sping! It snaps back! This sends it shooting from the water. If the salmon doesn't make the jump at the first try, it jumps again. It keeps on trying until it either succeeds or dies from wounds or weariness.



THE SALMON LADDER IS LIKE A LONG STAIRWAY WHICH THE FISH CAN CLIMB EASILY.

As the salmon fight on, hardships and lack of food destroy their grace and beauty. Their bright silvery color is lost. They become ugly, lean, and slimy. Heads and bodies are out of shape, tails and fins are torn, big sores show where the scales have been scraped off.

There are other changes too in the

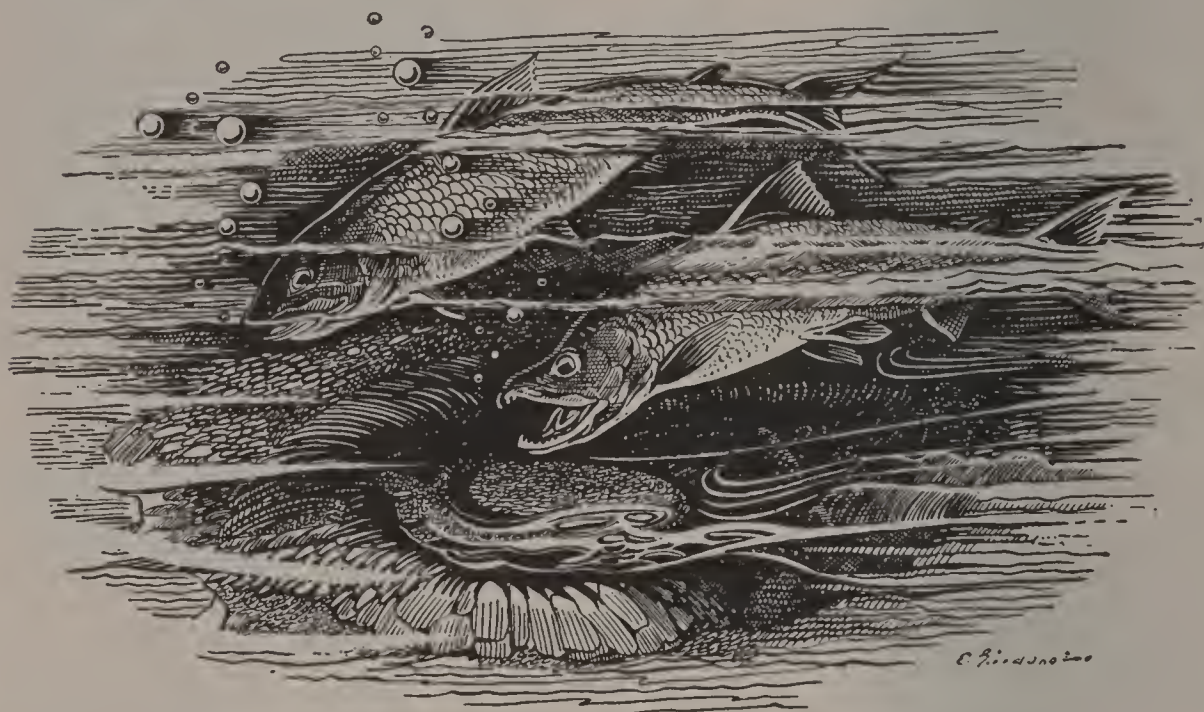
male salmon. Their lower jaws become sharper and sharper, and finally both jaws become strongly hooked. The front teeth grow sharper and longer, often a half-inch long. Sometimes their mouths cannot even be closed because of these teeth.

SPAWNING

When they have gone far enough, each father and mother salmon choose a place for their nest in quick flowing water, about one to four feet deep. Then with tail and nose the father digs a furrow in the stony river bed, like the furrow a farmer makes with his plow in the ground.

For the next few days the mother salmon is very busy. Usually she lays about nine to ten hundred eggs for each pound of her own weight. If she weighs ten pounds, there may be ten thousand eggs. She must lay a great number because many will be lost. Some will

never hatch. Most of those that do will die. Young fish do not have such an easy time as young children. They must shift for themselves. If the mother



THE MOTHER SALMON LAYS THOUSANDS OF EGGS, WHILE THE FATHER GUARDS THE NEST.

salmon laid only a few eggs, perhaps there would be no young salmon to grow up.

All the time that the mother salmon is spawning, the father salmon is busy protecting the nest from other fish, big and little, that want to destroy his home.

By the time the spawning is over, he is more torn and weary than ever from his many battles.

Now there is nothing more to be done at the nest. Nature will take care of the rest. The father and mother can leave.

Most salmon spawn only once. When they leave the spawning ground, they drift down the river, wasted in body from lack of food, too tired even to keep their balance. They have done their great work, and they are ready to die.

GROWING UP

Now the tiny eggs lie in their bed of gravel. Something is happening to them. Something in them is growing. Between 120 and 180 days pass. An eye forms, then a backbone. But each young one still has the yolk of its egg in a sack under its body. These queer, shapeless little creatures are called alevins.

For several weeks the alevin hides

among the stones. It eats nothing, soaking food from the yolk sack until all of that has disappeared.

By this time the little salmon looks like a real fish, though a very tiny one. Now it is a parr. It has a dark-banded red-spotted coat, with light blue streaks



BABY SALMON

along the sides. The parr looks so little like a grown-up salmon in coloring that for a long time people thought it was an entirely different kind of fish.

Hundreds of millions of these parrs swim around the spawning ground, but there are not so many of them as there were alevins. Many of the alevins died. Many of the parrs, too, will disappear. They move about in search of food, learning to use their fins better and better.

Only the fastest and the strongest will escape the bigger fish and the birds that are seeking a tasty mouthful.

Some young salmon stay in the streams only a few months. But most do not go down to the sea or the lakes for more than a year. Some remain in their early home as long as three years.

By the time the salmon are ready to go to sea, they have changed again. Their coats have become silvery, like the polished armor of a knight of old. Now they are called smolts. Although they may be several years old then, they weigh only a few ounces. Most of their growing will be done in the sea, when they will become grilse.

It is in the sea that the mystery begins. No one really knows what the grilse do. Swiftly they grow large, strong of body, swift of fin. They are mighty hunters of the deep, feared by smaller fish. Perhaps they go way out

to sea, to distant feeding grounds. Perhaps they stay close to shore.

And then, when they have reached their greatest beauty and strength, they are stirred by the call to return to the spawning grounds.

Men have made a great effort to find out how old the salmon are when they spawn. They know now that the age is different for each kind. Some spawn when they are two years old. Others wait until the sixth or seventh years.

This was discovered in a very interesting way. Men noticed that the scales of the fish had rings, just as the inside of a tree does, and they studied these rings. They found that every year more rings are formed on each scale. In the summer wide rings are formed. The rings that grow in winter are narrower. For every year each scale has a set of wide and narrow rings. By counting the rings on scales of salmon caught just after they

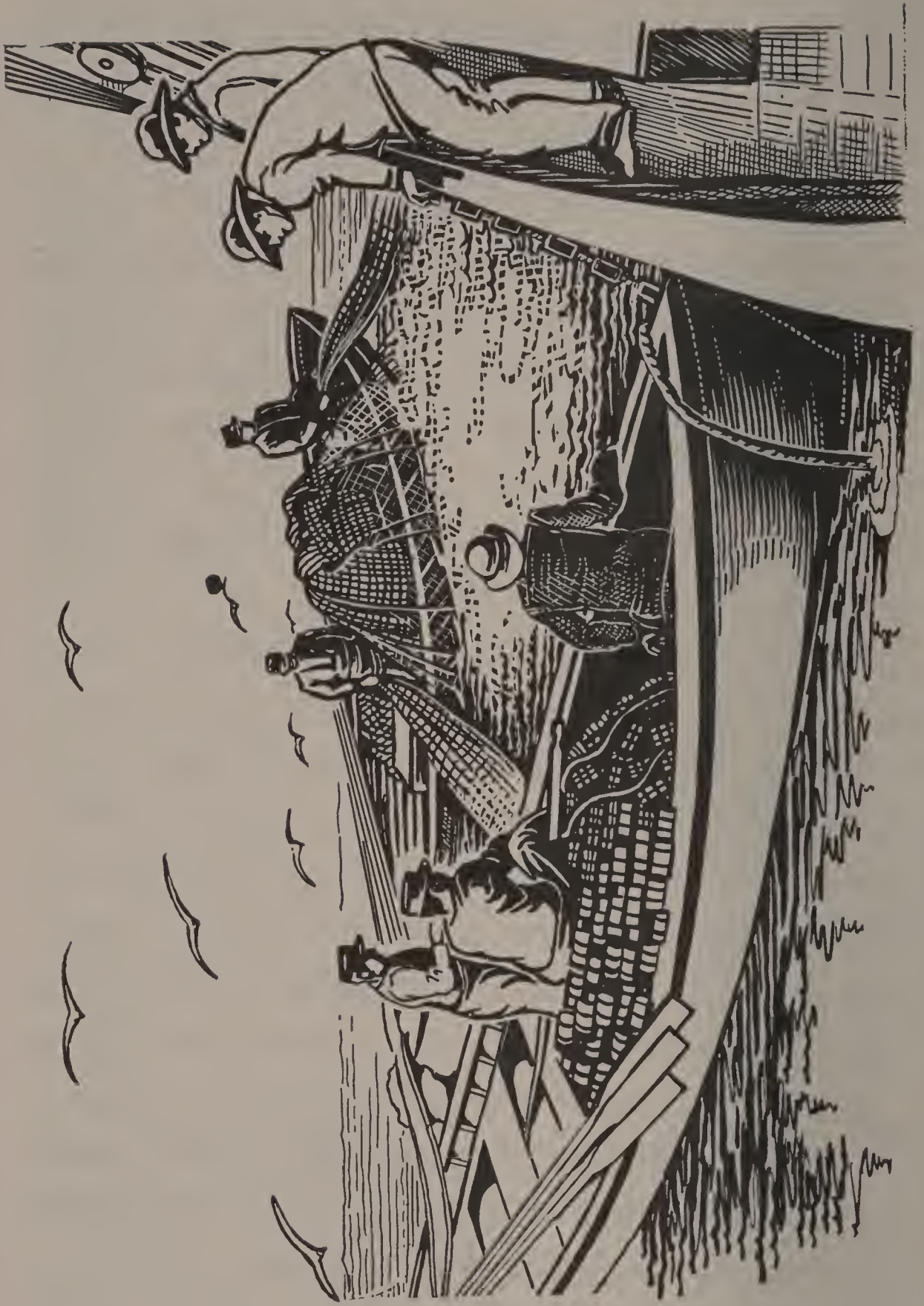
entered the streams to spawn, men can tell at what age each kind of salmon begins its run.

THE CATCH

It is during the runs up the streams that the fishermen catch most of their salmon. The salmon in the sea are too young and too hard to get. Those that have gone far upstream are not worth catching because they are thin and scarred from their journey.

When the run is on, a stream may look like a solid river of fish. In Puget Sound at certain times of the year nothing but fish can be seen for several miles. One time a count was made of salmon swimming up Wood River, Alaska. More than two and one-half million fish were counted in less than two months!

Since the run begins in each salmon stream at the same time each year, fishermen know just when to get ready and where to set their traps.

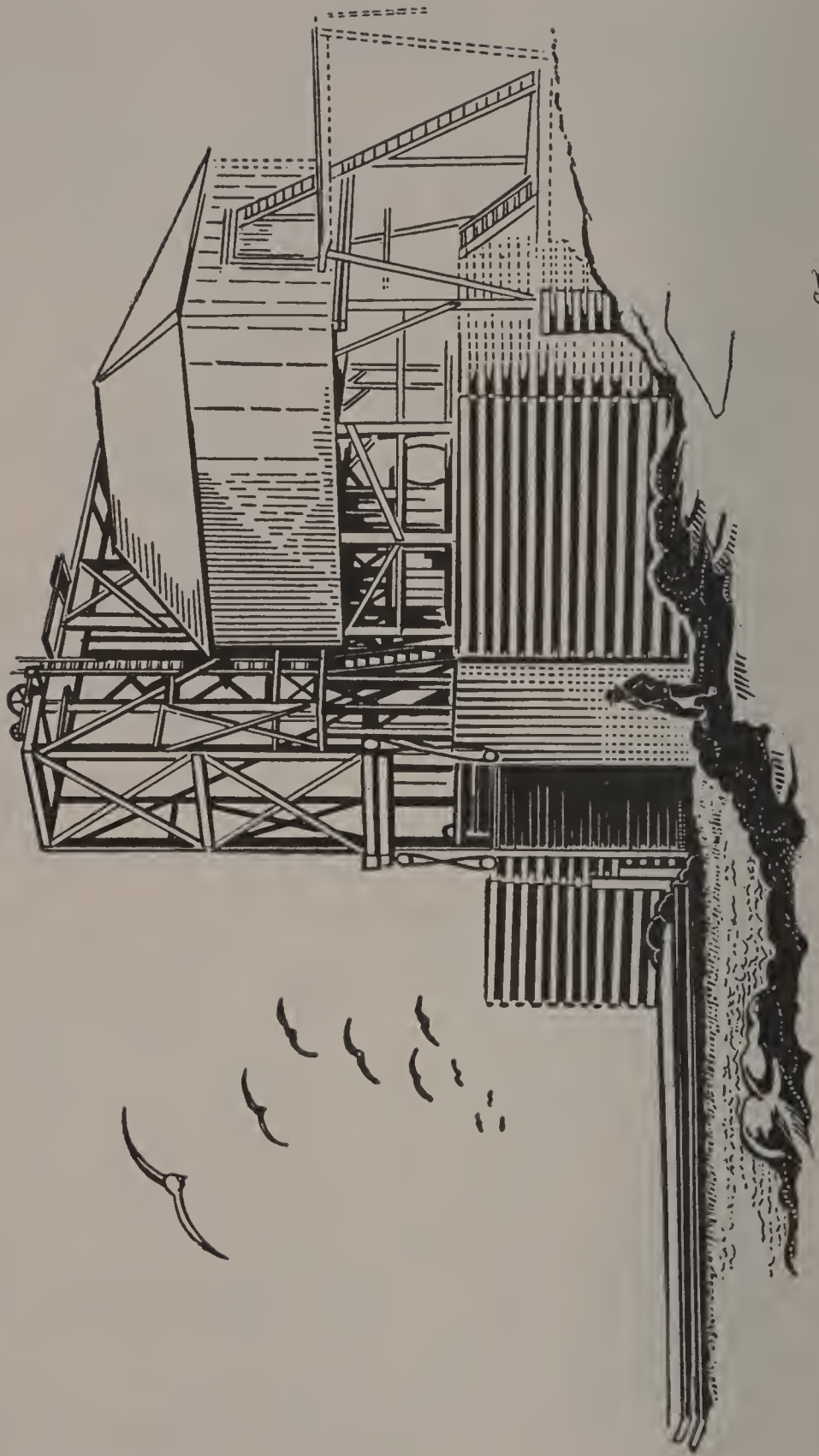


THESE FISHERMEN ARE HAULING IN A GREAT NET FULL OF SALMON.

There are many ways in which the salmon are trapped. One way is to sink great cage-like nets off the shore right in the path of the fish. The fish swim into the first section of the net cage without knowing it. They move from one net room to another, and fall at last into a great trap that holds many thousands of salmon.

Another kind of net is the purse seine. This big net is carried on a boat called a seiner. When a school of salmon is sighted, the seiner is run close to them. One man gets into a rowboat, holding one end of the net, while the seiner circles the salmon with the net. The net then hangs straight up and down around the fish. Now the bottom of the net is drawn up by a rope that runs through rings in the lower edge of the net. The salmon are then held in a big bag from which they cannot escape.

In rivers where the water flows swiftly,



IN SWIFT-FLOWING WATER A FISH WHEEL MAY BE USED TO CATCH SALMON.

the salmon are often caught by means of a fish wheel. This looks somewhat like the wheel of an old mill. Around the rim of the wheel, wire nets are fastened, their openings facing downstream. As the wheel turns, one net after another dips into the water and scoops up the salmon swimming upstream. The fish are lifted high into the air and poured into the tank. All the fisherman has to do is sit and watch the tank fill up.

CANNING

Some salmon are sold fresh. Others are frozen, or smoked, or dried. But by far the greatest part of the catch is put up in cans.

Most of the canneries are built near the fishing grounds, right by the water's edge. Then the scows, or boats, loaded with salmon can come alongside to deliver the fish or to take on canned fish.

In the newer canneries most of the



SOME SALMON ARE PACKED TO BE SHIPPED LONG DISTANCES.

work is done by machine. When the salmon arrive they are pitched on carriers that move on a belt to the killing room. This room must be kept very clean, of course. So it is flooded and scrubbed with salt water many times a day.

In the killing room the salmon are placed on long tables. In the old days

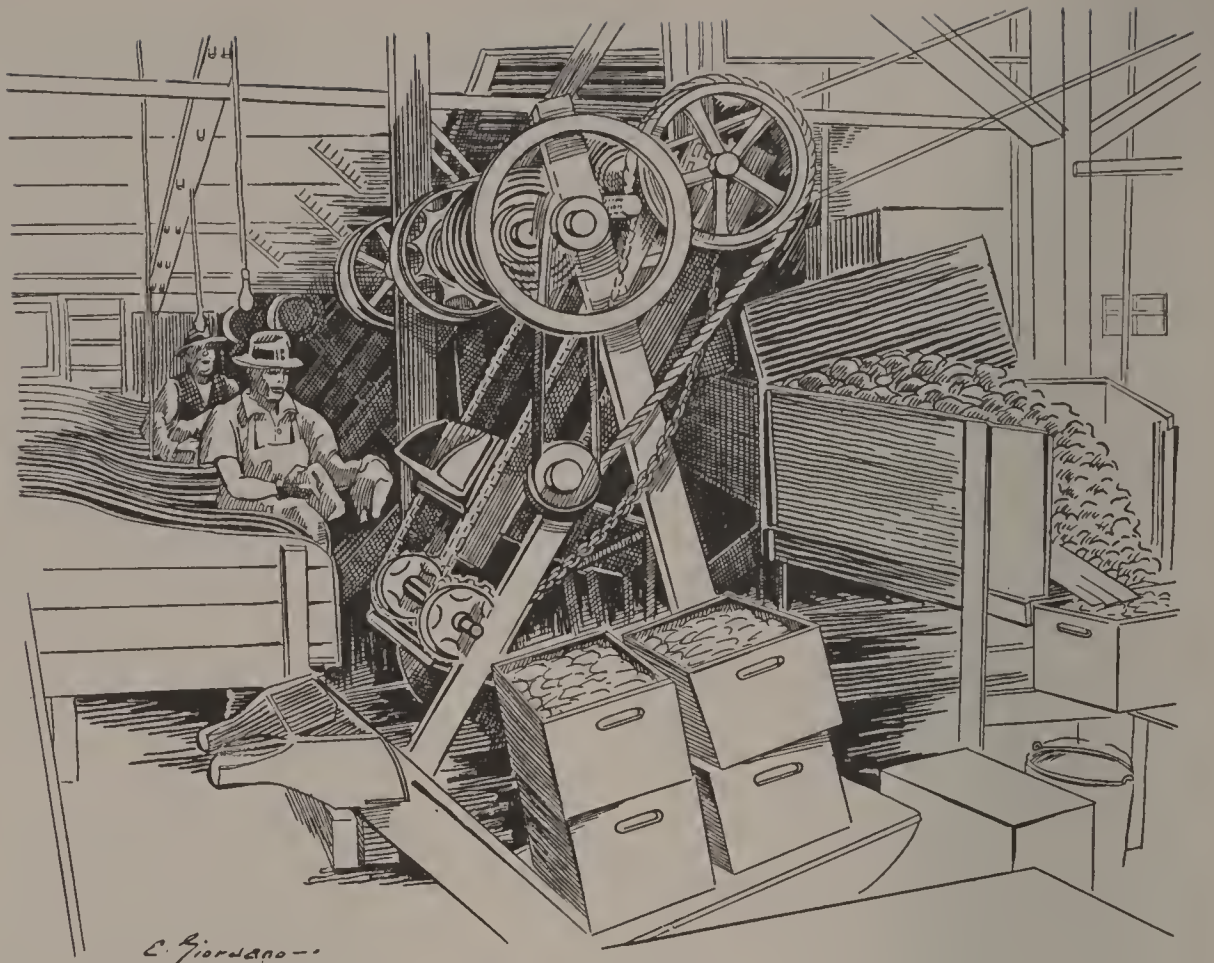
Chinese laborers stood around the tables, cutting off fins, heads, and tails. The fish were then thrown on another moving belt and carried to the cleaning machines to have the scales and insides removed. Men still do the killing in some canneries, but in the newest ones their place has been taken by a machine called the Iron Chink.

When the salmon have been well cleaned and the skin removed, the machine dumps them into a tank of water. Then they are carried through a row of round knives that are turning rapidly.



C. S. ...

THE CANNERY IS USUALLY BUILT NEAR THE FISHING GROUNDS,
RIGHT BY THE WATER'S EDGE.



THE SALMON ARE FED INTO THE IRON CHINK.

These knives cut the fish into the right size for the cans.

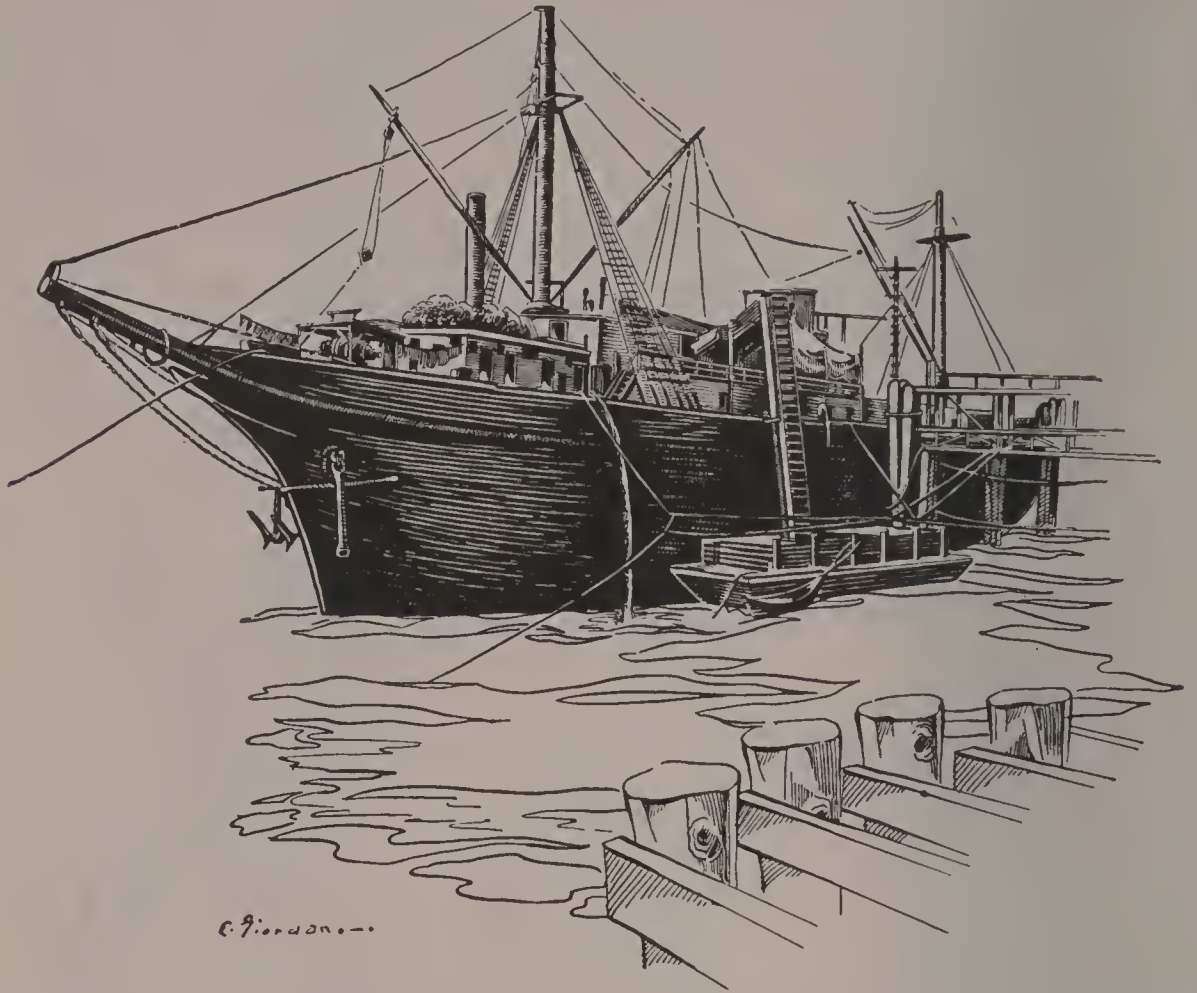
Now the filling machine puts the right amount of fish and salt into each can. Then the closing machine draws all the air out of the can and rolls the cover on air tight so that the fish cannot spoil. The closed cans are placed in a special steam oven and cooked for ninety minutes.



CANS ARE FILLED WITH SALMON.

When the labels have been pasted on the cans, they are packed for shipping. Then out into the world the salmon goes.

Every year about 700 million pounds of salmon are canned in the United States and Alaska. Besides that, salmon



THIS IS A FLOATING CANNERY. THE SALMON ARE CANNED OR FROZEN FOR SHIPPING, RIGHT ON THE SHIP.

is canned in large amounts in Canada, in Japan, and in Russia. It is not hard to see that salmon is one of our most important food fishes.

SPORT FISHING

But many fishermen don't go after salmon for food. All they want is the fun of catching it and letting other people know that they caught it. Such sport fishermen look down upon spearing and upon net and pot-hole fishing. They say none of these give the fish a chance to get away.

In spearing, a man simply finds a place where there are many salmon, and thrusts his spear into the water. Up comes the spear with a fish wriggling on the end of it. This is the way the Indians have fished for hundreds of years.

In pot-hole fishing, the man stands near a water fall where the salmon are leaping upward. Sometimes when a salmon cannot make the full jump, it falls backward, and lands in a deep hole full of water, near the fall. The fisherman just reaches down and lifts the fish from the pot-hole. Many bears catch

their fish in that way, waiting as patiently at the hole as a cat does at a mouse hole.

The sport fisherman catches his salmon with rod and line. The rod is made of light wood or metal. The line is a long strong cord or fine wire that is wound around a spool on the rod. This spool is called a reel.

On the end of the line is a very strong hook, and here the fisherman fixes his bait. If he is fishing in the sea or in a lake, where the salmon are still eating, he baits the hook with pieces of herring, or some other inviting food. If he is fishing in streams, where the salmon are on the way to the spawning ground and will not eat, he must attract them in some other way. He may do it with a flat round piece of shining metal called a spoon, or with a brightly-painted piece of wood or metal called a plug. Or he may use a spinner with gay-colored

feathers that spin as the water flows past them. These are called lures.

The fisherman keeps his boat where the water is flowing fast, or travels slowly along, letting the line trail behind in the water. Some salmon, seeing the bright moving lure, may snap at it. This is called striking. A fisherman never knows when he goes out in the morning whether the salmon will be striking that day. He may sit for hours while they just pass by his lure.

But suppose some big salmon in a lively mood does strike at the shiner. Down his throat with it goes the big hook. There is a jerk on the line. Frightened and angry, the salmon darts away. The fisherman, his reel screaming as the line unwinds, allows the salmon enough line so that a sudden tug won't break it. When the salmon swims close, he draws in the line. When the salmon swims away, he lets the

line loose. This is called playing the fish.

Thrashing about, tugging at the string, the salmon fights fiercely to be free. But even so glorious a fighter must tire at last. He becomes weaker and weaker. At last he can struggle no more. Slowly the fisherman draws him close to the boat, and takes him with a landing net.

Sometimes the salmon gets away. He breaks the line or tears himself from the hook. When this happens, many fishermen are angry. But the better ones say that if a salmon is a good enough fighter to free himself, he deserves a cheer from all true sport fishermen.

Many a salmon battle has gone down in fishermen's history. There's the story of the Atlantic salmon that was caught late one afternoon as he swam up a certain river. He battled all night and all of the next day, dashing madly up and down the stream. The first fisher-

man gave the rod to a second, who finally passed it to a third. Still the fish fought on.

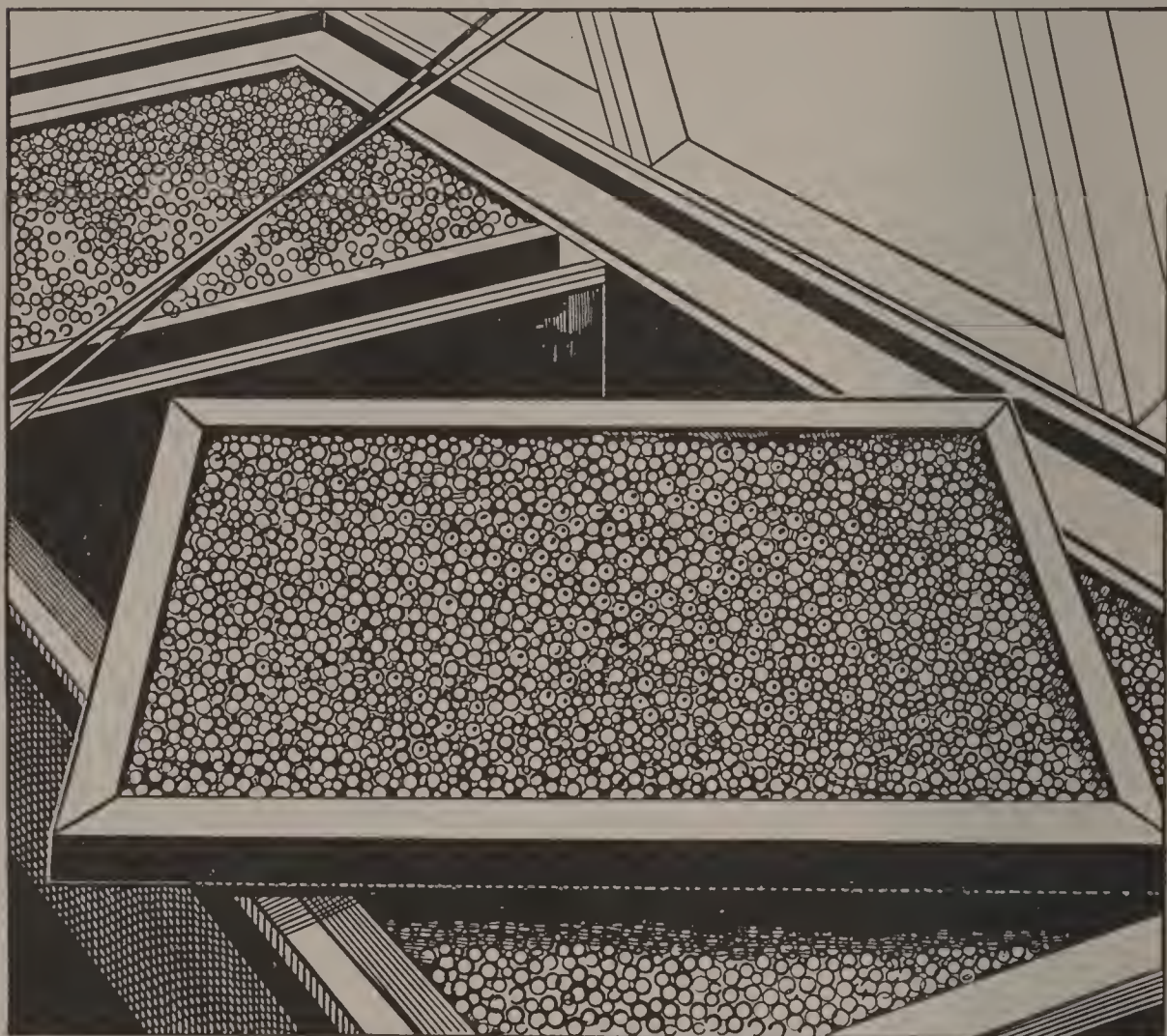
Twenty-two hours had passed since the first fisherman had felt the tug on his line that meant a bite. Suddenly, the salmon gave one great desperate jump. The rod in the man's hand broke, the line snapped, and away went the salmon!

No one knows what happened to that salmon, but it is pleasant to think that he had a long sweet rest and lived happily for many months afterwards. He was a fish that deserved to be called king of the river.

TAKING CARE OF OUR SALMON

So many salmon were caught every year that there was danger that they would become scarce, as the buffalo and other game have. So the United States Government set up places on certain streams to do nothing but raise salmon. These are called salmon hatcheries.

The first thing the hatchery has to do is to get eggs from which to hatch salmon. This is done by catching grown-up mother



IN EACH OF THESE CASES ARE ONE HUNDRED THOUSAND SALMON EGGS THAT WILL BE PLANTED AT U. S. HATCHERIES.

salmon and pressing out their eggs by hand. Then the eggs are placed in ponds. The little alevins and parrs can

grow in peace there. No big fish are around to harm them, and they get plenty to eat. When the young salmon are big enough to take care of themselves, they are carried to the rivers and set free. In this way enough new fish are put back every year to take the place of those that are caught.

The Government had another problem to solve. In some salmon rivers men had built dams over which the fish could not climb. In other streams were falls or rapids in which salmon were torn and bruised, or even killed. Some way had to be found for the fish to get past these places, or most of them would never get to the spawning grounds.

One way was to build fish elevators in streams at one side of the dams. Salmon coming upstream swim into the fish elevator just as people walk into an elevator. As the gate closes, the elevator begins to fill with water, and the floor

begins to rise, carrying the fish up to the top of the dam. Then the floor tilts and the fish swim out, safe above the dam.

Another way of helping the salmon was to build ladders. The ladder is like a stairway, with each step about one foot high. The salmon can leap easily from one step to the next, and when they reach the last one the dangerous waters are behind them.

The Government also stops fishing on rivers where salmon are becoming scarce. It makes rules about what kind of nets may be used. This is done so that enough fish will get by the nets to the spawning grounds to lay eggs. The Government tries in every way to make certain that America will never lose its salmon, as some parts of Europe have.

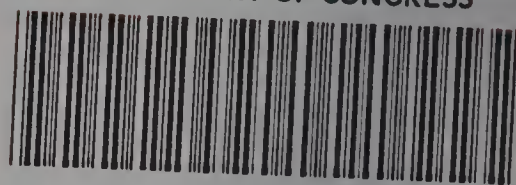
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