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STATE OF WASHINGTON

DEPARTMENT OF STATE

THE FISHERIES

OF THE

STATE OF WASHINGTON

By L. H. DARWIN,

State Fish Commissioner

State Game Warden

Washington State Issued by the
State Bureau of Statistics and Immigration

I. M. HOWELL, Sec'y of State,

Ex-Officio Commissioner

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Deputy Commissioner

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Traps in the Columbia River and on Puget Sound take salmon by the hundreds of thousands. A steam brailer is used to remove the fish from the traps into scows, which convey them to the canneries.

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THE FISHERIES OF THE STATE OF WASHINGTON

Value of Output.

Washington's fisheries resources are the greatest of all states in the Union and also the best fish, species for species, because the Pacific Ocean of which the waters of the State are tributary, is classed as a cold water, while the Atlantic is a warm water ocean.

The fishing industry in this state stands third, being outranked only by agriculture and lumbering. And what a vast resource it is may be ascertained from the incomplete figures compiled by the State Fish Commissioner's office for the year 1913, which was the year of the quadrennial sockeye salmon run. Under the law, as it existed at that time, only partial reports were made to the Fish Commissioner's office, but these reports, incomplete as they were, showed the value of the canned salmon product alone was \$12,937,006.78, while the value of the other salmon fisheries reported increased the grand total to \$15,215,674.73.

No record is obtainable of the value of the other fish, but it is safe to say that in 1913 the total value of the output of Washington's varieties of food fish and shell fish reached a grand total of \$20,000,000.00.

In 1914 the figures were as incomplete as in 1913, but in that year the value, as far as figures were obtainable was \$8,168,264.46 while the total was undoubtedly about \$14,000,000.00.

Leading Species.

To date the identity of 180 salt water and 30 fresh water species, or 210 in all, has been established in the waters of this state. Of these 50 salt water and 6 fresh water varieties, or 56 in all, are edible. At the head of the list stands the salmon. The principal species are Chinook, also known as Springs, Tyees, Blackmouth or King; the Sockeye, the Silverside, the Humpback, the Chum or Dog as it is often locally called, and the Steelhead.

The choicest of the varieties canned, and on an average possibly the largest quantity, are the Chinook and Sockeye. These are the red salmon. Following them come the Silverside, which is medium red, and Humpback which is known as pink salmon; while the Chum or Dog demands the lowest price because of the fact that it is white meat.

As the Chum or Dog salmon is just as highly flavored and has all the food values possessed by the higher priced kind, the fact that it

does not command as high a price in the can as the Chinook, Sockeye or Humpback is because of the fact that the public was first educated to the red meat salmon.

The Steelhead, which is a deep pink, is mostly sold fresh, comparatively few being canned. It is classed by the U. S. Bureau of Fisheries as a trout. The average weight of a Steelhead is 11 pounds. They are iced and shipped fresh in enormous quantities to the Eastern markets where they command fancy prices. The Chinook salmon is also shipped fresh to the Eastern markets in large quantities. This variety is also what is called mild-cured and shipped to Germany and other foreign markets, where it is preserved by other processes and then disposed of at very high prices.

Value of Equipment.

On November 30, 1915, the date of the last report made to the Fish Commissioner's office, there were 56 canneries in the State of Washington, and according to these reports, the value of the plants and operating appliances was \$5,317,753.72. The reports required by the fishing laws of the State do not furnish all the data as to the amount of money invested in the fisheries and fish taking appliances. However, it reaches a staggering sum. One of the items upon which no valuation is required by law is the purse seines. At this time there are some 300 in the State of Washington, and the average value of one of the boats equipped with seine is about \$7,000, so that their total value would be \$2,100,000.00. These boats are, in about 95 per cent. of the cases, owned by individual fishermen.

Then comes the boats and appliances owned by gill netters, traps, fish wheels, and scow wheels.

During the fiscal year of 1915, there were 610 fish trap licenses issued. Of this number 271 were in the Puget Sound District; 258 in Columbia River District; 50 in the Willapa Harbor District and 31 in the Grays Harbor district.

Cost of Trap Construction.

The expensive traps to construct are those on Puget Sound. All the traps for which licenses are issued are not constructed each year on Puget Sound. But about 80 per cent. of those licensed are constructed each year, while the law requires that in order to hold a location here a trap must be constructed at least every four years. Some of the traps on Puget Sound annually cost \$14,000.00 and they are torn out at the end of the fishing season, only to be put in again the next year. It is safe to say that there is no trap on Puget Sound which costs less than \$5,000.00 to construct each year. The fish traps on Columbia River, Grays Harbor and Willapa Harbor are much cheaper. In these districts they must be constructed every two years or the ownership is forfeited.

Principal Salmon Runs.

The principal salmon run of the Columbia River is the Chinook. There are also some Silverside, Steelhead and Blueback or Sockeye

The purse seine has revolutionized salmon fishing in Washington. This picture shows a purse seine "laid out." The average purse seine boat represents an investment of about \$7,000.

taken in this river, but not in quantities to permit their pack to any thing like the extent that the Chinook are canned. In a commercial way, the Columbia River Chinook has for a number of years held supremacy but in the last few years the Puget Sound Sockeye has been gaining in favor so fast that the price of the Columbia River Chinook and the Puget Sound Sockeye is now about the same.

International Dispute.

On Puget Sound the Sockeye salmon holds the favorite place. Once every four years they run in enormous quantities. Their native stream is the Fraser River, in the tributaries of which it is safe to say 98 per cent. of the Sockeye caught on Puget Sound are hatched. All the salmon species return to the streams in which they were hatched, or at least to streams in the vicinity of those in which they were hatched. The returning Sockeye in attempting to reach the Fraser River, first passes through American waters, and the American fisherman is thus given first chance at them. This has been a source of great friction between the fishing industries of British Columbia and the State of Washington. As this friction intensified, it grew to International importance and an attempt to adjust matters was made by a joint high commission, appointed by the United States and the Dominion of Canada Governments four or five years since. The treaty adjusted all the fishery disputes between the two governments from the Atlantic to the Pacific Coasts. It was ratified by the Canadian Government, and was first ratified by the American Senate, but Congress afterwards refused to pass the necessary laws to make it effective and it has since been rejected by the Canadian Government. As a result of the failure to reach an agreement, the Canadian Government has withdrawn nearly all fishing restrictions on the Fraser River, with the full knowledge that this action will permit the rapid extinction of the Sockeye run.

Experimenting to Increase Sockeye Run.

With the adoption of this destructive policy by the Canadian (British Columbia) Government last year, the Fisheries Department of the State of Washington started experimenting, trying to hatch Sockeye salmon on the American side. The only American stream which the Sockeye enters is the Skagit River, up which possibly 2 per cent. of them ascend. The Fisheries Department of the State started in by taking Sockeye salmon from traps situated from 14 to 15 miles distant from the Samish River, on which the State of Washington has a large hatchery, and towing these fish in live boxes to the mouth of this river where they were liberated into the stream across which a rack or fence was constructed, to prevent their returning to salt water. The result of the fisheries arrangements, despite adverse climatic conditions, was highly satisfactory, more than 1,000,000 fish being hatched from the eggs taken from the fish conveyed to the Samish river the first year.

This year the experiment is being repeated on a larger scale, and it is believed that twice as many eggs will be hatched as last. If

this year's experiments are proportionally successful as last year's, the Fisheries Department of this State will definitely enter upon the work of trying to hatch Sockeye in much larger quantities. It is immaterial whether or not by this method the Department is enabled to establish a run of the Sockeye in American streams, for the eggs can be secured each year in the same manner in which they were first obtained and the work will go on just the same, and whether or not the fish return to the American stream or Fraser river, matters not, for in any event the fish first enter American waters and give American fishermen first opportunity to take them.

Life of the Salmon.

The life of the different salmon species varies. The so-called Chinook of the Columbia River, which is also called the Spring, King, or Tye on Puget Sound, and Blackmouth or Tye on Willapa Harbor is one especially which seems to have a varying age of from four to in some instances six and one half years. Undoubtedly the big majority of them return at the age of four years. The Sockeye on the other hand is classed as a straight four year old fish, as is the Silver-side and the Chum or Dog. The Humpback obtains his majority and returns in two years. Of the above mentioned species (Chinook, Sockeye, Silverside, Chum, Humpback) die within a day or two after spawning. The only other species of salmon found in Washington waters is the Steelhead, which the Government calls a trout. This species does not die at the time of spawning, and as far as is known has no age limit, and in speaking of species of salmon it must be borne in mind that there are undoubtedly several varieties of Chinook, and this is true of the Sockeye, which in some localities, notably Grays Harbor, are called Quinault and in the Columbia River Blueback. The different members may vary slightly, but they all belong to the same general family.

Dr. Gilbert of Stanford University, possibly the leading authority of the life and habits of the Sockeye salmon has expressed the opinion that likely Puget Sound and the country northward to Alaska offers the best opportunity on the face of the known world for the maintenance of the fish supply. This is because of the fact that all species of salmon hatched in fresh waters make their way rather young to salt water, and return to their parent stream to deposit their spawn there, themselves dying in turn; for the salmon is one of the few members of the animal family that cannot beget without ceasing. It is the opinion of many practical hatcherymen that nature, by causing the death of the parent fish at the time of the spawning thus provides a food supply for the young salmon when they are born. The spawning salmon make their way up the fresh water streams to gravel beds where the female scoops out a round hole in the gravel in which she deposits her eggs. The salmon are monogamous, pairing off after they attain the spawning grounds. So it is that the egg of the female is immediately fertilized by the male swimming alongside, then the male fills the hole with gravel which the female has scooped out,

thus covering the eggs; this to prevent the trout and other fish which follow the salmon up stream from devouring them. Nature allows the parents to survive for two or three days during which time they hover over the spot where the female has deposited her eggs, and then they gradually weaken, float down stream a short distance and die.

State Hatcheries.

To maintain the enormous supply of food and game fish the State of Washington maintains or will be maintaining by the close of the fiscal year of 1916, a grand total of 33 hatcheries or as many in number lacking one as are maintained by the United States Government. Of this number 26 are classed as salmon hatcheries and 7 as trout hatcheries, but quite a few of the salmon hatcheries are used for hatching trout as well as salmon, and vice versa—a number of trout hatcheries are used to hatch salmon as well as trout.

The laws of Washington divide the state into four fishing districts; known respectively as Puget Sound, Columbia River, Grays Harbor and Willapa Harbor. The largest of these districts is Puget Sound, which contains from 75 per cent. to 80 per cent. of our fisheries resources. Following this, comes the Columbia River, containing some 15 per cent., while Grays Harbor and Willapa Harbor districts make up the remainder.

Of the 26 salmon hatcheries 16 are located in the Puget Sound district; these are Dungeness, Elwha, Green River, Green River Eyeing Station, Nisqually, Nooksack, Middle Fork Nooksack, South Fork Nooksack, Pilchuck, Chambers Creek, Samish, Skagit, Skokomish, Snohomish, Startup and Stillaguamish; 6 are situated in the Columbia River district, namely: Chinook, Kalama, Lewis River, Pateros-Methow, Wenatchee, Wind River, two in Grays Harbor district, Chehalis and Humptulips, and 2 in Willapa Harbor district, Willapa and North River. Of the total of 26 salmon hatcheries at this time, 10 have been constructed within the last three years. In addition to the construction of these ten new hatcheries during this period, the capacity of one of the other hatcheries has been increased five fold, another four fold and another three fold, while the capacity of many of the other hatcheries has been doubled or increased considerably over what it was prior to three years ago.

As a result, the hatcheries of the State of Washington, which during the season of 1911-1912 had a take of 77,900,000 eggs, during the season of 1915-1916 had a take of 158,400,000 eggs. In short, in the three years the take of the Washington salmon hatcheries has been more than doubled. The straight trout hatcheries number 7, and are known as the Lake Chelan, the Spokane, the Little Spokane, and the Walla Walla, Lewis River, Tilton River and Lake Crescent. Four of these seven have been constructed during the last three years, while the take of the trout eggs, which in the season of 1911-1912 was in round numbers 2,900,000, has increased during the season of 1915-1916 to over 17,000,000.

During the season of 1911-1912, it is estimated that it cost the

During the sockeye and humpback salmon fishing season the San Juan Islands present scores of scenes like this. More than three hundred purse seine boats and several hundred gill net boats find safe harbors almost anywhere among these islands.

State 88 8-10 cents per thousand to hatch salmon eggs, while during the season of 1915-1916, the cost will not exceed 30 cents per thousand.

United States Hatcheries.

While the exact figures of what it cost the United States Government to hatch salmon eggs in the State of Washington are not available, enough is known to warrant the assertion that it costs the Federal Government many times as much as it does the State, and this is one of the many reasons why the State has always opposed any action looking to the Federal Government taking over control of its fisheries. The United States Government at this time maintains five or more salmon hatcheries in this state.

It is estimated that in the State of Washington there are in the neighborhood of 60,000 people directly or indirectly dependent upon the fishing industry for their livelihood. The number has been rapidly increasing during the last 15 years.

Hatcheries Increase Salmon Run.

The ability to not only maintain but restore and in all likelihood increase the salmon run in some of the waters of the State has been absolutely demonstrated in the last few years. Notably has this been done in the Columbia River. For some 10 or 15 years the number of fish taken in this stream gradually decreased, owing to the extensive fishing operations carried on. However, the result of the establishment of hatcheries was first discernable three years ago (1913-14) when the run was larger than for several preceding years. The run in 1914-15 was the largest which had appeared in the Columbia River in 15 years, while as this is written the season of 1915-16 is at its height with indications that despite the most abnormal climatic conditions which have been known in more than 25 years the number of fish entering the Columbia River this season will be almost as large as the great run of 1914-15.

Fishermen regard the Columbia River now as a restored stream.

The Fisheries Department of Washington feeling that the world conditions of the last two years means that the people must look to the waters for their meat supply more than ever before will not rest content with simply restoring the depleted salmon runs in the Washington streams, but are trying to go further, and have intensive cultivation of the sea as there is today in many places intensive cultivation of the land.

Edible Varieties.

Because of the richness of our fishery resource, some varieties of fish which are used in the East are hardly classed as a table fish in Washington. Some Halibut and quite a few Sturgeon are in Washington waters, while smelt and herring abound. The Shad and Cod are taken in goodly quantities, as are Sole and Flounders. Salt water Perch also abound. The above mentioned fish are all present in large commercial quantities, and within the last few years the presence of certain Asiatic and European peoples have created a

great demand for the devil fish, which is highly regarded by them as a food fish. These same people also make use of Carp. Carp were introduced in some of the waters in this State 15 or 20 years since, and have thrived to the point where the Fisheries Department for the last few years is encouraging their destruction.

All the above named varieties of fish maintain their supply naturally—the State devoting itself exclusively to the propagation of salmon among the food fish and trout among the game fish.

Clam Fisheries.

In the matter of shell fish, Washington enjoys a unique distinction for our oyster (particularly the Puget Sound) small though they be, are the highest priced of any oyster produced on the American continent, while the Washington clam and crab enjoy the same distinction. Of the shell fish variety our clams lead in value of output as well as volume. Next to the Washington salmon clams are put into cans more extensively than any other variety of fish.

During the present fiscal year, licenses have been issued to 6 clam canneries in this State.

During the fiscal year ending November 1, 1915, there were 23,896 cases of clams packed in Washington, with a value of \$143,376.00.

While there are many varieties, the leading ones are known as the Razor clams, found only on the Pacific Ocean Beach, and the Puget Sound clam, which abounds in the inland salt waters of the State. The Pacific Ocean clam has a pure white meat and a delicacy of flavor that makes it the highest priced on the market.

Oyster Fisheries.

The Puget Sound oyster, which is hermaphrodite, as distinguished from the bisexual Atlantic Coast oyster, is much smaller than the average Eastern variety, but is also much firmer and more toothsome.

Formerly they grew in large quantities in natural beds. Before the State got around to preserving these natural beds, many of the choicest of them had been taken up by individuals whose title thereto has been confirmed. However, some 14,000 acres of land have been withdrawn for oyster reserve purposes, either because at the time, or prior to their withdrawal they had been natural oyster beds or it was believed at a future time they would become such. For many years so great was the supply that small attention was given them, with the result that by 1913, the State Reserves had been almost depleted.

While the State has been negligent on Puget Sound, many private owners have not been, but have prepared their land for intensive oyster cultivation, by diking and grading.

The theory of holding the State's natural oyster grounds is to insure a seed supply to the growers at a nominal price. Consequently the State in 1913 started to follow the example of the private indi-

Oyster culture is rapidly increasing in importance in the State of Washington.

viduals and commenced diking the first of their natural reserves on Puget Sound.

The first one to be improved was part of what is known as the Hammersly Reserve, where ten acres have been graded and diked at a cost of \$9,000.

The second improvement undertaken by the State is now under way at what is known as the Clifton Reserve where in the neighborhood of 6 acres will be graded and diked by September 11, 1916. It is believed that within two years, with only these 16 acres improved, out of 14,000, the revenue derived from the oyster reserves will make the industry self supporting.

The new law passed in 1915 will permit of the development of the State Reserves just as though they were owned by private individuals. If it is the desire of the State, the funds are already provided, under the law, whereby it will be possible to improve many acres of these reserves (which under our laws are reserved from sale or lease) in the succeeding years, and they can be made to yield the State a large revenue, if such is deemed the best policy.

The principal oyster beds on Puget Sound are found in Thurston and Mason counties; in fact, to such an extent do they lie in this vicinity that the Puget Sound oyster is generally known as the Olympia oyster, and Olympia, the capital city of this State, is the center of the business.

Privately cultivated beds are also found in Whatcom and Skagit counties, and some in Jefferson county.

There were marketed during the year ending March 31, 1915, from the Puget Sound district, 112,853 sacks of native oysters, worth \$814,033.40, from 547½ acres; and 3,224 boxes of eastern oysters, worth \$22,175.90, from 85 acres. During the same period the Willapa Harbor district produced 1,200 sacks of native oysters worth \$8,400.00, from 2,200 acres; and 8,000 boxes of eastern oysters worth \$56,000.00, from 1,500 acres. This represents a total yield of oysters amounting in value to \$900,609.30, from lands worth \$1,199,125.

The shell of the Willapa Harbor oyster is much larger than that of the Puget Sound. Some ten years ago the first attempt was made to transplant Eastern oysters to the Pacific Coast.

While the transplanted oysters would thrive and grow to a much larger size than if they had been permitted to remain in their native waters, it came to be the generally accepted belief that they would not propagate in Pacific Ocean waters. The conditions for oyster culture on Willapa Harbor is not nearly so favorable as on Puget Sound for the reason that this inlet is much nearer the ocean and the severe storms shift the sands so that diking, which has solved the situation on Puget Sound by preventing the exposure of the oyster to the heat of the summers and the cold of the winters, is not advisable on Willapa Harbor because the sand would readily fill in behind them. During the last year the state has attempted to assist nature on Willapa Harbor, by cutting the grass on natural beds and by reculching them, and also by the use of what is known as "agi-

tators." These take the slime from the shells leaving them rougher and therefore better spat catchers.

In the summer of 1915, Trevor Kincaid, professor of biology at the University of Washington discovered that in one of the favored spots in Willapa Harbor Eastern oysters were propagating naturally. Since that time investigations made by the fisheries department have disclosed the fact that there is considerable area on Willapa Harbor where the Eastern oyster has reproduced, and during June and July, 1916, the Eastern oysters which had been propagated on one of the State's Reserves were moved to a more favored locality in the hope that they had become sufficiently acclimated so that the area in which they would reproduce would be enlarged by their removal and replanting.

Crab Fisheries.

Of the shell fish, the future of the crab is the most promising, and is one of the future propagation tasks of the Fisheries Department. In places where they formerly abounded on Puget Sound they are now found in much fewer numbers. The great majority of crabs secured today in the State of Washington are along the Pacific Ocean shores in Grays Harbor, and Pacific counties. Of all those who make their livelihood from the sea the occupation of the crab fishermen is the most dangerous. His activities and exertions for the most part are around the mouth of the Columbia River, and the entrances of Willapa and Grays Harbor, and just inside the ocean's break. The best known is called the Dungeness Crab.

The Game Fish of Washington.

The choicest varieties to be found here are those which are native to Washington waters. They are the Cutthroat and the Rainbow and in almost as great a number is what is known as the Silver, which is, in reality, a land-locked Sockeye salmon. These are found in two of the lakes in this state which undoubtedly centuries ago had an outlet into salt water to which the salmon traveled. Some upheaval of the country cut this off for such a time that these fish lost their desire to go out to salt water. They die every four years just as do the Sockeye when they reproduce their species.

In addition to the native species of trout which are propagated extensively by the State, there has been introduced to our waters the Eastern Brook trout which thrived in some of the lakes of Eastern Washington, but does not seem to be able to survive in the waters of Western Washington. In addition to these are what are known as the Dolly Varden or Bull trout, which is the Pacific Coast equivalent of the Eastern Brook trout although as a rule he attains a larger growth than his Eastern brother, of the Char family. The native white fish is another most excellent table variety. Other varieties present in quantities are the Perch, Grayling, Crappie, Catfish, Bass, etc., etc.

The Fisheries Department of the State is the only one charged with the duty of maintaining an industry; reforestation has not yet been accepted as one of the State's prerogatives, but it is universally

conceded that the hatcheries of the State must annually produce their seed supply of young fish or the harvest two or four years later will be short just in proportion as a large or small crop is planted. During the height of the salmon hatching season, which is in the Fall and Winter, the Fisheries Department of the State employs more than 150 men. During the Summer, a large number of these men, including all of the hatchery superintendents are employed in the construction of new hatcheries and in the diking of oyster beds.

The Fisheries Department is also charged with the enforcing of all the laws of both food and game fish, for the State Fish Commissioner is also the State Game Warden. To aid in the enforcement of these laws the State maintains four patrol boats; two on Puget Sound, the "Governor Elisha P. Ferry," and the "Gov. John R. Rogers," one on the Columbia River, the "Governor John H. McGraw," and one on Grays Harbor. A fifth boat is maintained by the State the "Gov. Henry McBride," which is used in connection with the operations of the Lake Crescent Trout Hatchery.

Salmon Hatching.

The time which it takes a salmon egg to hatch varies according to the temperature of the water. The average time from the fertilization of the egg until it hatches, varies from 60 to 90 days. The usual period for the liberation of the salmon fry is the time when what is known as the eggsack is absorbed.

This egg sack is nature's food supply, and is gradually absorbed into and becomes the stomach of the salmon. It is generally from 30 to 60 days from the time the fish is hatched to the time this absorption has taken place, and until a few years ago, the rule in the Fisheries Department was to liberate the fry at this time. However, during the last few years the practice of feeding the young fry for several months instead of immediately turning them loose has been introduced and gradually enlarged until today at a majority of the hatcheries a goodly portion of the output is fed for a time before being liberated, on the theory that the older and larger fish is much more capable of protecting itself from its natural enemies than the younger fry. When the eggs are taken at the hatcheries from all those species save the Steelhead, the female is killed before the eggs are taken from her, and a portion of the bodies of the parent salmon are preserved in a mild salt solution and later on the flesh is freshened again, ground very fine and fed to the off-spring. In other words, the young fish are literally fed the bodies of their fathers and mothers.

The State Fisheries Exhibit.

The work of assembling this fisheries exhibit was begun some three years ago, and has been carried on steadily since.

It has been done without any direct appropriation made for the purpose, but the Department believed that the State will realize its value and the fact that it is symbolical of its third greatest industry, and will at no distant date make an appropriation that will permit of its enlargement so that it will contain species, either alive or still, of every variety of fish to be found in Washington waters.

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The destination of many of the fish—A salmon cannery on Puget Sound.