ALASKA SALMON INVESTIGATIONS IN 1900 AND 1901.

BY

JEFFERSON F. MOSER,

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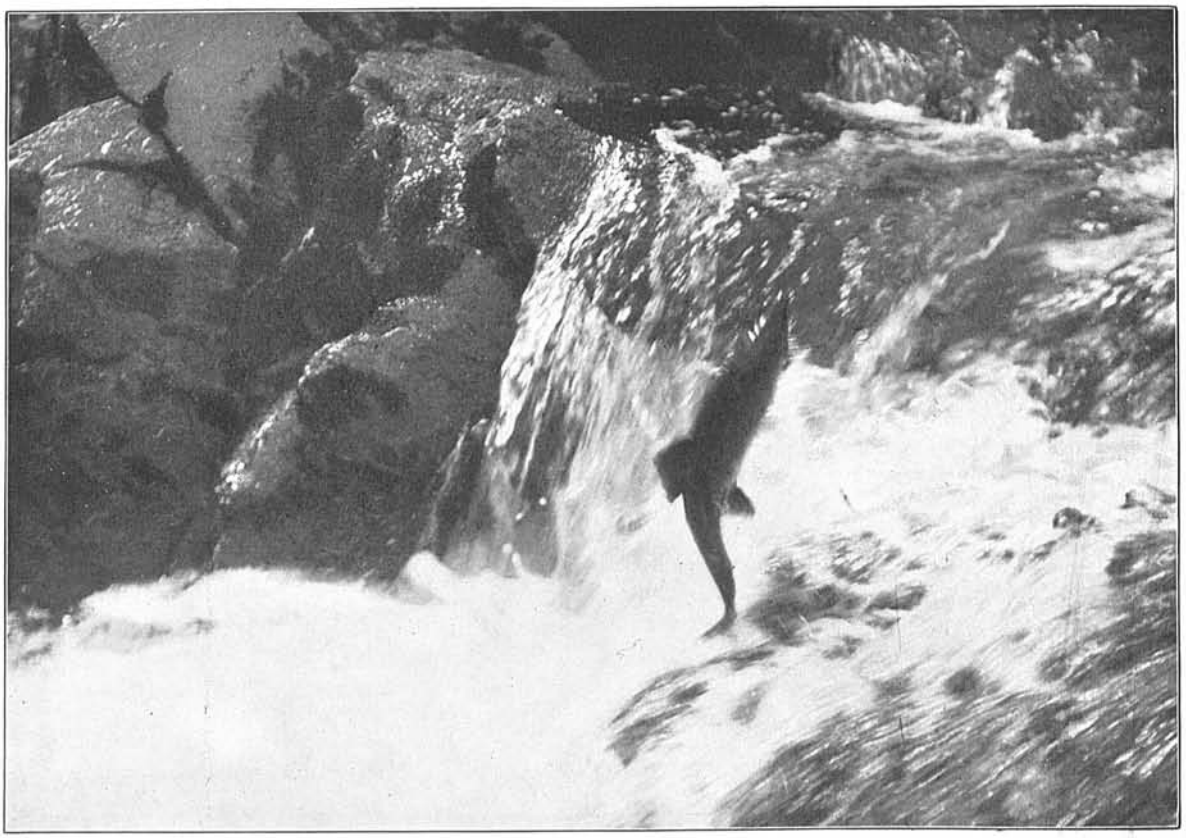
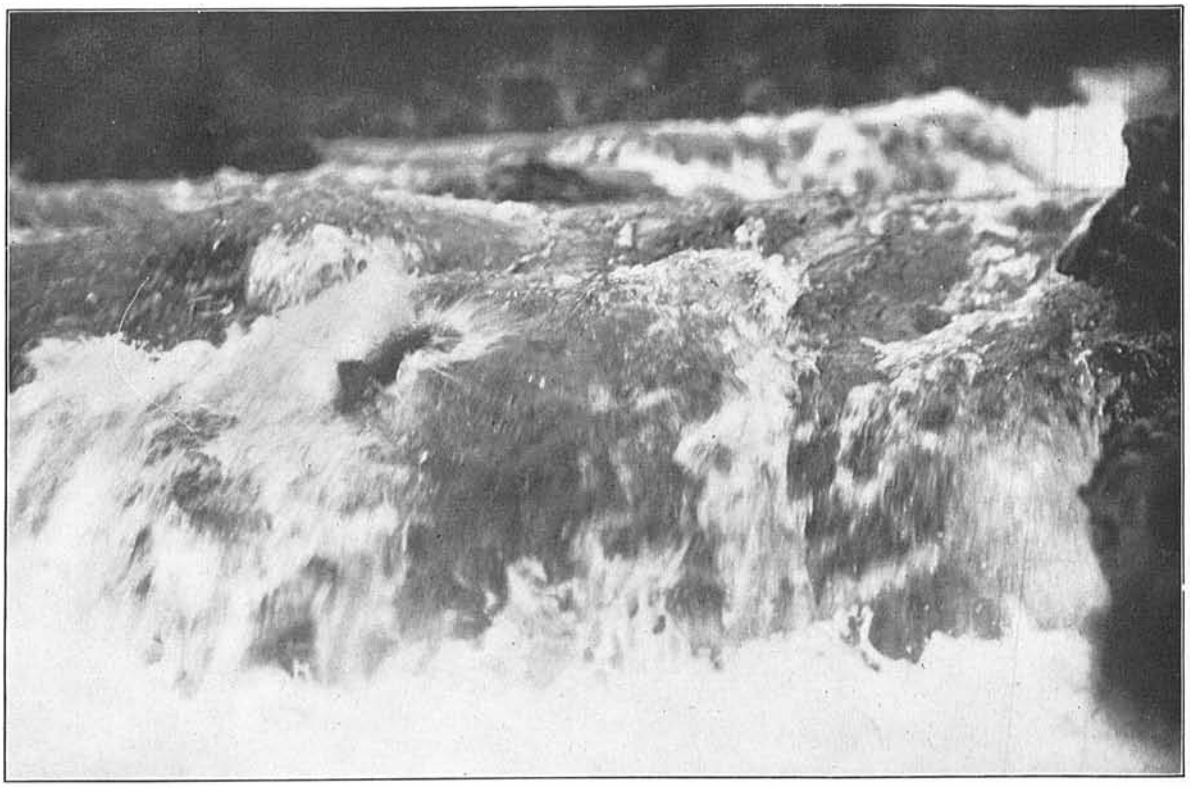




HUMPBACK SALMON ASCENDING LOW FALLS, LITNIK STREAM, AFOGNAK ISLAND.

SALMON INVESTIGATIONS OF THE STEAMER ALBATROSS IN THE SUMMER OF 1900.

By JEFFERSON F. MOSER,
Commander, United States Navy, Commanding.

INTRODUCTION.

The main features of the work of the *Albatross* during the summer of 1900 were a continuation of the exploration and examination of the stream and lake systems of Alaska, their general features and characteristics so far as they relate to salmon and other fishes, spawning-grounds, condition and nature of the water, character of shores and vegetation, the species of salmon entering and their movements, the time and duration of runs, the size and abundance of fish, waste species, signs and causes of depletion, the mortality of different species on the spawning-grounds, natural and artificial obstructions to the passage of fish, fishing methods and their relation to the maintenance of supply, and data relating to conditions for hatcheries. At the canneries statistics were obtained of the streams fished by them, and detailed statistics relating to the men, vessels, boats, and apparatus employed in the fisheries, together with the catch and pack of the various species for the years 1898, 1899, and 1900. The photographic and hydrographic works, so far as they relate to the subject, were also continued.

Except in the interior waters of southeastern Alaska, the salmon streams lie in unsurveyed localities usually dangerous to approach without local knowledge, and, while we were able when detained in port to add something to the hydrographic information by surveys and sailing directions, yet but little was accomplished in a field where much remains to be done.

Before proceeding with my report, I desire to express my appreciation of the work performed by the officers of the *Albatross* and the courtesies extended by those interested in the salmon fisheries. Lieut. Hugh Rodman, U. S. N., besides his duties as executive and navigating officer, was indefatigable in conducting the stream and lake explorations and in making the local surveys. Ensigns A. J. Hepburn, U. S. N., and Cyrus R. Miller, U. S. N., assisted in the field work. Ensign Clarence S. Kempff, U. S. N., besides his duties in charge of the engineer's department, made a number of the stream and lake examinations and assisted on the surveys. Mr. H. C. Fassett assisted me generally in the collection of data, and had charge of all the photography, in which he rendered valuable service. All performed their duties to my entire satisfaction.

My thanks are due to the superintendents of all the canneries we visited for the courteous manner in which we were everywhere received and for the assistance they offered. No obstacles were placed in our way, and, while they did not volunteer to tell us all they knew about the business, they cheerfully answered all the questions of which they had any knowledge.

As this report will be an addition or appendix to my report on the same subject, published under the title The Salmon and Salmon Fisheries of Alaska, 1899, it is unnecessary to repeat here the subjects therein treated, and which remain unchanged. Reference is therefore made to that report for the introductory remarks, the district divisions, the manner of conducting our investigations and the difficulties encountered, the species of salmon and their various names, the relative importance of the species, the salmon runs, spawning habits and enemies; the history of the canneries and the canning industry; salteries, fishery and cannery methods; the fisheries, labor, weight of fish, labels and brands, market prices, cans and boxes, the depletion of streams, barricades, and salmon laws; relation of the salmon fisheries to the Indian; complete statistics, and descriptions of all the canneries and streams visited from Dixon Entrance to Bering Sea.

The first day of the fiscal year found the *Albatross* at Unalaska, having arrived there June 29, via Japan and Kamchatka, from a cruise of scientific investigation in the South Pacific Ocean.

On account of the rush to the gold fields at Cape Nome, we had to await our turn to coal, finishing on the evening of July 3, when we entered Bering Sea once more and laid the course for Bristol Bay.

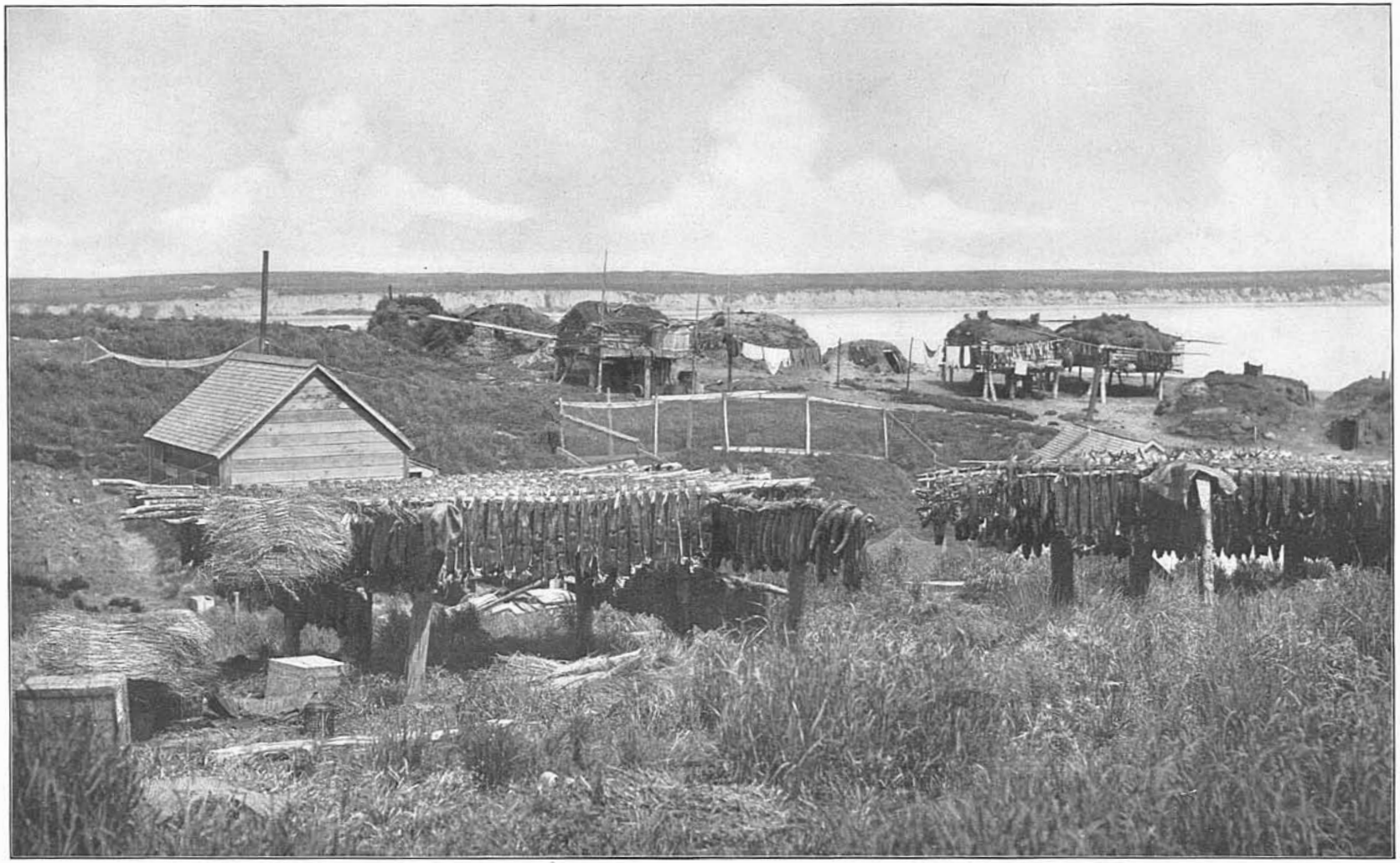
The following was our itinerary during the investigation:

Bering Sea district:
- Left Unalaska July 3.
- Bristol Bay, July 5-19.
- Unalaska, July 21-24.

Kadiak and Chignik district:
- Chignik Bay, July 28-29.
- Alitak Bay, July 30-August 7.
- Karluk, August 7-9.
- Uyak, August 9-11.
- Afognak, August 11-16.

Southeast Alaska district:
- Sitka, August 19-21.
- Killisnoo, August 21-22.
- Pyramid Harbor, August 22-23.
- Chilkoot Inlet, August 23-25.
- Taku Inlet, August 25-26.
- Taku Harbor, August 26-27.
- Port Snettisham, August 27.
- South Bay of Pillars, August 28-September 2.
- Shipley Bay, September 2-4.

Southeast Alaska district—Continued.
- Duncan Canal, September 5-8.
- Point Highfield, September 8-10.
- McHenry Inlet, September 10-12.
- Zimovia Strait, September 12-13.
- Union Bay, September 13-14.
- Ward Cove, September 14-15.
- Loring, September 15-17.
- Yes Bay, September 17-21.
- Karta Bay, September 21-23.
- Loring, September 23-24.
- Ketchikan, September 24.
- Boca de Quadra, September 24-25.
- Metlakahtla, September 25-27.
- Comox, British Columbia, October 2-3.
- Tacoma, Washington, October 4-17.
- Quartermaster Harbor, Washington, October 17-21.
- Comox, British Columbia, October 24-26.
- Sausalito, Cal., October 30.



NATIVE VILLAGE AND UKALA RACKS, ON BLUFF TO WESTWARD OF ARCTIC PACKING COMPANY (A. P. A.), NAKNEK RIVER.

BRISTOL BAY DISTRICT.

TOPOGRAPHIC AND GEOGRAPHIC FEATURES.

The commercial salmon fisheries included in the division laid out in my previous report as the Bering Sea district are confined entirely to Bristol Bay, and if the wide limits ascribed by some to this bay are accepted, the canneries and fisheries are all in the northeast section or on the rivers that empty there. One authority states that "Bristol Bay may be said to include all that part of Bering Sea lying east of a line drawn from the northwest cape of Unimak Island to the Kuskokwim River." In my opinion, a better western boundary, topographically, would be a line from Port Moller to Cape Newenham.

The commercial salmon fisheries of this district are on the Ugashik, Egegak, Naknek, Kvichak, Nushagak, and Wood rivers, and their sea approaches. These rivers are all large, with large lake sources, and, except Wood River, drain the western slopes of the mountain range that traverses the Alaska Peninsula and extends along the western border of Cook Inlet.

This mountain range lies close along the eastern side of the peninsula, and at intervals it rises into volcanic peaks of considerable height, some of which, by their smoky wreaths, still indicate activity. The greater part of the ridge is snow-covered, and its northern extension forms the mountain masses which extend along the western side of Cook Inlet, where the volcanoes Iliamna (12,000 feet) and Redoubt (11,000 feet) rise conspicuously above the lower masses.

This ridge is not altogether continuous; there are a few breaks which admit of portage, and as the end of the peninsula is reached there are a number of depressions. It is said that formerly sea-otter hunters from Bristol Bay, by ascending the Kvichak River to Lake Iliamna, made a portage to Kamyshak Bay. In the early days the Russian *promyshleniks* found their way from Kadiak Island to Bristol Bay, using the pass across the peninsula from Katmai to the headwaters of the Naknek.

For many years the Russian-American Company transported their merchandise across from Katmai, thus reaching the Bristol Bay, Nushagak, Yukon, and St. Michael regions. At Chignik there is a well-known portage, and beyond to the westward there are several which are still used. The mountain range shows two distinct benches of upheaval, and the theory has been advanced that in former ages, not very remote geologically, these depressions were submerged, forming waterways into Bering Sea, and the present ridge was then broken into islands, of which the present Aleutian chain is a continuation.

As the divide of this ridge lies close to the eastern shore, the watersheds on that side are short, the streams are numerous and small, and there are no great lakes and rivers. At Chignik, where probably the largest river on the eastern side has its outlet, there is a depression in the mountain chain, and the lakes in which the river has its source lie in a plain beyond, to the westward of the mountain masses. It is here that the portage referred to exists. It extends from the Chignik lakes to a stream which empties into Bering Sea near Port Haiden.

On the western slope of the peninsula there is a different topographical condition. The shore generally is low, with here and there an isolated mountain or projecting

spur, and in the vicinity of the larger rivers, where the peninsula expands to a width of from 60 to 90 miles, the mountains in the distance are visible only on a clear day. Along this shore there is an occasional high bluff which marks the sea terminus of a ridge of hills.

From the western shore to the mountains the country is a gradually ascending, rolling plain, hillocky in places, dotted with lakes fed by the glaciers and melting snows in the east, with much marshy tundra cut up by streams and mud sloughs.

It is on this western watershed of the Alaska Peninsula that the large lakes, Ugashik, Becharof, Illiak, Naknek, and, on the northern extension, Iliamna and Clark, are situated. These form the sources of the rivers on which the salmon fisheries in Bristol Bay are located.

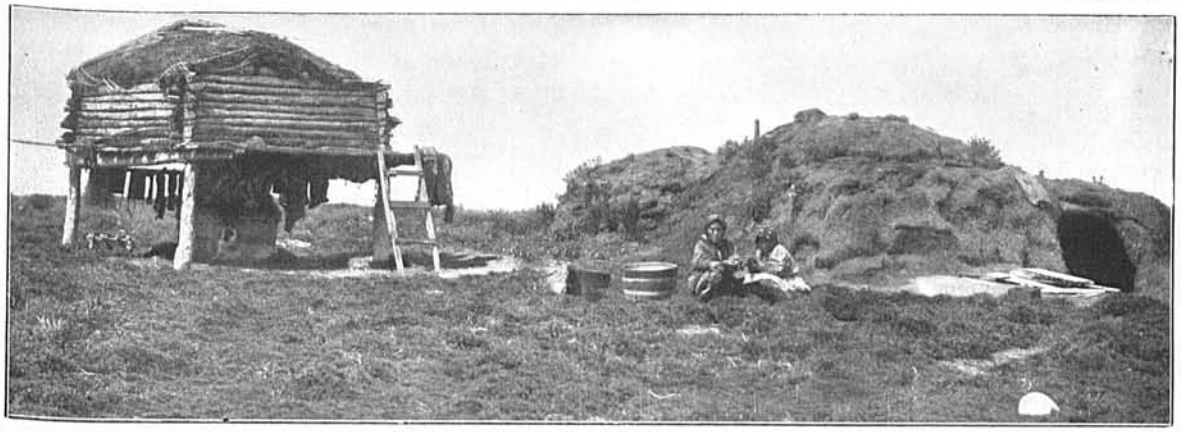
Referring to the topographical features of the Bering Sea district, the Russian missionary, Veniaminof, says:

> Slight elevations can be found along the whole extent of the American coast of Bering Sea; they are in nearly all cases connected with the mountains in the interior. If the observer ascends to a height the country appears to him like a heaving ocean suddenly become stationary, with its waves transformed into sand and mud; these waves are now covered with vegetation, but their outlines are still very striking. In the midst of this dry sea we find occasionally high, rocky islands entirely separated from the neighboring hills.

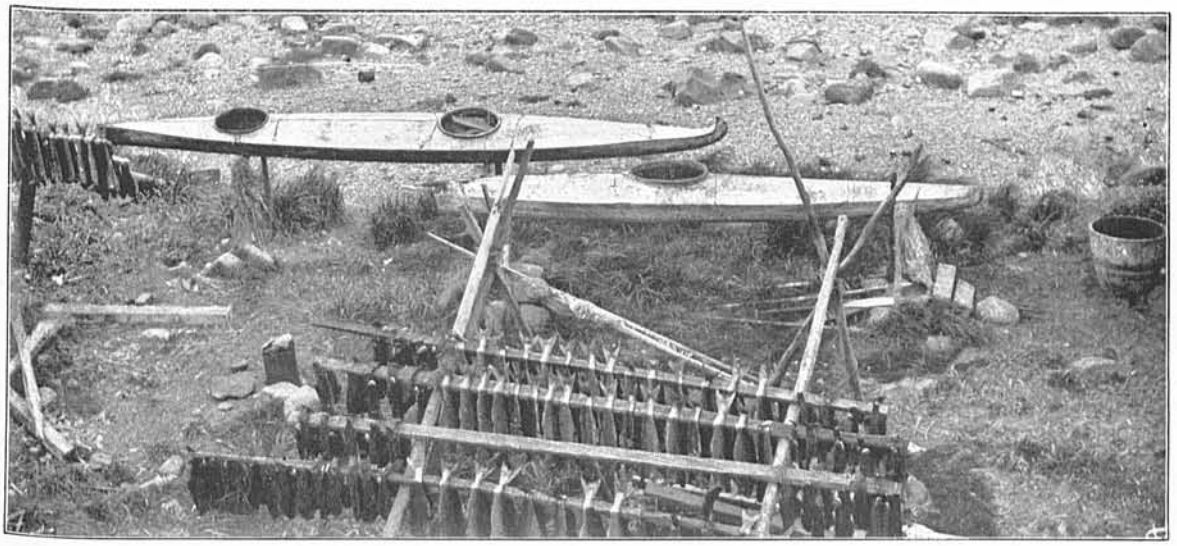
Of the interior of this country no exact information is at hand, and it still awaits the intelligent explorer. But little information can be obtained from the natives, and not much more from the prospector who occasionally finds his way into the interior, or the worthless squaw man, who at times is infused with sufficient energy to look for game.

The population is not large and consists of Innuits or Eskimos, who live in small villages located on high ground, on hills or bluffs bordering a river or lake. They subsist by hunting and fishing, and, when located near a cannery, earn good wages, if they desire to work. Their food is largely salmon, though seal, beluga, and walrus also enter their diet when they can be obtained, and occasionally a deer or moose is taken. Their food is all preferred "high"—not high in the sense of the epicure, but rotten; rancid oil is generally cooked with it or used for sauce. The decaying carcass of a whale cast on the beach attracts the natives for many miles, and a grand feast is held over it; rotten salmon heads are a *bonne bouche*. They are very filthy in their habits and live in very primitive dwellings, made by forming a shallow circular excavation and erecting over it a framework of driftwood, or whale ribs, with double walls filled with earth and stones and covered over with sod. A small aperture is left in the apex for the escape of smoke, though many of their dwellings now have side openings with a small window. The outside, or the roof, as it were (for all above ground is rounded in shape), is a gathering place for children and dogs, and is surrounded by mud and offal. The entrance is a low square hole, to enter through which one must stoop very low, or crawl, and then pass through a gallery or tunnel into the inner chamber, which is irregular in shape and from 10 to 15 feet in diameter.

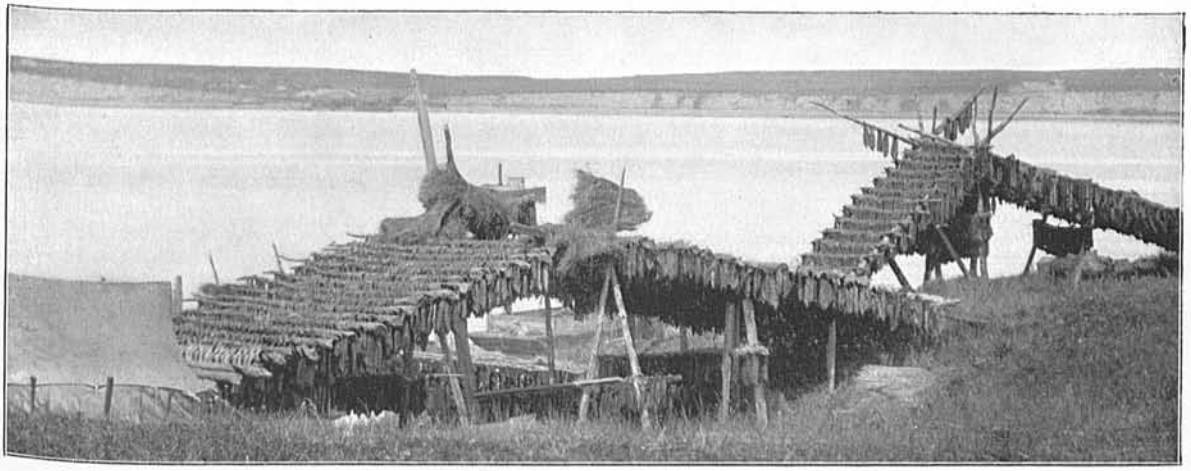
In the center, and under the smoke opening, is the fireplace, and along the walls are couches of skins or mats slightly elevated above the floor; frequently there are several of these dwellings connected by tunnels, all having one common entrance. Storehouses are built on driftwood posts 4 or 5 feet from the ground; in these the



NATIVE BARABARA (SOD HOUSE) AND STORE HOUSE, NEAR NAKNEK RIVER.



BIDARKA AND KAYAK ON BEACH, UGASHIK RIVER.



UKALA RACKS NEAR CANNERY OF ARCTIC PACKING COMPANY (A. P. A.), NAKNEK RIVER.

On the left is a typical diminutive tent, such as is used by the Bering Sea Eskimos and Aleuts.

winter supply of ukala is kept, inaccessible to dogs, foxes, and wolves. Salmon are dried in large numbers to make ukala for the winter supply.

In the interior, where it is obtainable, timber enters largely into the construction of the house. Near trading posts the dress is a combination of native and European, though many still wear skin coats (parkas) and skin trousers and boots. They travel by land with dog teams, and by water in skin boats (kayaks and bidarkas).

The Bristol Bay salmon rivers, of which we are now treating, are all large and flow great volumes of water. The banks are frequently low, cut by numerous mud sloughs, in places flooded at very high water, and at low water uncovering a beach of mud on which a landing can not always be made. The rolling tundra through which these rivers flow looks like a grass-covered plain, but it is all cut up into hillocks and hollows, marshes and ponds, making it generally impassable, except during the winter. Throughout this section travel, except by boat, must be confined to the winter months, when everything is frozen solid. The country is treeless. A belt of timber stretches from the northward to Lake Becharof and then makes a wide circuit and impinges on the Nushagak. The rivers widen considerably at the mouth, forming broad, shallow bays, though still called rivers at the canneries. As there is a rise and fall of the tide of from 18 to 24 feet, the change in the appearance of the tidal area at high and at low water is striking, for at high water the lower courses are filled to the banks, forming rivers as wide or wider than the Mississippi, while at low water they are confined to narrow, shallow channels running between uncovered shoals and banks. This subject will be referred to later under the heads of the several rivers.

As there seems to be some confusion in the geographical division of some of the rivers and bays, it is deemed advisable to state here the application of certain names in this report.

By some authorities the large arm of Bristol Bay, which receives the waters of the Nushagak and Wood rivers, is called the Lower Nushagak River. It is about 30 miles in length, 13 miles in breadth at the seaward entrance, and 4 miles at the head, and does not in any way partake of the nature of a river. Therefore this body of water, opening into Bristol Bay between Protection Point and Etolin Point and extending northward to the junction of the Nushagak and Wood rivers, will be called in this report Nushagak Bay, and the two rivers named will be regarded as emptying into the head of that bay.

The next great arm of Bristol Bay to the eastward of Etolin Point and extending to the northeastward will be called Kvichak Bay, for the seaward boundary of which will be taken a line from the southern point of entrance of the Egegak River to Etolin Point, and for the northern extreme a point above Koggiung, where the Kvichak River is confined in banks within the usual acceptation of that term. The Lockenuck, Kvichak, Naknek, and Egegak rivers will be considered as entering Kvichak Bay.

EARLY RECORDS OF SALMON FISHERIES IN BRISTOL BAY.

The history of the salmon fisheries of Bristol Bay for commercial purposes is given under the several cannery headings. The earliest record in the history is the salting of salmon on the Nushagak by the schooner *Neptune* in 1883, and the erection of cannery buildings that year for the Arctic Packing Company, which made a trial

pack of 400 cases the year following (1884). It is noticed, however, that Petroff, in the census report of 1880, states:

> The salmon family, the great feeder of all the Alaskan people, frequents in astonishing numbers the Nushagak and other streams emptying into Bristol Bay. The facilities for building traps and weirs are also extraordinary, and American fishermen have for some years been engaged here every season in reaping a rich harvest and shipping the fish, salted in barrels, to market. Hundreds of barrels have been filled with a single clean up of a trap. The only drawback to this business is the short period over which the run extends, necessitating the employment of a very large number of hands while it lasts. * * * Exports from this section have thus far been limited to from 800 to 1,200 barrels of salted salmon per annum from the Nushagak River.

It is probable that this latter reference was to the salting done by traders on a limited scale. The Alaska Commercial Company, or their agents, salted salmon at various stations prior to 1880, and, as they had an important station at Fort Alexander, on the Nushagak, it is probable that some salting was done there.

FISHING METHODS AND FISHERMEN.

Two methods only are employed in taking salmon for commercial purposes in this district, viz, by gill nets and by traps, and both are well adapted to the local conditions.

The strong currents and comparatively narrow deep-water channels, together with the discolored water, permit the use of gill nets with great success. The dimensions of the nets vary according to the depth of water and the individual ideas of the different cannery superintendents. For redfish the length varies from 75 to 80 fathoms; the depth from 20 to 26 meshes, and the mesh from 6⅛ to 6¼ inches stretched. For king salmon the length is from 120 to 125 fathoms, the depth 24 meshes, and the mesh 9¼ inches stretched. Floats are rigged 3 feet apart and leads 2¼ feet apart. The average value is about 65 cents per fathom, depending on the market and the quantity purchased. The large companies use a great amount of web, and have special arrangements with the manufacturers. By watching the market closely and buying when the price is low they have a great advantage over small operators.

The gill-net boats used on the Nushagak and the Ugashik are regular Columbia River boats, built in San Francisco at an average price, complete, of $200. The usual dimensions are: Length, 25 feet 1 inch; beam, 7 feet 8 inches; depth, 2 feet 6 inches; capacity, 300 cubic feet. They have a centerboard and spritsail, and will carry, as an extreme, 1,400 redfish. The boats used on the Kvichak, Naknek, and Egegak are flat-bottom double-enders, about 1 foot longer than the Columbia River boats, but have the same rig and the same capacity, and on the water resemble them very closely. Their value is about $100, complete. Two men form a gill-net crew—a netter and a boat-puller. They work on tides, and when the fish are plentiful remain near the canneries, but when the run is slack they may drift 15 or 20 miles away.

Traps, used extensively in the Bristol Bay district, are a subject for criticism throughout Alaska. They are expensive to build and maintain, but have many advantages to the canner. The great benefit of a trap is not only that it fishes day and night, but, if the run is heavy for a few days and the cannery fully supplied by the gill-netters, the fish in the traps can be held for a time until the catch of the gill-netters is slack. These advantages have frequently led the trapmen beyond the limits

of the law, and the time has come when the use of traps must be regulated and the law enforced, or else they must be abolished. Having in mind now the whole of Alaska, it is my opinion that if this be not done they will work a great injury to the fisheries.

Columbia River salmon boat.

Columbia River salmon boats and flat bottom salmon skiff.

Traps catch not only the salmon wanted, but all other species of salmon and other fish not wanted. Practically all fish taken in the traps, except redfish, are waste, and until one sees the tons of this waste product, one can not realize the magnitude of this giant octopus that grasps everything in its tentacles.

Fish were very plentiful this year, and the gill-netters were able to supply most of the fish used. It was said on this account that traps took more fish than were

wanted, and that they were frequently opened to let the impounded fish escape. This statement may be true, but there never was a cat that held a mouse with more tenacity than a canneryman holds a salmon, and it is doubted if a salmon of choice species is ever allowed to escape as long as it is fit to be put inside a tin can.

I have said here that practically all fish taken in the traps, except redfish, are waste. This should be slightly modified, though practically it is true; yet, in justice to the cannerymen, it may be said that the records of the past few years show that, besides redfish, on the average less than 8,000 cases of king and 8,000 cases of all other species were packed per year in the whole Bristol Bay district, and some of these no doubt were taken in traps.

There is a question arising in my mind which now can only be stated and left for the future to decide, as follows: Traps take all fish of all sizes; gill nets take only the large fish; will gill-net fishing result in decreasing the size of the fish?

In one locality trap men informed me that trap fish are more expensive than gill-net fish. In another place it was said that this year two gill-net boats secured more fish than one trap, but when asked why the traps were maintained the reply was that the fish were held in the traps until wanted.

One canneryman, whose resources seemed limited and who did not feel able to maintain traps, frankly said that traps should be abolished; but, when asked if he believed that traps were injurious to the fisheries, he was equally frank in saying "No." The motive is evident.

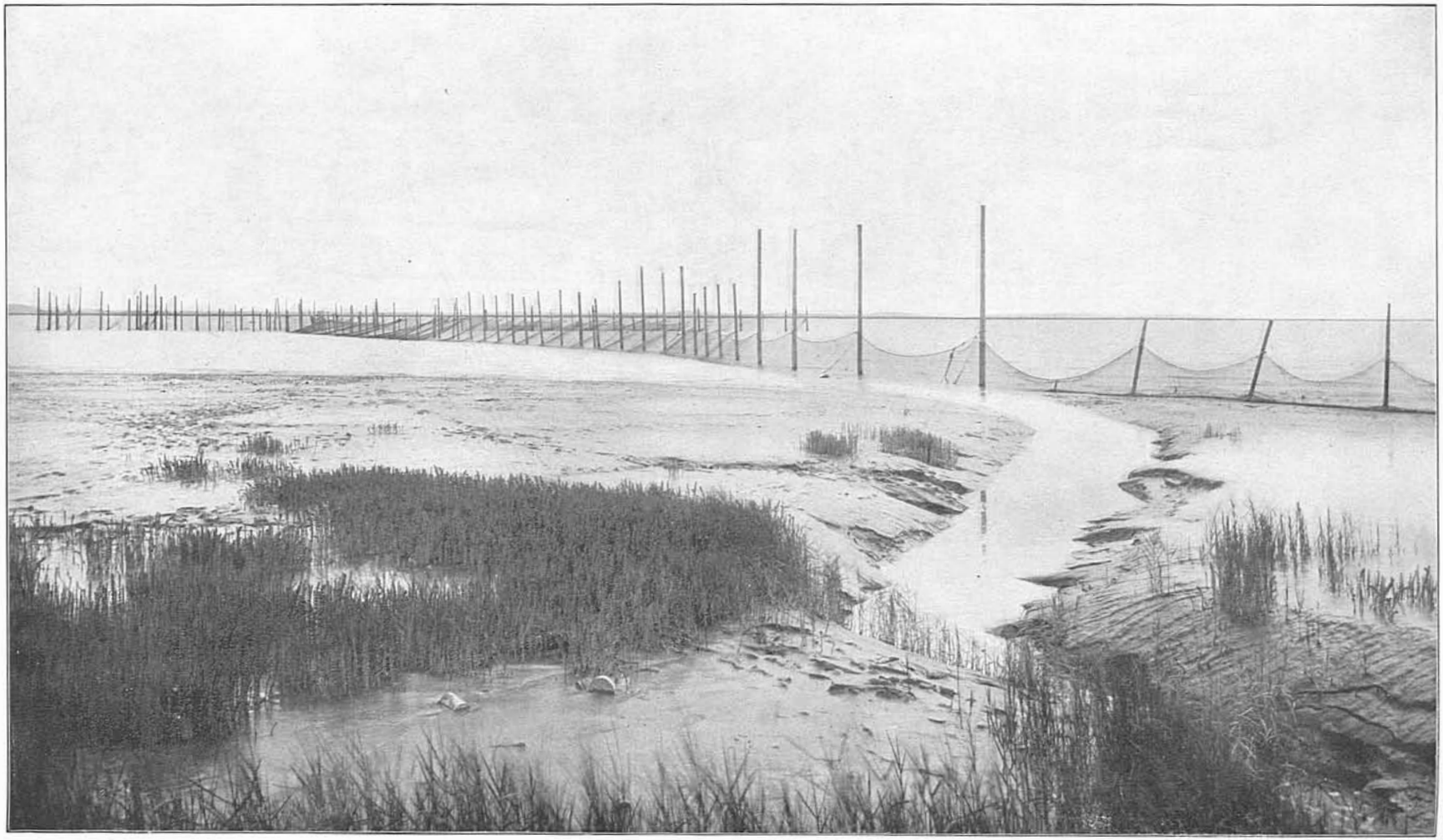
The traps used are of the general type illustrated in my report of 1897, page 170. They consist of the usual shore and channel leads, with hearts and pots, but there are all kinds of variations to meet local conditions or the fancy of the "trap boss." Some have two pots and some have additional appendages in the shape of corrals.

Not only is the first cost of a trap in this country large, but its maintenance forms a big item of expense. All piling must be imported, and the strong currents frequently damage both piles and web. The piles are pulled up when fishing ceases on account of the ice, and are redriven in the spring as soon as the ice is out of the river and before the fish begin to run. The largest trap seen in the Bristol Bay district had about 2,700 feet of leads laid out in a rather complex way, with two pots, 75 feet by 75 feet, and a large corral. (See sketch on page 200.)

Seines are not used in this district, largely on account of the strong current, although this could be overcome if there were good seining beaches. There are a few bowldery beaches, but, as a rule, the banks and beaches are soft mud, so that at low water landing at many points, if not impracticable, can only be effected with great effort. On one occasion, in landing at low water near a cannery on the Nushagak, we became mired to such an extent that it was only by clinging to a bidarka, pushed out to us by the natives, that we were extricated and hauled ashore.

The fishermen are white, usually foreigners, chiefly Scandinavians, with some Italians. They contract with the cannery for the season, and receive $50 per man for working the cannery ship from the home port to the cannery and back, discharging and loading the vessel at the cannery, getting the nets and boats ready, and doing other beach work until fishing begins. They receive full and excellent board and lodging from the time of leaving their home port until their return. The wages of trap and beach men are $30 per month and one-third cent per case. The gill-netters

Bull. U. S. F. C. 1901. (To face page 182.)



SALMON TRAP, BELONGING TO ALASKA PACKERS ASSOCIATION, NUSHAGAK RIVER.

SALMON TRAP BELONGING TO C. E. WHITNEY & CO., NEAR THEIR SALTING STATION ON NUSHAGAK BAY.

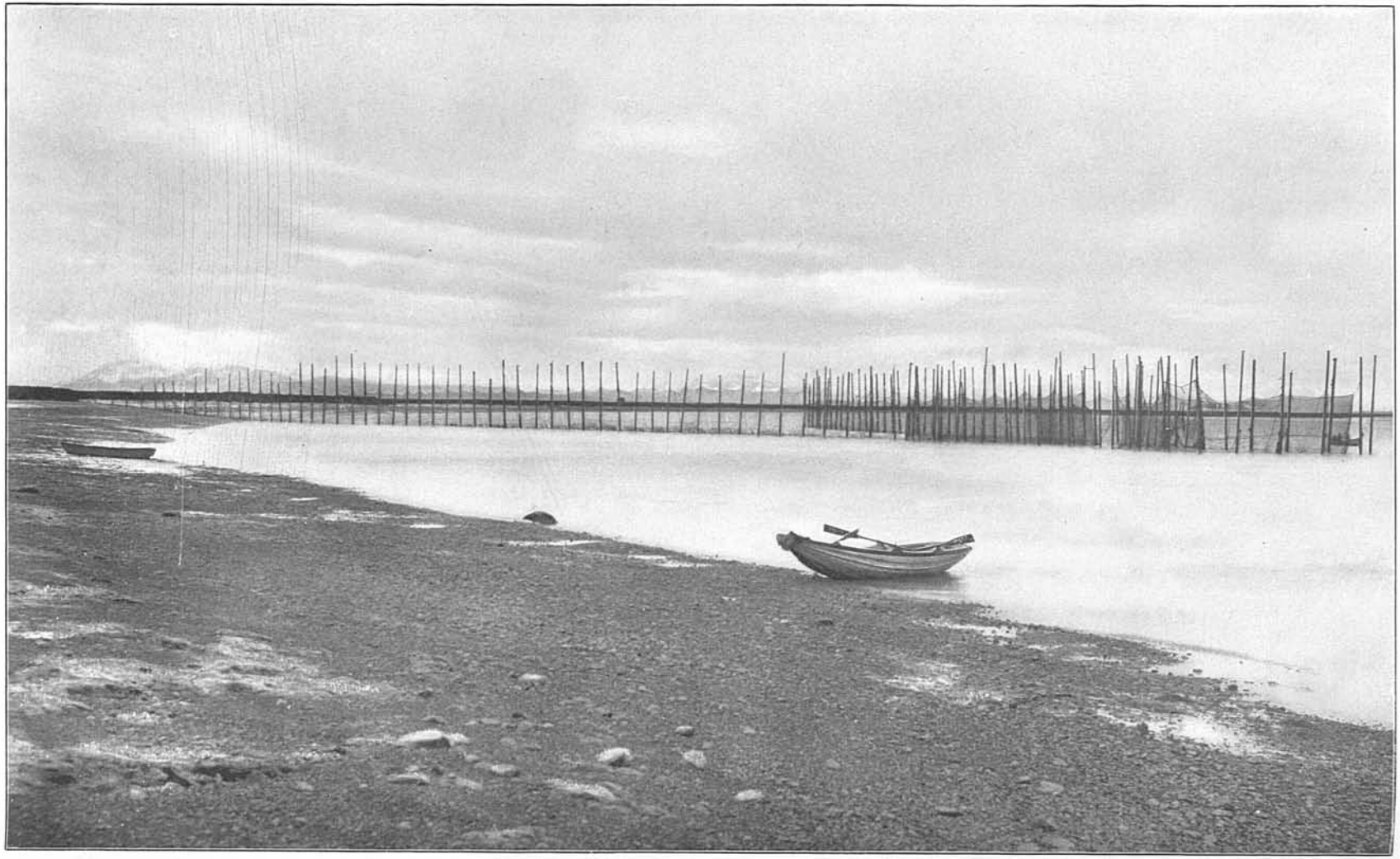
Bull. U. S. F. C. 1901. (To face page 182.)

SALMON TRAP, BELONGING TO ALASKA PACKERS ASSOCIATION, ON BEACH NEAR CANNERY OF ALASKA PACKING COMPANY (A. P. A.), NUSHAGAK BAY.

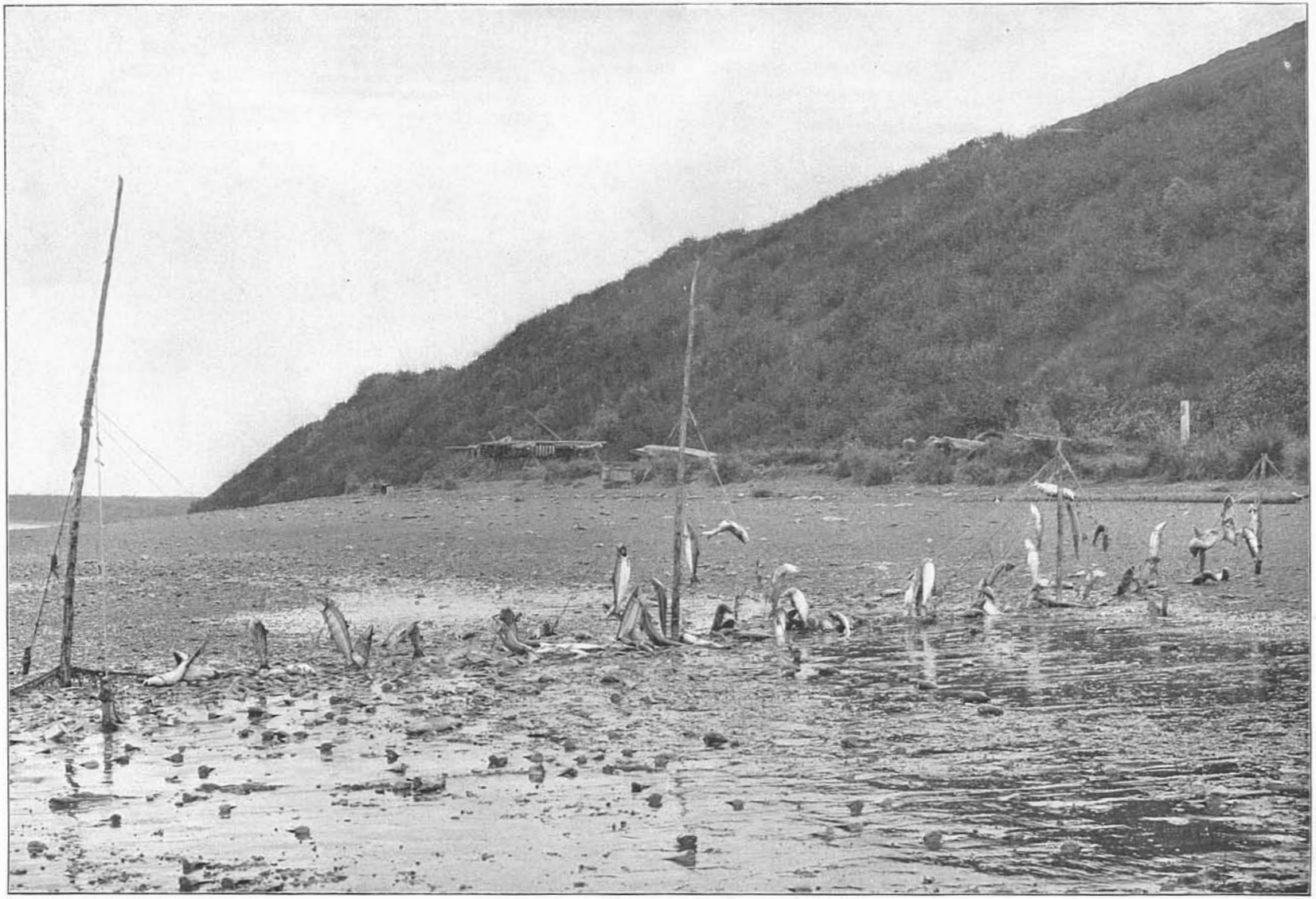
NORTHERN AND INSHORE POT OF SALMON TRAP, BELONGING TO ALASKA PACKERS ASSOCIATION, NEAR GRAVEYARD POINT, KVICHAK BAY.

View from beach at low tide, showing tunnel down; steamer Sayak at anchor beyond.

Bull. U. S. F. C. 1901. (To face page 182.)



SALMON TRAP, BELONGING TO ALASKA PACKERS ASSOCIATION, NEAR CANNERY OF BRISTOL PACKING COMPANY, UGASHIK RIVER.



NATIVE METHOD OF SETTING GILL NETS, ON BEACH NEAR PACIFIC STEAM WHALING COMPANY'S CANNERY, NUSHAGAK BAY.

and boat pullers receive 2 cents for each redfish and 10 cents for each king salmon per boat of two men, the fish being delivered and tallied at the cannery or to a tender of the cannery. During a good season they average as high as $75 per month. If during the fishing season a man is taken from his boat to do other work, he receives as wages an amount equal to the average share of that day.

When the run is heavy and more fish are supplied than the cannery can use, the fishermen may be limited in their catch to 1,000 a day, but not under that amount. It is not rare, when redfish are plentiful, for industrious and expert netters, by working early and late, to make two loads, or 2,400 fish, which nets $24 to each man in the boat. This season it was noticed at three places that limits of 1,000, 1,100, and 1,200 redfish, respectively, were placed on the boats, and with the first limit at one cannery it was necessary to take some men out of the boats to clean fish, the Chinese being unable to keep up the supply for the machinery. These men, therefore, received $10 per day for butchering.

Unless one has seen the bins of a large cannery in running order words can not fully convey an impression of the masses of fish used in a single day. A thousand salmon seems to the ordinary observer a large number, yet a single three-filler cannery will utilize each day 25,000, and this district, when running full, will pack each day 250,000 in its thirteen operating canneries. It is difficult to understand how it is possible to maintain the supply, although the run is immense.

In Nushagak Bay, off Clark Point, on two occasions the fish were running so heavily that they were caught in the propeller of the launch of the *Albatross*, stopping the engines.

THE RUNS AND CANNERY WORK.

The season in Bristol Bay is short. Not only do the fish run a very limited time but good weather lasts but a few months, although the conditions are far more agreeable during the summer than over Bering Sea generally. There are many bright, sunny days, frequently quite warm, fewer gales and less fog, but with September come the gales and cold.

The cannery ships try to reach their destinations as soon as the ice will permit them to enter the bays, as there is only a short time after their arrival to make the necessary preparations before the runs begin. They expect to arrive not later than the middle of May, and to do this they must enter Bering Sea early, often encountering much ice to the eastward, though the rivers may be mostly clear. Cannery steamers (tenders) sometimes reach their destinations in April, but frequently are obliged to lie outside or to haul into a mud slough at high water and lie ashore until the rivers have discharged the floating ice.

Bristol Bay is essentially a redfish district, and while all other species occur they do not run in large numbers. They will be referred to under the cannery headings.

When the vessels arrive in May there are no salmon in the streams, even for the cannery tables. The earliest arrivals are king salmon, which appear from June 6 to 16, depending upon the river conditions. They are followed a few days later by the redfish which, about June 16 to 20, run in sufficient numbers to warrant operating the canneries for them. The king salmon run scatteringly throughout the season; but even on the Nushagak, the only Bristol Bay locality where a regular pack of this

species is made, they cease fishing for them soon after the redfish commence to run, as the latter is the more profitable fish. King salmon are nowhere abundant in this district and the few taken in the traps and redfish nets after the packing of the former species is closed are used on the cannery tables, or their bellies are salted for personal use.

It is said that there is quite a run of cohoes after the canneries have "cleaned up." A few are taken at the close of the redfish run, and it is probable that they are present in numbers until cold weather sets in.

The canneries are practically in full operation about one month, as the redfish run is over by July 20 to 25, and during this time they present a busy scene; every one is worked to his full capacity, and nothing is thought of, talked of, dreamed of, but fish. The hands of the clock are moved ahead in the morning, righted at noon, and moved back in the evening to gain time; work starts by 3 in the morning, and the bathroom is frequently not cleaned up, if it is cleaned at all, until 10 and 11 at night. The employees appear weary; the Chinese, never very robust-looking, seem to drag along as though they would drop in their tracks. The tinned fish, after cooling, are stacked in great warehouses, for there is no time to lacquer, label, and box, as the energy of the whole force is concentrated in putting fish into tin cans and sealing them. The leaky cans accumulate, as the menders can not keep up with the work, resulting in a large percentage of do-overs. At last, when the force is about exhausted, a respite comes; the run slacks and there is a sigh of relief by all except the superintendent, who swears that he has not packed enough, though every can may be filled. The relief is only temporary, however; the lacquering, labeling, testing, and boxing must now be done, and there is a rush for the final clean up, all being eager to take their departure. While the Chinese are engaged in lacquering, etc., the fishermen and the beach gangs are pulling up the traps, drying and storing the nets, hauling out the fishing boats, and loading the transport vessels. When the cargo is on board, lighters, scows, and tenders are hauled out and put under cover, the doors are closed, the watchman takes charge, and the ships sail away with the pack and the human freight.

Cannery men expect to be "cleaned up" in this district by the middle of August.

CANS IN BRISTOL BAY.

On account of the short time intervening between the arrival of the cannery ship and the beginning of the runs it is impracticable to carry the tin plate and make all the cans by hand on the working ground, according to the practice in the other districts. Until recent years all the cans were transported. At the present time 30 to 40 per cent are made at the canneries and the rest are carried from the home port. It was noticed that some of these were rusty, and upon inquiry it was learned that many were in this condition, caused probably by being packed in boxes made of green lumber.

Can-making machines are now being installed, and the latest pattern seems to work well, so that the day is not far distant when the cans will be made from day to day as they are wanted. This will effect considerable saving in labor, in storage room, and injury in handling. Besides, the machine-made can is better than the one made by hand. It has fewer defects, fewer leaks, and consequently there are fewer do-overs.

CHINESE.

An account of the Chinese cannery labor in the other Alaska salmon districts is given in the 1897 report, page 23, and it does not differ materially here.

The arrangement for the employment of Chinese is made through the labor agencies of the large cities, principally in San Francisco. They work under a "boss" of their own, who guarantees each man a certain amount for the season. They do all the work in connection with the pack. They receive the uncleaned fish at the bins and deliver them canned, lacquered, and labeled, in cases, at the other end of the cannery. The packing company transports the Chinese to the field of work and carries them to the home port at the end of the season; it provides them with a bunk house and furnishes fuel, water, and salt. The "boss" supplies the Chinese "chow," but during the height of the season they also receive some food from the white mess.

The Chinese contract this year (1900), in Bristol Bay, was 45 cents per case for machine-filled and 60 cents per case for hand-filled pack. A certain number of cases are guaranteed in the contract, which must be paid for whether packed or not, and if the pack runs over the guaranty the extras are paid for at the same rate. On the other hand, they are under contract to pack a certain number per day if the fish be on hand; and if they are unable to do so the superintendent may employ extra hands and charge them against the Chinese "boss."

These hands are usually very satisfactory, but in 1900, on account of the scarcity of labor all over our country, particularly on the west coast, an inferior class of Chinese was obtained in many canneries, and there was great complaint. At one three-filler cannery visited, and rated at 2,400 cases capacity per day, 1,900 cases was the largest number that could be made, and this number only by the greatest effort. It was noticed that the Chinese appeared weak, and many seemed ill; in fact, the sick list was large, and it required much persuasion to turn them to work in the morning. The Chinese bosses in several instances could not fill the quota with their own kind and substituted some Japanese coolies, which complicated matters materially. At one cannery, usually employing 300 Chinese, there were 250 of that nationality and 50 Japanese. These latter were not only lazy and worthless, but were constantly raising a disturbance. Of the two classes the Chinese are greatly preferred. It must be remembered, however, that the work in Bristol Bay is very trying, the season is short, the working hours are long, and the laborer is on a constant rush from the time of landing until the pack is loaded.

The most arduous work in a cannery falls upon the butchers and fish-cleaners and the bathroom men. The former are on their feet during the long hours of each day, standing in slush and gurry, and suffer much with swelled feet and ankles, while the latter are on the constant move and are the last to clean up at night. The men that work at the lye tanks, with the hot spluttering lye splashing over them, have no sinecure.

NATIVE LABOR.

The canneries gladly employ every native who is willing to work; nay, more, they seek for this labor in the villages and offer every inducement for them to work, and would employ many more if they could be obtained and were reliable. This is not done for charity's sake—the canneries are not in the field for that purpose, though

they are far from being uncharitable—but because the labor is needed, particularly when the rush is on, and for which profitable provision can not otherwise be made.

When the cannery ships arrive in the spring the native, having struggled through a long, severe winter, is hungry and has many wants. He greets the cannery ship with childish glee and wishes work. It is given him, his hunger is appeased from the overflowing cannery table, his daily wages soon supply the few luxuries he desires, and then he no longer cares for work. Why should he work? Hunger no longer worries him, his immediate wants are satisfied, and he has no others!

The condition of native labor is the same here, among the Eskimo, as it is in other sections of Alaska, to which feature reference was made in the former report;

Eskimo women cleaning salmon.

only here the canneryman, being entirely out of the lines of communication with the labor market, seems still more desirous of employing natives and frequently sends some distance to their villages to enlist them in his work. Statistics show that the largest number employed in any one cannery is from 25 to 30 for a short period. Some days there may be 40 and the next only 10.

It is true that the canneries can not give them constant employment, as their intelligence only warrants giving them certain work; still a good, reliable native will have work the greater part of the time, and can earn during the short season from $100 to $125, also having his board furnished him during the time employed.

The wages paid this year to adult males was $2 per day; reliable men received $2.25; boys from 12 to 14 years of age received $1 per day, and children were seen

piling cans who were not more than 6 years of age, and who received 50 cents a day. They demand and receive their wages daily.

Formerly the wage of adult males was $1.50 per day, but in the early part of this season a "walking delegate," in the shape of a "tyone" (chief), appeared at the canneries and the natives struck for $2 and promptly got it.

Money seems to have no value to the native except to satisfy his immediate wants, and the traders cater to their taste for gewgaws by supplying them with things for which they have no use. They have a fancy for cuckoo clocks and watches, though they can not read the time; cheap jewelry and perfume; and a silk dress is more than tempting. One woman was noticed wearing the usual skin trousers and boots, and over all a velvetine dress, well tucked up, and as greasy as if it had been soaked in a pot of rancid oil. As before mentioned, the canneries supply board to all the natives employed; the food is abundant to the point of wastefulness; it is of excellent quality, well cooked, in large variety, and given with a generous hand; none need go hungry; even the hundreds of sled dogs from the villages greet the cannery ships, gather around the canneries during the season, and grow fat, sleek, lazy, and good natured.

Of the large supplies of food carried up in the spring a considerable quantity usually remains over when the cannery closes. This is stored at some of the canneries and the watchman is instructed to distribute food in case of distress.

A large amount of salmon is cured by the natives for their own use and for the dog supply during the winter. These fish are caught with the greatest ease. A small piece of condemned gill net is obtained from a cannery and is stretched between poles planted in line from high to low water mark. When the tide falls the net is frequently so full of fish that they can not all be utilized. Nets were noticed in which it appeared as if nearly every mesh held a fish, and others were seen in which the meshed fish were decaying, the natives being too lazy to remove them in proper time. (See plate IX.)

There can be no doubt that the canneries have benefited the native by adding to his physical comfort. The fish supply for his use has not been reduced; on the contrary, the cannery has placed in the hands of the native a means for taking fish far superior to anything he ever dreamed of, and if he is willing to work he can earn money and procure civilized comforts. Whether his contact with the fishermen and Chinese during their yearly visits adds anything to his moral well-being is a question, but he suffers no more here than natives do in all parts of the world when they come in contact with our civilization.

At Nushagak a large number of tyones called on board to pay their respects to the commanding officer. In answer to an inquiry, they said they had no complaints to make and they were satisfied with the surrounding conditions.

CANNERY WASTE.

The waste in the Bristol Bay district is strikingly large, due, in the first place, to the greater abundance of fish, and, secondly, to the necessity for rushing the pack on account of the short season. To the novice who is accustomed to see fish only in a market, where salmon are sold at from 10 to 20 cents per pound, this waste is the first thing to impress him. It is probably within the limit when it is said that the

waste in this district for the present year is not under 50,000 cases of redfish alone. The waste here referred to is in marketable salmon, and does not include other fishes wasted in the traps or nets. It runs through the whole process, from the time the fish are captured until the last tapping test is made.

The largest waste probably comes from holding the fish until they are unfit to pack and then throwing them away. This may occur at the traps, in the tenders, or in the fish-bins. Many are lost in passing from fishing boat to receiving scow; others again in pewing from scow to fish-house. In this district only three cuts are made, the end pieces being thrown away; then comes the waste in machines, which, including the loss of the tail pieces, is 32 per cent greater than with a careful hand-filled pack.

The do-overs should also be considered waste, though they reach consumers in out-of-the-way places. A certain percentage is unavoidable, but in a well-conducted establishment this should not exceed 1½ per cent. In this district it is over 4 per cent.

In front of every cannery in this district, and along the beaches for several miles, thousands of dead fish are seen. Usually the tide serves well and carries other thousands away, but sometimes the wind is unfavorable and winrows of decaying fish, a hundred feet in width, along the beach, testify to the enormous waste during a canning season.

There is another source of waste that may be mentioned, which consists of the king salmon, the finest salmon that swims the Pacific waters. This species does not run abundantly anywhere in Alaska. An average of less than 8,000 cases are packed in the Bristol Bay district, of which all but a few hundred are packed on the Nushagak. They run, however, in a scattering way in all the rivers where packing is done. Very few are canned after July 1, for the entire energy is then bent upon the redfish. As a few king salmon are taken every day during the season in the traps and nets, the bellies of those not used on the cannery table are cut out and salted for private use, and the remainder of the fish is frequently thrown away. Great, beautiful fishes, weighing from 25 to 40 pounds, from which the bellies had been removed, were seen at several places lying on the beach, to be carried away by the tide or consumed by the birds.

POUNDS OF LIVE FISH TO THE CASE.

In Southeast Alaska and in Prince William Sound, where redfish are not plentiful all parts are utilized and carefully packed. Upon investigating this subject in 1897 (see report, p. 31), it was concluded that, if care were taken, from 65 to 68 pounds of live fish would make a liberal case of 48 1-pound tins, depending somewhat upon the size of the fish. In a certain locality this year conditions made it possible to make a comparison between machine-filled cans and a hand pack, and it may be of interest on account of what has been said under the subject of waste.

A small cannery that made a very careful hand pack this season by using the whole fish averaged 8.3 redfish to the case. Near by is a larger cannery making a machine pack and using fish from the same stream. By making three cuts and rejecting the tail pieces this cannery averaged 11 redfish to the case. Thirty-three redfish taken in one haul of the ship's seine averaged 8.25 pounds, and 30 redfish from the cannery bin averaged 7.5 pounds, giving a mean of 7.875. Using these factors, it will be seen that in the hand pack 65.3 pounds of fish were used to the case, the same amount as shown in my previous investigation, while in the machine pack 86.6 pounds

were used, an increase of 32.5 per cent. It should be noted, however, that in the latter the tail pieces were rejected, but were packed under a separate brand.

Inquiry made of cannerymen in the Bristol Bay district shows that it was generally conceded that it took from 80 to 85 pounds of live redfish to make a case in this district. It is my own opinion that if the waste from all sources be considered, at least 100 pounds of live redfish are used, destroyed, or wasted for every case of this species of salmon packed in this district.

INFLUENCE OF WINDS ON MOVEMENTS OF FISH.

So far as observations have been made it has been noticed that salmon in inland waters, and upon approaching them, swim at a depth estimated at from 6 to 12 feet below the surface, and that they favor a course with the wind in approaching fresh water. At Koggiung, Naknek, and Egegak the southwest winds bring an abundance of fish during the run. At Ugashik the southwest winds are best, but northwest winds also are favorable, while on the Nushagak it is claimed that south and southeast winds give the best results in the fisheries. Upon examining a chart it will be noticed that these directions of winds are over the sea and toward the several localities mentioned. As before noted, in midsummer the weather over the land in the Bristol Bay district is frequently quite warm and sunny, often too warm to keep the fish in good condition very long. It is claimed that cold weather, with light rain, gives the most favorable conditions for the successful operation of a cannery.

SALTING.

Every cannery in Bristol Bay, or, if more than one cannery in a locality is operated under one management, then every group of canneries, is fitted for salting salmon. When the fish run in such numbers that the cannery can not utilize all, the surplus goes to the salting tanks. Practically all the fish used in this manner are redfish, of which 16,778 barrels were salted in 1900 and in addition 558 barrels of king salmon.

During 1900 there was but one saltery operated solely as such in this district. It is situated on the Nushagak and had an output of 7,186 barrels of redfish and 536 barrels of king salmon for the season.

It is claimed that if salmon are dry-salted in kenches, and then boxed or barreled, they will become rusty, though this method was practiced in several instances in Southeast Alaska this year. The usual method in Alaska is to salt the fish down in wooden tanks or vats, and leave them until they are thoroughly shrunk and the water in them has been replaced by brine. They may then be washed out at any time and resalted into barrels.

It is very difficult to obtain correct salting statistics, but the following, taken from the books of the Merchants' Exchange at San Francisco, may at least show the variations in different years.

Total pack of Alaska salt salmon.

	Barrels.		Barrels.
1889	6,930	1895	14,234
1890	13,417	1896	7,700
1891	8,913	1897	15,127
1892	17,895	1898	18,718
1893	21,290	1899	22,872
1894	29,096	1900	17,687

Formerly from 46 to 47 redfish were counted as making a full barrel of 200 pounds of the salted product in this district. Inquiry at different places this season showed that the number ranged from 48 to 52 redfish to the barrel. The largest saltery averages 50 redfish, 50 cohoes, or 14 king salmon to the barrel.

For other saltery notes reference is made to my former report, page 21.

CANNERIES AND CANNERY METHODS.

In my former report this subject was fully referred to and described, and it is not my intention to indulge in useless repetition; but since my last inspection many other canneries have been visited and considerable time has been spent in observing the processing of the fish. Some new "wrinkles" have been noted which, though possibly of minor importance, may be of interest.

The general methods are quite similar in all canneries, though the arrangement of buildings and machinery, the amount of the latter, and the detailed appliances differ materially. There seems to be no standard; a cannery is built and arranged according to the individual ideas of its superintendent, and no two appear to be alike, except a few built by one company, which all seem badly arranged. It is rather surprising that some model cannery is not constructed as an object lesson.

It is not my intention to lay out a plan for a cannery, but simply to make a few suggestions and point out special features which may improve them. A cannery building should have an abundance of light, be thoroughly ventilated, well drained, whitewashed inside, and washed down with a steam hose every working day. A three-filler cannery should have a width of at least 50 feet, and the length should correspond to the machines used in processing, giving ample room, so that the cans may go uninterruptedly throughout the whole length of the building. If the ground will not admit a building long enough to have the bathroom on the extension, the the latter, with the boilers, may be located in an ell. From the door where the fish are received to the bathroom, except the mending tables, there should be nothing but the machinery and appurtenances for processing the fish. A second floor may be necessary over the filling machines for the storage of cans and for the purpose of feeding them from an elevation, but it were better to feed with a traveler and leave the roof clear for skylights and ventilation. If, however, a second floor is insisted upon, it should be double-layed, one course diagonal, to keep out infiltration of dust and dirt over the machines. A separate two-story building, parallel with the cannery, and joining it by a platform at least 40 feet wide, should be erected for a warehouse, the platform to be used for a cooling space.

The fish-house should be over the water at all stages of the tide, so that boats and lighters may discharge at any time, and the muck and gurry be carried away by the current. The other buildings, mess-houses, bunk-houses, etc., should be placed conveniently, having due regard for protection from fire.

A very convenient rigging for transferring fish from the boats to the fish-house was noticed at a cannery where there is a large rise and fall of tide, uncovering a flat in front of the building. An inclined plane led from the side of the fish-house to below the low-water mark, and a car operated by cable and steam traversed the plane. The fishing boats hauled on either side at all stages of the tide and, lying at the same

level, tallied the catch into the car, which, when full, was run to the fish-house and unloaded by dumping.

At another cannery, where fish are conveyed to the cannery by steam tenders, an inclined plane was used, extending to deep water, having the end V-shaped, admitting the cannery steamer into the V and allowing her to discharge from either side. In this case the filled cars were run over an elevation into the bins and then dumped.

In a locality where the conditions did not permit the fish-house to be located over the water at low tide, and where the cannery supply of running water was large, an immense hopper was built under the floor, with an inclined trough, through which the gurry was washed by a constant stream.

In a few canneries it was noticed that each fish-cleaning table had a spray of water from several jets playing over it, thus washing off the blood and gurry. This feature might be more extensively copied, as it promotes cleanliness in a place which is never too clean or free from odor.

At several canneries a neat and satisfactory contrivance was seen in operation for transporting fish from the fish-house to the cannery, which consisted of a shallow trough having for its bottom an endless chain of buckets. As a neat addition, a spray, formed by a perforated pipe about 8 feet long and suspended over the buckets, washed the fish while passing under it.

A new solderer was noticed, having, instead of the endless chain to give motion to the cans, a metal spiral running the length of the machine and revolving on an axle through the center. Each loop grasped a can and followed it to the end, thus giving the cans the proper motion and preventing them from rolling side by side and lapping the solder over the ends, as is frequently the case with the chain machines.

An effective contrivance was seen by which the can, after leaving the solderer, was turned upon an endless belt so as to permit the solder to set into the top, and carried upright for a distance of about 20 feet, when it was again turned on its side automatically and rolled under the cooling spray. New retorts with quick closing doors were also seen.

The Alaska Packers Association sent several fish-cleaning machines into the field for trial, but none was seen in operation. It is understood, however, that one, the invention of William Munn, the superintendent of their cannery at Alitak Bay, has been perfected after several trials, and is said to work so satisfactorily that a number are now under construction for the season of 1901. If a machine for fish-cleaning can be successfully operated it will be a great boon to the canneries.

Can-making machines are now being extensively introduced by the Alaska Packers Association, and the season of 1901 will probably see all their canneries equipped with these machines. A set consists of one cutter, which cuts the sheet tin into exact lengths for the bodies; one body-maker, which forms the body, makes the seam, and solders it; one topper and one solderer, both of which are of the same form as those used in the cannery. In the can-making department there are also dies operated by steam for cutting tops and bottoms and an extra one for cutting floats—the small piece of tin used inside the can under the top to keep the vent clear in processing. The feed for the plate in the body-maker seems to be the most imperfect part of the machine, causing frequent jams; but even allowing for delays due to these jams, a set will turn out an average of fifty cans a minute.

BRANDING SALMON.

Attempts have been made at different points on the Pacific coast to mark salmon, and it would be interesting if the facts in all cases were recorded as well as the results. It is well known that at several points young salmon have been marked by cutting off the fleshy (adipose) fin; but, unfortunately, this seems to be the only method offering any facility for marking these fishes, and if all localities adopt the same system but little benefit will be derived.

My attention has, on several occasions, been invited to so-called marked fish other than those from which the fleshy fin had been removed, and it may be of some interest to give a brief description of them. In 1897 it was called to a mark on the gill cover of a redfish at Uyak. The mark was elliptical in shape, with three-fourths inch and one-half inch as the respective major and minor axes; the edge appeared milled, and there were some blurred marks around the inner circle, while in the center there was a design which might be taken for a crown surmounting a sphere. At San Francisco, in the office of the Alaska Packers Association, a similar mark, also on the gill cover, is preserved in alcohol. This year, on the Nushagak, a mark of the same kind, though less distinct, was seen on the gill cover of a humpback. My first impression was that these marks had been made by a coin, but this would be impracticable unless made on an adult fish. It is my belief now that the mark is that of some parasite which had become firmly attached to the gill cover and left its impression. This year two redfish were taken on the Nushagak that had the dorsal-fin rays entirely removed and the skin was apparently joined smoothly over the back.

One fish was taken in the same locality with an impression resembling an M or a W, 1¾ inches square on its side; and another with the same letter, and a scroll drawn out from the end. At Koggiung two fish were taken with the M or W marks, and one with H W or M H. These marks were midway on the side of the fish, brown in color, and apparently the scales were wanting in the wake of the lines, which had the appearance of having been traced with an iron. It is doubtful if young fish can be marked in this manner, and the suggestion is offered that it is possible that the marks may have been produced by the fish lying on a piece of webbing in the bottom of the boat, and that the fish piled on top may, under proper conditions, have furnished sufficient pressure to form the marks.

OTHER SALMON STREAMS IN BERING SEA.

The question is frequently asked whether there are any streams in Bering Sea, other than those of the Bristol Bay region, which carry salmon that may be utilized for commercial purposes. To this no definite reply can be made for the reason that other factors enter into the proposition besides the one of an abundance of salmon. Accessibility is an important factor; feasibility in making a catch, length of season, and climatic conditions are others. It is customary, before building a cannery in a new locality, to thoroughly prospect it first. A saltery is often maintained for several seasons and the values of the streams ascertained. It is known that salmon of different species run in numbers in the rivers on the American side, as far north as the Noatak, which empties into Kotzebue Sound, and it is probable that other rivers emptying into the Arctic Ocean also carry salmon.

The Nushagak is the northernmost river now fished for commercial purposes; to the westward of it is the Togiak, emptying into Kululak Bay, between Cape Constantine and Cape Newenham. The Alaska Packers Association prospected this river by maintaining a saltery near its mouth for two years, seasons of 1895 and 1896, and then abandoned it as unprofitable.

The next large river to the northward is the Kuskokwim, which, so far as known, is not accessible to vessels. The tides in this river are far greater than on the Nushagak, and the entrance is choked with banks and shoals. The census report of 1890 states, page 101:

But a few miles to the northward of Quinhaghamiut [which is 55 miles to the northward of Goodnews Bay, according to the same report] is the present limit of navigation for seagoing crafts, at the mouth of the Kuskokwim, and even that point is reached with difficulty and at considerable risk, owing to shoals of unknown extent and shifting channels; and as at this point the anchorage is entirely exposed to prevailing winds and sea, the Kuskokwim River can scarcely be considered open to commerce. At present but one vessel a year runs in when the indications are favorable to discharge a cargo of goods sent up for the Kuskokwim trade by the Alaska Commercial Company.

The census report of 1880, in relation to salmon on the Kuskokwim, states:

Altogether these people would be in a sorry plight indeed were it not for the abundant supply of salmon during the summer. * * * They all flock together on the banks of the Kuskokwim and fairly line the river with fish traps and drying frames, or poles, and from the beginning of June to the month of August the traps are constantly being emptied and filled again. The quantity of fish secured during the season is very great, even in proportion to the number of inhabitants, but when we consider the wasteful habit of drying the fish until only a small fraction of the original substance remains it can not astonish us to hear the natives compla'n of an insufficient supply. Over 4,000 people lay in the winter supply for themselves and for their dogs during a few months of summer, but it is safe to state that with a more economical mode of preserving the fish four times the number could live in comfort within the same space.

In the next stretch to the northward there are doubtless other rivers carrying salmon, but of these there seems to be no information, until we arrive at the Yukon, and here no exact data is obtainable. The census report of 1880 states, page 11:

The ice came down the Yukon in such masses and in such profusion that it grounded in the deltoid mouth in the month of July so as to form a barrier against the running of the salmon.

Again, in reference to the Yukon, page 73:

We know that the run of the various species of salmon is very large, though not extended over a large period, and also that a large proportion of the catch is preserved by the wasteful process of drying only. * * * As far as the Eskimo race has extended its settlements on the banks of the river, to a distance of from 200 to 300 miles from the sea, the fish-traps already described lie on both banks; but as the mode of fishing affects only such fish as ascend the stream along the banks and eddies, the number of salmon which complete their journey of reproduction without meeting any obstacles must exceed by far the number secured by the natives. In view of the immense width and depth of the river, it seems very doubtful whether any of this immense mass of fish could be secured by fishermen, even were they provided with all the appliances now in use on the Columbia River, in Oregon, and the Sacramento, in California.

This great river we know is not accessible to any seagoing vessel, as none but those of the shallowest draft can enter.

In reference to rivers farther north, quoting from the census report of 1880:

Of the consumption of fish along the Arctic coast of Alaska to the northward of Bering Straits, no reliable data are accessible. The people subsist to a greater extent upon seals, walrus, and the meat of whales. The run of salmon in the few larger rivers is necessarily short, and the fish are much smaller than we find them to the southward; the natives, however, manage to put up during the brief summer a small supply of dried salmon and whitefish.

All the northern rivers probably carry large numbers of salmon, but, owing to their inaccessibility and the shortness of the season, it is doubtful if there is any locality on the American side of Bering Sea, except the Bristol Bay region, where commercial salmon fishing can be profitably conducted until salmon become very scarce. On the Asiatic side, so far as my inquiry extends, the rivers carry the same species of salmon as on the American side, and the fisheries each year are being extended. Large numbers of salmon are dry-salted on the Amur River and shipped to Japan. The Russian Seal-Skin Company, which has large concessions covering eastern Siberia, including Kamchatka, is extending its fisheries year by year. On our recent visit to Kamchatka information was obtained at Petropaulski, from their Russian manager, to the effect that they have been exporting salt salmon for the last three or four years and have now 25 fishing stations, 9 in the Sea of Okhotsk, 9 in the Bay of Avatcha, 4 on the approaches to that bay, and 3 on the outer coast in the vicinity of Cape Tschipunski. The company employs, distributed amongst these stations, 500 Japanese fishermen, who, with their sampans, nets, etc., are brought from Hakodate in the spring and returned there in the fall. The fish are dry-salted, packed in wooden crates of about 120 pounds each, and find a ready market in Japan. In 1899 the company shipped 900,000 salmon. It was the intention of this company to erect a cannery in Avatcha Bay during the year 1900, for operation in 1901.

It was stated that Kamchatka River carried an abundance of salmon of all species; but it is understood that the locality has not been prospected and the commercial value is therefore unknown. Probably all the Kamchatka rivers carry salmon.

The *Albatross* arrived in Bristol Bay July 5, making an anchorage off Cape Grey, the northern entrance point to Ugashik, but, being unable to communicate on account of unfavorable weather, we proceeded the following day to Nushagak Bay, making an anchorage off Protection Point. Expecting to obtain the services of a pilot, but no one appearing, communication was opened with the canneries, some 25 miles distant. On July 8, Mr. P. H. Johnson, the superintendent of all the Alaska Packers Association canneries on the Nushagak, came on board and kindly piloted the vessel to an anchorage in 3½ fathoms, at low water, off the cannery of the Alaska Packing Company; this is the upper cannery on the western shore, immediately below the junction of the Nushagak and Wood rivers. Here it was learned that it was impracticable to carry the *Albatross*, on account of her draft, to the canneries on the Kvichak and vicinity, and, as a cannery tender was about to leave for that section, the commanding officer and two assistants took passage on her and left that day for Kvichak Bay. In no other way could this investigation have been carried on so effectively and in so short a time, and my thanks are due to Mr. Johnson, not only for this courtesy, but for others extended to myself and the officers of this vessel.

NAVIGATION NOTES.

Until a proper survey of the Bristol Bay region has been made, it must be regarded by mariners as a dangerous locality to navigate; it is only by the greatest vigilance and constant use of the lead that disaster can be avoided upon approaching the land. This is especially true of the northern arms and approaches, which receive the waters of the great salmon streams on which all the Bering Sea canneries are located. These rivers are the Egashak, Wood, and Nushagak, emptying into Nushagak Bay; the Kvichak, Lockenuck, Naknek, and Egegak, which empty into

Kvichak Bay; and the Ugashik next to the southward of the Egegak. These rivers are large, and discharge a great quantity of water into wide indentations, locally still retaining the name of rivers, which open on the arms of the great bay. The banks of the rivers are frequently marshy, generally muddy, and the discolored water is charged with a large amount of sediment, which, when deposited, forms the dangers to be encountered.

On account of the funnel-shaped configuration, the tidal currents run with great force, having a velocity, at times, of at least 6 knots, and a rise and fall of from 18 to 24 feet; vast areas of shoals are uncovered at low water, leaving only pools and shallows, with generally narrow channels between. Navigation in the arms and approaches is only successfully accomplished at, or near, high water, even by those thoroughly acquainted with the channels.

From a point about 3 miles to the westward of Cape Grey, the *Albatross* kept along the coast, at a distance of 6 to 8 miles, for 25 miles, and then steered a course to clear the shoals off Cape Constantine. Acorn Peak was made and mistaken for Nichols Hills, but before the latter were well made out we were inside the shoals, as indicated on Coast Survey chart No. 8800, and Cape Constantine was in sight from aloft. After bringing Nichols Hills on a bearing WNW., as advised in the sailing directions, the course was laid for them and an anchorage made in 8 fathoms at low water, with Point Protection bearing SSW., distant 2½ miles. This anchorage, according to directions, is not considered a good one, and, according to the cannery people, should not be selected.

It is regretted that, as our visit to the Nushagak was for only a few days in connection with the special fishery investigation, exact directions can not be given for the navigation of these waters, but, from inquiry and my own limited experience, the following notes may be of service to others. No regular survey has yet been made of this locality. The published charts are not based upon surveys, but are compilations from all available sources, for the most part from sketches, and at best from reconnoissances, so that they should by no means be strictly followed. The mariner must regard these charts as maps and a general guide only.

"Nichols Hills," as indicated on Coast Survey chart No. 8800, and on others, is very misleading. There are no high isolated hills in the vicinity. A line of high bluffs from Egashak River border this shore to the southward, fringed by a narrow belt of marsh, and about 4 miles northwest from Protection Point these bluffs are broken on top into mounds which are the Nichols Hills, locally known as The Knolls. Under average conditions they do not afford a leading mark, as stated, for guidance from seaward, as they rise but little above the bluff line, and it is not believed they can be made out by a stranger in time to avoid the dangers off Cape Constantine.

About 2 miles northwest from Point Protection the bluffs referred to break away to the westward, and are lost on approaching the beach 2 miles south from the same point. Point Protection and its vicinity for several miles is low and marshy, with an occasional low mound and hillock. The flagstaff and pilot station no longer exist. The old Eskimo who formerly piloted the cannery vessels is dead, and a hut in ruins and a grave are all that is left to mark the former site. There are no inhabitants in the vicinity. The nearest village is Ekuk, 15 miles to the northward, on the eastern side of the bay.

The coast between Cape Constantine and Point Protection is generally low. The interior is rolling, broken into high mounds, ponds, and marshes.

Very little is known of the extent of shoal water off Cape Constantine. It is probable that the bottom is much broken and lumpy off the whole entrance to the bay. The *Albatross*, two hours before low water, had several soundings of 5 fathoms, well outside of the bay, in what is considered to be the best water.

On May 20, 1898, the Alaska Packers Association cannery ship *Sterling*, with the spring outfit for Koggiung on board, was lost on the shoals about 5 miles to the southward of Cape Constantine. At the point where the vessel struck, Cape Constantine and Point Protection are in range.

At Point Etolin there is a line of low bluffs, which at three points shows a bald yellowish face, the highest to the westward. The land in this vicinity is generally low. It is said the shoal off Point Etolin does not extend as far offshore as indicated on Coast Survey chart No. 8800. The cannery tenders in running from the Nushagak to the Kvichak usually round Point Etolin by the lead, keeping in 3 or 4 fathoms of water, which they expect to find about 4 miles from the shore.

It is my opinion that a vessel bound for the Nushagak should make Cape Grey, the northern entrance point to the Ugashik, which is high and easily recognized, and from this position take her departure and shape the course for the entrance, favoring the Etolin side in preference to the Cape Constantine side, and using the lead constantly in approaching these shoals. A vessel should arrive in the entrance of the bay midway between Point Protection and Point Etolin, and from this position a course northwest for a distance of 5 miles will carry outside the lower bar, where a stranger must anchor and communicate for a pilot. Judgment must be used in making allowance for tidal currents, and it is needless to say that the right arm of the navigator in this region is the lead.

The following notes, made upon leaving the Nushagak, may be of service. A vessel bound out should leave the upper anchorage two hours before high water, so as to have the best water on the bars. The *Albatross* left the anchorage at the upper cannery at high water and followed the western shore, at a distance of 300 or 400 yards, to the lower cannery on the same side (Bristol Bay Canning Company). After rounding the point below this cannery, the distance from shore was increased to avoid a spit making out from the first valley beyond the point, on which the bark *Wildwood* was lost. Having passed the spit, the western shore was kept well on board, making allowances for the beach that uncovers at low water. A short distance above Coffee Point the *Albatross* laid a course SSE. ⅝ E. for 2.3 miles, then SE. ½ E. for 1.1 miles, which carried over what is known as "The Cross-over" and to Clark Point. The eastern shore was then followed at a distance of one-quarter to one-half mile, and on arriving off Ekuk we hauled sharp across the river bar on a course SW. This course was kept until the cannery at Clark Point came on with the second depression in the distant blue ridge to the northward, and the right tangent of the ridge on the south side of the Egashak River came on with the left tangent of the first high mountain of the ridge beyond the low land. The course was then changed to SE. ½ S., and after running about 3½ miles the outer bar was crossed.

The *Albatross* made the shoal water of the outer bar on the following bearings: Clark Point, N. by W.; Nichols Hills, S. by W.; right tangent of bluff south of the

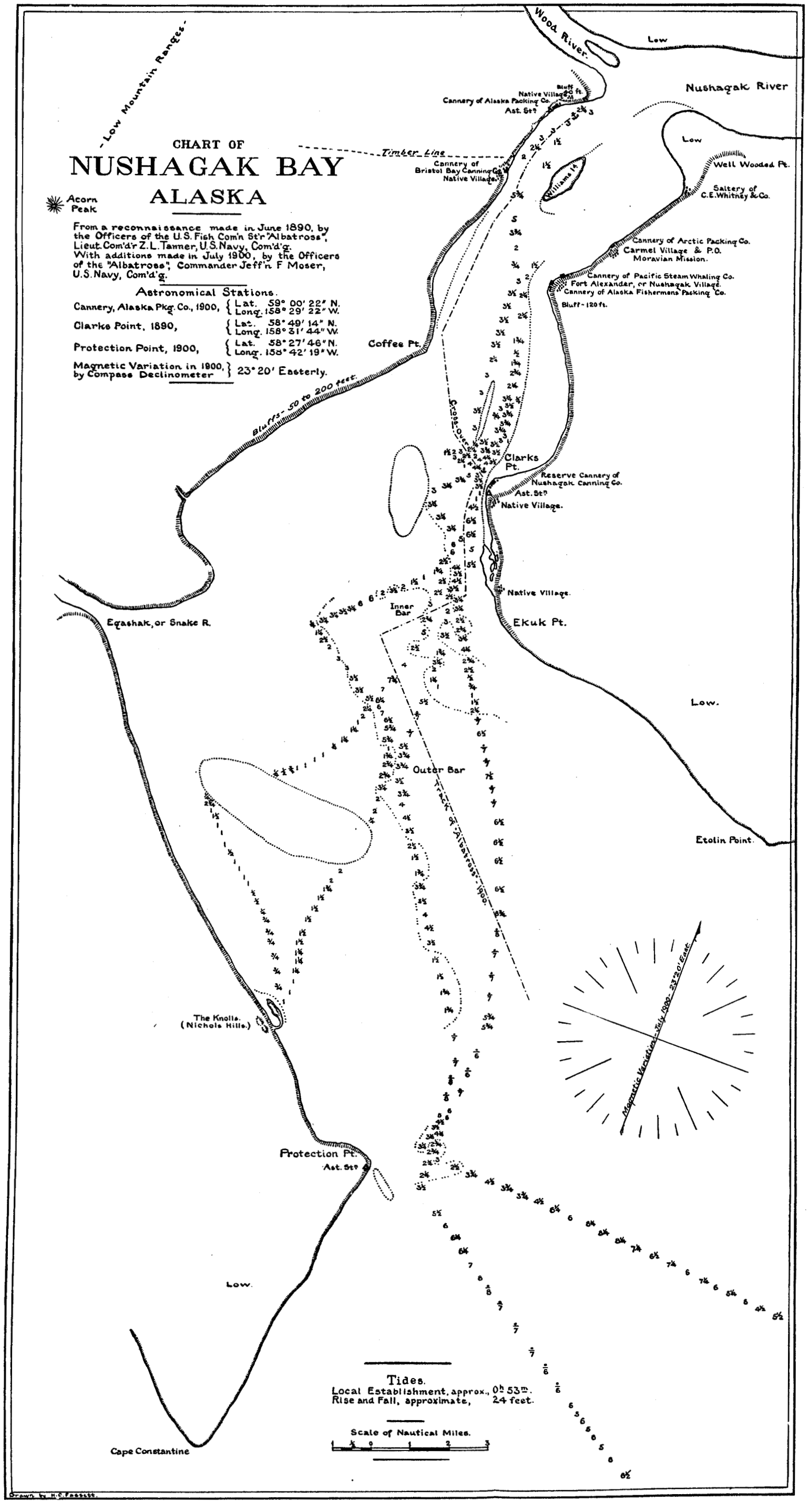


CHART OF
NUSHAGAK BAY
ALASKA
From a reconnaissance made in June 1890, by the Officers of the U.S. Fish Com'n St'r "Albatross", Lieut. Com'd'r Z. L. Tanner, U.S. Navy, Com'd'g.
With additions made in July 1900, by the Officers of the "Albatross", Commander Jeff'n F. Moser, U.S. Navy, Com'd'g.
Astronomical Stations.
Cannery, Alaska Pkg. Co., 1900, Lat. 59° 00' 22" N. Long. 158° 29' 22" W.
Clarke Point, 1890, Lat. 58° 49' 14" N. Long. 158° 31' 44" W.
Protection Point, 1900, Lat. 58° 27' 46" N. Long. 158° 42' 19" W.
Magnetic Variation in 1900, by Compass Declinometer 23° 20' Easterly.
Acorn Peak
Low Mountain Ranges
Wood River
Low
Nushagak River
Bluff 40 ft.
Native Village
Cannery of Alaska Packing Co.
Ast. Stn
Timber Line
Cannery of Bristol Bay Canning Co.
Native Village
Williams Is.
Low
Well Wooded Pt.
Saltery of C. E. Whitney & Co.
Cannery of Arctic Packing Co.
Carmel Village & P.O.
Moravian Mission.
Cannery of Pacific Steam Whaling Co.
Fort Alexander, or Nushagak Village.
Cannery of Alaska Fishermens' Packing Co.
Bluff - 120 ft.
Coffee Pt.
Bluffs - 50 to 200 feet.
Cross-Over
Clarks Pt.
Reserve Cannery of Nushagak Canning Co.
Ast. Stn
Native Village.
Native Village.
Ekuk Pt.
Inner Bar
Egashak, or Snake R.
Low.
Outer Bar
Track of "Albatross" 1900
Etolin Point.
Magnetic Variation - July 1900 - 23° 20' East.
The Knolls. (Nichols Hills.)
Protection Pt.
Ast. Stn
Low.
Tides.
Local Establishment, approx., 0h 53m.
Rise and Fall, approximate, 24 feet.
Scale of Nautical Miles.
Cape Constantine
Drawn by H. C. Fassett.

Egashak River, W. ⅝ N. From the outer bar the cannery vessels are said to steer SE. by S. to sea. The *Albatross*, with an ebb tide, steered SE. until clear of all shoals, and then laid her sea course. On a sketch made of this locality by the *Albatross* in 1890, a few additions have been noted and the approximate track of the *Albatross* in July, 1900, has been plotted, all of which may be of service.

The following observations were made, using an artificial horizon:

Protection Point.—Latitude, 58° 27′ north, 5 sets circum-meridian altitudes. Longitude, 158° 42′ 19″ west, mean of 15 post-meridian altitudes.

Upper cannery, Alaska Packing Company, 150 yards southwest of cannery building.—Latitude, 59° 00′ 22″ north, 2 circum-meridian and 1 meridian altitude. Longitude, 158° 29′ 22″ west, mean of ante-meridian and post-meridian sights. Variation, by compass declinometer, 23° 20′ E.

From three days' observations, near neap tides, at the upper cannery, the approximate establishment is 0 h. 59 m.; approximate rise and fall, 21.55 feet. But as the former observations of the *Albatross* were probably for a longer series, that data has been retained on the chart, viz, local establishment, approximate, 0 h. 53 m.; rise and fall, approximate, 24 feet.

NUSHAGAK RIVER (TAHLEKUK).

This river, with its headwaters and tributaries, is not well known, and but little definite information could be obtained at the canneries, where it is locally referred to as the Main River. The system drains the hills and mountains between lakes Clark and Iliamna on the east and the Kuskokwim on the west. Above Kakwok, about 50 miles from the mouth, it receives a tributary from the westward which is the outlet of Lake Tikchik, and possibly a chain of lakes extending toward the Kuskokwim. This lake is by some referred to as Lake Nushagak, but the main river seems to extend to the northeast, where it has many tributaries and is known as the Mulchutna. According to the census report of 1890, page 92—

> The watershed between the Nushagak Valley and the Iliamna Basin is low and dotted with lakes and ponds, the general characteristics of these slopes being the same near the divide. * * * The whole Nushagak, or, better, Tahlekuk River Valley, including Tikchik River and Lake, is densely wooded with trees not more than a foot in diameter, which, however, increase in size as the upper courses are reached, so that on the Mulchutna and the Kokhtuli (Forest) rivers exceptionally large trees may be found in numbers.

The river on its lower course is large, and flows a great quantity of water into the head of Nushagak Bay, where it forms a junction with Wood River.

Fishing on the Nushagak is carried on entirely by traps and gill nets, and, for king salmon, commences from June 6 to 16, depending upon the season; at the large canneries fishing for this species is finished by June 30. They run scatteringly throughout the whole season, but after the redfish come in in abundance, the king-salmon gear is taken in and those found in the traps and the stray ones taken in nets are used fresh; the surplus bellies salted are for private use. The smaller canneries, however, pack the king whenever a sufficient number accumulate to make a few cases.

The redfish run in sufficient numbers to commence packing from June 16 to 20, and they are expected to run until July 20 to 25. This year the redfish run was so large that the gill-netters were limited. It is said that they supplied nearly all the fish, and of the number packed only 20 per cent were taken from traps.

Occasionally there are a large number of dog salmon, and in the early part of the season, before the redfish run strong enough to keep the full force employed, some are packed under pink-label brands. Scattering dog salmon are taken throughout the season. There is a prejudice against these fish, caused, it is believed, by the name. The sea run, in my opinion, is a very good fish, and many are consumed fresh every year, but not under that name.

At intervals of several years there is a large run of humpbacks, but so little attention is paid to this species that the date of the run is not available, but, approximately, from the middle of July to the middle of August covers the period.

Cohoes are not plentiful, and are not regularly packed. Occasionally a bunch is captured large enough to induce the canner to turn the machinery on a few hundred cases. They usually commence to run early in August, and continue after the cannery is closed, probably until after cold weather sets in.

There are no steelheads and no sturgeon. Trout are plentiful, and occasionally a shad has been taken, so it is said; sole and smelt also are taken.

WOOD RIVER AND ALEKNAGIK LAKE.

The commanding officer examined the river for a distance of 15 miles, and Lieutenant Rodman, with the steam launch, made a running sketch of the river and lake. It is from Lieutenant Rodman's notes that the following remarks are largely written, and reference is made to the sketch accompanying the report.

Wood River empties into the head of Nusnagak Bay at its junction with the Nushagak River, about 1¾ miles above the cannery of the Alaska Packing Company. The mouth is much obstructed by shoals and flats, making the entrance difficult at low water, even for small boats, without local knowledge. Its length to the lake entrance is about 24 miles; the width at the mouth is about three-fourths mile, and thence for 15 miles it varies from 600 to 200 yards; above, it narrows very much until, arriving at the lake entrance, it has a width of about 50 yards. The left bank, for a distance of about 16 miles from the mouth, is a low marshy plain, treeless until the upper part of the stretch is reached, where small clumps appear. The right bank is generally low, with bluffs bordering the stream in places, or separated from it by a belt of marsh land from one-fourth to one-half mile in width. The bluffs and the high rolling land back from the river are wooded with spruce, broken here and there by tundra flats. The banks on the upper course are high and more heavily wooded, the last 2 miles lying between steep banks from 100 to 200 feet high.

There are three low islands in the lower part of the river and one in the upper part. The first is about a mile from the mouth and is over a mile in length; the second and third are 8½ and 9½ miles respectively from the mouth, each situated in a sharp bend. In ascending, these islands are left to the eastward. The fourth is very small, about 20 miles from the mouth, and should be left to the westward.

The banks and bottom are of mud and gravel. In the upper course there are a number of sand and gravel bars, extending entirely across the channel, but it is probable that 2 feet can be carried across them at any time. For the first 15 miles the water is discolored and muddy, but above this it is usually clear, though at high-water spring tides the discoloration continues farther up. About 10 miles from the mouth it receives as a tributary the Maklau River, which is said to be about 8 miles

long. From 3 to 3½ feet can be carried up the river at low water for a distance of 15 miles, and thence to the lake not more than 2½ feet, though at high water 4 feet can be carried this distance. Local knowledge is required in its navigation at all stages of the tide, to avoid the numerous shoals and bars. The channel crosses and recrosses the river, and while the best water can usually be found on the outer course of the bends, this is not always the case.

Fifteen miles from the mouth there is a rise of tide, on the springs, of about 12 feet, at which point it is either slack or ebb current for about nine hours on each full tide, and at the lake entrance it rises about 1½ feet, but, from the size of the lake, there can be no material change in its water level due to tidal influence.

A current of about 3 knots sets out of the lake at all times and a continuous set of not less than 2 knots down the upper course. The flood current reaches a point about 18 miles from the mouth.

The head of the river flows from a shallow basin, about a mile in diameter and 1 to 2 fathoms deep, with a sandy and gravelly bottom, and at the head of this basin is a passage, several hundred yards in width, marked by low gravel tongues making out from either side, which opens upon the lake proper.

The lake is about 24 miles long, the general direction being northwest by west, and has an average width of about 2 miles.

Generally speaking, the shores are mountainous, the estimated heights ranging from 500 to 2,500 feet, those on the north, where a long flat-topped ridge parallels the shore for a distance of at least 10 miles, being the highest. The southern shore for the first 3 or 4 miles is low and rolling, with alternate open flats and woods running back several miles to the mountains. From the middle of the southern shore a narrow peninsula, about 6 miles long and 500 feet high, with a rise of 700 to 800 feet at each end, parallels the general axis of the lake and forms a deep narrow bay about three-quarters of a mile wide. The country generally is well wooded, though the mountain tops are bare.

There are many islands in the lake scattered throughout its length, mostly along the northern shore and extending to within 6 miles of the head. The large ones are well wooded, and, along the northern side, blend with the mainland, making them difficult to distinguish when seen from a point along the middle line of the lake.

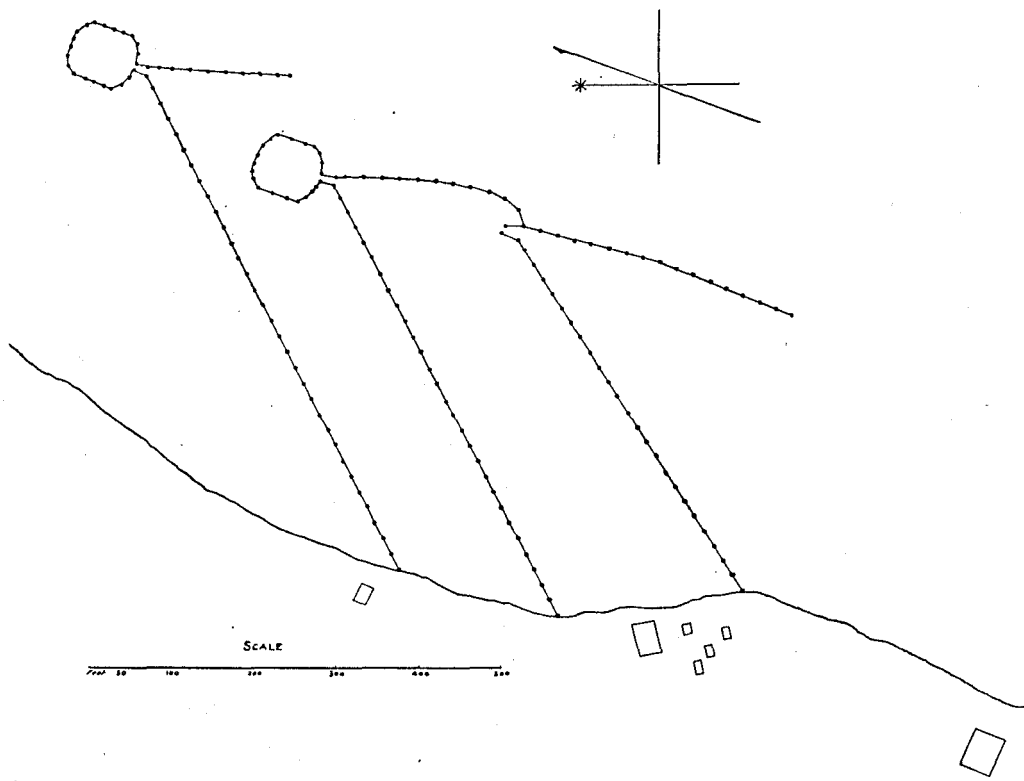
Along the center line the water appears deep; soundings were obtained in from 9 to 35 fathoms, but between some of the islands gravel bars with less than 2 feet obstructed the passage.

The water is clear; the bottom, when visible, is gravelly with small bowlders, but clean and free from grass. Gravel banks are found along the main and island shores, even bordering the rocky outcrops.

The main feeder is on the northern shore about 6 miles from the head; it is about 50 yards wide at the mouth, and 3 or 4 feet deep, and flows from the northward. It is said this stream is the outlet to two more lakes. At the head of the lake entering from the westward is a small feeder which is about 20 yards wide at the mouth and 3 feet deep. The other feeders indicated on the sketch were not visited for want of time; they were simply reported to exist, and are said to be small. Apparently the feeders flow through valleys of gentle declivity, as no falls or strong rapids were noticed, nor were any cascades seen in the mountains.

There is a village on a low sandy flat at the head of Wood River, at the northern entrance to the basin, and a second village at the mouth of the main feeder on the western shore. A large amount of salmon is taken and cured by the natives near these places and at several other points on the northern shore.

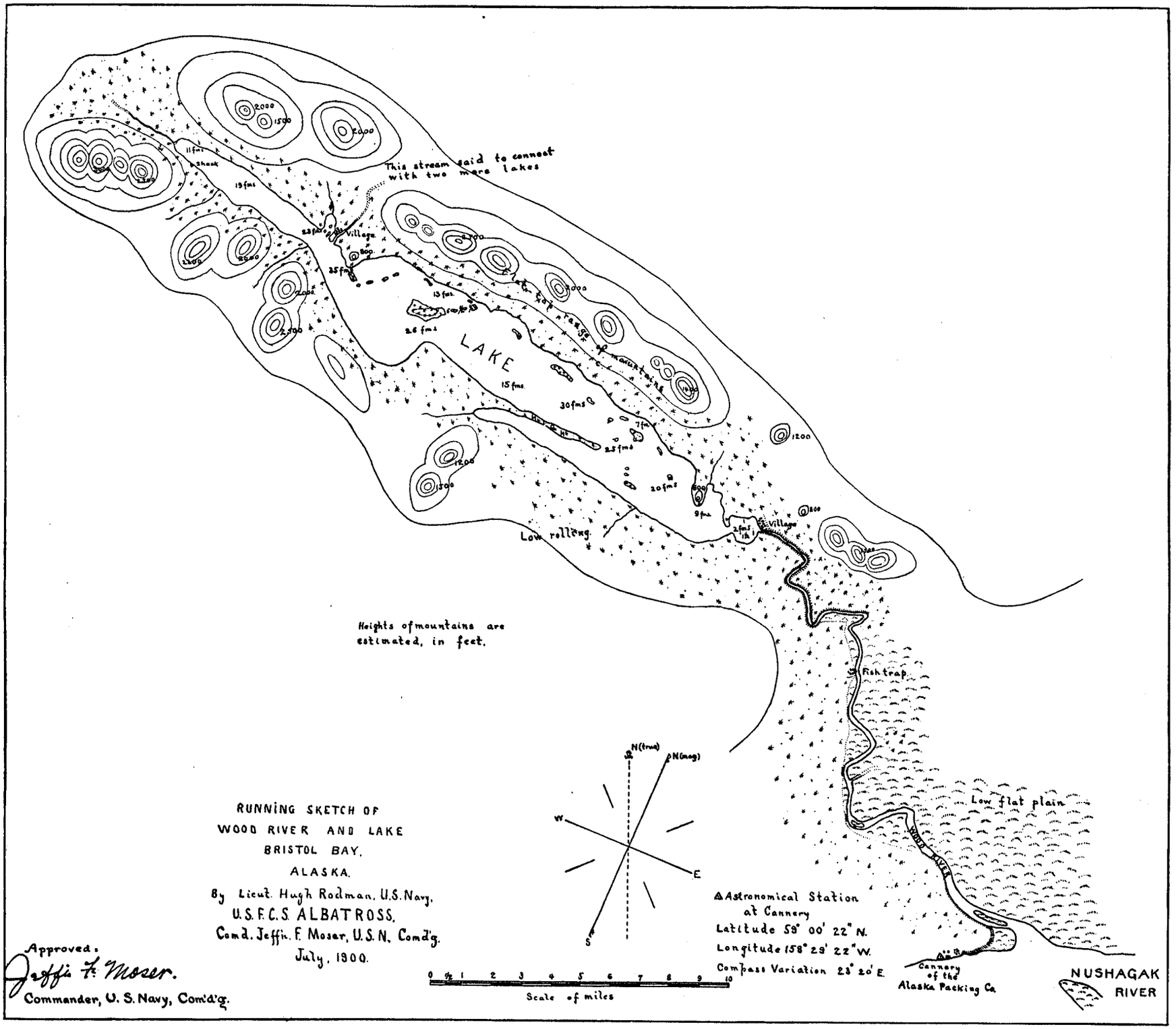
It is said that both Dolly Varden and cutthroat trout are taken on the lake. Salmon were present in very great numbers and were not only seen jumping from the surface of the lake, but, when the bottom was visible, great schools could be seen both near and away from the streams. Around the mouths of the streams they appeared in masses and a great many were noticed in Wood River ascending to the



Fish trap in Wood River, about 15 miles above mouth.

spawning-ground. In and around the feeders they had turned deep red in color, and it was particularly noticed that they seemed free from signs of injury or disease, due, doubtless, to the scarcity of obstructions in the river.

Time did not permit specific investigation relating to hatcheries, as such work would probably have to extend over quite a period in order to report with any degree of intelligence, but the general situation seems to be favorable. The basin at the outlet would make an excellent retaining-pond for ripening the fish, and, with pure water near by, two of the hatchery problems would be solved. The temperature would probably be the drawback, and some method would have to be adopted for warming the hatching water during the fall and winter.



RUNNING SKETCH OF
WOOD RIVER AND LAKE
BRISTOL BAY,
ALASKA.
By Lieut. Hugh Rodman, U.S. Navy,
U.S.F.C.S. ALBATROSS,
Com'd. Jeffn. F. Moser, U.S.N. Com'd'g.
July, 1900.

Approved:
Jeffn F. Moser.
Commander, U. S. Navy, Com'd'g.

On the western bank of Wood River, about 15 miles from its mouth, is a trap and a trap house. This trap is the largest that was seen in the Bristol Bay district and is rather a complex arrangement. It has 2,700 feet of leads, with two hearts, 75 by 75 feet, and a corral. A description of it is rather difficult, and reference is therefore made to the sketch.

NUSHAGAK CANNERIES.

All the canneries on the Nushagak are located on the upper end of the bay, two on the western side, and four, besides a large saltery, on the eastern side; and, if one which has not been in operation since 1891 is excepted, all are within 6 miles of the mouth of the river. A brief history of the canneries was given in the report of 1897, page 173, but, as the district had not then been visited, the data was incomplete. In order to cover the whole subject in this report, it is deemed advisable to give the history anew, even at the expense of some little repetition.

On the Nushagak this year (1900) there were five operating and one reserved canneries, and one saltery, as follows: Arctic Packing Company, Nushagak Canning Company (reserved), Bristol Bay Canning Company, and the Alaska Packing Company, all belonging to the Alaska Packers Association; the Nushagak Cannery of the Pacific Steam Whaling Company, and the Alaska Fishermen's Packing Company. The saltery is known as the C. E. Whitney & Co. station.

Arctic Packing Company.—In 1883 the schooner *Neptune* was sent by Mr. Rohlfs to prospect for fish on the Nushagak, and a large number of redfish salted. The same year cannery buildings were erected for the above-named company, and in 1884 an experimental pack of 400 cases was made. This is the first cannery that operated in Bering Sea. It has made a pack every year to date, excepting 1892, when it joined the pool of the Alaska Packing Association and was closed; in 1893 it became a member of the Alaska Packers Association. The cannery is located on the eastern shore 1¾ miles above Fort Alexander, at a place called Kanulik, and known as the Mission. The Moravian mission and the village are situated on the bluff overlooking the cannery. The Nushagak post-office is also located at this point. The capacity of the cannery was increased this year and now has a daily output of 2,400 cases.

Alaska Packing Company.—This company was organized at Astoria, and in the spring of 1886 sent a cannery outfit on the schooner *Sadie F. Caller* and the brig *Courteney Foard* to the Nushagak, where a cannery was built at the head of the bay on the western side, at the village of Kanakanek (also called Chogiung) about 1½ miles below the junction of the Wood and Nushagak rivers. It made a pack that year and every year since to date. It entered the pool of the Alaska Packing Association in 1892, and became a member of the Alaska Packers Association in 1893. The capacity was increased this year, and it now has a daily output of 2,400 cases.

Bristol Bay Canning Company was organized in San Francisco and built a cannery in 1886 on the western shore of Nushagak Bay, in a bend about 2 miles below the cannery of the Alaska Packing Company. It made a pack that year and every year to date. In 1892 it entered the pool of the Alaska Packing Association, and in 1893 became a member of the Alaska Packers Association. The capacity was increased in 1900, and it now has a daily output of 2,400 cases.

Nushagak Canning Company built a cannery on the eastern shore of Nushagak

Bay in 1888, at a place called Stagarok (also known as Clark Point), 5½ miles below Fort Alexander and 3 miles above Ekuk. It was operated in 1888, 1889, 1890, and 1891, but has not since been used. In 1892 it joined the pool of the Alaska Packing Association, and became a member of the Alaska Packers Association in 1893. This cannery is held in reserve and at present is used as a fishing station.

These four canneries are all owned and (except the reserve cannery) operated by the Alaska Packers Association, under one local management. There is a foreman at each cannery, all under the orders of one superintendent, Mr. P. H. Johnson, who resides, during the packing season, at the cannery of the Alaska Packing Company, where he is in communication with all the canneries. The greatest distance between any two in operation is 4 miles in a straight line, but on account of shoals and banks long detours are necessary in going from one to another. The association now contemplates establishing a telephone service to connect the several establishments.

The supplies are common to all the canneries of this system and are kept at the Alaska Packing Company's cannery, where there are large storehouses and considerable machinery for work in wood and metal. The fish are distributed so as to give each one a supply in order to keep all in full operation. In the statistics the pack only is kept separate. Until the present year the canneries had each a two-filler outfit, but in the spring of 1900 an additional filler was installed, and each has now a daily capacity of 2,400 cases. They all have practically the same machinery for processing the fish, which consists in each of 8 retorts, 3 fillers, 3 toppers, 2 solderers, and 1 cutter, with spare ones at headquarters to supply breaks. There are no fish-hoists or elevators; fish are pewed from boats and lighters, at low water, to platforms, and thence to fish-house, and, after cleaning, are conveyed in cars to the cutters.

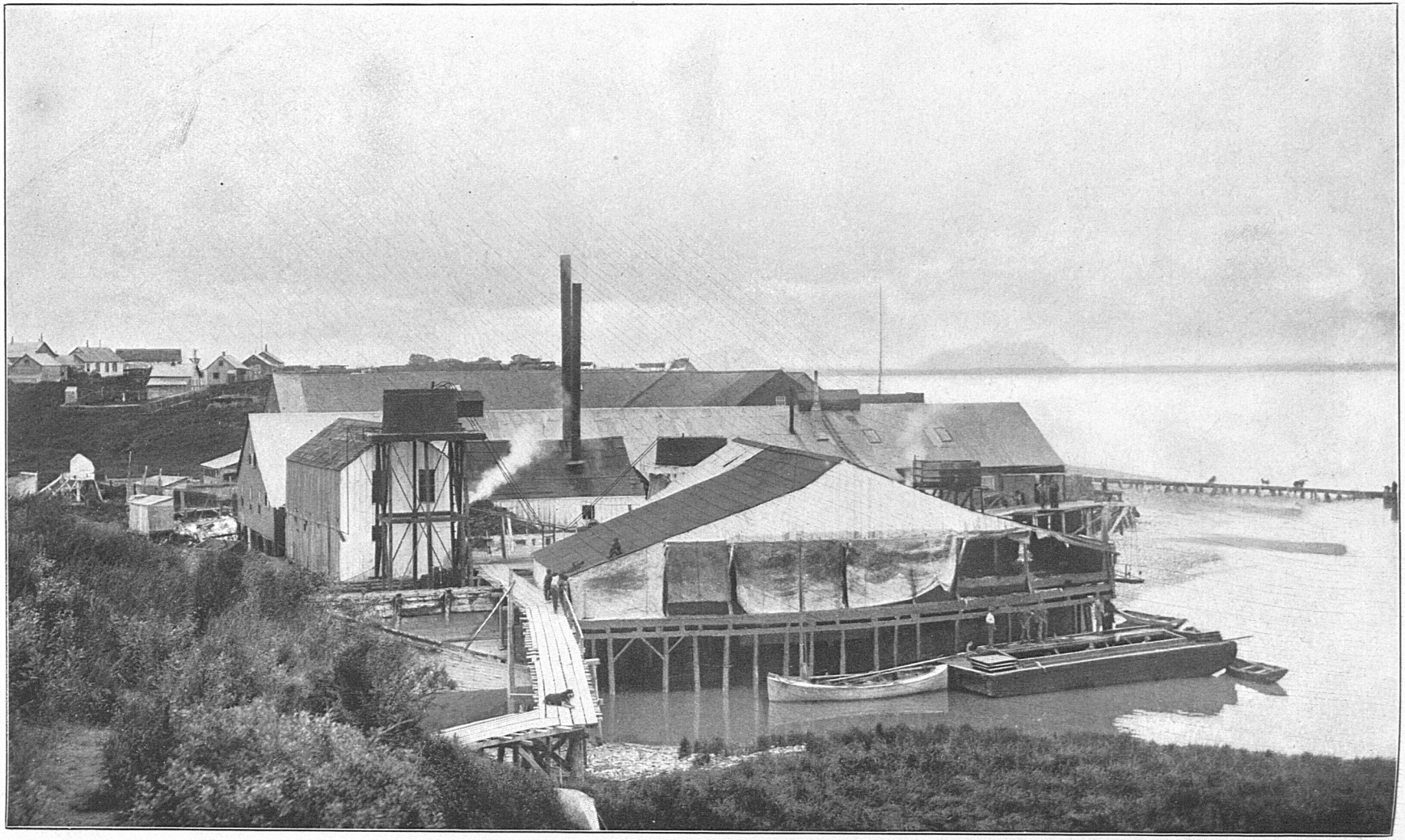
About 33 per cent of the cans are made at the canneries and the rest brought from San Francisco; 100-pound domestic tin plate is used for tops and bodies. A few can-making machines were supplied in 1900, but at the time of our visit had not been set up. It is hoped eventually to make all cans at the canneries. All transportation is done by the association's own vessels, or by chartered vessels, all of which are kept moored during the season in the channels of the bay near the canneries.

The Chinese and the fishermen's contracts, and native wages for this district, have been given on preceding pages.

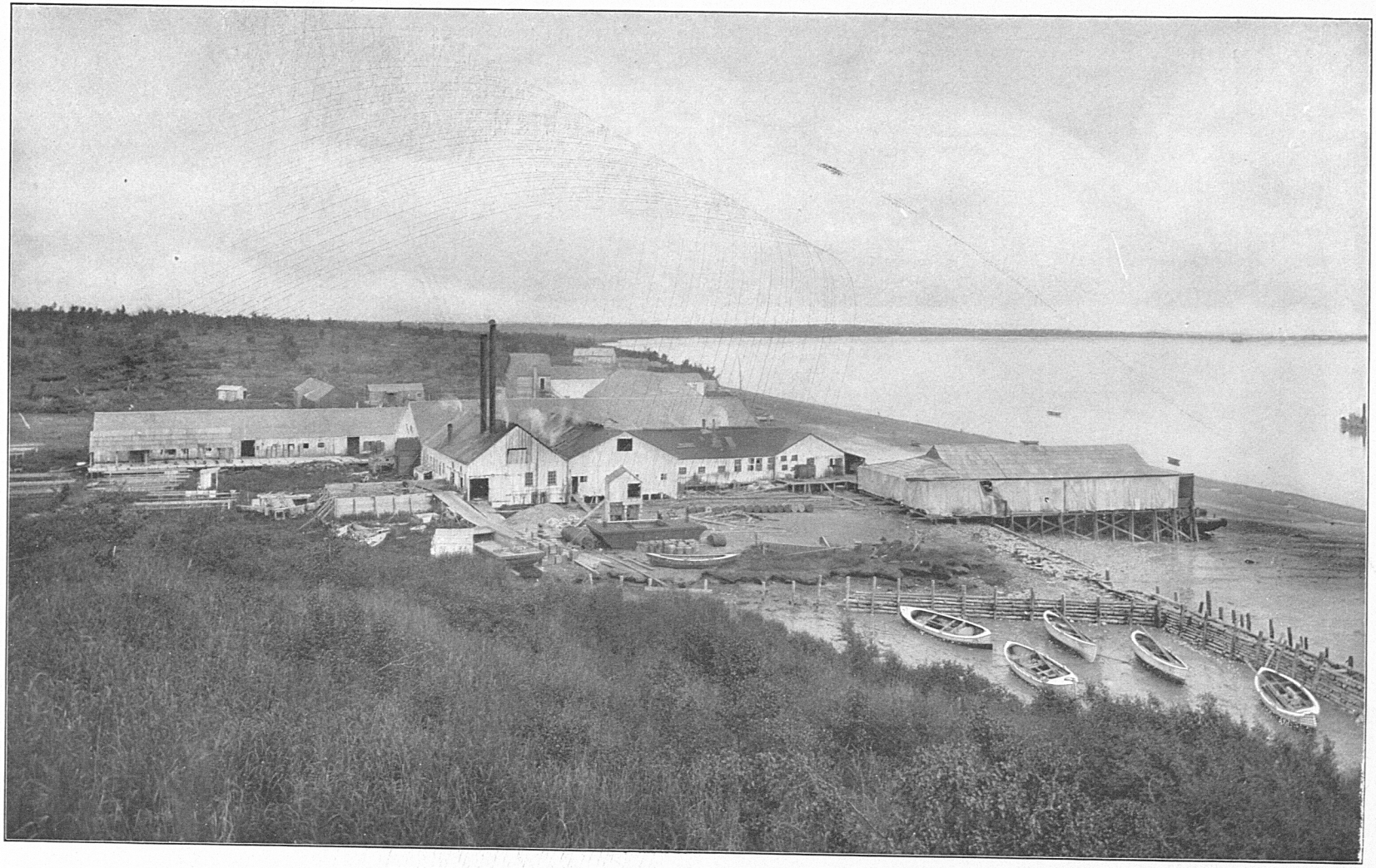
The Alaska Packers Association has in its employ a physician and surgeon, who attends to the employees of the association. His office and dispensary are at the cannery of the Alaska Packing Company.

In 1900 the three operating canneries of the Alaska Packers Association employed 215 white fishermen, 66 white cannery-hands, 450 Chinese, and 75 natives. They used two sets of gill nets, 80 nets in each set, for redfish, each net 75 fathoms long, 24 meshes deep, and 6⅛-inch stretched mesh; 1½ sets of gill nets, 80 nets to each set, for king salmon, each net 125 fathoms long, 24 meshes deep, and 9¼-inch mesh; value of all about 65 cents per fathom. Besides these they had on hand a large quantity of web and material for making nets.

They used four traps—one at Clark Point, and one on the right bank of the Nushagak above the junction, each having a shore lead 500 feet long and an outside lead 350 feet long, with a square pot 40 feet by 40 feet; one trap, immediately below the cannery of the Alaska Packing Company, on Nushagak Bay, had leads 50 feet and



CANNERY OF ARCTIC PACKING COMPANY (A. P. A.), NUSHAGAK BAY.

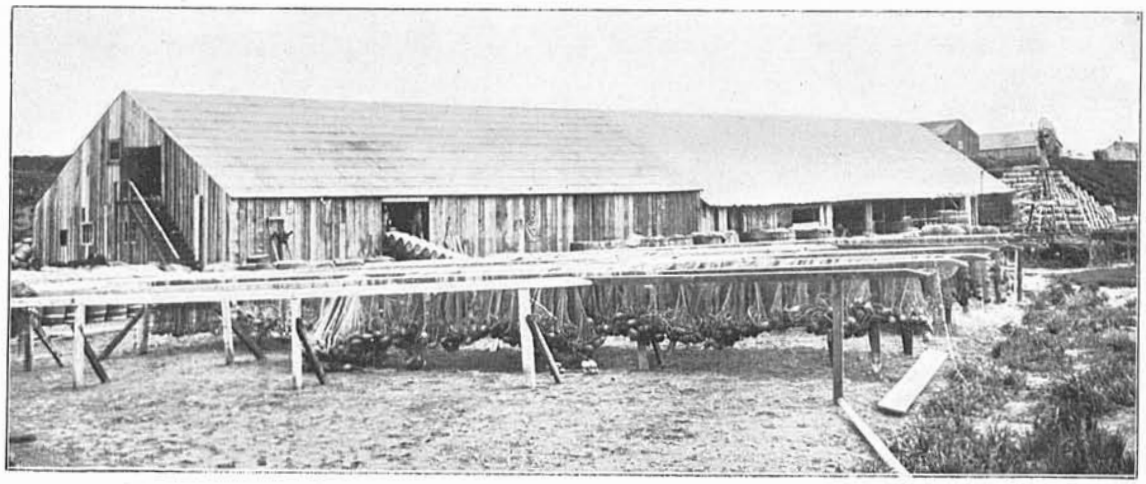


CANNERY OF BRISTOL BAY CANNING COMPANY (A. P. A.), NUSHAGAK BAY.

View from bluff to eastward.

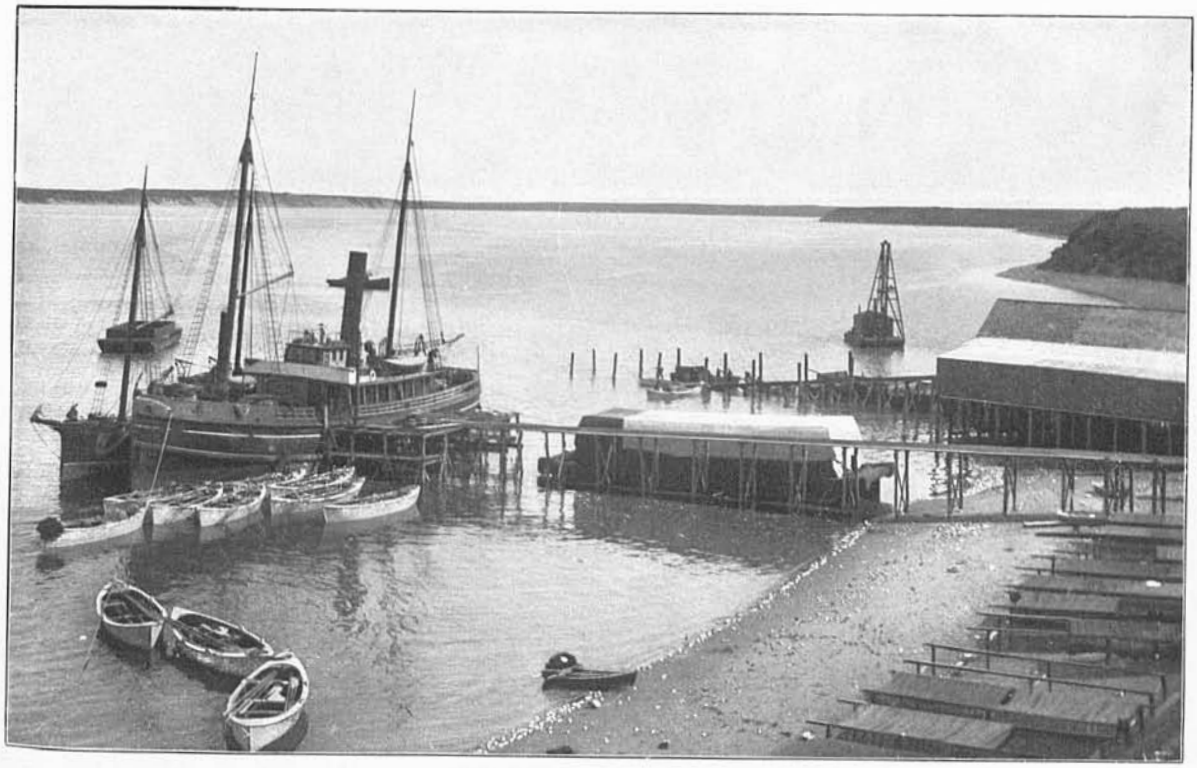
Bull. U. S. F. C. 1901. (To face page 202.)

CANNERY OF PACIFIC STEAM WHALING COMPANY, NUSHAGAK BAY.



SALTING STATION OF C. E. WHITNEY & CO., NUSHAGAK BAY.

View from bank to northward.



ARCTIC PACKING COMPANY (A. P. A.), NAKNEK RIVER.

View of wharf, steamers, fish railroad, etc.

300 feet, pot 40 feet by 40 feet; and the large trap on Wood River which has previously been described. These traps must cost from $1,200 to $1,500 each, except the Wood River trap, which can hardly have been completed under $4,000.

The following boats were used: 18 lighters, value, $600 each; 25 skiffs, $30 each; 80 Columbia River gill-net boats, $200 each, and 2 pile-drivers, $1,200 each.

The following vessels were employed:

Class and name.	Tons.	Crew.	Value.	Owned or chartered.
Steamer Polar Bear	28	5	$12,000	Owned.
Steamer Queen	18	3	10,000	Do.
Launch Amy S	5	2	4,000	Do.
Launch Tyone	5	2	6,000	Do.
Ship Oriental	1,550	(1)	55,000	Chartered.
Ship Eclipse	1,469	(1)	35,000	Do.
Ship Tacoma	1,671	(1)	60,000	Owned.

[1] Fishermen.

The following was the output in 1900:

Species.	Alaska Packing Co.			Arctic Packing Co.			Bristol Bay Canning Co.		
	Cases.	No. to the case.	Dates.	Cases.	No. to the case.	Dates.	Cases.	No. to the case.	Dates.
King salmon	2,543	3	June 17-June 25	3,530	3	June 15-June 25	2,256	3	June 17-June 28
Redfish [1]	56,228	13	June 25-July 24	57,230	13	June 23-July 23	57,079	13	June 20-July 25
Cohoes	332	13	July 21-July 24	1,254	13	July 22-July 23	931	13	July 23-July 23
Dog salmon	1,694	13	June 19-June 27	1,921	13	June 19-June 27	2,331	13	June 23-June 27

[1] The Alaska Packing Co. also put up 1,420 barrels and 698 half barrels, averaging 50 to the barrel.

The Nushagak Cannery, of the Pacific Steam Whaling Company, is located on the eastern shore of Nushagak Bay at Fort Alexander, which is also known as Nushagak Village. The cannery outfit was transported by vessels of the company and arrived on the Nushagak April 12, 1899. The erection of the buildings was commenced at once and the cannery was ready for work June 8. A pack was made in 1899 and in 1900. It is a modern cannery, well built and equipped, has good light, and is clean and airy. The capacity is 1,600 cases per day. The cannery machinery consists of 4 large retorts (90 cases each), 2 fillers, 2 solderers, 1 topper, and 1 cutter. Fish are pewed from lighters and boats to the fish-house, and, when cleaned, are carried to the cannery by a conveyor consisting of an endless chain of buckets passing under a shower. Fifteen per cent of the cans used this year were made at the cannery, the remainder being transported. One-hundred-pound tin plate was used for tops and bodies, 20 per cent of which was imported. It is proposed to increase the capacity of the cannery to three fillers and to install can-making machinery.

The fishermen's and the Chinese' contracts and natives' wages were the same as previously noted. In 1900 the cannery employed 56 white fishermen, 10 white cannery-hands, 35 natives, and 100 Chinese.

The cannery used for redfish two sets of gill nets (25 to a set), each net, length 75 fathoms, depth 24 meshes, 6¼-inch mesh; and for king salmon two sets of nets (22 in a set), each net, length 125 fathoms, depth 24 meshes, 9¼-inch mesh; value of all, 65 cents per fathom.

The following boats were used: Six lighters, value, $300 each; 4 skiffs worth $30 each, and 25 Columbia River gill-net boats worth $200 each.

The following vessels were employed:

Class and name.	Tons.	Crew.	Value.	Owned or chartered.
Steamer Rattler	15	2	$4,500	Owned.
Bark Undaunted	1,647	(1)	60,000	Chartered.

[1] Fishermen.

The following was the output in 1900:

Species.	Cases.	No. to the case.	Dates.
King salmon	2,291	3.6	June 12–July 22.
Redfish [1]	39,223	13	June 22–July 22.
Dog salmon	1,873	13	June 20–July 1.

[1] Salted, 415 barrels redfish, 48 to the barrel.

The Alaska Fishermen's Packing Company, of Astoria, built a cannery immediately below that of the Pacific Steam Whaling Company in the spring of 1899. The canning outfit arrived May 27, and the plant was ready for operation June 25. They made a pack in 1899 and in 1900. The cannery has a daily capacity of 1,600 cases, and the following machinery is used in processing the fish: Six retorts (capacity, 47 cases each), 2 fillers, 2 toppers, 1 wiper, 2 solderers, and 1 cutter; 28 per cent of the cans were made at the cannery, using 100-pound domestic tin for bodies and tops. The fish are pewed to the fish-house and the cleaned fish then transferred by cars to the cutter.

In 1900 the cannery employed 55 white fishermen, 7 white cannery-hands, 35 natives, and 93 Chinese.

They used for redfish 30 gill nets, each 70 fathoms long, 30 meshes deep, 6¼-inch mesh; for king salmon, 25 gill nets, each 70 fathoms long, 22 meshes deep, 10-inch mesh; all valued at 75 cents per fathom.

The following boats were used: Four lighters, value, $700 each; 3 skiffs, value, $30 each; 17 Columbia River gill-net boats, value, $200 each.

The following vessels were employed:

Class and name.	Tons.	Crew.	Value.	Owned or chartered.
Steamer North Star	34	4	$15,000	Owned.
Bark Harry Morse	1,241	(1)	20,000	Chartered.

[1] Fishermen.

The output of the cannery for the year 1900 was as follows:

Species.	Cases.	No. to the case.	Dates.
King salmon	1,990	3	June 15–July 22.
Redfish [1]	38,100	12.5	June 25–July 22.

[1] Salted, 445 barrels and 105 half-barrels of redfish, 48 to the barrel.

Saltery of C. E. Whitney & Co.—This saltery was built and operated by the Bristol Bay Canning Company, on the Egashak (Snake) River in 1886; three years later three fishermen acquired each a one-quarter interest and moved the outfit to the mouth of the Nushagak. Upon the formation of the Alaska Packers Association, Messrs. C. E. Whitney & Co. purchased the one-quarter interest of the Bristol Bay Canning Company, and also that of one of the fishermen, and in 1895 purchased another quarter. In 1899 the firm became the owner of the saltery by purchasing the remaining quarter. The saltery was moved to its present site about 1892. It is the largest in Alaska and is located on the eastern shore of the Nushagak Bay, 4½ miles above Fort Alexander, at a point where the bluff recedes and the long, broad low point commences to make out to form the head of the bay.

The following are the statistics for 1900: 62 whites employed as fishermen, trapmen, saltery hands, etc., and 3 natives.

Fishing gear: One trap, near the saltery, having leads of 150 feet and 50 feet, with a pot 20 feet by 20 feet; 14 gill nets, for redfish, each 85 fathoms long, 23 meshes deep, 6¼-inch mesh; 14 gill nets, for king salmon, each 120 fathoms long, 25 meshes deep, 9¼-inch mesh.

Boats, lighters, etc.: 3 lighters, valued at $500 each; 5 skiffs, value, $30 each; 14 Columbia River boats, value, $200 each.

The following vessels were employed:

Class and name.	Tons.	Crew.	Value.	Owned or chartered.
Steamer Usok	7	2	$3,000	Owned.
Barkentine Willie R. Hume	589	(1)	25,000	Chartered.

[1] Fishermen.

The pack was completed very early on account of the large run of fish, and on July 17 the vessel was loaded and ready for sea.

The saltery output for 1900 consisted of 536 barrels of king salmon, June 14 to July 11, 14 to the barrel; 7,186 barrels of redfish, June 14 to July 11, 50 to the barrel.

The following is the output of the saltery from 1889 to date:

Year.	No of barrels.	Year.	No of barrels.
1889	250	1895	1,043
1890	400	1896	1,741
1891	700	1897	2,436
1892	1,000	1898	4,112
1893	1,400	1899	6,225
1894	650	1900	7,722

About 90 per cent of the pack consists of redfish; the remaining 10 per cent is made up of king salmon and cohoes—very few of the latter.

THE KVICHAK.

The large arm at the head of Bristol Bay, extending to the northeast and bounded on the south by a line from the southern entrance point of Egegak River to Etolin Point, has been designated in a previous paragraph as Kvichak Bay. The upper

part of the bay is very shoal, and as the current is strong it can be safely navigated only by small vessels built to resist the shock of repeated grounding. It is said that the banks from the Etolin side project halfway across the bay, and, with those from the peninsula side, confine the channel to a comparatively narrow limit. A seagoing vessel, however, under skillful guidance and with local knowledge, may reach a point a few miles below the mouth of the Naknek River, which is about 30 miles below the head of the bay; but some cannerymen, considering the risk too great to carry their transport vessels even to the mouth of the Naknek, leave them there for the season.

Above the mouth of the Naknek River the shoals begin to extend across the channel, and as a point higher up is reached the whole bay, at low water, is filled with uncovered banks having shallow, narrow channels winding through them.

At the head of the bay is the mouth of the Kvichak River, which is the outlet to the great lakes, Iliamna and Clark, lying on the western side of the mountain system bordering Cook Inlet. Very little is known of this lake region, as it has been visited by very few white men.

Mr. A. B. Schanz, the census enumerator of this district for 1890, and Mr. John W. Clark, of the Alaska Commercial Company, ascended the Nushagak and, taking one of the tributaries, made a portage to the Chultina, which was followed to Lake Clark. A description of the source of the Kvichak is given in the Census Report of 1890, page 92. From it the following quotation is made:

> We discovered Lake Clark on the morning of Sunday, February 15, 1891. It is a typical Alaskan mountain lake, for it has all the characteristics in a marked degree. It is very long, very narrow, very irregular, and very deep, and is surrounded on all sides by high mountains. It is nearly 70 miles long, is at the widest point hardly 10 miles wide, and is crooked and very full of bays and bights. We tried in vain, with a sounding line over 100 fathoms long, to find its bottom; and the mountains hemming it in tower in altitude from 5,000 to 12,000 feet. The general direction of the lake is northeast and southwest, and extends from the base of the Alaskan range bordering Cook Inlet to the one hundred and fifty-fifth meridian. The longitude of the geographical center of the lake is about 160° 15′ W. It has five noteworthy affluents, and its outlet, the Noghelin River, was found to be an important stream of great volume, open throughout the winter on account of its force, and running generally almost due south. The Noghelin supplies the great Lake Iliamna with its vast store of crystal water, the source of which has hitherto been absolutely unknown to geographers.
>
> Lake Iliamna is the largest lake thus far discovered in Alaska. Its greatest length is about 90 miles, and its greatest width about 40. It therefore extends over one-half the width of the peninsula, and together with its outlet, the Kvichak River, it provides a waterway from Bristol Bay to within 20 miles of Cook Inlet, and an easy portage over a mountain pass completes the route.

The river is large and discharges a great quantity of water. It is said that the influence of the tide is felt 30 miles from the mouth. The Kvichak flows into the head of the bay on the western side; on the eastern side a smaller river, the Lockenuck, having a lake source, it is said, discharges its water. At the head of the bay there is an extreme rise and fall on spring tides of over 25 feet.

The Kvichak is purely a redfish region. All the other species occur, but in a scattering way. The traps take a few trout, but no steelheads, shad, or sturgeon. The times of the runs are about the same as those given for the Nushagak. Inquiry was made regarding a hatchery site, but no information could be obtained of any location in the vicinity suitable for the purpose.

Koggiung, the location of the cannery of the Point Roberts Packing Company, is on the eastern shore at the upper end of Kvichak Bay, about 6 miles below the

SALTING STATION OF C. E. WHITNEY & CO. LOADING BARKENTINE WILLIE R. HUME, NUSHAGAK BAY.

mouth of the river, and, according to the chart (which is only a sketch), is in latitude 59° 01′ north; longitude 156° 56′ west.

Point Roberts Packing Company.—The Prosper Fishing and Trading Company established a saltery at Koggiung in 1894 and salted that year and in 1895. In 1896 it was sold to the Alaska Packers Association under the name of the Point Roberts Packing Company. The Alaska Packers Association established a saltery at Koggiung in 1894, near that of the Prosper Fishing and Trading Company, and after the purchase of the latter in 1896 consolidated the two. This saltery has been operated every year except 1899.

In 1895, under the same name (Point Roberts Packing Company), the Alaska Packers Association built a cannery at Koggiung, utilizing the available machinery from the cannery of the Central Alaska Company at Thin Point. It was a two-filler cannery of 1,500 cases capacity per day. It made the first pack in 1896 and a pack every year since to date. In 1897 it was enlarged to three fillers, and in 1898 a second three-filler cannery was built close to and connected with the first, so that the plant now practically consists of a six-filler cannery and a saltery.

The cannery is substantially built, light, roomy, airy, and clean. It is well equipped, and has a rated capacity of 4,800 cases per day. It has 18 retorts, of 47 cases capacity each; 4 boilers, 6 fillers, 6 toppers, 4 solderers, 2 cutters, and 5 can-makers. Fish are transferred from boats and lighters by steam hoists to the fish-house, and from the latter, when cleaned, to the cannery by a conveyor consisting of an endless chain of buckets. About 33 per cent of the cans are made at the cannery and the remainder brought from San Francisco; 100-pound tin plate is used for bodies, and 90-pound for tops; 50 per cent of the plate is imported.

The fishermen's and Chinese' contracts, and native wages, are the same as previously stated.

The Kvichak Packing Company.—Under this name the Alaska Packers Association built a cannery in the spring of 1900, on the eastern shore of Kvichak Bay, about 6 miles below the cannery of the Point Roberts Packing Company, and on the northern point of entrance to Bear Slough. It is a three-filler cannery with a daily capacity of 2,400 cases, and has substantial warehouses and quarters. It is well lighted, roomy, and well ventilated, and contains the latest machinery and cannery improvements. It was ready and commenced packing June 29.

This cannery is operated under one management with the Point Roberts Packing Company, in a manner similar to those of the association on the Nushagak. They are under the superintendency of Mr. H. C. Jansen, who has his headquarters at the former cannery, with telephone communication, so as to direct the affairs of all. The cannery machinery of the Kvichak Packing Company consists of 9 retorts of 47 cases capacity each, 3 fillers, 3 toppers, 2 solderers, and 1 cutter. Can-makers will be installed in 1901. Fish are transferred from boats by steam hoists to cars, thence to fish-house, and, when cleaned, by conveyor to cannery.

As the two Alaska Packers Association canneries are under one management the supplies, fish, etc., are common to all, and the field statistics given, except the pack, will be combined, therefore, for the two canneries.

The cannery transporting vessels—those that bring the spring outfits to Bering Sea and return with the pack in the fall—are moored in the channel in Nushagak

Bay in the vicinity of Clark Point. The transfer is made to and from the canneries by large, specially constructed steamers, drawing from 10 to 12 feet of water, heavily built and quite flat on the bottom, so that when they ground on the mud banks they may stand up when the tide leaves them, with cargo and vessel uninjured. The largest, built this year, the *Kvichak*, has a capacity of 32,000 cases, and the second, the *President*, can carry 11,000 cases.

In 1900 the Point Roberts and the Kvichak together employed 154 white fishermen, trapmen, etc., 38 white cannery-hands, 33 natives, and 447 Chinese and Japanese. The Alaska Packers Association has a physician in its employ at Koggiung, who attends the employees from Koggiung to Ugashik. There were on hand 100 gill nets for redfish—length, each, 75 fathoms; depth, 20 meshes, 6½-inch mesh; value, 65 cents per fathom. One trap, located on the eastern shore of the bay, about 12 miles below the Point Roberts cannery, had an inshore lead of 60 feet, an offshore lead of 300 feet, with a 40-foot by 40-foot pot. The offshore lead was parallel with the shore and not more than 100 feet from it; value about $1,000.

The following vessels were employed:

Name and class.	Tons.	Crew.	Value.	Owned or chartered.
Steamer Kvichak	610	13	$200,000	Owned.
Steamer Sayak	90	4	8,000	Do.
Steamer Lillian	19	3	9,000	Do.
Launch Herbert	5	2	4,000	Do.
Ship St. Nicholas	1,687	(1)	50,000	Chartered.
Ship Servia	1,736	(1)	55,000	Do.
Ship Bohemia	1,528	(1)	55,000	Owned.
Schooner (3-mast) Prosper	229	(1)	15,000	Do.

[1] Fishermen.

The boats used were: 7 lighters, worth $800 each; 6 trap-scows, $100 each; 10 skiffs, $30 each; 50 flat-bottom gill-net boats, $100 each; 2 pile-drivers, $1,200 each.

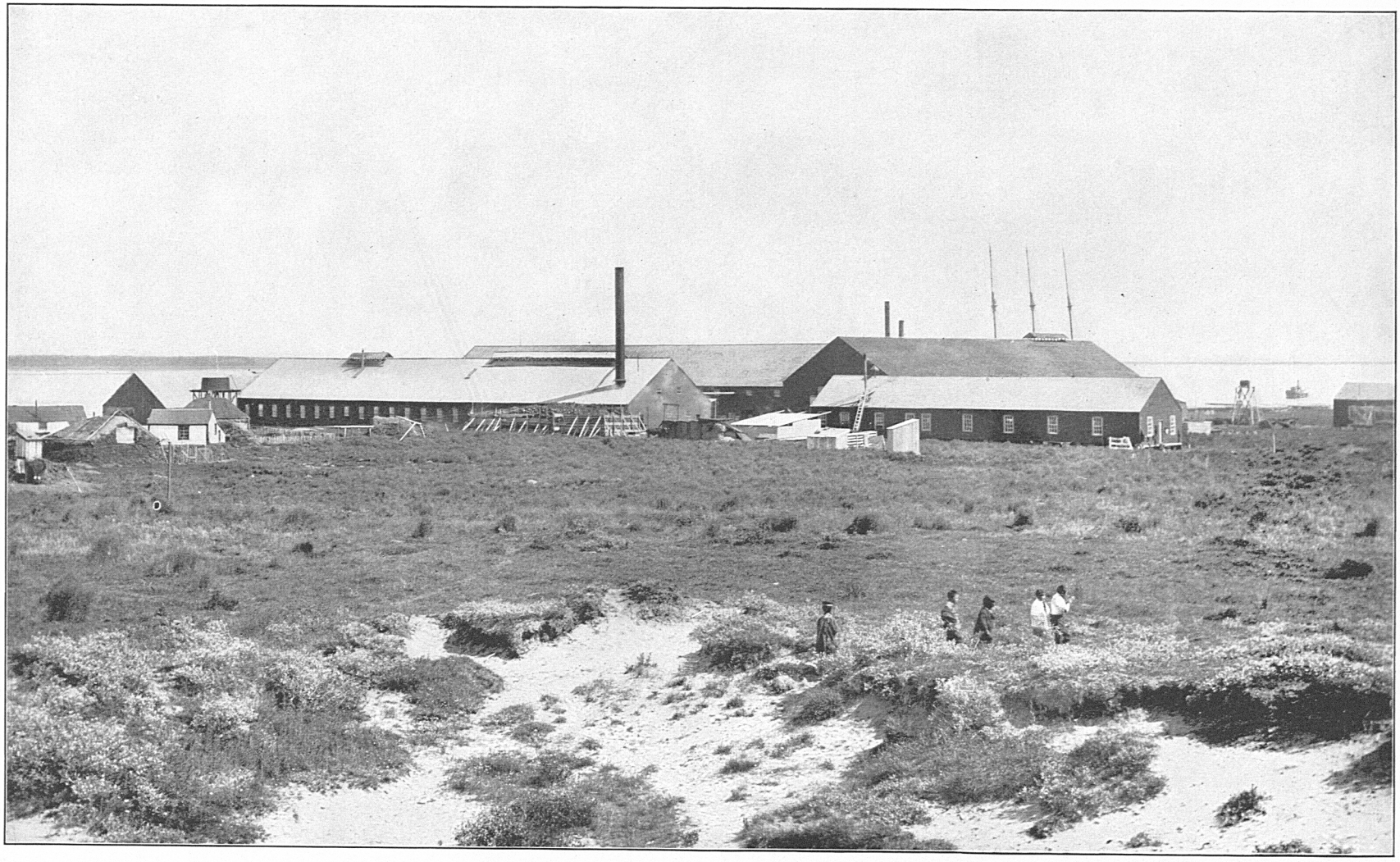
The following was the output in 1900:

Species.	Cases.	No. to the case.	Dates.
Point Roberts Packing Co.:			
Redfish [1]	99,578	12.5	June 23-July 25.
King salmon	341	3	Do.
Cohoes	297	10	July 20-July 25.
Humpbacks	1,676	19	July 15-July 25.
Kvichak Packing Co.:			
Redfish	45,200	12.5	June 28-Aug. 1.

[1] Salted: 92 barrels and 115 half-barrels of redfish, 50 trap fish, or 40 gill-net fish, to the barrel.

These canneries obtain their fish by gill nets and traps. During the 1900 season but one trap was used—that referred to on a preceding page. In 1898 and 1899 an additional trap was used in the Kvichak River, about 15 miles above the cannery. About 30 per cent of the catch is made by this means. Preparations for salting about 1,500 barrels are usually made, but very few were cured in this way during the 1900 season. It is said that, in salting, trap fish run about 50 to the barrel, while gill-net fish run about 42, which is a marked illustration of selection by gill nets.

May 20, 1898, the ship *Sterling*, with the outfit for the Koggiung cannery, was lost on the shoals off Cape Constantine. No lives were lost.



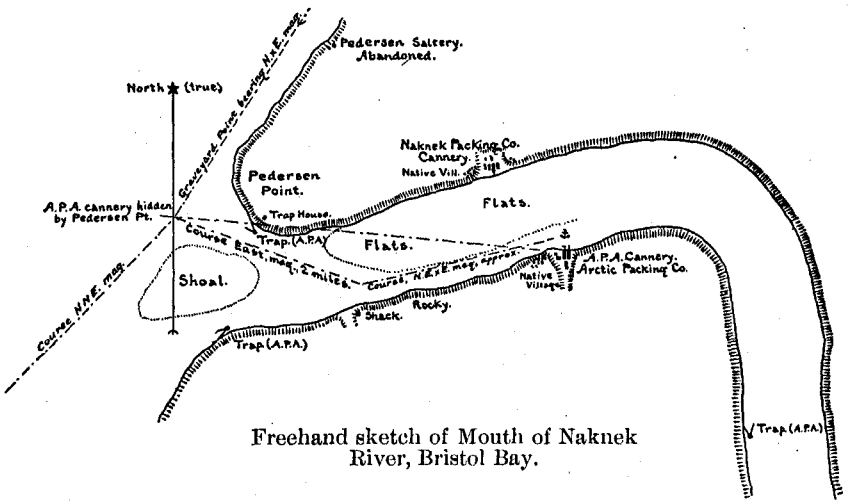
CANNING PLANT OF POINT ROBERTS PACKING COMPANY (A. P. A), KOGGIUNG, KVICHAK BAY.

View from sand dune to southwest.

North Alaska Salmon Company.—This company, organized from the Sacramento River Packers' Association and incorporated under the laws of California, sent a large cannery plant to Bristol Bay in the spring of 1900 and built two canneries on the left bank of the Kvichak River, near the mouth, about 6 miles above Koggiung. The plant was placed in two canneries, 1,000 feet apart, for the purpose of obtaining fire protection. They will be operated, however, under one management during the season of 1901, when the first pack is expected. Each cannery will have 4 retorts, 2 fillers, 2 toppers, 2 solderers, 1 cutter, and 1 set of can-makers. As the cannery will employ 50 hands to the filler, a daily capacity is expected of 1,800 cases, or 3,600 cases for the two canneries; a conservative rating, however, would be 3,200 cases.

THE NAKNEK RIVER.

The next large salmon river is the Naknek, which enters Kvichak Bay, on the eastern side, about 25 miles to the southward of Koggiung, in latitude 58° 42′ north, longitude 157° 02′ west (approximate). The river has its source in a large lake of the same name (at one time also known as Lake Walker), on which two villages are



Freehand sketch of Mouth of Naknek River, Bristol Bay.

located. The river is large, about 60 miles in length, and flows a great body of water in a general westerly direction. It is said that tide water extends about 25 miles from the mouth, at which point the river is about one-half mile in width, and that at the mouth there is an extreme rise and fall of spring tide of over 20 feet.

Shoals and banks, many of which uncover at low water, fill the lower course of the river and extend 3 or 4 miles off the mouth, then trend around to the northward and join the body of banks that fill the upper end of Kvichak Bay. At low water the channel between the banks and the flats is very shallow; cannery steamers, drawing but 7 feet of water, await half tide before entering. Navigation is done on the rising tide or at high water.

The mouth of the river is about 3 miles wide between the headlands, which consist of bluffs about 100 feet high. Within the entrance the banks converge quite rapidly, and about 4 miles from the mouth the river is about three-fourths of a mile wide

between the banks. At this point the canneries are located, that of the Arctic Packing Company on the left bank, and nearly opposite, on the right bank, that of the Naknek Packing Company. Abreast of the cannery and for a long distance below the river bed at low water is four-fifths uncovered, and it is said that at very low water it may be forded above the cannery; nevertheless, it runs a large body of water. Very little is known of the interior. During early Russian times this lake and river formed a connecting link of the trail from Kadiak to the Nushagak, by way of Katmai.

The Naknek is essentially a redfish river, though members of all other species are present, but only in a scattering way. During the season a few king salmon and cohoes are taken. Exceptionally, there is a small run of humpbacks, but practically no dog salmon. There are a few trout, but no steelheads, shad, sturgeon, halibut, or cod.

The redfish commence running about June 14, when about 100 cases may be packed. Eight or ten days later they are running strong. July 16–20 they begin to slack, and by July 25–28 the run, for cannery purposes, is finished. In the spring very large schools of young salmon, about 4 inches in length, are seen passing out to sea. There does not appear to be any site for a hatchery in the vicinity.

Fishing is carried on entirely by gill nets and traps, which were used by both companies until this year, when the Naknek Packing Company abandoned trap fishing as too expensive to maintain.

Arctic Packing Company.—In 1890 this company built and operated a saltery on the Naknek, at a point indicated in the preceding paragraph. This saltery was sold to the Alaska Packers Association in 1893. In 1894 the association built a cannery at the same point, utilizing in its construction the available machinery of the cannery of the Thin Point Packing Company, at Thin Point, and made the first pack in 1895. A pack has been made every year since to date. The saltery has been operated every year except 1897. The original plant was a two-filler cannery, but in the spring of 1900 an additional machine was installed, and it now has a daily capacity of 2,400 cases. A pack of 55,000 cases is expected during a good average season.

The canning machinery consists of 3 fillers, 3 toppers, 2 solderers, 1 fish-cutter, and 9 retorts. Fish are transferred from boat to fish-house by cable cars running on an inclined plane and operated by steam. Can-makers have been installed, and when in thorough running order will probably make most of the cans used, though this year only 30 per cent were made on the ground, the remainder being brought from San Francisco. One-hundred-pound tin plate was used for bodies, and 90-pound plate for tops, all imported, as the pack of this cannery was for export trade.

Transportation is by the company's vessels, which in the spring approach the mouth of the river as closely as safety permits, and after discharging are moved to Nushagak Bay, where they are loaded with the pack at the end of the season.

Fishermen's and Chinese' contracts and native wages are the same as previously noted. In 1900 the cannery employed 58 white fishermen, 54 white cannery-hands, trap and beach men, and salters, 20 natives, and 140 Chinese.

The following boats were used: Eight lighters, worth $800 each; 10 skiffs, $40 each; 34 flat-bottom gill-net boats, $100 each; and 1 pile-driver, $1,200. The gill-net boats are of the same type as those used on the Kvichak, and described on page 180.

There were in use for redfish 29 gill nets, besides 47 spare ones, and sufficient

webbing for 12 more. The nets are each 75 fathoms long, 22 meshes deep, and 6⅛-inch mesh. King-salmon nets are not used. In addition three traps were driven, but as the netters brought in an abundance of fish only two were used. One was located on the left bank of the river, about 6 miles above the cannery, with inshore and offshore leads of 750 feet and 1,900 feet, respectively, heart 80 feet by 160 feet, and pot 40 feet by 40 feet. Another, at the northern point of entrance to the river, had leads of 750 feet and 1,100 feet, respectively, pot 40 feet by 40 feet, but no heart; and the third, of the same dimensions, which was not used, on the southern shore near the entrance. These traps are driven in the spring and pulled up when fishing ceases. They are valued at about $1,200 each. About 20 per cent of the fish used by this cannery are taken in traps.

The following vessels were employed, all owned by the company:

Class and name.	Tons.	Crew.	Value.
Steamer President	238	9	$40,000
Launch Ralph L.	5	2	4,500
Launch Northern Light	4	2	3,000
Ship Indiana	1,413	(1)	50,000
Bark Merom	1,134	(1)	20,000

[1] Fishermen.

The following was the output in 1900:

Species.	Cases.	No. to the case.	Dates.
King salmon	69	6	June 18–June 24.
Redfish[1]	61,816	12.5	June 18–July 28.
Humpbacks	449	22	On July 25.

[1] Salted, 1,356 barrels and 1,141 half-barrels of redfish; 52 to the barrel.

Naknek Packing Company.—In 1890 Mr. L. A. Pedersen established and operated a small saltery on the right bank of the Naknek about 3 miles above the mouth. In 1894 a company under the above title, incorporated under the laws of the State of California, absorbed the saltery and erected a cannery near it. The first pack was made in 1895, and a pack has been made every year to date. The saltery has also been operated every year, and in 1897 an additional one was built and operated on the shore of Kvichak Bay, about 2 miles above the mouth of the Naknek. The latter was abandoned in 1900. During the present season (1900) the cannery plant was enlarged by the addition of a small cannery building, warehouse, bunk houses, etc., and it is expected to have three fillers ready for operation in 1901 and the cannery equipped for a pack of at least 40,000 cases.

The following cannery machinery is now installed: Eight retorts, 2 fillers, 3 toppers, 2 solderers, and 1 cutter. Fish are pewed from boats and lighters to fish-house. Thirty-three per cent of the cans are made at the cannery; the rest are brought from San Francisco. Can-makers have been installed, and it is expected to make a large proportion of tins at the cannery in the future. One-hundred-pound tin plate is used for bodies and 95-pound plate for tops, 50 per cent of which is imported.

The transportation was by a vessel of the company, which was kept moored in Kvichak Bay below the mouth of the river.

The fishermen's and Chinese' contracts and native wages were the same as given on previous pages for this district.

In 1900 the company employed 60 white fishermen and beach-hands, 12 white cannery-hands, 11 natives, and 131 Chinese. Twenty-one redfish gill nets were used, each 75 fathoms long, 22 meshes deep, 6¼-inch mesh; value, 65 cents per fathom.

They have 7 lighters, $600 each; 5 skiffs, $25 each; and 28 flat-bottom gill-net boats, $100 each.

The vessels employed were: Steamer *Fram*, 12 tons; crew, 3; value, $8,000; owned. Bark *B. P. Cheney*, 1,200 tons; crew, fishermen; value, $20,000; owned.

The following was the 1900 output:

Species.	Cases.	No. to the case.	Dates.
King salmon[1]	31	4, 8	Throughout the season.
Redfish[1]	35,675	12	June 23-July 25.
Humpbacks	352	22	July 23-July 28.

[1] There were salted 22 barrels of king salmon and 1,150 barrels of redfish, the latter running 47 to the barrel.

THE EGEGAK RIVER.

This river empties into the outer limits of Kvichak Bay about 34 miles south of the Naknek, and has Cape Chichagof for its northern entrance point. It is a large river about 2 miles in width at the cannery, and is the outlet to Lake Becharof. It flows in a general westerly direction for about 50 miles. Tide water is said to extend about 25 miles up the river; very little is known of the locality.

The lower part of the river is a wide bay, contracted at the mouth, and, like other rivers of this district, at low water a large part of the bed is exposed in shoals and banks, with narrow channels winding through them. At the entrance shoal water extends several miles offshore, and the small cannery steamers enter only from half to full tide. The channel into this river is wider and deeper than in the Naknek and Kvichak, and, if it were properly buoyed, vessels of moderate draft could enter at high water; there is, however, no swinging room inside. The cannery transporting vessel, a bark of 554 tons, is carried in at high water and moored head and stern alongside of the low-water bank.

This river is also essentially a redfish stream, though all other species are found, but they are scattered throughout the season and are few in number. There are a few trout, but no steelheads, shad, sturgeon, halibut, or cod. The time of run of the redfish is the same as given under the Naknek, to which reference is made.

Egegak Fishing Station.—Under this name the Alaska Packers Association, in 1895, established and operated a saltery on the right bank of the Egegak about 5 miles from the entrance, and salted every year until 1900, when the apparatus was moved to the new cannery site, though the buildings were left standing.

Egegak Packing Company.—In 1899 the Alaska Packers Association, under this title, commenced building a cannery on the left bank of the Egegak, opposite and a little above the salting station, utilizing the available machinery of the cannery of the Baranoff Packing Company, of Redfish Bay, Southeast Alaska. This plant had been purchased during the winter of 1898 and 1899, when that locality was abandoned. The new cannery was completed in 1900, and the first pack commenced July 1. It has substantial buildings, and is clean and well arranged. The cannery

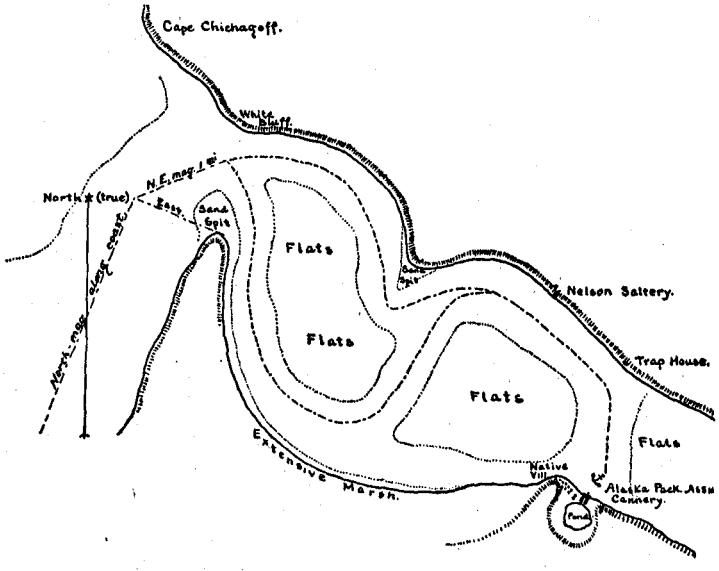
machinery consists of 5 retorts, 2 fillers, 2 toppers, 2 solderers, and 1 cutter; can-makers will be installed. This year all cans were brought from San Francisco, 100-pound tin plate being used for bodies and 95-pound plate for tops; all domestic.

Fish are pewed from boats to cars which are hauled by cable, operated by steam, over an inclined plane leading from the fish-house to the water at all stages of the tide. After cleaning, the fish are passed directly from the draining table to the cutter.

The saltery, which has been moved to the cannery site, is operated in conjunction with the cannery.

The fishermen's and Chinese contracts and native wages were the same as for other canneries of this district. In 1900 this cannery employed 39 white fishermen, 16 white cannery-hands, 10 natives, and 80 Chinese.

They used 20 gill nets, each with a length of 80 fathoms; depth, 26 meshes, 6⅛-inch mesh; value, about 65 cents per fathom. No traps were driven, but they



Freehand sketch of entrance to Egegak River, Bristol Bay.

were prepared to drive two with leads of 200 and 250 feet and pots 40 feet by 40 feet, valued at about $1,000 each.

They used 5 lighters, $200 each; 7 skiffs, $30 each; 19 flat-bottom gill-net boats $100 each, and one pile-driver, $1,500.

The following vessels were employed:

Class and name.	Tons.	Crew.	Value.	Owned or chartered.
Steamer President[1]				
Launch Llewellyn	5	2	$1,000	Owned.
Launch Corinne	5	2	2,000	Do.
Bark Charles B. Kenney	1,014	(2)	30,000	Chartered.
Bark Will W. Case	554	(2)	18,000	Owned.

[1] Employed at Naknek also, which see. [2] Fishermen.

The following was the output in 1900: Redfish, 21,652 cases, 12.5 to the case, July 1 to July 25. Redfish, salted, 582 barrels and 1,513 half-barrels, 50 to the barrel.

THE UGASHIK RIVER.

The mouth of this river is about 40 miles below the Egegak, and, according to the chart, is in latitude 57° 38′ north, longitude 157° 48′ west; but the chart is apparently much in error. The river, it is said, has its source in a lake system of considerable extent, about 50 miles in the interior of the peninsula. In its lower course it has as tributaries King Salmon River, which enters through the left bank from the southeast about 5 miles from the pilot station, and Dog Salmon River, which enters through the left bank about 15 miles from the pilot station. These are large streams, and it is probable there are others higher up.

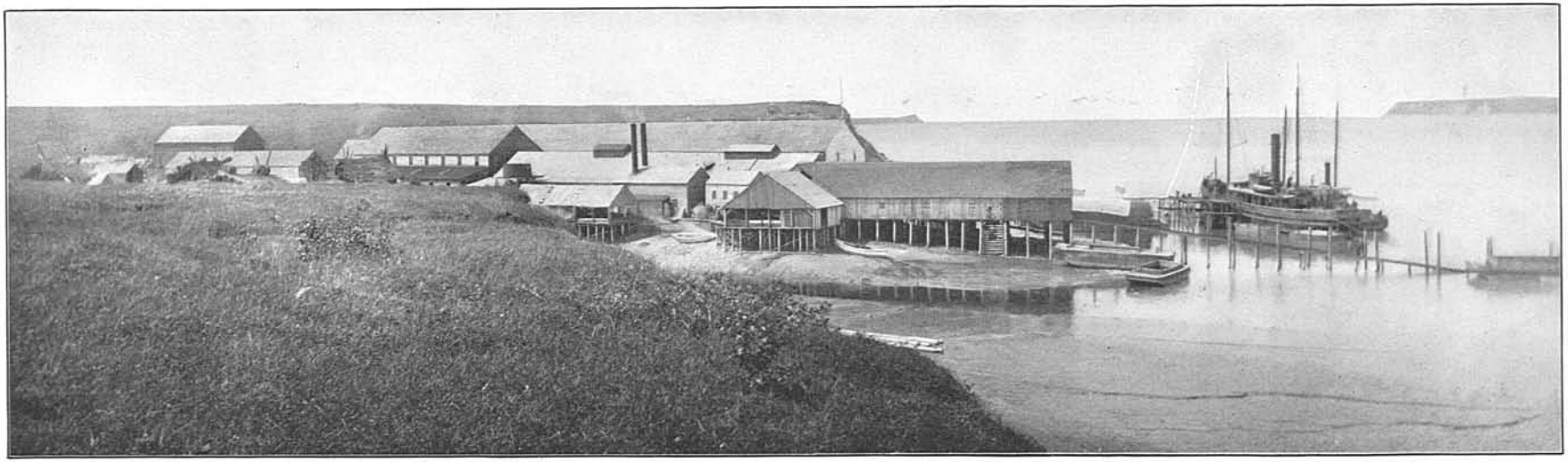
The Ugashik is a large river and discharges a great quantity of water into the wide indentation that has Cape Grey for its northern point and Cape Menchikoff for its southern. Cape Grey is a prominent bluff about 200 feet high, ranging several miles along the shore, brownish in color, with a few yellow vertical stripes. It appears to be the terminal point of a low ridge, which itself slopes to low land on each side. Cape Menchikoff is also a high bluff having a wider range along the shore and more hilly country back of it.

From seaward the near land visible between the capes, including the river valley, appears to be all low. The capes can be approached from the westward to within a distance of about 2 miles. The distance between them is estimated at about 20 miles, though the chart would seem to indicate the distance as about 2 miles. From the capes the low land converges to the eastward to a point where the river may be said to enter. Here it is about 6 miles across between high-water banks, and has on the northern side a bluff, 10 to 12 miles from Cape Grey, known as Smoky Point. This is recognized as the northern entrance point to the river.

The indentation formed by the two capes, the converging land, and the lower courses of the river are filled with shoals and banks. There is, however, a fair channel, through which, it is said, 9 feet may be carried at low-water spring tides. This channel is buoyed during the canning season by the Alaska Packers Association for the convenience of their vessels, but no regular system is adopted and a stranger would be unable to follow it with safety. The outer buoy is on the bar, which is nearly on a line between Cape Grey and Cape Menchikoff, 9 miles from the former. From this buoy it is about 6 miles to Smoky Point.

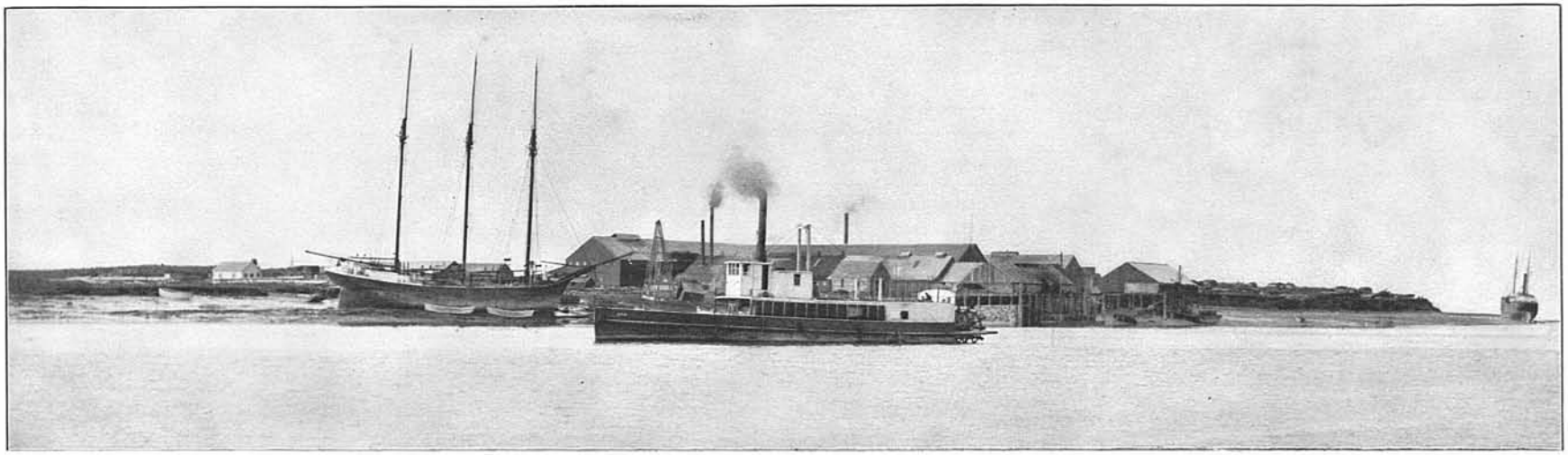
About 6 miles higher up the river, on a bluff on the right bank, is a native village which is called the "Pilot Station," and immediately above it, on a lower bluff, is the cannery of the Alaska Packers Association, called the Ugashik Fishing Station. It is about 17 miles from Cape Grey. An Eskimo formerly lived in the village who piloted vessels through the channel, hence the name, Pilot Station. The river is very tortuous, and winds and recurves to such an extent that at a point about 20 miles by river from the Alaska Packers Association cannery the distance across country is about 7 miles.

The Ugashik, like the rivers previously described in this report, is essentially a redfish river, and some years these salmon run in very large numbers. King salmon occur scatteringly throughout the season, and at times dog salmon are plentiful. There are practically no humpbacks, but it is said there is a run of cohoes after the canneries close. There is, at times, an abundance of trout, flounders, and crabs, but



CANNING PLANT OF ARCTIC PACKING COMPANY (A. P. A.), NAKNEK RIVER.

General view from bluff to eastward, showing headlands at entrance.



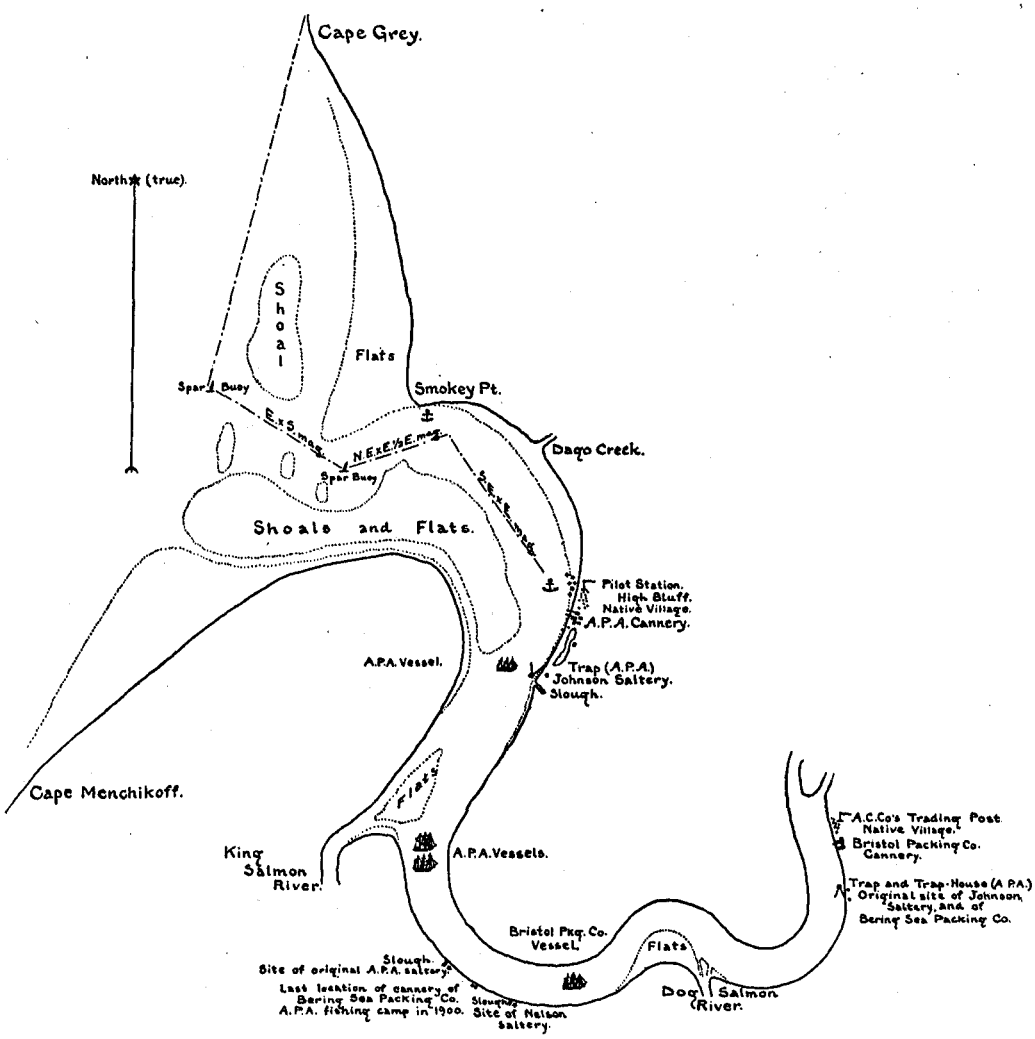
Schooner Prosper. Steamer Sayak. Steamer Kvichak.

CANNING PLANT OF POINT ROBERTS PACKING COMPANY (A. P. A.), KOGGIUNG, KVICHAK BAY.

View from stream to northeast.

no halibut, shad, or sturgeon. The runs correspond to the times given for the Naknek River.

Johnson Saltery.—Mr. C. A. Johnson salted salmon on the Ugashik from 1889 to 1898, both inclusive. He was the pioneer in this business on the river and built and operated a saltery in 1889, on the left bank, about 23 miles above Smoky Point and



Freehand sketch of Lower Ugashik River, Bristol Bay.

2 miles below the trading post of the Alaska Commercial Company. This saltery was merged in the cannery of the Bering Sea Packing company. In 1894 Mr. Johnson established and operated another saltery on the right bank of the river, about 1½ miles above the pilot station, which he sold in 1899 to the Alaska Packers Association, who absorbed it in their cannery plant.

Bering Sea Packing Company.—In 1890 this company, a branch of the Alaska Improvement Company, though a separate corporation, purchased the machinery of the Western Alaska Packing Company at Ozernoy, and commenced building a cannery on the left bank of the Ugashik, near the first Johnson saltery. In transporting the machinery on the schooner *Premier*, that vessel went ashore in Stepovak Bay and the machinery did not all reach the Ugashik until 1891, when it was installed and a small pack made that year. As the site appeared unsuitable, the cannery remained closed in 1892 and 1893, and in 1894 it was moved to a point on the left bank, about 15 miles above Smoky Point, where it was operated in 1894, 1895, and 1896. In 1897 it was sold to the Alaska Packers Association, with other property of the Alaska Improvement Company, and the machinery and equipment were utilized in the Alaska Packers Association cannery. Nothing remains but the dwelling of the superintendent, now used as a fishing camp by the Alaska Packers Association.

Nelson saltery.—In 1893 Mr. Charles Nelson established a saltery on the left bank of the Ugashik, immediately above the last site of the Bering Sea Packing Company. After operating it in 1893 and 1894 it was sold to the Alaska Packers Association and closed.

Alaska Packers Association Saltery.—In 1893 the Alaska Packers Association built a saltery on the left bank of the Ugashik, about a mile below the last site of the Bering Sea Packing Company. It was operated in 1893, 1894, and 1895, and then merged in with the Alaska Packers Association cannery, built the latter year near the pilot station.

Ugashik Fishing Station.—In 1895 the Alaska Packers Association built a cannery on the right bank of the Ugashik immediately above the pilot station, where the river is about 3 miles wide, utilizing in its construction the available machinery of the Russian-American Packing Company's cannery at Afognak. It made the first pack in 1896, and has packed every year since to date. Originally it was a two-filler cannery, but in 1900 another filler was installed, and it now has a capacity of 2,400 cases per day. The machinery consists of 7 retorts, 3 fillers, 3 toppers, 2 solderers, 1 cutter, 1 spare filler, 1 spare topper, and 2 sets of can-making machines.

Fish are pewed from boats and lighters to platforms and thence to fish-house, and when cleaned are transported in cars to the cutter. Seventy per cent of the cans are made at the cannery and the rest transported from San Francisco. One hundred pound tin plate is used for bodies and 95-pound tin for tops, all imported.

Fishermen's and Chinese' contracts and native wages were the same as mentioned under other canneries.

The transporting vessels enter the river at high water, and during the season are moored in the channel, one near the cannery and two near the left bank about 5 miles above the cannery.

In 1900 this cannery employed 64 white fishermen and trapmen, 24 white cannery and saltery hands, 20 natives, and 140 Chinese.

It used two sets of gill nets, 24 to a set, each 85 fathoms long, 26 meshes deep, 6⅛-inch mesh; value, about 65 cents per fathom. There were 3 traps; one about a mile above the cannery, on the right bank, with leads each 500 feet and pot 40 by 40 feet; one about 18 miles above the cannery, on the left bank, with leads each 400 feet and pot 40 by 40 feet, and one about 22 miles above the cannery, with leads

of 600 feet and 400 feet, respectively, and pot 40 by 40 feet. These traps are valued at about $1,000 each. It is stated that about 20 per cent of the fish are taken in traps.

The following boats were used: Nine lighters, valued at $800 each; 10 skiffs, $25 each; 30 Columbia River gill-net boats, $200 each; 1 pile-driver, $1,500.

The following vessels were used:

Class and name.	Tons.	Crew.	Value.	Owned or chartered.
Steamer Thistle	56	5	$25,000	Owned.
Launch Collis	5	2	7,000	Do.
Launch Cathie K	3	2	2,500	Do.
Bark Nicolas Thayer	555	(1)	15,000	Do.
Bark Coryphene	733	(1)	15,000	Chartered.
Three-masted schooner Premier	292	(1)	15,000	Owned.

[1] Fishermen.

The following was the output in 1900: King salmon, 101 cases, 4 to the case, June 18 to June 29; redfish, 54,581 cases, 13 to the case, June 21 to July 29. There were salted 603 barrels and 606 half-barrels of redfish, 50 to the barrel, and 10 barrels of coho bellies.

Bristol Packing Company.—This company, organized largely by the stockholders of the Naknek Packing Company, sent a cannery outfit to the Ugashik early in the spring of 1900 and located on the left bank of that river about 25 miles from Smoky Point, near the site of the old trading post of the Alaska Commercial Company. The cannery was ready for packing July 9. It was not fully equipped, but had at the time of our visit 2 retorts, 1 fruit topper, 1 solderer, and 1 cutter. The work was done largely by hand, but it was estimated that 500 cases could be packed per day. All the cans were brought from San Francisco; they were made of 100-pound imported tin plate. It is said that in 1901 the cannery will be equipped with 3 fillers and the corresponding machinery, and it is anticipated that a pack of 40,000 cases will be made during the season.

The transporting vessel ascended the river to a point about 8 miles below the cannery, where she was moored in the channel for the season.

In 1900 this cannery employed 27 white fishermen and beachmen, 6 white cannery-hands, 10 natives, and 48 Chinese.

They used 8 gill nets, each 75 fathoms long, 23 meshes deep, 6½-inch mesh, valued at 65 cents per fathom. No traps were used.

The following vessels owned by the company were used: Gasoline launch *Amelia*, 5 tons; crew, 2; value, $2,000; bark *Agate*, 595 tons; crew, fishermen; value, $10,000. They have 1 lighter, value, $250; 1 skiff, $25; 7 gill-net boats, $100 each.

The output in 1900 was: Redfish, 6,653 cases, 12 to the case, July 9 to July 29. Commenced salting July 2, and salted 1,150 barrels of redfish, 46 to the barrel.

With the Ugashik our examination of the Bristol Bay district was finished. It is a wonderful salmon country, and can not be equaled. The redfish still run in countless numbers, and, as the rivers can not be barricaded and as overfishing has not yet produced its effect, there seems to be no depletion. The next few years, however, will see many new canneries established by the capital that was used in the canneries on the failing waters of the northwest coast of the United States. But in the absence of proper laws, or the enforcement of such poor ones as now obtain, these streams, too, will become depleted in time.

CHIGNIK DISTRICT.

This district was visited the latter part of July. The remarks made in my former report (pp. 164–171) on this locality hold good at the present day, and it appears unnecessary to make any changes or modifications after this second visit and examination. There have been no additions to the three operating canneries, which have packed every year to date.

The cannery men still contend that there is no diminution in the numbers of salmon taken from the river and lagoon, yet the locality no doubt is badly overfished. The lagoon and approaches and the river approaches are studded with traps, some with leads 3,500 feet long, and sometimes so interlaced that at a distance the channel appears completely blocked, and it hardly seems possible for a fish to pass. Plate IX indicates the positions of these traps at the time of our visit, and it will be seen that while 12 have but one pot, 6 have two. As the latter really consist of 2 traps joined on the leads, there were actually 24 traps, or one more than during the season of 1897, at the time of our visit.

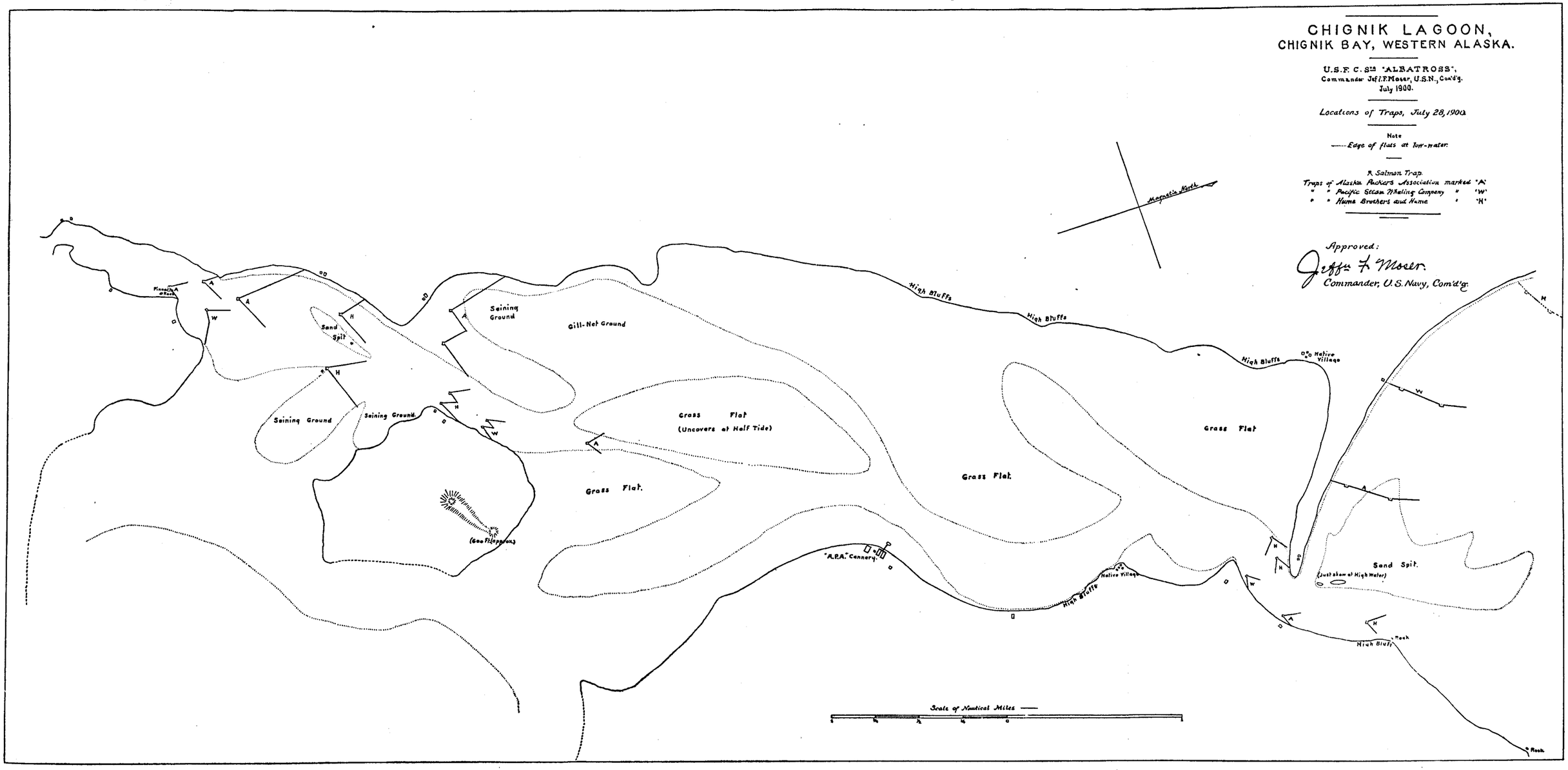
My opinion of traps has been expressed and the waste from them referred to, but as a further illustration of this trap waste a single occurrence related to me may be given: A lighter having a capacity of 45 tons, and having nearly that amount of fish aboard, was towed to a cannery where the species desired for canning, amounting to about 6 tons, were removed; the rest, consisting of cod, tomcod, halibut, flounders, sculpins, dog salmon, trout, etc., were waste. In the spring of the year immense numbers of tomcod are taken. It is said that as much as 15 tons of this species have been thrown out of a trap in one day.

Trap men claim that the waste species are released, but such is not generally the case. If the trap be full of fish not wanted, the pot may be lowered and the fish released alive, because that is the simplest method for emptying the pot, but usually all are dipped out together and the sorting is done afterwards.

If traps be prohibited—and in my opinion they should be—it is difficult to say what the fishing results will be at Chignik. At present traps, gill nets, and seines are used, and the catch is represented in the following proportions: Traps, 70 to 75 per cent; gill nets, 20 to 25 per cent; and seines, about 5 per cent. It is believed that an honest effort has been made with gill nets and seines, but the results have been very unsatisfactory. For gill-net fishing the water is too clear and the channels too shallow and narrow. For seining there are no beaches and the bottom is unsuitable. However, if the fish are there the cannerymen will devise some means for obtaining them. A few years ago purse seines were tried in southeastern Alaska and pronounced a failure; now they are very generally used in certain localities, and with such success that the boast is made that they need no longer construct barricades, as they take with purse seines all the fish that come to the streams.

The times of the runs of the fish are given in my former report (page 169), to which may be added that some years there is a small run of humpbacks and usually a great many dog salmon. Steelheads rarely occur. Dolly Varden trout are numerous and arrive a few days before the redfish, remaining until late in the fall.

The Chinese contract at Chignik varied this year from 42 cents to 42½ cents per case, on guaranties of 20,000 to 28,000 cases, with the usual conditions.


CHIGNIK LAGOON,
CHIGNIK BAY, WESTERN ALASKA.
U.S.F.C. S.S. "ALBATROSS",
Commander Jeff. F. Moser, U.S.N., Com'd'g.
July 1900.
Locations of Traps, July 28, 1900.
Note
Edge of flats at low-water.
A Salmon Trap.
Traps of Alaska Packers Association marked "A"
" " Pacific Steam Whaling Company " "W"
" " Hume Brothers and Hume " "H"
Approved:
Jeff. F. Moser.
Commander, U.S. Navy, Com'd'g.
Magnetic North
Kinsolving Rock
Sand Spit
Seining Ground
Gill-Net Ground
Seining Ground
Seining Ground
Grass Flat
(Uncovers at Half Tide)
Grass Flat.
Grass Flat.
Grass Flat
(See Floppers)
"A.P.A." Cannery
High Bluffs
High Bluffs
High Bluffs
High Bluffs
High Bluffs
Native Village
Native Village
Sand Spit.
(Just show at High Water)
Rock
Rock
Scale of Nautical Miles

The fishermen's contract varied in the different canneries. In one, all fishermen and trapmen were paid $30 per month, with full board, from the time of signing in San Francisco until paid off on return, and one-fourth cent per case. In two other canneries the same contract as the preceding was made with the trapmen, except that their pay ceased on leaving Chignik, for the reason that they were not obliged to work the vessel. In these two canneries the gill-netters were differently paid. In one they received $15 per month, without board, from the day of arrival until the day of departure, 3 cents per fish to be divided among all netters, and 35 cents per day for commutation of ration. In the other cannery gill-netters had $20 per month from the date of arrival to that of departure, full board, and 3 cents per fish.

We spent a Saturday in the lagoon. One cannery packed a few fish in the morning, left from the preceding day, and was then closed. The tunnels of the traps of this cannery were all up, so far as could be seen, and upon inquiry it was reported that they had strict orders to obey the weekly close season, and were doing so. Several scow-loads of fish, however, were noticed during the afternoon on their way out, and the web of a number of traps was noticed down.

For a history of the canneries, with their locations, etc., see my former report.

The Chignik Bay Company has a daily capacity of 1,600 cases, and operates in its cannery 7 retorts, 2 fillers, 2 toppers, 2 solderers, and 1 cutter. It has two sets of can-makers, with a capacity of 70,000 cans per day, and all the tins are made at the cannery, largely of imported material, using 100-pound plate for the bodies and 95-pound plate for the tops. The fish are pewed from boats and lighters to the fish-house, and the cleaned fish are conveyed by car to the cannery. It employed in 1900 63 white fishermen, 13 white beachmen, 3 white coal-miners, 4 white cannery-hands, 2 natives, and 90 Chinese. They used 1 gill net, but have 10, each 135 fathoms long, 30 meshes deep, 6⅛-inch mesh, value 65 cents per fathom; 3 drag seines, but have 4, from 75 to 180 fathoms long, 3 to 3½ inch mesh, 120 to 180 meshes deep at bunt, value $1.50 per fathom; 6 traps of 1 pot and 2 traps of 2 pots, shore leads varying from 150 to 3,500 feet, average 1,000 feet; channel leads, 100 to 1,600 feet, average 900 feet; hearts 75 feet across, and pots 40 feet by 40 feet, average value $1,500 each. The trap web is all tanned, pots 54-thread, wings 36-thread; the piles are 10 feet apart.

The following boats were used: Two schooner-rigged lighters, capacity 11,000 fish, value $1,500 each; 1 sloop-rigged lighter, capacity 4,000 fish, value $750; 12 trap scows, capacity 1,800 to 3,500 fish, average value $250; 3 flat-bottom seine boats, $100 each; 15 skiffs, $25 each; 7 Columbia River boats, $200 each; 8 flat-bottom gill-net boats, $100 each; 3 pile-drivers, $750 each.

The following vessels owned by the company were employed:

Class and name.	Tons.	Crew.	Value.
Steamer Afognak	37	5	$18,000
Steamer Baby Ruth	10	4	5,000
Ship George Skolfield	1,275	(1)	20,000

[1] Fishermen.

The following was the ouput in 1900: Redfish, 40,334 cases, 10.5 to the case, June 10 to August 12; cohoes, 62 cases, 10 to the case, August 3 to August 12.

The *Pacific Steam Whaling Company's cannery* at Chignik, located in Anchorage Bay, operated this year in its canning plant 2 iron retorts, 4 steam boxes, 1 filler, 1 solderer, and 1 cutter. The fish are pewed from lighters to the fish-house, and after cleaning carried by cars to the cannery. The plant has a daily capacity of 950 cases, and they expect to pack during the season about 30,000 cases. It has no can-makers. The cans are all made by hand at the cannery, using 100-pound tin for tops and bodies, of which about 13 per cent is imported. The plant will probably be enlarged.

In 1900 this cannery employed 60 white fishermen and trapmen, 10 white cannery-hands, 4 natives, and 60 Chinese. They used 10 gill nets, each 260 fathoms long, 30 meshes deep, 6-inch mesh, valued at 65 cents per fathom; 3 seines, 2 of 200 fathoms length and 1 of 300 fathoms length, each 22 feet deep, 3-inch mesh, valued at $1.50 per fathom; 4 traps (2 single pot, 2 double pot), average shore lead 800 feet, average channel lead 800 feet, heart 80 feet each side, and pot 40 feet by 40 feet, average value $1,500 each.

The boats used were: Four lighters, $400 each; 2 sail scows, value $200 and $800; 10 trap scows, $60 each; 10 skiffs, $25 each; 3 seine boats, $75 each; 3 gill-net skiffs, $100 each, and 3 pile-drivers, $1,000 each.

The vessels employed were: Steamer *C. C. Cherry*, 37 tons, crew 6, value $15,000, owned; launch *Esquimaux*, 5 tons, crew 2, value $2,500, owned.

Transport of pack and spring outfit by calling vessels of company.

The following was the output in 1900: Redfish, 32,966 cases, 11.4 to the case, June 9 to August 6; dog salmon, 120 cases, 10 to the case, July 20 to July 28. Salted 69 barrels of humpback bellies, 450 to the barrel.

Hume Bros. & Hume cannery at Chignik, located at Anchorage Bay, operated this year in its cannery plant 4 retorts, 1 filler, and 1 solderer. The fish are handled from lighters to cannery in the same manner as noted under other canneries. The plant has a capacity of 800 cases per day, and they expect to make a season pack of 25,000 cases. Cans are made by hand, of 100-pound tin for tops and bodies, of which 50 per cent is imported.

In 1900 this cannery employed 52 white fishermen, 10 white cannery-hands, 6 natives, and 58 Chinese. They used 15 gill nets, each 150 fathoms long, 26 meshes deep for lagoon and 40 meshes deep for outside fishing, 6-inch mesh, value 65 cents per fathom; 2 seines, 150 fathoms long, 25 feet deep at bunt, 3-inch mesh, value $1.50 per fathom; 7 traps (5 single, 2 double), average shore and channel leads 800 feet, heart 80 feet on each side, pot 40 feet by 40 feet, average value $1,500.

The boats used were 13 lighters, $140 each; 2 sail scows, $300 and $600; 14 skiffs, $25 each; 2 seine boats, $70 each; 8 Columbia River boats, $200 each; 10 gill-net skiffs, $100 each; 2-pile drivers, $1,050 each.

The following vessels (owned by the company) were employed:

Class and name.	Tons.	Crew.	Value.
Launch Florence Hume	5	2	$3,200
Launch Ethel and Marian	6	3	2,880
Bark Ferris S. Thompson	480	11	12,000
Schooner Maid of Orleans	171	8	8,000

The following was the output in 1900: Redfish, 23,003 cases, 11 to the case, June 6 to August 19; dog salmon and humpbacks, 3,614 cases, 10 to 21 to case, July 2 to August 19.

ALITAK BAY, KADIAK ISLAND.

On Olga Bay, and its connecting waters with Alitak Bay, locally known as the "South End," there are one operating and one reserve canneries and several excellent salmon streams. As the locality was not visited in 1897, and as the whole region is unsurveyed, the *Albatross* this season, whilst engaged in the salmon investigation, made a sextant reconnoissance of a portion of these waters. The area is so large that the five days allotted to the work were not sufficient to cover more than the anchorages and the passages leading to them. The results, however, should be of great service to vessels navigating these waters. In the following notes reference is made to the drawing of the reconnoissance accompanying this report.

Alitak Bay is a large body of water on the southwestern side of Kadiak Island, about 65 miles by sea from Karluk. The entrance, from Cape Alitak on the west to Cape Trinity on the east, is about 8 miles wide, and in its length of 14 miles the bay narrows to 5 miles at the upper end, where it terminates in two wide arms, each several miles in length. The general direction of the bay is NNE. and SSW. The western side has several indentations, with islands, rocks, and foul ground for a distance of 2 miles off the middle section. At the northern end of this section, about 11 miles from Cape Alitak, a passage extends westward around the upper islands and opens upon a broad sheet of water, named Moser Bay, which, in a distance of 3 miles, turns to the northward the same distance, where a narrow gut leads to Olga Bay.

In approaching Alitak Bay from the northward Low Cape is first made about 9 miles from the western point of entrance. The former is a low bluff, and the shore line, which is low with high mountains in the background, extends to the latter in a deep bend, making to the northward and eastward.

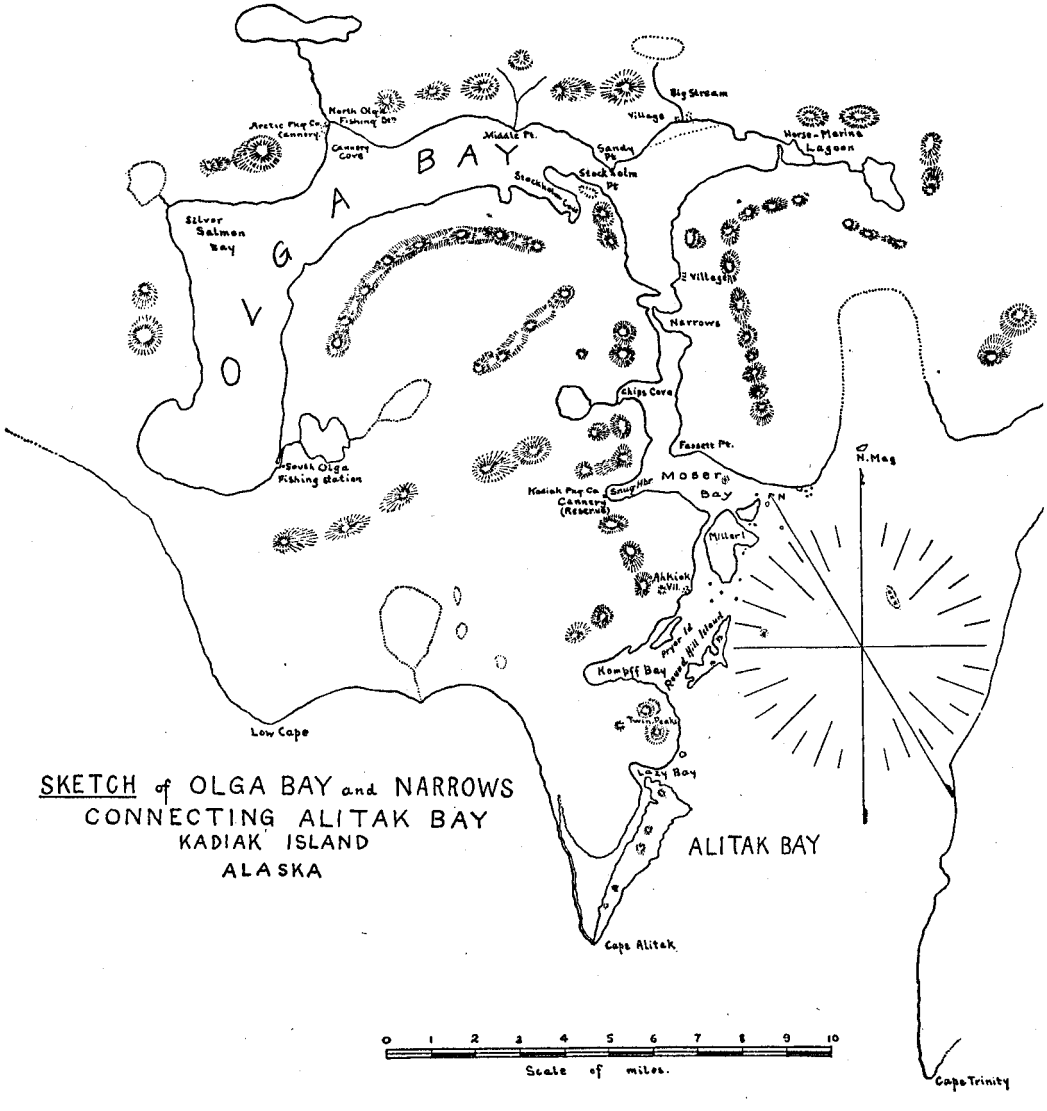
Cape Alitak is the terminal point of an undulating granite ridge, named Tanner Head, about 4 miles in length, the northern end bordering on Lazy Bay. This ridge is a peninsula, with the highest hills (about 600 feet) at the northern and middle parts, from which there is a gradual roll and descent to the pitch of the cape; this, at the extreme point, is low and rocky. In approaching from the westward it is seen as a long point with rolling hills and knobs gradually shelving to the sea.

Five miles to the northward from Cape Alitak the western shore makes out in a high head, named Drake Head, which separates Lazy Bay from Kempff Bay. Surmounting the head are two conical peaks, Twin Peaks, about 1,200 feet high, which, in clear weather, can be seen a long distance from seaward. They are easily recognized, and make an excellent guide to the entrance.

South of Drake Head is Lazy Bay, which may be recognized from its position with reference to the Twin Peaks and Egg Island, the latter a small rocky islet lying just north of the entrance. From this bay a narrow arm, named Rodman Reach, projects to the southwest inside of Tanner Head to Cape Alitak, where it forms a basin from which another narrow arm extends for some distance to the northwest, being separated from the sea by but a narrow strip of land. Lazy Bay affords good anchorage and is very accessible.

Kempff Bay, northward of Drake Head, is about 1½ miles long by 0.4 mile wide, and is apparently clear of dangers. For want of time, no soundings were made, but if upon examination proper depths are found, it should make an excellent harbor.

From Drake Head to the passage leading to Moser Bay are a number of islands, rocks, and ledges making off from the western shore. Inside of these is Akhiok,



a native village, which, in 1890, contained over 100 inhabitants. The people here suffered severely during the last winter (1899–1900), many dying with a disease never properly diagnosed, but which was probably grip.

The peninsula separating the North Arm of Alitak Bay from Moser Bay is a high ridge shelving toward the southern end, and has been used by the cannnery steamers

as a leading mark. High Rock is a high, detached rock, easily recognized on approaching the passage, with rocks and submerged reefs, covered in summer by kelp, extending nearly two-fifths mile off the southern and eastern sides.

The eastern shore of Alitak Bay consists of high, bold bluffs, terminating in Cape Trinity, which, from a distance, appears bold, and on the continuation of the general line of the bluffs. This shore was not closely examined, and, while no dangers were seen, it should be approached with caution. Near the middle of the bay, 10 miles within the entrance point, is an extensive ledge named Middle Reef, covered at high water, but baring over a considerable area at low water.

In the extreme western end of Moser Bay is Snug Harbor, and 2 miles to the northward is Chips Cove, both affording excellent anchorage.

The peninsula formed by Olga and Alitak bays and the connecting waters is treeless. It is broken up by mountain masses rising to a height of about 2,000 feet, rolling tundra, marshes, and lakes.

The sextant reconnoissance extends only to the Narrows connecting Moser Bay with Olga Bay. The plan of the latter is from a running sketch made in the steam launch, checked by a few cuts made upon mountain peaks.

SAILING DIRECTIONS.

In entering Alitak Bay, after making the Twin Peaks, shape the course to arrive off the entrance with Cape Alitak bearing NW. distant 2½ miles; then lay a course N. by E. ¾ E., and run 8.4 miles. This should bring a ledge, that is said to cover only at high water spring tides, on the port beam distant 1 mile; then change course to N. ¼ W. bringing High Rock ahead, and run 3 miles, when the passage to Moser Bay should be wide open. Now follow the chart, keeping in mid-channel, favoring the northern shore for the deepest water, and, when well inside, keep in the middle of Moser Bay; if bound for Snug Harbor, open it fair, steer for the center, and anchor with the lead. Do not approach the head too closely, as the flats make off some distance from the reserve cannery building. If bound for Chips Cove, keep in mid-channel and anchor by the lead. The only danger known in Moser Bay is a shoal, or reef, lying 1 mile to the eastward of Point Fassett and one-fourth mile off shore, and a spit making off a short distance from the middle point of the southern shore.

Cape Alitak, bearing SW. ¼ W., mag., distant 4½ miles.

The bottom, in the passage, is much broken; immediately inside 3½ fathoms were found in mid-channel at low water. It should be remembered that the work of the *Albatross* was only a sextant reconnoissance and not a detailed survey, so that every precaution should be observed in entering. It may be remarked here that the dangers are usually marked by kelp in summer, but this is not always the case.

Lazy Bay.—The Twin Peaks and Egg Island are the guides to Lazy Bay. No hidden dangers were found. With the bay wide open enter in mid-channel on a west course, and anchor at discretion.

Time did not permit sounding inside of Rodman Reach, but from all appearances it may be entered far enough to obtain shelter from all winds. The first projecting point has a spit extending from it.

It is said that a 5-fathom ridge, or bar, extends from Cape Alitak to Cape Trinity, and that kelp has been seen in places on it. The *Albatross* on entering encountered the shoal soundings at this point, and also on leaving, as shown on the chart. The shoals off the southwest end of Tugidak Island are said to run in ridges.

The Narrows.—About 1 mile to the northward of Chips Cove is the southern entrance to the Narrows which lead to Olga Bay. They are about 1 mile in length and in the narrowest part about 300 feet in width. The channel is tortuous with many rocks, some of which uncover at low water, and others which are only apparent by the heavy swirls over them when the current is running full. The small cannery steamers use the Narrows, but local knowledge is necessary and a large vessel should not attempt the passage. With the current running full the cannery steamers wait for slack water, which occurs two hours after high and low water at Snug Harbor. The current at its greatest velocity probably reaches 8 knots. It is said that 3½ fathoms can be carried through the channel at low water, but this statement should be received with caution.

Observations with sextant and artificial horizon for geographical position were obtained at the northern entrance to Snug Harbor, which gave latitude 56° 59′ 26″ north, longitude 154° 12′ 22″ west. Variation by compass declinometer 29° 17′ east. Establishment from 8 successive high waters, at moon's age from five to nine days: XI^h 38^m. Mean rise and fall of tide during same period, 6.71 feet.

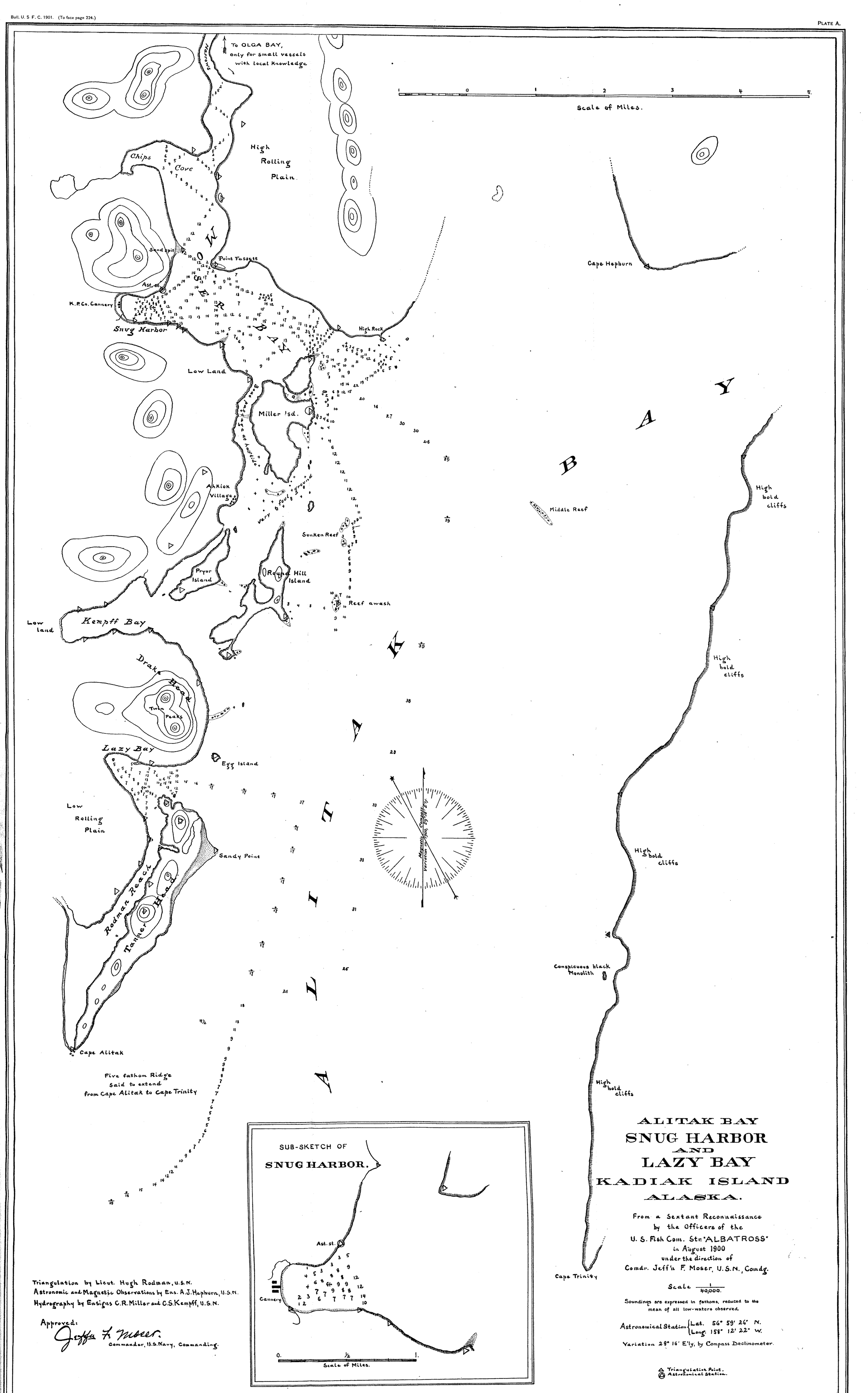
Olga Bay is an irregular-shaped body of water lying in a general east-and-west direction, rather crescentic in form, with the cusps to the southward; it is from 17 to 18 miles in length, with a width of from one-half mile to 2 miles. The western end is the largest and is separated from the sea about 6 miles to the northward of Low Cape by a strip of low land only three-fourths of a mile wide. The bay has the appearance of a lake, and having such a narrow passage to the sea the tidal influence is not very great, the rise and fall varying from 1 to 2 feet at the cannery.

OLGA BAY CANNERIES.

The only operating cannery in this section is located on the northern shore of Olga Bay, about 10 miles from the northern end of the Narrows. The history was given from incomplete data in my report of 1897, but as some additional information has become available, it is rewritten here.

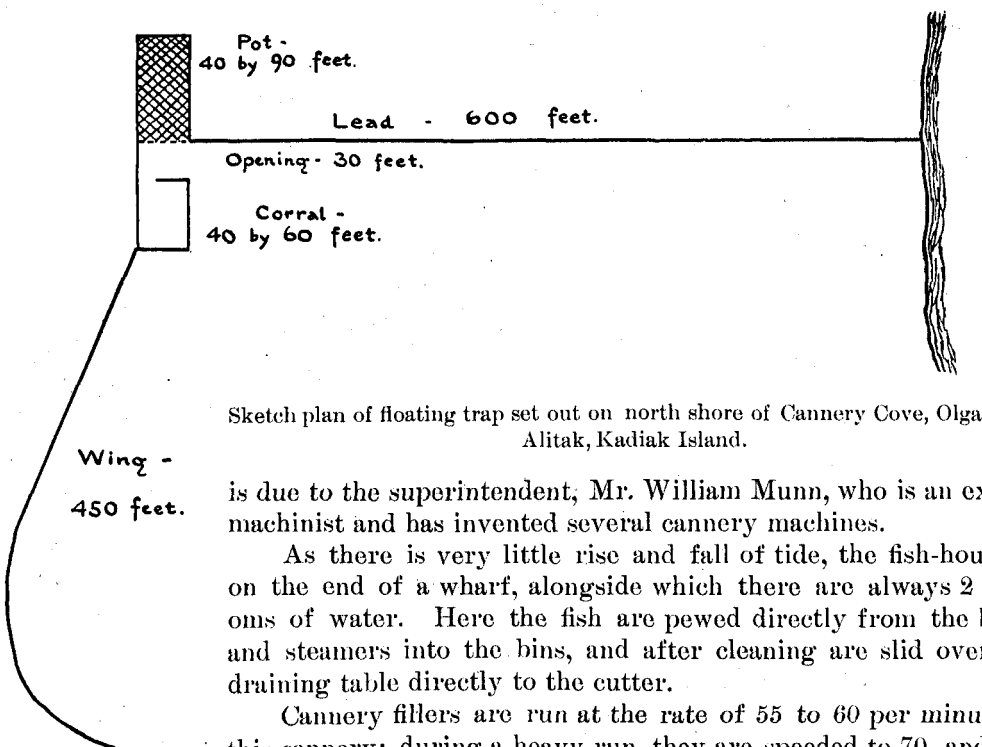
Arctic Packing Company.—In 1889 this company built a cannery in the southwestern end of Olga Bay, at the mouth of a small stream on the eastern shore known as the South Olga Fishing Station. The cannery was not well equipped, and the capacity was only from 250 to 300 cases per day. As the location was not favorable it was moved the following year across the bay to a point 8 miles to the northward, on the right bank and near the mouth of a small stream known as the North Olga Fishing Station, which is its present position. The change of location was very satisfactory, and the cannery was much improved in equipment, buildings, etc.

In 1891, under an agreement with the Kodiak Packing Company, in the same locality, the cannery of the latter was closed and its quota of fish was packed in the Arctic cannery. In 1892 it was in the pool formed by the Alaska Packing Association,


To OLGA BAY, only for small vessels with local knowledge
Scale of Miles.
High Rolling Plain.
Chips Cove
Sand spit
Point Fassett
K.P.Co. Cannery
Snug Harbor
High Rock
Low Land
Miller Isd.
Akkiok Village
Sunken Reef
Pryor Island
Round Hill Island
Reef awash
Low land
Kempff Bay
Drake Head
Twin Peaks
Lazy Bay
Egg Island
Low Rolling Plain
Sandy Point
Rodman Reach
Tanner Head
Cape Alitak
Five fathom Ridge said to extend from Cape Alitak to Cape Trinity
Cape Hepburn
Middle Reef
High bold cliffs
Conspicuous black Monolith
Cape Trinity
SUB-SKETCH OF SNUG HARBOR.
Ast. st.
Cannery
Scale of Miles.
ALITAK BAY
SNUG HARBOR
AND
LAZY BAY
KADIAK ISLAND
ALASKA.
From a Sextant Reconnaissance by the Officers of the U. S. Fish Com. Str. "ALBATROSS" in August 1900 under the direction of Comdr. Jeff'n F. Moser, U.S.N., Comdg.
Scale 1/40,000.
Soundings are expressed in fathoms, reduced to the mean of all low-waters observed.
Astronomical Station Lat. 56° 59' 26" N. Long. 158° 12' 22" W.
Variation 29° 16' E'ly, by Compass Declinometer.
Triangulation Point.
Astronomical Station.
Triangulation by Lieut. Hugh Rodman, U.S.N.
Astronomic and Magnetic Observations by Ens. A.J. Hepburn, U.S.N.
Hydrography by Ensigns C.R. Miller and C.S. Kempff, U.S.N.
Approved: Jeffn F. Moser. Commander, U.S. Navy, Commanding.

and in 1893 it entered the Alaska Packers Association. It has been operated every year since its construction, and now has a running capacity of 1,000 cases per day.

This cannery, also known as the "Olga Bay" and the "South End," is well arranged and more than usually clean. The cannery machinery consists of 5 retorts, 1 filler, 1 topper, 1 solderer, and 1 cutter, with 1 filler and 1 topper in reserve. It has a complete can-making outfit, and it is claimed that 900 cases of cans have been made in one day, but 700 cases would be a better average. The plant has been successfully operated by running all the machinery together, salting the cans at once at the can-makers, and conveying them to the filler. In this way, when the machinery runs well, 700 cases can be turned out daily. The successful operation of this plant



Sketch plan of floating trap set out on north shore of Cannery Cove, Olga Bay, Alitak, Kadiak Island.

is due to the superintendent, Mr. William Munn, who is an expert machinist and has invented several cannery machines.

As there is very little rise and fall of tide, the fish-house is on the end of a wharf, alongside which there are always 2 fathoms of water. Here the fish are pewed directly from the boats and steamers into the bins, and after cleaning are slid over the draining table directly to the cutter.

Cannery fillers are run at the rate of 55 to 60 per minute at this cannery; during a heavy run they are speeded to 70, and 500 cases have been run through at 80 per minute. This high rate requires a thorough knowledge of the machinery and delicate adjustment, and it is doubted if the cans at a much higher rate than 60 can be successfully handled at the filling table for any great length of time.

The tin plate used was 100-pound for bodies and 95-pound for tops, all imported. One pound of solder was used per case for hand-made cans and three-fourths of a pound for the machine-made. In salting the cans one-sixth ounce of fine granulated salt was used per can, or one-half pound per case.

Occasionally, when the run is large, a little incidental salting is done.

The Chinese contract was the same as at Chignik. The fishermen received $50 each for working the ship to and from the cannery, discharging and loading, and 8 mills per case for each man, with full board, except the Italians, who messed themselves and received 35 cents each per day for rations.

Transportation is by company's vessels, which are moored in Chips Cove.

At the time of our visit the superintendent was experimenting with a machine of his own invention for cleaning fish, which, it is learned, has since proven successful, and a large number have been ordered for the 1901 season. If this machine is placed in successful operation, it will not only save much labor but will afford a great relief in the fish-house, which is usually much crowded and overworked during a heavy run.

In 1900 the Arctic cannery employed 40 white fishermen, 9 white cannery-hands, 10 natives, and 59 Chinese. It used six seines, having a total length of 1,200 fathoms, each from 100 to 350 fathoms long, 100 to 130 meshes deep, 3-inch mesh, all hung straight, valued at $1.50 per fathom. It had also 3 bales of spare web, and material on hand to make a 400-fathom purse seine if required.

A floating trap had also been constructed by the Italian fishermen. It was first used in 1899, when it took about one-half the pack, while in 1900 it only took about 50,000 fish. This trap was located about one-half mile from the cannery and a short distance east from the mouth of the home stream. It had a shore lead of 100 fathoms, a corral 40 feet by 60 feet, pot 40 feet by 90 feet, curved wing 75 fathoms, and a 30-foot opening. There were used in its construction 300 keg floats, several thousand cork seine floats, 50 anchors from 200 to 400 pounds each, 3-inch cork line, 3½-inch anchor line, 1¾ to 2¼ inch pursing line. The web was 3-inch mesh, of from 15 to 45 threads, disposed according to strain. This trap was valued at $2,500.

The following boats were used: Two fish lighters, $250 each; 1 cargo lighter, $500; 6 seine boats, $60 each; 2 fish scows, $100 each; 1 otter boat, $100; 18 dories, $30 each; 3 skiffs, $15 each; 1 hand pile-driver, $100.

The following vessels (owned by the cannery) were employed:

Class and name.	Tons.	Crew.	Value.
Steamer Hattie Gage	42	5	$17,000
Launch Aurora	5	2	2,500
Bark Electra	939	(1)	15,000

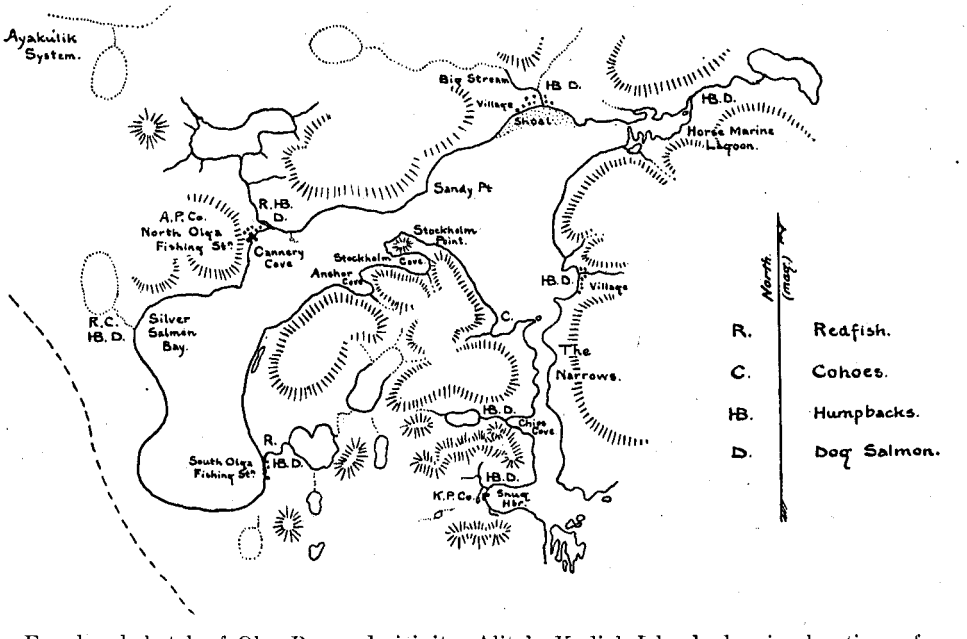
[1] Fishermen.

The salmon pack in 1900 consisted of 32,342 cases of redfish, 13.5 to the case, packed June 8 to August 13. No other fish were packed and none salted.

Kodiak Packing Company.—In 1889 a company, organized under this title, sent a cannery outfit to this district on the bark *Lizzie Williams*, which was wrecked in April on Tugidak Island and became a total loss. The superintendent returned at once to San Francisco, obtained another outfit, and erected a cannery at the head of Snug Harbor. It was operated in 1889 and 1890, and in 1891 its quota of fish, under previous arrangement, was packed in the cannery of the Arctic company. It entered the pool formed by the Alaska Packing Association in 1892, and in 1893 became a member of the Alaska Packers Association. Most of the machinery has been removed, but the buildings are substantial, in excellent repair, and the cannery could be placed in operating condition in a short time by installing machinery. It may be said to be in reserve. It is locally known as the "Snug Harbor" or "Oliver Smith" cannery, and, when operated, it obtained fish from the same streams as those now fished by the Arctic Company.

OLGA BAY STREAMS.

The streams fished by the Arctic Packing Company are all situated on Olga Bay, except one on the outside coast, which, however, is only resorted to at rare intervals. There are three streams which run redfish: The North Olga, or home stream, where the cannery is now located; the South Olga stream, the original site of the cannery; and Silver Salmon Bay stream, in the extreme western end of the bay. The latter runs very few redfish and can not be depended upon, but, with another smaller stream that empties into a cove west of the northern end of the Narrows, it has a small run of cohoes. This species may be found in other streams, but they run after the cannery closes. Humpbacks and dog salmon are found in all the streams, but, as the cannery only seeks redfish, little is known of the abundance of other



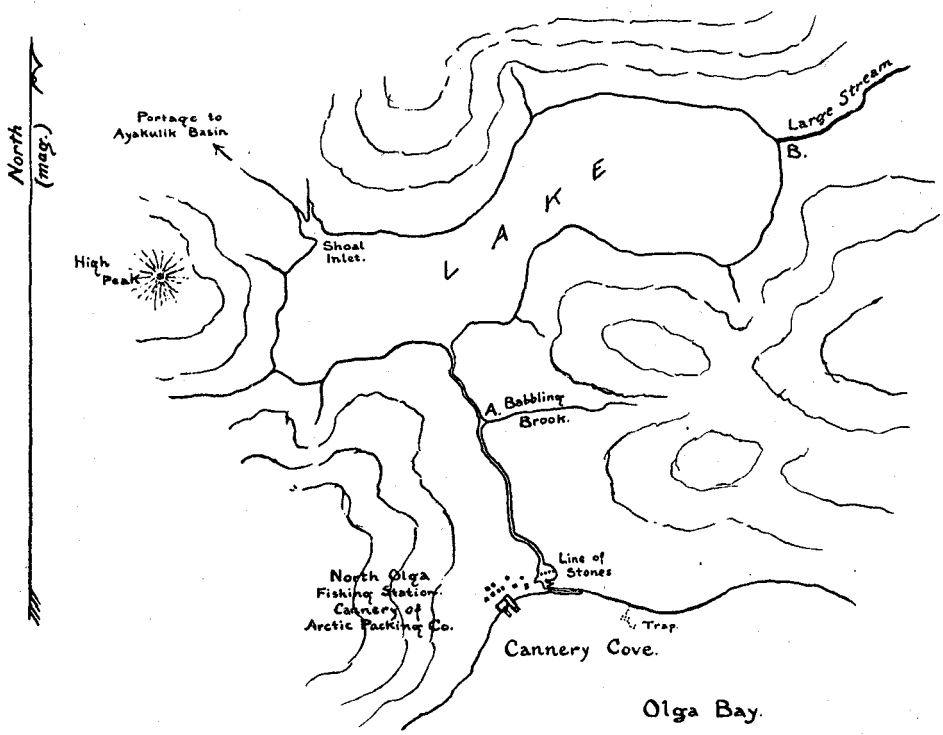
Free-hand sketch of Olga Bay and vicinity, Alitak, Kadiak Island, showing locations of lakes and streams and the species of salmon found.

species. The Horse Marine stream formerly carried a few redfish, but its entrance has become grassy and they have ceased entering. The redfish school around the shores of the bay, usually near the streams; they may appear in one place in large numbers and a few hours later be miles away. Their movements here seem to depend upon the state of the weather and the direction of the wind and sea.

The Olga Bay streams were examined by Mr. Fassett, and from his notes the following account is condensed.

North Olga, or Home Stream, empties into the bay just east of the cannery. It is about 1½ miles in length and flows in a general south-southeasterly direction from the lake which is its source. The stream bed winds through low rolling hills

covered with a rank growth of coarse grass and shrubs. In places it broadens out into small grassy flats with low banks of earth and stones; again, the banks are high, steep, and grassy, with rocky ledges outcropping in places. The bed is chiefly of shingle and gravel, with some sand in the wider parts; at the rapids and riffles there are bare rocky ledges, small bowlders, and heavy stones. There are no falls in the stream, but several short rapids, none of which, however, would prevent even a humpback salmon from easily ascending. The fall from the lake to high-water mark of the bay is about 40 feet. At the lake the outlet is about 18 feet wide with an average depth of 1½ feet, and the current sluggish, less than 1 knot per hour.



Free-hand sketch of North Olga stream and lake, Olga Bay, Alitak, Kadiak Island.

About half a mile from the lake the stream receives a small tributary known locally as Babbling Brook, which drains the rolling hills to the eastward. There are also several tiny rills carrying seepage from the surrounding hills into the stream, but their total volume is inconsiderable. At the beach the discharge of the stream is about 12 feet wide, average depth 2 feet, and current about 1½ knots per hour. A short distance from the beach of Olga Bay the stream widens into a small lagoon-like basin, into which the tide water backs through a narrow channel. Apparently this channel shifts from time to time with the changing of the shingle after heavy southerly gales; at present the outlet bends sharply to the eastward and runs parallel to the beach, separated from it by a ridge of shingle a few feet wide, and 100 yards distant discharges into the bay. The lagoon, so called, is about 160 yards long and

half as wide; the land about it is low and fairly flat, and covered with a dense growth of raspberry bushes, shrubs, and coarse grass. Tide water backs into the lagoon.

The water of the stream is slightly discolored by the vegetation, and does not seem to be very pure. But few dead salmon were noticed on the banks, or about the lake outlet; nor were more than half a dozen redfish seen to pass into the lake during a period of over an hour. Young salmon, from 1½ to 3 and 4 inches in length, were seen in numbers, however, in the upper part of the stream close to the lake, and a few were noticed in the lower part of the stream in the straight runs, hugging close to the undercut banks. Many flounders and sculpins were seen in the lagoon, and they, with the Dolly Vardens and cut-throats, were gorging themselves with the eggs of the humpbacks, which latter were spawning at the time.

Above the lagoon, in every broad pool or pond-like widening, mallard ducks with young were found feeding, but upon what could not be learned. The lake could not be examined for lack of time and facilities. The sketch of the lake was made from the vicinity of the outlet, and can be regarded merely as a crude approximation.

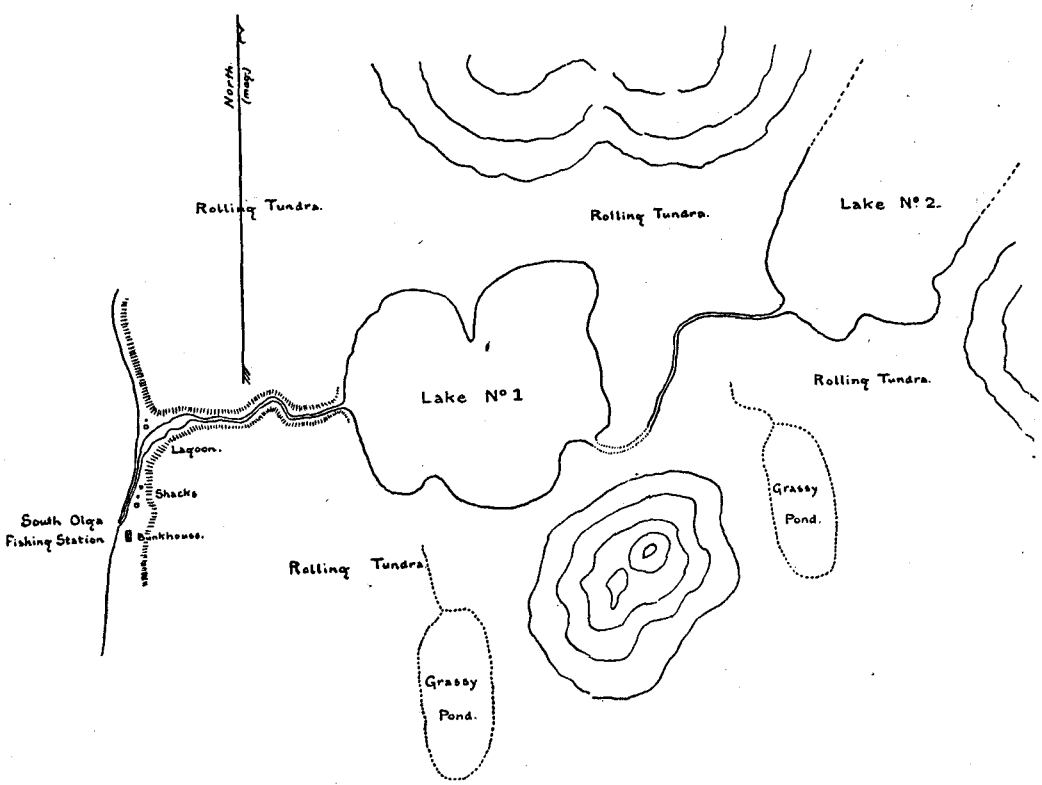
The lake is said to be about 3 miles long, east-northeast and west-southwest, and is about 1¼ miles across from the outlet to the Ayakulik Portage. It appears, and is reported to be, deep, with generally bold shores, dropping quickly into deep water. The beaches near the outlet are very narrow, of water-worn bowlders and rubble, with here and there small patches of sand and shingle. On the north the hills rise quickly to a considerable height, and the same is true of the west end; an intermediate point to the northeast of the outlet, which juts into and divides the lake into two main bodies, rises to the southward in an even gentle slope, also to a good height. Northwest of the outlet is a low valley making back from a small inlet, and through it a small portage leads to the waters of a lake draining into the Ayakulik River. The shores are everywhere covered with the same rank, dense growth of shrubs and grasses, and on the hillsides are extensive patches of scrub alders and cottonwoods.

Seepage enters the lake from every little ravine in the hills, and there are reported to be feeders, as indicated on the sketch, none of which, however, were examined. The large stream that enters the head of the eastern arm through a broad valley was carefully examined some months ago for a hatchery site, and it is reported that the conditions here are all that could be desired; there are broad spawning-grounds, excellent natural facilities for taking ripe fish and for holding them if necessary, ample level area for extensive nursery ponds and for building purposes, and a splendid supply of excellent water by gravity; the chief objections would be the cost of transporting material and supplies, and the isolation.

The Babbling Brook was also examined and found suitable for hatchery purposes. Where the brook joins the main stream there is a broad widening forming a good-sized pond in which retaining and ripening corrals could readily be fenced off, and where fry could be looked after in the spring until large and strong enough to be set free. The low ground in this little pocket in the hills is ample for building purposes, and the buildings would be well protected from the free sweep of the winter gales. The water from Babbling Brook is very clear and pure, would require but little filtering, and is said never to freeze. There is the added advantage of its accessibility, twenty minutes by trail taking one to the cannery. The waters of the

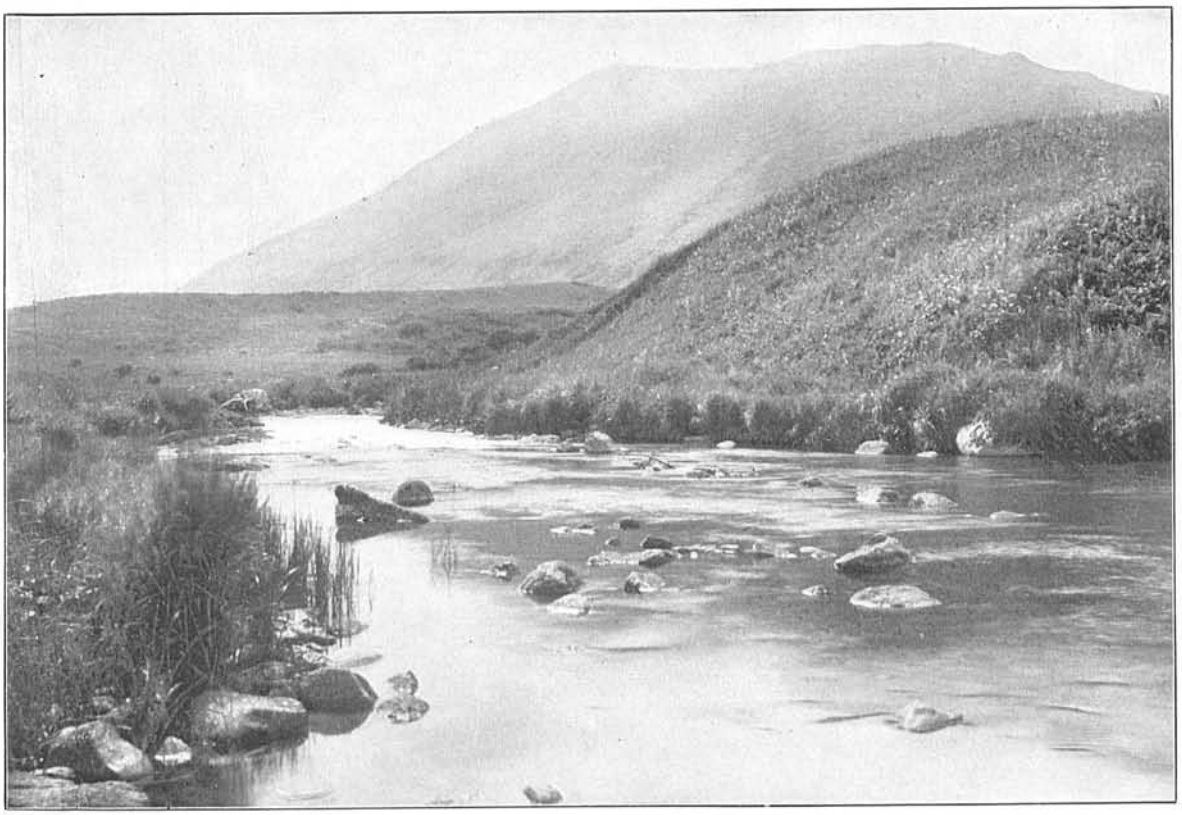
brook would furnish an ample supply for a plant of large capacity; any other water required could be obtained from the stream or from the lake by gravity; the bed of the brook at this point is about 18 feet below the normal level of the lake.

South Olga Stream is the outlet of the lower of a chain of lakes lying in a broad low valley eastward of the southern end of Olga Bay. It flows for about three-fourths of a mile in a general west by south direction, winding through a ravine in the tundra-covered mesa to the bay shore, then turns sharply to the southward parallel to the beach, back of a bare narrow shingle barrier, and a quarter of a mile distant enters the bay. The outlet at the lake is about 30 feet wide, 12 to 14 inches

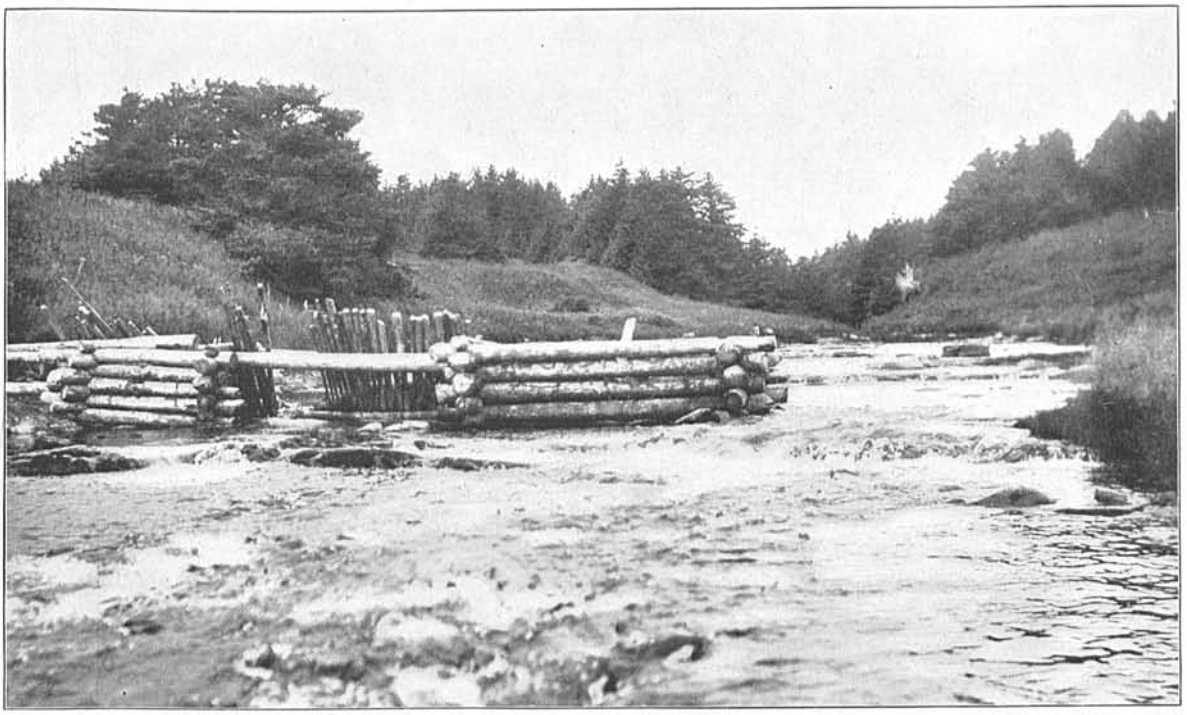


Free-hand sketch of South Olga stream and lakes, Olga Bay, Alitak, Kadiak Island.

deep, with a current of less than a knot an hour. The bed of the stream is broad, full of small bowlders and rocky outcrops in its upper third, generally of gravel and shingle, and quite gradual in descent; the fall between lake and exit being not more than 12 or 15 feet, salmon would not have the least difficulty in ascending, as the few rapids in the upper course are low and insignificant. About 400 yards before it reaches the beach the stream broadens out into a lagoon-like pond 100 yards wide, with a sluggish current and marshy banks. This is a favorite breeding-place for mallard and teal ducks. At one time, apparently, the exit was at the western end of the lagoon, but the shingle bank, thrown up by some heavy westerly gale, has



HEAD OF NORTH OLGA STREAM, ALITAK, KADIAK ISLAND.



ZAPOR IN STREAM ENTERING LITNIK BAY, AFOGNAK ISLAND.

driven it to the southward as described; the present fishing station is located on the beach at the exit. Considerable of the volume of the stream must seep out through the shingle, for at its visible exit it has shrunk to barely 10 feet in width, 10 or 12 inches in depth, with a velocity of 1½ knots an hour. In the lagoon the bottom is of sand and shingle. The banks of the stream, except the lagoon, are steep inclines covered with a dense growth of rank grasses and moss. Tide water rarely backs up into the lagoon; during heavy westerly storms the seas break over the shingle barrier. The water is rather discolored, this being particularly noticeable below the lagoon.

Red salmon were running in numbers up the stream at the time of our visit, though very few were observed entering the lake during the short time spent at the outlet. Large schools were seen in the lagoon, and it is possible that the fish school there before finally ascending to the lake. No dog salmon or humpbacks were noticed, though both species are said to run at times. The course of the stream was followed from the lake outlet to the exit, except a short distance above the lagoon, and it is not believed there were any barricades at that time; no signs or indications of them were discovered, and no well-worn trails were seen anywhere beyond the lagoon. It is not believed, therefore, that salmon have this season been taken in any other than the salt water of the bay. The entrance of fish could be stopped in a moment by merely laying a small piece of web across the beach at the stream exit, and probably this has been done when fish were scarce. Immense numbers were jumping about the bay in all directions on the afternoon of August 2, but no fishing was going on, as the crew stationed there had already taken their daily quota.

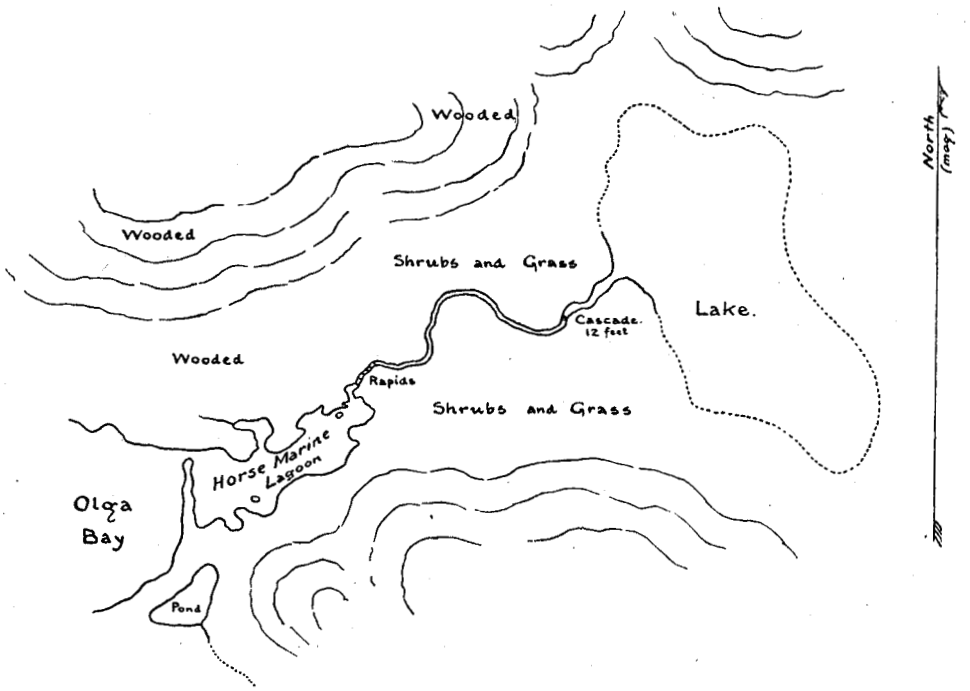
For want of proper facilities the lake could only be examined from a point near the outlet. Its axis is about east by north and west by south (magnetic), a mile in greatest length, by three-fourths of a mile average width. The shores are grassy on all sides, and the beaches of gravel, sand, and shingle, with rocky ledges and outcrops in places, shelve gently into deeper water. The lake did not have the appearance of more than moderate depth. The other lakes shown on the sketch were not seen by the party at this time, but had been previously sketched from the mountains northwest of Snug Harbor. Very few dead salmon were seen along the banks of the stream, and none on the beaches of the lakes. No entering streams or feeders were to be seen.

It did not appear that the locality is well suited for hatchery purposes; the lake water is far from pure and would require careful filtering, and a supply, as far as could be seen, is only to be had by pumping.

Horse Marine Lagoon, at the eastern end of the eastern arm of Olga Bay, is separated from the latter by a narrow grass-covered shingle spit. The spit extends north from the southern shore of the bay, leaving a narrow opening, the exit of the lagoon, between its northern end and the opposite shore. The lagoon is about five-eighths mile in length, east-northeast and west-southwest (magnetic), in the general direction of the short valley into which it makes; the width is about one-third its length. It is shallow, with bottom of sand, gravel, shells, and shingle, and is badly choked by a thick matted growth of coarse eelgrass; the shores are indented with several small sloughs and coves. The banks were everywhere covered (August 2) with a dense growth of coarse grasses and rank weeds, wild flowers, and berry shrubs. The small tides of the outer bay are felt to the head of the lagoon, but to no great extent; very

little of the lagoon bares at ordinary low water. The water is brackish and slightly warmer than the bay; no temperature observations, however, were made. Many humpbacks and a few dog salmon were seen schooling just inside the entrance, while Dolly Varden trout of large size, starry flounders, and sculpins were seen in great numbers. A few humpbacks were spawning in the lower part of the lagoon and in the slough on the northern side.

A mile from the northeastern end of the lagoon, at the head of the valley, is a deep fresh-water lake. This is an irregular basin about 1½ miles in greatest length by less than half a mile average width, the major axis lying northwest by north and southeast by east (magnetic). It is surrounded by hills on all sides except at the valley through which it drains. It was not practicable to examine the lake at this



Free-hand sketch of Horse Marine lagoon, stream, and lake, Olga Bay.

time. No entering streams were to be seen from the outlet, though three or four valleys in the distance probably carry small feeders, where there are doubtless good spawning-beds. It is not doubted that there is a suitable location for a hatchery somewhere on this lake, as the indications point to a good supply of water by gravity from the surrounding hills. The lake is drained by a shallow stream which follows a winding course for 1¼ miles through the valley and enters the head of the lagoon. The floor of the valley is undulating, covered with grasses, moss, wild flowers, and scrub in its greater part, with some fair-sized alders, willows, and spruce trees on the northern side. The stream flows with a velocity of about 1½ to 2 knots an hour above the rapids near the lagoon, where it is about 30 feet wide by 8 inches average depth. Above the cascade, in the upper part, the stream is broad with fine gravel

bottom, sluggish current, and grasses growing in the water along the shores. Elsewhere the bed of the stream is rocky with some gravel and shingle in places. It is full of low riffles and a few short rapids, besides the cascade and rapids indicated on the sketch, and the total fall from lake to lagoon is about 45 feet.

There are no artificial obstructions in the stream, which was followed its entire length, and no natural ones to prevent the ascent of the more vigorous species of salmon or trout. Humpbacks would probably find difficulty in passing the cascade, and a number of them were seen in the pools below it. Many small fry, 2 to 4 inches in length, probably young salmon, were seen in the upper reaches of the stream above the cascade and in the lake in the vicinity of the outlet.

The Horse Marine stream is referred to in Dr. Bean's report on the salmon and salmon rivers of Alaska, page 183, as the North Fishing Station, and the same name is used by Captain Larsen on his sketch map. The report gives a brief description of the location as seen on September 9. This stream was formerly good for several thousand redfish, but since the eelgrass grew up and filled the lagoon this species has abandoned it. About five or six years ago 1,500 redfish were taken from the Horse Marine, but during the last three years not a single redfish has been secured.

In Olga Bay the redfish run early. Fishing commences June 7 to 9, though they are not numerous during June; still the cannery expects to pack 5,000 cases by July 4, when the big run sets in and continues until the first week in August. They then begin to slacken and by the end of the month are not numerous enough to fish for. During this season (1900) the run was heavy and a much larger pack could have been made had there been more material on hand. In 1896 the run of redfish was small, but there were a large number of grilse, and it is said they were all males with the generative organs fully developed. One hundred and ninety-five cases of these were packed; the flesh was very red, firm, of fine flavor, but more juicy than full-grown salmon, and their weight averaged about 1 pound each. It is estimated that the following redfish were taken from Olga Bay during the last three years: In 1898, 430,000; in 1899, 400,000, and in 1900, 420,000. The Arctic cannery utilized all these fish except in 1898, when the two canneries at Uyak fished here, and together took about 50,000, and Karluk received about 10,000; and in 1899 the Uyak canneries received about 15,000. No stream tallies are kept, but the average value of 400,000 redfish for the section is probably a fair estimate, of which 100,000 are taken in the vicinity of North Olga stream, 200,000 in the vicinity of the South Olga stream, and 100,000 in Silver Salmon Bay and scattering.

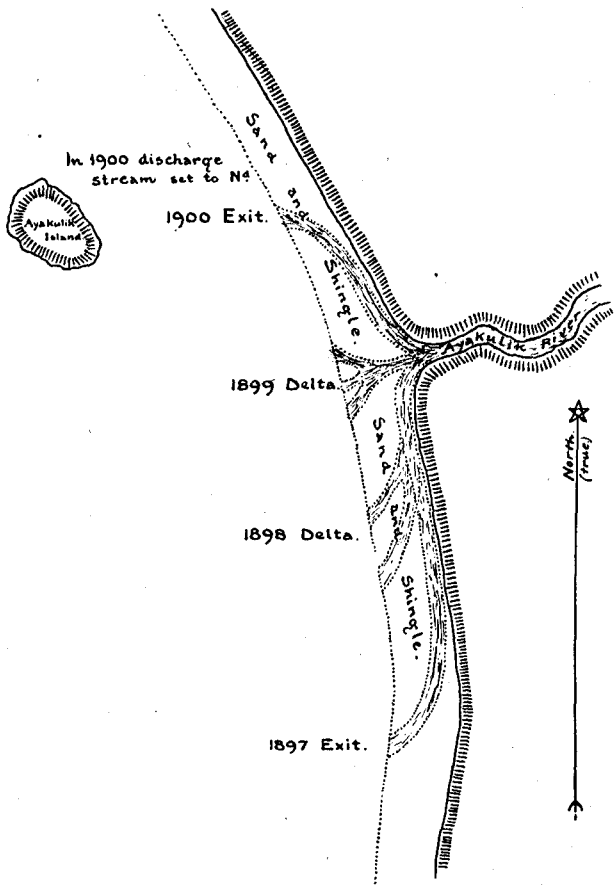
The cannery also receives a few fish from other places. In 1898, 60,000 redfish were taken at Ayakulik, and 35,000 were received from Chignik. In 1900 they received 25,000 from Ayakulik taken by Karluk fishermen.

Cohoes do not seem to be abundant; they first appear July 15 to 20, and straggle in small numbers until after the cannery closes. They are not packed at this cannery unless the redfish run is very slack, and then only to make up the guaranty.

King salmon occur as occasional stragglers and are rare visitors. Humpbacks and dog salmon are waste species here, and are used only by the natives for ukala. The former are noticed early in July and run throughout the season; the latter are seen soon after the redfish appear, and straggle throughout the season. There is no run of steelheads; a few individuals are taken at times and used by the cannery

hands. Dolly Varden trout appear a few days before the redfish and remain throughout the season. Cut-throat and rainbow trout are seen in the streams, but none have been noticed in salt water. Cod and halibut are seen in small numbers around the fisheries, and in greater numbers around the canneries, where they are attracted by the offal. Flounders are plentiful; shad have never been seen here.

Ayakulik River is on the western side of Kadiak Island, and empties into the sea midway between Low Cape and the Seal Rocks, to the eastward of Ayakulik Islet. It is small, but discharges a large body of water. Among cannerymen it is known as Red River, but this name should not be confounded with the Red River which lies 6 miles to the northward according to Coast Survey chart No. 8500.



Sketch showing changes in exit of Ayakulik River, 1897 to 1900.

The locality has been fished by the canneries on Kadiak Island for many years, but it has not been a favorite place, as the seining must be done on the open coast and can only be carried on during very favorable conditions. The seines are hauled in the surf and the fish thrown out on the sandy beach, then transported in carriers to boats in the river and carried to the waiting steamers outside. These fish are covered with sand and difficult to thoroughly cleanse on that account.

The following information relating to the river was furnished by the superintendent of the Olga Bay cannery: In 1897 and for several years prior to that time the stream, after leaving the ravine in the bluffs, turned sharply to the southward and skirted the line of bluffs for 1¼ miles, behind a broad spit of sand and shingle, before entering the sea. In 1898 the channel broke across the spit about halfway between the 1897 exit and the river mouth proper. In 1899 it ran straight out over the shingle to sea. This year the stream bends sharply to the northward, flowing along the base of the bluffs, and discharges about one-half mile above the ravine behind Ayakulik Islet. The fresh-water discharge now passes to the northward toward Seal Cape, and the salmon have been schooling in great numbers this year between the island and the main shore. They come from the northward, and it is

believed that the increase in this year's numbers is due chiefly, if not entirely, to the fact that Karluk fish making the coast in the vicinity of Seal Cape feel the influence of this fresh water, and, following it up, soon find themselves off the mouth of the Ayakulik, schooling in the open water, as described. As the stream has worked to the northward the catch of redfish has been observed to increase.

The run of redfish at Ayakulik this season has been very large, and it is estimated that the total catch amounted to 700,000 fish from the beach around the mouth of the stream. In the early part of August the humpbacks came in myriads; it is said that a boat could hardly pull through the dense masses when they were schooling, and that fishing for redfish then ceased. The weather was very favorable for conducting the fisheries at Ayakulik this year; the sea was exceptionally smooth, an excellent condition for outside beach work.

KARLUK.

A full account of the canneries, streams, and fisheries is given in my former report, pages 144 to 157, to which reference is made, and only changes or omissions, together with the 1900 statistics, will be referred to in this article. The operating canneries at Karluk are the Karluk Packing Company, the Hume-Aleutian Packing Company, and the Alaska Improvement Company; those of the Hume Canning and Trading Company and the Kodiak Packing Company are held in reserve. These are all the property of the Alaska Packers Association, and, with the cannery of the association at Uganuk, they are operated under one superintendent, with headquarters at Karluk Spit; there is a foreman at each operating plant. Karluk is the depot of supplies for the district, and affairs are conducted in much the same manner as noted under Nushagak and elsewhere, where several canneries under one organization are located in close proximity, that is, the stores and equipments are common to all and the fish are supplied equally. As the run at Uganuk is short, usually ending by the middle of July, the force at that cannery is transferred to the Karluk canneries on the completion of the pack. In 1898 and 1899 the three canneries mentioned as the operating canneries at Karluk were used, but the run of fish was so slack during those years that in 1900 only the Karluk Packing Company and the Alaska Improvement Company were employed in packing.

The Hume-Aleutian cannery was not operated, and as it was desired to increase the capacity of the Bering Sea canneries, the three fillers and three toppers of the former were removed and installed in the latter district. They expect to install new machinery in the Hume-Aleutian cannery in 1901. The reserve canneries are in the same condition as mentioned in my last report, though that of the Kodiak Packing Company can hardly be said to be in reserve, as practically all the machinery has been removed and the buildings used as warehouses, workshops, etc.

There has been no increase in the capacity of the operating canneries. The cannery machinery in each consists of 7 retorts, 3 fillers, 2 toppers, 2 solderers, 1 cutter, and 2 sets of canmakers. Usually 2 fillers only are used, giving these canneries a daily capacity of 1,600 cases, though by using a third filler the capacity might be increased to 2,400 cases; but that could hardly be kept up for any length of time, unless an additional topper is used, which may be taken from the can-making department. A fair capacity for these canneries as now installed is 2,000 cases per day.

The speed of the fillers, running at an average rate and in such a manner that the handlers are not crowded beyond their capacity, is 52 to 58 per minute, though it is claimed the machines, when well adjusted, will run at a speed of 80 to 90. At this rate the pack can not be handled unless the filling tables are very differently arranged.

A good average for the can-makers is 50 per minute. All cans are made at the cannery, of 100-pound tin for bodies and 95-pound for tops, of which 50 per cent is imported; 1 pound of solder is used to the case.

Transportation is by the vessels of the company and chartered vessels, and they usually make several trips during a season. If idle for any length of time, they are moored at Larsen Cove, a branch of Uyak Bay.

The Chinese contract was 42½ cents per case for machine-filled and 47½ cents for hand-packed, with the usual conditions. Fishermen's contract was $25 per month from the time fishing commenced until it ceased and 18 cents per case, divided equally amongst all; $40 per month from the time the vessel arrived until fishing commenced and from the time fishing ceased until the day of departure; full board from the time of signing until paid off, except the Italian crew, who boarded themselves and received 35 cents per day commutation. There are two classes of fishermen; one consists of Scandinavians, who operate on the Spit, and the other of Italians, who operate the Tanglefoot Bay side.

The streams and vicinity, together with the species, times of the runs, and other matters relating to Karluk, were fully described in my former report. It need only be said that the pack made here is essentially of redfish, all other species being incidental. Occasionally, after long intervals, there is an enormous run of humpbacks. There was such a run in 1890, and this season they were again very plentiful around the whole island. During our visit the seines were choked with them, and, as previously mentioned, at Ayakulik fishing for redfish ceased on account of the great number of humpbacks present. There are usually a few scattering king salmon around Karluk beach, most abundant in June, when a pack of from 500 to 1,000 cases is sometimes made. A few cohoes and dog salmon also occur, but the small pack usually made of the former comes from Sturgeon River. Steelheads are taken, commencing early in August and increasing during the latter part of the month, but never in sufficient numbers to utilize; thirty or forty may be taken one day and the next few days only three or four, or possibly none. Cod are abundant. Halibut are not plentiful, and neither shad nor sturgeon have been seen. Usually there are many trout, but this year they were very scarce.

The Karluk canneries this year fished the Spit and adjacent waters, Ayakulik, Uganuk, Little River, Eagle Harbor, and Kiliuda Bay, though the yield from the last two places was not over 9,000 fish. There seemed to be no contention this year over the fishing rights in this vicinity.

The fisheries at Karluk during the seasons of 1898 and 1899 were considered a failure, as only about 65 per cent of the general average of the past ten years was made. The canneries at Karluk, Uganuk, and Uyak combined have, for the ten years ending with 1897, made an average pack of over 200,000 cases per year, and at no time during this period has the pack fallen as low as for the years of 1898 and 1899. Some cannerymen claim that these slack runs are only temporary; others believe that they indicate the first sign of decline, and that while some years there

may again be large runs, the average will become less. In 1900, however, there was a large increase, the canneries under consideration packing about 220,000 cases. It will be interesting to note the future pack of this locality, as the hard fishing commenced in 1888, and the first output of the hatchery was made in 1896.

For future comparison it may be interesting to record the redfish statistics of the Karluk canneries for 1900, which are as follows:

Packed at the two Karluk canneries		2,031,971
Received from Ayakulik River	242,500	
Received from Little River	5,800	
Received from Eagle Harbor	1,000	
Received from Uganuk	24,000	
		273,300
		1,758,671
Sent to Uganuk from Karluk		9,000
Total redfish taken at or near Karluk Spit		1,767,671
Packed at the Uganuk Cannery		170,960
Received from Ayakulik River	17,500	
Received from Little River	17,300	
Received from Kiliuda Bay	4,900	
Received from Eagle Harbor	3,000	
Received from Karluk	9,000	
		51,700
		119,260
Sent to Karluk		24,000
Redfish taken at Uganuk		143,260

The following are the statistics for 1900 of the Karluk and Uganuk canneries combined. There were employed 171 white fishermen, 13 native fishermen, 43 white cannery-hands, 8 natives, and 263 Chinese.

There were used 10 seines, each 400 fathoms long and 185 meshes deep; 6 seines, each 250 to 300 fathoms long, and 120 to 160 meshes deep; and 3 hatchery seines, each 100 fathoms long and 80 meshes deep, all 3-inch mesh and valued at $1.50 per fathom. This, however, only represents a fraction of the material on hand. There is a warehouse filled with old seines, many bales of all kinds of webbing, and an abundance of floats, sinkers, cordage, etc. At Uganuk the two floating traps mentioned in my former report were used. These traps are valued at $1,500 each.

The following boats were used: Nine lighters, $500 each; 3 launch tenders, $90 each; 17 fish scows, $150 each; 20 seine boats, $150 each; 33 dories, $25 each; 1 hatchery scow, $150; 6 hatchery transporting cars, $30 each.

The following vessels were used:

Class and name.	Tons.	Crew.	Value.	Ownership.
Steamer Kadiak	58	9	$20,000	Owned.
Steamer Gertie Story	36	7	12,000	Do.
Launch Karluk	8	2	10,000	Do.
Launch Uganuk	8	2	10,000	Do.
Launch Delphine	5	2	2,500	Do.
Launch Ida	5	2	2,700	Do.
Ship Santa Clara	1,453	18	40,000	Do.

The ship *Indiana* and the bark *Merom*, which are accredited to the Alaska Packers Association cannery at Naknek, were also employed in part at Karluk. The bark *Merom* broke from her moorings off Karluk Spit on October 6, 1900, during a gale, and was totally wrecked on the rocks, losing 12,572 cases of salmon.

The following was the output in 1900:

Species.	Cases.	Number to the case	Dates.	Remarks.
Karluk Packing Co.:				
King salmon	475	4.9	June 9–June 28	None salted.
Redfish	77,558	13.6	June 9–Sept. 14	
Cohoes	1,382	7.2	Aug. 25–Sept. 14	
Alaska Improvement Co.:				
King salmon	612	4.9	June 5–June 28	Do.
Redfish	69,712	13.9	June 4–Sept. 21	
Cohoes	2,791	8.0	Aug. 25–Sept. 21	
Uganuk:				
Redfish	13,370	12.8	June 9–July 17	

The hatchery operated by the Alaska Packers Association on Karluk Lagoon was visited by Mr. Fassett, whose report will be found on pp. 331–348.

UYAK.

The Uyak Bay canneries, of the Pacific Steam Whaling Company and Hume Bros. & Hume, were fully described in my previous report, pages 158–159, and will only be referred to in connection with the statistics. These canneries are practically the same as in 1897, and as there are no redfish streams in Uyak Bay all the fish are obtained at a distance. The principal places fished are Karluk, The Slide, Waterfalls, Ayakulik, Uganuk, Little River, Eagle Harbor, Kushuack, Kukak, and Kiliuda Bay. Formerly the Afognak streams at Litnik, Paramanof, and Malinof were also fished, and it is said fish are still obtained at these places.

The *Pacific Steam Whaling Company* cannery uses steam boxes in the canning process for first cooking, and for second cooking 2 iron retorts; it has 1 filler in use, and 1 spare one, 1 solderer, and 1 cutter. Topping is done by hand. All cans are made by hand at the cannery, using 100-pound imported tin-plate for bodies and tops.

Fish are pewed from boats or steamers to the fish-house on the end of the wharf, and when cleaned are transported by handcarts to the cutters. The cannery has a capacity of 900 cases per day.

The Chinese contract was the same as that of the Karluk canneries. The fishermen's contract was $25 per month from the day of landing to the day of departure, transportation and full board from the time of leaving the home port until the return to the port of departure, and $15 per thousand fish.

During the season of 1900 the cannery employed 64 white fishermen, 6 white cannery-hands, 4 natives, and 56 Chinese; they also purchased fish from 26 natives, who were paid from $30 to $35 per thousand.

They used 5 seines; one 700 fathoms, one 550 fathoms, and three 350 fathoms long; 2¾-inch to 3-inch mesh, and 180 meshes deep. They have 10 spare seines; average value of all, $1.50 per fathom.

There are 5 lighters, $450 each; 15 seine boats, $70 each; 3 sailboats, $90 each; 13 dories, $30 each; and one pile-driver, $1,000.

The following vessels (owned by the company) were employed: Steamer *Shelikoff*, 101 tons, crew 10, value $36,000; launch *Kenai*, 5 tons, crew 2, value $7,000. Transportation of spring outfit and fall pack is by calling vessels of company.

The following was the output in 1900: Redfish, 29,384 cases, 13.7 to the case, May 28 to August 25; humpbacks, 1,025 cases, 21 to the case, July 20 to August 25.

Hume Bros. & Hume.—This cannery operates 4 retorts, 1 filler, 1 solderer, and 1 cutter, and tops by hand. All cans are made by hand at Uyak of 100-pound imported tin for bodies and tops. The fish are handled in the manner noted under the preceding cannery. The Chinese contract was the same as at Karluk and the fishermen's contract the same as given under the Pacific Steam Whaling Company's cannery.

The following are the statistics for the Hume cannery, season of 1900: Employed 52 white fishermen, 9 natives, 12 white cannery-hands, 56 Chinese; used 10 seines, from 150 to 350 fathoms long, 160 meshes deep, 3-inch mesh, valued at $1.50 per fathom; 4 lighters, $400 each; 12 seine boats, $120 each; 1 whitehall boat, $75; 20 dories and skiffs, $20 each; 1 pile-driver, $1,000.

The following vessels (owned by the cannery) were employed:

Class and name.	Tons.	Crew.	Value.
Steamer Equator	42	7	$12,000
Steamer Francis Cutting	59	8	10,000
Launch Herbert Hume	5	2	3,500
Bark Harvester	716	12	12,000

The following was the output in 1900: Redfish, 27,636 cases, 13.5 to the case, June 5 to September 20; humpbacks, 2,064 cases, 21 to the case, July 5 to September 20. Scattering cohoes and dog salmon were packed with humpbacks under pink brands. Salted 25 barrels of redfish.

The only places in this vicinity that might offer a hatchery site are Little River and Uganuk.

AFOGNAK.

From Uyak the *Albatross* went to Afognak, where an examination was made of the Fish Commission interests in that locality. During the four days in which these investigations were being conducted a sextant reconnaissance was made of Afognak (Litnik) Bay and approaches. As the locality is exceedingly foul and had never previously been surveyed, the chart accompanying this report will no doubt be useful to the Commission and to the mariner, and the following notes, so far as they relate to Afognak Bay, are referred to it.

In leaving the anchorage off the canneries at Uyak, of which a survey was made by this vessel in 1897 and published in Coast Survey Bulletin No. 38, a course was laid out of Uyak Bay clearing the shores and headlands of Capes Kiliugmuit, Ugat, and Uganuk by about 1 mile and entering Karluk Strait in mid-channel. A course through the middle of Karluk Strait seems perfectly safe and clear, and on this course the head of the vessel is found to point for about the center of Whale Island, possibly a little to the southward.

The Raspberry Island side seems to be the boldest, though no outlying dangers were seen anywhere. A short distance to the eastward of Dry Island, which lies off the entrance to an indentation on the southern shore midway in the strait, the tides coming through Shelikoff Strait meet the tides from the eastward around Whale Island. Outside and between the two small islets off the southeastern end of Raspberry Island is a sunken rock known as Thomas Rock. A fair berth of these two islets is said to clear the rock.

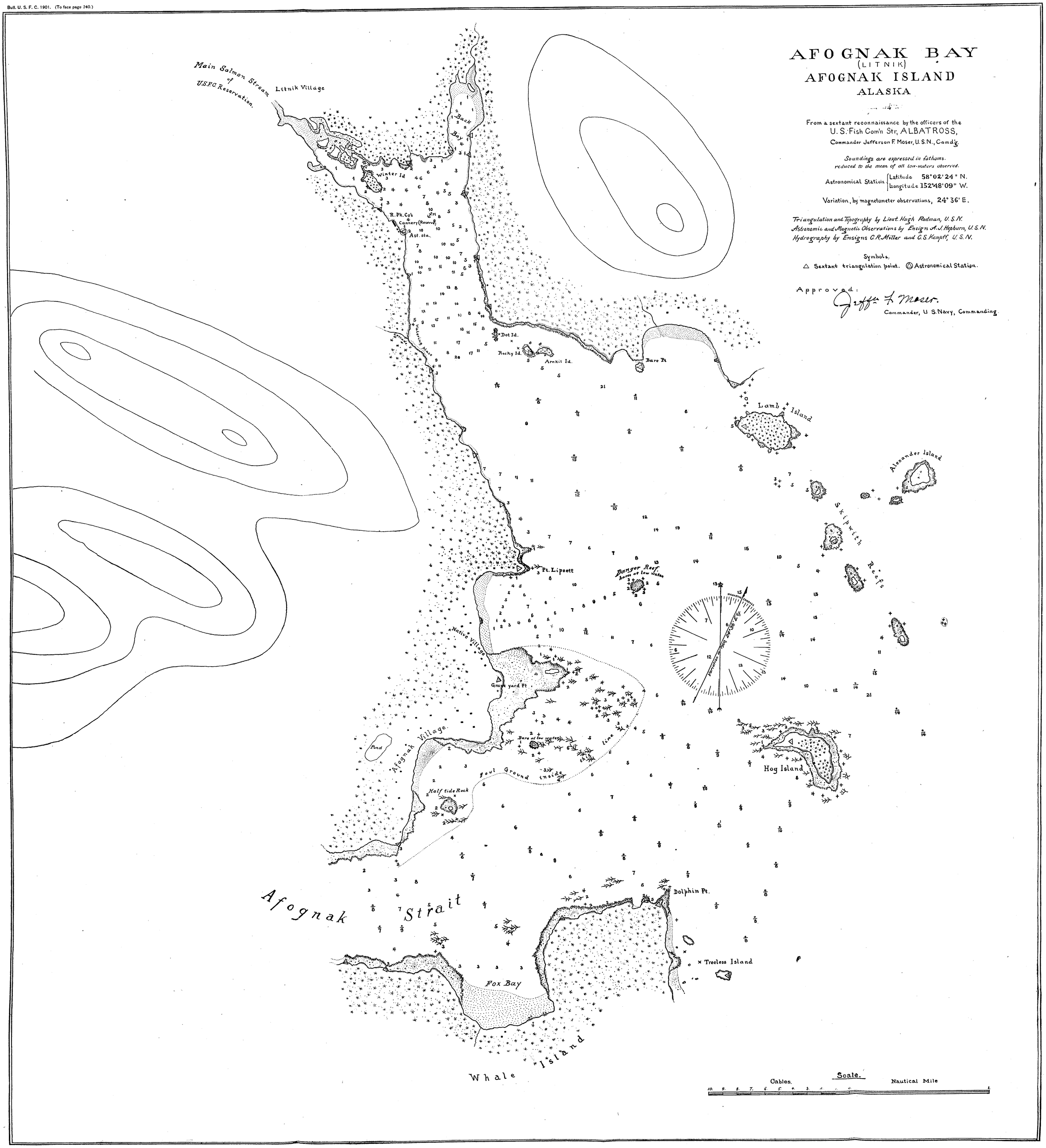
At Whale Island Karluk Strait forms two passages. The one to the southward, described by this vessel in Coast Survey Bulletin No. 38, was called Whale Passage, and the one to the northward is Afognak Strait. The latter should not be attempted by a deep-draft vessel until a satisfactory survey has been made, as there are indications at one point that there may not be sufficient depth at extreme low water for vessels of moderate draft, nor by any vessel without local knowledge, as the currents are strong and the passage very foul. Time did not permit the reconnaissance made by this vessel to extend through Afognak Strait. Sufficient only was done to appreciate the strong current and foul conditions of the shore.

The northern shore of Afognak Strait is foul in patches for nearly one-third of the width. On the southern side, at a point about one-third the length of the island from the western end, a bank makes off from Whale Island a considerable distance, and a reef, uncovered at low water, lies off the bight near the eastern end of the island, but the latter is off the fairway. Off Afognak village the reef extends a full mile to the eastward and from one-fourth to one-half mile to the southward.

The largest island off the southeastern end of Raspberry Island is Dearborn Island, the point of which seems to project farther into the strait. Off the southern end of this island there is a bare rock, always above water, which is a leading mark to the western end of Afognak Strait. The *Albatross* passed this rock, leaving it to the northward, distant 250 yards, and then brought it astern, steering for the saddle in Hog Island, which from this point is seen about one-third the length of that island from the northern end. After running half the length of Whale Island and well clear of the bank previously referred to on the southern side of the channel, the course was changed to head for the southern end of Hog Island, which was kept until that island was about 1 mile distant, when the course was gradually changed to the northward, rounding the reef off Afognak village into the bay.

Afognak (Litnik) Bay.—Litnik is a corruption of the Russian word Elitnik, meaning a place where fish are dried and prepared for future use, and is the name given locally and used throughout the Kadiak district to the body of water known to us as Afognak Bay, and to the river and lake at its head. Locally, the name Afognak Bay is applied to a small, shallow, foul cove, about 1½ miles to the westward of the village, on the northern side of the strait. Afognak is retained, however, in this report, for the large bay, as the President's proclamation and the Fish Commission records refer to it by that name.

Afognak (Litnik) Bay is on the eastern side of the extreme southern point of the island of that name. The approach from the westward (Shelikof Strait) is through Karluk Strait and Afognak Strait or Whale Passage; from Kadiak (St. Paul), through Usinka Narrows; and from sea, to the eastward, through the broad open waters between Pillar Cape and Spruce Island. The bay proper may be said to include the waters inclosed by a line drawn from Afognak village and the outlying reefs to Hog Island, thence by Skipwith Reefs to Lamb Island and the main shore, and is, approximately, 5 miles long by 2 miles greatest and one-half mile least width. The shores are heavily wooded, with high mountains lying back, from which ridges and hills project toward the bay. The entrance is much obstructed by islets and reefs, and great care must be exercised in the approaches, but the bay proper, except for one reef, is apparently clear of danger, with excellent anchorage at the head.


AFOGNAK BAY
(LITNIK)
AFOGNAK ISLAND
ALASKA
From a sextant reconnaissance by the officers of the
U. S. Fish Com'n Str, ALBATROSS,
Commander Jefferson F. Moser, U. S. N., Comd'g.
Soundings are expressed in fathoms.
reduced to the mean of all low-waters observed.
Astronomical Station { Latitude 58°02'24" N. Longitude 152°48'09" W.
Variation, by magnetometer observations, 24° 36' E.
Triangulation and Topography by Lieut. Hugh Rodman, U. S. N.
Astronomic and Magnetic Observations by Ensign A. J. Hepburn, U. S. N.
Hydrography by Ensigns C. R. Miller and C. S. Kempff, U. S. N.
Symbols.
△ Sextant triangulation point. Ⓐ Astronomical Station.
Approved:
Jeffer F. Moser.
Commander, U. S. Navy, Commanding.
Main Salmon Stream of U.S.F.C. Reservation.
Litnik Village
Back Bay
Winter Id
R. Pk. Co's Cannery (Reserve)
Ast. sta.
Watering place
Dot Id.
Rocky Id.
Arnkit Id.
Bare Pt
Lamb Island
Alexander Island
Skipwith Reefs
Pt. Lipsett
Danger Reef, bares at low water
Native Village
Grave yard Pt
Afognak Village
Pond
Bare at low water
Foul Ground inside this line
Half tide Rock
Hog Island
Afognak Strait
Dolphin Pt.
Treeless Island
Fox Bay
Whale Island
Scale.
Cables.
Nautical Mile

Afognak village is located at the extreme southwestern end of the bay, and consists of two parts; the most southerly is a settlement with a population of about 175 whites and half-breeds, and to the northward (separated from the other by a high grassy bluff named Graveyard Point) is a native village of less than 100 inhabitants. Very foul ground, marked by kelp in summer, extends one-half mile off the principal village, increasing to 1 mile off Graveyard Point, and reaching halfway across the passage to Hog Island, a small wooded island, slightly crescent-shaped, with the cusps to the southwest. It is about half a mile long, in a general east-and-west direction, about 250 yards in width, and, when seen from the westward, it has a dip or saddle in the northern third. From high-water mark the rocky shelf projects in reefs a distance of 200 yards on all sides, and on the western end of the reef extends toward the village for three-tenths of a mile. These reefs are all marked by kelp in summer.

Nearly a mile to the northeastward of Hog Island are Skipwith Reefs, a line of high rocks always out of water, which, with Lamb Island, a larger wooded island, form the eastern side of the bay. Between Hog Island and Skipwith Reefs is a wide, clear passage, which might be called the Eastern Passage, and is the one to be preferred by strangers on entering or leaving the bay.

Danger Reef is a large reef, bare at low water, with deep water close to and all around it, and lies NNE. ½ E., 1.2 miles from Graveyard Point. It is estimated that it covers at three-quarter tide, or earlier. It is a bad reef when covered, as it is not marked by kelp and is not easily seen.

On the northern side, outside of the point marking the contraction of the bay, are three small, low, wooded islets lying close to the shore. The western one is Dot Island, which, when seen clear of the adjoining land, has a conical appearance. West of this islet, on the opposite shore, is a fine cascade, falling to the beach, from which most excellent water may be obtained. At the head of the bay, in the northwestern arm leading to the reservation stream, are several small islands. The first one is Winter Island, beyond which vessels should not go; it is high, rocky, and heavily wooded with spruce. The channel to the northward of Winter Island is obstructed by rocky ledges, and to the southward, as a point higher up is reached, it grows shallow and grassy. The latter is the boat channel to the river mouth.

Several cannery steamers from Karluk winter in this arm. They anchor to the eastward of Winter Island, and then haul the sterns of the vessels close up to the rocks on the island (which are bold), where they are clear of the ice forced out of the river in the spring.

At the extreme northern end a narrow extension of the bay, about a mile long by 1½ cables in width and 2 fathoms deep, is known locally as Back Bay. It should afford good anchorage for a small vessel. At its head are two humpback streams.

On the western shore, at the point where the bay turns to form the northwestern arm, are the locations of the canneries of the Royal Packing Company and the Russian-American Packing Company.

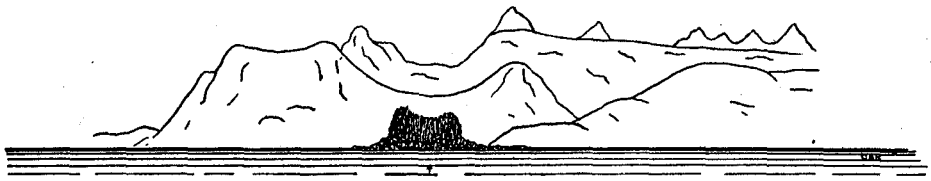
The history of these canneries is given in my former report, pages 163 and 164, to which reference is made. Nothing is left of the cannery of the Russian-American Packing Company. The buildings of the Royal, in which are stored a number of boats, and several detached houses are still standing and in fair condition. A watchman is kept here by the Alaska Packers Association during the summer, and during the winter the ship-keepers of the cannery steamers care for the property.

The anchorage in the upper bay off the cannery building is in 7 to 8 fathoms, mud bottom. It is said an anchorage may be made in summer off the native village south of Point Lipsett in 5 to 6 fathoms. This bight is, however, open to the eastward and can not be recommended.

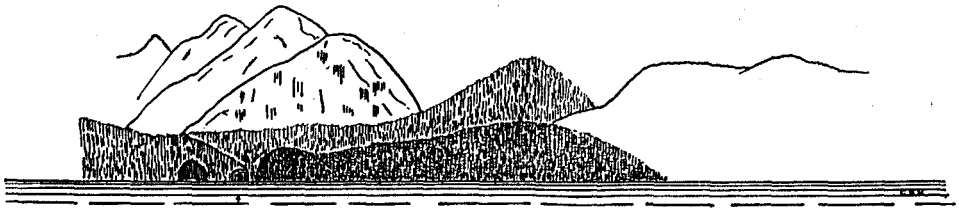
The following results by sextant and artificial horizon were obtained for geographical position at the high water, grass-covered rock on the western shore of the bay one-tenth mile south from the cannery building: Latitude, 58° 02′ 24″ north; longitude, 152° 48′ 09″ west; variation by compass declinometer 24° 36′ east.

Establishment from seven successive high waters, at moon's age from 17 to 20 days, XI^h 25^m. Mean rise and fall of tide during same period, 9.95 feet.

Sailing directions, Afognak Bay.—There are two passages used in entering this bay, one to the eastward and the other to the westward of Hog Island. In coming through Afognak Strait steer for Hog Island, and when three-fourths mile distant



Hog Island bearing SE. by E. ½ E., mag., in saddle of back range, clears Danger Reef.



Cannery building bearing WNW. ¼ W., mag., between Dot Island and adjoining shore to eastward, leads through East Passage and clears Danger Reef.

haul up for Lamb Island and run for it until the cannery building is open to the eastward of Dot Island; then change course for Dot Island, and when well clear of Danger Reef keep in mid-channel to the anchorage. At low water Village Reefs may be rounded by the kelp, and Danger Reef is then distinctly visible. The cannery steamers frequently pass between Village Reefs and Danger Reef, but local knowledge is necessary for this channel. The western passage should be used with caution, particularly at high water, as a stranger in keeping off Village Reefs may get on the foul ground on the Hog Island shore. For a stranger the eastern passage is recommended, as it is wide, straight, and apparently clear. In entering by this passage keep in mid-channel between Hog Island and the southern bare rock of Skipwith Reefs, and steer for Dot Island. On this course the cannery building will be seen between Dot Island and the adjoining shore to the eastward. When clear of Danger Reef follow the directions given under the eastern passage.

A line between Dot Island and Hog Island clears Danger Reef to the eastward one-fourth mile. On this line Hog Island will be seen filling a wide saddle in the distant mountains, and Dot Island will be slightly to the eastward of a V in the back range. The *Albatross* entered by the western passage and left by the eastern one.

AFOGNAK SALMON STREAMS.

At the head of Back Bay are two small streams, which at the time of our visit were literally choked with humpbacks. Cohoes are also said to run here, and several dead king salmon were seen. A small stream to the eastward of Bare Point carries a large number of humpbacks and is said to have a fair run of cohoes. Back of the village of Afognak is a shoal lagoon, or lily pond, which drains through a shifting channel and carries a few humpbacks and cohoes.

The reservation stream, previously referred to as emptying into the head of the northwestern arm of the bay, is the only redfish stream in this vicinity. A board of experts was appointed by the Commissioner in 1889 to examine the salmon streams of Alaska, and as this board spent the summer of that year in examining Karluk, Alitak, and Afognak, the results of which, so far as they relate to Afognak, are given on pages 185–188 and 207–208 of the U. S. Fish Commission Bulletin for 1889, the stream and lake will here be referred to in only a general way, though both were visited on several occasions by this party.

This year the redfish and humpbacks were very abundant in the reservation stream, and it is said that the stream can furnish, without injury, from 100,000 to 150,000 redfish a year, but of this there is no data, as all commercial fishing in late years has been done surreptitiously. The runs are remarkably early in this stream, scattering redfish appearing early in May and in large numbers by the middle of that month; by June 1 there is usually a lull. This is called the early run. The second run is said to commence with the spring tides in June, and the fish are then abundant until the middle of July, when the run grows slack, and by the last of the month it is practically over. If the water in the river is low the fish school around the mouth in great numbers, but upon the first rise they rush to the lake in a body. The redfish, upon arriving, school around the upper part of the bay, mostly along the western shore, where there are several excellent seining beaches.

Cohoes appear in small numbers the last week in July; the run is at its height the last of August, and continues, in diminishing numbers, until October. Humpbacks appear during the middle of July, and run in large numbers during August, growing less the latter part of that month and until the middle of September. The last fish are, however, of very poor quality. Dog salmon are not very numerous, and seem to run scatteringly with all other species. Straggling king salmon are seen at irregular intervals throughout the season. They are never abundant and are only recognized as occasional visitors. Steelheads are believed to winter in the lakes, and descend to the sea as soon as the stream opens in the spring. They appear at all times during the season, but are most numerous during the coho run. Dolly Varden trout appear with the earliest species and remain throughout the season.

The estuary and river to the falls, and the tributaries below, were crowded with humpbacks at the time of our visit. Great numbers were noticed trying to surmount

the falls, and many were seen thrown by their own velocity against the rocks in the rush to ascend. It is probable that few of this species gain the lake, and that most of them spawn in the lower course of the river and in the tributaries referred to. On my visit to the lake, for want of facilities the shores could not be examined except in the vicinity of the outlet and for about half a mile along the eastern side. Dead fish were not very abundant along the lake shores. All the dead redfish seen were opened, and it was found that 50 per cent of the females had not spawned and 30 per cent of the males had milt. A similar condition was previously noticed and referred to in my former report, pages 12 and 13. There may be some abnormal impediment in the genital pore, but it is more probable that in ascending a difficult stream the exertion is so great that the fish dies of exhaustion before it is fully ripe.

On August 15 the temperature of the surface water of the lake near the shore was 62° F., at 4 feet depth 58° F. and 59° F. The stream at the falls was 65° F.

It is said that the reservation stream has been fished by all the canneries each year until 1899, when only two corporations out of the three operating in the vicinity fished here. The natives report that this year (1900) one cannery obtained fish both from Malinof and from the Afognak stream; that a small schooner in charge of a member of the Brotherhood of Afognak Pioneers fished in the vicinity of the Royal cannery, entering and leaving the bay under cover of darkness. Several members of the organization, when questioned in regard to it, claimed to have no knowledge of such fishing. It is believed, however, that the natives' report is true.

The natives fish the stream, using, so it is said, the usual hook and pole, though at the summer village (Litnik), on the left bank of the stream near the mouth, several nets were seen which were also probably used.

ZAPORS.

From the earliest Russian times the natives were taught to barricade the streams by zapors, or barricades which were maintained for generations in the principal rivers. Upon the advent of the canneryman this method of holding the fish was encouraged and aided in every possible way. These zapors, as originally constructed, consisted of large cribs of heavy logs weighted with stone, placed at intervals across the river to form piers, at a suitable location. Between the piers other logs were secured, forming a line of support for the rails, or saplings, which were placed side by side, in the direction of the stream, with the butts upstream, embedded in the gravel or river bottom, and the other end resting on the timber support. The arrangement of these rails was the same as those used in the construction of the barricades in southeastern Alaska, and described in my former report, page 37. This arrangement permitted the water to pass through the interstices or over the ends, and prevented any fish from ascending. At a point below this dam a similar one was constructed, but near the center, or wherever the depth was most suitable, an opening was left for a sluice, the latter arranged to permit the fish to pass in, but not out. The fish were then impounded between the two barricades and easily captured.

The zapors of late date, however, consist of only one barricade, which prevents the fish from ascending. The one until lately maintained in the reservation stream was of this construction and was located a short distance above tide water, below the first falls, about a mile from the low-water mouth of the river proper. Three cribs

CASCADES IN LITNIK STREAM.

Many humpbacks in pool. Salmon struggling in falls.

formed the piers, and at the time of our visit the northern crib had been removed and was lying on the rocks a short distance below. This zapor, or rather a zapor, has been maintained at this point for many years. It was carried away during the winter of 1895 and 1896 and rebuilt by the natives as soon as the conditions permitted. In August, 1899, the master of one of the Alaska Packers Association cannery steamers, with the assistance of some natives, pulled out the northern crib. As this made but a small opening which could readily be closed, a party from the *Albatross* dismembered the remaining cribs, piled the timber and rails on shore, and burnt them. The stream is now (August, 1900) clear of artificial obstruction.

INHABITANTS.

The inhabitants of Afognak consist of Kadiak Eskimos, Russian half-breeds, and a few white hunters and fishermen. As much complaint has been made in this locality, not only on account of the illegal fishing of the reservation stream by the canneries, but by the inhabitants in relation to their condition and surroundings (see salmon inspector's report, 1899, pp. 38–48), it is deemed necessary, in order that the Commission may be advised of the facts, to state the situation as it appears to me after our visit.

When Alaska was under the management of the Russian-American Company the time arrived when they had in their employ many men who had grown old in their service or who had lost their health and could not very well be discharged and thrown upon their own resources. Upon representing this condition to the Russian Government an order was issued, in 1835, directing the company to locate, as permanent settlers, such of the employees as had married native or half-breed women, and who, on account of age or ill health, could no longer serve the company. The latter, under this order, was obliged to select suitable land, build comfortable dwellings, furnish agricultural implements, seed, cattle and fowls, and a year's provisions. The settlers were exempt from taxation and military duty, and the Russians were known as colonial citizens and the half-breeds as colonial settlers. The eastern side of Cook Inlet, Afognak Island, and Spruce Island were selected as most suitable for settlement, and the half-breeds now forming the larger part of the population at Afognak village are largely descendants from these colonial citizens and settlers. The early name of the village was Ratkovsky. The half-breeds have always lived on a higher plane of civilization than the natives and are more industrious. Among them are a number of skilled craftsmen, such as carpenters and boat-builders, and in the latter occupation it is said they excel the whites usually employed at the canneries.

In our investigations in Alaska we have come in contact with all the different phases of native life, from the Haida of the south to the Innuit of the north, from the Athapascan of the east to the Aleut of the west, and there are few places that can equal Afognak in natural resources for native life. None need suffer here, and if any do it is through their own neglect. Potatoes and the hardier vegetables of all kinds grow well and can be stored for winter use; hay can be made for cattle; the waters teem with fish, not only with salmon during the summer, which may be cured for winter use in practically unlimited quantities, but all during the year cod may be taken in numbers on the adjacent banks. The furs are not all gone yet; bear, fox, and mink are still found in limited numbers, and the catch of sea otter

this year has been comparatively large. As for the means for purchasing other provisions and clothing, it is here in the hands of any industrious man or woman. There is a great demand for dried fish—ukala—in all the mining regions of the north, principally for dog food. The stores, of which there are two in Afognak, representing large trading companies, pay in trade (provisions and clothing) 2 cents per pound for ukala, and will purchase all brought to them. For the use of the natives here the supply of salmon has not decreased, and there should not be the slightest difficulty in easily obtaining in a short time all that is required for the family during the winter, and afterwards ukala can be made for sale or trade. We were not at Afognak during the redfish run, but it is said that it was very large; the humpbacks were running at the time of our visit, and they were very numerous. It was not necessary to hook them out of the stream; when wanted for examination we simply kicked them out on the bank. To show the abundance of fish, it may be mentioned that the ship's dog dragged many struggling ones out of the water.

The women, assisted by the old men and children, usually prepare the ukala and do the garden work, so there is no excuse for the able men not seeking employment in other fields; but the latter fancy that they must hunt, and imagine that they can do nothing else, or rather, that it is degrading to work. In former times hunting formed the chief element of support, and while the fur-bearing animals have not entirely passed away, their numbers have declined to such an extent that the income derived from this source can now only be reckoned as incidental. The sea-otter hunter was an important man in his village; extensive preparations were made before his departure and he was feasted upon his return. He was looked up to as a leading spirit in the locality. The sea otter is practically passing away, but the hunter remains, and reports are made that he is starving. Possibly he may be short of food at times, but it is because he is not willing to exert himself; he is a sea-otter hunter in a sea that has few left, and he claims he can do nothing else.

There is another field in which the native can earn sufficient money to provide for himself and family not only the necessities of life, but many of the comforts and a few luxuries. It is in cannery work. Frequent inquiry has been made at the canneries, and the reply has always been to the effect that they are more than desirous to employ all the male population in the surrounding district, if they are steady and reliable, and to give such labor employment throughout the season. Quite a number of the inhabitants of Afognak are so employed, several holding positions where skill is required, but the majority are shiftless, stop work after having earned a few dollars, and expend it in spirits if they can get it. The canneries, however, do not want a class who can not be depended upon in time of need.

Unskilled labor at the canneries commands from $1 to $1.25 per day with good board, and, as the season in this district is long, a reliable hand may earn from $125 to $150 during the summer—more than sufficient to carry him through the winter very comfortably if he is at all thrifty. The canneries will also purchase fish from the natives, paying from $30 to $35 per thousand for redfish. The hatchery at Karluk is partly supplied with fish taken by natives, and the superintendent states that two men on one occasion, in one day, made $15 each; this was, of course, very exceptional. At one cannery no cash is paid until the cannery is closed; this is done to hold the natives and prevent them from leaving as soon as they have earned a little money.

The native conditions here are similar to those of all other localities visited. The native is naturally indolent and improvident. In former times he lived in his crude way by hunting and fishing, with a feast thrown in when a dead whale drifted to his shores. Civilization has brought new wants, to supply which he is unwilling to exert himself, so he cries starvation, in which he is supported and badly advised by white squawmen who settle among them and eke out an easy, shiftless existence.

Reports are frequently circulated by people who do not understand the situation, or, understanding it, willfully misrepresent it, implying that the canneries are a detriment to the native population; that they are taking away the food and that starvation must follow. From my experience in Alaska, in connection with the salmon question, it may be said that up to the present time I have found no truth in these reports. The canneries have not, so far, in any locality reduced the salmon so as to affect the native's winter supply; instead of working an injury, they have been, and are, a benefit to him. They bring to him better methods for obtaining his fish, and, that which is of more importance, they bring money to all who are willing to work. Were the canneries to close to-day the native would be the principal sufferer.

Judging from the appearance of the village at Afognak, and comparing it with other native communities in Alaska, there seems to be little cause for complaint. The village has rather a neat and thrifty appearance, the log and frame houses have a substantial air, there are many gardens growing potatoes and other truck, pigs and poultry seem to thrive, and several families have one or two cows. The children seen in the village appeared bright, clean, strong, and always well clad.

One of the principal half-breeds said that while there was no large amount of money in circulation and few were prosperous, still none were destitute nor in danger of becoming so. It may be remarked here that many of the natives in this district, and to the westward, died during the past winter with a disease believed by some to be grip. It is said that at Little Afognak nearly all succumbed.

The half-breeds and natives of Afognak, according to their own custom, have three recognized districts for hunting and fishing. The half-breeds of the village fish and hunt the northwestern section of the island, drained by the streams named Malinof and Paramanof; the natives of the village have the southern end of the island, which includes the reservation stream and extends to the western shore of Little Afognak Bay; the inhabitants of the latter place claim the island to the eastward of their settlement, and Marmot Island. These districts are again subdivided among the different families for hunting purposes, while the streams are open to all belonging to the district. These limits are accepted by all the inhabitants, and the intrusion of any alien is considered an abuse of their customs. It is natural, therefore, that they resent the fishing of the Afognak streams by the canneries, nor can they understand how these streams, which belong to them by tribal rights, can be closed by the Government. The situation here is the same as it is in southeastern Alaska—the native sees the value of the fish to the canneryman, and he wants the streams, not for his own use entirely, but to sell the fish to the canneries. In other words, he wants to own the streams and bar out the canneries, which is clearly untenable. To the appeal of the natives has been added that of the white men of the district.

The village of Afognak contains a number of whites, nearly all Scandinavians, married to half-breeds or natives or living with them, nearly all working in canneries

during the summer and finding life rather easy during the winter. These people have organized themselves into an association under the name of the Brotherhood of Afognak Pioneers and have taken upon themselves the regulation of municipal affairs.

In the salmon inspector's report for 1899, page 47, there is an appeal addressed to the inspector to the effect that, as the streams of Afognak are closed, they are "unable to obtain a living" and request the "permission of the Treasury Department to fish the streams of Afognak Islands." This appeal has 23 names, the nationality of which may easily be recognized. Inquiry was made in reference to the signers, and it was learned that they all belonged to the brotherhood. One is dead; 1 was injured while hunting, but does some work; 2 are Russian residents; 3 are storekeepers and well-to-do, and the remaining 16 are employed in the canneries and fisheries, some in leading positions, such as master of cannery steamer, foreman of working gang, watchman, etc. Further comment is unnecessary, as it is evident the white population desire to have the exclusive use of the Afognak streams, so they may sell fish to the canneries.

In concluding these remarks on the conditions at Afognak as they appeared to me, it is my desire to say that my sympathies are entirely with the natives, and were it possible to make any recommendations for their benefit, such would be made; it can only be asked that whatever legislation is effected a fair balance may be cast in their favor. We should not ask too much from a people who have for centuries lived on the resources which nature alone has offered and who now emerge upon a destructive civilization which holds them probably in a worse condition than in former times when they were a more primitive people. The rich furs which they formerly poured into the laps of the traders, and for which they received food and a few necessities, are gone, and the fur-trader is also going, for he can no longer fill his coffers with the catch of the grub-staked hunter. The first stage of the native's life here is over; he is now upon the second, marked on the one hand by the influence of vicious white men and on the other by the kind and gentle teachings and example of a people who sacrifice themselves for the native interests, but whom they usually do not understand. If he survives these two directly opposite influences, he may become a good citizen. It has been my experience, however, that in all parts of the world among primitive people the second stage is deadly, and that what might be called a refined civilization thrust upon a native race kills as many as the more vicious condition.

From Afognak the *Albatross* went directly to Southeast Alaska, to continue the stream and lake investigations commenced in 1897.

COOK INLET.

Alaska Salmon Association.—In the Cook Inlet district but one new cannery has been established; it is that of the Alaska Salmon Association, which was incorporated in San Francisco. This company, in 1899, purchased the C. D. Ladd saltery on the left bank and at the mouth of the Chuitna River, Cook Inlet, a good-sized stream entering the northern shore of the inlet about 6 miles above Tyonek. In the spring of 1900 this company erected a cannery on the site of the Ladd saltery and made a small hand-pack. The cannery machinery consists of 3 retorts, 1 solderer, 1 Columbia River washer, 1 cutter, and the necessary equipment for making cans by hand.

The capacity of the cannery is 500 cases per day, but next year (1901) 2 fillers and a topper will be installed, which, with the necessary hands, should increase it to 1,600 cases per day. The tin plate used is 100-pound domestic. Fish are pewed to the fish wharf and after cleaning are conveyed to the cannery.

The Chinese contract was 45 cents per case, with the usual conditions. The fishermen received $25 per month from the time engaged at San Francisco until paid off, and one-half cent each per case. The sailors were paid $40 per month when working the vessel and $50 per month when fishing, but no bonus. Full board was furnished for all except the Chinese.

The following men were employed: Thirty-nine white fishermen and trapmen, 4 white cannerymen, 12 white beachmen, and 51 Chinese. The cannery used 4 traps; leads 100 fathoms, wings 40 fathoms, pots 40 feet by 40 feet, all 6 fathoms deep; leads, 3½-inch mesh, 48 thread; wings and pots, 3-inch mesh, 60 thread; value, $1,500 each. One drag seine 150 fathoms long, 5 fathoms deep, 3-inch mesh, value $1.65 per fathom. Sixty gill nets, each 65 fathoms long, 30 meshes deep, one-third of them 9-inch mesh, one-third 6¼-inch mesh, and one-third 5¾-inch mesh; value, 65 cents per fathom. The traps were located early in the season, as follows: One near Tyonek, one between that place and Chuitna, one at the mouth of the home river, and one about 3 miles to the eastward. Heavy winds and strong currents demolished all these traps, except the one near Tyonek, before fishing began, and the latter was only saved by hard labor, which the catch did not justify. About 10 per cent of the catch was taken in traps, the remainder in gill nets.

The boats consisted of 4 scows, $250 each; 2 lighters, $150 each; 1 lighter, $50; 20 gill-net skiffs, $40 each; 5 old skiffs, $30 each; 1 yawl, $40; 1 pile-driver, $1,150.

The vessels employed were: Bark *Prussia*, 1,131 tons, crew fishermen, value $25,000, chartered; launch *King Fisher*, 7 tons, crew 3, value $5,500, owned.

The following was the output for the season:

Species.	Cases.	No. to the case.	Dates.
King salmon:			
Red	[1] 326	3.5	June 10–July 2.
White	[2] 922	3.5	Do.
Redfish[3]	3,640	12	July 1–Aug. 9.
Humpbacks[3]	5	.....	
Dog salmon	12	.....	

[1] Flats. [2] Talls. [3] Salted 44 barrels of redfish and 3 barrels of humpbacks.

Pacific Steam Whaling Company's cannery at Kenai, Cook Inlet.—Reference was made to this cannery in my former report, page 141. The buildings were erected in 1897 near the cannery of the Northern Packing Company, and the available machinery from the cannery at Coquenhena, in the Copper River delta, was installed here in the spring of 1898. The first pack was made that year.

The following cannery machinery is used: Two retorts, 4 steam boxes, 1 filler, 1 solderer, and 1 cutter; topping is done by hand. Fish are hoisted in buckets by steam to the fish-house, and when cleaned are conveyed by carts to the cannery.

All the tins are made at the cannery by hand; 100-pound tin plate is used for the bodies and tops; 46 per cent of the plate is imported.

In 1900 the following hands were employed: 40 white and 10 native fishermen, 6 white cannery-hands, 6 natives, and 60 Chinese.

They used 5 traps, averaging 1,000 feet length of lead, 240 feet length of curved wing, 30 feet by 30 feet pot, value $500 each; 20 gill nets for king salmon, each 60 fathoms long, 22 meshes deep, 9¼-inch mesh, value 65 cents per fathom, and 20 gill nets for redfish, each 60 fathoms long, 30 meshes deep, 6-inch mesh, value 65 cents per fathom.

The following boats were used: Seven lighters, $350 each; 20 gill-net boats, $40 each; 1 seine boat, $100; 3 skiffs, $25 each; 2 pile-drivers, $1,500 each.

The following vessels (owned) were employed: Gasoline *Duxbury*, 30 tons, crew 5, value $10,000; steamer *Salmo*, 28 tons, crew 6, value $10,000. Transportation by calling vessel of company.

The output in 1900 was:

Species.	Cases.	No. to the case.	Dates.
King salmon	2,400	2.7	June 1–July 10
Redfish	20,924	13	June–Aug. 10
Cohoes	1,765	8.1	July 1–Aug. 10

The Chinese contract was 42 cents per case. Fishermen received transportation and board and 1 cent each per case.

Arctic Fishing Company.—The cannery of this company at Kussilof, Cook Inlet, was fully described, together with the surrounding conditions, in my former report, pages 142–143, and the statistics for 1900 only will be referred to here.

This company employed the following hands in 1900: Forty-five white fishermen, 10 native fishermen, 10 white cannery-hands, and 100 Chinese. Eight traps were used, with leads from 100 to 700 feet long, pots 30 feet by 30 feet, depth at pots 30 feet, average value $1,000; 30 king-salmon gill nets each 60 fathoms long, 22 meshes deep, 9½-inch mesh; 30 redfish gill nets, each 60 fathoms long, 28 meshes deep, 6⅛-inch mesh, value 65 cents per fathom. There were used 3 sail lighters, $450 each; 7 trap scows, $50 each; 20 gill-net boats, $40 each; 2 Columbia River boats, $200 each; 6 skiffs, $30 each; 2 pile-drivers, $1,500 each.

The machinery consisted of 6 retorts, 2 fillers, 2 toppers, 1 solderer, 1 cutter, and 1 can-maker; 75 per cent of the tins are made at the cannery of 100-pound tin plate, 60 per cent of which material is imported. Fish are hoisted in tubs to the fish-house by steam and, when cleaned, are conveyed in cars to the cannery.

The Chinese contract was 45 cents per case, with the usual conditions. The fishermen received $50 for the run and 1 cent per case, with full board.

The following vessels (owned) were employed:

Class and name.	Tons.	Crew.	Value.
Ship Centennial	1,138	Fishermen.	$30,000
Steamer Jennie	69	6	30,000
Steamer Reporter	26	3	10,000
Launch Arthur	5	2	1,800

The following was the output in 1900:

Species.	Cases.	No. to the case.	Dates.
King salmon	6,169	3	May 26–Aug. 10
Redfish	22,185	13	May 28–Aug. 12
Cohoes	5,427	12	July 15–Aug. 12

PRINCE WILLIAM SOUND AND COPPER RIVER.

This district, with the canneries, was fully described in my former report, pages 129–139. Since then the cannery at Coquenhena has made one more pilgrimage. It was dismantled in 1897, and, as previously noted, the available machinery was installed in the Pacific Steam Whaling Company's cannery at Kenai, Cook Inlet.

The Pacific Packing Company, at Odiak, for the season of 1900 employed 1 doctor, 60 white fishermen, 10 white cannery and beach hands, 6 natives, and 60 Chinese. It had 1 drag seine 250 fathoms long, 120 meshes deep, 2½-inch mesh; value, $1.50 per fathom; 38 gill nets, each 350 fathoms long, 30 meshes deep, 6⅛-inch mesh; value, 65 cents per fathom. The boats were 2 lighters, $400 each; 3 house scows, $400 each; 33 Columbia River boats, $200 each; 2 seine boats, $200 each; 6 skiffs, $25 each.

The following vessels were employed:

Class and name.	Tons.	Crew.	Value.	Owned or chartered.
Bark Kate Davenport	1,175	[1]	$10,000	Chartered.
Steamer Pacific	31	6	15,000	Owned.
Steamer S. B. Matthews	164	6	14,000	Do.
Steamer Susanna	18	4	8,000	Do.

[1] Fishermen.

The following was the output of canned salmon in 1900, none being salted:

Species.	Cases.	No. to the case.	Date.
King salmon	473	4½	May 9–June 12
Redfish	35,049	11½	May 9–Aug. 4
Humpbacks	3,888	22½	July 6–Aug. 2

The Chinese contract was 42 cents, with the usual conditions. The fishermen received $60 for the run and 4 cents per boat of two men for redfish, 10 cents for king, and $10 per thousand for humpbacks, with full board.

The cannery machinery consists of 8 retorts, 2 fillers, 2 toppers, 2 solderers, and 1 cutter. The tins are all made at the cannery, by hand, of 100-pound domestic plate for bodies and 95-pound tin for tops.

The fish are pewed to the fish-house and, after cleaning, are conveyed by cars to the cannery.

The Pacific Steam Whaling Company, at Orca, employed, in 1900, 60 white fishermen, 13 white cannery-hands, 2 natives, and 60 Chinese.

They used 2 drag seines, each 120 fathoms long, 40 meshes deep, 3-inch mesh; value, $1.50 per fathom; 30 gill nets, 400 fathoms long, 28 meshes deep, 6 to 6¼ inches mesh. The boats used were 5 house scows, $400 each; 30 Columbia River boats, $200 each; 2 seine boats, $200 each; 8 skiffs, $25 each; 1 pile-driver, $200.

The following vessels were employed:

Class and name.	Tons.	Crew.	Value.	Owned or chartered.
Ship America	1,908	(1)	$55,000	Chartered.
Steamer Thlinket	90	4	10,000	Owned.
Steamer Wild Cat	104	4	10,000	Do.

[1] Fishermen.

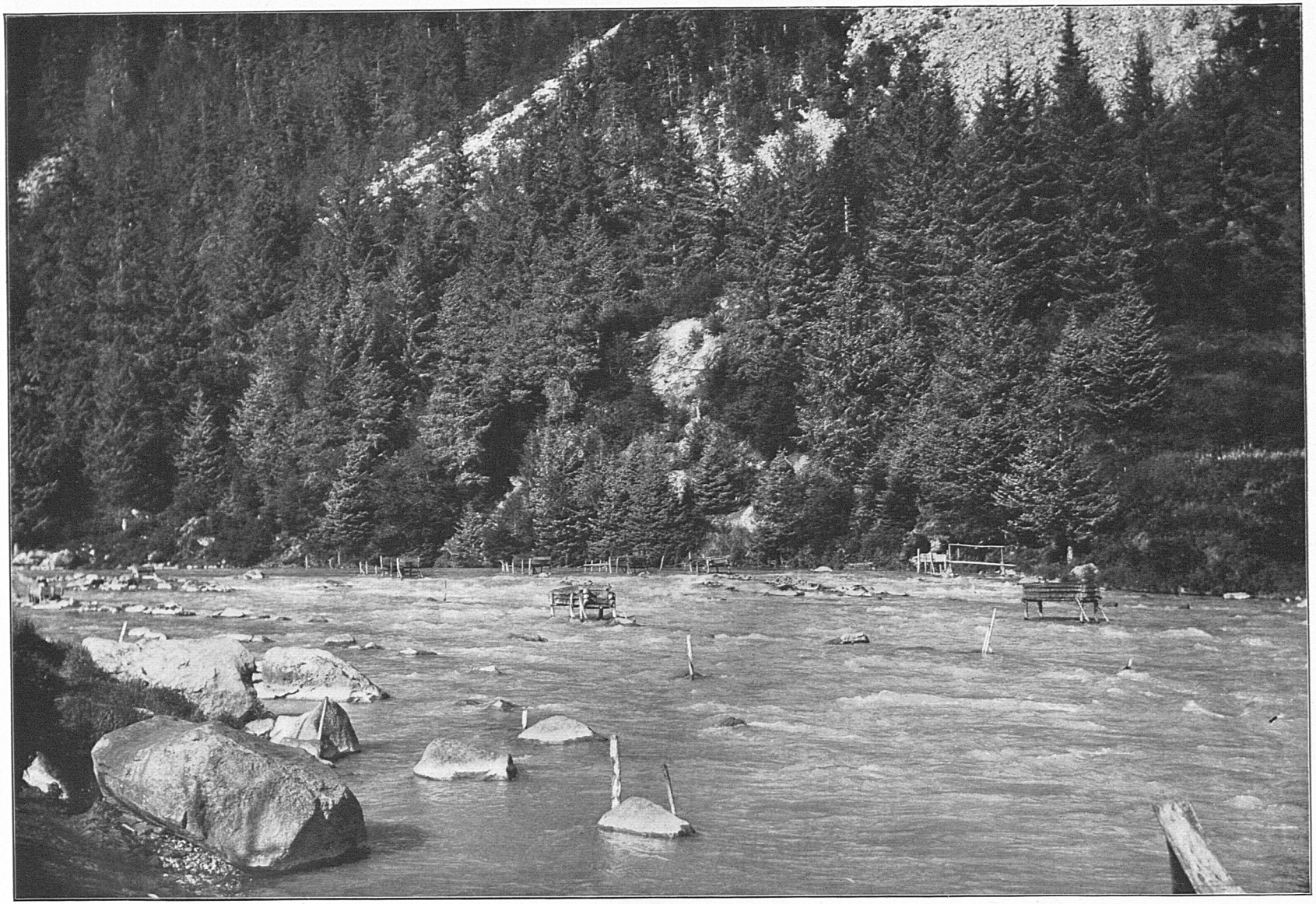
The following was the canned output in 1900, none being salted:

Species.	Cases.	No. to the case.	Date.
King salmon	369	4.2	May 7-June 7
Redfish	28,501	12	May 7-July 22
Humpbacks	1,718	28	July 20-July 24

The Chinese contract was 42 cents per case, with the usual conditions. The fishermen received $15 per month throughout the season, full board and transportation, and 4 cents per boat for redfish, 10 cents for king salmon, and $5 per thousand for humpbacks.

The cannery machinery consists of 4 steam boxes, 2 retorts, 1 filler, 1 solderer, and 1 cutter. Fish are pewed to the fish-house and, after cleaning, are passed directly to the cutter from the draining tubs. They use 100-pound tin plate for bodies and tops, all imported. All the tins are made at the cannery.

The redfish used in these canneries are nearly all taken from the Copper River delta. All the humpbacks and a few redfish come from the Prince William Sound streams. A description of the locality, time of runs, and other information is given in my former report.



CHILKOOT STREAM, SHOWING NATIVE FISHING PLATFORMS IN CURRENT.

SOUTHEASTERN ALASKA.

Since my former report eight new canneries have been built in this district, one of which made its first pack in 1899 and the remainder during the present season (1900). During the same period one has been dismantled, that of the Baranof Packing Company at Redfish Bay, which was sold to the Alaska Packers Association and moved to the Egagak, and one was in course of construction, in 1900, at Bartlett Bay, which will be operated in 1901. The season of 1901 promises to see many new canneries in Alaska, a number of which will locate in this district.

Western Fisheries Company.—A company under this title, organized at Portland, Oreg., built a cannery in the spring of 1900 at the head of Dundas Bay, which is on the northern side of the junction of Cross Sound and Icy Straits. The cannery is one of the smaller ones and has a capacity of 300 cases per day, made largely by hand.

In 1900 this cannery employed 9 white fishermen, 26 native fishermen, 5 white cannery-hands, 20 native men, 6 native women, and 30 Chinese. The record of the native men includes those to whom gear was furnished and from whom the catch was purchased. They used one purse seine 150 fathoms long; 6 drag seines—length, 2 of 140 fathoms, 1 of 100 fathoms, 1 of 80 fathoms, 1 of 60 fathoms, and 1 of 50 fathoms—valued at $1.50 per fathom; 4 gill nets of 150 fathoms each, valued at 65 cents per fathom. There was 1 lighter, $250; 5 seine boats, $75 each; 4 gill-net boats, $50 each; 2 Columbia River boats, $100 each; 1 dory, $50; 1 skiff, $50.

The transportation was by regular freight steamers. The following cannery steamers were used: Steam tug *Favorite*, 7 tons, crew 3, value $2,000, chartered; steam tug *Beaver*, 19 tons, crew 5, value $5,500, owned.

The following was the output in 1900, none being salted:

Species.	Cases.	Number to the case.	Date.
King salmon	60	4.5	Sept. 1-Sept. 30
Redfish	6,130	8 to 12	June 28-Aug. 25
Cohoes	977	7.5	July 30-Sept. 20
Humpbacks	1,866	18	July 10-Aug. 10
Dog salmon	4,760	6.5	July 15-Sept. 20

The Chinese contract was 38 cents for 1-pound talls, 40 cents for half-pound flats, and 42 cents for 1-pound flats, with the usual conditions. The white fishermen received $40 to $60 per month, with transportation and board. Fish were purchased at the following rates: King salmon, 10 cents; cohoes, 6 cents; redfish, 5 cents; dog salmon, 2 cents; humpbacks, 1 cent.

The following are the numbers of fish taken and the localities where found: 275 king salmon off Hooniah; 66,901 redfish in Dundas Bay, Taylor Bay, Surge Bay, Cape Spencer, Thakanis Bay, Soapstone Point, Excursion Inlet, and Glacier Bay; 8,596 cohoes, scattering on the redfish grounds; 35,383 humpbacks at Port Althrop, Soapstone Point, and Excursion Inlet, and 29,803 dog salmon in Dundas Bay.

Pyramid Harbor Packing Company.—This cannery, the fisheries, and the general locality were described in my former report, pages 125 to 128, so that only the statistics for 1900, together with references to features omitted or changes made, will be given here. The canning machinery consists of 6 retorts, 2 fillers and 1

spare one, 2 toppers, 2 solderers, 1 cutter, and 1 can-making set. All tins are made at the cannery of 100-pound tin plate for bodies and 95-pound for tops; 60 per cent of the plate is imported. It has a daily capacity of 1,600 cases, but this amount is rarely attained. The pack of this cannery is the choicest in Alaska; it is mostly for export, is made with great care, and has only about ½ per cent of do-overs. It is very clean and free from the unpleasant odors noticed in many packing houses.

The fish are pewed from boats to a car operated by a cable and steam, traveling on an inclined plane from the water's edge to the fish-house, and the cleaned fish are passed from the draining tubs direct to the cutter. The gurry is carried with a stream of water in a wide trough under the fish-house into the bay. The Chinese contract was 42½ cents for machine-filled cans, with the usual conditions. The boss received $50 a month and his lay, and the tester $250 for the season. The fishermen had $50 for the run and 4 cents per fish for each boat of two men and full board. About ten natives were employed as boat-pullers, who shared in the gill-net catch. Klootchmen employed in the cannery received $1.25 per day.

The cannery purchased fish from about 224 Chilkat and Chilkoot Indians, paying 10 cents for redfish, though formerly 6 and 8 cents were paid. The Chilkats delivered at the cannery, while the cannery steamers called for the Chilkoot fish.

The following redfish were delivered by the Chilkat Indians: In 1898, 11,156 during August; in 1899, from July 19th to August 31st, 21,000; in 1900, from July 25th to September 1st, 47,967.

By the Chilkoot Indians: In 1898, July 12th to August 22d, 99,660; in 1899, from July 10th to August 13th, 148,896; in 1900, from July 12th to August 22d, 169,107.

The cannery obtains its fish from Chilkat and Chilkoot inlets and rivers and from Taku Inlet. King salmon run at Taku from May 25 to June 30; at Chilkat, from June 10 to July 10, but they are not abundant. A few straggling redfish appear at Chilkat about June 20, but they are not found in large numbers until the last of June or early in July. They are plentiful then until the middle of August and straggle with cohoes until the last of September. The run in Chilkoot begins earlier and closes earlier than in the Chilkat. (In my former report the names became transposed and this was wrongly stated on page 128.) A good run for about forty-five days is usually looked for. The redfish are called sock-eye, the name used for this species in Puget Sound and on the Columbia; and it was noticed that with the advent of canneries backed by capital from that district the name sock-eye is becoming more common in Alaska. Cohoes are called kluks, which is the Indian name and the same as that used at Killisnoo. They run in Chilkat Inlet from about the middle of August to early in October, possibly later, and are quite abundant in September. There are very few humpbacks in Chilkat, but it is said that they are quite abundant in Chilkoot. Dog salmon straggle through the season and some years are abundant in September.

The pack of this cannery is in redfish; the king salmon and cohoes are incidental and the humpbacks and dog salmon are not used. The first steelhead ever seen in this locality was taken this year. The only sturgeon ever seen was mentioned in my former report. No shad have been seen. There are many Dolly Varden trout and some very large halibut. The cannery uses gill nets exclusively, while the Indians fish the rivers with gaffs and nets, the latter about 60 fathoms long.

The following are the statistics of the Pyramid Harbor cannery for 1900:

Hands employed: 92 white and 10 native fishermen; 224 natives from whom fish were purchased; 12 white cannery-hands, 16 Klootchmen, and 86 Chinese.

Fishing gear: 56 gill nets for redfish, each 300 fathoms long, 28 meshes deep, 6⅛-inch mesh; 14 gill nets for king salmon, each 180 fathoms long, 30 meshes deep, 8½-inch mesh.

Boats, lighters, etc.: Three lighters, $400 each; 56 Columbia River boats, $200 each; 3 skiffs, $25 each, and 1 pile-driver, $1,000.

The following vessels (owned) were employed in 1900: Steamer *Elsie*, 37 tons, crew 4, value $16,000; ship *Two Brothers*, 1,263 tons, crew fishermen, value $35,000.

The following was the 1900 output:

Species.	Cases.	No. to the case.	Date.
King salmon:			
Red	[1]2,255	3.5	May 29-June 30.
White	[2]977	3.5	Do.
Redfish	51,856	11	July 9-Sept. 1.
Cohoes	513	7.5	Aug. 20-Sept. 1.

[1] Flats. [2] Talls.

CHILKOOT INLET.

Chilkoot Inlet is the arm at the head of Lynn Canal east of Chilkat and is separated from that inlet by a long, narrow peninsula terminating in Seduction Point.

Chilkoot Packing Company.—At the head of Chilkoot Inlet is the cannery of the Chilkoot Packing Company, organized at Aberdeen, Wash., with a capital of $20,000. This company built their cannery in April, 1900, at the head of the inlet, on the northern shore, in a small bend immediately outside of the line where the river flats impinge upon the shore line. The promoters of this cannery formerly owned a cannery at Grays Harbor, Washington.

The Chilkoot cannery in 1900 had a daily capacity of 200 cases, but this might be doubled. The plant consists of 2 steam boxes, 2 retorts, 1 soldering machine, and 1 cutter. It is one of the smaller canneries and makes a hand pack. For the season of 1901 they expect to have fillers and toppers in operation.

Nine thousand cases of cans were made by hand at the cannery and the rest were purchased; 95-pound tin plate was used, all domestic. Fish are pewed from boats to fish-house and when cleaned are carried to the cannery on a conveyer of an endless chain of buckets. Transportation is by regular freight steamers.

The Chinese contract was 42½ cents, with the usual conditions. Fishermen received $25 per month from the time of departure from Puget Sound to date of return, with full board, transportation, and 5 cents for each redfish per boat of two men. The cannery paid the Indians 10 cents for redfish taken with their own gear and 8 cents for redfish taken with cannery boats and gear.

They used seines and gill nets and fished from the head of the inlet to Haines Mission for redfish and in Berners Bay for cohoes and dog salmon, though all the species occur in the inlet; scattering king salmon sometimes appear. A few redfish have been seen as early as June 15. Trout are abundant and halibut and flounders are not uncommon. The Chilkoot redfish run quite large. We weighed 33 taken

in the ship's seine, and they averaged 8¼ pounds; 30 from the cannery bin averaged 7½ pounds. The following record of steelheads may be of interest: August 20, 1 steelhead; August 25, 3 steelheads, length 28 inches, weight 9½ pounds; August 26, 2 steelheads, length 28 and 32 inches, weight 10 and 13½ pounds; August 29, 3 steelheads, length 26, 28, and 31 inches, weight 9½, 10½, and 13½ pounds; September 4, 4 steelheads; September 8, 2 steelheads.

In 1900 the cannery employed 24 white and 8 native fishermen and purchased from 16 natives; 9 white cannery-hands, 17 natives, and 28 Chinese.

It used 1 purse seine, 160 fathoms by 20 fathoms, 3¾-inch mesh, value $1,400; 16 gill nets, each 270 fathoms long, 25 meshes deep, 6¼-inch mesh, value 65 cents per fathom; 2 Columbia River boats, $90 each, and 1 skiff, $25.

The following cannery steamers were used: Steamer *Estella*, 20 tons, crew 3, value $3,500, owned; launch *J. R. Roberts*, 9 tons, crew 2, value $3,000, chartered.

The following was the output of canned salmon, none being salted:

[Half-pound tins are packed in cases of 48 tins, but are reckoned in cases of 48 pounds.]

Species.	Cases.	No. to the case.	Date.
Redfish	[1] 9,022 [2] 4,098 [3] 828	8, 3	June 30–Sept. 7.
Cohoes	[1] 574 [3] 170	8	Sept. 7–Sept. 15.
Dog salmon	[1] 158	8	Sept. 16–Sept. 25.

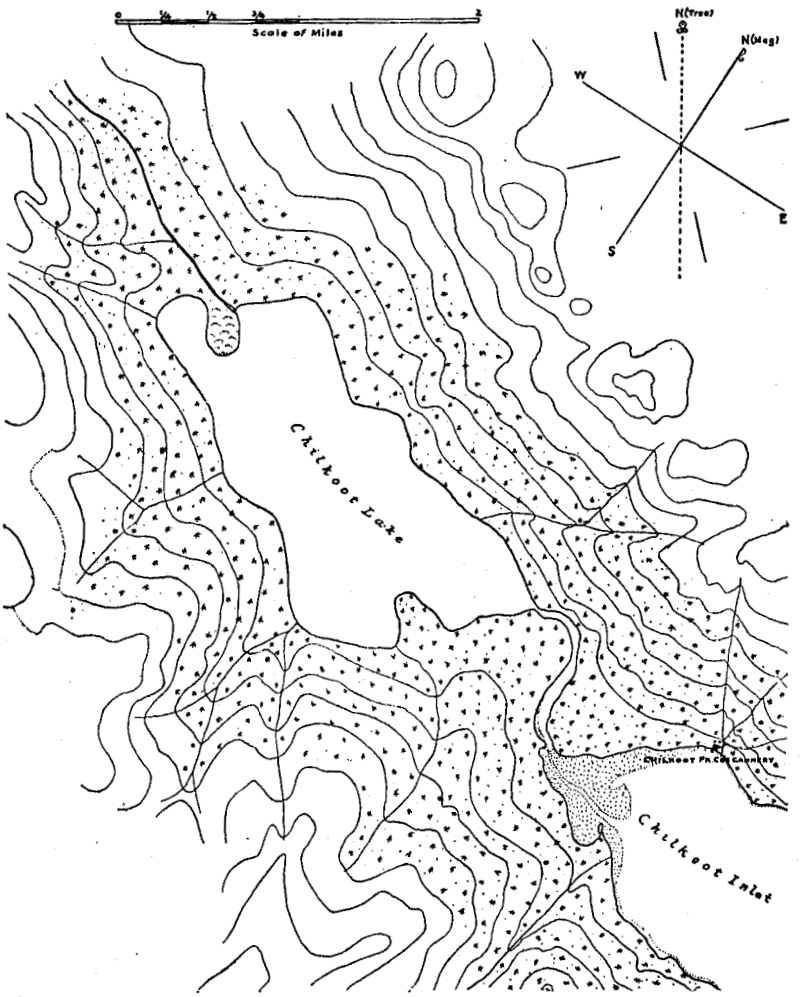
[1] One-pound talls. [2] One-pound flats. [3] One-half pound flats.

CHILKOOT RIVER AND LAKE.

The northwestern end of Chilkoot Inlet terminates in a narrowing, V-shaped indentation, which receives at its head the waters of Chilkoot River. The indentation is about one-half mile wide at the outer end by three-fourths mile in length, and at low water is an uncovered flat, with a shallow boat channel meandering through it, which carries the river discharge. At the apex of the V is the river mouth, which at this point is contracted to about 100 feet by a point making from the western shore. Within the point is a tidal basin about 100 yards wide and one-fourth mile long, which extends to the foot of the rapids at the head of tide water. From here the stream first curves gently to the northward and then to the westward until it reaches the lake, three-fourths mile distant, having an average width of about 125 feet. With the exception of a length of about one-fourth mile from the lake, where, however, the current flows with considerable velocity, the entire river from tide water is a rapid of gentle fall. At the middle of this length, on the western shore, is a summer village of Chilkoot Indians, who fish the stream and, it is said, the lake also.

The bottom of the stream is rocky and bowldery. The right bank is steep to a narrow grassy shelf which merges into rolling, densely wooded hills; the left bank is steep and wooded, with grassy recesses, and rises rapidly to the precipitous mountain masses. The rapids are all staked off, each stake indicating the fishing-place allotted to an Indian family, which is handed down from one generation to another and jealously guarded against intruders. During the fishing season the Indians build platforms over or secure canoes on their claims, and from either conduct the fishing,

by means of a large iron barbless hook secured to the end of a stout pole. The impaled fish is thrown into a box alongside of the fishermen. At one point of the rapids runways have been constructed by piling rocks in parallel lines and confining the water to narrow channels. In these runways fyke-net-shaped traps are arranged to be raised or lowered to meet the level of different stages of the water. It is said they do not work very well, but to my eyes it looked as if few fish could pass without being trapped. It is probable that short nets are also used in the rapids.



Plan of Chilkoot lake and stream.

The lake has an extreme length of 2½ miles in a northwest and southeast direction, with an average width of 1 mile. It lies in a basin nearly surrounded by lofty, precipitous mountains reaching an altitude of 4,000 to 5,000 feet, and is largely fed by cascades and streamlets from the melting snows and glaciers. There is one feeder worthy of the name of stream which enters the lake at the extreme northwestern

end through a narrow valley leading to a glacier. We had no means for reaching this stream, but at a distance it appeared as if there were considerable areas of flat land around its mouth. The banks around the southern end of the lake, and on either side as far as could be seen, are steep and rocky, and the bottom bowldery, shelving rapidly to deep water. The spawning-grounds are probably around the feeder at the head of the lake where, it is said, the bottom is sand and gravel. The water is quite cold and whitish, like all glacial waters.

The only probable site for a hatchery is near the large feeder, where water by gravity and ripe fish could be obtained. The water would probably have to be filtered, and the question of freezing might be an important one, and can only be solved by a series of observations over an extended period.

KILLISNOO.

The Alaska Oil and Guano Company's works at Killisnoo were again visited. They were described in my former report, pages 121 to 125. There has been no change in the plant since our previous visit. The large trap in Hootznahoo Inlet has been abandoned, as the results were not commensurate with the expense involved. The herring taken in this locality are very rich in oil, and when salted have attracted the attention of the eastern market. A large order was placed with this company for the salt product, which, however, they were unable to fill. Fishing commenced this year on May 26, a date much earlier than heretofore.

There were employed 20 white and 10 native fishermen; for factory and beach hands 27 whites, 38 natives, and 13 Chinese. Their rate of pay is given in my former report, page 122. The company used two purse seines, 150 fathoms by 15 fathoms, value $1,200 each; one drag seine, 250 fathoms by 20 fathoms, $2,000; 3 lighters, $800 each; 8 seine boats, $125 each; 6 strike boats, $75 each; 20 dories, $25 each.

The following vessels were employed on the fisheries. Their crews are included in the numbers given under the hands employed.

Class and name.	Tons.	Crew.	Value.	Chartered or owned.
Steamer Dolphin	60	18	$10,000	Chartered.
Steamer Favorite	42	16	5,000	Owned.
Launch Louise	5	3	3,000	Do.

The following was the output in 1898, 1899, and 1900:

1898.—45,240 barrels of herring, making 165,500 gallons of oil and 886 tons of guano; from June 27 to November 19.

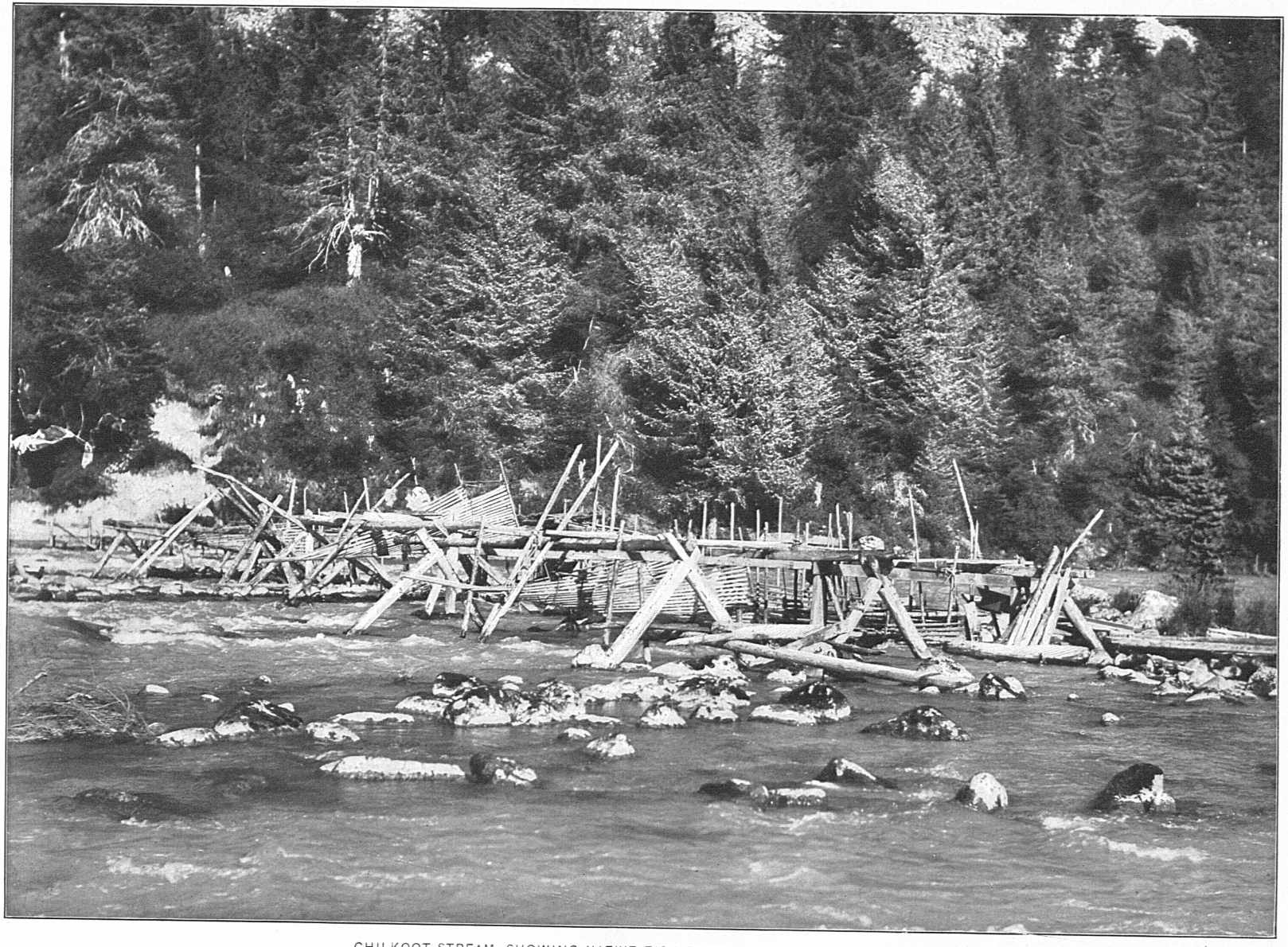
1898.—Salted 1,300 half-barrels of herring and 25 half-barrels of humpback bellies.

1899.—36,800 barrels of herring, making 128,000 gallons of oil and 714 tons of guano; from July 5 to November 5.

1899.—Salted 1,650 half-barrels and 200 barrels of herring, and 31 half-barrels of humpback bellies.

1900.—60,300 barrels of herring, making 172,000 gallons of oil and 1,194 tons of guano; from May 26 to November 5.

1900.—Salted 185 half-barrels and 100 barrels of herring, 5 barrels of king salmon, 8 half-barrels and 210 barrels of redfish, and 523 half-barrels of humpback bellies.



CHILKOOT STREAM, SHOWING NATIVE FISH RUNS AND TRAPS IN CURRENT.

TAKU INLET.

Taku Packing Company.—A company under this title was organized in Astoria, Oreg., by some of the stockholders of the Alaska Fishermen's Packing Company, Nushagak, with a capital of $20,000, and in the spring of 1900 a cannery was built on Taku Inlet. The construction of the buildings was commenced March 28, and the plant was ready for operation on May 17. It is located on the western shore of Taku Inlet, 2½ miles west by north from Jaw Point, on the northern side of a small bight (Sunny Cove), which receives the waters of a small stream.

It is a small cannery, making a hand pack, and has a daily capacity of 250 cases, with expectations of making from 15,000 to 18,000 cases a year. The capacity of the cannery will be increased in 1901. It has 1 steam box, 1 retort, 1 solderer, and 1 hand cutter. The cans, which were purchased and carried to Alaska, were made of 95-pound tin plate. Transportation is by regular freight steamers, which call upon notification. The Chinese contract was 42 cents for talls and 44 cents for flats, with the usual conditions. The fishermen were transported each way, had full board, received $80 for the season, and 5 cents for redfish and 10 cents for king salmon per boat of two men. The native cannery-hands were paid $2 per day.

This year the fishing was confined to Taku Inlet and most of the fish were obtained near the mouth of the river, described in my former report, page 126. It is expected, however, in the future to expand the fisheries and include neighboring streams. Fishing in the inlet is difficult on account of ice pouring from the glaciers, and, as there are no seining beaches, it is confined to gill nets.

According to the cannery data king salmon begin to run in Taku Inlet May 8 and continue to June 26. The Pyramid Harbor cannery, which has fished here for many years, gave the dates of the king salmon runs as May 25 to June 30. It is probable that the time depends upon the movements of the ice, and the earlier date may be for the first arrivals whose numbers are insufficient for a large cannery. Of the early run 15 per cent are white-meated, and this proportion increases until the latter part of the run, when about 30 per cent are found in this condition. One king salmon was taken weighing 64 pounds. The first arrivals of the redfish were noted on June 20, but they did not come in sufficient numbers for canning until July 1; they then continued to August 12.

Cohoes run from August 1 to October 1, and dog salmon are noticed scattering throughout the season, but are most abundant in August. Steelheads are quite abundant and were first noticed from July 15 to August 1. At the time of our visit, August 25 and 26, they formed about 10 per cent of the catch. Dolly Varden trout are numerous, and there are a few halibut, but no shad or sturgeon.

The following are the statistics:

Hands employed: Thirty white and 14 native fishermen, 7 white and 2 native cannery-hands, and 19 Chinese.

Fishing gear: Fifteen redfish gill nets, each 150 fathoms long, 35 meshes deep, 6¼-inch mesh; and 22 king-salmon gill nets, 150 fathoms long, 22 meshes deep, 9½-inch mesh, value 65 cents per fathom.

Boats, lighters, etc.: 2 lighters, $225 each; 1 fish scow, $150; 15 gill-net boats, $60 each; 2 dories, $25 each. Launch *Fawn*, 5 tons, crew 2, valued at $1,000, owned.

The output was as follows, none being salted:

Species.	Cases.	No. to the case.	Date.
King salmon:			
Red	[1] 3,150	2.8	May 17-June 26
Pink	[1] 454		
White	[1] 771		
Redfish	[1] 5,818 [2] 830	9	July 5-Aug. 12
Cohoes	[1] 3,227	7	Aug. 1-Sept. 15
Dog salmon	[1] 2,472	6.5	Aug. 15-Sept. 25

[1] Talls. [2] Flats.

PORT SNETTISHAM.

Taku Fishing Company.—This company, with a capital stock of $15,000, said to be owned in San Francisco, but with home address at Portland, Oreg., commenced the construction of a cannery on March 4, 1900, and had the plant ready for operating June 4. It is located on the southern side of the entrance to Port Snettisham, in the first bend within the southern entrance point, 2 miles east of Point Styleman. It is a small cannery, making a hand pack, with a daily capacity of 300 cases, and an outfit for about 12,000 to 15,000 cases per season. It has 3 retorts, 1 solderer, and 1 hand cutter. All cans are made by hand at the cannery, of 95-pound domestic tin.

The Chinese contract was 43 cents for hand-filled cans, with the usual conditions. The locality has not heretofore been considered a favorable location; hence no fishermen's contracts could be made and they were paid wages throughout the season. The white fishermen were transported and, with the natives, received from $40 to $65 per month and board. The cannery paid 7 cents each for redfish and 50 cents per hundred for humpbacks. King salmon were obtained from Taku Inlet and redfish from Port Snettisham. Humpbacks were largely from Limestone Inlet and from small streams near the cannery.

Employees: 16 white and 20 native fishermen, 4 white cannery-hands, 25 Chinese.

Fishing gear: Four gill-nets for king salmon, each 150 fathoms long, 20 meshes deep, 9¼-inch mesh; 14 gill-nets for redfish, each 150 fathoms long, 30 meshes deep, 6½-inch mesh—all valued at 65 cents per fathom. The cannery had 1 purse seine, 165 fathoms long, 300 meshes deep, 3½-inch mesh, value $400, and 3 drag seines averaging 100 fathoms long, 5 fathoms deep, and 3½-inch mesh, value $1.50 per fathom.

Boats, etc.: One lighter, $500; 3 seine boats, $50 each; 3 Columbia River boats, $150 each; 9 gill-net boats, $50 each. The following launches were also used: *N. & S.*, 10 tons, crew 2, valued at $1,800, owned; *Pescadero*, 4 tons, crew 1, value $600, owned. The transportation was by regular freight steamer.

The following was the output:

Species.	Cases.	No. to the case.	Date.
King salmon:			
Red	454	3	June 1-June 20
White	97	3	Do.
Redfish	2,542	9	July 9-July 27
Cohoes	756	7	Sept. 1-Sept. 24
Humpbacks	3,593	21	July 25-Aug. 16
Dog salmon	2,016	7	July 9-Sept. 24

WRANGELL NARROWS.

Icy Strait Packing Company, Petersburg.—This company, incorporated in the State of Washington, is organized from the stockholders of the Quadra Packing Company, who, to expand their work in Alaska, purchased the saltery interests in Bartlett Bay, near Icy Strait, intending to build a cannery at that point during the season of 1899. Circumstances arose which made it inexpedient to carry out the Bartlett Bay project at the time, and, attention having been directed to a site in Wrangell Narrows for a cannery, fishery, sawmill, etc., work was commenced on this plant in the summer of 1899, when a small sawmill was set up, a substantial steamer wharf built, and a warehouse, store, and residence completed. It is located inside of the northern entrance to Wrangell Narrows on the southeastern shore, about a mile above Turn Point and an equal distance from the open waters of Frederick Sound. The position is an excellent one, as it is convenient to several very good fisheries, and all steamers pass close to the wharf on their regular routes to and from Alaska ports. A town site has been recorded, a post-office and an express office established under the name of Petersburg, and an Indian village has sprung up close by. During the winter of 1899–1900, and while the building operations were in progress, the company engaged in the herring and halibut fisheries. Of the former, during the months of September and October, 1,500 barrels were salted, mostly taken from Wrangell Narrows. The halibut were shipped on ice to Puget Sound. As this may become an important industry, it will be referred to under another heading.

In the spring of 1900 the cannery building, warehouse, bunk-house, etc., were erected and the canning machinery installed. Situated on the steamer route, the surroundings have been made attractive by gardens, plank walks, bridges, etc., and the buildings are substantial, well arranged, and very clean.

Fish are pewed from boats or lighters to the fish-house on the end of the wharf, which is well arranged, clean, and clear of bad odors. After cleaning, the fish are passed directly from the draining tables to the cutter. As the pack is made by hand, the severed fish are carried from the cutter to the filling tables, which are arranged for 64 fillers. Klootchmen do most of this work and receive 6 cents a case for filling. The cans then go to the washer, after which the floats are put in and the tops put on by Chinese; they then pass to the crimpers, and in succession to the acid bath, solderer, etc.

The cannery machinery consists of 5 steam boxes, 3 retorts, 1 cutter, 1 washer, 2 cappers, 2 crimpers, and 1 solderer. They have a good supply of hand tools, small lathe, drill press, etc., and a well-equipped cooperage and box factory. 14,500 cases of cans were purchased; the remainder were made at the cannery. The tin was 100-pound plate for the tops and bodies, both domestic and imported, but the proportion of each could not be ascertained. The cannery as installed at present has a daily capacity of 1,000 cases, hand-filled. It is probable that filling machinery will be introduced, though it is believed that a hand-filled pack is preferred.

The Chinese contract was 45 cents, with the usual conditions. The fishermen received $35 per month, board and allowances, which brings the average up to about $50 per month. Native fishermen receive the same as whites if they complete the season. Fish were purchased at the lowest rates for which they could be obtained. The native work this season was very satisfactory.

The fisheries of this cannery were conducted over such a wide area and in such an irregular way that no accurate stream data is available. The crews were moved from place to place, as seemed to offer the best facilities and the most fish. Points 130 to 140 miles distant were reached for fish to supply the cannery, and much enterprise was exhibited on this work. The following streams were fished, and the numbers taken by this cannery, where known, are given: Taku Inlet; North Stream, Stikine Delta; Blind River, Wrangell Narrows; North End, Wrangell Narrows; head of Duncan Canal; Redfish Bay, 34,000 redfish; Freshwater Bay, 25,000 redfish; Basket Bay, 30,000 redfish; Sitkoh Bay, 30,000 redfish; North Bay of Pillars; South Bay of Pillars, 6,500 redfish; Tebenkof Bay, 7,000 redfish; Shipley Bay; Rocky Straits, 25,000 redfish; Red Bay, 30,000 redfish.

In addition to the plant at Petersburg this company operated salteries in conjunction with it at Taku Inlet, Shipley Bay, and Bartlett Bay, and also on the hulk *Blanche*, and as the men and material are interwoven with the cannery operations these salteries will be referred to and the statistics given as a whole.

Bartlett Bay saltery is located on the abandoned cannery site of the Bartlett Bay Packing Company, once the property of the Alaska Packers Association, which, as previously noted, was the location first selected by the Icy Strait Packing Company for their cannery. During the season of 1899 two white fishermen, on the part of the new company, prospected the place for fish and salted 200 barrels of salmon, which were marketed from Petersburg.

During the season of 1900 regular salting operations were conducted here by the Icy Strait Packing Company, and at the same time buildings were erected for a cannery, in which machinery will be installed in the spring of 1901. The cannery will be operated that season.

Shipley Bay saltery, which was formerly operated by Walter Kosmikoff and located at the head of that bay (see my former report, p. 109), was acquired by the Icy Strait Packing Company and operated during the season of 1900.

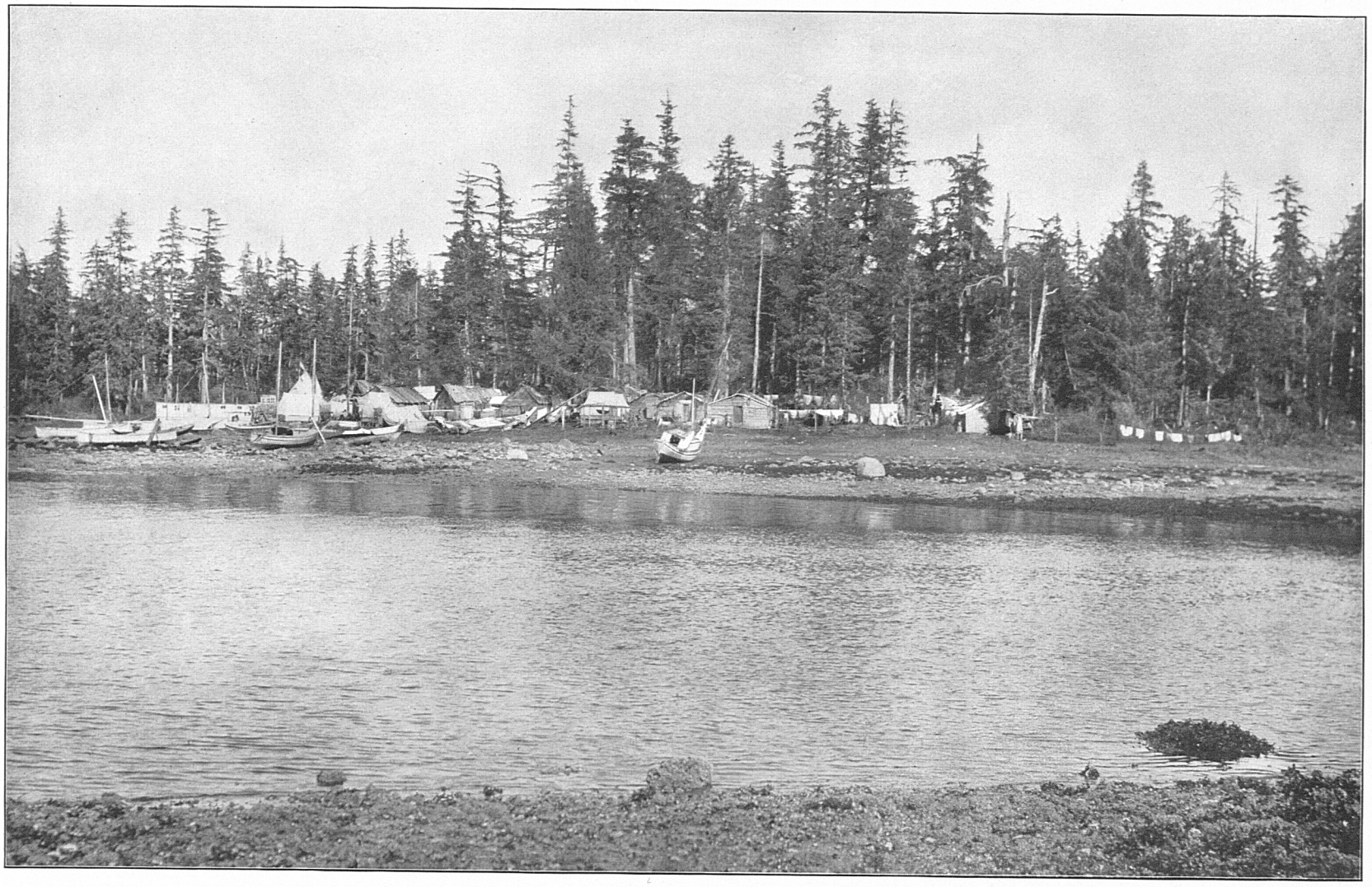
Taku Inlet saltery was built in 1897 by the present Alaska manager of the Icy Strait Packing Company on Taku Point, near the head of the inlet of that name. In 1898 and 1899 it was operated by the Quadra Packing Company, and in 1900 by a large force, with gear, from the Petersburg establishment.

The hulk *Blanche* was used by the Icy Strait Packing Company for salting herring, and was moved in the narrows from point to point as occasion required, though generally located off Blind River. The company fitted out to salt 4,000 barrels by the end of the year. The herring come to Wrangell Narrows in July, and are found in that vicinity until February.

The following are the statistics of the Icy Strait Packing Company, and in it are included the men, boats, gear, etc., employed in the salteries at Bartlett Bay, Shipley Bay, Taku Inlet, and on the hulk *Blanche*.

Hands employed: 34 white and 24 native fishermen; 10 white and 42 native cannery-hands, and 50 Chinese.

Fishing gear: Five purse seines, each 120 fathoms long, 10 fathoms deep, and 3-inch mesh; value, $3 per fathom. Five drag seines, each 120 fathoms long, 6 fathoms deep, and 3-inch mesh; value, $1.50 per fathom. Two drag seines (for herring), 180 fathoms long, 15 fathoms deep, and 2-inch mesh; value, $3 per fathom.



NATIVE VILLAGE NEAR CANNERY OF ICY STRAIT PACKING COMPANY, NORTH END OF WRANGELL STRAIT.

Gill nets: King salmon, each 50 fathoms long, 25 meshes deep, and 9-inch mesh; redfish, 50 fathoms long, 40 meshes deep, and 5¾-inch mesh; cohoes, 75 fathoms long, 30 meshes deep, and 7-inch mesh (120 nets in all; value, 65 cents per fathom).

Boats, lighters, etc.: 1 cargo lighter, $850; 12 seine boats, $100 each; 12 gill-net boats, $50 each; 12 seine-boat tenders, $35 each; 4 skiffs, $20 each; 1 pile-driver, $500.

The following vessels (owned) were employed:

Class and name.	Tons.	Crew.	Value.
Steamer White Wings	34	6	$7,000
Steamer Annie M. Nixon	18	6	6,000
Steamer (stern. pad.) Gypsy Queen	58	.....	6,000
Hulk Blanche	107	(1)	4,500
Scow Elliott	43	(1)	1,000

[1] Fishermen.

The output of the cannery consisted of—

Species.	Cases.	No. to the case.	Date.
Redfish	[1] 8,625 [2] 1,316	15	July 1–Aug. 20
Cohoes[3]	[1] 500 [2] 1,000	7	Sept. 10–Oct. 10
Humpbacks	[1] 10,000	20	July 20–Sept. 15
Dog salmon	[1] 4,800 [2] 3,700	8.5	Aug. 15–Oct. 30

[1] Talls. [2] Flats. [3] Salted 100 barrels cohoes, running 27 to the barrel.

The Bartlett Bay saltery in 1899 salted 200 barrels of redfish. In 1900 it salted 530 barrels of redfish, 45 to the barrel, June 25 to August 7; 120 barrels of cohoes, 30 to the barrel, August 20 to September 30.

The Shipley Bay saltery in 1900 salted 200 barrels of redfish, 50 to the barrel, June 27 to August 14.

The Taku Inlet saltery in 1898 salted 140 barrels of king salmon and 12 barrels of white king-salmon bellies. In 1899 it salted 400 barrels of king salmon, 12½ to the barrel, and 12 barrels of white king-salmon bellies, May 10 to June 25. In 1900 it salted 400 barrels of king salmon, 12½ to the barrel, and 12 barrels of white king-salmon bellies, May 7 to June 25.

On the hulk *Blanche* in 1899 there were salted 1,500 barrels of herring, September 15 to October 31; in 1900, 1,000 barrels of herring, August 1 to October 3.

Pacific Coast and Norway Packing Company, Wrangell Narrows.—This is a company chartered in Minnesota, with main office at Minneapolis, and said to be incorporated for $1,000,000, of which, however, a very small portion only is reported to have been subscribed. It is a new organization, and this year was prospecting for a cannery site on Wrangell Narrows, or in that vicinity. It is expected to build a cannery in the spring of 1901 and make a pack that season, but none of the details have yet been considered. This season a floating saltery outfit was operated and salmon and herring were salted. Later the halibut industry is to be examined.

The following are the statistics, as far as they could be learned:

Men employed: 16 white and 8 Japanese fishermen and 2 Japanese cooks.

Outfit: 1 herring seine, 130 fathoms long, 40 feet deep, 1½-inch mesh, value $800; 1 herring seine, 110 fathoms long, 30 feet deep, 1½-inch mesh, value $600; 2 gill nets, 75 fathoms long, 30 meshes deep, 7-inch mesh, value 65 cents per fathom; 2 seine boats, $180 each; 2 dories, $30 each; 3 skiffs, $20 each.

The vessels were the steamer *Neptune*, 176 tons, crew 10, value $10,000, owned; house scows *Ike*, value $1,000, owned; *Joe*, value $1,000, owned.

This outfit reached Wrangell Narrows August 20, and has been operating in the vicinity of Blind River. To September 5th, 250 barrels of herring and 8 barrels of cohoes had been salted. The party was fitted out to salt 3,000 barrels of herring. One of the house scows is fitted up as a cooper shop and the other as a bunk-house.

The Royer-Warnock Packing Company.—This firm hails from San Francisco and located a cannery in southeastern Alaska in the spring of 1900. The site is that of the Buck saltery, in Beecher Pass, which connects Duncan Canal with Wrangell Narrows. The cannery is on the northern side of the pass, immediately within the southeastern point of the largest and easternmost of three islands which lie in the pass just south of Hood Point, with which they are connected at low water.

The cannery is a very small plant, the old saltery building having been utilized in the so-called main building, and is without appliances usually found in a cannery of simplest form. It is believed that under present conditions an output of 25 cases a day would tax the efforts of the cannery. On the day of my visit 900 fish were received, and it was said that it would take from Thursday morning until Sunday to pack them. The superintendent stated that machinery would be introduced next year (1901), so that a season's pack of 25,000 cases could be made. In this event new buildings will have to be erected, as the present ones are mere shacks.

The pack was truly made by hand. The fish were cut in sections with an ordinary butcher's knife, and the cans filled, capped, crimped, and soldered by hand. All cans were purchased; weight of tin plate unknown. There were no fishermen; all fish were purchased, and for them 6 cents to 8 cents were paid. There was no Chinese contract; the Mongolians employed were paid $35 per month and received board and transportation.

The cannery employed 2 white men, 10 Japanese, and 1 Chinese. It had 2 seines, each 100 fathoms by 5 fathoms, value, $1.50 per fathom; 1 gill net, 100 fathoms by 30 meshes, 7-inch mesh; 1 seine boat, $30; 1 scow, $30; 1 dory, $10; and 1 naphtha launch, the *Ro-Wa*, of 4 tons, crew 2; valued at $800.

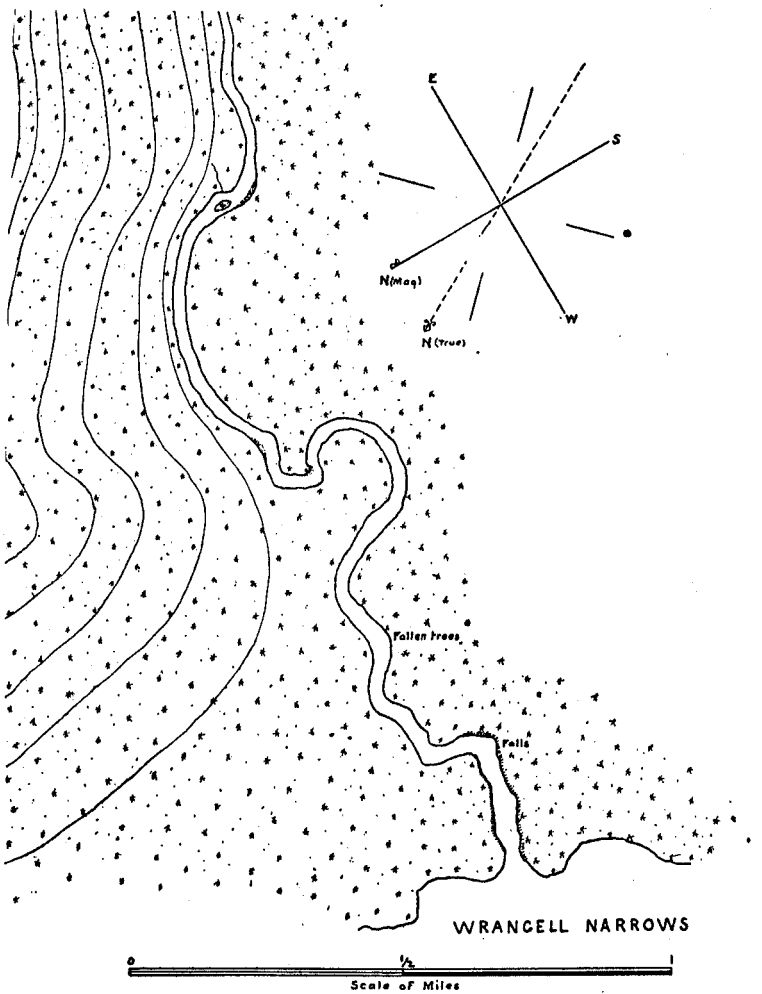
Nineteen barrels of redfish were salted. The pack of canned salmon for the season consisted of:

Species.	Cases.	No. to the case.	Date.
Redfish	480	12	July and August.
Cohoes	1,060	7.5	Do.
Dog salmon	20	7.8	

WRANGELL NARROWS STREAM.

Emptying into Wrangell Narrows on the eastern side, opposite Finger Point and one-half mile to the northward of the astronomical station, Coast Survey chart No. 8180, is a large stream which was said to run redfish. This stream was examined by

Ensign Hepburn, and from his report it is quite probable that it is not a redfish stream and that but few salmon can surmount the obstacles. The stream is not a lake outlet, but drains the hills about 10 miles to the southeast from its mouth. Throughout its entire course, and to within one-half mile of its mouth, it follows a line of hills which lie to the northward. The opposite side is comparatively low. Three hundred yards within the mouth, at a sharp bend, is a fall to which tide water



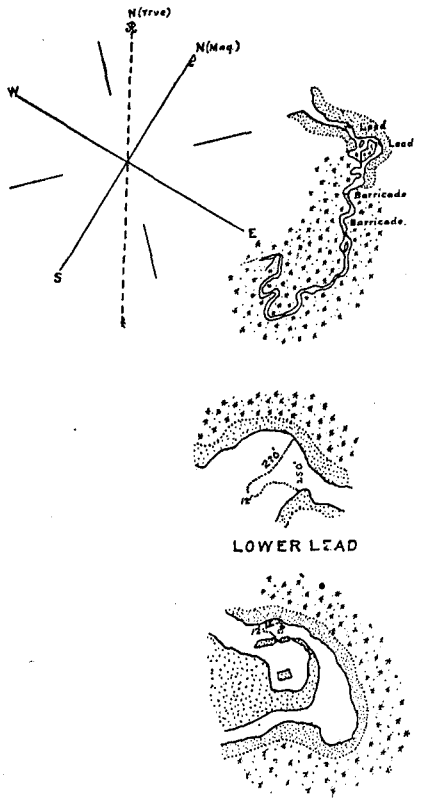
Cascade stream, east side of Wrangell Narrows, opposite Finger Point.

extends. At low water the fall is about 30 feet high, and it is only at high-water spring tides that fish can ascend. Above the falls the width is 45 feet, depth 1½ feet, and current 1½ knots. The bottom is rocky where the stream narrows, and in the wider reaches it is sandy and gravelly. The color of the water is dark, and the temperature (September 6) 2 miles from the mouth was 50° F. The banks are heavily timbered, and there is a dense undergrowth. On the left bank, beyond the stream

belt, the country seemed open. A number of dead dog salmon and cohoes were seen below the falls, and a few cohoes were noticed jumping at the falls. It was learned that dog salmon and cohoes are the only ones that try the falls at all.

SALMON BAY STREAM.

This stream was examined by Ensign Kempff and Mr. Fassett. Salmon Bay is on the northeastern end of Prince of Wales Island, about 7 miles to the eastward of Red Bay, at the junction of Clarence and Sumner straits. Salmon Bay is a narrow inlet curving in a southerly direction, about one-half mile in length, and at the head has a narrow rocky passage which, after a few hundred yards, widens, forming a tidal basin that receives the waters of a redfish stream. This stream was explored for a distance of 3½ miles to a moderate elevation, and as the lake was not reached the party returned. There was no one in the vicinity from whom any information could be obtained. It was afterwards learned that the lake is some distance in the interior. The stream is very tortuous and flows through a comparatively level country. The land around the mouth of the stream is low and grassy, tide water extending about 1½ miles within the mouth. The bottom is rocky and bowldery, with gravel patches over which fish were seen spawning. The water has the brownish tinge common to lake water in this district, and 1 mile above the mouth had a temperature of 66° F., 3 miles above the same point 58° F., September 4. The average width is about 40 feet; depth, 1 foot; current strong. No tributaries were noticed in the distance examined. About 2 miles from the mouth there is a fall or rapid, in steps about 4 feet high, which, however, does not prevent the fish from ascending. The banks are wooded, and several open spaces were noticed back of the fringe of growth bordering the stream.



Stream and leads, Salmon Bay, Prince of Wales Island.

Just beyond the head of tide water the stream during the fishing season may be barricaded. On each bank are heavy posts and on line a number of stakes driven in the stream bed, with bowlders between. It is not known exactly what this may be, but from the old web found on the banks it is believed that a net has been stretched across the stream, supported by the stakes, with the foot held in position by the bowlders.

At two points, about one-half mile within the mouth, runways or leads have been constructed by piling the rocks from either bank in V-shape, leaving the apex open. It is possible that these runways are used in connection with the fyke-shaped traps

used by the natives. On the left bank, at the outer runway, is the site of a saltery formerly operated here. Humpbacks, dog salmon, and Dolly Varden trout were the only fish seen. It is said that this stream has been much abused by barricading, and a few years ago it was believed that it was practically exhausted for commercial purposes, but redfish are still taken in considerable numbers. The stream has a probable value of 20,000 redfish and 3,000 cohoes. The only stream data obtainable are the following:

Year.	Time of run.	Species.	Number taken.
1896	July 1-30	Redfish	19,725
1896	Aug. 1-31	Cohoes	2,682
1897	July 1-15	Redfish	15,012
1898	June 28-July 20	Redfish	22,000
1899	June 20-Aug. 2	Redfish	25,401
1900	June 18-July 27	Redfish	33,290

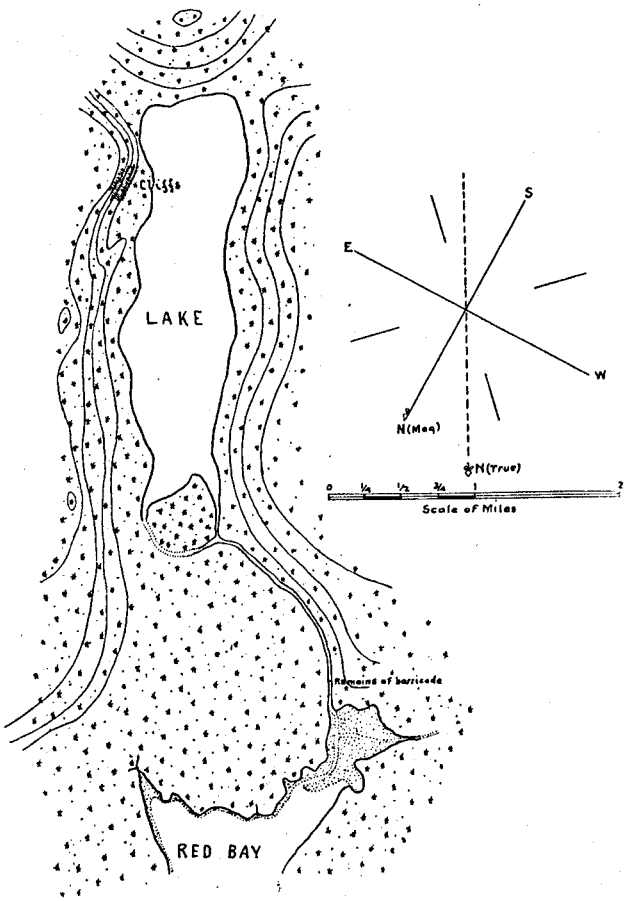
Salmon Bay saltery.—On the southern point of the entrance to Salmon Bay is a saltery formerly conducted by Mr. Tom McCauley. Several years ago the salting tanks were moved to Whale Passage, and the saltery is now used as a cooperage. The buildings, dwelling, store, etc., at the time visited were in good repair; a large number of barrels were stored in a warehouse, and quite an outfit of coopering tools was noticed, but everything was locked and no one in sight. The fish taken from the stream are sold fresh to the Wrangell cannery by Mr. McCauley, who claims the fishing right here.

RED BAY STREAM.

Red Bay is on the northern side of Prince of Wales Island and opens on Sumner Strait. (See Coast Survey chart Nos. 8200 and 8168.) The southwest extremity of the bay narrows to a pocket, which is an uncovered flat at low water, and receives at the southeastern end the waters of a redfish stream, which was examined by Lieutenant Rodman September 4. It is about 1½ miles in length, has an average width of 30 feet and depth of 12 inches, with two rocky pools about 5 feet in depth in its length; it flows in a northwesterly and northerly direction from the lake over a gravelly bottom with occasional bowlders, running with a slack current, and has no falls or heavy rapids in its course. The lake, at the point of outlet, flows in two streams, forming an island about one-half mile in diameter. The eastern bank of the main stream is generally low and flat, the western bank steep, and both timbered with the usual growth of the country. Tide water extends about 150 yards within the tree line, and the temperature of the water above this point was found to be 62° F.

The lake, which lies in a general north-and-south direction, is about 2½ miles long by one-half mile wide; it is elevated about 40 feet above sea level, and has a temperature of 61° F. at a depth of 3 feet. The eastern shore is generally steep, having near the head of the lake a gray precipitous cliff, while lying off the lower end is a small wooded island. The western shore has a more gentle slope, and all the surroundings are heavily wooded. For want of proper facilities the lake could not be examined, but at the head it appeared as though it received two feeders. The shore shelf, as far as could be seen, was gravelly.

About 200 yards from the mouth of the stream, and above tide water, forked posts were found planted on the banks, and a large number of slat racks, 8 feet by 4 feet, were stacked near by. As the current is very gentle it is probable that a heavy crossbeam is laid across the crotches, supported by stakes in the stream, and that the racks are then laid across by bedding one end in the gravel, bottom upstream, and inclining the other end against the beam. A line of bowlders across the stream probably served to ballast the lower ends of the screens, thus effectively closing it to fish on their way to the spawning-grounds. Small pieces of web and cordage were also seen in the vicinity, which may have been used in closing the stream.



Lake and stream at head of Red Bay, Prince of Wales Island.

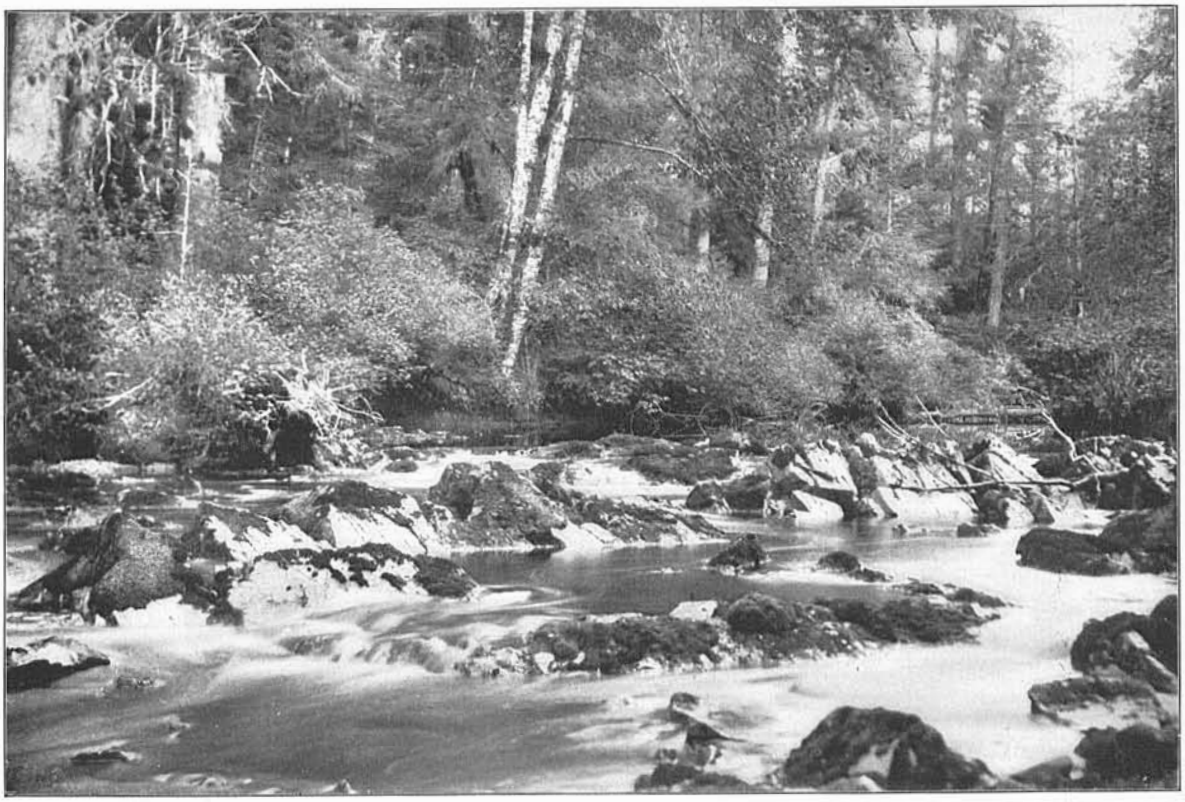
With the means at hand two men could close the stream in about two hours. Naturally, it is free from obstruction. A few redfish, many humpbacks, and a few dog salmon were seen in the stream, confined largely to the pools, in which 500 or 600 were noticed, all in an advanced stage of ripening. The bed of the stream seemed to offer a good spawning-bed. No fish were seen in the lake, but here and in the stream large numbers of small fry, 1 inch to 3 inches long, were noticed.

It is said that this stream has been much abused by barricading, and it is difficult to obtain its real value now, as the canneries naturally do not wish to give their stream records to the public, and they are cautious in giving figures.

The following are the records as far as they are available:

Year.	Time of run.	Species.	Number.
1896	July 18–31	Redfish	16,348
1896	Aug. 1–Sept. 1	Cohoes	4,542
1897	July 7–29	Redfish	12,004
1898	July 10–Aug. 5	Redfish	24,000
1899	Unknown		
1900	July 5–Aug. 5	Redfish	11,243

The stream has a present value of not over 18,000 redfish and 5,000 cohoes for a single season.



SALMON BAY STREAM, PRINCE OF WALES ISLAND.

Riffles where humpbacks were spawning, about 2 miles from mouth.

TEBENKOF STREAM. LOG FORMING FOUNDATION OF FISH BARRIER.

The stream named "Salmon Creek" on Coast Survey chart No. 8168 of Red Bay was a mere rill at the time of our visit, and those named creeks Nos. 1, 2, 3, and 4 were not seen; they are probably small waterways during heavy rains. The stream named "Little Creek," to the westward of the redfish stream, is about as large as the latter and carries many humpbacks.

At the point marked "Fishery and Indian Village" is the site of the old saltery, formerly operated by Mr. Tom McCauley, but later moved to Whale Passage. The saltery building is in bad condition and the wharf has disappeared, except the inshore end. There are two houses near by, but no one was seen in the vicinity; the place looked abandoned. The fish were formerly used in the saltery, but are now sold by Mr. McCauley to the Wrangell cannery.

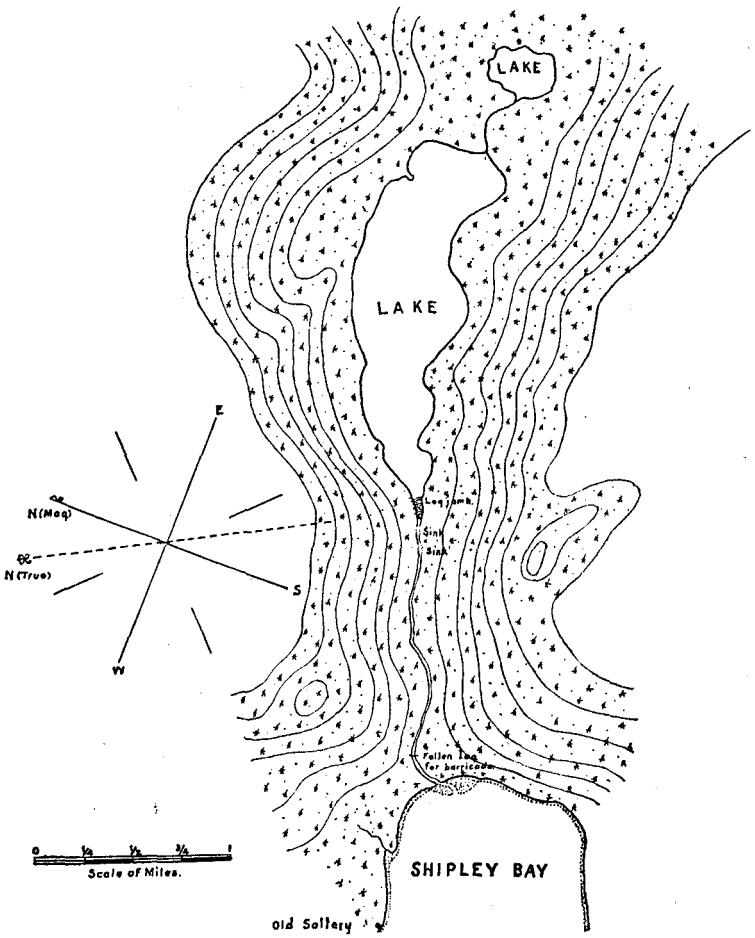
SHIPLEY BAY AND STREAM.

Shipley Bay is on the western side of Kosciusko Island, which lies close to and on the northwestern side of Prince of Wales Island, from which it is separated by Klawak Passage. It is a very deep indentation, about 6 miles long and 1½ miles wide, but much obstructed by reefs, though there is a good channel and excellent anchorage at the head of the bay. At the eastern end, toward the northern side, is a saltery formerly owned by Mr. Walter Kosmikoff, known locally as "Russian Walter," who salted salmon and at times salmon trout. Fish were sold fresh when the opportunity offered, but as it was out of the track of the cannery steamers, few were disposed of in that way, though occasionally a few were sent to Wrangell on the monthly mail boat which passes here on its run between Klawak and Wrangell.

In 1899 the saltery was purchased in the interest of the Icy Strait Packing Company and was operated, as noted, under that company. It was closed at the time of our visit, and there was no one in the vicinity.

At the extreme head of the bay and about half a mile from the saltery is the mouth of a redfish stream, which was examined by Lieutenant Rodman and Mr. Fassett, September 3. This stream, with the lake system, lies in a general east-and-west direction, the former about 1½ miles long, 20 to 25 feet wide, and 12 to 15 inches deep. It flows between steep timbered mountains, 2,000 feet high, with a strong current, over a rocky bed which has occasional gravel spots. There are many rapids in the stream, but no steep falls to prevent the fish from ascending. No stream yet visited by this party has as many natural obstructions as this one. It is choked from the lake to the mouth by fallen timbers which have come down the steep mountain side, and at two points, 50 yards and 150 yards from the lake, there have been heavy slides into the bed of the stream, the water disappearing entirely under the detritus at each point and reappearing after it has passed the obstruction. It is impossible for fish to overcome these obstacles, but it is probable that during heavy rains, which are frequent in this district, the volume of water is so great that the subsurface drains under the obstructions can not carry it all away, and there is then a flow over the top. Below these natural obstructions, where the stream again appears, the pools were filled with salmon of all species, and some trout, most of the former well matured. The stream water had the usual discoloration and a temperature of 58.5° F.

The lake is about 1¾ miles long, has an extreme width of one-half mile, and an elevation of 55 feet. The whole head of the outlet is filled with logs and dead trees; beyond this jam the shore is rocky as far as could be seen from the outlet. As there were no facilities for examining the lake, and it was impracticable to follow the shore, the party ascended a high mountain overlooking the lake and from this position made the sketch. At the extreme eastern end a second small lake was seen, connected with the main body by a fair-sized stream. Several small feeders



Lake and stream, Shipley Bay, Prince of Wales Island.

were also seen, but none of any consequence except the lake connection, near which some sandbars were noticed. The temperature of the lake near the outlet, at a depth of 3 feet, was found to be 59° F.

In the stream, about 50 yards above tide water, which extends but a very short distance from the mouth, some stakes and old webbing were found, and immediately above a tree had been felled across. All this may have been used for barricading the stream, but whether any obstructions have been used recently to hold the fish is unknown to this party.

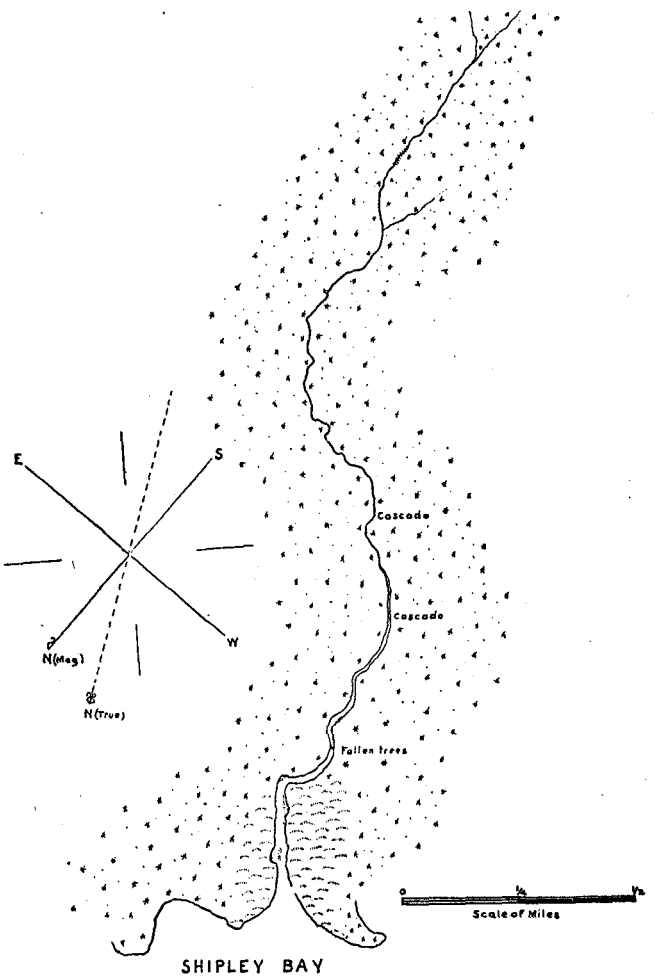
On account of the natural obstructions in the stream the locality is probably not suitable for hatchery purposes. The stream data is very meager, but the following may be of some service, though it should be remembered that except for 1900 the fish taken for the saltery are not included:

In 1892 the Baranoff Packing Company took 6,762 redfish from July 9 to 20; in 1893, 5,295 redfish from July 8 to 30. In 1898 the Wrangell cannery took 5,000 redfish from July 15 to August 15. In 1900 the Icy Strait Packing Company took 12,000 redfish from June 27 to August 14. The stream has a probable value of 12,000 redfish.

SHIPLEY BAY STREAM No. 2.

On the southern side of the bay a small stream discharges into a cove formed by a long peninsula and the point next eastward. This stream was examined by Ensign Hepburn, and found to carry only humpbacks and dog salmon, though cohoes may also run later.

The stream is not a lake outlet, but has its source in the mountains about 6 miles in a general southerly direction from the mouth. At a point 3 miles from the mouth, where it reaches an elevation of 170 feet, it is quite small and flows through a gently ascending and rather flat country, increasing in size toward the mouth by conjunction with small branches. Tide water extends three-eighths of a mile upstream; immediately above this point the width is about 16 feet, depth 9 inches, with a velocity of about 3 knots. The bed is generally rocky, and where it widens it is sandy and gravelly. From a point 1 mile above its mouth and for a distance of about three-fourths of a mile it runs as a continuous rapid. There are two cascades, as noted in the sketch, with the greatest sheer fall of 3 feet. The water is dark, and at the mouth and 1 mile above had a temperature of 51° F. The banks are densely wooded, but back from the stream belt the country seemed more open. At the mouth is a gravel bar, and within the banks are grassy. There are no



Humpback Stream, Shipley Bay, Prince of Wales Island.

artificial obstructions, but throughout its entire length there is much fallen timber, which in places must offer much difficulty to the fish in ascending. Humpbacks and dog salmon were seen for a distance of about 2½ miles; all were in poor condition, and the lacerations showed the difficulties encountered in ascending. Dead dog salmon were numerous.

BAY OF PILLARS AND STREAMS.

This bay is on the west side of Kuiu Island and opens on Chatham Strait, having Point Sullivan for the northern entrance point and Point Ellis marking the southern. It is a large body of water, much obstructed by islands and reefs, and has two deep arms similarly obstructed; the one on the north will be referred to as the North Bay of Pillars, and the other as the South Bay of Pillars.

These waters have been surveyed by the Coast and Geodetic Survey, and as that office has probably written sailing directions, notes for entering will not be made here.

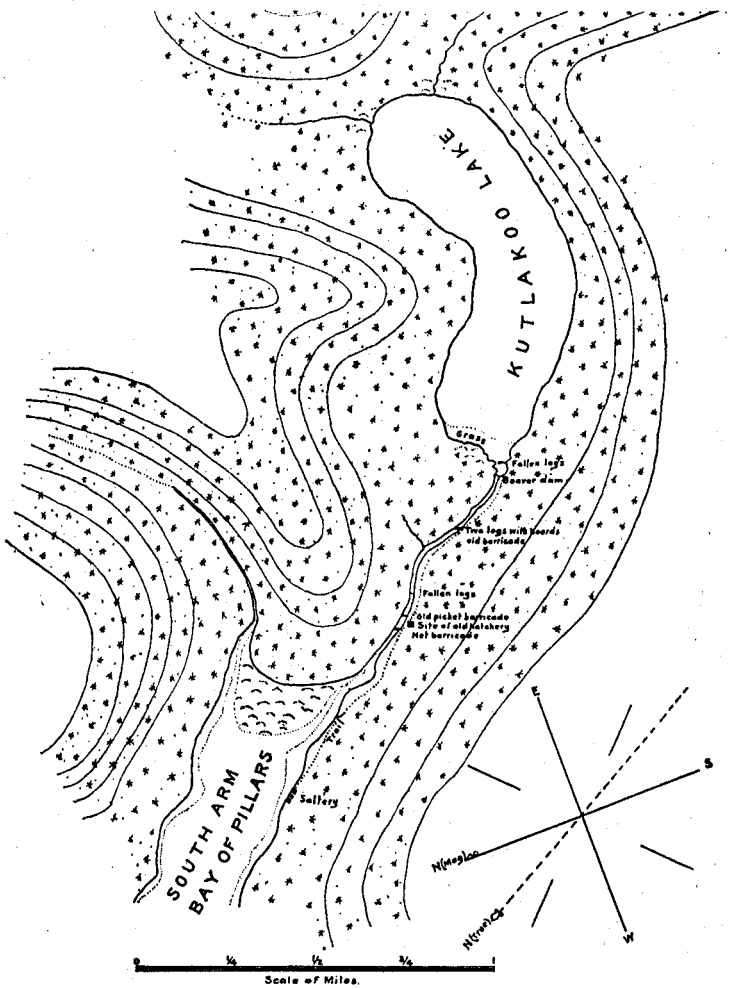
On the southern shore of the South Bay of Pillars, about 4 miles from Point Ellis, the cannery of the Astoria and Alaska Packing Company was located. This cannery was burned in 1892 (see my former report, p. 121), but the site and remaining building were purchased by Mr. Jack Mantle, who lives here during the fishing season and operates a saltery in each of the Pillar Bay arms.

The principal streams in this vicinity fished for commercial purposes are: One at the head of the South Bay of Pillars, which, when the cannery was operated, was known as the Home Stream or Point Ellis Stream (the Indian name for it is Kutlakoo); one at the head of the North Bay of Pillars, which is known as the Pillar Bay Stream; and one in the large bay to the southward (Tebenkof Bay), known as Kuiu Stream, or Alecks Stream.

POINT ELLIS STREAM, OR KUTLAKOO.

Entering the South Bay of Pillars the ship's course is close along the southern shore, quite straight, and fairly clear for a distance of 5 miles, when the bay becomes choked with islands and reefs, which straggle to the head. In the southeastern angle an arm extends to the eastward for about a mile, and receives the waters of a small humpback stream. On the northern side the bay terminates in the Narrows (Skookum Chuck), which extend in a northeastern direction about three-fourths of a mile, with a width of about 100 yards, through which the current is quite violent during the strength of the tide. These Narrows connect with an inner bay 3 miles long, in a northeast and southwest direction, by three-fourths of a mile wide, which at the eastern end sends an arm at right angles to the southward about 1 mile long by one-fourth of a mile wide, receiving at the western terminus the waters of the Point Ellis or Kutlakoo stream. This stream, examined by Lieutenant Rodman and Mr. Fassett, is a lake outlet, and from the grassy flats at its mouth to the lake is about three-fourths of a mile long, with an average width of 18 feet and a depth of 10 inches. It has a general north-and-south direction, flowing over a gravelly bottom between moderately steep banks heavily wooded. As the lake is not more than 15 or 20 feet above tide water the current is not strong, nor are there any falls or strong rapids. Tide water extends about 50 yards within the mouth.

The lake is slightly crescentic in shape, with a general northwesterly and southeasterly direction, and is about 1 mile long, with an average width of one-fourth of a mile. The shores are heavily wooded and rise rapidly to the higher mountains. The water appears deep and clear, with a brownish tinge, and as far as could be examined the bottom is gravelly around the shore shelf. At the point of discharge the lake is shallow, with a grassy bottom. There are several feeders. The largest enters the



Kutlakoo Lake and Stream, Kuiu Island.

head of the lake through a narrow valley and is nearly as large as the outlet; it forms the main spawning-ground for the redfish. A second feeder, said to be on the eastern side, was not noticed by the party.

The temperature of the stream water on August 29 was 62° F., and the lake water, at a depth of 2 feet, one-fourth of a mile from the outlet, was 61° F.

In 1892 Mr. J. C. Callbreath, the present owner of the hatchery on Etolin

Island, then part owner and manager of the Point Ellis cannery, operated a small hatchery on the left bank of this stream (Kutlakoo), about 200 yards above the mouth. It was rather primitive, the work all being conducted without shelter. The hatchery water was conveyed by a box flume from a point on the stream about 300 yards from the lake, where the remnants of a barricade built to hold the spawning fish may still be seen. About 1,000,000 eggs were fertilized and placed in the baskets, but after they commenced hatching an exceptionally high September tide destroyed the plant, and it was never rebuilt. It is said that much difficulty was experienced with fungus. At the old hatchery site stakes were found driven in the bed of the stream, between which, it is said, a net is stretched to hold the fish. A few yards above this point are the remains of a picket barricade.

Immediately below the point of discharge from the lake a beaver dam was found, built of sticks, brush, and moss, which held the waters back and allowed no fish to pass. This was partly cleaned away by the examining party, and, as the water rushed through, the stream rose very materially, and large numbers of salmon, held in the pools below, ascended rapidly.

The value of the stream, as given by the cannery the last year it was fished, is 35,000 redfish, 5,000 cohoes, and 100,000 humpbacks. The owner of the saltery states that the number for redfish is too large, but the stream will yield from 20,000 to 22,000 redfish, possibly a few more by hard fishing. The first run of redfish in this stream usually occurs from June 25 to July 1, and the second run from July 10 to August 7. The length of the season varies with the condition of the weather; if it is dry there will not be sufficient water to permit the fish to ascend, and they are held around the mouth until the water rises. These redfish run about 50 to the barrel, or 13 to 14 to the case. The cohoes in this stream are very large and run 24 to the barrel. They appear from the middle to the latter part of August; from September 10 to October 4 they run strong and continue in diminishing numbers until November. The humpbacks run from the 15th of July to the end of August, and they are present some years in large numbers until the end of September, but they are not then in good condition. The dog salmon run with the humpbacks.

It is said that a good hatchery site might be located near the large feeder at the head of the lake.

Complete stream data is not available, but the following may be of interest:

The Baranoff Packing Company took fish from the stream as follows: In 1892, 8,942 redfish, July 2 to July 25, and 2,143 cohoes, August 18 to September 8; in 1893, 2,605 redfish, July 4 to July 20; in 1894, 8,740 redfish, July 7 to July 25; in 1895, 14,572 redfish, July 4 to August 10; in 1896, 15,834 redfish, July 12 to August 28; in 1897, 11,709 redfish, July 6 to August 7.

By other fisheries: In 1898, 10,000 redfish; 1899, unknown; 1900, 16,500 redfish.

The Point Ellis stream (Kutlakoo) is the only salmon stream in the South Bay of Pillars that has any present commercial value. At the old cannery site there is a small stream, called by the Indians Quat-a-hein, or trout stream, on account of the abundance of that species, and around its mouth some years several thousand cohoes may be obtained, but it is only an occasional run.

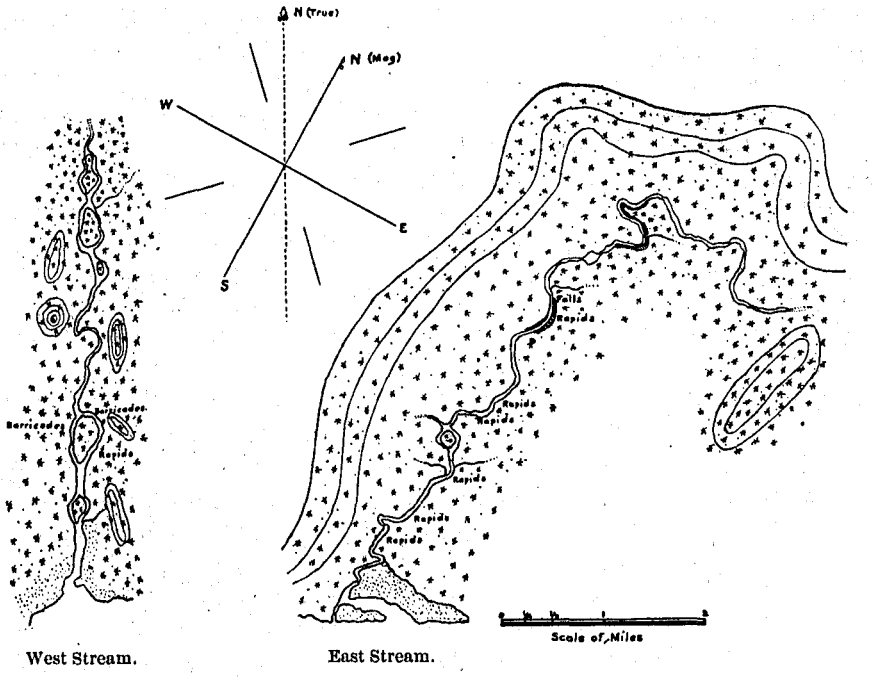
Bull. U. S. F. C. 1901. (To face page 274.)

KUTLAKOO STREAM, KUIU ISLAND.

New fence near mouth.

NORTH BAY OF PILLARS.

The North Bay of Pillars, like the South, is much obstructed by islets and reefs, and local knowledge is necessary for safe navigation. The head of the bay, however, is clear, and is 1¼ miles in length by 1 mile in width, forming a beautiful harbor with excellent anchorage in moderate depths. At the extreme northern head of the bay are the mouths of two large streams, three-fourths of a mile apart, bordered by extensive tidal flats. Neither of these streams is said to carry redfish, but all other species common to the district run here.



Sketches of East and West streams, North Bay of Pillars.

PILLAR BAY STREAM.

This is the western stream at the head of the bay and is the most important, as it carries a great number of cohoes of large size. It was examined by Ensign Kempff August 29 a distance of 4½ miles, where it is elevated 40 feet above the sea.

It flows in a general south-southeast direction between steep banks, heavily wooded, over a gravelly bed. The water is clear, of a brownish tinge, as though flowing from a lake (though none was found), and at each mile from the mouth the temperature was 51° F. Tide water extends 1 mile from the mouth, at which point the stream is 9 feet wide, 12 inches deep, and runs a 3-knot current. In the length examined two tributaries enter from the eastward, one three-fourths of a mile, the other 1¾ miles, from the mouth. The stream flows around several islands in its course. The eastern channel, around an island about 2 miles from the mouth, has at the lower end a rapid about 30 yards long, and at the other end of this, and in the

western channel, are the remains of barricades. Trees have been felled across these branches and were still in position, but the split rails were washed away. A gravel ridge was noted on the upstream side, where the rails had lodged in the bed. A large number of humpbacks and dog salmon were seen spawning in the lower courses, growing less in number as the higher portion of the stream was reached. It was too early for cohoes.

This is a very large stream, flowing considerable water, and carries a heavy run of all species of salmon common to the district, except redfish, of which, it is said, there are none in the North Bay of Pillars. This is a noted locality for cohoes. Fifty thousand to 60,000 of this species, it is said, may be taken around the mouth and the head of the bay, as well as about 100,000 humpbacks. Dog salmon are also abundant. These cohoes are large and, for commercial purposes, run from September 1 to October 7, then in diminishing numbers until November. The humpbacks run from the middle of July to the end of August and the dog salmon throughout the season, but mostly during the humpback run.

There are no stream records available. Besides those salted, cannery steamers sometimes fish here for a few days, and what can be done during that time is indicated by the following record from the books of the Baranoff Packing Company: In 1892, 1,522 cohoes, September 8 to 15; in 1895, 2,836 cohoes, September 20 to 22; in 1896, 3,607 cohoes, September 15 to 19; in 1897, 957 cohoes, September 19.

PILLAR BAY STREAM, No. 2.

This stream, next east of the Pillar Bay Stream and three-fourths of a mile from it, was also examined by Ensign Kempff for a distance of 8 miles and no lake found. From the most distant point reached, which is 305 feet above sea level, the stream flows to the northwest for 3 miles and then turns in a general southerly direction for 5 miles. The water is clear and clean and flows over a rocky bottom, interspersed with patches of gravel and shoals, over which fish were spawning. There are numerous rapids, and at a point 4 miles from the mouth there is a drop of 30 feet in the main fall, besides several smaller steps. The banks are heavily wooded, precipitous, and broken into bluffs in the vicinity of the falls and at a point about 1 mile above the mouth. Tide water extends a mile from the mouth, where the stream is 30 feet wide, 18 inches deep, and runs with a strong current. The temperature, taken each mile, was 51° F. (August 30). Five small tributaries were noticed in the distance—two entering from the west and three from the east—and were examined. There were no natural or artificial obstructions below the falls. A large number of humpbacks and dog salmon were seen spawning in the lower courses of the stream, diminishing in numbers as far as the falls, but none above it.

The fishing is carried on around the head of the bay. The values given under the Pillar Bay Stream include the one just described, though it furnished but a small part of the total.

MANTLE SALTERIES.

There are two salteries operated by Mr. Jack Mantle; one on the eastern bank of the arm and near the mouth of the Point Ellis Stream, where there are 10 tanks each of 20 barrels capacity, and one on the western shore of the inner North Bay of

Pillars opposite the mouth of the Pillar Bay Stream, where 6 tanks, each of 20 barrels capacity, are operated. There is also one saltery tank at the old cannery site.

He used 1 drag seine 120 fathoms by 4 fathoms by 3-inch mesh, valued at $200; 1 scow of 100 barrels capacity, value $75; 1 35-foot seine boat, value $50, and 1 small skiff, value $25. During the fishing season he employed 6 men (native) for fishermen and 4 klootchmen for butchers. The saltery at the Point Ellis Stream is operated during the early part of the season for redfish, and when the cohoes begin to run the gear is transferred to the Pillar Bay Stream and that species is salted. Mantle commenced salting here in 1893, and has averaged about 350 barrels each year to date.

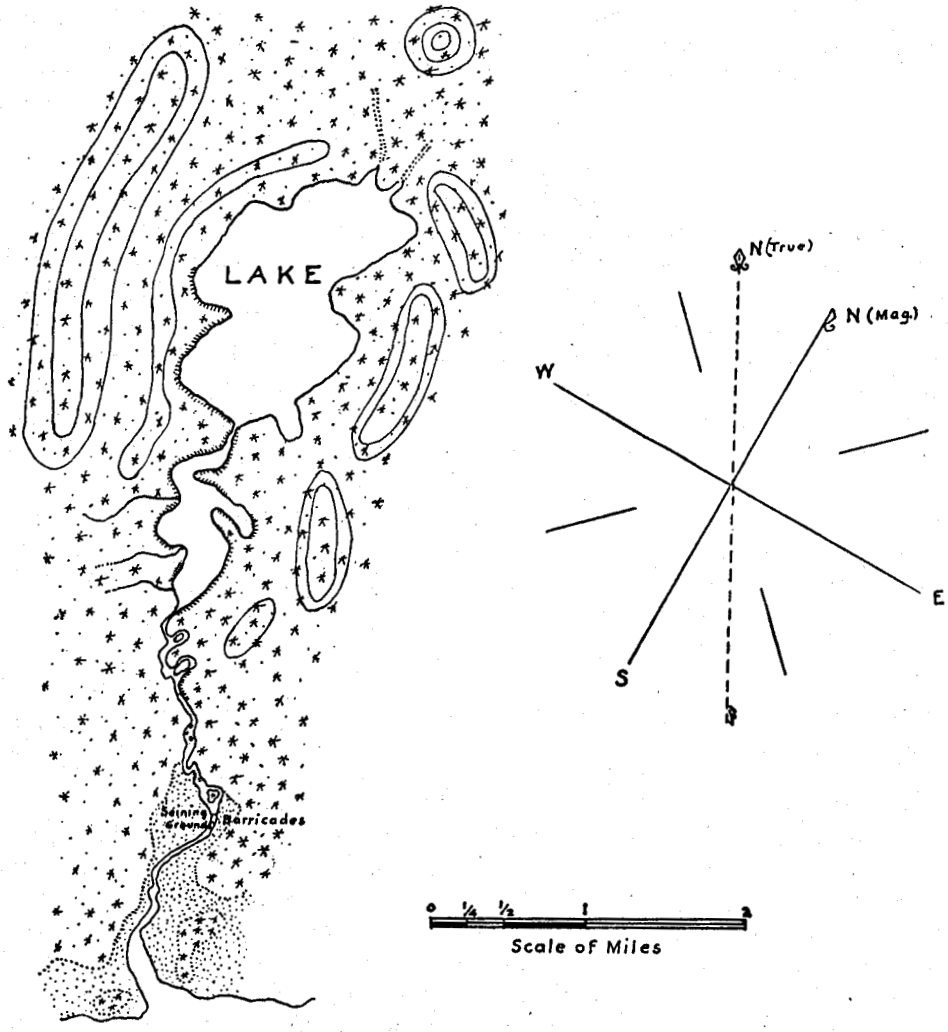
TEBENKOF BAY.

This bay is on Kuiu Island, next south of the Bay of Pillars, and opens upon Chatham Strait. It is a large sheet of water and is said to have deep channels and good anchorages, but has not yet been surveyed. Several streams carrying various species of salmon enter the bay, but only one that has a run of redfish in sufficient numbers for commercial purposes. This one is known as Kuiu Stream, or Alecks Stream. This stream was examined by Ensign Kempff and Mr. Fassett on August 31, who visited it with a party from the anchorage in Pillar Bay. It is located on the eastern side of the inner bay, about the middle of its length, and is hidden in approaching it by islands lying off the shore, but it may be recognized by a log house situated a short distance north from the mouth.

The general direction of the stream and lake system is north-northwest and south-southeast. The former is about 2½ miles in length. The stream flows over a rocky and gravelly bottom between moderately steep, well-timbered banks, and at a point midway on its course is 50 feet wide, 1 foot deep, and has a current of about 1 knot per hour. The water, though clear, has a brownish tinge and a temperature of 55° to 56° F. There are no marked rapids, and no tributaries were noticed. Tide water extends nearly a mile from the mouth, around which, at low water, extensive flats are uncovered. The stream drains two lakes. The first, a "mud" lake, is an irregular shaped body of water about 1 mile long, with an extreme width of one-half mile. It is shallow, with a muddy bottom, and has three very small and shallow feeders entering from the westward, none of which appeared to be used as spawning ground. The temperature of the water along the shores of this lake was found to be 63° F. This increased temperature above that of the stream is due probably to the shallow depth along the side where there is no circulation. At the upper end of the lake there is a narrow extension, about 250 yards long, connecting with the second lake, which is about 2 miles in length, with an extreme width of 1½ miles, and, from appearances, quite deep. The banks are steep, well timbered, and rise rapidly to the higher slopes. The beaches bordering them are gravelly with shale. The lake is at an elevation of about 50 feet above tide water, and the surface temperature of the water near the shore was 61° F. At the head it receives two large feeders, which appear to flow through converging valleys, and in these feeders are spawning beds of the redfish.

In the main stream, a short distance above tide water, posts were found which were probably used to support a net stretched across to hold the fish, a line of rocks

indicating the foot weights that had held the net close to the bed. Above this were the remains of three barricades, within a distance of 100 yards of one another, consisting of trees felled across the stream. The rails had been carried away, probably by freshets. Pieces of wire netting were found, indicating that this also had been used in its construction. A large number of humpbacks and dog salmon were seen



Aleck Lake and Stream, Tebenkof Bay, Kuiu Island.

over the gravel beds in the main stream, but no redfish, this species probably having all ascended to the feeders; the date of visit was too early for cohoes. Large numbers of dead fish were noticed.

From inquiry and observation it is believed that a good site for a hatchery might be obtained on the banks of the large feeders at the head of the lake. The redfish running in this stream are said to be small, averaging about 65 per barrel, or 15 to 16

to the case, but they run very early; in fact, the dates given are the earliest of any stream within my knowledge in southeastern Alaska. The run of redfish commences about June 1 and continues until the middle of July. The cohoes run for fishing purposes from September 1 until the early part of October, and in scattering bunches until November. The humpbacks are said to be very plentiful and are exceptionally large and fine fish. They usually run early, the time being from July 1 to August 1. The only record available is a statement that the Point Ellis cannery in one season took from around this stream 38,000 redfish, 10,000 cohoes, and 200,000 humpbacks. Mr. Jack Mantle, who has fished in this locality for many years, stated that he had seen a large run of steelheads in the stream in May.

The following notes from the records of the Baranoff Packing Company, giving their catches from this stream, may be of interest as indicating the catch of a cannery steamer visiting different localities for fish: 5,990 redfish, June 15 to July 7, 1892; 3,529 redfish, June 19 to July 27, 1893; 730 redfish, July 19 to July 21, 1895; 1,500 redfish, June 15 to July 29, 1896; 4,304 redfish, June 29 to July 7, 1897.

WRANGELL.

Glacier Packing Company, Point Highfield.—The history of this cannery with the streams fished, etc., was given in my former report, pages 103–108, and reference here will only be made to such details as were not then recorded.

There has been no change in the cannery, but the company expects to erect new buildings for the season of 1901.

In canning, the following machinery is operated: Five retorts, 2 fillers and 1 spare one, 2 toppers, 1 solderer, and 1 cutter.

The fish are hoisted by steam in buckets to the wharf, dumped into the bins, and, after cleaning, transferred direct from the draining tubs to the cutters. The daily capacity is 1,600 cases. There are no can-makers. All tins are made at the cannery by hand, except about 1,200 cases of flats, using 100-pound tin plate for bodies and 95-pound for tops, all domestic.

The Chinese contract was 42½ cents, with the usual conditions. The fishermen contracted for $125 for the run, 10 cents for king salmon, and 5 cents for redfish and cohoes, per boat of two men, and full board. The cannery purchased fish and paid 7 cents for redfish and cohoes, if the gear (web and boats) was furnished, or 8 cents if it was not furnished. Humpbacks were purchased at $10 per thousand. The cannery steamers call at the fisheries for all fish. Occasionally a steelhead is taken; there are plenty of halibut and flounders, but no shad or sturgeon since my last report.

The following are the statistics for 1900:

Hands employed: 24 white fishermen, besides purchasing from fisheries engaging 150 native fishermen, 7 white and 4 native cannery-hands, and 86 Chinese.

Fishing gear: Twelve king salmon gill nets, each 250 fathoms by 28 meshes by 8½-inch mesh; 12 redfish gill nets, each 250 fathoms by 30 meshes by 6½-inch mesh, value 65 cents per fathom; 2 drag seines, 120 fathoms by 200 meshes at bunt and 100 meshes at wings by 3-inch mesh, valued at $1.50 per fathom; 5 purse seines, 120 fathoms by 250 meshes by 3-inch mesh, value $2 per fathom.

Boats, lighters, etc.: Two lighters, $600 each; 7 seine boats, $60 each; 14 Columbia River boats, $200 each; 8 old Columbia River boats, $25 each; 5 skiffs, $25 each.

The following vessels, owned by the company, were employed:

Class and name.	Tons.	Crew.	Value.
Ship Llewellyn J. Morse	1,271	(1)	$35,000
Steamer Ella Rohlffs	36	5	15,000
Steamer Aleut	19	5	10,000

[1] Fishermen.

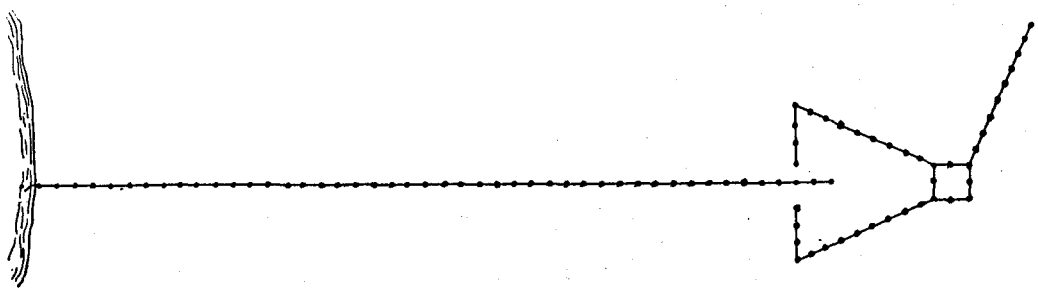
The following was the output in 1900:

Species.	Cases.	Number to the case.	Dates.
King salmon	1,837	3.8	May 15–July 1
Redfish	10,848	10.1	June 18–Aug. 10
Cohoes	9,401	7.4	July 10–Sept. 18
Humpbacks	36,432	15.8	July 2–Aug. 22

Thlinket Packing Company.—This company was organized at Portland, Oreg., and incorporated under the laws of that State. A sawmill at Point Gerard, on the mainland opposite Point Highfield at the junction of the Eastern Passage and the southeast stream of the Stikine Delta, was purchased, and in the spring of 1899 a cannery was erected and a small pack was made that year. The site does not afford much room on level ground, necessitating considerable crowding in the building arrangements. There is a substantial wharf with the fish-house over deep water, where the current carries away the gurry and leaves the place free from the unpleasant odors so frequently noticed around plants of this kind. The cannery plant consists of 2 steam boxes, 2 retorts, 2 hand cutters, 1 can-washer, 1 crimper, and 1 solderer. The pack is made by hand, and the plant has a daily capacity of 800 cases. The fish are pewed from boats or lighters into a chute, adjustable for different stages of the tide, which leads to a cage car, or vertical elevator, operated by steam. When this car is filled it is hoisted and its contents dumped into a second car which runs to the fish-house. All the cans, except a small percentage of flats, are made by hand at the cannery, of 100-pound domestic tin plate. The Chinese contract was 42 cents for talls made at the cannery, 38 cents for talls purchased, and 42 cents for flats purchased, with the usual conditions. The fishermen's contract was transportation and board, bonus of $80 each for beach work, 10 cents for king salmon, 5 cents for redfish and cohoes, and 1 cent for humpbacks, per boat. The fishing bosses had allowances which brought their monthly wages to $70 or $75, and the others averaged $50 and $55 per month. Indian labor was used, but it is not looked upon with favor on account of being unreliable.

Four traps were built this year at an expense of $5,500, located as follows: One in Dry Strait; 1 in the lower part of the southeast stream of the Stikine; 1 about 300 yards west from the cannery, and 1 in Zimovia Strait, about 10 miles below Wrangell. The first three were complete failures, although rebuilt several times; the fourth was

fairly successful and about paid the expenses connected with all. The following are its dimensions: Lead, 150 fathoms, heart double, 15 fathoms across, and pot 36 feet square, in 70 feet of water at high water. A short channel lead, or wing, extended from the corner of the heart. Webbing all tarred; 4-inch mesh for the leads, 3-inch mesh for the rest.



Sketch-plan of Thlinket Packing Co.'s salmon trap, located on Zimovia Strait.

The transportation was by regular steamer lines running from Puget Sound to Alaska.

The following are the statistics for 1900:

Hands employed: 35 white and 30 native fishermen, 9 white and 7 native cannery-hands, 49 Chinese.

Fishing gear: In addition to the traps referred to, 13 king-salmon gill nets, each 200 fathoms by 22 meshes, 9¼-inch mesh; 12 redfish gill nets, each 200 fathoms by 24 meshes, 6¼-inch mesh; value, 65 cents per fathom; 4 drag seines 100 fathoms long by 178 meshes, 3-inch mesh, value $1.50 per fathom; 1 purse seine 185 fathoms by 220 meshes, 3-inch mesh, value $600; 1 purse seine 100 fathoms by 160 meshes, 3-inch mesh, value $400.

Boats, lighters, etc.: One house scow, $400; 1 fish scow, $100; 10 Columbia River boats, $200 each; 6 gill-net skiffs, $60 each; 6 seine boats, $60 each; 2 whitehalls, $85 each; 3 skiffs, $20 each.

Cannery tenders: Launch *Perhaps*, 6 tons; crew, 2; value, $1,500; owned. Steamer *Baranoff*, 10 tons; crew, 5; value, $5,000; chartered.

The following was the output in 1900:

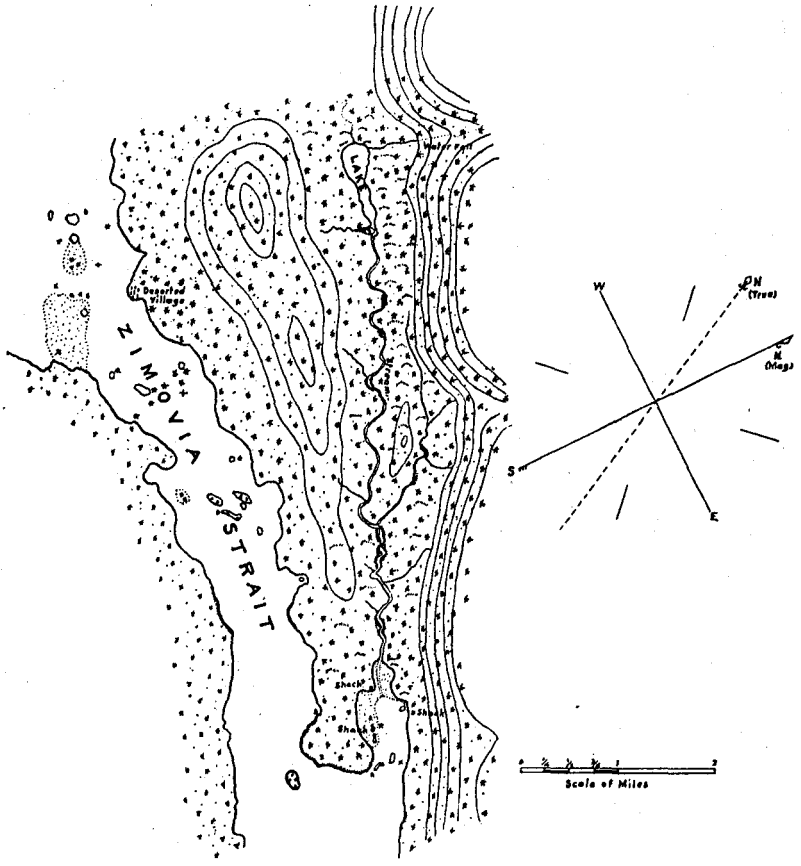
Species.	Cases.	Number to the case.	Dates.
King salmon:			
Red	[1]1,375	3	May 14-June 28
White	[2]674		
Redfish	[1]505	11	June 28-Aug. 16
	[2]3,460		
Cohoes	[2]2,349	7.5	Aug. 2-Sept. 21
Humpbacks	[2]15,540	18	July 12-Aug. 31
Dog salmon	[2]1,737	6.5	Aug. 1-Sept. 15

[1] Flats. [2] Talls.

The streams fished by this cannery are the following: Southeast Pass Stikine River, Anan Bay, Seward Passage, Thoms Place, Kunk Creek, Rocky Bay, Steamer Bay, Eagle Creek, Ratz Harbor, Red Bay.

THOMS STREAM (AW-AW), ZIMOVIA STRAIT.

Near the southern end of Zimovia Strait, on the eastern side, 4 miles northwest from Found Island, is a bight with several islets and rocks at the entrance. At the head of this bight is a redfish stream, referred to in my former report, page 107, as Old Village, but better known as Thoms Stream, fished by the Wrangell and Gerard Point canneries. It was examined September 13 by Lieutenant Rodman.



Thoms Stream and Lake, Wrangell Island.

This stream and lake drain a low, flat country, lying between mountain systems, reaching an elevation on the east of 2,000 to 2,500 feet, and on the west 500 to 1,000 feet. In its windings the stream is fully 6 miles in length from mouth to source, and, in a straight line, about 4½ miles in a general WNW. direction. Tide water extends through extensive flats around its mouth, uncovered at low water and about 200 yards within the tree line, where it is 55 feet wide and from 12 to 18 inches deep. The banks generally are low, but in places there are narrow canyons where they rise abruptly. The borders are wooded with the usual growth, but considerable areas of boggy, moss-covered flats were noticed. The bottom is gravelly, with patches of rock and bowlders, but there are large areas well adapted for spawning-beds;

about 1½ miles below the lake the stream runs over a series of rapids; the highest fall of any of the steps is not over 2 feet. There are no falls or serious obstacles to impede the ascent of fish, the stream is usually clear, and there were no evidences of barricades. The water is brownish in color, with a temperature of 54° F. There are a number of small tributaries, one of some size about 2½ miles from the mouth; this is about 2 miles long and has its source in the mountains to the eastward. The altitude of the main stream at the mouth of the tributary is 155 feet and of the lake 295 feet. The latter is small, pear-shaped, and about 1 mile long, with a greatest width of not much more than one-fourth mile. The lower end is narrow, apparently shallow, and has many pond lilies. The shores are low and, though wooded, there is considerable open country, particularly on the eastern side, where there are large areas of grassy, boggy flats.

At the lower end on the western side there is a feeder, and one at the upper end, in which the sound of falls was heard. It is possible that there are other feeders or lake connections, as the volume of discharge is large. From the surrounding conditions it is believed that a good hatchery site might be found here.

The only stream records available are the following:

Species.	1897.		1898.		1900.	
	No.	Date.	No.	Date.	No.	Date.
Redfish	17,138	June 28–Aug. 6	10,000	June 28–Aug. 1	24,661	June 26–Aug. 1.
Cohoes	1,992	Aug. 16–31	5,000	Aug. 10–Sept. 1	7,651	Aug. 5–Sept 12.
Humpbacks	42,169	July 12–Aug. 18	.....	.....	74,000	Aug. 5–18.

Under average conditions the stream has a value of about 20,000 redfish and 5,000 cohoes.

MEYERS STREAM, CLEVELAND PENINSULA.

Lemesurier Point, the northwestern end of Cleveland Peninsula, forms, with a string of islands to the westward of that point, a narrow bay, at the head of which is the mouth of a stream fished by Mr. Meyers. This stream carries a few redfish, and was partially examined by Lieutenant Rodman on September 14.

The stream is very small, and when examined there was so little water running in it that at low water humpbacks could not enter. At the mouth it was about 8 feet wide, with an inch of water over a riffle for a distance of 150 yards. A mile above the mouth it was a mountain brook, flowing between rocks and bowlders, with here and there a shallow pool. Tide water extends about 150 yards upstream. At a distance of 1 mile the elevation is 70 feet, and the temperature of water was 51° F. The stream bottom is rocky, with gravel patches, and the banks are well wooded. Many of the pools were filled with spawning humpbacks in an advanced stage of decay, and many dead fish were seen along the banks. In places the bottom was covered with spawn.

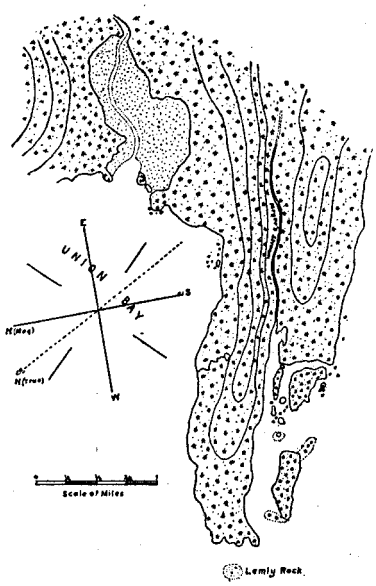
The stream is said to have a lake source, but the examination was not continued to the lake. Later it was learned that the stream is usually very low and that fish can not ascend until after the fall rains raise the water.

Formerly the fish from Meyers stream were sold to the Loring cannery. None were purchased by Loring in 1900. The following is the only record available:

Species.	1896.		1897.		1898.		1899.	
	No.	Date.	No.	Date.	No.	Date.	No.	Date.
Redfish	4,651	July 16–Aug. 7	4,700	July 20–Aug. 20	6,838	July 13–Aug. 30	3,211	Aug. 8–Sept. 8
Cohoes	1,408	Sept. 1–Sept. 14	2,250	Sept. 1–Sept. 20	256	Aug. 20–Aug. 30	.....	.....
Humpbacks	.....	.....	9,874	July 26–Aug. 26	11,499	July 20–Aug. 30	8,760	Aug. 8–Sept. 8

It is probable that the cohoes were obtained from the large stream at the head of Union Bay, which is said to carry no redfish, but some cohoes and humpbacks.

It is believed that, through the rapacity and greed of fishermen, the salmon fisheries of the northwestern coast of the United States are rapidly declining. Other fields are now being sought in order that these also may pay tribute, and soon they will enter the exterminating process.



Meyers Stream, Cleveland Peninsula.

Great Northern Fish Company.—This is one of a number of small canneries and salteries, capitalized from the Puget Sound and Columbia River districts, which sprang into existence this year in southeastern Alaska. This company, not incorporated, hails from Seattle, and fitted out for an extensive salting expedition in a rather novel way. It was arranged to follow the fish; to salt from a barge, from shacks on shore, from salteries, if they could be rented, or from schooners; to occupy a station where fish were plentiful, and when they became slack to pack up and locate where they were abundant; to salt everything of all species, from the best to the worst, from those fresh out of the water to others not so fresh; to salt direct into barrels and boxes, and to carry the product to Seattle and there resalt and assort. The first grades were intended for the best markets, the second for bars and free lunches, and the third for districts where one salt fish is not known from another. Old saltery men shook their heads and said salmon could not be salted that way. It was tried, however, but with what ultimate success could not be learned. It was said this company expected to salt 20,000 to 30,000 barrels of salmon during the season.

Union Bay was one station selected to carry on this work. At the eastern point of entrance to this bay a long tongue of land, bordered on the western side by a few islands, makes to the southward, forming a narrow, shallow cove about a mile in length. Inside the entrance point a bight makes into the tongue for a distance of about 200 yards, and at the head is a saltery of the above company. At the time of our visit the place was closed and no one was in sight.

The outfit here consisted of a rough board building 20 by 40 feet, evidently the bunk and mess house; a rude wharf floored over with saplings cut from the adjoining forests, and a raft of logs lashed together and floored over with saplings. There was no equipment of any kind.

It was afterwards learned that the outfit arrived at Union Bay May 27, and left with all the gear on September 1 for Karta Bay, one white crew having been sent there in advance August 1. The old Baronovich saltery, at the latter place, was rented by the month and operated by this company.

During our visit at Karta Bay they were salting dog salmon for the Japanese market, for which they said they had an order to furnish 300,000. These salmon were simply gutted, the viscera and gills removed, and, without being otherwise cleaned, they were salted in kenches, and, after shrinking, resalted in boxes for shipment.

On September 23 the Baronovich saltery was closed, the equipment, pack, and attendants placed on barges or transferred to the steamer *Dirigo*, and the outfit transported to Cholmondley Sound, where the Miller saltery had been rented.

The following outfit was used by the Great Northern Fish Company: Launch *Griffin*, crew 3, value $3,000, chartered; 1 cargo lighter, $1,000; 1 scow, $150; 2 scows, $60 each; 5 seine boats, $80 each; 3 skiffs, $35 each; 3 purse seines, 220 fathoms by 16 fathoms, 2¼-inch mesh, value $750 each; 3 drag seines, each 120 fathoms by 8 fathoms, 3-inch mesh, $1.75 per fathom; 2 gill nets, each 50 fathoms by 50 meshes, 5½-inch mesh, 65 cents per fathom.

There were employed 30 white salters and beach men, 16 white fishermen, 15 white and 4 Indian casuals; about one-half of these were hired in Alaska. From the middle of September the white men began to leave and return to Puget Sound, and more Indians were then employed. Steady hands received in pay and allowance an amount equal to about $60 per month, whites and natives alike, but the casuals, who are sailboat tramps, were paid on whatever terms could be arranged; sometimes it was board and keep until the arrival of the *Pardner*, and again it was passage to the Sound with the next shipment. The boxes used for shipping dry-salted dog salmon to the Sound held from 750 to 800 pounds. Those used to ship to Japan held 400 pounds, or from 48 to 50 cured fish.

This company also chartered the schooner *Volunteer*, 12 tons, and sent her to Redfish Bay for salting purposes. The record to September 23 was 41,024 redfish salted. Arrangements were also made to take the output of the Point Barrie saltery, formerly operated by Cyrus Orr, but now by a Russian called "Zip" Moon, and 300 barrels of redfish and dog salmon were expected from this source. The company also claimed to have made arrangements at Boca de Quadra to dry-salt dog salmon and to put up black-cod as Pacific-coast mackerel, but inquiry at that point failed to elicit any information confirming this. There are probably few black-cod in those waters, except strays.

It was also proposed to carry on extensive herring salting at Point Barrie during the fall and winter, and the barkentine *Blakeley* was said to be en route (September 23) to Karta Bay, to be sent later with an outfit to Port Bucarelli for 2,500 barrels of salt herring.

It has since been learned that this company failed. Diligent inquiry was made as to the results of its operations, and the following is the approximate output for the season: 5,000 barrels salted salmon of all kinds, principally humpbacks; 30,000 dog salmon, dry-salted, for the Japanese market.

RICE'S SALTERY, KARTA BAY.

Rice's saltery, Karta Bay.—Owing to the failure of the salmon run in Puget Sound, Mr. J. E. Rice, of Whatcom, Wash., came to Karta Bay, August 20, with a small outfit and commenced salting salmon on the southeastern shore of the inner bight, in a shack rented from the Baronovich family. The pack consisted largely of dog salmon, dry-salted and shipped in boxes, though other species were not neglected and were salted direct in barrels. No salting tanks were used.

The equipment consisted of 2 seine boats, $50 each; 1 fish scow, rented from the Loring cannery; 3 dories, $30 each; 1 seine, 175 fathoms by 6½ fathoms, 3-inch mesh, valued at $1.50 per fathom. All labor was hired in the vicinity; 15 to 20 men were employed during the season, and were paid $3 per day without board or lodging. Fish were also purchased from the Indians at the following rates: Redfish and cohoes, 10 cents each; humpbacks, $6 per thousand; dog salmon, $15 per thousand.

The following was the output for the season: Seventy-five barrels redfish, 25 half-barrels redfish, 75 barrels cohoes, 50 half-barrels cohoes, 575 boxes dry-salt dog salmon, averaging 55 fish to the box, or 31,625 cured fish, weighing 241,400 pounds.

The barrels used were full size, machine-made, with galvanized hoops, and cost, in Puget Sound, $1.50 each. In salting without tanks the fresh fish are salted in the barrels, the fish forming their own pickle; after four or five days' shrinking the barrels are filled with fish to the top and weighted, and after complete shrinkage they are resalted, the barrels headed and placed chime up; an auger hole is then bored in the upper chime and the barrel kept filled with pickle.

Mr. Rice prepares his dog salmon by butchering in the usual manner, except that the head is left on. After thorough cleansing in salt water they are salted down with coarse salt, flesh up, in piles called "kenches," about 4 feet square and 4 feet high. In from four to six days, depending upon the weather, the fish having shrunk sufficiently, the excess of salt is shaken off, the inside is sprinkled with clean Liverpool salt, folded back in the shape of the fish, and boxed; a sprinkling of salt is placed on the outside to keep the fish from sticking together. It is said that fish prepared in this manner keep a long period.

Mr. Rice also purchased all halibut of 40 pounds weight and over at a uniform rate of 50 cents each; these were flitched, dry-salted in kenches, and shipped to the Sound, where they were washed and smoked for market.

KARTA BAY STREAM.

This stream, described on pages 88 to 90 in my former report, has been very much overfished during the past few years; it is said there were as many as 30 seines at work in the vicinity of the mouth of the stream during the height of the last run.

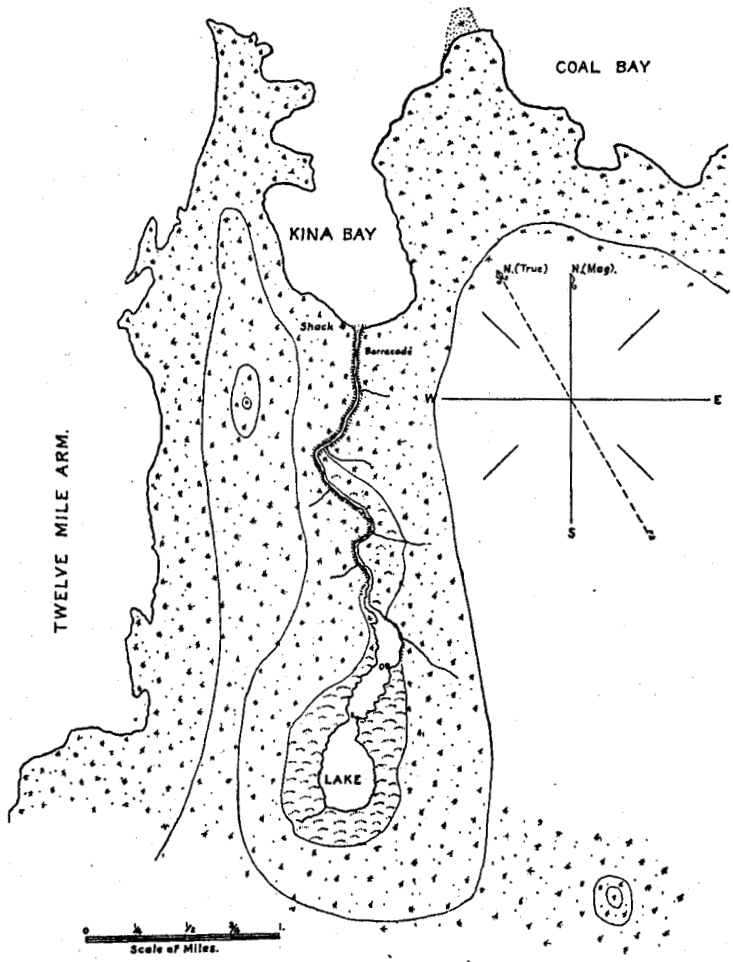
The following contains only the catch of three canneries for 1898, 1899, and 1900; that of the salteries and smaller fisheries is unknown.

Species.	1898.		1899.		1900.	
	No.	Date.	No.	Date.	No.	Date.
Redfish	106,876	June 16–Aug. 11	55,730	June 18–Aug. 15	63,305	June 19–Aug. 20
Cohoes	14,855	Aug. 25–Sept. 15	4,000	Aug. 14–Sept. 12	6,224	Aug. 30–Sept. 20
Humpbacks	25,680	Aug. 1–Aug. 11	114,743	July 22–Aug. 14	185,676	July 18–Aug. 20

These numbers are probably too small by 20 per cent. An estimate made by a canneryman, who has a very good knowledge of this stream, gives the catch of redfish from this stream in 1898, 120,000; in 1899, 85,000; in 1900, 100,000.

KINA STREAM, KASAAN BAY.

Between Coal Bay and Twelvemile Arm there is a large unnamed bight, which extends nearly 2 miles into the southern shore, and which receives at its head the waters of a small stream called Kina, referred to in my former report, page 90.



Lake and stream, Kina Bay, Prince of Wales Island.

This stream was examined, on September 22, by Ensign Miller who found that it had its source in a lake. It is about 1½ miles long, with a width of from 10 to 40 feet, and depth from 12 to 18 inches, with pools 4 feet in depth. It flows through a heavily wooded, rolling country, between rocky banks from 20 to 50 feet high, and over a bowldery and gravelly bed showing here and there exposed ledges. The

water has the usual brownish tinge common to lake water in this district, and had a temperature of 53.5° F., while the small tributaries had a temperature of 49° to 50° F. There are no falls, but in the lower end, where the stream narrows, there is a series of rapids which, however, do not prevent fish from ascending. Tide water extends about 100 yards within the mouth, and a short distance beyond is a barricade of the usual log and sapling form, having, at the time visited, some of the poles missing. There are numerous fallen trees across the stream. The upper half widens toward the lake and has a sluggish current. The lake is 135 feet above sea level and consists of three ponds, connected by small straits. The whole system is about 1 mile in length with a greatest width of less than one-quarter mile. It is surrounded by many flats and is quite shallow, with pond lilies and grasses growing over the bed. The temperature of the lake water was 55° F. There are several small feeders entering the lake and stream, as indicated on the sketch. The stream and lake system lies in a general north and south direction.

Numerous humpbacks and dog salmon were seen around the mouth. This stream was formerly fished by Mr. Myers, who sold the catch to Loring. It has not a large output, as the following records, the only ones available, will show:

Species.	1896.		1897.		1898.	
	No.	Dates.	No.	Dates.	No.	Dates.
Redfish	2,018	July 29–Aug. 23	1,500	July 19–Aug. 16	774	July 29–Aug. 16
Cohoes			470	Aug. 8–Sept. 4	2,291	Aug. 31–Sept. 5
Humpbacks			15,000	July 19–Aug. 16	5,754	July 29–Aug. 16

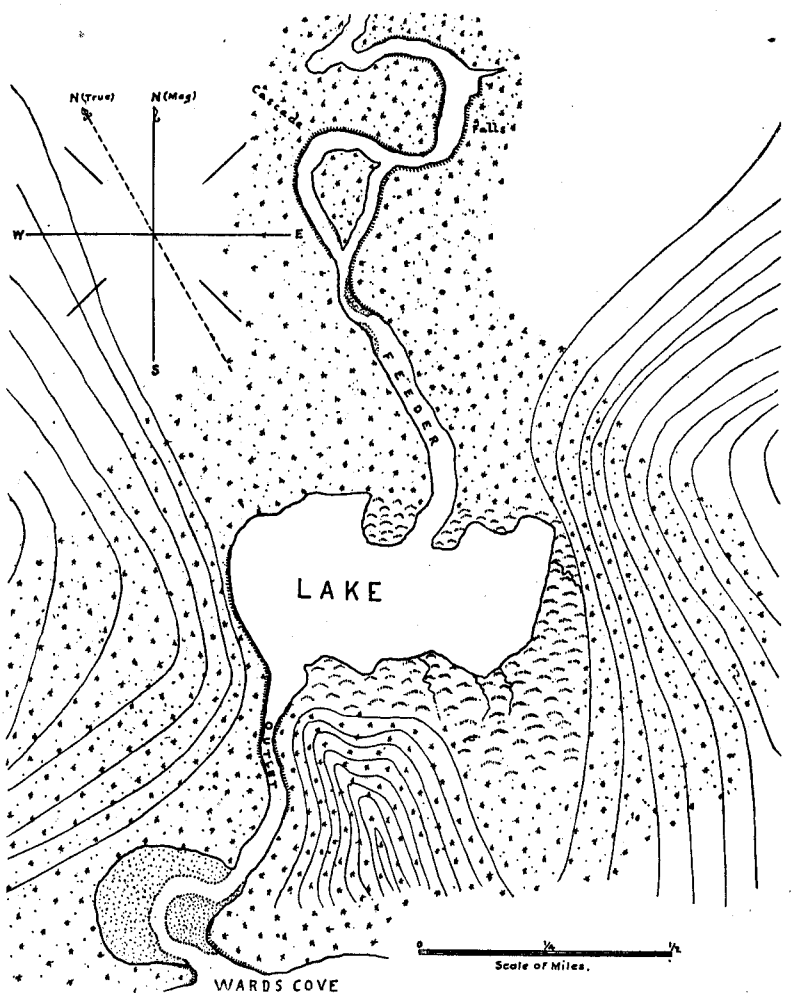
WARD COVE, TONGASS NARROWS.

About 5 miles to the westward of Ketchikan a small bay makes in on the northern shore of Tongass Narrows, known as Ward Cove, and referred to in my previous report, page 65. A mining boom has been been attempted here, and on the western side of the cove a very small village has been built, consisting of a steamer wharf, store, a few dwellings, and a post-office, called Revilla. A sawmill has been built at the head of the bay on the western point of entrance to the redfish stream. Opposite, on the eastern head, there was formerly a saltery, purchased some years ago by the Alaska Packers Association and since dismantled. All that remains now is the shack of an old Indian, who salts a few barrels of salmon during the season.

Ward Cove Stream empties into the head of the cove, and is the outlet to a chain of lakes. It was examined by Ensign Hepburn September 15. It flows in a fairly straight course in a southerly direction over rocky bottom, with a rapid current throughout its length, between high bluff banks well wooded. Tide water extends a short distance within the mouth. The stream water is fairly clear, and had a temperature of 56° F. It is about three-fourths of a mile long, and 100 yards below the lake has a width of 20 feet, a depth of 9 inches, and a 3-knot current.

The first lake is oblong, one-half mile long by one-fourth mile wide, and is elevated 70 feet above tide water. On the east and west the mountains impinge on the lake. On the southeastern side there is a narrow, swampy valley which has several small streams draining through it. Toward the north the country is generally low, with small hills. It is generally well timbered, and along the shore in many places

there is a dense growth of grass and berry bushes. The temperature of the lake water was 55° F. About the middle of the northern shore there is a feeder, which is said to be a lake connection. Near the entrance point it has a width of 60 feet, depth of 4 inches, and a 2-knot current, flowing over a coarse gravel bottom. About 1 mile from the lake and just beyond a large island the feeder has a fall of 7 feet sheer, and one-half mile above this there is a heavy cascade extending a length of



Lake and stream, Ward Cove, Revillagigedo Island.

100 feet and having sheer falls of 2 to 3 feet. There is also a cascade in the branch that flows around the western side of the island, but the branch on the eastern side is clear. The temperature of the water in the feeder, 2 miles from the lake, was 50° F. The feeder was followed for a distance of 2½ miles, until it was apparent that no fish could go farther, but no other lake was seen, though it is reported by the natives that there are two more beyond. No fish were seen above the falls.

A few humpbacks were seen spawning along the shore of the lake, though the principal spawning-beds are in the first half mile of the feeder, where humpbacks were seen in great numbers, as well as many of another species, probably redfish. A large number of dead fish were seen along the borders of the lake and feeder.

Judging from the surroundings, a good hatchery site might be located near the mouth of the feeder. In the main stream outlet no sign of artificial barricades was noted. A number of fallen trees lie in the stream, but form no serious obstacle.

The following is the only record available:

Species.	1897.		1898.		1899.		1900.	
	No.	Date.	No.	Date.	No.	Date.	No.	Date.
Redfish	1,500	July 24-Aug. 23	1,535	July 21-Aug. 25	1,000	.....	873	July 13-Aug. 23
Cohoes	600	July 24-Aug. 13	743	July 19-Aug. 25	1,000	.....	1,179	July 13-Sept. 7
Humpbacks	11,000	.....do.....	34,935	July 21-Aug, 30	15,000	.....	52,511	Aug. 3-Sept. 7

The above represents the catch of one cannery calling occasionally and making a seine haul. Several other canneries, at intervals, also fish the place.

It is probable that the stream has a value of 5,000 redfish, 1,000 cohoes, and 50,000 humpbacks.

KETCHIKAN.

The saltery formerly operated here by Clark and Martin has been closed and the property absorbed by a local company, who have extended the wharf for the accommodation of steamers and made additions to the saltery for warehouse purposes.

Ketchikan cannery of the Fidalgo Island Canning Company.—This company engaged in packing salmon at Anacortes, Wash., and built a cannery in the spring of 1900 on the northern shore of Tongass Narrows, about one-half mile east from the old Clark and Martin saltery (see former report, page 65). The buildings are substantial, well located, clean, and the cannery arranged to make a hand pack. Fish are conveyed from the boats by an endless-chain conveyor, adjustable for the tides, to the fish-house built over the water; the cleaned fish are conveyed to the cutters on push carts. The tables of the butchers have sprays over them.

The following machinery is used in the canning process: Four steam boxes, 3 retorts, 1 washer, 1 topper, 2 crimpers, 2 solderers, and 1 cutter, all adjustable to the different sizes packed. The filling tables accommodate 60 workers; daily capacity of cannery, 1,200 cases. The cans are all made at the cannery by hand, of 100-pound domestic tin plate. It is probable that fillers will be introduced and the cannery enlarged in 1901, though a hand pack is preferred.

The Chinese contract was 45 cents for 1-pound talls and flats, and 43 cents for one-half pound flats per case of 48 cans. Filling was paid for separately at the rate of 6 cents per case of 48 tins. Fishermen received $40 per month, and collectively, $10 per thousand for redfish and cohoes, $2 per thousand for humpbacks, with full board and transportation; the boss fisherman had $75 per month. Fish were purchased from Indians and others at the following rates: Redfish and cohoes, 7 cents each; dog salmon, $15 per thousand; humpbacks, $7 per thousand; the cannery providing boats and gear. Transportation is by regular line of freight steamers.

The cannery obtained fish from Quadra, George Inlet, Ward Cove, Carroll Inlet, Thorne Arm, Kah-Shakes, Duke Island, Smeaton Bay, Hassler Harbor, Point Alava, Annette Point, Dalls Head, Bostwick Inlet, and Fish Creek.

The following are the statistics for 1900:

Hands employed: 34 white, 38 natives, and 3 Japanese fishermen; 6 white and 50 native cannery-hands, and 50 Chinese.

Fishing gear: Eight purse seines, each 175 fathoms by 10 to 12 fathoms, 3-inch mesh, $3 per fathom; 2 drag seines, each 160 fathoms by 6 fathoms, 3½-inch mesh, $1.75 per fathom.

Boats, lighters, etc.: Three lighters, $75 each; 2 lighters, $225 each; 2 scows, $20 each; 12 seine boats, $70 each; 8 dories and skiffs, $30 each. Steamer *Delta*, 59 tons, crew 6, value $6,000, chartered.

No salting was done at this cannery. The following was the pack of canned salmon in 1900:

Species.	No. of cases.	No. to the case.	Date.
Redfish	[1] 437 [2] 1,573 [3] 4,389	11.5	July 10–Aug. 31
Cohoes	[1] 470 [2] 112 [3] 250	10	July 13–Sept. 8
Humpbacks	[1] 8,425 [2] 6,175 [3] 5,135	19.3	July 13–Sept. 8
Dog salmon	[1] 304	8.5	Aug. 24–Sept. 8

[1] 1-pound talls. [2] 1-pound flats. [3] One-half pound flats, 96 per case.

NAHA STREAM AND LAKES.

This stream was referred to in my former report, pages 94–97, and described as far as the falls in the stream connecting Lake No. 1 and Lake No. 2. On September 1, Lieutenant Rodman and Ensign Kempff, with an Indian guide, examined lakes Nos. 2, 3, and 4 as far as any fish can ascend, and from their report the following is condensed, reference being made to the sketch accompanying this report:

Stream connecting Lakes Nos. 1 and 2.—From the falls above Lake No. 1 the stream maintains its volume and flows over a rocky and gravelly bottom; it rises gently to Lake No. 2. Just below this lake is a series of small cascades, none of which is over 2 feet in height or forms any obstruction to the ascent of salmon. One or two small tributaries enter the stream on the northern side, but they are unimportant. The stream throughout its length was full of humpbacks. The distance between Lakes No. 1 and No. 2 by the stream bed is about 2½ miles, but by trail along the northern side the distance from the falls to Lake No. 2 is materially less.

Lake No. 2.—Altitude, 50 feet; temperature of lake and stream, 55° F. This lake is gourd-shaped, with a rather rounding basin about half a mile in diameter, making its length, with the long narrow neck on entering, about three-fourths of a mile. The shores, except the western side, are rocky and gravelly, and the lake generally has a very clear appearance. But few pond lilies and little grass were noticed anywhere.

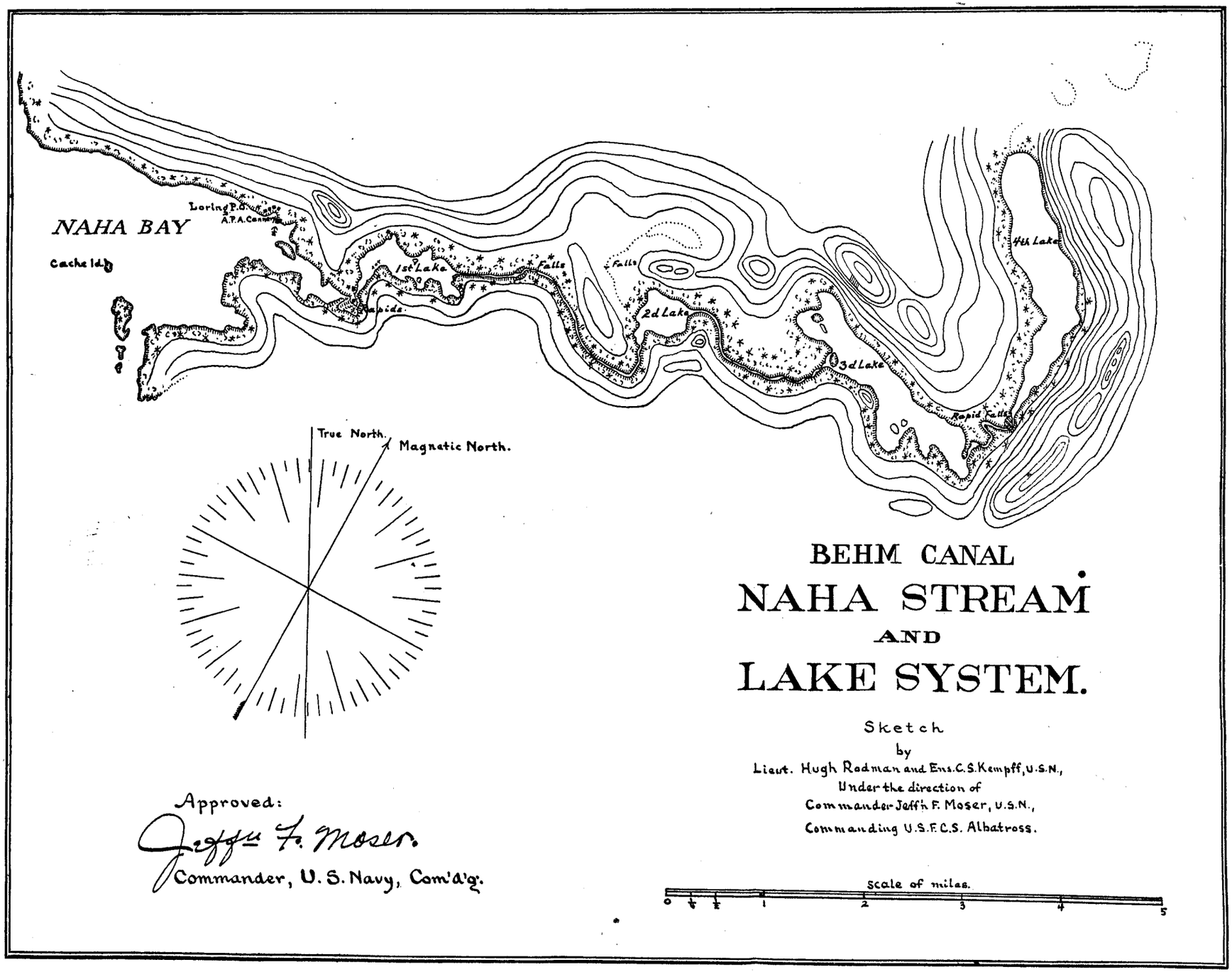
On the western side there is a feeder about 30 feet wide by 8 inches deep, which, according to the guide (who owns and hunts the land bordering the lake system), is the outlet to a lake lying about 1½ miles to the northward. About 1 mile from the mouth it has a high fall, which prevents fish from ascending to the lake; as far as the fall, however, there is good spawning-ground.

Stream connecting Lakes No. 2 and No. 3.—This stream is about 2 miles long, 80 feet wide, and 14 inches deep, with a fall of 103 feet in its length. It was only examined at the lake ends, but it can have no serious obstructions, as redfish enter Lake No. 3. The mouth of the stream, and for one-fourth mile above, was full of humpbacks, but they do not enter Lake No. 3. The temperature of the water in the stream was 55° F. At the head of the stream, at its source in Lake No. 3, there is a small island, partly in the lake, around which the waters from both lake and stream flow.

Lake No. 3.—Altitude, 153 feet; temperature of water, 56° F. The length of this lake is about 2½ miles, with a width ranging from one-fourth to one-half mile. The northern shore is comparatively straight, very steep, and rocky; the other shores are low and flat, with open glades, permitting easy travel; the southern side is marked by several deep indentations. At the extreme eastern head is a feeder which was not examined.

Stream connecting Lakes Nos. 3 and 4.—This stream enters Lake No. 3 at the eastern end, near its head, where it is about 60 feet wide, 8 inches deep, with a temperature of 56° F. It is about a mile long following the stream bed, though the lakes are only about one-half a mile apart in a straight line. It has a fall of 167 feet in its length, part of which is over sheer falls, making it impossible for salmon of any kind to enter Lake No. 4. The first fall is about one-fourth mile above Lake No. 3, beyond which no fish were seen, and while it is possible that it can be passed, it is not probable that they can pass over the series of cascades at the head of the stream where it leaves Lake No. 4. Here the fall is at least 100 feet in one-fourth mile, and the water rushes along with great velocity, without any eddies or resting places. Redfish were seen as far as the first fall.

Lake No. 4.—Altitude, 320 feet; temperature of water, 56° F. The length of this lake is about 3½ miles, with an average width of one-fourth mile, expanding toward the head. The banks are steep and the shore lines, as far as examined, are rocky. It is said that there are two more lakes in this system connected with Lake No. 4, but as no salmon can enter the latter, it was not deemed necessary for our purposes to continue the examination any further. In Lake No. 4 many cutthroat trout were seen, but no salmon or signs of them. The water throughout the lake system was unusually low. In Lake No. 4, judging from the marks along the shore, it appeared to be 2½ feet below a mean level. There were no barricades in any of the streams. The whole system has all the natural features for excellent spawning-grounds; the streams are clear, free from obstruction, there is much sand and gravel, little or no mud, and plenty of water, with moderate current. The color of the water becomes lighter as the upper lakes are reached. At Lake No. 1 it is tinged a deep brown, and at Lake No. 4 it is much lighter in color.


NAHA BAY
Loring P.O.
A.T.A. Camp
Cache Id.
1st Lake
Falls
Rapids
Falls
2d Lake
3d Lake
4th Lake
Rapid Falls
True North.
Magnetic North.
BEHM CANAL
NAHA STREAM
AND
LAKE SYSTEM.
Sketch
by
Lieut. Hugh Rodman and Ens. C. S. Kempff, U.S.N.,
Under the direction of
Commander Jeff'n F. Moser, U.S.N.,
Commanding U.S.F.C.S. Albatross.
Approved:
Jeff'n F. Moser.
Commander, U. S. Navy, Com'd'g.
Scale of miles.
0 ¼ ½ 1 2 3 4 5

The head of Lake No. 3 would afford an excellent site for a hatchery. There is an abundance of water, which could be conveyed by gravity, and plenty of spawning fish. Another site could probably be found at the mouth of the feeder in Lake No. 2, but it is probable that spawning fish might not be so easily obtained.

In addition to the record of the stream given in my former report, page 96, the following may be added:

Species.	1898.		1899.		1900.	
	No.	Dates.	No.	Dates.	No.	Dates.
Redfish	18,377	July 20–Aug. 2	13,176	.....	15,224	July 1–Sept. 21
Cohoes	5,000	Aug. 15–Sept. 15	1,000	.....	2,000	July 15–Sept. 1
Humpbacks	150,000	July 15–Aug. 15	189,650	.....	150,000	July 31–Sept. 1

LORING.

Alaska Salmon Packing and Fur Company.—The cannery of this company was described in my former report, pp. 92 to 94, but additional information and the statistics for 1900 will be given here. The following machinery is used in canning: Six retorts, 2 fillers, 2 toppers, 2 solderers, and 1 cutter. The daily capacity is 1,800 cases. There are no can-makers; all tins are made at the cannery by hand, using 100-pound plate for bodies and 95-pound plate for tops, of which 16 per cent is imported. There is an inclined railway from the fish-house, Y-shaped at the tide-water end, which admits a steamer into the Y at any stage of the tide. Fish are discharged on either side into cars, which are hauled to the fish-house by cable operated by steam. A new cannery is to take the place of the old one for the season of 1901.

The Chinese contract was 42½ cents, with the usual conditions; fishermen received $45 per month and board, from the time of signing to the day on which they were paid off. In purchasing fish the following prices were paid: 5½ to 7 cents for redfish, 7 cents for cohoes, and $6 to $7.50 per thousand for humpbacks. All the fishing gear and boats were supplied by the cannery.

The following are the statistics for 1900:

Hands employed: 100 white fishermen, besides 150 natives employed at fisheries from whom fish were purchased; 20 white and 40 native cannery-hands; 120 Chinese.

Fishing gear: Twenty-four purse seines, each 150 to 200 fathoms by 7 to 12 fathoms, 3-inch mesh, valued at $2.50 per fathom; 16 drag seines, each 150 to 200 fathoms by 4 to 6 fathoms, 3-inch mesh, valued at $1.50 per fathom.

Boats, lighters, etc.: Two cargo lighters, $150 each; 42 seine boats, $50 each; 20 fish lighters, $75 each; 1 whitehall, $50; 12 skiffs, $20 each.

The vessels used were as follows:

Class and name.	Tons.	Crew.	Value.	Remarks.
Steamer Arctic	21	5	$4,000	Owned.
Steamer Novelty	33	5	12,000	Do.
Ship Sintram	1,495	(1)	50,000	Chartered.

[1] Crew fishermen.

The following was the pack in 1900:

Species.	Cases.	No. to the case.	Dates.
Redfish	16,219	12	June 17-Aug. 29
Cohoes	3,825	9	Aug. 29-Sept. 18
Humpbacks	47,114	19	July 17-Sept. 6

YES BAY.

Boston Fishing and Trading Company.—In my former report, pp. 97 to 100, this cannery is described, together with the home stream and lake system, which were examined at that time. Reference will here be made only to the changes and additional data, together with the statistics for the season.

The barricade has been removed from the stream and it is now clear of this obstruction. The trap formerly referred to is still used at the mouth of the stream. It has a lead from the eastern shore of 300 feet, a channel lead of 100 feet, and heart 100 feet; on the side are two pots, one 30 feet by 30 feet, the other 28 feet by 28 feet. It extends a long distance across the banks at the mouth of the stream and with a short net extension the entire stream can be closed.

Excepting the king salmon, all the species of salmon are represented in this stream; steelheads are rarely taken, shad and sturgeon have never been seen, Dolly Varden trout are abundant, and at times there are numbers of halibut and flounders. In the spring tomcod are abundant.

Practically all the redfish packed at this cannery come from the home stream. The cohoes come from the home stream, Burroughs Bay, and scattering; humpbacks principally from the home stream and Short Bay, though some are received from the Hot Springs, Gedney Pass, Spacious Bay, Stewart River, and adjoining inlets. Dog salmon are taken scatteringly from all the above places, and the king salmon all come from Burroughs Bay. This cannery has not fished Checats since 1897.

The following is the record of the home stream since the date of my last report:

Species.	1898.		1899.		1900.	
	No.	Dates.	No.	Dates.	No.	Dates.
Redfish	44,271	July 12-Sept. 3	69,000	July 14-Sept. 13	80,000	July 14-Sept. 17
Cohoes	6,413	Aug. 11-Aug. 29	6,300	Aug. 7-Sept. 13	7,700	Aug. 11-Sept. 17
Humpbacks	45,000	July 15-Aug. 30	75,000	July 12-Sept. 6	60,000	July 15-Sept. 14
Dog salmon	.....	.....	500	July 14-Sept. 13	2,250	July 21-Sept. 17

The following machinery is used in the canning process: Four iron retorts, 1 steam box, 1 filler, 1 crimper, 1 solderer, and 1 cutter. The tops are put on by hand. All tins are made at the cannery by hand, of 90-pound domestic plate. Fish are pewed from boats and lighters to the fish-house, and after cleaning are passed directly from the draining tubs to the cutter. The daily capacity of the cannery is 800 cases. The Chinese contract was 38½ cents, with the usual conditions. Fishermen received $40 per month, from time of arrival to day of departure, with full board and transportation. The klootchmen (native women) were paid for cannery work $1.25 per day, and the bucks from $1.50 to $2.50 per day, the butchers receiving the highest rates. Fish were also purchased for which the following rates were paid: Redfish

5 cents each, cohoes 6 cents each, humpbacks 75 cents per hundred, dog salmon, in good condition, 2½ cents each. The cannery finds all gear.

The following are the statistics for 1900:

Hands employed: Fifteen white and 15 native fishermen, 5 white and 15 native cannery-hands, 61 Chinese.

Fishing gear: One trap, previously described, value $1,000; 1 purse seine, 230 fathoms by 20 fathoms, value $2.50 per fathom; 3 drag seines, 175 fathoms, 150 fathoms, and 120 fathoms long by 10, 8, and 6 fathoms deep, all 3-inch mesh, value $1.50 per fathom; 2 gill nets, each 100 fathoms by 32 meshes, 10½-inch mesh; 2 gill nets, each 100 fathoms by 35 meshes, 6½-inch mesh, value 65 cents per fathom.

Boats, lighters, etc.: Five lighters, $50 each; 4 seine boats, $50 each; 6 skiffs, $25 each. Steamer *Rosie*, 8 tons, crew 2, value $2,500, owned. Transportation by regular line of freight steamers.

The following was the pack in 1900:

Species.	Cases.	No. to the case	Dates.
King salmon	713	2.5	June 25–July 10
Redfish	9,825	8.5	July 13–Sept. 7
Cohoes	2,306	7.5	Aug. 20–Sept. 27
Humpbacks	20,051	15	July 18–Sept. 18
Dog salmon	728	6	July 10–Sept. 27

BOCA DE QUADRA.

These waters and the cannery of the Quadra Packing Company were described in my former report, pages 62 to 64, and only the additional information which has been obtained will be referred to here.

Salteries.—The Clark & Martin saltery at the mouth of Quadra redfish stream has tumbled down through decay and is practically abandoned. Near this site a saltery was operated in 1899 by Mr. Hilton, from Bellingham Bay, who dry-salted about 4,000 dog salmon. In 1900 the saltery was operated by Mr. Z. Doty, from Whatcom, who also salted a few dog salmon. Neither of these men had any gear; they simply bought the "slop overs," as they are called, dog salmon or "chums," from the cannery seines.

In 1899 a Mr. D. Blaauw, from Tacoma, built a saltery on Grouse Island and operated it the same way as mentioned under the other salteries. He dry-salted about 14,000 dog salmon (chums), and shipped them to the Sound. In 1900 the saltery was closed.

Quadra Stream, described in my former report, is one of the best redfish streams in Southeast Alaska, and is noted for the large fish which it carries. It has attracted the attention of the canneries operated in the vicinity, and so vigorous is the fishing carried on that it is believed very few fish ever reach the spawning-grounds. In 1899 it was fished by the Loring cannery with 8 purse seines, the Quadra cannery with 8 purse seines, and Metlakahtla cannery with 2 purse seines, or a total of 18 purse seines. In 1900 it was fished by the Loring cannery with 8 purse seines, the Quadra cannery with 8 purse seines, the Ketchikan cannery with 8 purse seines, the Metlakahtla cannery with 2 purse seines, a fishery from Port Gravina with 2 purse seines, and 2 independent gangs with 1 purse seine each, or a total of 30 purse seines.

When it is considered that the stream is only about 50 or 60 feet in width at the mouth, and the inlet, Mink Arm, is less than one-half of a mile in width, it may be fancied that a fish has very little chance to escape the 30 purse seines that are constantly sweeping these waters, which are deep and bold and permit seining into the mouth of the stream. If there is no law regulating such fishing, there is one permitting the closing of such streams, and unless properly regulated this stream should be closed until the rapacity and greed of the fishermen have subsided. In my former report the value of Quadra Stream was given as 50,000 redfish, and it is believed that this number can be taken under average conditions with safety to the stream.

So far as data have been obtained from the different canneries fishing this stream, the following is the record, which, however, does not include the catch of independent fisheries and salteries:

Year.	Species.	Number.	Date.
1895	Redfish	97,000	
1896	do	137,000	July 13–Aug. 31
1897	do	65,000	
1898	do	98,138	July 12–Aug. 29
	Cohoes	5,664	Aug. 18–Sept. 4
	Humpbacks	100,000	July 15–Aug. 15
1899	Redfish	166,232	July 16–Aug. 28
	Cohoes	4,522	Aug. 20–Aug. 28
	Humpbacks	301,000	July 17–Aug. 10
1900	Redfish	174,614	July 12–Aug. 31
	Humpbacks	223,000	July 15–Aug. 12

Quadra Packing Company.—The cannery of this company was described in my former report. From it has sprung the Icy Strait Packing Company, the salteries at Taku, Bartlett Bay, and Shipley Bay, the new cannery now building at Bartlett Bay, and it is said another cannery is to be built in Sitkoh Bay next spring (1901).

The machinery employed in the canning process consists of 4 steam boxes, 2 retorts, 1 capper, 2 crimpers, 1 washer, and 1 cutter. The cans are filled by hand, for which purpose there are filling tables for 40 operators. The daily capacity is 800 cases. The tins are all made at the cannery by hand of 100-pound plate, 50 per cent of which is imported.

The Chinese contract was 45 cents for hand-filled cans, with the usual conditions. The fishermen received transportation, board, $35 per month, and, collectively, 1 cent each for redfish and cohoes, $2 per thousand for humpbacks, and $4 per thousand for dog salmon.

Fish were purchased at the following rates: Redfish and cohoes, 7 to 10 cents; humpbacks, $10 to $12 per thousand; dog salmon, $15 per thousand. The higher price was paid when no gear was furnished. Native fillers received 7 cents per case. Transportation was by regular line of steamers.

There are very few steelheads in these waters; only two were brought to the cannery this season. Neither shad nor sturgeon have ever been taken; a few halibut are found around the cannery during the packing season.

The following are the statistics for 1900:

Hands employed: 24 white and 40 native fishermen, 5 white and 25 native cannery-hands, 43 Chinese.

There were used 8 purse seines, average 180 fathoms by 15 fathoms, 3-inch mesh, valued at $3 per fathom; 1 drag seine, 115 fathoms by 8 fathoms, 3-inch mesh, valued at $2 per fathom; 1 house scow, $75; 8 seine boats, $100 each; 9 skiffs, $30 each. Steam-tender service was furnished by the Icy Strait Packing Company.

The following was the pack in 1900:

Species.	Cases.	No. to the case.	Dates.
Redfish	6,000	10.7	July 14-Aug. 25
Cohoes	600	7.5	Aug. 25-Sept. 20
Humpbacks	6,000	20	July 17-Aug. 31
Dog salmon	1,000	7	Do.

METLAKAHTLA.

Metlakahtla Industrial Company.—There has been but little change in this cannery since the date of my last report, in which the conditions were described on pages 66 and 67. The money advanced by the friends of Mr. Duncan for the construction of the cannery has been paid in full with interest, and it is now free of debt, the profits being expended for the welfare of the community and for the improvement of the village.

The cannery has a good location on a large wharf, which permits the largest steamers alongside at all stages of the tide. It is well lighted, commodious, and thoroughly clean. The buildings are large enough for a pack of 40,000 cases, and the plant has a daily capacity of 700 cases. All the work, from first to last, is done by Indians—men, women, and children. No whites are employed in the cannery, fisheries, or steamers, and, as Mr. Duncan wishes to give employment to as many natives as possible, the pack is made entirely by hand.

The only machinery used is 1 cutter, 1 crimper, and 1 solderer. On the wharf is an elevator for transferring fish from the boats to the fish-house. The first cooking is done in boiling water, for which 5 boxes are used, and for the second cooking there are 3 retorts. All the tins are made at the cannery, of 100-pound domestic plate. All the packing cases are made in the community sawmill. The lacquering is done by Indian girls, who roll the cans by hand on pads covered with lacquer.

The children receive 50 cents to $1 per day, and adults from $1 to $3 per day.

In purchasing fish the following prices are paid: Redfish, 7 cents; cohoes, 8 cents; dog salmon, 2½ cents; humpbacks, 1 cent.

The following are the statistics for 1900:

Hands employed: 24 native fishermen, besides 38 from whom fish were purchased; 174 native cannery-hands.

Fishing gear: Eight purse seines, average 158 fathoms by 8½ fathoms, 3-inch mesh; 4 drag seines, average 163 fathoms by 6 fathoms, 3-inch mesh; 5 gill nets, average 172 fathoms by 4 fathoms, 5½-inch mesh.

Boats, lighters, etc.: Two lighters, $100 each; 7 seine boats, $50 each; 6 sailboats, $100 each; 10 dories, $25 each.

Transportation by regular line of steamers.

The cannery steamers employed were: *Herald*, 17 tons, crew 5, value $9,000, owned; *Marie G. Haaven*, 12 tons, crew 5, value $5,000, owned.

The following was the pack in 1900:

Species.	Cases.	No. to the case.	Dates.
Redfish	6,930	13.7	June 20-Sept. 5
Cohoes	610	7.9	July 27-Sept. 12
Humpbacks	9,690	20	July 18-Sept. 4
Dog salmon	330	7	.....

No salting has ever been done here. The streams fished for the cannery are the Home Stream, Tamgas, Duke Island, Quadra, Karta Bay, Kithraum, Peter Johnson, Nowiskay, Old Johnson, Kegan, and Kagahine.

KLAWAK.

North Pacific Trading and Packing Company.—This cannery and its surroundings were described in my former report, pages 109 to 115, and only such additional information as seems pertinent to bring the records up to date will be referred to here.

The cannery, together with all the buildings, sawmill, store, etc., was burnt on September 18, 1899. In the spring of 1900 the same company built a new cannery about a mile south from the old site and on the opposite side of the arm, where it is more accessible to vessels. It is considerably larger than the old plant, and modern machinery has been installed. In the canning process the following machinery is used: Four retorts, 1 filler, 1 topper, 1 solderer, and 1 cutter. This should give the cannery a daily capacity of 800 cases. The fish are butchered on a float and conveyed to the cutter by a conveyor on the endless-chain principle.

The Klawak cannery, representing the earliest in Alaska, was, from 1878 to 1896, operated by Indian labor. These people demanded more and more each year until the expense of the pack became greater than it would have been had Chinese labor been employed. The result was that the cannery slowly introduced the latter. In 1896 there were employed in the cannery 62 natives and 2 Chinese, and in 1900 13 natives and 46 Chinese.

The following are the statistics for 1900:

Hands employed: 55 native fishermen, 10 white and 13 native cannery-hands, and 46 Chinese.

Fishing gear: Nine purse seines, each 175 fathoms by 240 meshes, 3-inch mesh, valued at $300 each.

Boats, etc.: One scow, $100; 11 seine boats, $80 each; 5 skiffs, $25 each.

Transportation was by special sail, chartered.

The cannery steamers were the *Klawack*, 10 tons, crew 4, value $5,000, owned; *Cora*, launch, 5 tons, crew 2, value $1,500, owned.

The following was the pack in 1900:

Species.	Cases.	No. to the case.	Dates.
Redfish	8,228	14.2	June 17-Aug. 25
Cohoes	3,973	8	July 21-Sept. 25
Humpbacks	15,551	17	July 17-Aug. 27

The cannery obtained its fish principally from the Home Stream, Sar-Kar, Warm Chuck, and Hetta.

In order to continue the data for the Klawak Stream, given in my former report, the following record may be added:

Species.	1898.		1899.		1900.	
	No.	Dates.	No.	Dates.	No.	Dates.
Redfish	36,881	June 20-Aug. 8	75,000	June 16-Aug. 20	31,000	June 17-Aug. 24
Cohoes	11,664	Sept. 7-Sept. 29	5,000	Aug. 15-Sept. 18	500	Aug. 14-Sept. 24
Humpbacks	65,000	.....	53,000	.....	200,000	July 16-Aug. 27

The *Albatross* did not visit the cannery this season, and the above information, together with the following, was obtained by interviews with the superintendent.

Klawak Hatchery.—This hatchery, described in former report, was moved in 1898 from the head of the main stream to the mouth of Three-mile Stream, a lake feeder on the northern side. The new hatchery house is 60 feet by 18 feet, and contains twelve troughs, 16 feet by 14 feet, arranged in pairs, with a passage around each pair. There are 6 baskets to a trough, each basket holding 50,000 eggs, giving the hatchery a capacity of 3,600,000 eggs. The hatchery water is supplied by a flume from the head of the feeder. About 50 yards within the mouth of the feeder a fence with a trap holds the spawners, from which they are seined as wanted.

The only hatchery data available is the following: In 1898, July 23 to August 26, 736 females were stripped, obtaining 2,586,000 eggs, 2,150,000 of which were hatched. This would give 3,513 eggs to the fish and the loss about 17 per cent.

The highest and lowest monthly temperatures of the water are as follows: June, 48°, 44°; July, 48°, 46°; August, 54°, 50°; September, 52°, 44°; October, 46°, 39°; November, 44°, 32°; December, 40°, 35°. At a temperature of 50° F. the fish are hatched in about 70 days; the longest period of incubation thus far has been 120 days; eye-spots appear in 27 days, and the egg-sac is absorbed in 42 days.

The young fish are siphoned from the troughs into buckets as soon as hatched, and planted in a shallow part of the lake. It is said here that the young fish go to sea the spring of the second year after the parent fish has entered the stream. The milt of 2.5 to 3 males is used for impregnating the eggs of every full female. This year (1900) several thousand young fish were marked by cutting off the fleshy fin.

The following is the output for three years: 2,586,000 eggs and 2,150,000 fry in 1898; 3,600,000 eggs and 3,000,000 fry in 1899; 3,600,000 eggs, about 1,000,000 fry in 1900 (nearly all eggs were lost by a hard freeze).

Information was received that, owing to the very severe weather in Alaska this year, all the eggs in the hatchery were frozen.

HUNTER BAY.

Pacific Steam Whaling Company.—Time did not permit a visit to this cannery during the season of 1900. The cannery and the district were visited in 1897 and fully described in my former report, pages 68 to 73.

The following statistics and additional information were obtained by personal interviews with members of the company and the cannery superintendent.

The cannery machinery consists of 2 steam boxes, 5 retorts, 2 fillers, 2 solderers, and 1 cutter, giving it a daily capacity of 1,600 cases. Topping is done by hand. Fish are pewed to the fish-house, and thence passed by hand direct from the draining tubs to the cutters. There are no can-makers; all tins are made by hand at the cannery, of 100-pound plate, 66 per cent of which is domestic.

The Chinese contract was 42½ cents per case. The white fishermen received transportation and board and were paid 5 cents for redfish and the same for cohoes. The cannery also purchased fish and paid 6 cents for redfish, 6 cents for cohoes, and one-half cent for humpbacks. Native wages were 25 cents per hour for adult males, and $1 to $1.50 per day for klootchmen.

The following are the statistics for 1900:

Hands employed: 21 whites, and employed and purchased fish from 121 natives: 10 white cannery-hands and 90 Chinese.

Fishing gear: Twenty-two seines, square hung, for drag seines or pursing by hand; they average 195 fathoms by 5 fathoms, 3-inch mesh; value, $1.50 per fathom; 2 lighters, $100 each; 2 fish-scows, $50 each; 22 seine boats, $50 each; 3 skiffs, $25 each, and 1 pile-driver, $800.

The following steamers were owned and operated by the cannery:

Class and name.	Tons.	Crew.	Value.
Steamer Alice	19	5	$12,000
Steamer Golden Gate	59	9	25,000
Gasoline launch Alphonse XIII	5	2	3,000

The transportation is by calling vessels of the Pacific Steam Whaling Co

The following was the pack in 1900:

Species.	No. of cases.	No. to the case.	Date.
Redfish	7,828	12.8	June 18–Aug. 10
Cohoes	4,070	9	July 31–Sept. 10
Humpbacks	31,709	18.6	July 17–Aug. 28

The following localities are fished by this cannery: Karta Bay, Hetta Inlet, Nichols Bay, Hunter Bay, Moira Sound, Klakas Inlet, Nutqua Inlet, Sukkwan Inlet, Hessa Inlet, Peter Johnson Stream, Eeke Inlet, Cholmondeley Sound, Skookum Chuck, Klawak, and Copper Mountain Bay.

The Pacific Steam Whaling Company, in connection with the cannery, operate a hatchery which is situated on Hetta Lake.

HETTA STREAM.

This stream was fully described in my former report, pages 73 to 75. As it is one of the large redfish streams of southeastern Alaska, and as many wild statements have been made in regard to the catch from it, the following data, added to that previously given, makes a complete record from 1886 to 1900, both years inclusive.

It may be added that this record is the entire catch from Hetta Stream by the canneries at Hunter Bay and Klawak and the saltery at Hetta, but does not include any fish taken for local use or the small salteries, if any were taken by the latter.

Species.	1898.		1899.		1900.	
	No.	Date.	No.	Date.	No.	Date.
Redfish	179,109	June 10-Aug. 3	250,834	June 15-Sept. 5	138,733	June 17-Aug. 23
Cohoes	290		539		.....	
Humpbacks	25,000	July 25-Aug. 25	229,556	June 27-Aug. 23	58,216	

The hard fishing of this stream commenced in 1896, and unless it has received an impulse from some other source, as from Mr. Callbreath's hatchery, there is no doubt that the locality is overfished.

M'HENRY INLET.

On the eastern side of Etolin Island is a large bay (represented on Coast Survey chart No. 8200 without any soundings), having numerous islands and reefs, and a rather uninviting appearance; it is known as McHenry Inlet. At the head of the inlet are two bights or coves, which are very foul and at low water expose many ledges and extensive flats. The cove at the east receives at its head a small stream, known as Falls Creek, and, a little to the southward, a second stream called Trout Creek. The head of the western cove receives the waters of a small stream which is a lake outlet, and on this lake is the hatchery of Mr. John C. Callbreath.

There is a deep-water channel through McHenry Inlet which leads to a beautiful, spacious, landlocked harbor, near the head of the inlet, for which the following directions may be of service:

Directions for entering McHenry Inlet.—On account of the small scale of the chart No. 8200, and the absence of names, the approach is rather difficult to describe. At the entrance to the inlet (see chart) is a string of islets and rocks making off to the northwestward from Avon Island. North from the rock named Quartz Rock is a large wooded island, having an extensive reef projecting to the westward. Northward from this is a small wooded island, having a rock off its southeastern end, and north of this is another small islet having a rock, marked on the chart, off its southern end; the latter islet is the guide to the channel and will here be called Entrance Islet. It is small, rocky, and heavily wooded; the central trees projecting highest give it a conical appearance, and, as it is quite symmetrical, it presents about the same shape from all sides. In standing for McHenry Inlet bring Entrance Islet to bear ENE., and stand for it, shaping course on near approach to pass it close to, about 75 yards, leaving it to the southward. Nearly ahead, and in the center of the inlet, will now be seen Dot Islet, a low rocky islet lying close to the water, with a few low trees and bushes growing over it, and south of it, near the southern shore, will be seen a bare rock. The channel lies between Dot Islet and the rock. After passing Entrance Islet, the course should bend to the southward so that in heading midway between Dot Islet and the bare rock, Entrance Islet will be directly astern.

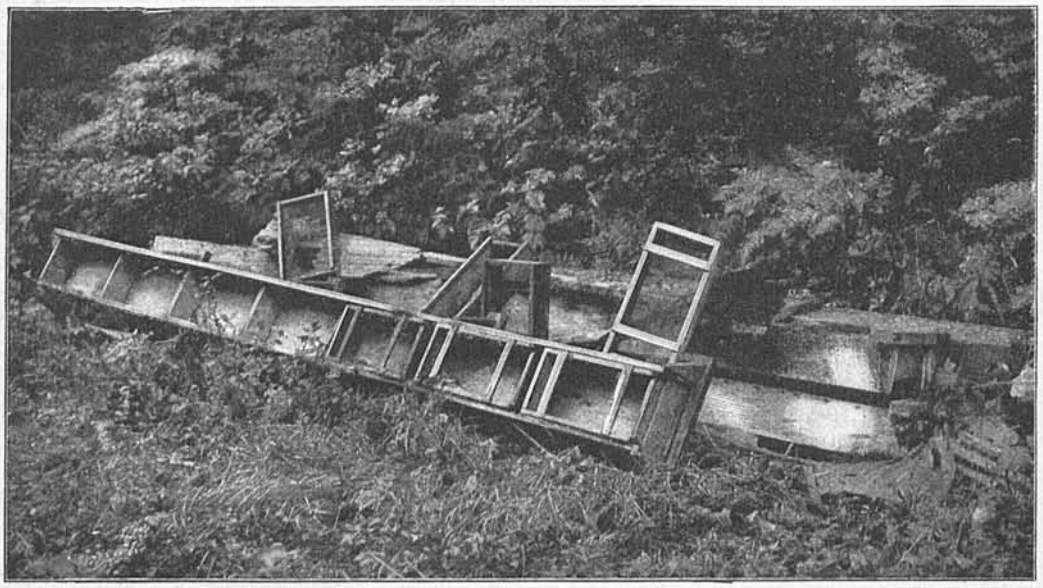
Having passed Dot Islet, keep to the southward of mid-channel for 1 mile, then haul to mid-channel and anchor about a mile below the head of the inlet, favoring

the eastern shore. Do not attempt to enter the bight or coves at the head, or approach them too closely, as they are very foul. The anchorage is in 20 fathoms, soft bottom, about one-half mile below the point of the tongue separating the two coves, and toward the eastern side.

CALLBREATH HATCHERY.

Mr. John C. Callbreath has been a resident of Alaska for many years; he was the manager of the Point Ellis cannery until it was destroyed by fire in 1892, and has lately been engaged in the transportation business on the Stikine River and in trading, making his home at Wrangell. He is a representative citizen, enterprising, and devoted to salmon culture.

In 1892, in connection with the Point Ellis cannery, he started the hatchery referred to under that stream heading. Having seen the rise of the salmon industry,



Ruins of trough and baskets, Callbreath's old hatchery.

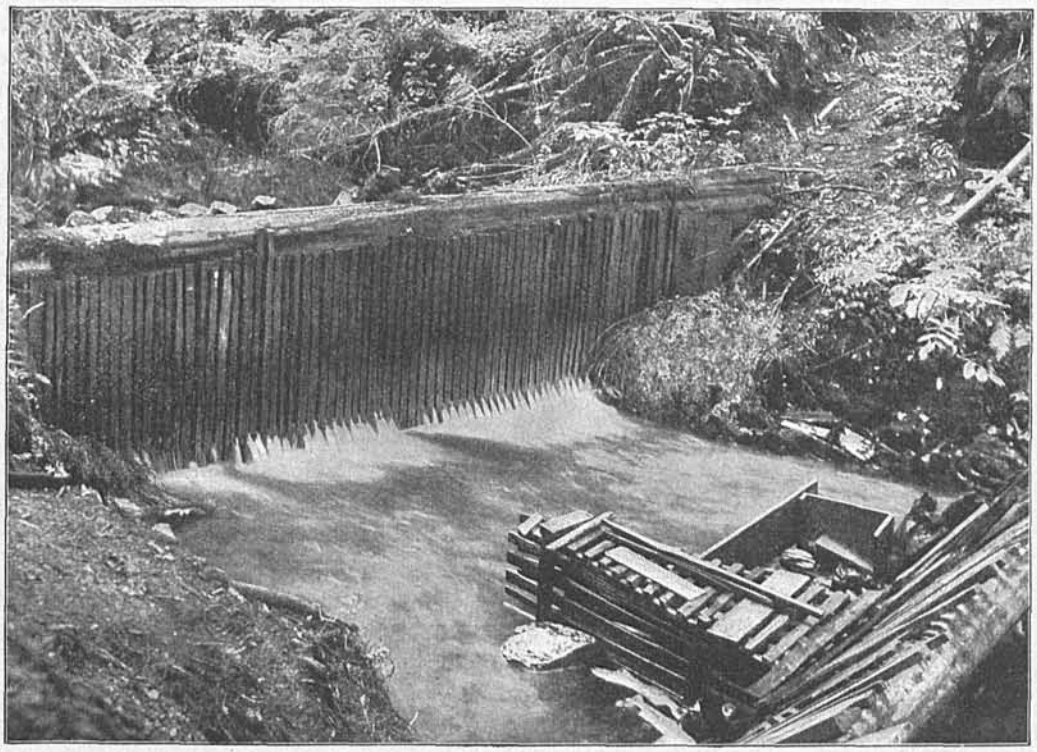
and knowing, as all must know who are familiar with the question, that the abusive and excessive fishing and total disregard of the law by the fisheries must slowly but surely exterminate the salmon for commercial purposes, he determined to take a salmon stream that under normal conditions carried a few thousand redfish, and by artificial propagation increase the production to hundreds of thousands. He hoped that, if successful, a law would be framed making all the increase his own property.

The hatchery is a private enterprise, unconnected with any cannery or fishery, and based upon the widely prevailing belief that the salmon return to the parent stream in four years after they are hatched. As this time has passed, however, without any apparent return, Mr. Callbreath has extended his period to ten years.

In establishing the hatchery a stream was sought satisfying the conditions imposed, and one was found at the head of McHenry Inlet. It is small, about one-

half mile in length, and flows over a rocky and bowldery bed between heavily wooded shelving banks. At its head is a small lake 42 feet above tide water, slightly L-shaped, about three-fourths mile long by one-fourth wide, and bordered by low wooded banks. The stream was never known to supply more than from 3,000 to 5,000 redfish, a number too small to attract the attention of the commercial fisheries. In fact, it was known as a "cultus chuck" or worthless stream.

After making satisfactory arrangements with the Indians claiming the stream, a hatchery was built in 1892 on the right bank about 200 yards from the mouth, and suitable dams were thrown across the stream to impound the fish. The hatchery water was taken from the stream, conveying it by a flume from a point near the



Trap pen and barrier in lower course of stream, Callbreath's Hatchery, McHenry Inlet.

lake, where a dam was built. After operating the hatchery during the latter part of the season in 1892 and turning out about 600,000 fry, it was seen that the breeding fish could not be impounded properly in the stream, many dying, probably from exhaustion in attempting to pass the barrier; it was also found that the stream water used in the hatchery was unsuitable, not only on account of the wide range in temperature, but the organic matter it contained smothered the eggs and caused fungus. An excellent site having been found on the lake in the vicinity of the streams forming the natural spawning-beds, with a spring giving an abundant supply of pure water of very equable temperature, the hatchery was moved in the spring of 1893 to its present site. It was operated that year and every year until 1900, when the pro-

jector decided that his means would not permit him to continue the work unless some return was made.

From its first inception it was determined that, in order to obtain the best results, only the most desirable species should be admitted to the lake, and that all enemies must be removed and excluded. In order to carry this into effect dams were built across the stream with racks below them, as shown in the sketch, at a point about 100 yards from salt water, where an islet divides the stream into two parts. The dam and fence on the western side of the islet allow nothing to pass. The fence on the eastern side has a trap opening, admitting fish to the foot of the dam. Here the redfish and cohoes are lifted by dip nets to the pool above, from which point they can ascend quickly to the lake. Nothing can enter the lake which is not passed over the dam by hand. The humpbacks, dog salmon, Dolly Varden trout, and all enemies, are carefully excluded, and the lake is therefore free of undesirable and predatory species. The lake has been carefully fished, and all enemies to the fry, such as cut-throats and other trout, sticklebacks, bullheads, sculpins. etc., have been removed, so that it is comparatively clear of enemies.

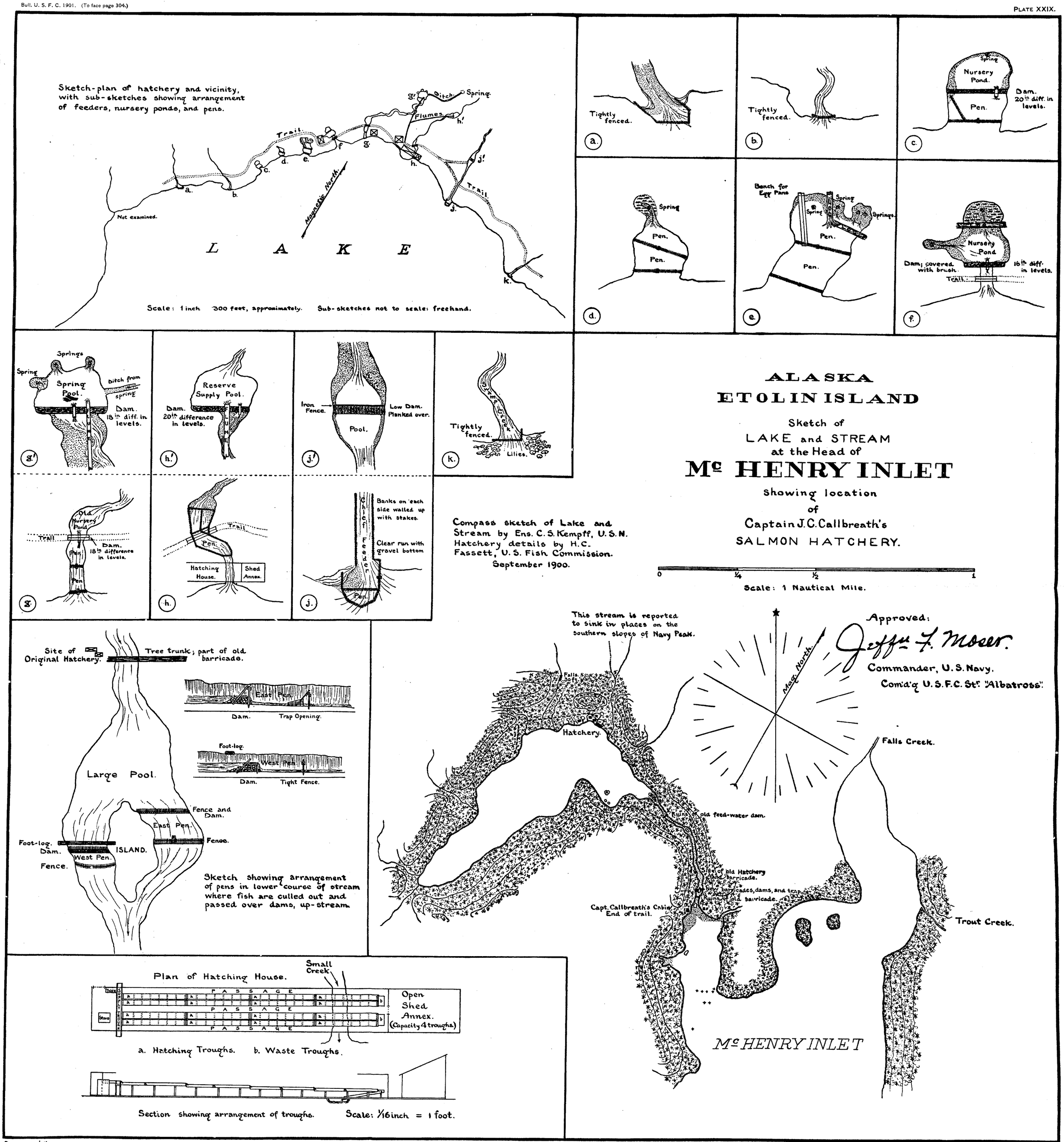
The hatchery is located on the northern side of the lake, about three-eighths mile from the head of the outlet, and midway between a series of 11 springs and feeders, the extreme distance being less than one-fourth mile from the main building. The hatching-house stands on the border of the lake, partly over a small feeder, and back of it is a substantial and comfortable log dwelling, 20 feet by 36 feet. Strung along the lake are two houses for the hatchery hands, each 12 feet by 16 feet, a smoke-house for smoking the stripped fish, and a tool-house. The original cost of the plant, and all expenses connected with it to date (September, 1900), amount to $16,000.

The hatchery usually opens July 1, when preparations are begun for the season; stripping generally commences September 1; the place is closed about March 1.

The hatchery building is 75 feet long, east and west, by 11 feet in width; south wall 11 feet high, north wall 6 feet high; shed roof, with windows on the south side only; on the east end is an open shed annex, 18 feet by 11 feet.

The troughs are 16 feet by 13½ inches by 5½ inches, inside measurement, made of planed lumber, 1½-inch bottom, 1¼-inch sides, covered with asphalt varnish. In the main building are 2 lines of troughs arranged in pairs, with 8 troughs in a line, making a total of 16, arranged with a passage around the lines as shown in the sketch. Each pair of troughs has a drop of 1 inch in its length, with a fall of 4 inches to the next. The first compartment in each trough is 8 inches in length, and receives and aërates the water; then come 7 basket divisions, each 24 inches long, separated by the Williamson system of division plates, 2 inches apart; the last space is 4 inches. The annex will accommodate 4 troughs, but it has seldom been used.

The baskets are of the usual wire webbing, five-eighths inch by one-sixth inch for redfish eggs, and five-eighths inch by one-fifth inch for cohoes, and are 23¾ inches by 12¾ inches by 4¾ inches, and have no wooden rims. They are supported an inch from the bottom of the trough by broad-headed nails and tin clips. All are well lacquered. A full basket contains 60,000 redfish eggs, or 30,000 to 35,000 coho eggs. The capacity of the hatchery is therefore 6,720,000 redfish eggs, and the annex 1,680,000 of the same species, but it is doubted if the latter can be regarded as a reliable factor in estimating the capacity.



Drawn by H. C. Fassett.

The hatchery water is received from a pool about 150 yards north of the hatchery, which is supplied by three springs (see sketch *g*) in the immediate vicinity, augmented by an additional spring, which is connected with the pool by a ditch. From the pool the water is conveyed by a covered flume to the west end of the hatchery building and is then distributed, as shown in plate XXIX. The flow is regulated at the closed end of the flume in the pool by means of holes in the bottom plank, in which plugs may be inserted, increasing or decreasing the supply as may be necessary. The main flume, midway in its length, is joined by a flume running from a reserve pool to the eastward, which may be used if necessary. The water is very clear and evidently quite pure, as no trouble has ever been experienced from fungoid growth. It is not filtered, but there are screens in the upper end of the flume to strain out foreign particles which may fall into the pool. The water is very equable in temperature and is said never to freeze. The lowest temperature observed in midwinter is recorded as 38° F., and the highest in midsummer 46° F. These are the extremes, the average range running from 39° to 45° F. During moderate winter weather the temperature of the water runs from 40° to 43° F.—never above the latter. While the temperature of the water is frequently taken during the season, there is no daily record from which curves may be drawn. The following may be noted as fair averages: July 25, 1898, 45° F.; September 14, 1898, 43° F.; lowest during the winter of 1898–99, 39° F.; April 15, 1899, 41° F. The lake water ranges from the freezing point in winter to 60° F. in midsummer. It is claimed that the present hatchery supply is sufficient for 15,000,000 eggs and that there are additional springs in the vicinity which, at small expense, can be utilized. In the hatchery the same water is used through four troughs, and if the annex is used, through five. It then passes by a sluice to the small creek under the hatchery.

The arrangements seem crude, and all fittings and appliances are constructed at the least expense, yet it all indicates an intelligent endeavor in a direction where there was but little previous experience in the work. Judging from the output, however, the hatchery has been very successful, and is a striking example of what may be done in this line of work if undertaken in an intelligent manner. Mr. Callbreath certainly deserves great credit, not only for the work he has accomplished, but for the proof he has given that a hatchery may be operated successfully for very little money.

Feeders, ripening pools, and nurseries.—The redfish and cohoes after entering the lake remain in its waters until ripe, a period varying from two to six weeks, sometimes longer, depending upon the condition of the fish as they enter from the sea; and when ripe they seek the feeders to spawn. In the immediate vicinity of the hatchery there are six feeders and springs which form natural spawning-beds and are arranged for taking ripe fish, and also several nursery ponds. The mouths of these feeders are fenced and have trap openings, which admit the fish, but do not permit them to leave.

Feeders *a*, *b*, and *k* are tightly fenced to prevent adult fish from entering, as they are full of obstructions on which the fish might injure themselves. *c*, *d*, *e*, and *f* are spring pools, which have been cleared and improved, opening on the lake. The pool *c* is separated by a dam into two ponds, the inner one forming an excellent nursery. *d* is not considered very good. *e* is the best pond, and secures

the largest number of breeders except *j*. *f* is a nursery pond; an inclined fence of brush surmounts the dam and partly shades the pool, which is believed to benefit the fry. *g* is the outlet for the overflow from the hatchery reservoir pool; it has several small pools, formed by widenings in the stream, where fry were one year planted but did not do very well. The lower of these pools, shown on the sketch, was also used as a nursery, but was unsatisfactory. *h* is the overflow from the auxiliary pool for hatchery supply, and receives the hatching-house waste; at times a few fish are permitted to enter and are spawned as needed to fill up baskets. *j* is the chief feeder entering the lake, and is about 100 yards east from the hatchery; the mouth is fenced with the usual trap opening, and from this point for about 70 feet upstream the banks are walled up with vertical slabs. At *j'* the stream has been dammed to make an upper pool in which, and in the upper reaches, fry are released. The ripe fish are stripped on the west bank of the lower reach.

Spawning.—The ripe fish enter the pens through the traps and are taken by dip nets; they average about 7 pounds in weight. Spawning begins about September 1, and continues actively for about six weeks; a few ripe fish keep running until late in the winter, the latest arrivals having the most perfect eggs.

In spawning the wet process is used; a pan is half filled with water, into which the ova are stripped and the milt added; these are mixed with the fingers, and then set aside for one hour, after which the eggs are thoroughly washed, transferred to buckets, and carried to the hatchery where they are placed in the baskets.

It is found that impregnation will take place up to 3 minutes after the ova have been ejected, and that the best results are obtained by adding the milt between ½ and 1½ minutes after ejection.

Size of eggs.—The number of eggs of both redfish and cohoes has been frequently counted, and it has been found that a full healthy female of each species contains 3,500 eggs, but it is rare that the full number is obtained. As frequently some are left in the fish, and others are not in good condition, the count is made on 3,000 eggs to the full fish, or 20 redfish, or 10 to 12 cohoes, to the basket, the eggs of the latter being about twice the size of the former. When a large number of fish mature at the same time it is frequently found that some eggs have been voided, and in such cases it will take two and sometimes three fish to make one "count" fish.

In counting the eggs a condensed-milk can is used as a measure. This measure, by repeated counting, has been found to contain 1,904 redfish or 848 coho eggs. A quantity of eggs from a healthy, normal, ripe female redfish was secured and measured with the following results: Forty covered 2 square inches and 20 in a line against a straight edge occupied a length of exactly 4½ inches, giving a single egg a diameter of 0.225 inch. It has been observed that brilliantly colored or unusually large or small eggs are apt to prove failures.

Several hundred cohoes are usually stripped each year and the eggs hatched. They run about six weeks later than the redfish.

The picking of eggs is done with ordinary tin forceps and is commenced six to eight weeks after the eggs are placed in the baskets. It is claimed that the percentage of bad eggs is very small, and that very little, if any, fungus appears. The delicate period is unknown here. It is probably covered during the time the eggs remain undisturbed.

Period of incubation.—The temperature records are not at all complete, and no attempt has been made to determine the thermal hatching unit. Generally it may be said that with a temperature of 45° F., the average highest, to 39°, the average lowest, the eye-spots appear in from 30 to 38 days. A few are earlier, and a few are 45 days before they are well eyed out. In 90 days they are hatching rapidly; in 100 days two-thirds are hatched; in 110 days four-fifths are out, and the remainder straggle along for several months. As the hatchery closes March 1 the unhatched eggs are buried in the gravel, simulating the natural conditions. The cohoes hatch about 10 days earlier, and an experiment made with a basket of humpback eggs showed that they hatched in 70 days under conditions in which the redfish hatched in 90 days.

Eggs which hatch out well in advance of the mass ("prematures") and those equally late, produce usually very weak fish or "freaks." It has been the experience here that it is useless to waste time on these fish, as they invariably die. It has been found that the fry just hatched collect in the lower end of the troughs, and to prevent loss they are removed as early as possible, within a day or two after hatching, and placed in the nursery, the upper ponds of the feeders, and sometimes in the lake, where the bottom is grassy or covered with pond lilies.

The yolk-sac is absorbed in from forty-five to fifty days, but shows plainly at sixty days, though skinned over and in the belly. After this has taken place they are taken from the nursery and some are placed in the feeders and others in the lake, where the natural conditions are most favorable for their protection.

The loss varies from 8 to 12 per cent, depending upon the season; if there is an abundance of rain, permitting the fish to ascend without injury, the eggs are found in good condition and the loss is small. During a dry season the fish are kept from ascending until the fall rains, and as they partially ripen in the salt or brackish water the eggs are more easily injured. Realizing the advantage in having the fish arrive in the lake in a healthy, vigorous state, considerable work has been done at the outlet to remove obstructions and to improve the natural conditions.

Barren lakes.—Mr. Callbreath lays considerable stress upon the use of what he terms barren lakes in connection with hatchery work. These lakes have in their sea connections high falls or cascades preventing the passage of fish from the sea and usually are quite clear of the enemies of salmon fry. Mr. Callbreath has planted redfish fry in two of these barren lakes, both discharging their water into Burnett Inlet. In 1894 and 1896, 1,000,000 redfish fry were planted each year in Burnett Lake, about 13 miles from the hatchery, and in 1895, 2,000,000 redfish fry were planted in Francis Lake, about 11 miles from the hatchery. The following coho fry have been planted in Falls Creek, previously referred to: 1893, 66,000; 1894, 50,000; 1896, 135,000; 1899, 60,000. The rest of the hatchery output has been planted in the home lake and feeders. The fry are transported as soon after hatching as the weather permits and before the egg sac is absorbed, as they then require fewer changes of water. Coal-oil cans are used for transportation cans; a screw-top mouthpiece, 1¼-inch opening, is soldered to the top of the can and the fry are poured in through a funnel having a large opening. A 5-gallon can will hold 30,000 redfish fry, or about 15,000 coho fry, and two such cans placed in the original case make a load for one man carried on the back with pack straps and, if the weather is cold, wrapped in blankets.

The following data, representing the output from this hatchery from July, 1892, to September, 1900, was furnished by Mr. Callbreath:

Year.	Redfish.					Cohoes.				
	Number adults passed over dam.		Total number of fry hatched.	Number of fry planted and locality.		Number adults passed over dam.		Total number of fry hatched.	Number of fry planted and locality.	
	Males.	Females.		Hatchery lake.	Other lakes.	Males.	Females.		Home lake.	Falls Creek.
1892...	[1] 3,000	([2])	600,000	600,000	.....	.....	.....	.....	.....	.....
1893...	[1] 3,010	([2])	1,888,000	1,888,000	.....	[1] 1,151	([2])	416,000	350,000	66,000
1894...	2,438	2,016	4,928,000	3,928,000	[3] 1,000,000	256	230	363,000	313,000	50,000
1895...	2,799	2,497	4,960,000	2,960,000	[4] 2,000,000	134	204	515,000	515,000	.....
1896...	1,617	2,008	3,880,000	2,780,000	[3] 1,100,000	374	338	510,000	375,000	135,000
1897...	1,817	1,572	2,000,000	2,000,000	.....	590	500	526,000	526,000	.....
1898...	1,189	821	1,800,000	1,800,000	.....	158	142	250,000	250,000	.....
1899...	1,058	1,175	1,385,000	1,385,000	.....	991	963	950,000	890,000	60,000
	10,918	10,089	21,441,000	17,341,000	4,100,000	2,503	2,377	3,530,000	3,219,000	311,000
1900...	1,991	1,863	None stripped; fish allowed to seek natural spawning beds.			526	482	None stripped; fish allowed to seek natural spawning beds.		

[1] Both sexes; not included in total. [2] Not known. [3] To Burnett Lake. [4] To Francis Lake.

In this record it should be remembered that the number of fish passed over the dam is not the number stripped. The number recovered for spawning purposes varies so much that no percentage can be stated, and what becomes of those not stripped is a mystery to the hatchery people. For instance, in 1899 there were passed over the dam between July 16th and October 26th 1,175 female and 1,058 male redfish, a total of 2,233, and from August 29th to November 14th 963 female and 991 male cohoes, making a total of 1,954; of this number 1,367 redfish and 1,231 cohoes were recovered; this includes not only all spawned fish, but all found dead along the shores after diligent and repeated search.

The following experience at the hatchery may be of interest and worthy of record: On September 23, 1898, about 20 spawners were allowed to enter one of the hatchery ponds and spawn. On April 13, 1899, nearly seven months later, these spawning-beds were turned over and a number of young fish found with the egg-sac not yet absorbed. The same run of fish stripped and hatched in the troughs had the egg-sacs absorbed two months prior to that time. It is the opinion at the hatchery that the young go to sea in from 10 to 15 months after they are hatched, though some remain in the lake until they are from 20 to 24 months old.

Mr. Callbreath is positive that his fish will return, but he now believes the time has not yet arrived for the first output to mature. It is earnestly hoped he may realize all he anticipates, for the zeal and enthusiasm which he displays should meet with ample reward. In the meantime he is carrying on a very interesting experiment; if his fish return he will have demonstrated that salmon *do return to the parent stream*, he will have thrown much light on the age of fish, and he will have proved that a stream running a few fish can be made to yield abnormally. If this is demonstrated a law should be passed permitting the leasing of small streams for hatchery purposes and recognizing ownership in fish thus hatched. This would mean a great deal to southeastern Alaska, as it would draw settlers who could make a very good living by operating a hatchery and cultivating the little patches of land that are favorably located.

HALIBUT FISHERIES OF SOUTHEASTERN ALASKA.

Since my former report on this subject, pages 45 to 48, there has been no development of any halibut banks in this section, but the spots in which these fish occur have been utilized by small boats in a manner that has made them profitable.

A few years prior to 1899 the fresh-halibut fishery was conducted by a few small schooners and sloops, chiefly from Puget Sound, which shipped the iced product by freight steamers to the Sound market from Wrangell. The fishing, however, was desultory, and could hardly have been called profitable until 1899, when the Icy Strait Packing Company completed their wharf at Petersburg, near the upper end of Wrangell Narrows, and arranged with a steamship company to make regular calls for freight. Under this arrangement it was agreed that the halibut boats of Chatham Strait and Frederick Sound should ship from the new station. During the first winter, from October, 1899, to March, 1900, about 20 small schooners and sloops of from 5 tons to 20 tons formed the fleet, calling regularly at Petersburg with fresh halibut for shipment. The fish were obtained chiefly in Chatham Strait and Frederick Sound. Twelve of these vessels averaged 2 dories and 5 men, and 8 averaged 1 dory and 3 men, making a total of 32 dories and 84 men, each of whom may be said to have had a personal interest in a vessel. From October, 1899, to April, 1900, the Icy Strait Packing Company also engaged in the halibut fisheries, employing their cannery steamers for this purpose. The steamer *White Wings*, 34 tons, valued at $7,000, besides her regular winter crew of 4, carried 8 deck-hands and fishermen, working 4 dories; and the steamer *Annie M. Nixon*, 18 tons, valued at $6,000, in addition to her crew of 4, employed 6 fishermen, working 3 dories. The fishermen received board and 20 cents per fish of more than 15 pounds weight. The fish averaged 40 pounds, dressed. The largest weighed 250 pounds. The catch for the season of the Icy Strait Packing Company amounted to 700 boxes of fresh halibut iced, 500 pounds net weight per box, and was shipped to Seattle and sold at an average price of 3 cents per pound. It is said that the 20 small craft engaged in the fishery each averaged 40 boxes of fresh halibut per month, making 200 tons per month.

It may therefore be said that there were employed on these halibut fisheries from October, 1899, to the end of March, 1900, two small steamers and 20 small sail vessels, using 39 dories and employing 98 fishermen.

The ice used is gathered from the neighboring glaciers, and if ground in a mill made for the purpose is in the best form, though many merely break it into fine lumps with a club.

As mentioned in my former report, no great banks where halibut occur in such numbers that a seagoing vessel may make a load and return to market have yet been found in Alaska, but there are many spots on which halibut may be found, and fishing from small vessels convenient to a steamer route, as outlined above, seems to offer the best means for conducting these fisheries successfully.

It is possible that these fisheries will increase in importance until the spots are cleaned off, when some other field will be sought until the grounds recuperate. At present it is promising enough to attract the attention of many small fishers from the Sound country. The gear used consists of bottom trawls and long hand lines; it is simple and inexpensive.

GENERAL CONDITIONS.

THE LAW.

During the investigation of the salmon fisheries in Alaska in 1897, when this vessel visited all the operating canneries and fisheries outside of Bering Sea, it was my opinion, frequently expressed, that as a rule the streams were overfished and could not continue for a long period to withstand the enormous draft made upon them.

These fisheries have grown to such an extent that unless one has been in constant touch with the subject, the situation can not be fully grasped. In 1878, when the first canneries were established, the total Alaska pack was 8,159 cases; seven years later, in 1885, the pack was 83,415 cases; only four years afterwards, in 1889, the pack had grown to be 719,196 cases; and seven years from that date, 1896, it was 966,707 cases; followed by a slack year, 1897, which yielded 909,078 cases. The past season, however (1900), has exceeded even the canners' expectations, and an output of 1,548,139 cases was the result. Multiplying this number by 85 may give approximately the number of pounds of live salmon taken from the Alaska streams by the canneries. This does not include the amount taken by the salteries, or by the whites and natives for their own local use. It may be imagined how prolific these rivers must be when, under any condition, they can furnish this mass of fish. Every means that man can devise is used for their capture and apparently without restriction.

In my former report, pages 38–42, the subject of the law was briefly discussed, and, with the experience since obtained, there seems no reason for changing the recommendations then made, but, on the contrary, they should be emphasized and augmented. My opinion of traps has been given previously and need not be repeated here, except to say that, whatever legislation is effected, there should be no exceptions made.

During the past three years so-called purse seines have grown in favor, particularly in southeastern Alaska, and it is now claimed by those operating them that it is no longer necessary to resort to barricades, as the purse seines take all the fish before they can enter the streams. These seines are simply deep drag seines, square hung, which, in hauling, are pursed by gathering in the foot rope. Around the larger and more prolific streams of southeastern Alaska, such as Hetta, Karta Bay, and Quadra, there were from 25 to 30 of these seines in operation during the season of 1900, one seine following the other in such rapid succession that few fish escaped capture. Purse seines, or seines used as such, should be abolished; in fact, the only fishing apparatus allowed should be gill nets and drag seines; no exceptions should be made. The use of these appliances should be regulated, and competent inspectors appointed to enforce the law and the regulations.

In the small streams examined this year those away from the lines of travel were all found to have evidences of barricading. In some, where the current is not very strong, stakes, planted on the banks and in the stream bed to support a net held to the bottom by bowlders, answered the fishermen's purpose, while in other cases the regular log barricade, referred to in my previous report, was strongly in evidence.

Since it is believed that the Puget Sound and Columbia River salmon fisheries are failing, attention has been drawn to Alaska. Six new canneries appeared in

southeastern Alaska during 1900, generally small in their appointments, prepared to make a hand pack of 12,000 to 20,000 cases for the season. It is confidently expected, if the labor can be obtained, that from 15 to 20 additional ones will be located throughout Alaska in 1901, and all of the older canneries expect to increase their capacity. It is hardly necessary for me to say that the fisheries can not support all these canneries, at the present rate, for any length of time; they will surely become exhausted for extensive commercial purposes.

There is another point which should receive the attention of the law, and that is the inspection of the product put in the cans and of the labeling. Compared with the large amount of salmon that reaches the market, the quantity that might be called unfit bears a very small proportion. Yet salmon that should not be consumed are packed under misleading labels, and the law should prohibit it. The law also should require the canner to plainly label every can he produces with the species of fish in the can, the quality, and the location of the cannery packing. The number of different labels now used on the Pacific coast is very large; a list before me from one lithographic company represents 702. From this it may be inferred that even an expert finds difficulty in telling the quality of the goods covered by a label. It was noticed in some of the new canneries that frequently a low grade of fish was covered by the most brilliant of labels, and in one instance—though doubtless there are others—dog salmon were covered by "Fresh Columbia River salmon." Such practices must throw discredit upon all goods, and one would fancy that reputable canneries would ask protection against it.

It is my opinion that a section of the law should provide for a certain time when fishing for redfish may commence, and prohibit their capture before that time. The object of this close season is to permit all the earliest arrivals to ascend to the lakes, where they may spawn early and have the eggs hatched before the cold weather sets in. It is probable that many of the feeders, used as spawning-beds, freeze to the bottom during the winter, and the late eggs must necessarily be destroyed. No one appreciates the difficulty in framing such a law more than the writer; but it is not impracticable, and with the data now at hand it is entirely feasible. Take, for example, southeastern Alaska. We know that all redfish packed from the earliest arrivals to about July 4 hardly pay cannery expenses. This does not take into account the small pack of king salmon, made by a few canneries, from the Chilkat, Taku, Stikine, and Unuk. A law, therefore, prohibiting the capture of redfish in southeastern Alaska before July 4 would be an excellent provision, and other districts could be treated in a similar manner. In order to execute the law, might it not be well to pay informers one-half of all fines collected?

With the large accessions of canneries in Alaska the struggle in the fisheries is sure to increase, and every means will be employed for the capture of fish regardless of the law, unless the Government enforces it by an efficient and intelligent inspection. The future, even more than the past, requires efficient inspection, which, however can not be realized under the present conditions.

STATISTICS.

Comparison table of the salmon packing industry of the Pacific coast, from its first inception in 1866 to 1900.

[Compiled from various sources.]

Year.	Alaska.	British Columbia.	Puget Sound.	Outside rivers.	Columbia River.	Sacramento River.	Total.
1866	.....	.....	.....	.....	4,000	.....	4,000
1867	.....	.....	.....	.....	18,000	.....	18,000
1868	.....	.....	.....	.....	28,000	.....	28,000
1869	.....	.....	.....	.....	100,000	.....	100,000
1870	.....	.....	.....	.....	150,000	.....	150,000
1871	.....	.....	.....	.....	200,000	.....	200,000
1872	.....	.....	.....	.....	250,000	.....	250,000
1873	.....	.....	.....	.....	250,000	.....	250,000
1874	.....	.....	.....	.....	350,000	2,500	352,500
1875	.....	.....	.....	.....	375,000	3,000	378,000
1876	.....	9,847	.....	25,600	450,000	8,300	493,747
1877	.....	67,387	.....	24,800	460,000	21,500	573,687
1878	8,159	113,601	.....	30,000	460,480	36,500	648,740
1879	12,530	57,394	.....	30,000	480,000	31,000	610,924
1880	6,539	61,300	.....	37,200	630,000	51,000	786,039
1881	8,977	175,675	.....	48,500	551,000	181,200	965,352
1882	21,745	255,061	.....	49,000	541,360	200,300	1,067,466
1883	48,337	243,000	.....	38,000	629,400	160,000	1,118,737
1884	63,886	138,945	.....	41,350	656,179	81,450	981,810
1885	83,415	106,865	.....	51,750	524,530	48,500	815,060
1886	142,065	163,004	.....	131,100	454,943	39,300	930,412
1887	206,677	201,990	.....	195,400	373,800	36,500	1,014,367
1888	412,115	135,600	.....	154,000	367,750	61,200	1,130,665
1889	719,196	414,400	.....	199,068	325,500	66,666	1,724,830
1890	682,591	409,464	.....	67,117	433,500	25,065	1,617,737
1891	801,400	314,813	.....	78,305	390,185	10,353	1,595,056
1892	474,717	236,997	.....	129,000	502,800	2,281	1,345,795
1893	643,654	637,120	.....	105,309	375,700	23,336	1,785,119
1894	686,440	562,371	.....	103,340	511,000	28,463	1,891,614
1895	626,530	564,877	.....	205,500	627,500	25,185	2,049,592
1896	966,707	598,300	248,200	115,400	463,621	13,387	2,405,615
1897	909,078	1,015,477	423,500	68,683	552,721	38,543	3,008,002
1898	965,097	454,500	417,700	78,600	473,230	29,731	2,418,858
1899	1,078,146	711,600	871,500	82,432	340,125	33,227	3,117,030
1900	1,548,139	527,281	478,742	106,300	313,417	39,304	3,013,183
Total	11,116,140	7,176,869	2,439,642	2,195,754	13,613,741	1,296,791	38,839,937

NOTE.—Prior to 1896 the Puget Sound pack is included under "Outside rivers." The pack is given in cases of 48 one-pound tins.

Table showing by years the number of salmon canneries operated in each district of Alaska, from 1878 to 1900, with the annual per cent value of total salmon pack (canned) for each district.

Year.	Southeast Alaska.		Prince William Sound and Copper River.		Cook Inlet.		Kadiak and Chignik.		Bering Sea.		Total number of canneries.
	No. of canneries.	Annual per cent of total salmon pack.	No. of canneries.	Annual per cent of total salmon pack.	No. of canneries.	Annual per cent of total salmon pack.	No. of canneries.	Annual per cent of total salmon pack.	No. of canneries.	Annual per cent of total salmon pack.	
1878	2	100	.....	.....	.....	.....	.....	.....	.....	.....	2
1879	2	100	.....	.....	.....	.....	.....	.....	.....	.....	2
1880	1	100	.....	.....	.....	.....	.....	.....	.....	.....	1
1881	1	100	.....	.....	.....	.....	.....	.....	.....	.....	1
1882	1	52.9	.....	.....	1	27.8	1	19.3	.....	.....	3
1883	4	39	.....	.....	1	32	1	29	.....	.....	6
1884	4	31.5	.....	.....	1	34.7	1	33.1	1	0.7	7
1885	3	14	.....	.....	1	24.8	1	43.2	1	18	6
1886	4	12.8	.....	.....	1	20.1	1	32.6	3	34.5	9
1887	5	15.2	.....	.....	1	14.9	1	34.7	3	35.2	10
1888	6	19.7	.....	.....	2	10.3	4	48.2	4	21.8	16
1889	12	19.1	4	3.4	2	7.1	15	54.2	4	16.2	37
1890	12	20.9	3	6.2	2	4.2	14	51.3	4	17.4	35
1891	11	19.5	3	8.5	3	7.4	8	48	5	16.6	30
1892	7	24.4	.....	0	1	4.3	5	57.9	2	13.4	15
1893	8	21.1	3	12	1	4.9	7	45.2	3	16.8	22
1894	7	20.8	3	11.4	1	5	6	47	4	15.8	21
1895	7	23.7	3	9.6	1	5.7	6	37.1	6	23.9	23
1896	9	27.1	3	9.6	1	3.6	8	37.1	8	22.6	29
1897	9	29.9	2	5.7	1	3.6	10	32.8	7	28	29
1898	9	26.1	2	6.3	2	5.8	10	28.7	7	33	30
1899	9	28.8	2	5.7	2	4.8	10	22.5	9	38.2	32
1900	16	29.5	2	4.5	3	4.1	9	23.2	12	38.7	42
Percentage of gross pack for 23 years	.....	24.9	.....	6.2	.....	6	.....	37.5	.....	25.4	

Complete table of Alaska salmon (canned) pack, by canneries and districts, from its earliest inception in 1878 to close of season of 1900.

[One case contains 48 pounds of salmon, net weight.]

Name of company and location of cannery.	Owned in 1900 by—	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	Total.
Southeast Alaska.		*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
North Pacific Trading and Packing Co., Klawak	Same company	5,402	6,675	6,539	8,977	11,501	8,240	6,189	8,428	7,860	9,562	12,325	11,370	10,188	9,256	10,194	12,595	14,455	12,228	16,675	15,705	16,307	19,100	[1] 27,752	267,523
Cutting Packing Co., Old Sitka, Baranof Island	Defunct	2,757	5,855	Closed.		[2] Abandoned.																			8,612
Cape Fox Packing Co., north shore, Boca de Quadra	do						2,000	3,000	5,900	500	Sold; moved.														11,400
Tongass Packing Co., Ketchikan, Tongass Narrows	do										5,500	11,000	[3] 13,000												29,500
Chilkat Packing Co., east shore, Chilkat Inlet	do						6,000	7,000	2,400	1,700	8,000	Closed.	13,500	15,000	13,369	Burnt.									66,969
Northwest Trading Co., Pyramid Harbor	do						3,800	6,000	Closed.	8,600	5,000	Transf. to new co.													23,400
Pyramid Harbor Packing Co., Pyramid Harbor	Alaska Packers Association											19,300	[4] 13,400	12,300	18,300	28,964	13,668	38,781	35,373	47,456	37,456	39,669	53,237	55,601	413,505
Aberdeen Packing Co., Lower Stikine River	Defunct										3,400	14,000	Sold; moved.												17,400
Glacier Packing Co., Point Highfield, Wrangell Island	Alaska Packers Association												13,800	14,600	15,876	Closed.	22,728	25,250	27,416	44,233	45,918	49,332	50,201	58,518	367,872
Alaska Salmon Packing and Fur Co., Loring	do											18,771	28,862	23,024	22,786	21,446	25,153	26,869	32,554	61,467	62,040	59,343	63,390	67,158	512,863
Cape Lees Packing Co., Burroughs Bay	Defunct											5,732	10,574	10,823		Closed.		Dismantled.							27,129
Boston Fishing and Trading Co., Yes Bay	Same company												4,500	9,343	17,365	13,734	15,102	12,000	14,100	24,100	22,300	15,174	25,504	33,623	206,845
Baranoff Packing Co., Redoubt, Baranof Island	Defunct												4,454	10,123	Moved.										14,577
Baranoff Packing Co., Redfish Bay, Baranof Island	do														7,949	10,259	9,889	11,189	14,805	15,358	14,070	12,681	[5] Abandoned.		96,200
Astoria and Alaska Packing Co., Freshwater Bay	do												5,000	Moved.											5,000
Astoria and Alaska Packing Co., Point Ellis, Kuiu Island	do													8,000	16,200	Burnt May 1.									24,200
Bartlett Bay Packing Co., Bartlett Bay	do												[6] 4,300	12,000	7,600	Closed.		[7] Dismantled.							23,900
Chilkat Canning Co., Chilkat Village, Chilkat Inlet	Alaska Packers Association												19,000	17,000	20,914	20,000	24,418			Closed; in reserve.					101,332
Metlakahtla Industrial Co., Metlakahtla	Same company													[8] 500	7,000	11,125	12,500	14,000	12,000	17,650	15,490	11,671	12,322	17,560	131,818
Quadra Packing Co., Mink Arm, Boca de Quadra	Icy Strait Packing Co																			8,000	24,500	16,000	37,000	13,600	99,100
Pacific Steam Whaling Co., Hunter Bay	Same company																			27,442	34,388	31,208	38,265	43,607	174,910
Thlinket Packing Co., Gerard Point, Eastern Passage	do																						11,200	25,640	36,840
Fidalgo Island Canning Co., Ketchikan	do																							27,256	27,256
Royer-Warnock Packing Co., Beecher Pass	do																							1,560	1,560
Icy Strait Packing Co., Petersburg, Wrangell Narrows	do																							29,941	29,941
Taku Fishing Co., Port Snettisham	do																							9,458	9,458
Taku Packing Co., Taku Inlet	do																							16,722	16,722
Western Fisheries Co., Dundas Bay	do																							13,793	13,793
Chilkoot Packing Co., Chilkoot Inlet	do																							14,850	14,850
Total of annual packs in Southeast Alaska		8,159	12,530	6,539	8,977	11,501	20,040	22,189	16,728	18,660	31,462	81,128	141,760	142,901	156,615	115,722	136,053	142,544	148,476	262,381	271,867	251,385	310,219	456,639	2,774,475
Prince William Sound and Copper River.																									
Central Alaska Co., Little Kayak Island	Defunct												1,600	[9] Moved.											1,600
Peninsula Trading and Fishing Co., Little Kayak Island	do												2,540	14,200	Moved.										16,740
Peninsula Trading and Fishing Co., Coquenhena	do														18,085	Closed.	15,270	15,000	15,000	20,672	Closed.	[10] Abandoned.			84,027
Pacific Packing Co., Odiak	Alaska Packers Association												5,064	13,716	27,209	Closed.	28,999	28,378	21,453	39,873	23,301	32,158	31,931	39,410	291,492
Pacific Steam Whaling Co., Odiak	Defunct												15,000	14,278	22,797	Closed.	32,729	35,285	Moved.						120,089
Pacific Steam Whaling Co., Orca	Same company																		23,041	32,321	28,756	28,668	29,864	30,588	173,238
Total of annual packs in Prince William Sound and Copper River													24,204	42,194	68,091	None.	76,998	78,663	59,494	92,866	52,057	60,826	61,795	69,998	687,186
Cook Inlet.																									
Alaska Packing Co., Kussilof River	Defunct					6,044	14,818	21,141	Transf. to new co. 19,217	28,433	30,765	29,455	31,782	[11] Closed.	19,157	Closed.	31,665	34,033	36,188	34,767	32,582	39,566	28,815	33,781	42,003
Arctic Fishing Co., Kussilof River	Alaska Packers Association											12,996	18,712	15,905	18,254				Closed; in reserve.						430,156
Northern Packing Co., Kenai, Kaknu River	do													12,750	21,586	20,741	Closed.		[12] Dismantled.						65,867
George W. Hume, Kussilof River	Defunct																					16,876	23,300	25,089	55,077
Pacific Steam Whaling Co., Kenai, Kaknu River	Same company																							4,905	65,265
Alaska Salmon Association, Chuitna River	do																								4,906
Total of annual packs in Cook Inlet						6,044	14,818	21,141	19,217	28,433	30,765	42,451	50,494	28,655	58,997	20,741	31,665	34,033	36,188	34,767	32,582	56,442	52,115	63,775	663,273

[1] Burnt September 18, 1899; rebuilt spring of 1900 on new site.
[2] Machinery moved to Arctic Packing Co., Kussilof River.
[3] Burnt in August, 1889.
[4] Burnt and rebuilt in spring.
[5] Machinery moved to Egegak Packing Co., Egegak River.
[6] Hand pack; machinery installed in 1890.
[7] Machinery moved to Pyramid Harbor Packing Co., Pyramid Harbor.
[8] Experimental pack.
[9] Moved to Thin Point, Alaska Peninsula.
[10] Machinery moved to Pacific Steam Whaling Co., Kenai.
[11] Transport vessel wrecked and outfit lost.
[12] Consolidated with Arctic Fishing Co., Kussilof River.

 [For remaining districts see next sheet, 312——2.]

Complete table of Alaska salmon (canned) pack, by canneries and districts, from its earliest inception in 1878 to close of season of 1900—Continued.

[One case contains 48 pounds of salmon, net weight.]

Name of company and location of cannery.	Owned in 1900 by—	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	Total.
Kadiak and Chignik.		*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*	*Cases.*
Karluk Packing Co., Karluk, Kadiak Island	Alaska Packers Association					4,200	13,479	20,156	33,470	46,150	71,750	101,304	62,057	40,306	66,483	75,416	59,220	79,000	48,379	68,495	54,777	28,898	31,210	79,415	984,165
Kodiak Packing Co., Karluk, Kadiak Island	do											26,146	30,287	43,060	41,000	Closed.	30,138			Closed; in reserve.					170,631
Aleutian Islands Fishing and Mining Co., Karluk	Defunct											33,700	53,551	40,335	[1]39,312	[2]Consolidated.									166,898
Hume-Aleutian Packing Co., Karluk, Kadiak Island	Alaska Packers Association															76,233	59,959	79,000	47,500	70,320	49,633	24,398	18,987	Closed.	426,030
Arctic Packing Co., Larsen Cove, Uyak Bay, Kadiak Island	Defunct											37,500	44,200	37,600	[3]41,000	Closed.				[4]Dismantled.					160,300
Royal Packing Co., Afognak Bay, Afognak Island	Alaska Packers Association												16,412	9,926			[5]Closed.			[4]Dismantled.					26,338
Russian-American Packing Co., Afognak Bay, Afognak	do												25,500	26,500	[6]25,000		[5]Closed.		[7]Dismantled.	[8]Abandoned.					77,000
Hume Packing Co., Karluk, Kadiak Island	do												28,000	37,613	36,247	[9]Consolidated.									101,860
Alaska Improvement Co., Karluk, Kadiak Island	do												25,600	26,000	26,000	52,098	43,076	54,300	35,700	87,613	49,852	29,455	29,439	73,115	532,248
Arctic Packing Co., Olga Bay, Alitak, Kadiak Island	do												[10]13,850	17,800	26,600	21,077	25,777	27,720	15,331	23,155	37,401	34,168	28,294	32,342	303,515
Kodiak Packing Co., Snug Harbor, Alitak, Kadiak Island	do												12,535	16,347	Closed.		[11]Partly dismantled.			In reserve.					28,882
Chignik Bay Co., Chignik Lagoon, Alaska Peninsula	do												21,500	14,455	24,730	49,931	57,553	55,352	70,050	48,361	38,159	50,418	34,674	40,396	505,579
Shumagin Packing Co., Chignik Lagoon	Defunct												11,200	[12]14,455	[12]24,832	Closed.		Consolidated.							50,487
Chignik Bay Packing Co., Chignik Lagoon	Alaska Packers Association												10,500	[12]14,455	[12]24,780				Closed; in reserve.						49,735
Western Alaska Packing Co., Ozernoi, Stepovak Bay	Defunct												6,400	2,198	[13]Abandoned.										8,598
Thin Point Packing Co., Thin Point, Alaska Peninsula	do												25,161	2,401	4,206	Closed.		[14]Abandoned.							31,768
Central Alaska Co., Thin Point, Alaska Peninsula	do													7,000	4,089		Closed.		[15]Abandoned.						11,089
Hume Canning and Trading Co., Tanglefoot Bay, near Karluk	Alaska Packers Association																15,429	26,984	15,277		Closed; in reserve.				57,690
Uganuk Fishing Station, Uganuk Bay, Kadiak Island	do																			21,005	2,113	6,643	11,912	13,370	55,043
Pacific Steam Whaling Co., Anchorage Bay, Chignik	Same company																			21,515	24,000	30,061	31,600	33,086	140,262
Hume Bros & Hume, Anchorage Bay, Chignik	do																			17,893	12,000	27,400	21,500	26,617	105,410
Pacific Steam Whaling Co., Uyak Bay, Kadiak Island	do																				17,000	29,800	19,000	30,409	96,209
Hume Bros. & Hume, Uyak Bay, Kadiak Island	do																				13,375	16,500	15,569	29,700	75,144
Total of annual packs in Kadiak and Chignik						4,200	13,479	20,156	33,470	46,150	71,750	198,650	386,753	350,451	384,279	274,755	291,152	322,356	232,237	358,357	298,310	277,741	242,185	358,450	4,164,881
Bristol Bay, Bering Sea.																									
Arctic Packing Co., Nushagak Bay	Alaska Packers Association							[16]400	14,000	19,000	24,000	25,000	25,000	33,000	30,883	Closed.	35,848	30,413	33,631	35,676	35,890	41,011	45,383	63,935	493,070
Alaska Packing Co., Nushagak Bay	do									16,500	27,500	19,000	30,000	31,000	31,077	31,859	37,188	30,038	34,632	39,115	37,849	42,306	46,775	60,797	515,636
Bristol Bay Canning Co., Nushagak Bay	do									13,322	21,200	30,000	33,221	30,400	37,100	31,640	34,750	30,999	33,434	38,314	34,117	39,962	43,566	62,597	514,622
Nushagak Canning Co., Nushagak Bay	do											15,886	27,764	23,990	30,363				Closed; in reserve.						98,003
Bering Sea Packing Co., Ugashik River	Defunct														3,995	Closed.		[17]17,394	12,007	20,004	[18]Sold; dismantled.				53,400
Arctic Packing Co., Naknek River	Alaska Packers Association																		22,731	27,133	34,676	34,870	43,790	62,334	225,534
Naknek Packing Co., Naknek River	Same company																		13,700	8,600	18,000	28,000	31,000	36,058	135,358
Point Roberts Packing Co., Koggiung, Kvichak Bay	Alaska Packers Association																			29,730	55,508	94,053	116,451	101,892	397,834
Ugashik Fishing Station, Ugashik River	do																			19,764	38,272	38,501	44,984	54,682	196,203
Pacific Steam Whaling Co., Nushagak Bay	Same company																						18,228	43,387	61,615
Alaska Fishermen's Packing Co., Nushagak Bay	do																						21,455	40,090	61,545
Kvichak Packing Co., Kvichak Bay	Alaska Packers Association																							45,200	45,200
Egegak Packing Co., Egegak River	do																							21,652	21,652
Bristol Packing Co., Ugashik River	Same company																							6,653	6,653
Total of annual packs in Bristol Bay, Bering Sea								400	14,000	48,822	72,700	89,886	115,985	118,390	133,418	63,499	107,786	108,844	150,135	218,336	254,312	318,703	411,832	599,277	2,826,325
Recapitulation.																									
Southeast Alaska		8,159	12,530	6,539	8,977	11,501	20,040	22,189	16,728	18,660	31,462	81,128	141,760	142,901	156,615	115,722	136,053	142,544	148,476	262,381	271,867	251,385	310,219	456,639	2,774,475
Prince William Sound and Copper River													24,204	42,194	68,091	None.	76,998	78,663	59,494	92,866	52,057	60,826	61,795	69,998	687,186
Cook Inlet						6,044	14,818	21,141	19,217	28,433	30,765	42,451	50,494	28,655	58,997	20,741	31,665	34,033	36,188	34,767	32,532	56,442	52,115	63,775	663,273
Kadiak and Chignik						4,200	13,479	20,156	33,470	46,150	71,750	198,650	386,753	350,451	384,279	274,755	291,152	322,356	232,237	358,357	298,310	277,741	242,185	358,450	4,164,881
Bristol Bay, Bering Sea								400	14,000	48,822	72,700	89,886	115,985	118,390	133,418	63,499	107,786	108,844	150,135	218,336	254,312	318,703	411,832	599,277	2,826,325
Grand total of annual packs in Alaska		8,159	12,530	6,539	8,977	21,745	48,337	63,886	83,415	142,065	206,677	412,115	719,196	682,591	801,400	474,717	643,654	686,440	626,530	966,707	909,078	965,097	1,078,146	1,548,139	11,116,140

[1] Packed in cannery of Hume Packing Co., Karluk.
[2] Consolidated with Hume Packing Co., to form the Hume-Aleutian Packing Co., Karluk.
[3] Packed in cannery of Kodiak Packing Co., Karluk.
[4] Machinery moved to Uganuk Fishing Station, Uganuk Bay.
[5] Rendered inoperative by President's proclamation creating a Fish Commission reservation on Afognak Island.
[6] Packed in cannery of Alaska Improvement Co., Karluk.
[7] Machinery moved to Ugashik Fishing Station, Ugashik River.
[8] Buildings moved to Uganuk Fishing Station, Uganuk Bay.
[9] Consolidated with Aleutian Islands Fishing and Mining Co., to form Hume-Aleutian Packing Co., Karluk.
[10] Moved to new site on same bay.
[11] Part of machinery moved to Karluk.
[12] Packed in cannery of Chignik Bay Co., Chignik.
[13] Machinery moved to Bering Sea Packing Co., Ugashik River.
[14] Moved to Arctic Packing Co., Naknek River.
[15] Machinery moved to Point Roberts Packing Co., Kvichak Bay.
[16] Experimental pack.
[17] Moved to new site on same river.
[18] Available property moved to Ugashik Fishing Station, Ugashik River.

Alaska pack of canned salmon—1898.

[Cases = 48 one-pound or 96 half-pound tins. Tierces = 400 pounds net. Barrels = 200 pounds net. Half-barrels = 100 pounds net. Casks = 800 pounds net.]

Name of company and location of cannery.	Daily capacity, in cases.	Redfish.				Cohoes.				Humpbacks.				King.				Dog.				Total number of cases packed.	Salt packs of canning plants.
		Number of cases packed.	Average number fish per case.	Packing.		Number of cases packed.	Average number fish per case.	Packing.		Number of cases packed.	Average number fish per case.	Packing.		Number of cases packed.	Average number fish per case.	Packing.		Number of cases packed.	Average number fish per case.	Packing.			
				Began.	Ceased.			Began.	Ceased.			Began.	Ceased.			Began.	Ceased.			Began.	Ceased.		
Arctic Packing Co. (A. P. A.), Nushagak Bay	1,600	38,363	13	June 16	July 23	1,132	11	July 18	July 24					1,388	3	June 16	June 29	128	13	June 20	June 29	41,011	
Alaska Packing Co. (A. P. A.), Nushagak Bay	1,600	38,538	13	June 21	July 25	1,821	11	July 22	...do...					2,265	3	June 6	June 30	182	13	June 22	June 24	42,306	900 barrels redfish.
Bristol Bay Canning Co. (A. P. A.), Nushagak Bay	1,600	37,950	13	June 20	July 24	752	11	July 21	July 23					1,093	3	June 19	July 1	167	13	June 20	June 29	39,962	
Point Roberts Packing Co. (A. P. A.), Kvichak Bay	4,800	93,963	12	June 18	July 18									90	3	June 18	July 18					94,053	787 barrels and 362 half barrels redfish.
Arctic Packing Co. (A. P. A.), Naknek River	1,600	34,845	12.5	June 14	July 16									25	5	...do...	June 29					34,870	907 barrels redfish.
Naknek Packing Co., Naknek River	1,500	28,000	12	June 20	July 23																	28,000	2,000 barrels redfish.
Ugashik Fishing Station (A. P. A.), Ugashik River	1,600	38,501	13	June 19	July 21																	38,501	277 barrels and 496 half barrels redfish.
Chignik Bay Co. (A. P. A.), Chignik Lagoon	1,600	50,418	10.5	June 9	Aug. 9																	50,418	
Pacific Steam Whaling Co., Anchorage Bay, Chignik	900	29,897	10.5	...do...	Aug. 12	79	10	Aug. 1	Aug. 15									85	10	July 20	July 26	30,061	90 barrels humpback bellies.
Hume Bros. & Hume, Anchorage Bay, Chignik	800	27,400	10.5	June 4	Aug. 10																	27,400	90 barrels and 4 half barrels redfish.
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak	1,000	34,168	13.5	...do...	Aug. 20																	34,168	59 barrels and 71 half barrels redfish.
Karluk Packing Co. (A. P. A.), Karluk	1,800	28,898	13	June 2	Sept. 24																	28,898	
Alaska Improvement Co. (A. P. A.), Karluk	1,800	27,734	13	June 8	Sept. 17	1,721	8.5	Sept. 1	Sept. 17													29,455	
Hume-Aleutian Packing Co. (A. P. A.), Karluk	1,800	22,974	13	July 21	Sept. 9	1,424	8.5	Sept 7	Sept. 9													24,398	
Uganuk Fishing Station (A. P. A.), Uganuk Bay	1,000	6,643	11	June 8	June 17																	6,643	
Pacific Steam Whaling Co., Uyak Bay	900	29,800	12.5	May 25	Sept. 10																	29,800	
Hume Bros. & Hume, Uyak Bay	900	16,500	12.5	June 4	Sept. 14																	16,500	
Pacific Steam Whaling Co., Kenai	800	11,736	12.8	July 1	Aug. 20	3,075	8.5	July 21	Aug. 20					2,065	3	June 5	July 1					16,876	
Arctic Fishing Co. (A. P. A.), Kussilof River	1,500	28,810	13	May 26	Aug. 10	7,196	12	July 15	Aug. 10					3,560	3	May 26	July 25					39,566	
Pacific Packing Co. (A. P. A.), Odiak	1,500	17,541	10.5	May 10	Aug. 5					14,432	20½	July 7	Aug. 5	184	4¾	May 10	June 9					32,158	
Pacific Steam Whaling Co., Orca	800	23,338	9.5	May 17	July 28					5,248	20	July 23	July 31	82	4	May 17	June 15					28,668	
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor	1,600	34,851	11	July 6	Sept. 20	4,799	7.5	Aug. 16	Sept. 20					19		(Scattering in early part of season.)						39,669	
Glacier Packing Co. (A. P. A.), Point Highfield	1,500	10,888	11	June 25	Aug. 5	12,653	7.5	July 5	Sept. 10	23,700	17	July 1	Aug. 25	2,091	4	May 15	June 26					49,332	
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring	2,800	16,416	11.5	June 22	Aug. 26	5,482	8.95	Aug. 17	...do...	37,445	18.58	July 15	Aug. 30									59,343	650 barrels redfish; 300 half barrels bellies (Hetta).
Boston Fishing and Trading Co., Yes Bay	800	4,919	8.5	July 14	Sept. 6	160	7.5	Aug. 18	Sept. 15	5,473	15	July 12	Aug. 31					4,622	6	July 24	Aug. 20	15,174	110 barrels cohoes.
Quadra Packing Co., Mink Arm, Boca de Quadra	600	10,000	11	July 15	Aug. 25	2,000	8	Aug. 12	Sept. 5	4,000	18	July 20	Aug. 25									16,000	70 tierces full king; 12 barrels white king bellies.
Metlakahtla Industrial Co., Metlakahtla	700	7,850	13.4	June 16	Sept. 3	1,047	7.93	Aug. 10	Sept. 13	2,774	19	July 27	...do...									11,671	
Baranoff Packing Co., Redfish Bay	500	12,681	11	June 21	Aug. 28																	12,681	
North Pacific Trading and Packing Co., Klawak	500	9,172	11.3	June 20	Aug. 23	3,654	6	Aug. 16	Sept. 29	3,481	20	July 25	Aug. 16									16,307	250 cases clams; 225 cases clam juice.
Pacific Steam Whaling Co., Hunter Bay	1,600	10,147	11.5	June 22	Aug. 30	8,216	7.6	July 18	Sept. 13	12,845	14.5	July 18	Aug. 23									31,208	680 half barrels bellies (Nutqua).
Total		782,941				54,711				109,399				12,862				5,184				965,097	

Alaska pack of canned salmon, 1899.

Name of company and location of cannery.	Daily capacity in cases.	Redfish.				Cohoes.				Humpbacks.				King.				Dog.				Total number of cases packed.	Salt packs of canning plants.
		Number of cases packed.	Average number fish per case.	Packing—		Number of cases packed.	Average number fish per case.	Packing—		Number of cases packed.	Average number fish per case.	Packing—		Number of cases packed.	Average number fish per case.	Packing—		Number of cases packed.	Average number fish per case.	Packing—			
				Began.	Ceased.			Began.	Ceased.			Began.	Ceased.			Began.	Ceased.			Began.	Ceased.		
Arctic Packing Co. (A. P. A.), Nushagak Bay	1,600	42,932	13	June 16	July 20									2,229	3	June 13	June 26	222	13	June 20	June 24	45,383	
Alaska Packing Co. (A. P. A.), Nushagak Bay	1,600	44,044	13	June 24	July 23	36								2,097	3	...do...	June 24	598	13	June 22	June 26	46,775	1,695 barrels and 86 half barrels redfish.
Bristol Bay Canning Co. (A. P. A.), Nushagak Bay	1,600	41,562	13	June 20	July 18									1,893	3	...do...	June 25	111	13	June 23	June 24	43,566	
Pacific Steam Whaling Co., Nushagak Bay	1,600	15,978	13	June 20	July 14									2,250	2.8	June 10	July 1					18,228	
Alaska Fishermen's Packing Co., Nushagak Bay	1,600	21,165	12.5	June 25	July 25	290	12	July 24	July 25													21,455	
Point Roberts Packing Co. (A. P. A.), Kvichak Bay	4,800	116,385	12	June 13	July 23									266	3	June 18	July 21					116,651	
Arctic Packing Co. (A. P. A.), Naknek River	1,600	43,744	12.5	June 15	July 19									46	3	June 16	June 19					43,790	2,875 barrels and 1,000 half barrels redfish.
Naknek Packing Co., Naknek River	1,500	31,000	12	June 22	July 24																	31,000	300 barrels and 1,500 half barrels redfish.
Ugashik Fishing Station (A. P. A.), Ugashik River	1,600	44,984	13	June 19	July 24																	44,984	998 barrels and 990 half barrels redfish.
Chignik Bay Co. (A. P. A.), Chignik Lagoon	1,600	33,561	10.5	June 10	Aug. 23	1,113	10.5	Aug. 9	Aug. 26													34,674	
Pacific Steam Whaling Co., Anchorage Bay, Chignik	900	31,600	10.5	June 7	Aug. 12																	31,600	60 barrels humpback bellies.
Hume Bros. & Hume, Anchorage Bay, Chignik	800	21,245	10.5	June 8	Aug. 13	255	9	Aug. 12	Aug. 12													21,500	
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak	1,000	28,041	13.5	June 15	Aug. 30	253																28,294	38 barrels and 75 half barrels redfish.
Karluk Packing Co. (A. P. A.), Karluk	1,800	31,143	13	June 1	Sept. 25									67	5	June 17	June 18					31,210	
Alaska Improvement Co. (A. P. A.), Karluk	1,800	27,786	13	June 12	Sept. 2	1,444	8.5	Aug. 31	Sept. 2					209	5	June 14	June 27					29,439	
Hume-Aleutian Packing Co. (A. P. A.), Karluk	1,800	17,366	13	July 24	Sept. 7	1,621	8.5	Aug. 29	Sept. 7													18,987	
Uganuk Fishing Station (A. P. A.), Uganuk Bay	1,000	11,912	11	June 7	July 20																	11,912	
Pacific Steam Whaling Co., Uyak Bay	900	19,000	12.5	May 24	Sept. 10																	19,000	
Hume Bros. & Hume, Uyak Bay	900	14,919	12.5	May 31	Sept. 1					650	21	July 30	Aug. 26									15,569	
Pacific Steam Whaling Co., Kenai	800	17,582	12.8	May 30	Aug. 12	3,314	9	July 27	Aug. 20					2,404	2.9	May 27	July 18					23,300	
Arctic Fishing Co. (A. P. A.), Kussilof River	1,500	28,342	13	May 26	Aug. 11	2,489	12	July 15	Aug. 12					2,984	3	May 26	July 24					28,815	
Pacific Packing Co. (A. P. A.), Odiak	1,500	25,279	11¾	May 13	Aug. 12					5,864	25.5	July 10	Aug. 12	788	4	May 13	June 17					31,931	
Pacific Steam Whaling Co., Orca	800	24,932	11	May 10	July 24					4,316	20	July 31	Aug. 7	616	4	May 9	June 8					29,864	
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor	1,600	48,495	11	July 8	Aug. 31	562	7.5	Aug. 24	Aug. 30					4,180	3.5	May 31	June 30					53,237	
Glacier Packing Co. (A. P. A.), Point Highfield	1,500	10,081	12	June 25	Aug. 1	6,956	8	July 10	Sept. 3	30,993	18	June 29	Aug. 17	2,171	4	May 15	July 25					50,201	
Thlinket Packing Co., Gerard Point	800	2,750	11.5	July 6	Aug. 1	4,650	7.5	Aug. 1	Sept. 10	2,600	18	July 20	Aug. 20	1,200	3	...do...	July 29					11,200	
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring	1,800	19,218	11.76	June 18	Aug. 29	3,581	9.15	Aug. 22	Sept. 15	40,591	18.99	July 17	Aug. 30									63,390	300 barrels redfish; 350 half barrels bellies (Hetta).
Boston Fishing and Trading Co., Yes Bay	800	7,965	8.6	July 14	Sept. 11	1,546	7.5	Aug. 29	Sept. 13	15,993	15	July 14	Sept. 8									25,504	
Quadra Packing Co., Mink Arm, Boca de Quadra	600	12,500	11	July 4	Aug. 25	2,500	7.5	Aug. 25	Sept. 20	21,000	20	July 16	Aug. 30					1,000	7	July 28	Aug. 20	37,000	130 casks full king; 12 barrels white king bellies; 200 barrels full redfish; 1,500 barrels clean herring.
Metlakahtla Industrial Co., Metlakahtla	700	6,373	13.4	July 1	Sept. 2	997	8	Aug. 8	Sept. 15	4,952	22	July 19	Aug. 26									12,322	
North Pacific Trading and Packing Co., Klawak	500	14,600	14	June 20	Aug. 24	2,000	6	Aug. 16	Sept. 18	2,500	20	July 24	Aug. 20									19,100	
Pacific Steam Whaling Co., Hunter Bay	1,600	12,770	12	June 14	Sept. 4	5,795	9	Aug. 17	Sept. 13	19,700	18.9	July 25	Sept. 12									38,265	900 half barrels full humpbacks.
Total		864,254				39,402				149,159				23,400				1,931				1,078,146	

Alaska pack of canned salmon, 1900.

[For salt output of canning companies, see page 313.]

Name of company and location of cannery.	Daily capacity in cases.	Redfish.				Cohoes.				Humpbacks.				King.				Dog.				Total number of cases packed.
		Number of cases packed.	Average number fish per case.	Packing.		Number of cases packed.	Average number fish per case.	Packing.		Number of cases packed.	Average number fish per case.	Packing.		Number of cases packed.	Average number fish per case.	Packing.		Number of cases packed.	Average number fish per case.	Packing.		
				Began.	Ceased.			Began.	Ceased.			Began.	Ceased.			Began.	Ceased.			Began.	Ceased.	
Arctic Packing Co. (A. P. A.), Nushagak Bay	2,400	57,230	13	June 23	July 23	1,254	10	July 22	July 23					3,530	3	June 15	June 25	1,921	13	June 19	June 27	63,935
Alaska Packing Co. (A. P. A.), Nushagak Bay	2,400	56,228	13	June 25	July 24	332	10	July 21	July 24					2,543	3	June 17	...do...	1,694	13	...do...	...do...	60,797
Bristol Bay Canning Co. (A. P. A.), Nushagak Bay	2,400	57,079	13	June 20	July 25	331	10	July 23	July 23					2,256	3	...do...	June 28	2,331	13	June 23	...do...	62,597
Pacific Steam Whaling Co., Nushagak Bay	1,600	39,223	13	June 22	July 22									2,291	3.6	June 12	July 22	1,873	13	June 20	July 1	43,387
Alaska Fishermen's Packing Co., Nushagak Bay	1,600	38,100	12.5	June 25	...do...									1,990	3	June 15	...do...					40,090
Point Roberts Packing Co. (A. P. A.), Kvichak Bay	4,800	99,578	12.5	June 23	July 25	297	10	July 20	July 25	1,676		July 15	July 25	341	3	June 23	July 25					101,892
Kvichak Packing Co. (A. P. A.), Kvichak Bay	2,400	45,200	12.5	June 28	Aug. 1																	45,200
Arctic Packing Co. (A. P. A.), Naknek River	2,400	61,816	12.5	June 18	July 28					449	20	July 25	July 25	69	3	June 18	June 24					62,334
Naknek Packing Co., Naknek River	1,500	35,675	12	June 23	July 25					352	22	July 23	July 28	31	4.8	(Scattering latter part of season.)						36,058
Egegak Packing Co. (A. P. A.), Egegak River	1,600	21,652	12.5	July 1	July 28																	21,652
Ugashik Fishing Station (A. P. A.), Ugashik River	2,400	54,581	13	June 21	July 29									101	3	June 18	June 29					54,682
Bristol Packing Co., Ugashik River	500	6,653	12	July 9	...do...																	6,653
Chignik Bay Co. (A. P. A.), Chignik Lagoon	1,600	40,334	10.5	June 10	Aug. 12	62	10	Aug. 3	Aug. 12													40,396
Pacific Steam Whaling Co., Anchorage Bay, Chignik	900	32,966	10.5	June 9	Aug. 6													120	10	July 20	July 28	33,086
Hume Bros. & Hume, Anchorage Bay, Chignik	800	23,003	10.5	June 6	Aug. 19					[1] 3,614		July 2	Aug. 19									26,617
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak	1,000	32,342	13.5	June 8	Aug. 13																	32,342
Karluk Packing Co. (A. P. A.), Karluk	1,800	77,558	13.6	June 9	Sept. 14	1,382	7.2	Aug. 25	Sept. 14					475	5	June 9	June 24					79,415
Alaska Improvement Co. (A. P. A.), Karluk	1,800	69,712	13.9	June 4	Sept. 21	2,791	8	...do...	Sept. 21					612	4.9	June 5	June 28					73,115
Uganuk Fishing Station (A. P. A.), Uganuk Bay	1,000	13,370	12.8	June 9	July 17																	13,370
Pacific Steam Whaling Co., Uyak Bay	900	29,384	12.5	May 28	Aug. 25					1,025	21	July 20	Aug. 26									30,409
Hume Bros. & Hume, Uyak Bay	900	27,636	12.5	June 5	Sept. 20					2,064	21	July 5	Sept. 20									29,700
Alaska Salmon Association, Chuitna River	500	3,640	12	July 1	Aug. 9					5		(Latter part of season.)		[2] 326 [3] 922	3.5	June 10	July 2	12		(Latter part of season.)		4,905
Pacific Steam Whaling Co., Kenai	800	20,924	13	June 1	Aug. 10	1,765	8.1	July 1	Aug. 10					2,400	3.6	May 29	July 10					25,089
Arctic Fishing Co. (A. P. A.), Kussilof River	1,500	22,185	13	May 27	Aug. 12	5,427	12	July 16	Aug. 12					6,169	3	May 27	July 22					33,781
Pacific Packing Co. (A. P. A.), Odiak	1,500	35,049	11.5	May 9	Aug. 4					3,888	22¼	July 6	Aug. 2	473	4½	May 9	June 12					39,410
Pacific Steam Whaling Co., Orca	800	28,501	12	May 7	July 22					1,718	28	July 20	July 24	369	4.2	May 7	June 7					30,588
Western Fisheries Co., Dundas Bay	300	6,130	12	June 28	Aug. 25	977	7.5	July 30	Sept. 20	1,866	18	July 10	Aug. 10	60	4.5	Sept. 1	Sept. 30	4,760	6.5	July 15	Sept. 20	13,793
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor	1,600	51,856	11	July 9	Sept. 1	513	7.5	Aug. 20	Sept. 1					3,232	3.5	May 29	June 30					55,601
Chilkoot Packing Co., Chilkoot Inlet	300	13,948	8.3	June 30	Sept. 7	744	8	Sept. 7	Sept. 15									158	8	Sept. 16	Sept. 25	14,850
Taku Packing Co., Taku Inlet	250	6,648	9	July 5	Aug. 12	3,227	7	Aug. 1	...do...					[2] 3,150 [4] 454 [3] 771	2.7	May 17	June 26	2,472	6.5	Aug. 15	...do...	16,722
Taku Fishing Co., Port Snettisham	300	2,542	9	July 9	July 27	756	7	Sept. 1	Sept. 24	3,593	21	July 25	Aug. 16	[2] 454 [3] 97	3	June 1	June 20	2,016	7	July 9	Sept. 24	9,458
Icy Strait Packing Co., Petersburg, Wrangell Narrows	1,000	9,941	15	June 20	Aug. 20	1,500	7	Aug. 20	Oct. 10	10,000	20	July 15	Sept. 15					8,500	8.5	July 15	Oct. 30	29,941
Royer-Warnock Packing Co., Beecher Pass	20	480	12	July 1	Aug. 10	1,060	7.5	July 25	Sept. 1									20	7.8	(Scattering during August.)		1,560
Glacier Packing Co. (A. P. A.), Point Highfield	1,500	10,848	10.1	June 18	...do...	9,401	7.4	July 10	Sept. 18	36,432	15.8	July 2	Aug. 22	1,837	3.8	May 15	July 1					58,518
Thlinket Packing Co., Gerard Point	800	3,965	11	June 28	Aug. 16	2,349	7.5	Aug. 2	Sept. 21	15,540	18	July 12	Aug. 31	2,049	3	May 14	June 28	1,737		Aug. 1	Sept. 15	25,640
Fidalgo Island Canning Co., Ketchikan	1,000	6,399	11.5	July 10	Aug. 31	832	10	July 13	Sept. 8	19,685	19.25	July 13	Sept. 8					340	8.5	Aug. 24	Sept. 8	27,256
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring	1,800	16,219	11.6	June 17	Aug. 29	3,825	9	Aug. 29	Sept. 18	47,114	19	July 17	Sept. 6									67,158
Boston Fishing and Trading Co., Yes Bay	800	9,825	8.5	July 13	Sept. 7	2,306	7.5	Aug. 20	Sept. 27	20,051	15	July 18	Sept. 18	713	2.5	June 25	July 10	728	6	July 10	Sept. 27	33,623
Quadra Packing Co., Mink Arm, Boca de Quadra	800	6,000	10.7	July 14	Aug. 25	600	7.5	Aug. 25	Sept. 20	6,000	20	July 17	Aug. 31					1,000	7	July 17	Aug. 31	13,600
Metlakahtla Industrial Co., Metlakahtla	700	6,930	13.7	June 20	Sept. 5	610	8	July 27	Sept. 12	9,690	19.9	July 18	Sept. 4					330	8.5	Aug. 25	Sept. 10	17,560
North Pacific Trading and Packing Co., Klawak	800	8,228	14.3	June 17	Aug. 25	3,973	8	Aug. 17	Sept. 25	15,551	17	July 17	Aug. 27									27,752
Pacific Steam Whaling Co., Hunter Bay	1,600	7,828	12.8	June 18	Aug. 10	4,070	9	July 31	Sept. 10	31,709	18.6	...do...	Aug. 28									43,607
Total		1,197,406				50,984				232,022				37,715				30,012				1,548,139

[1] Humpbacks and dog mixed—under "pink" label. [2] Red. [3] White. [4] Pink.

The following recapitulation shows the total packs for 1898, 1899, and 1900, and the percentage the different species contribute to each pack:

Species.	Cases.	Per cent.
1898.		
Redfish	782,941	81.12
Cohoes	54,711	5.67
Humpbacks	109,399	11.34
King	12,862	1.33
Dog	5,184	.54
Total	965,097	.....
1899.		
Redfish	864,254	80.16
Cohoes	39,402	3.65
Humpbacks	149,159	13.81
King	23,400	2.17
Dog	1,931	.18
Total	1,078,146	.....
1900.		
Redfish	1,197,406	77.34
Cohoes	50,984	3.29
Humpbacks	232,022	14.99
King	37,715	2.44
Dog	30,012	1.94
Total	1,548,139	.....

Salt salmon pack of Alaska, 1900.

Name of concern and location of saltery.	King, whole.	King, bellies.	Redfish, whole.	
	Barrels.	*Barrels.*	*Barrels.*	*Half bbls.*
Alaska Packing Co. (A. P. A.), Nushagak Bay			1,420	698
Pacific Steam Whaling Co., Nushagak Bay			415	
Alaska Fishermen's Packing Co., Nushagak Bay			465	105
C. E. Whitney & Co., Nushagak Bay	536		7,186	
Point Roberts Packing Co. (A. P. A.), Kvichak Bay			92	115
Arctic Packing Co. (A. P. A.), Naknek River			1,356	1,141
Naknek Packing Co. Naknek River	22		1,150	
Egegak Packing Co. (A. P. A.), Egegak River			852	1,513
Ugashik Fishing Station (A. P. A.), Ugashik River			603	606
Bristol Packing Co., Ugashik River			1,150	
Hume Bros. and Hume, Uyak Bay			25	
Alaska Salmon Association, Chuitna River			44	
Perry Hinkle, Port Althorp, Surge Bay			600	
Icy Strait Packing Co., Bartlett Bay, Icy Strait			530	
Icy Strait Packing Co., Taku Inlet	400	12		
Perry Hinkle, Freshwater Bay and Basket Bay			900	
Alaska Oil and Guano Co., Killisnoo	5		210	8
Great Northern Fish Co., Redfish Bay, Baranof Island			850	
Jack Mantle, Point Ellis, Kuiu Island			220	
Zip Moon, Point Barrie			200	
Icy Strait Packing Co., Shipley Bay			200	
Royer-Warnock Packing Co., Beecher Pass			19	
Great Northern Fish Co., Union Bay			100	
John E. Rice, Karta Bay			75	25
Alaska Packers Association, Hetta Inlet			179	
Total	963	12	19,041	4,211

Name of concern and location of saltery.	Cohoes, whole.		Humpbacks, whole.	Humpbacks, bellies.		Dog, whole.	Remarks.
	Barrels.	*Half bbls.*	*Barrels.*	*Barrels.*	*Half bbls.*	*Barrels.*	
Ugashik Fishing Station (A. P. A.) Ugashik River.	10						[1] Bellies.
Pacific Steam Whaling Co., Anchorage Bay, Chignik.				69			
Alaska Salmon Association, Chuitna River			3				
Icy Strait Packing Co., Bartlett Bay, Icy Strait.	120						
Alaska Oil and Guano Co., Killisnoo					523		Also 100 barrels and 185 half barrels herring.
Zip Moon, Point Barrie			15				
Finn & Young, Shakan			[2] 500				[2] Includes some redfish and cohoes.
Fred. Brockman, Sarcar					225		
Icy Strait Packing Co., hulk *Blanche*, Wrangell Narrows.	100						Also 1,000 barrels herring.
Pacific Coast and Norway Packing Co., Wrangell Narrows.	8						Also 250 barrels herring.
Tom McCauley, Whale Passage					900		
John Frey, Zimovia Strait			200		300		
Great Northern Fish Co., Union Bay	[3] 400		4,500				[3] Includes some bright-fleshed dog salmon packed as cohoes.
Robert Bell, Thorne Bay	140			280	500		
Great Northern Fish Co., Karta Bay						[4] 1,200	[4] Dry salted.
John E. Rice, Karta Bay	75	50				[5] 1,207	[5] Dry salted.
Alex. Miller, Cholmondeley Sound			700		800		
Z. Doty, Mink Arm, Boca de Quadra						[6] 150	[6] Dry salted; estimated.
Alaska Packers Association, Hetta Inlet				61	84		
Craig Miller, Copper Mountain Bay			400		450		
Banter & West, Sukkwan Inlet							Sold fresh to canneries; salted few for local use.
Total	853	50	6,318	410	3,782	2,557	

RECAPITULATION.

Species.	Description.	Barrels.	Half barrels.
King	Whole	963	
	Bellies	12	
Redfish	Whole	19,041	4,211
Cohoes	Whole	843	50
	Bellies	10	
Humpbacks	Whole	6,318	
	Bellies	410	3,782
Dog	Whole	2,557	
	Total	30,154	8,043
	Half barrels reduced at 2 for 1 to barrels	4,021	
	Grand total	34,175	

Vessels employed, 1898.

Name of company and location of cannery.	Steam vessels.					
	Name.	Class.	Tons.	Crew.	Value.	Ownership.
Arctic Packing Co. (A. P. A.), Alaska Packing Co. (Nushagak Bay), Bristol Bay Canning Co. (Nushagak Bay)	Polar Bear	Steamer	28	5	$12,000	Owned.
	Amy S	Launch	5	2	3,000	Do.
	Tyone	do	5	2	4,500	Do.
	Corrinne	do	5	2	1,500	Do.
Point Roberts Packing Co. (A. P. A)., Kvichak Bay.	President	Steamer	238	9	40,000	Do.
	Herbert	Launch	5	2	4,000	Do.
	Northern Light	do	4	2	3,000	Do.
Arctic Packing Co. (A. P. A.), Naknek River.	Thistle[1]	Steamer	56	5	25,000	Do.
	Ralph L	Launch	5	2	4,500	Do.
Naknek Packing Co., Naknek River	Amelia	Gas launch	5	2	1,200	Do.
Ugashik Fishing Station (A. P. A.), Ugashik River.	Cathie K	Launch	3	2	2,500	Do.
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	Afognak	Steamer	37	5	16,000	Do.
	Baby Ruth	Stern-wheel	10	4	4,500	Do.
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	Esquimaux	Launch	5	2	2,500	Do.
Hume Bros. & Hume, Anchorage Bay, Chignik.	Ethel and Marian	do	6	3	2,800	Do.
	Florence Hume	do	5	2	3,000	Do.
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	Hattie Gage	Steamer	42	5	17,000	Do.
Karluk Packing Co. (A. P. A.), Karluk.	Kadiak	do	58	9	20,000	Do.
Alaska Improvement Co. (A. P. A.), Karluk.	Gertie Story	do	36	7	10,000	Do.
	Delphine	Launch	5	2	2,500	Do.
Hume-Aleutian Packing Co. (A. P. A.), Karluk.	Aurora	do	5	2	3,500	Do.
	Ida	do	5	2	2,700	Do.
Uganuk Fishing Station (A. P. A.), Uganuk Bay.	Julia M	do	5	2	2,000	Do.
Pacific Steam Whaling Co., Uyak Bay.	Golden Gate	Steamer	59	8	25,000	Do.
	Kenai	Launch	5	2	7,000	Do.
Hume Bros. & Hume, Uyak Bay	Equator	Steamer	42	7	10,000	Do.
	Herbert Hume	Launch	5	2	3,500	Do.
Pacific Steam Whaling Co., Kenai	Salmo	Steamer	28	6	10,000	Do.
	Anita[2]	Launch	5	2	1,000	Do.
Arctic Fishing Co. (A. P. A.), Kussilof River.	Jennie	Steamer	69	6	26,000	Do.
	Arthur	Launch	5	2	2,000	Do.
Pacific Packing Co. (A. P. A.), Odiak.	S. B. Matthews	Stern-wheel	164	6	14,000	Do.
	Pacific	Steamer	31	6	14,000	Do.
	Susanna	Stern-wheel	18	4	8,000	Do.
Pacific Steam Whaling Co., Orca	Wild Cat	do	104	4	10,000	Do.
	Thlinket	do	90	4	10,000	Do.
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	Elsie	Steamer	37	4	16,000	Do.
	Lillian	do	19	3	9,000	Do.
Glacier Packing Co. (A. P. A.), Point Highfield.	Ella Rohlfs	do	36	5	14,000	Do.
	Aleut	do	19	5	10,000	Do.
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	Novelty	do	33	5	12,000	Do.
	Arctic	do	21	5	8,000	Do.
Boston Fishing and Trading Co., Yes Bay.	Rosie	Launch	8	2	2,000	Do.
Quadra Packing Co., Mink Arm, Boca de Quadra.	White Wings	Steamer	34	6	7,000	Do.
	Annie M. Nixon	do	18	6	6,000	Do.
Metlakahtla Industrial Co., Metlakahtla.	Herald	do	17	5	7,000	Do.
	Marie G. Haaven	do	12	5	4,000	Do.
Baranoff Packing Co., Redfish Bay.	Wigwam	do	24	5	10,000	Do.
North Pacific Trading and Packing Co., Klawak.	Klawack	do	10	4	5,000	Do.
	Cora	Launch	5	2	1,500	Do.
Pacific Steam Whaling Co., Hunter Bay.	Alice	Steamer	19	5	10,000	Do.

[1] Also attended Ugashik Station.

[2] Lost, fall of 1898.

Vessels employed, 1898—Continued.

Name of company and location of cannery.	Sail vessels.					
	Name.	Rig.	Tons.	Crew.	Value.	Ownership.
Arctic Packing Co. (A. P. A.), Alaska Packing Co. (A. P. A.), Bristol Bay Canning Co. (A. P. A.), Nushagak Bay.	Oriental	Ship	1,550	Fishermen	$40,000	Chartered.
	Indiana	do	1,413	Fishermen	40,000	Owned.
	Willie R. Hume	4-mast barkentine.	589	Fishermen	25,000	Chartered.
Point Roberts Packing Co. (A. P. A.), Kvichak Bay.	W. H. Macy	Ship	2,038	Fishermen	50,000	Do.
	Sterling[1]	do	1,637	Fishermen	30,000	Owned.
	Bohemia	do	1,528	Fishermen	35,000	Do.
	Prosper	3-mast schooner	229	Fishermen	15,000	Do.
Arctic Packing Co. (A. P. A.), Naknek River.	Merom	Bark	1,134	Fishermen	16,000	Do.
	Antelope	Schooner	117	Fishermen	7,000	Chartered.
Naknek Packing Co., Naknek River	B. P. Cheney	Bark	1,200	Fishermen	15,000	Owned.
Ugashik Fishing Station (A. P. A.), Ugashik River.	Nicolas Thayer	do	555	Fishermen	12,000	Do.
	Will W. Case	do	554	Fishermen	12,000	Do.
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	Llewellyn J. Morse	Ship	1,271	Fishermen	35,000	Do.
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	(Transports by calling vessel of company.)					
Hume Bros. & Hume, Anchorage Bay, Chignik.	Ferris S. Thompson	Bark	480	11	9,000	Owned.
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	Coryphene	do	733	Fishermen	10,000	Chartered.
Karluk Packing Co. (A. P. A.), Karluk.						
Alaska Improvement Co. (A. P. A.), Karluk.	St. Nicholas	Ship	1,687	Fishermen	40,000	Do.
Hume-Aleutian Packing Co. (A. P. A.), Karluk.	Santa Clara	do	1,453	Fishermen	35,000	Owned.
Uganuk Fishing Station (A. P. A.), Uganuk Bay.						
Pacific Steam Whaling Co., Uyak Bay.	(Transports by calling vessel of company.)					
Hume Bros. & Hume, Uyak Bay	Harvester[2]	Bark	716	12	9,000	Owned.
Pacific Steam Whaling Co., Kenai	(Transports by calling vessel of company.)					
Arctic Fishing Co. (A. P. A.), Kussilof River.	Centennial	Ship	1,138	Fishermen	20,000	Do.
Pacific Packing Co. (A. P. A.), Odiak.	Electra	Bark	939	Fishermen	12,000	Do.
Pacific Steam Whaling Co., Orca	America	Ship	1,908	Fishermen	40,000	Chartered.
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	Invincible	do	1,393	Fishermen	25,000	Do.
Glacier Packing Co. (A. P. A.), Point Highfield.	George Skolfield	do	1,275	Fishermen	20,000	Owned.
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	Hecla	do	1,435	Fishermen	25,000	Chartered
Boston Fishing and Trading Co., Yes Bay.	(Transports by regular line of steamers.)					
Quadra Packing Co., Mink Arm, Boca de Quadra.	(Transports by regular line of steamers.)					
Metlakahtla Industrial Co., Metlakahtla.	(Transports by regular line of steamers.)					
Baranoff Packing Co., Redfish Bay.	(Transports by regular line of steamers.)					
North Pacific Trading and Packing Co., Klawak.	(Transports by special sail charter.)					
Pacific Steam Whaling Co., Hunter Bay.	(Transports by calling vessel of company.)					

[1] Lost, May, 1898.

[2] Also attended Chignik.

RECAPITULATION.

	Number.	Net tonnage.	Value.
Steam	51	1,515	$449,700
Sail	24	26,971	577,000
Total	75	28,486	1,026,700

Vessels employed, 1899.

Name of company and location of cannery.	Steam vessels.					
	Name.	Class.	Tons.	Crew.	Value.	Ownership.
Arctic Packing Co. (A. P. A.), Alaska Packing Co. Nushagak Bay. Bristol Bay Canning Co. Bay.	Polar Bear	Steamer	28	5	$12,000	Owned.
	Wigwam	do	23	3	10,000	Do.
	Amy S	Launch	5	2	4,000	Do.
	Tyone	do	5	2	5,000	Do.
	Corrinne	do	5	2	1,500	Do.
Pacific Steam Whaling Co., Nushagak Bay.	Jeanie	Steamer	862	12	75,000	Do.
	Rattler	Launch	5	2	4,500	Do.
Alaska Fishermen's Packing Co., Nushagak Bay.	North Star	Steamer	34	4	15,000	Do.
Point Roberts Packing Co. (A.P.A.), Kvichak Bay.	President	do	238	9	40,000	Do.
	Herbert	Launch	5	2	4,000	Do.
	Northern Light	do	4	2	3,000	Do.
Arctic Packing Co. (A. P. A.), Naknek River.	Thistle[1]	Steamer	56	5	25,000	Do.
	Ralph L	Launch	5	2	4,500	Do.
Naknek Packing Co., Naknek River.	Amelia	Gas launch	5	2	1,800	Do.
Ugashik Fishing Station (A. P. A.), Ugashik River.	Collis	Launch	5	2	7,000	Do.
	Cathie K	do	3	2	2,500	Do.
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	Afognak	Steamer	37	5	17,000	Do.
	Baby Ruth	Stern-wheel	10	4	4,500	Do.
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	C. C. Cherry	Steamer	37	6	15,000	Do.
	Esquimaux	Launch	5	2	2,500	Do.
Hume Bros. & Hume, Anchorage Bay, Chignik.	Ethel and Marian	do	6	3	2,800	Do.
	Florence Hume	Launch	5	2	3,000	Do.
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	Hattie Gage	Steamer	42	5	17,000	Do.
Karluk Packing Co. (A. P. A.), Karluk.	Kadiak	do	58	9	20,000	Do.
Alaska Improvement Co. (A.P.A.), Karluk.	Gertie Story	do	36	7	11,000	Do.
	Karluk	Launch	8	2	8,000	Do.
Hume-Aleutian Packing Co. (A. P. A.), Karluk.	Delphine	do	5	2	2,500	Do.
	Aurora	do	5	2	3,000	Do.
Uganuk Fishing Station (A. P. A.), Uganuk Bay.	Ida	do	5	2	2,700	Do.
Pacific Steam Whaling Co., Uyak Bay.	Wallowa	Steamer	92	10	12,500	Chartered.
	Kenai	Launch	5	2	7,000	Owned.
	Equator	Steamer	42	7	11,000	Do.
Hume Bros. & Hume., Uyak Bay	Francis Cutting	do	59	8	10,000	Do.
	Herbert Hume	Launch	5	2	3,500	Do.
Pacific Steam Whaling Co., Kenai.	Duxbury	Gasoline	30	5	10,000	Do.
	Salmo	Steamer	28	6	10,000	Do.
Arctic Fishing Co. (A. P. A.), Kussilof River.	Jennie	do	69	6	28,000	Do.
	Arthur	Launch	5	2	1,800	Do.
Pacific Packing Co. (A. P. A.), Odiak.	S. B. Matthews	Stern-wheel	164	6	14,000	Do.
	Pacific	Steamer	31	6	14,000	Do.
	Susanna	Stern-wheel	18	4	8,000	Do.
Pacific Steam Whaling Co., Orca	Wild Cat	do	104	4	10,000	Do.
	Thlinket	do	90	4	10,000	Do.
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	Elsie	Steamer	37	4	16,000	Do.
	Lillian	do	19	3	9,000	Do.
Glacier Packing Co. (A. P. A.), Point Highfield.	Ella Rohlffs	do	36	5	14,000	Do.
	Aleut	do	19	5	10,000	Do.
Thlinket Packing Co., Point Gerard.	Perhaps	Launch	6	2	1,500	Do.
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	Novelty	Steamer	33	5	12,000	Do.
	Arctic	do	21	5	6,000	Do.
Boston Fishing and Trading Co., Yes Bay.	Rosie	Launch	8	2	2,000	Do.
Quadra Packing Co., Mink Arm, Boca de Quadra.	Gypsy Queen	Stern-wheel	58	None.	6,000	Do.
	White Wings	Steamer	34	6	7,000	Do.
	Annie M. Nixon	do	18	6	6,000	Do.
Metlakahtla Industrial Co., Metlakahtla.	Herald	do	17	5	8,000	Do.
	Marie G. Haaven	do	12	5	4,000	Do.
North Pacific Trading and Packing Co., Klawak.	Klawack	do	10	4	6,000	Do.
	Cora	Launch	5	2	1,500	Do.
Pacific Steam Whaling Co., Hunter Bay.	Golden Gate	Steamer	59	9	25,000	Do.
	Alice	do	19	5	11,000	Do.

[1] Also attended Uganuk.

Vessels employed, 1899—Continued.

Name of company and location of cannery.	Sail vessels.					
	Name.	Rig.	Tons.	Crews.	Value.	Ownership.
Arctic Packing Co., Alaska Packing Co., Bristol Bay Canning Co. (A. P. A.), Nushagak Bay.	Oriental	Ship	1,550	Fishermen.	$50,000	Chartered.
	Indiana[1]	do	1,413	do	45,000	Owned.
	Invincible	do	1,393	do	25,000	Chartered.
	Willie R. Hume	4-mast barkentine	589	do	25,000	Do.
Pacific Steam Whaling Co., Nushagak Bay.	R. W. Bartlett	3-mast schooner	473	do	20,000	Do.
Alaska Fishermen's Packing Co., Nushagak Bay.	Harry Morse	Bark	1,241	do	20,000	Do.
Point Roberts Packing Co. (A.P.A.), Kvichak Bay.	Bohemia	Ship	1,528	do	45,000	Owned.
	Prosper	3-mast schooner	229	do	15,000	Do.
Arctic Packing Co. (A. P. A.), Naknek River.	Merom	Bark	1,134	do	18,000	Do.
Naknek Packing Co., Naknek River.	B. P. Cheney	do	1,200	do	18,000	Do.
Ugashik Fishing Station (A. P. A.) Ugashik River.	Coryphene	do	733	do	15,000	Chartered.
	Nicolas Thayer	do	555	do	12,000	Owned.
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	Llewellyn J. Morse	Ship	1,271	do	35,000	Do.
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	(Transports by calling vessel of company.)					
Hume Bros. & Hume, Anchorage Bay, Chignik.	Ferris S. Thompson	Bark	480	11	10,000	Owned.
	Maid of Orleans	Schooner	171	8	7,000	Do.
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	Electra	Bark	939	Fishermen.	12,000	Do.
Karluk Packing Co. (A. P. A.), Karluk.						
Alaska Improvement Co. (A.P.A.), Karluk.	St. Nicholas	Ship	1,687	do	40,000	Chartered.
Hume-Aleutian Packing Co. (A. P. A), Karluk.	Santa Clara	do	1,453	do	35,000	Owned.
Uganuk Fishing Station (A. P. A.), Uganuk Bay.						
Pacific Steam Whaling Co., Uyak Bay.	(Transports by calling vessel of company.)					
Hume Bros. & Hume, Uyak Bay	Harvester	Bark	716	12	10,000	Owned.
Pacific Steam Whaling Co., Kenai	(Transports by calling vessel of company.)					
Arctic Fishing Co. (A. P. A.), Kussilof River.	Centennial	Ship	1,138	Fishermen.	25,000	Owned.
Pacific Packing Co. (A. P. A.), Odiak.	Charles B. Kenney	Bark	1,014	do	25,000	Chartered.
Pacific Steam Whaling Co., Orca	America	Ship	1,908	do	50,000	Do.
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	Two Brothers	do	1,263	do	35,000	Owned.
Glacier Packing Co. (A. P. A.), Point Highfield.	George Skolfield	do	1,275	do	20,000	Do.
Thlinket Packing Co., Point Gerard.	(*Transports by regular line of steamers.*)					
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	Sintram	Ship	1,495	Fishermen.	50,000	Chartered.
Boston Fishing and Trading Co., Yes Bay.	(Transports by regular line of steamers.)					
Quadra Packing Co., Mink Arm, Boca de Quadra.	Blanche	Schooner, hulk	107	Fishermen.	4,500	Owned.
	Elliott	Barge	43	do	1,000	Do.
Metlakahtla Industrial Co., Metlakahtla.	(Transports by regular line of steamers.)					
North Pacific Trading and Packing Co., Klawak.	(Transports by special sail charter.)					
Pacific Steam Whaling Co., Hunter Bay.	(Transports by calling vessel of company.)					

[1] Also called at Karluk.

RECAPITULATION.

	No.	Net tonnage.	Value.
Steam	60	2,700	$618,600
Sail	27	26,998	667,500
Total	87	29,698	1,286,100

Vessels employed, 1900.

Name of company and location of cannery.	Steam vessels.					
	Name.	Class.	Tons.	Crew.	Value.	Ownership.
Arctic Packing Co. (A. P. A.) Nushagak Bay.	Polar Bear	Steamer	28	5	$12,000	Owned.
Alaska Packing Co. (A. P. A.) Nushagak Bay.	Queen	do	18	3	10,000	Do.
Bristol Bay Canning Co. (A. P. A.) Nushagak Bay.	Amy S	Launch	5	2	4,000	Do.
	Tyone	do	5	2	6,000	Do.
Pacific Steam Whaling Co., Nushagak Bay	Rattler	do	5	2	4,500	Do.
Alaska Fishermen's Packing Co., Nushagak Bay.	North Star	Steamer	34	4	15,000	Do.
Point Roberts Packing Co. (A. P. A.) Kvichak Bay.	Kvichak	do	610	13	200,000	Do.
Kvichak Packing Co. (A. P. A.) Kvichak Bay.	Sayak	Stern-wheel	90	4	8,000	Do.
	Lillian	Steamer	19	3	9,000	Do.
	Herbert	Launch	5	2	4,000	Do.
Arctic Packing Co. (A. P. A.), Naknek River.	President[1]	Steamer	238	9	40,000	Do.
	Ralph L	Launch	5	2	4,500	Do.
	Northern Light	do	4	2	3,000	Do.
Naknek Packing Co., Naknek River	Fram	Steamer	12	3	8,000	Do.
Egegak Packing Co. (A. P. A.), Egegak River.	Llewellyn	Launch	5	None.	1,000	Do.
	Corrinne	do	5	2	2,000	Do.
Ugashik Fishing Station (A. P. A.), Ugashik River.	Thistle	Steamer	56	5	25,000	Do.
	Collis	Launch	5	2	7,000	Do.
	Cathie K	do	3	2	2,500	Do.
Bristol Packing Co., Ugashik River	Amelia	Gasoline launch	5	2	2,000	Do.
Chignik Bay Co. (A. P. A), Chignik Lagoon	Afognak	Steamer	37	5	18,000	Do.
	Baby Ruth	Stern-wheel	10	4	5,000	Do.
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	C. C. Cherry	Steamer	37	6	15,000	Do.
	Esquimaux	Launch	5	2	2,500	Do.
Hume Bros. & Hume, Anchorage Bay, Chignik.	Ethel and Marian	do	6	3	2,880	Do.
	Florence Hume	do	5	2	3,200	Do.
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	Hattie Gage	Steamer	42	5	17,000	Do.
	Aurora	Launch	5	None.	2,500	Do.
Karluk Packing Co. (A. P. A.), Karluk	Gertie Story	Steamer	36	7	12,000	Do.
	Kadiak	do	58	9	20,000	Do.
Alaska Improvement Co. (A. P. A), Karluk	Karluk	Launch	8	2	10,000	Do.
Uganuk Fishing Station (A. P. A.), Uganuk Bay.	Uganuk	do	8	2	10,000	Do.
	Ida	do	5	2	2,700	Do.
	Delphine	do	5	2	2,500	Do.
Pacific Steam Whaling Co., Uyak Bay	Shelikoff	Steamer	101	10	36,000	Do,
	Kenai	Launch	5	2	7,000	Do.
Hume Bros. & Hume, Uyak Bay	Francis Cutting	Steamer	59	8	10,000	Do.
	Equator	do	42	7	12,000	Do.
Alaska Salmon Association, Chuitna River	Herbert Hume	Launch	5	2	3,500	Do.
	King Fisher	do	7	3	5,500	Do.
Pacific Steam Whaling Co., Kenai	Duxbury	Gasoline vessel	30	5	10,000	Do.
	Salmo	Steamer	28	6	10,000	Do.
Arctic Fishing Co. (A. P. A.), Kussilof River	Jennie	do	69	6	30,000	Do.
	Reporter	do	26	3	10,000	Do.
	Arthur	Launch	5	2	1,800	Do.
Pacific Packing Co. (A. P. A.), Odiak	S. B. Matthews	Stern-wheel	164	6	14,000	Do.
	Pacific	Steamer	31	6	15,000	Do.
	Susanna	Stern-wheel	18	4	8,000	Do.
Pacific Steam Whaling Co., Orca	Wild Cat	do	104	4	10,000	Do.
	Thlinket	do	90	4	10,000	Do.
Western Fisheries Co., Dundas Bay	Beaver	Steamer	19	5	5,500	Do.
	Favorite	Launch	7	3	2,000	Chartered.
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	Elsie	Steamer	37	4	16,000	Owned.
Chilkoot Packing Co., Chilkoot Inlet	Estella	do	20	3	3,500	Do.
	J. R. Roberts	Launch	9	2	3,000	Chartered.
Taku Packing Co., Taku Inlet	Fawn	do	5	2	1,000	Owned.
Taku Fishing Co., Port Snettisham	N. & S	Steamer	10	2	1,800	Do.
	Pescadero	Launch	4	1	600	Do.
Icy Strait Packing Co., Petersburg, Wrangell Narrows.	Gypsy Queen	Stern-wheel	58	None.	6,000	Do.
	White Wings	Steamer	34	6	7,000	Do.
	Annie M. Nixon	do	18	6	6,000	Do.
Royer-Warnock Packing Co., Beecher Pass	Ro-Wa	Gasoline launch	4	2	800	Do.
Glacier Packing Co. (A.P.A.), Point Highfield.	Ella Rohlffs	Steamer	36	5	15,000	Do.
	Aleut	do	19	5	10,000	Do.
Thlinket Packing Co., Gerard Point	Baranoff	do	10	5	5,000	Chartered.
	Perhaps	Launch	6	2	1,500	Owned.
Fidalgo Island Canning Co., Ketchikan	Delta	Steamer	59	6	6,000	Chartered.
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	Novelty	do	33	5	12,000	Owned.
	Arctic	do	21	5	4,000	Do.
Boston Fishing and Trading Co., Yes Bay	Rosie	Launch	8	2	2,500	Do.
Quadra Packing Co., Mink Arm, Boca de Quadra.	Slowly	do	5	2	1,000	Chartered.
Metlakahtla Industrial Co., Metlakahtla	Herald	Steamer	17	5	9,000	Owned.
	Marie G. Haaven	do	12	5	5,000	Do.
North Pacific Trading and Packing Co., Klawak.	Klawack	do	10	4	7,000	Do.
	Cora	Launch	5	2	1,500	Do.
Pacific Steam Whaling Co., Hunter Bay	Golden Gate	Steamer	59	9	25,000	Do.
	Alice	do	19	5	12,000	Do.
	Alphonso XIII	Gasoline launch	5	2	3,000	Do.

[1] Also attended Egegak.

Vessels employed, 1900—Continued.

Name of company and location of cannery.	Sail vessels.					
	Name.	Rig.	Tons.	Crew.	Value.	Ownership.
Arctic Packing Co. (A. P. A.) Nushagak Bay.	Oriental	Ship	1,550	Fishermen	$55,000	Chartered.
Alaska Packing Co. (A. P. A.) Nushagak Bay.	Eclipse	do	1,469	Fishermen	35,000	Do.
Bristol Bay Canning Co. (A. P. A.) Nushagak Bay.	Tacoma	do	1,671	Fishermen	60,000	Owned.
Pacific Steam Whaling Co., Nushagak Bay.	Undaunted	Bark	1,647	Fishermen	35,000	Chartered.
Alaska Fishermen's Packing Co., Nushagak Bay.	Harry Morse	do	1,241	Fishermen	20,000	Do.
Point Roberts Packing Co. (A.P.A.) Kvichak Bay.	Servia	Ship	1,736	Fishermen	55,000	Do.
Kvichak Packing Co. (A.P.A.) Kvichak Bay.	St. Nicholas	do	1,687	Fishermen	50,000	Do.
	Bohemia	do	1,528	Fishermen	55,000	Owned.
	Prosper	3-masted schooner	229	Fishermen	15,000	Do.
Arctic Packing Co. (A. P. A.), Naknek River.	Indiana[1]	Ship	1,413	Fishermen	50,000	Do.
Naknek Packing Co., Naknek River	Merom[2]	Bark	1,134	Fishermen	20,000	Do.
Egegak Packing Co. (A. P. A.), Egegak River.	B. P. Cheney	do	1,200	Fishermen	20,000	Owned.
	Charles B. Kenney	do	1,014	Fishermen	30,000	Chartered.
	Will W. Case	do	554	Fishermen	18,000	Owned.
Ugashik Fishing Station (A. P. A.), Ugashik River.	Coryphene	do	733	Fishermen	15,000	Chartered.
	Nicolas Thayer	do	555	Fishermen	15,000	Owned.
	Premier	3-masted schooner	292	Fishermen	15,000	Do.
Bristol Packing Co., Ugashik River.	Agate	Bark	595	Fishermen	10,000	Do.
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	George Skolfield	Ship	1,275	Fishermen	20,000	Do.
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	(Transports by calling vessel of company.)					
Hume Bros. & Hume, Anchorage Bay, Chignik.	Ferris S. Thompson	Bark	480	11	12,000	Owned.
	Maid of Orleans	Schooner	171	8	8,000	Do.
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	Electra	Bark	939	Fishermen	15,000	Do.
Karluk Packing Co. (A. P. A.), Karluk.						
Alaska Improvement Co. (A.P.A.), Karluk.	Santa Clara	Ship	1,453	Fishermen	40,000	Do.
Uganuk Fishing Station (A. P. A.), Uganuk Bay.						
Pacific Steam Whaling Co., Uyak Bay.	(Transports by calling vessel of company.)					
Hume Bros. & Hume, Uyak Bay	Harvester	Bark	716	12	12,000	Owned.
Alaska Salmon Association, Chuitna River.	Prussia	do	1,131	Fishermen	25,000	Chartered.
Pacific Steam Whaling Co., Kenai	(Transports by calling vessel of company.)					
Arctic Fishing Co. (A. P. A.), Kussilof River.	Centennial	Ship	1,138	Fishermen	30,000	Owned.
Pacific Packing Co. (A. P. A.), Odiak	Kate Davenport	Bark	1,175	Fishermen	10,000	Chartered.
Pacific Steam Whaling Co., Orca	America	Ship	1,908	Fishermen	55,000	Do.
Western Fisheries Co., Dundas Bay.	(Transports by regular line of steamers.)					
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	Two Brothers	Ship	1,263	Fishermen	35,000	Owned.
Chilkoot Packing Co., Chilkoot Inlet.	(Transports by regular line of steamers.)					
Taku Packing Co., Taku Inlet	(Transports by regular line of steamers.)					
Taku Fishing Co., Port Snettisham.	(Transports by regular line of steamers.)					
Icy Strait Packing Co., Petersburg, Wrangell Narrows.	Blanche	Schooner hulk	107	Fishermen	4,500	Owned.
	Elliot	Barge	43	Fishermen	1,000	Do.
Royer-Warnock Packing Co., Beecher Pass.	(Transports by regular line of steamers.)					
Glacier Packing Co. (A. P. A.), Point Highfield.	Llewellyn J. Morse	Ship	1,271	Fishermen	35,000	Owned.
Thlinket Packing Co., Gerard Point	(Transports by regular line of steamers.)					
Fidalgo Island Canning Co., Ketchikan.	(Transports by regular line of steamers.)					
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	Sintram	Ship	1,495	Fishermen	50,000	Chartered.
Boston Fishing and Trading Co., Yes Bay.	(Transports by regular line of steamers.)					
Quadra Packing Co., Mink Arm, Boca de Quadra.	(Transports by regular line of steamers.)					
Metlakahtla Industrial Co., Metlakahtla.	(Transports by regular line of steamers.)					
North Pacific Trading and Packing Co., Klawak.	(Transports by special sail charter.)					
Pacific Steam Whaling Co., Hunter Bay.	(Transports by calling vessel of company.)					

[1] Also called at Karluk.

[2] Lost October 1900, at Karluk.

RECAPITULATION.

	No.	Net tonnage.	Value.
Steam	78	2,757	$856,280
Sail	33	34,813	925,500
Total	111	37,570	1,781,780

Labor employed, 1898.

Name of company and location of cannery.	Fishermen.		Other employees.			Total employees.
	White.	Native.	White.	Native.	Chinese.	
Arctic Packing Co / Alaska Packing Co / Bristol Bay Canning Co. (A. P. A.), Nushagak Bay	160	.....	51	75	306	592
Point Roberts Packing Co. (A. P. A.), Kvichak Bay	76	.....	25	25	300	426
Arctic Packing Co. (A. P. A.), Naknek River	40	.....	36	30	102	208
Naknek Packing Co., Naknek River	56	.....	11	8	95	170
Ugashik Fishing Station (A. P. A.), Ugashik River	50	.....	18	30	100	198
Chignik Bay Co. (A. P. A.), Chignik Lagoon	70	.....	[1]23	.....	100	193
Pacific Steam Whaling Co., Anchorage Bay, Chignik	60	.....	10	4	60	134
Hume Bros. & Hume, Anchorage Bay, Chignik	52	.....	10	6	60	128
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak	29	.....	9	15	59	112
Karluk Packing Co. (A. P. A.), Karluk / Alaska Improvement Co. (A. P. A.), Karluk / Hume-Aleutian Packing Co. (A. P. A.), Karluk / Uganuk Fishing Station (A. P. A.), Uganuk Bay	171	34	57	.....	393	655
Pacific Steam Whaling Co., Uyak Bay	52	13	6	4	52	127
Hume Bros. & Hume, Uyak Bay	50	6	12	.....	60	128
Pacific Steam Whaling Co., Kenai	32	10	6	6	60	114
Arctic Fishing Co. (A. P. A.), Kussilof River	40	10	10	.....	100	160
Pacific Packing Co. (A. P. A.), Odiak	60	6	30	6	60	162
Pacific Steam Whaling Co., Orca	60	.....	13	.....	60	133
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor	88	[2]12	12	[3]15	86	213
Glacier Packing Co. (A. P. A.), Point Highfield	24	150	7	4	86	271
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring	90	100	15	25	130	360
Boston Fishing and Trading Co., Yes Bay	12	13	4	13	31	73
Quadra Packing Co., Mink Arm, Boca de Quadra	[4]24	30	5	[5]30	45	134
Metlakahtla Industrial Co., Metlakahtla	.....	[6]23	.....	162	.....	185
Baranoff Packing Co., Redfish Bay	.....	17	3	6	31	57
North Pacific Trading and Packing Co., Klawak	.....	30	17	[7]57	14	118
Pacific Steam Whaling Co., Hunter Bay	18	([8])	10	.....	60	88
Total employees	1,314	454	400	521	2,450	5,139

Labor employed, 1899.

Arctic Packing Co / Alaska Packing Co / Bristol Bay Canning Co (A. P. A.), Nushagak Bay	160	.....	51	75	336	622
Pacific Steam Whaling Co., Nushagak Bay	38	.....	14	15	50	117
Alaska Fishermen's Packing Co., Nushagak Bay	34	.....	5	35	63	137
Point Roberts Packing Co. (A. P. A.), Kvichak Bay	91	.....	25	25	300	441
Arctic Packing Co. (A. P. A.), Naknek River	48	.....	42	30	102	222
Naknek Packing Co., Naknek River	62	.....	13	10	95	180
Ugashik Fishing Station (A. P. A.), Ugashik River	50	.....	18	30	100	198
Chignik Bay Co. (A. P. A.), Chignik Lagoon	70	.....	[1]23	.....	102	195
Pacific Steam Whaling Co., Anchorage Bay, Chignik	60	.....	10	4	60	134
Hume Bros. & Hume, Anchorage Bay, Chignik	52	.....	10	6	65	133
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak	30	.....	9	15	59	113
Karluk Packing Co. (A. P. A.), Karluk / Alaska Improvement Co. (A. P. A.), Karluk / Hume-Aleutian Packing Co. (A. P. A.), Karluk / Uganuk Fishing Station, (A. P. A.), Uganuk Bay	176	34	57	.....	393	660
Pacific Steam Whaling Co., Uyak Bay	60	26	6	4	52	148
Hume Bros. & Hume, Uyak Bay	50	6	12	.....	60	128
Pacific Steam Whaling Co., Kenai	32	10	6	6	60	114
Arctic Fishing Co. (A. P. A.), Kussilof River	42	10	10	.....	100	162
Pacific Packing Co. (A. P. A.), Odiak	60	6	30	6	60	162
Pacific Steam Whaling Co., Orca	60	.....	13	.....	60	133
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor	88	[9]12	12	[3]17	86	215
Glacier Packing Co. (A. P. A.), Point Highfield	24	150	7	4	86	271
Thlinket Packing Co., Gerard Point	12	19	[10]6	[3]20	16	73
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring	100	150	20	25	130	425
Boston Fishing and Trading Co., Yes Bay	15	15	5	15	40	90
Quadra Packing Co., Mink Arm, Boca de Quadra	26	40	5	[5]29	45	145
Metlakahtla Industrial Co., Metlakahtla	.....	[11]24	.....	17	.....	41
North Pacific Trading and Packing Co., Klawak	17	.....	17	[12]57	20	111
Pacific Steam Whaling Co., Hunter Bay	18	([13])	10	.....	60	88
Total employees	1,475	502	436	445	2,600	5,458

[1] Includes 3 coal miners.
[2] Purchased fish from 192 natives.
[3] Klootchmen.
[4] Labor figures approximate.
[5] Includes 25 Klootchmen.
[6] Purchased fish from 32 natives.
[7] Includes 12 men, 25 women, 20 children.
[8] Purchased fish from 50 natives.
[9] Purchased fish from 196 natives.
[10] Includes 1 woman, cooking.
[11] Purchased fish from 36 natives.
[12] Includes 12 men, 25 women, 20 children.
[13] Purchased fish from 150 natives.

Labor employed, 1900.

Name of company and location of cannery.	Fishermen.		Other employees.			Total employees.
	White.	Native.	White.	Native.	Chinese.	
Arctic Packing Co., Alaska Packing Co., Bristol Bay Canning Co. (A. P. A.), Nushagak Bay	215	.....	66	75	450	806
Pacific Steam Whaling Co., Nushagak Bay	56	.....	10	35	100	201
Alaska Fishermen's Packing Co., Nushagak Bay	55	.....	7	35	93	190
Point Roberts Packing Co., Kvichak Packing Co. (A. P. A.), Kvichak Bay	154	.....	25	25	[1] 300	672
			13	8	[2] 147	
Arctic Packing Co. (A. P. A.), Naknek River	58	.....	54	20	140	272
Naknek Packing Co., Naknek River	60	.....	12	11	131	214
Egegak Packing Co. (A. P. A.), Egegak River	39	.....	16	10	80	145
Ugashik Fishing Station (A. P. A.), Ugashik River	64	.....	24	20	140	248
Bristol Packing Co., Ugashik River	27	.....	6	10	48	91
Chignik Bay Co. (A. P. A.), Chignik Lagoon	63	.....	[3] 20	2	90	175
Pacific Steam Whaling Co., Anchorage Bay, Chignik	60	.....	10	4	60	134
Hume Bros. & Hume, Anchorage Bay, Chignik	52	.....	10	6	58	126
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak	40	.....	9	10	59	118
Karluk Packing Co. (A. P. A.), Karluk; Alaska Improvement Co. (A. P. A.), Karluk; Uganuk Fishing Station (A. P. A.), Uganuk Bay	171	13	43	8	263	498
Pacific Steam Whaling Co., Uyak Bay	64	26	6	4	56	156
Hume Bros. & Hume, Uyak Bay	52	9	12	.....	56	129
Alaska Salmon Association, Chuitna River	39	.....	16	.....	51	106
Pacific Steam Whaling Co., Kenai	40	10	6	6	60	122
Arctic Fishing Co. (A. P. A.), Kussilof River	45	10	10	.....	100	165
Pacific Packing Co. (A. P. A.), Odiak	60	6	30	6	60	162
Pacific Steam Whaling Co., Orca	60	.....	13	2	60	135
Western Fisheries Co., Dundas Bay	9	26	5	[4] 26	30	96
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor	102	[5] 10	12	[6] 16	86	226
Chilkoot Packing Co., Chilkoot Inlet	24	[7] 8	9	17	28	86
Taku Packing Co., Taku Inlet	30	14	7	2	19	72
Taku Fishing Co., Port Snettisham	16	20	4	.....	25	65
Icy Strait Packing Co., Petersburg, Wrangell Narrows	26	28	7	[8] 42	50	153
Royer-Warnock Packing Co., Beecher Pass	(9)	(9)	2	.....	[10] 11	13
Glacier Packing Co. (A. P. A.), Point Highfield	24	150	7	4	86	271
Thlinket Packing Co., Gerard Point	35	30	9	[11] 7	49	130
Fidalgo Island Canning Co., Ketchikan	34	[12] 41	7	[13] 50	50	182
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring	100	150	20	40	120	430
Boston Fishing and Trading Co., Yes Bay	15	15	5	15	61	111
Quadra Packing Co., Mink Arm, Boca de Quadra	24	40	5	[9] 25	43	137
Metlakahtla Industrial Co., Metlakahtla	.....	[14] 24	.....	174	174	372
North Pacific Trading and Packing Co., Klawak	.....	55	16	[15] 13	46	130
Pacific Steam Whaling Co., Hunter Bay	21	(16)	10	.....	90	121
Total employees	1,934	685	543	728	3,570	7,460

[1] Includes a few Japanese.
[2] Chinese and Japanese.
[3] Includes 3 coal miners.
[4] Includes 6 Klootchmen.
[5] Purchased fish from 224 natives.
[6] Klootchmen.
[7] Purchased fish from 16 natives in addition.
[8] Includes 28 Klootchmen.
[9] Purchased all fish.
[10] 10 Japanese; 1 Chinaman.
[11] Includes 5 Klootchmen.
[12] Includes 3 Japanese.
[13] Includes 40 Klootchmen.
[14] Purchased fish from 38 natives in addition.
[15] 3 Bucks; 10 Klootchmen.
[16] Purchased fish from 121 natives.

Net equipment, 1898.

Name of company and location of cannery.	Gill nets.			Seines.			Traps.		
	No.	Description.	Value per fathom.	No.	Description.	Value per fathom.	No.	Description.	Average value.
Arctic Packing Co. (A. P. A.), Nushagak. Alaska Packing Co. (A. P. A.), Nushagak. Bristol Bay Canning Co. (A. P. A.), Nushagak.	120 60	Redfish, 75 fms. by 24 m by 6½ in. King, 125 fms. by 24 m. by 9½ in.	$0.65 .65				1 3	Double; total leads 2,700 ft.; pots 75 ft. square. Single; inshore leads 300 to 500 ft.; pots 40 ft. square.	$4,000 1,200
Point Roberts Packing Co. (A. P. A.), Kvichak Bay.	40	Redfish, 75 fms. by 20 m. by 6½ in.	.65				2	1 double, 1 single; leads vary; pots 40 ft. square.	1,000
Arctic Packing Co. (A. P. A.), Naknek River.	36	Redfish, 65 fms. by 20 m. by 6½ in.	.65				2	Single; inshore leads are 775 ft.; channel, 1,500 ft.; pots 40 ft. square.	1,200
Naknek Packing Co., Naknek River.	20	Redfish, 75 fms. by 22 m. by 6½ in.	.65						
Ugashik Fishing Station (A. P. A.), Ugashik River.	42	Redfish, 85 fms. by 26 m. by 6½ in.	.65				2	Single; inshore leads are 500 ft.; pots 40 ft. square.	1,000
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	10	Redfish, 135 fms. by 30 m. by 6½ in.	.65	4	Drag, 75 to 180 fms. by 120 to 180 m. by 3 to 3½ in.	$1.50	10	Single; average shore leads 1,000 ft.; pots 40 ft. square.	1,500
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	11	Redfish, 260 fms. by 30 m. by 6 in.	.65	1 3	Drag, 300 fms. by 22 ft. by 3 in. Drag, 200 fms. by 22 ft. by 3 in.	1.50 1.50	10	Single; average shore leads 600 ft.; pots 40 ft. square.	1,500
Hume Bros. & Hume, Anchorage Bay, Chignik.	11	Redfish, 150 fms. by 26 and 40 m. by 6 in.	.65	1	Drag, 150 fms. by 25 ft. by 3 in.	1.50	7	5 single, 2 double; average shore and channel leads 800 ft. each; pots 40 ft. square.	1,500
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.				5 1	Drag, average 200 fms. by 80 to 120 m. by 3 in. Purse, 400 fms. (not rigged).	1.50			
Karluk Packing Co. (A. P. A.), Karluk. Alaska Improvement Co. (A. P. A.), Karluk. Hume-Aleutian Packing Co. (A. P. A.), Karluk. Uganuk Fishing Station (A. P. A.), Uganuk Bay.				10 6 3	Drag, 400 fms. by 185 m. by 3 in. Drag, 250 to 300 fms. by 120 to 160 m. by 3 in. Drag, 100 fms. by 80 m. by 3 in. (hatchery).	1.50 1.50 1.50	2	Floating; shore leads 1,200 and 1,800 ft. at Uganuk.	1,500
Pacific Steam Whaling Co., Uyak Bay.				1 1 3	Drag, 700 fms. by 180 m. by 3 in. Drag, 550 fms. by 180 m. by 3 in. Drag, 350 fms. by 180 m. by 3 in. (Also 10 spare seines of various sizes in reserve.)	1.50			
Hume Bros. & Hume, Uyak Bay.				8	Drag, 150 to 350 fms. by 100 to 160 m. by 3 in.	1.50			
Pacific Steam Whaling Co., Kenai.	10 10	King, 60 fms. by 22 m by 9½ in. Redfish, 60 fms. by 30 m. by 6 in.	.65 .65	1	Drag, 150 fms. 3 in.	1.50	4	Single; leads 600 ft.; pots 30 ft. square.	300
Arctic Fishing Co. (A. P. A.), Kussilof River.	30 30	Redfish, 60 fms. by 28 m. by 6½ in. King, 60 fms. by 22 m. by 9½ in.	.65 .65				6	Single; leads 100 to 700 ft.; pots 30 ft. square.	1,000
Pacific Packing Co. (A. P. A.), Odiak.	38	Redfish, 350 fms. by 30 m. by 6½ in.	.65	1	Drag, 250 fms. by 120 m. by 2½ in.	1.50			
Pacific Steam Whaling Co., Orca.	30	Redfish, 400 fms. by 28 m. by 6 to 6½ in.	.65	2	Drag, 120 fms. by 140 m. by 3 in.	1.50			
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	50 14	Redfish, 300 fms. by 28 m. by 6½ in. King, 180 fms. by 30 m. by 8½ in.	.65 .65						
Glacier Packing Co. (A. P. A.), Point Highfield.	12 12	King, 250 fms. by 28 m. by 8½ in. Redfish, 250 fms by 30 m. by 6½ in.	.65 .65	2 5	Drag, 120 fms. by 200 m. by 3 in. Purse, 120 fms. by 250 m. by 3 in.	1.50 2.00			

Net equipment, 1898—Continued.

Name of company and location of cannery.	Gill nets.			Seines.			Traps.		
	No.	Description.	Value per fathom.	No.	Description.	Value per fathom.	No.	Description.	Average value.
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	...	...	...	7	Purse, 150 to 200 fms. by 7 to 12 m. by 3 in.	$2.50	...	...	...
				10	Drag, 150 to 200 fms. by 4 to 6 m. by 3 in.	1.50	...	...	...
Boston Fishing and Trading Co., Yes Bay.	...	...	...	1	Purse, 230 fms. by 20 fms. by 3 in.	2.50	1	Double; shore lead 300 ft.; channel, 100 ft; 1 pot 30 ft. square, 1 pot 28 ft. square.	$1,000
				3	Drag, 175, 150, 120 fms. by 10, 8, 6 fms. by 3 in.	1.50			
Quadra Packing Co., Mink Arm, Boca de Quadra.	36	Redfish, 50 fms. by 40 m. by 5⅛ to 6 in.	$0.65	8	Purse, 135 to 180 fms. by 12 to 15 fms. by 3 in.	3.00	...	...	...
	36	Coho, 75 fms. by 30 m. by 7 in.	.65	2	Drag, 115 fms. by 8 fms. by 3 in.	2.00	...	...	...
	36	King, 50 fms. by 25 m. by 9 in.	.65						
Metlakahtla Industrial Co., Metlakahtla.	8	Redfish, average 172 fms. by 4 fms. by 5⅛ in.	.65	6	Purse, average 158 fms. by 8⅛ fms. by 3 in.	3.00	...	...	...
				9	Drag, average 163 by 6 fms. by 3 in.	1.50	...	...	...
Baranoff Packing Co., Redfish Bay.	...	...	...	2	Drag, 125 fms. by 3 in.	1.50	...	...	...
North Pacific Trading and Packing Co., Klawak.	...	...	...	3	Purse, 175 fms. by 240 m. by 3 in.	1.50	...	...	...
Pacific Steam Whaling Co., Hunter Bay.	...	...	...	15	Combination purse and drag, average 195 by 5 fms. by 3 in. mesh.	1.50	...	...	...

Net equipment, 1899.

Name of company and location of cannery.	Gill nets.			Seines.			Traps.		
	No.	Description.	Value per fath.	No.	Description.	Value per fath.	No.	Description.	Value, each.
Arctic Packing Co. (A. P. A.), Nushagak Bay.	120	Redfish, 75 fms. by 24 m. by 6⅛ in.	$0.65	...	...	...	1	Double; total leads 2,700 ft.; pots 75 ft. square.	$4,000
Alaska Packing Co. (A. P. A.), Nushagak Bay.	60	King, 125 fms. by 24 m. by 9¼ in.	.65				4	Single; inshore leads 300 to 500 ft.; pots 40 ft. square.	1,200
Bristol Bay Canning Co. (A. P. A.). Nushagak Bay.									
Pacific Steam Whaling Co., Nushagak.	30	Redfish, 75 fms. by 24 m. by 6⅛ in.	.65	...	...	...	...	...	...
	30	King, 125 fms. by 24 m. by 9¼ in.	.65	...	...	...	...	...	...
Alaska Fishermen's Packing Co., Nushagak.	30	Redfish, 70 fms. by 30 m. by 6⅛ in.	.75	...	...	...	...	...	...
	25	King, 70 fms. by 22 m. by 10 in.	.75	...	...	...	...	...	...
Point Roberts Packing Co. (A. P. A.), Koggiung, Kyichak River.	60	Redfish, 75 fms. by 20 m. by 6⅛ in.	.65	...	...	...	2	1 double, 1 single; leads vary; pots 40 ft. square.	1,000
Arctic Packing Co. (A. P. A.), Naknek River.	48	Redfish, 75 fms. by 20 m. by 6⅛ in.	.65	...	...	...	3	Single; inshore leads 800 ft.; channel 1,600 ft.; pots 40 ft. square.	1,200
Naknek Packing Co., Naknek River.	20	Redfish, 75 fms. by 22 m. by 6⅛ in.	.65	...	...	...	...	...	...
Ugashik Fishing Station (A. P. A.), Ugashik.	42	Redfish, 85 fms. by 26 m. by 6⅛ in.	.65	...	...	...	3	Single; inshore leads average 500 ft.; pots 40 ft. square.	1,000
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	10	Redfish, 135 fms. by 30 m. by 6⅛ in.	.65	4	Drag, 75 to 180 fms. by 120 to 180 m. by 3 to 3⅛ in.	$1.50	10	Single; aver. shore leads 1,000 ft.; pots 40 ft. square.	1,500
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	12	Redfish, 260 fms. by 30 m. by 6 in.	.65	2	Drag, 200 fms. by 22 ft. by 3 in.	1.50	8	Single; aver. shore leads 600 ft.; pots 40 ft. square.	1,500
				1	Drag, 300 fms. by 22 ft. by 3 in.	1.50			
Hume Bros. & Hume, Anchorage Bay, Chignik.	11	Redfish, 150 fms. by 26 to 40 m. by 6 in.	.65	1	Drag, 150 fms. by 25 ft. by 3 in.	1.50	7	5 single; 2 double; aver. shore and channel leads 800 ft. each; pots 40 ft. square.	1,500

Net equipment, 1899—Continued.

Name of company and location of cannery.	Gill nets.			Seines.			Traps.		
	No.	Description.	Value per fath.	No.	Description.	Value per fath.	No.	Description.	Value per fath.
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.				6	Drag, average 200 fms. by 100 to 130 m. by 3 in.	$1.50	1	Floating; lead 100 ms.; pot 40 by 190 ft.	$2,500
				1	Purse, 400 fms. (not rigged).	3.00			
Karluk Packing Co. (A. P. A.), Karluk.				10	Drag, 400 fms. by 185 m. by 3 in.	1.50	2	Floating; shore leads 1,200 and 1,800 ft. at Uganuk.	1,500
Alaska Improvement Co. (A. P. A.), Karluk.				6	Drag, 250 to 300 fms. by 120 to 160 m. by 3 in.	1.50			
Hume-Aleutian Packing Co. (A. P. A.), Karluk.				3	Drag, 100 fms. by 80 m. by 3 in. (Hatchery.)	1.50			
Uganuk Fishing Station (A. P. A.), Uganuk Bay.				1	Drag, 700 fms. by 180 m. by 3 in.	1.50			
Pacific Steam Whaling Co., Uyak Bay.				1	Drag, 550 fms. by 180 m. by 3 in.	1.50		(Also 10 spare seines of various sizes, in reserve.)	
				3	Drag, 350 fms. by 180 m. by 3 in.	1.50			
Hume Bros. & Hume, Uyak Bay.				8	Drag, 150 to 350 fms. by 100 to 160 m. by 3 in.	1.50			
Pacific Steam Whaling Co., Kenai.	20	Redfish, 60 fms. by 30 m. by 6 in.	$0.65	1	Drag, 150 fms. by 3 in.	1.50	5	Single; leads average 1,000 ft.; pots 30 ft. square.	500
	20	King, 60 fms. by 22 m. by 9½ in.	.65						
Arctic Fishing Co. (A. P. A.), Kussilof River.	30	Redfish, 60 fms. by 28 m. by 6½ in.	.65				8	Single; leads 100 to 700 ft.; pots 30 ft. square.	1,000
	30	King, 60 fms. by 22 m. by 9½ in.	.65						
Pacific Packing Co. (A. P. A.), Odiak.	38	Redfish, 350 fms. by 30 m. by 6½ in.	.65	1	Drag, 250 fms. by 120 m. by 2½ in.	1.50			
Pacific Steam Whaling Co., Orca.	30	Redfish, 400 fms. by 28 m. by 6 to 6½ in.	.65	2	Drag, 120 fms. by 140 m. by 3 in.	1.50			
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	50	Redfish, 300 fms. by 28 m. by 6½ in.	.65						
	14	King, 180 fms. by 30 m. by 8½ in.	.65						
Glacier Packing Co. (A. P. A.), Wrangell, Point Highfield.	12	Redfish, 250 fms. by 30 m. by 6½ in.	.65	5	Purse, 120 fms. by 250 m. by 3 in.	2.00			
	12	King, 250 fms. by 28 m. by 8½ in.	.65	2	Drag, 120 fms. by 200 m. by 3 in.	1.50			
Thlinket Packing Co., Gerard Point.	10	Redfish, 200 fms. by 22 m. by 6½ in.	.65	2	Drag, 90 fms. by 190 m. by 3 in.	1.50			
	4	King, 200 fms. by 22 m. by 9½ in.	.65	1	Drag, 65 fms. by 140 m. by 3 in.	1.50			
Alaska Salmon Packing and Fur Co., (A. P. A.). Loring.				15	Purse, 150 to 200 fms. by 7 to 12 fms. by 3 in.	2.50			
				10	Drag, 150 to 200 fms. by 4 to 6 fms. by 3 in.	1.50			
Boston Fishing and Trading Co., Yes Bay.				1	Purse, 230 fms. by 20 fms. by 3 in.	2.50	1	Double; shore lead 300 ft.; channel 100 ft.; 1 pot 30 ft. square; 1 pot 28 ft. square.	1,000
				3	Drag, 175 fms. by 10 fms. by 3 in.	1.50			
				3	Drag, 150 fms. by 8 fms. by 3 in.	1.50			
				3	Drag, 120 fms. by 6 fms. by 3 in.	1.50			
Quadra Packing Co., Mink Arm, Boca de Quadra.	36	Redfish, 50 fms. by 40 m. by 5½ to 6 in.	.65	9	Purse, 135 to 200 fms. by 12 to 15 fms. by 3 in.	3.00			
	36	Coho, 75 fms. by 30 m. by 7 in.	.65	2	Purse, 180 fms. by 15 fms. by 2 in. (herring).	2.50			
	36	King, 50 fms. by 25 m. by 9 in.	.65	2	Drag, 115 fms. by 8 fms. by 3 in.	2.00			
Metlakahtla Industrial Co., Metlakahtla.	7	Redfish, average 172 by 4 fms. by 5½ in.	.65	7	Purse, average 158 fms. by 8½ fms. by 3 in.	3.00			
				7	Drag, average 163 fms. by 6 fms. by 3 in.	1.50			
North Pacific Trading and Packing Co., Klawak.				3	Purse, 175 fms. by 240 m. by 3 in.	1.50			
Pacific Steam Whaling Co., Hunter Bay.				15	Combination purse and drag; average 195 fms. by 5 fms. by 3 in.	1.50			

Net equipment, 1900.

Name of company and location of cannery.	Gill nets.			Seines.			Traps.		
	No.	Description.	Value per fath.	No.	Description.	Value per fath.	No.	Description.	Aver. value.
Arctic Packing Co. (A. P. A.), Nushagak Bay.	160	Redfish, 75 fms. by 24 m. by 6½ in.	$0.65				1	Double; total leads, 2,700 ft.; pots, 75 ft. square.	$4,000
Alaska Packing Co. (A. P. A.), Nushagak Bay. Bristol Bay Canning Co. (A. P. A.), Nushagak Bay	120	King, 125 fms. by 24 m. by 9½ in.	.65				3	Single; inshore leads, 300 to 500 ft.; pots, 40 ft. square.	1,200
Pacific Steam Whaling Co., Nushagak Bay.	50	Redfish, 75 fms. by 24 m. by 6½ in.	.65						
	44	King, 125 fms. by 24 m. by 9½ in.	.65						
Alaska Fishermen's Packing Co., Nushagak Bay.	30	Redfish, 70 fms. by 30 m. by 6½ in.	.75						
	25	King, 70 fms. by 22 m. by 10 in.	.75						
Point Roberts Packing Co. (A. P. A.), Kvichak Bay. Kvichak Packing Co. (A. P. A.), Kvichak Bay.	100	Redfish, 75 fms. by 20 m. by 6½ in.	.65				1	Double; inshore leads, 60 ft.; channel leads, 300 ft.; pots, 40 ft. square.	1,000
Arctic Packing Co. (A. P. A.), Naknek River.	[1]76	Redfish, 75 fms. by 22 m. by 6½ in.	.65				[2]3	Single; inshore leads, 750 ft.; channel leads, 1,400 ft.; pots, 40 ft. square.	1,200
Naknek Packing Co., Naknek River.	21	Redfish, 75 fms. by 22 m. by 6½ in.	.65						
Egegak Packing Co. (A. P. A.), Egegak River.	20	Redfish, 80 fms. by 26 m. by 6½ in.	.65				[3]2	Single; inshore leads, 200 and 250 ft.; pots, 40 ft. square.	1,000
Ugashik Fishing Station (A. P. A.), Ugashik River.	48	Redfish, 85 fms. by 26 m. by 6½ in.	.65				3	Single; inshore leads, 500 ft., average; pots, 40 ft. square.	1,000
Bristol Packing Co., Ugashik River.	8	Redfish, 75 fms. by 23 m. by 6½ in.	.65						
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	[4]10	Redfish, 135 fms. by 30 m. by 6½ in.	.65	[5]4	Drag, 75 to 180 fms. by 120 to 180 m. by 3 and 3½ in.	$1.50	6 Sing. 2 Doub.	Aver. inshore leads, 1,000 ft.; aver. channel leads, 900 ft.; pots, 40 ft. sq.	1,500
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	10	Redfish, 260 fms. by 30 m. by 6 in.	.65	2 1	Drag, 200 fms. by 22 ft. deep by 3 in. Drag, 300 fms. by 22 ft. deep by 3 in.	1.50 1.50	2 Sing. 2 Doub.	Aver. inshore and channel leads, each 800 ft.; pots, 40 ft. square.	1,500
Hume Bros. & Hume, Anchorage Bay, Chignik.	15	Redfish, 150 fms. by 26 to 40 m. by 6 in.	.65	2	Drag, 150 fms. by 25 ft. deep by 3 in.	1.50	5 Sing. 2 Doub.	Aver. inshore and channel leads, each 800 ft.; pots, 40 ft. square.	1,500
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.				1 6	Purse, 400 fms. (not rigged). Drag, average 200 fms. by 100 to 130 m. by 3 in.	3.00 1.50	1	Floating; inshore lead, 100 fms.; pot, 40 by 90 ft.	2,500
Karluk Packing Co. (A. P. A.), Karluk. Alaska Improvement Co. (A. P. A.), Karluk. Uganuk Fishing Station, (A. P. A.), Uganuk Bay.				10 6 3	Drag, 400 fms. by 185 m. by 3 in. Drag, 250 to 300 fms. by 120 to 160 m. by 3 in. Drag, 100 fms. by 80 m. by 3 in. (hatchery).	1.50 1.50 1.50	2	Floating; inshore leads, 1,200 and 1,800 ft.; at Uganuk.	1,500
Pacific Steam Whaling Co., Uyak Bay.				1 1 3	Drag, 700 fms. by 180 m. by 3 in. Drag, 550 fms. by 180 m. by 3 in. Drag, 350 fms. by 180 m. by 3 in.	1.50		(Also 10 spare seines of various sizes, in reserve.)	
Hume Bros. & Hume, Uyak Bay.				10	Drag, 150 to 350 fms. by 160 m. by 3 in.	1.50			
Alaska Salmon Association, Chuitna River.	20	Redfish, 65 fms. by 30 m. by 5¾ in.	.65						
	20	Redfish and cohoes, 65 fms. by 30 m. by 6½ in.	.65	1	Drag, 150 fms. by 5 fms. by 3 in.	1.65	4	Single; inshore leads, 600 ft.; pots, 40 ft. square.	1,500
	20	King, 65 fms. by 30 m. by 9 in.	.65						
Pacific Steam Whaling Co., Kenai.	20	Redfish, 60 fms. by 30 m. by 6 in.	.65						
	20	King, 60 fms. by 22 m. by 9½ in.	.65	1	Drag, 150 fms., 3 in.	1.50	5	Single; inshore leads average 1,000 ft.; pots, 30 ft. square.	500

[1] 47 of these nets not in use; reserve.
[2] 1 of these traps not equipped with web; reserve.
[3] Traps on hand but not in use; rese rve.
[4] Only 1 gill net in use; 9 in reserve.
[5] 1 seine not used; reserve.

Net equipment, 1900—Continued.

Name of company and location of cannery.	Gill nets.			Seines.			Traps.		
	No.	Description.	Value per fath.	No.	Description.	Value per fath.	No.	Description.	Aver. value.
Arctic Fishing Co. (A. P. A.), Kussilof River.	30	Redfish, 60 fms. by 28 m. by 6¼ in.	$0.65				8	Single; leads from 100 to 700 ft.; pots, 30 ft. square.	$1,000
	30	King, 60 fms. by 22 m. by 9¼ in.	.65						
Pacific Packing Co. (A. P. A.), Odiak	38	Redfish, 350 fms. by 30 m. by 6¼ in.	.65	1	Drag, 250 fms. by 120 m. by 2⅛ in.	$1.50			
Pacific Steam Whaling Co., Orca.	30	Redfish, 400 fms. by 28 m. by 6¼ in.	.65	2	Drag, 120 fms. by 40 m. by 3 in.	1.50			
Western Fisheries Co., Dundas Bay.	4	150 fms. long	.65	1	Purse, 150 fms. long.	3.00			
				6	Drag, average 100 fms. in length.	1.50			
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	56	Redfish, 300 fms. by 28 m. by 6¼ in.	.65						
	14	King, 180 fms. by 30 m. by 8¼ in.	.65						
Chilkoot Packing Co., Chilkoot Inlet.	16	Redfish, 270 fms. by 25 m. by 6¼ in.	.65	1	Purse, 160 fms. by 20 fms. by 3¾ in.	(1)			
Taku Packing Co., Taku Inlet.	15	Redfish, 150 fms. by 35 m. by 6¼ in.	.65						
	22	King, 150 fms. by 22 m. by 9¼ in.	.65						
Taku Fishing Co., Port Snettisham.	14	Redfish, 150 fms. by 30 m. by 6¼ in.	.65	1	Purse, 165 fms. by 300 m. by 3⅛ in.	(2)			
	4	King, 150 fms. by 20 m. by 9¼ in.	.65	3	Drag, 100 fms. by 5 fms. by 3¼ in.	1.50			
Icy Strait Packing Co., Petersburg, Wrangell Narrows.	120	Redfish, 50 fms. by 40 m. by 5¾ in.	.65	5	Purse, 120 fms. by 10 fms. by 3 in.	3.00			
				5	Drag, 120 fms. by 6 fms. by 3 in.	1.50			
		Cohoes, 75 fms. by 30 m. by 7 in.	.65	2	Combination, 180 by 15 fms. by 2 in. (herring).	3.00			
		King, 50 fms. by 25 m. by 9 in.	.65						
Royer-Warnock Packing Co., Beecher Pass.	1	Cohoes, 100 fms. by 30 m. by 7 in.	.65	2	Drag, 100 fms. by 5 fms. by 3 in.	1.50			
Glacier Packing Co. (A. P. A.), Point Highfield.	12	Redfish, 250 fms. by 30 m. by 6¼ in.	.65	5	Purse, 120 fms. by 250 m. by 3 in.	2.00			
	12	King, 250 fms. by 28 m. by 8⅛ in.	.65	2	Drag, 120 fms. by 200 m. by 3 in.	1.50			
Thlinket Packing Co., Point Gerard.	12	Redfish, 200 fms. by 24 m. by 6¼ in.	.65	1	Purse, 185 fms. by 220 m. by 3 in.	(3)	4	Single; inshore leads average 750 ft.; pots, 36 ft. square.	1,375
	13	King, 200 fms. by 22 m. by 9¼ in.	.65	1	Purse, 100 fms. by 160 m. by 3 in.				
				4	Drag, 100 fms. by 178 m. by 3 in.	1.50			
Fidalgo Island Canning Co., Ketchikan.				8	Purse, 175 fms. by 10 to 12 fms. by 3 in.	3.00			
				2	Drag, 160 fms. by 6 fms. by 3¼ in.	1.75			
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.				24	Purse, 150 to 200 fms. by 7 to 12 fms. by 3 in.	2.50			
				16	Drag, 150 to 200 fms. by 4 to 6 fms. by 3 in.	1.50			
Boston Fishing and Trading Co., Yes Bay.	2	Redfish, 100 fms. by 35 m. by 6¼ in.	.65	1	Purse, 230 fms. by 20 fms. by 3 in.	2.50	1	Double; inshore lead, 300 ft.; channel lead, 100 ft.; 1 pot, 30 ft. square, 1 pot, 28 ft. square.	1,000
	2	King, 100 fms. by 32 m. by 10½ in.	.65	3	Drag, 175 fms. by 10 fms. by 3 in. Drag, 150 fms. by 8 fms. by 3 in. Drag, 120 fms. by 6 fms. by 3 in.	1.50			
Quadra Packing Co., Mink Bay, Boca de Quadra.				8	Purse, 180 fms. by 15 fms. by 3 in., average.	3.00			
				1	Drag, 115 fms. by 8 fms. by 3 in.	2.00			
Metlakahtla Industrial Co., Metlakahtla.	5	(Average) 172 fms. by 4 fms. by 5⅛ in.	.65	8	Purse (average), 158 fms. by 8⅛ fms. by 3 in.	3.00			
				4	Drag (average), 163 fms. by 6 fms. by 3 in.	1.50			
North Pacific Trading and Packing Co., Klawak.				9	Purse, 175 fms. by 240 m. by 3 in.	(4)			
Pacific Steam Whaling Co., Hunter Bay.				22	Combination (average), 195 fms. by 5 fms. by 3 in.	1.50			

[1] Whole cost, $1,400. [2] Whole cost, $400. [3] $500 each. [4] $300 each.

Boat equipment, 1898.

Name of company and location of cannery.	Unrigged vessels.			Boats, etc.		
	No.	Description.	Value each.	No.	Description.	Value each.
Arctic Packing Co., Alaska Packing Co., Bristol Bay Canning Co. (A. P. A.) Nushagak.	18	Lighters	$600	60	Columbia River gill-net boats.	$200
	2	Pile-drivers	1,200	25	Skiffs	30
Point Roberts Packing Co. (A. P. A.), Kogglung, Kvichak River.	6	Lighters	800	20	Gill-net boats, F. B.[1]	100
	6	Trap scows	100	10	Skiffs	30
	2	Pile-drivers	1,500			
Arctic Packing Co. (A. P. A.), Naknek River.	5	Lighters	500	19	Gill-net boats, F. B	85
	1	Pile-driver	1,200	10	Skiffs	40
Naknek Packing Co., Naknek River	7	Lighters	600	23	Gill-net boats, F. B	100
				5	Skiffs	25
Ugashik Fishing Station (A. P. A.), Ugashik.	9	do	800	24	Columbia River boats	200
	1	Pile-driver	1,500	10	Skiffs	25
	2	Sail lighters	1,500	3	Seine boats, F. B	100
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	1	do	750	7	Columbia River boats	200
	10	Trap scows	250	8	Gill-net boats, F. B	100
	3	Pile-drivers	750	12	Skiffs	25
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	4	Lighters	400	3	Seine boats	75
	1	Sail scow	200	9	Columbia River boats	200
	10	Trap scows	60	3	Gill-net boats, F. B	100
	3	Pile-drivers	1,000	10	Skiffs	25
Hume Bros. & Hume, Anchorage Bay, Chignik.	13	Lighters	140	2	Seine boats	70
	1	Sail scow	600	8	Columbia River boats	200
	1	do	300	10	Gill-net boats, F. B	100
	2	Pile-drivers	1,050	14	Skiffs	25
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	1	Cargo lighter	500	6	Seine boats, F. B	60
	2	Fish lighters	250	1	Otter boat	100
	2	Fish scows	100	18	Dories	30
	1	Hand pile-driver	100	3	Skiffs	15
Karluk Packing Co., Alaska Improvement Co., Hume-Aleutian Pkg. Co., Uganuk Fishing Station (A. P. A.) Karluk and Uganuk Bay.	7	Lighters	500	18	Seine boats, F. B	150
	12	Fish scows	150	33	Dories	25
	1	Hatchery scow	150	3	Launch tenders	90
				6	Hatchery cars	30
Pacific Steam Whaling Co., Uyak Bay	4	Lighters	450	11	Seine boats, F. B	70
	1	Pile-driver	1,000	3	Sail boots	90
				10	Dories	30
Hume Bros. & Hume, Uyak Bay	3	Lighters	400	9	Seine boats	120
	1	Pile-driver	1,000	1	Whitehall boat	75
				17	Dories	20
				2	Skiffs	25
Pacific Steam Whaling Co., Kenai	5	Lighters	400	1	Seine boat	100
	1	Pile-driver	1,500	10	Gill-net boats, F. B	40
				3	Skiffs	25
Arctic Fishing Co. (A. P. A.), Kussilof River.	3	Sail lighters	450	15	Gill-net boats, F. B	40
	4	Trap scows	50	4	Skiffs	30
	1	Pile-driver	1,500			
Pacific Packing Co. (A. P. A.), Odiak	2	Lighters	400	2	Seine boats	200
	3	Scows	400	33	Columbia River boats	200
				6	Skiffs	25
Pacific Steam Whaling Co., Orca	4	House scows	400	2	Seine boats	200
	1	Pile-driver	200	30	Columbia River boats	200
				8	Skiffs	25
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	3	Lighters	700	50	Columbia River boats	200
	1	Pile-driver	1,000	3	Skiffs	25
Glacier Packing Co. (A. P. A.), Point Highfield.	2	Lighters	600	7	Seine boats	60
				14	Columbia River boats	200
				8	Old River boats	25
				5	Skiffs	25
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	2	Cargo lighters	150	17	Seine boats	50
	20	Fish lighters	75	1	Whitehall boat	50
				12	Skiffs	20
Boston Fishing and Trading Co., Yes Bay	5	Lighters	50	4	Seine boats	50
				6	Skiffs	25
Quadra Packing Co., Boca de Quadra	2	House scows	75	12	Gill-net boats, F. B	50
	1	Fish raft	25	12	Seine boats	100
	1	Pile-driver	500	12	Seine-boat tenders	30
				4	Skiffs	20
Metlakahtla Industrial Co., Metlakahtla	2	Lighters	100	6	Seine boats	50
				7	Sailboats	100
				8	Dories	25
Baranoff Packing Co., Redfish Bay				4	Seine boats	75
North Pacific Trading and Packing Co., Klawak.	1	Scow	100	4	Seine boats	25
				5	Skiffs	25
Pacific Steam Whaling Co., Hunter Bay	4	Lighters	100	15	Seine boats	50
	2	Fish scows	50	3	Skiffs	25
	1	Pile-driver	800			

[1] F. B.=flat bottom.

Boat equipment, 1899.

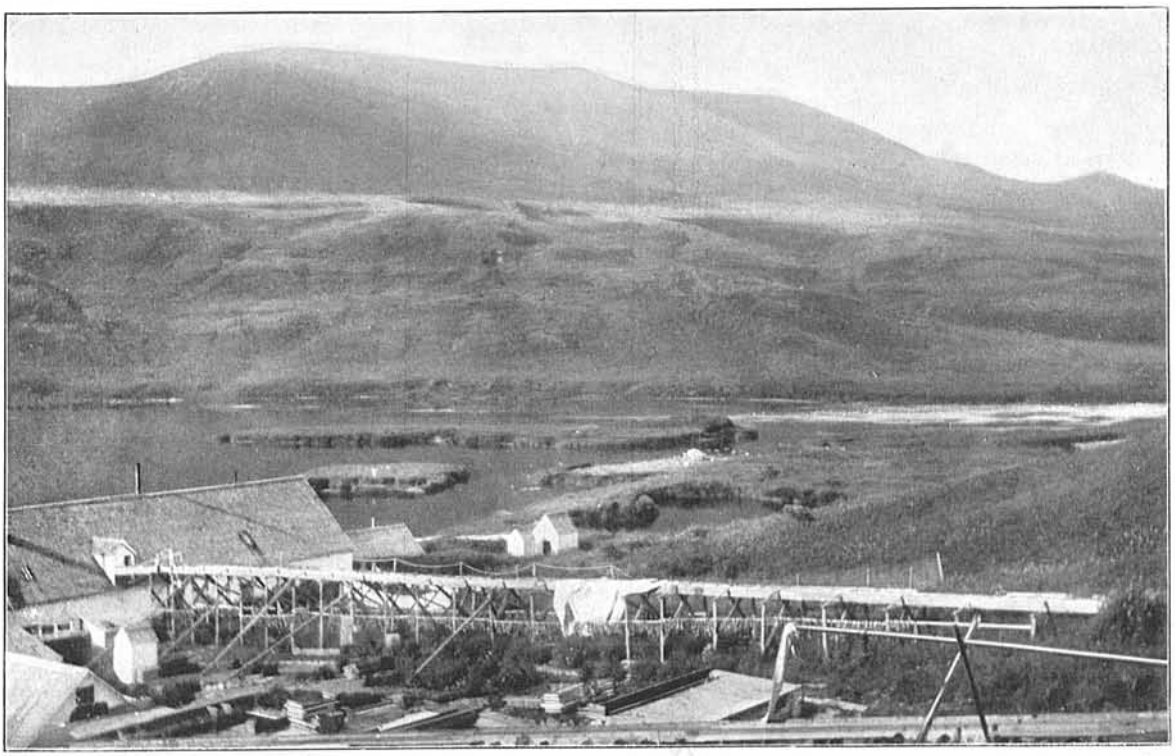
Name of company and location of cannery.	Unrigged vessels.			Boats, etc.		
	No.	Description.	Value each.	No.	Description.	Value each.
Arctic Packing Co., Alaska Packing Co., Bristol Bay Canning Co. (A. P. A.) Nushagak Bay.	18	Lighters	$600	60	Columbia River, gill-net boats.	$200
	2	Pile-drivers	1,200	25	Skiffs	30
Pacific Steam Whaling Co., Nushagak Bay.	4	Lighters	300	15	Columbia River boats	200
				4	Skiffs	30
Alaska Fishermen's Packing Co., Nushagak Bay.	3	.....do	700	17	Columbia River boats	200
				3	Skiffs	30
Point Roberts Packing Co. (A. P. A.), Kvichak Bay.	7	.....do	800	30	Gill-net boats, F. B	100
	6	Trap scows	100	10	Skiffs	30
	2	Pile-drivers	1,500			
Arctic Packing Co. (A. P. A.), Naknek River.	7	Lighters	800	24	Gill-nets boats, F. B	85
	1	Pile-driver	1,200	10	Skiffs	40
Naknek Packing Co., Naknek River	8	Lighters	600	25	Gill-net boats, F. B	100
				5	Skiffs	25
Ugashik Fishing Station (A. P. A.), Ugashik River.	9	.....do	800	24	Columbia River boats	200
	1	Pile-driver	1,500	10	Skiffs	25
	2	Sail lighters	1,500	3	Seine boats, F. B	100
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	1	.....do	750	7	Columbia River boats	200
	12	Trap scows	250	8	Gill-net boats, F. B	100
	3	Pile-drivers	750	15	Skiffs	25
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	4	Lighters	400	3	Seine boats	75
	1	Sail scow	800	10	Columbia River boats	200
	1	.....do	200	3	Gill-net boats, F. B	100
	10	Trap scows	60	10	Skiffs	25
	3	Pile-drivers	1,000			
Hume Bros. & Hume, Anchorage Bay, Chignik.	13	Lighters	140	2	Seine boats	70
	1	Sail scow	600	8	Columbia River boats	200
	1	.....do	300	10	Gill-net boats, F. B	100
	2	Pile-drivers	1,050	14	Skiffs	25
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	1	Cargo lighter	500	6	Seine boats	60
	2	Fish lighters	250	1	Otter boat	100
	2	Fish scows	100	18	Dories	30
	1	Hand pile-driver	100	3	Skiffs	15
Karluk Packing Co., Alaska Improvement Co., Hume-Aleutian Packing Co., Uganuk Fishing Station (A. P. A.) Karluk and Uganuk Bay.	9	Lighters	500	20	Seine boats, F. B	150
	13	Fish scows	150	33	Dories	25
	1	Hatchery scow	150	3	Launch tenders	90
				6	Hatchery cars	30
Pacific Steam Whaling Co., Uyak Bay	5	Lighters	450	12	Seine boats, F. B	70
	1	Pile-driver	1,000	3	Sailboats	90
				10	Dories	30
Hume Bros. & Hume, Uyak Bay	4	Lighters	400	10	Seine boats	120
	1	Pile-driver	1,000	1	Whitehall boat	75
				17	Dories	20
				2	Skiffs	25
Pacific Steam Whaling Company, Kenai	7	Lighters	350	1	Seine boat	100
	2	Pile-drivers	1,500	20	Gill-net boats, F. B	40
				3	Skiffs	25
Arctic Fishing Co. (A. P. A.), Kussilof River	3	Sail lighters	450	15	Gill-net boats, F. B	40
	5	Trap scows	50	4	Skiffs	30
	2	Pile-drivers	1,500			
Pacific Packing Co. (A. P. A.), Odiak	2	Lighters	400	2	Seine boats	200
	3	Scows	400	33	Columbia River boats	200
				6	Skiffs	25
Pacific Steam Whaling Co., Orca	4	House scows	400	2	Seine boats	200
	1	Pile-driver	200	30	Columbia River boats	200
				8	Skiffs	25
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	3	Lighters	1,100	50	Columbia River boats	200
	1	Pile-driver	1,000	3	Skiffs	25
Glacier Packing Co. (A. P. A.), Point Highfield.	2	Lighters	600	7	Seine boats	60
				14	Columbia River boats	200
				8	Old river association	25
				5	Skiffs	25
Thlinket Packing Co., Gerard Point	.....	.....	.....	10	Gill-net boats, F. B	65
				3	Seine boats	50
				3	Skiffs	20
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	2	Cargo lighters	150	25	Seine boats	50
	20	Fish lighters	75	1	Whitehall boat	50
				12	Skiffs	20
Boston Fishing and Trading Co., Yes Bay	5	Lighters	50	4	Seine boats	50
				6	Skiffs	25
Quadra Packing Co., Mink Arm, Boca de Quadra.	2	House scows	75	12	Gill-net boats, F. B	50
	1	Fish raft	25	12	Seine boats	100
	1	Pile-driver	500	12	Seine-boat tenders	30
				4	Skiffs	20
Metlakahtla Industrial Co., Metlakahtla	2	Lighters	100	6	Seine boats	50
				6	Sailboats	100
				9	Dories	25
North Pacific Trading and Packing Co., Klawak.	1	Scow	100	4	Seine boats	25
				5	Skiffs	25
Pacific Steam Whaling Co., Hunter Bay	4	Lighters	100	15	Seine boats	50
	2	Fish scows	50	3	Skiffs	25
	1	Pile-driver	800			

Boat equipment, 1900.

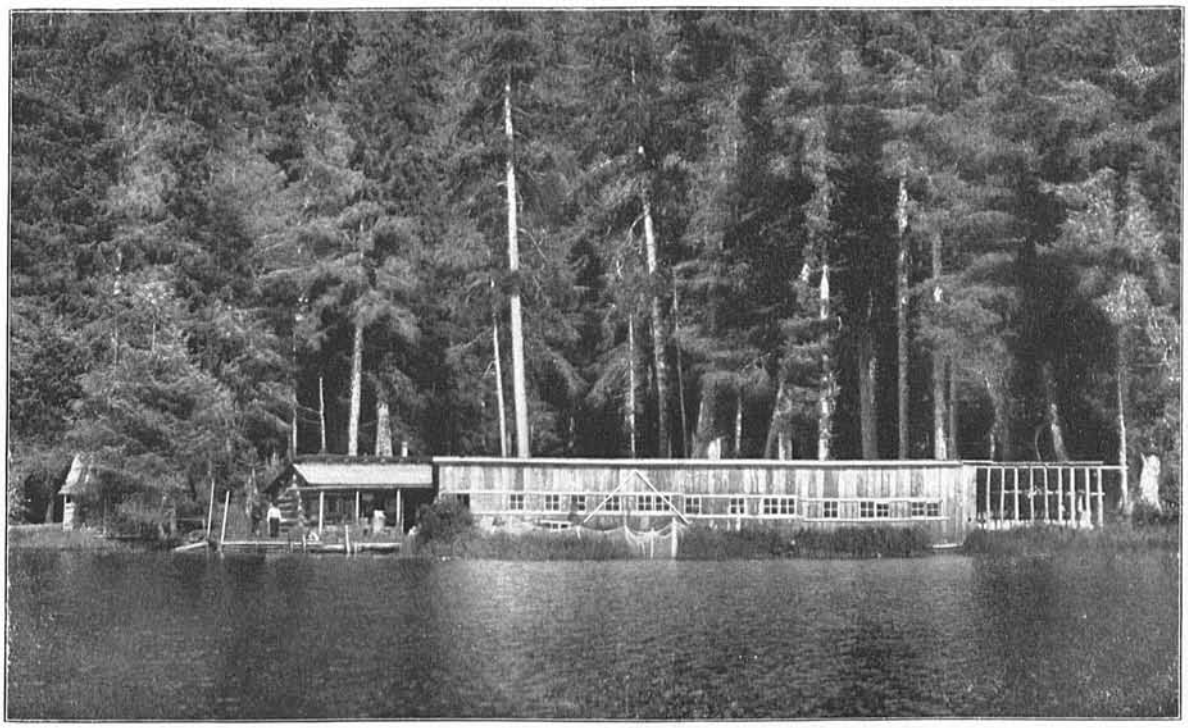
Name of company and location of cannery.	Unrigged vessels.			Boats, etc.		
	No.	Description.	Value, each.	No.	Description.	Value, each.
Arctic Packing Co., Alaska Packing Co., Bristol Bay Canning Co. (A. P. A.), Nushagak Bay.	18	Lighters	$600	80	Columbia River gill-net boats.	$200
	2	Pile-drivers	1,200	25	Skiffs	30
Pacific Steam Whaling Co., Nushagak Bay.	6	Lighters	300	25	Columbia River boats	200
				4	Skiffs	30
Alaska Fishermen's Packing Co., Nushagak Bay.	4	do	700	17	Columbia River boats	200
				3	Skiffs	30
Point Roberts Packing Co., Kyichak Packing Co. (A. P. A.), Kyichak Bay.	7	do	800	50	Gill-net boats, F. B	100
	6	Trap scows	100	10	Skiffs	30
	2	Pile-drivers	1,200			
Arctic Packing Co. (A. P. A.), Naknek River.	8	Lighters	800	34	Gill-net boats, F. B	100
	1	Pile-driver	1,200	10	Skiffs	40
Naknek Packing Co., Naknek River	7	Lighters	600	28	Gill-net boats, F. B	100
				5	Skiffs	25
Egegak Packing Co. (A. P. A.), Egegak River.	5	do	200	19	Gill-net boats, F. B	100
	1	Pile-driver	1,500	7	Skiffs	30
Ugashik Fishing Station (A. P. A.), Ugashik River.	9	Lighters	800	30	Columbia River boats	200
	1	Pile-driver	1,500	10	Skiffs	25
Bristol Packing Co., Ugashik River	1	Lighter	250	7	Gill-net boats	100
				1	Skiff	25
Chignik Bay Co. (A. P. A.), Chignik Lagoon.	2	Schooner lighters	1,500	3	Seine boats, F. B.	100
	1	Sloop lighter	750	7	Columbia River boats	200
	12	Trap scows	250	8	Gill-net boats, F. B	100
	3	Pile-drivers	750	15	Skiffs	25
Pacific Steam Whaling Co., Anchorage Bay, Chignik.	4	Lighters	400	3	Seine boats	75
	1	Sail scow	800	9	Columbia River boats	200
	1	do	200	3	Gill-net boats, F. B	100
	10	Trap scows	60	10	Skiffs	25
	3	Pile-drivers	1,000			
Hume Bros. & Hume, Anchorage Bay, Chignik.	13	Lighters	140	2	Seine boats	70
	1	Sail scow	600	8	Columbia River boats	200
	1	do	300	10	Gill-net boats, F. B	100
	2	Pile-drivers	1,050	14	Skiffs	25
Arctic Packing Co. (A. P. A.), Olga Bay, Alitak.	1	Cargo lighter	500	6	Seine boats, F. B.	60
	2	Fish lighters	250	1	Otter boat	100
	2	Fish scows	100	18	Dories	30
	1	Hand pile-driver	100	3	Skiffs	15
Karluk Packing Co., Alaska Improvement Co., Uganuk Fishing Station. (A. P. A.) Karluk and Uganuk Bay.	9	Lighters	500	20	Seine boats, F. B.	150
	17	Fish scows	150	33	Dories	25
	1	Hatchery scow	150	3	Launch tenders	90
				6	Hatchery cars	30
Pacific Steam Whaling Co., Uyak Bay	5	Lighters	450	15	Seine boats, F. B.	70
	1	Pile-driver	1,000	3	Sail boats	90
				13	Dories	30
Hume Bros. & Hume, Uyak Bay	4	Lighters	400	12	Seine boats	120
	1	Pile-driver	1,000	1	Whiteball boat.	75
				20	Dories and skiffs	20
Alaska Salmon Association, Chuitna River.	2	Lighters	150	20	Gill-net boats, F. B.	40
	4	Scows	250	5	Skiffs	30
	1	Lighter	50	1	Yawl	40
	1	Pile-driver	1,150			
Pacific Steam Whaling Co., Kenai	7	Lighters	350	1	Seine boat	100
	2	Pile-drivers	1,500	20	Gill-net boats, F. B.	40
				3	Skiffs	25
Arctic Fishing Co. (A. P. A.), Kussilof River.	3	Sail lighters	450	2	Columbia River boats	200
	7	Trap scows	50	20	Gill-net boats, F. B.	40
	2	Pile-drivers	1,500	6	Skiffs	30
Pacific Packing Co. (A. P. A.), Odiak	2	Lighters	400	2	Seine boats	200
	3	House scows	400	33	Columbia River boats	200
				6	Skiffs	25
Pacific Steam Whaling Co., Orca	5	House scows	400	2	Seine boats	200
	1	Pile-driver	200	30	Columbia River boats	200
				8	Skiffs	25
Western Fisheries Co., Dundas Bay	1	Lighter	250	5	Seine boats	75
				2	Columbia River boats	100
				4	Gill-net boats	50
				2	Dories and skiffs	50
Pyramid Harbor Packing Co. (A. P. A.), Pyramid Harbor.	3	Lighters	400	56	Columbia River boats	200
	1	Pile-driver	1,000	3	Skiffs	25
Chilkoot Packing Co., Chilkoot Inlet				2	Columbia River boats	90
				1	Skiff	25
Taku Packing Co., Taku Inlet	2	Lighters	225	15	Gill-net boats	60
	1	Fish scow	150	2	Dories	25
Taku Fishing Co., Port Snettisham	1	Lighter	500	3	Seine boats	50
				3	Columbia River boats	150
				9	Gill-net boats, F. B.	50
Icy Strait Packing Co., Petersburg, Wrangell Narrows.	1	Cargo lighter	850	12	Seine boats	100
	1	Pile-driver	500	12	Gill-net boats, F. B.	50
				12	Seine-boat tenders	35
				4	Skiffs	20
Royer-Warnock Packing Co., Beecher Pass.	1	Scow	30	1	Seine boat	30
				1	Dory	10

Boat equipment, 1900—Continued.

Name of company and location of cannery.	Unrigged vessels.			Boats, etc.		
	No.	Description.	Value, each.	No.	Description.	Value, each.
Glacier Packing Co. (A. P. A.), Point Highfield.	2	Lighters	$600	7	Seine boats	$50
				14	Columbia River boats	200
				8	Old river boats	25
				5	Skiffs	25
Thlinket Packing Co., Gerard Point	1	House scow	400	6	Seine boats	60
	1	Fish scow	100	10	Columbia River boats	200
				6	Gill-net boats, F. B	60
				2	Whitehall boats	85
				3	Skiffs	20
Fidalgo Island Canning Co., Ketchikan	2	Lighters	225	12	Seine boats	70
	3	do	75	8	Dories and skiffs	30
	3	Scows	20			
Alaska Salmon Packing and Fur Co. (A. P. A.), Loring.	2	Cargo lighters	150	42	Seine boats	50
	20	Fish lighters	75	1	Whitehall boat	50
				12	Skiffs	20
Boston Fishing and Trading Co., Yes Bay	5	Lighters	50	4	Seine boats	50
				6	Skiffs	25
Quadra Packing Co., Mink Arm, Boca de Quadra.	1	House scow	75	8	Seine boats	100
				9	Skiffs	30
Metlakahtla Industrial Co., Metlakahtla	2	Lighters	100	7	Seine boats	50
				6	Sailboats	100
				10	Dories	25
North Pacific Trading and Packing Co., Klawak.	1	Scow	100	11	Seine boats	80
				5	Skiffs	25
Pacific Steam Whaling Co., Hunter Bay	2	Lighters	100	22	Seine boats	50
	2	Fish scows	50	3	Skiffs	25
	1	Pile-driver	800			



MOUTH OF KARLUK RIVER WHERE IT EMPTIES INTO KARLUK LAGOON.



CALLBREATH'S HATCHERY, McHENRY INLET, ETOLIN ISLAND.

THE KARLUK HATCHERY.

By Harry Clifford Fassett,
U. S. Fish Commission.

The following notes concerning the salmon hatchery maintained by the Alaska Packers Association near Karluk, Kadiak Island, Alaska, are based upon an inspection made in accordance with instructions of Captain Moser August 8, 1900.

The plant is a model one. It is located on the southern shore, at the eastern end of the Karluk Lagoon, near the outlet of Karluk River, where a streamlet, called by the hatchery people Shasta Creek, enters the lagoon from the hills to the southward. From the rising ground immediately back of the hatchery Karluk Head, 3 miles west (magnetic), may be seen over the intervening low points, with the cannery buildings of Karluk Spit showing to the right of it. Here ground was broken for the hatchery May 28, 1896, and on August 29, the same year, construction work was so far advanced that stripping was begun. The actual cost of the present plant is said to be fully $20,000, and the annual expenditure about $10,000 for maintenance, repairs, and labor. Considering the extent of the establishment, the rate of wages necessarily demanded from its isolation, the long period of incubation, and expensive methods of securing stock fish, this hardly seems excessive.

In 1897 a party from this vessel visited this hatchery, the results of whose observations are contained in Captain Moser's report upon "Alaska Salmon and Salmon Fisheries, 1897," pages 155–157, to which attention is invited.

Since then the establishment has been considerably improved, without, however, increasing the egg capacity of the hatching-house; in fact, this has been reduced by one trough, which was removed to make room for the hot-water drum of the heating system. A number of new ripening ponds have been made, the rearing or nursery pond enlarged, and the original ponds remodeled. In the main building the dining room and kitchen have been moved upstairs, an additional room built out in front, the basement enlarged and partly cemented, heating system enlarged and improved, and an electric-light plant installed. The latter has a capacity of about 40 lights, with 25 outlets at present, and the power is generated by a small Pelton wheel fed by a 6-inch pipe under a head of about 60 feet.

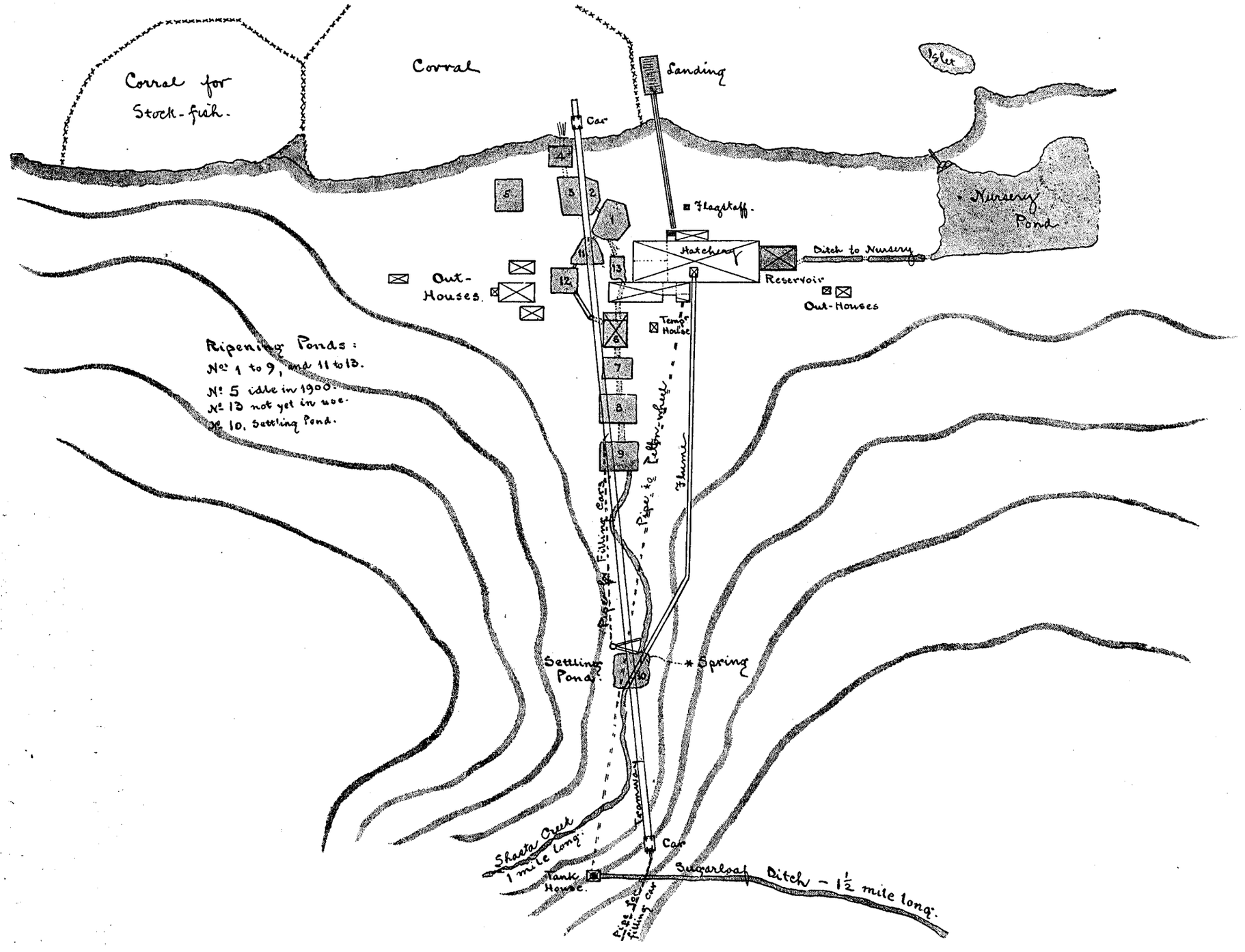
The main building, 32 feet by 100 feet, faces to the northward (see sketch). Immediately west of it are a tramway and line of ponds, the latter extending down the slope along the original bed of Shasta Creek northward to the beach. Abutting the eastern end of the hatching-house is a covered pond known as the "reservoir," and beyond, in the same direction, a narrow ditch leads to the nursery pond. A plank walk extends from the hatchery steps across the narrow beach flat to a short wooden pier which ends at a condemned lighter weighted with stones, forming the landing place. Immediately westward of the landing are the corrals. On either flank of

the main building are small outhouses, sheds, etc., and close to the rear entrance is a small shed where the thermometers are kept. South of the hatching-house, at the head of a small ravine and on the edge of a narrow undulating terrace in the hills, the present sources of the water supply are brought together.

Shasta Creek is a tiny rill draining the low hills to the southward and westward, and has an average volume of about 10 miner's inches of clear water of excellent quality; it is about a mile in length from its source to the lagoon. "The Ditch" comes in from the eastward, and carries the waters of a small creek flowing down the side of a mountain, about a mile distant, which is locally known as Sugarloaf Peak. The bed of the ditch is now well settled and ballasted, smooth, free from sudden drops, falls, or riffles, of a very gradual pitch, and carries an average of between 25 and 30 miner's inches of clear, colorless water of excellent quality; it is about 1½ miles long. At the end of the ditch its waters are received by a shed-covered tank (the "tank house"), in the bottom of which is the connection to a line of 6-inch piping leading to the hatchery below; a branch of this system supplies the Pelton wheel. The escape or waste from the tank-house finds its way into Shasta Creek, close by. From this point to the lagoon beach is about 200 yards in a straight line.

The waters of Shasta Creek are first tapped by a line of iron pipe a short distance above the tank-house; this pipe is used for filling a car at the upper end of the gravity tramway, which is close to the tank-house. The creek passes to northward and westward of the tank-house and plunges down the small ravine previously mentioned, and about one-fourth the distance to the beach ends in the highest pond. From this pond, called No. 10, or the "settling" pond, a wooden flume carries part of the water into the upper part of the hatching-house, while the overflow escapes via the old creek bed to the next pond below. The settling-pond also receives, in its northeastern corner, the waters of a small spring running the year round; this corner of the pond never freezes. The escape of pond No. 10 is tapped to supply another short line of piping which leads northward to the next pond, where it is used in connection with the tramway. This pond, No. 9, is the upper ripening pond and located about midway between the tank-house and the beach. In close order, terraced northward down the gentle slope, are ripening-ponds No. 8, No. 7, and No. 6, the latter housed in. From No. 6 the waste water escapes through open ponds No. 12 and No. 11 into No. 1, and, by another outlet, to pond No. 13 and thence to No. 1. From pond No. 1 the water passes in turn through No. 2, No. 3, and No. 4, and thence into the East Corral. Pond No. 5 is out of the direct line of the system, and was not in use in 1900. No. 13 was built this season, but had not been placed in use at the time of my visit. None of the water used in the ripening-ponds goes into the hatching-house.

The supply for the hatching-house is first by the pipe-line which leads from the ditch (via the tank-house), and next by flume from the settling-pond. The settling-pond is quite deep, much more so than any other, and receives its feed so gently as not to stir the sediment from the bottom and roil the water. As its name implies, its function is to allow the small débris carried by the creek to settle before passing on into the flume or to the lower ponds. The discharge, whether from the pipe line or the flume passes into a filter in the upper story of the hatching-house, thence into a tank, from which it is piped to the troughs. The waste water discharges into the



SKETCH PLAN OF SALMON-HATCHING PLANT, OPERATED BY ALASKA PACKERS ASSOCIATION AT SHASTA CREEK, KARLUK LAGOON, KADIAK ISLAND.

Scale and dimensions arbitrary.

reservoir, and from it escapes through the narrow ditch already mentioned into the nursery, or rearing-pond, whence it passes through a short flume into the lagoon.

As far as the circumstances have permitted, the ripening-ponds have been dug rectangular in shape, and as opportunity affords they are walled up with rubble and cement. The floors are of broken rock and gravel, but it is the intention to cover these with cement also as soon as time permits. The fish do not ripen well in dirty water, and their frequent violent movements stir up any mud which may be on the bottom or in the interstices of the sides. The same movements of the fish tend to keep in suspension any slime or other foreign material, which thus passes out through the wasteway, and this is so slight where the ponds are walled solidly that no deleterious effects are apparent, even after the water has passed through several ponds full of ripening fish.

All the upper ponds have sufficient fall between one and another for excellent aeration, a most important consideration where many fish are impounded. Covered pond No. 6 has the best arrangement for aeration, which may be described as follows: The feed water passes through a wooden trough suspended horizontally over the pond and extending longitudinally toward the center. The bottom of the trough is about 4 feet above the surface of the pond, and is pierced by numerous auger holes, through which the water falls in tiny streams. Besides giving perfect aeration this method distributes the supply over such a large area that the impounded fish are less excited than is the case where the same volume enters in a single stream; they keep more quiet, ripen more quickly, and if they do leap do not strike against anything which will bruise them, but merely fall back into the pond again. This arrangement will be extended to the other ponds whose relative elevations will admit of it, as opportunity offers. The low ponds, No. 3, No. 4, and No. 5, have not given satisfaction, and this is due probably to lack of adequate aeration. No. 2, however, though on practically the same level as No. 3, is an excellent pond, but its superiority is thought to be due to being tightly walled, and consequently cleaner than its mate. No. 5 is expected to prove satisfactory after it has been cemented.

When a pond is to be gone over for ripe fish the water is lowered to a depth of about 21 inches, or knee-deep, the waste gates being arranged to let it fall to that depth, but no less, for fear of smothering the fish. A panel of slat fencing is then lowered into the water at one end and pushed slowly toward the opposite side of the pond, the spawn-takers wading behind it. The fish are carefully dipped up, examined, and if found ripe for spawning placed in a floating car, made of slats, for future attention; if still green they are freed in the pond behind the fence. This method of handling the impounded fish has proven the best with the delicately organized red salmon, and explains the importance of having the ponds of a regular shape; thus every fish can be handled and every ripe one secured with the least injury. After the operation has been completed the fence is removed and the live-car of ripe fish towed gently alongside the stripping platform, of which there is one at each ripening-pond.

Stock fish for the hatchery are secured by seining crews working under the orders of the superintendent of the association's canneries at Karluk Spit. These crews are composed of natives who are borne on the cannery rolls. The principal seining-ground is on the northern shore of the lagoon, opposite the hatchery, from

the mouth of the river downstream to a rocky point three-quarters of a mile westward. After a seine haul is made the live fish are bailed into two live-cars, composed of old dories and skiffs with square ports cut between each frame, over which galvanized wire netting of 1½-inch mesh is stretched. Two men in another boat then tow the live-cars across to the corrals, where the fish are tallied out. It has been observed that it is much better to impound the stock fish, especially early in the season, in a large inclosure. When first taken they are exceedingly restless, chafing under restraint, and if closely confined soon become scarred and bruised, causing fungoid growths to appear quickly. The nearer the adult fish approaches maturity the more quiet it becomes.

The corrals are two in number, and cover an area of about 3 acres, the East Corral being about twice as large as the West. At high high water there are about 10 feet of water at the outer edge of the corrals and at the inshore edge about 2 or 3 feet; the rise and fall here, extreme range, is about 5 feet. The corral fences are composed of wire and cotton netting, the latter above, stretched between piles and stands of old iron pipe. Everything but the piling is removed after spawn-taking ceases for the season; the piles are secured after the ice loosens them in the winter and are then hauled ashore.

The mortality of the fish seined is greatest in the corrals, as they receive the roughest treatment in the process of first capture. In discharging the live-cars into the East Corral the cars are brought bodily inside the inclosure through a movable panel, after which the fish are dumped out. At the West Corral the cars are towed alongside an opening above the water line and the fish dipped over from the outside.

In taking fish from the corrals for the ripening ponds the seine is again employed, the one used being about 12 fathoms in length. This is hauled into the shoal water off the lower end of the tramway; four large floating cribs of slats are then secured to the cork line outside, two being for bucks and two for females. The fish are then picked out of the net as tenderly as possible and examined; if too green they are passed back into the corral. When the cribs have been filled with a sufficient number they are hauled alongside the tramway and the fish dipped out into a car, previously filled with fresh water, in which they are transported to the pond prepared for them and there left to ripen. When fish which are quite or nearly ripe are secured they are taken care of separately. A number of fish nearly ripe are often taken with the incoming tide from the No. 4 pond, finding their way through the wasteway as the water rises.

The tramway is about 200 yards long and leads from the hill near the tank-house in a straight line, crossing several ponds en route, to the lagoon beach near the eastern end of the East Corral. It is a gravity road, built of plank, and its chief purpose is the hauling of stock fish to the upper ripening-ponds. Two strongly built cars, connected by a manila cable, are used, one at each end of the line. After the lower car, which is much smaller, has been filled with water and live fish the larger one at the upper end is loaded, also with water, its greater weight hauling the lower car to the upper ripening-pond, No. 9, midway of the tramway, where the two cars meet. Intermediate stops, as required, are made at the lower ponds. After discharging the fish from the lower car enough water is drawn from the larger one to change the preponderance of weight, and the cars then resume their original

positions at either end of the line. This method of transportation is an old one, much used by mining men.

As already indicated, there is a spawning platform adjacent to each ripening pond, and as but one of these is covered the spawn-taking is conducted almost wholly in the open air. In 1900 no spawning was done at one of the ponds, it being used for the bucks alone. The methods employed on the spawning platform and in the hatching-house were originally those followed at the salmon stations of the United States Fish Commission, and more especially at the quinnat hatchery at Baird, Cal., the changes inaugurated being the result of subsequent experience in the handling of the more delicate red salmon.

Spawning is done by hand exclusively; strait-jackets are not necessary with these small fish. One hundred and fifty is counted a big day's stripping, though as high as 224 have been handled. The spawn pans are circular, 9 inches in diameter at the top, beveled to 7 inches across the bottom, and 3½ inches deep; a thin coat of asphaltum lacquer prevents their rusting and renders them easily cleansed. Two methods are employed in the taking of spawn; the first method, which is considered the better, is the "dry," the mixing of eggs and milt being done with the fingers. The eggs are not washed, but are placed directly in the baskets within two or three minutes after stripping. The second method is similar, except that after the two or three minutes have elapsed a little water is added; they are then allowed to stand until adhesion ceases and basketed without washing. When circumstances permit, the milt of two bucks is used to fecundate the eggs of one female.

Twenty-five females are reckoned to a full basket, which, at the estimated average of 3,000 good eggs per fish, gives a total capacity of 75,000 eggs per basket. The diameter of the redfish egg ranges between 0.10 and 0.31 inch, with an average of about 0.22 inch. It is much lighter in color than the egg of the quinnat salmon, and has a very delicate appearance. At Karluk it has been found that redfish run from 2,500 to 4,500 eggs, in rare instances 5,000, and that a fair average will be about 3,700; but there is, of course, a certain unavoidable loss in the spawning operation, and frequently a large number of eggs come from the fish dead; 3,000, therefore, is a fair average.

A glance at the sketch plan of the hatching-house will give a fair idea of its interior floor arrangement. There are 12 sets, or sections, of 4 troughs each, and 1 set of 3, making a total of 51 hatching-troughs. These troughs all measure 14 feet in length, 16 inches in width, and 7 inches in depth inside. They are built of clean-grained redwood, all sides surfaced, and all 2 inches thick. In making the joints a thick coating of asphaltum tar is spread over the parts to be joined, with an even layer of cotton wadding as calking material. The completed trough receives a coat of refined tar and two coats of asphaltum varnish. Built in this manner and properly supported the troughs will not warp or spring, and there has never been the slightest difficulty from leaks. This is an important consideration in the hatching-house. Not only do leaky troughs add greatly to the waste of water and keep the employees uneasy concerning the amount of water getting to the eggs, but the unavoidable jarring and other shocks connected with the necessary repairs are frequently fatal to a large number of eggs. A dry trough makes a dry hatching-house, and in a dry house only will the best efficiency of the egg-picking crew obtain. Where one has to stand on a wet

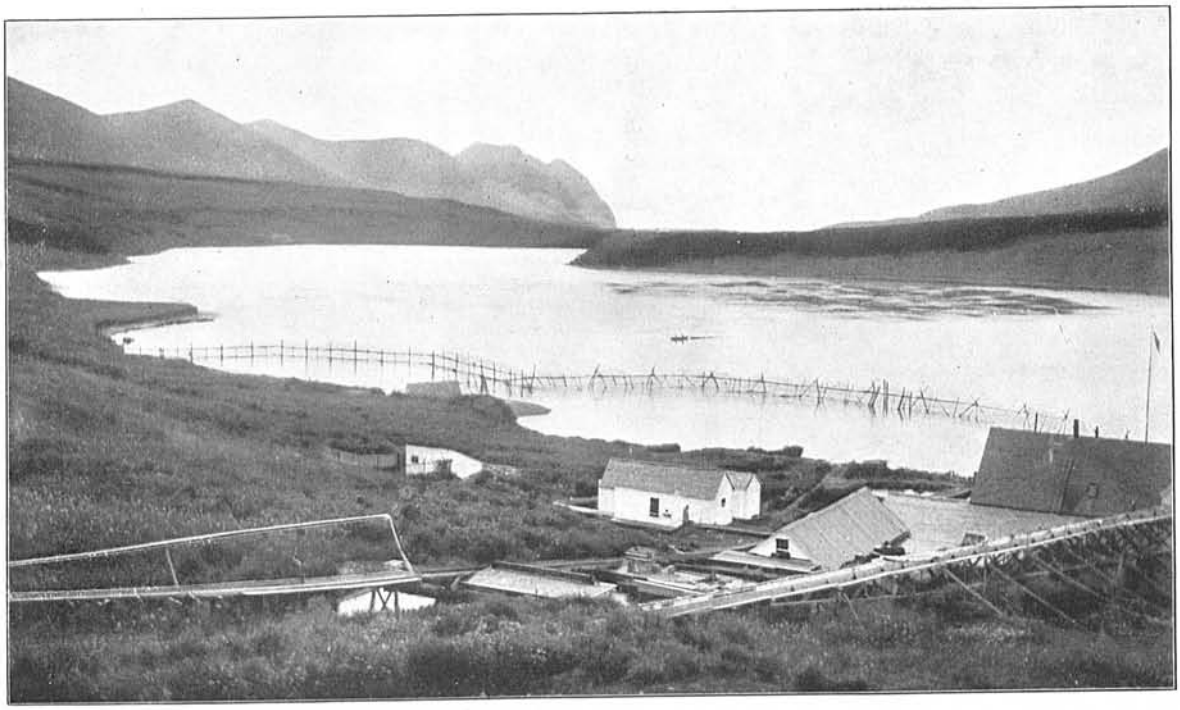
cold floor all day in a chilly, drafty room, at work requiring deftness of touch and close attention, considerable endurance is needed physically, and it is by no means unusual at hatcheries to have to call in new help while the regular hatching-house force are suffering from colds, rheumatic attacks, etc. In a dry, well-lighted hatchery the interest of the fish-culturist does not wane from physical causes, and the eggs and fry consequently receive the benefit of these comforting features. Nearly anyone will hurry through with his allotted number of baskets in a sloppy, cheerless, and chilly barn, slighting the work in spite of himself, and yet the same person would almost always give intelligent attention to a task which he finds extremely interesting under physically comfortable conditions.

Besides the superintendent the permanent force of the station numbers 6, including a cook. All the regular work of fish-culture is done by this force, and a large part of the building and permanent improvements is executed by the same persons. When additional labor is necessary a request is made upon the superintendent of the association's canneries at Karluk Spit.

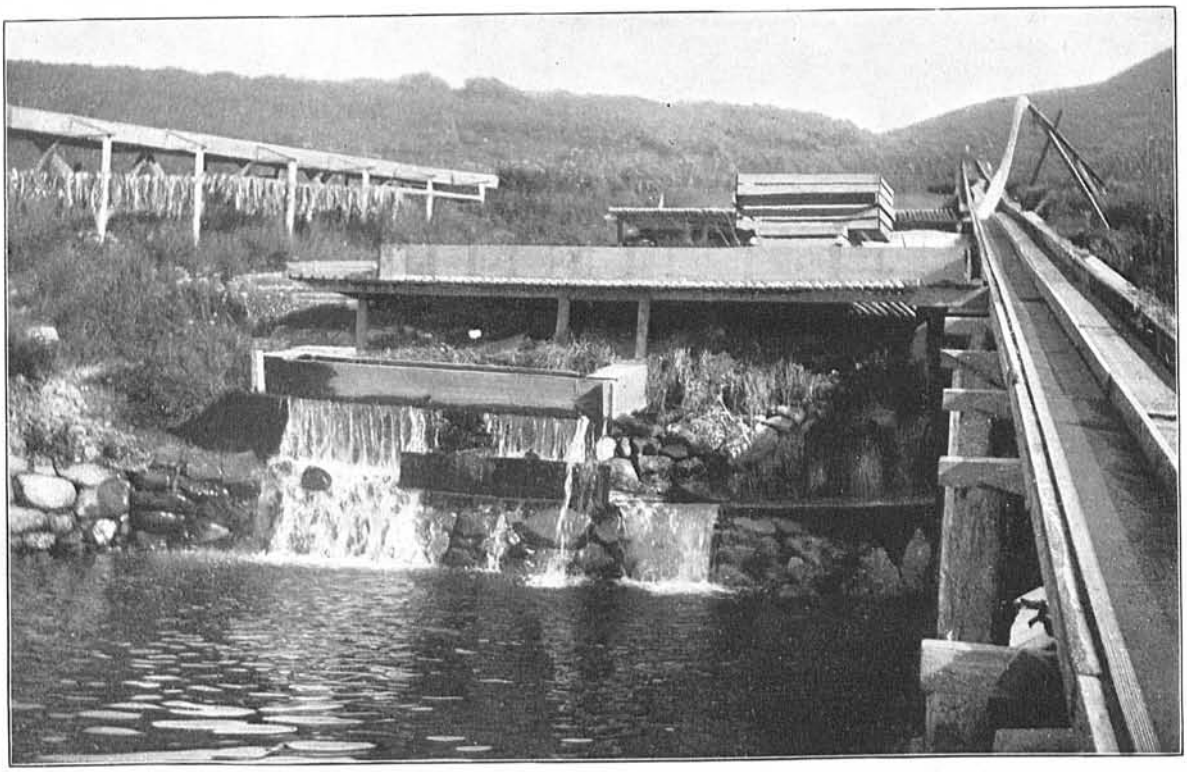
A furnace in the basement of the main building, directly under the hatching-house, heats the water for a system of piping used solely for artificial heating. A set of coils is arranged directly under each section of troughs, and there is also a system of piping on the bottom of the reservoir pond. When artificial heat is employed in forcing the hatching of the eggs the steam boiler is placed in use to drive the pumps. The latter draw the water from the reservoir pond, where it has been warmed, discharging it into the filter upstairs. It will be remembered that the waste of the hatching-house troughs escapes to the reservoir pond, but before using this warm water again filtering and aerating are necessary. Just enough new water is added to freshen the supply without much reducing the temperature, and very little is needed. If the water were not used over and over again in this manner it would be almost impossible and entirely impracticable to heat it sufficiently during the cold winter months, but the system of aerating and freshening is so well controlled that the feed water remains perfectly good after repeated use.

The feed water of the hatching-house, whether received from the flume or pipe line, is thoroughly filtered before passing into the troughs. Much of the coarser débris, such as straws, twigs, leaves, etc., is cleared from the water at the settling-pond and tank-house, and coarse-mesh wire screens in the lower end of the flume are also employed. Referring to the sketch it will be seen that the filter is simply a set of screens of varying degrees of fineness, arranged in a long wooden trough. The water falls from the flume or pipe upon the upper end of the top screen, which is a long board pierced with numerous auger holes. These holes increase in diameter as the farther end is approached, and the board is given sufficient pitch to cause the water to run down and cover it all, the function of the board being primarily to distribute and incidentally to aërate.

Falling next through a fine-mesh screen of wire netting the water is received in very fine spray-like condition by the last and lowest tray or screen. This is made of burlap, tightly stretched over a strong, light wooden frame, and has proven a most excellent filtering material. After it has become thoroughly soaked the jute or hemp of which it is composed swells closely and tightly, efficiently cleansing the



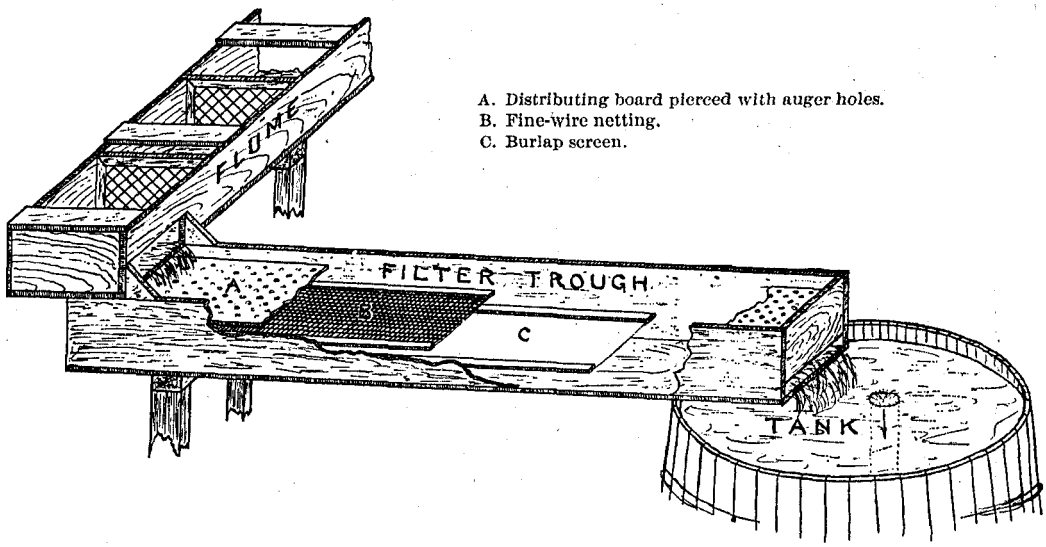
KARLUK HATCHERY, SHOWING CORRALS, AND IN DISTANCE EEL-GRASS BED.



A RIPENING POND, KARLUK HATCHERY.

water of very fine particles. With the more than usually excellent quality of water here, and its lack of foreign material, the above arrangement is found to meet the requirements of filtering. Where a refinement of this feature is necessary, however, it will readily be seen that there is no limit to the extension of the number or fineness of the screens.

The burlap used is of a slightly superior quality to the ordinary bagging, and in addition to its efficiency has its cheapness to recommend it. When stretched on frames it should be evenly secured, as its shrinking tendencies cause it to tear where the strains are unequal. The frames should be small and in sufficient number to allow of at least two changes in addition to the set in the filter trough. This is necessary, as the burlap will rot if left continuously in water, but if removed and thoroughly dried every ten days or two weeks the screens will last a long time. Four or 5 feet is a good length for the frames. When using more than one set of burlap or cloth screens care should be observed that the joints between the ends of the frames do not occur directly below each other; they should be staggered—that is, designed to occur at different intervals—the reason for which is plain.



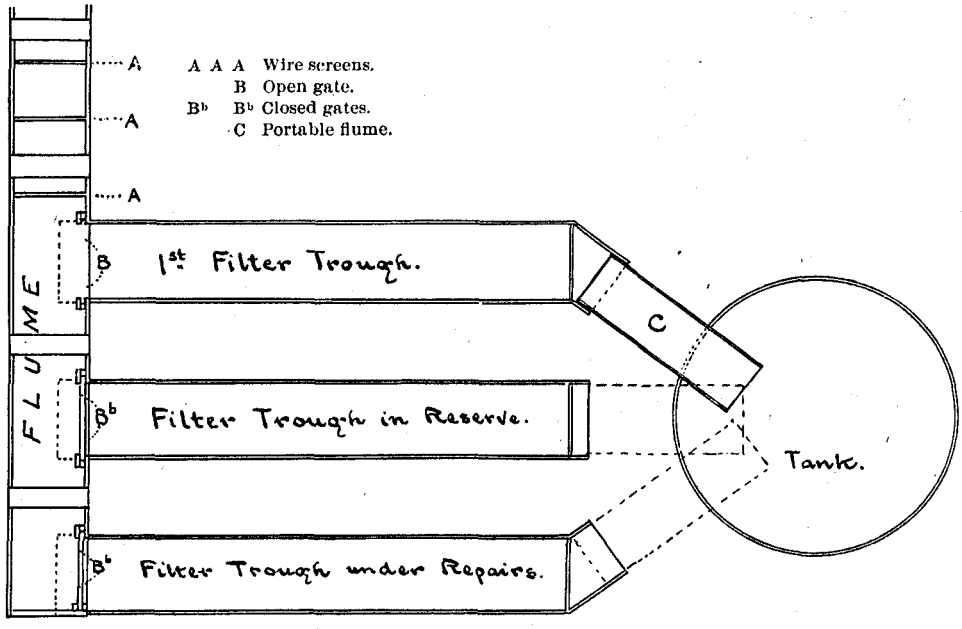
Perspective sketch of Richardson filter.

While there is as yet but one filter trough in the hatchery at Karluk, the superintendent, Mr. James A. Richardson, is a strong advocate of three, arranged somewhat as shown in the sketch. This will allow one to be in use, one in reserve, and the third under whatever repairs it may require. With a long hatching season and a long nursing period little opportunity is offered to overhaul so important an adjunct as the filter if to do so requires that it be placed temporarily out of commission. As the expense is slight, such an arrangement has much to recommend it.

It is stated that fungus has never caused trouble at the Karluk hatchery under the present management; at the old station, less than a mile westward on the same side of the lagoon, much difficulty was experienced from this cause. It is due to dirty water, unclean troughs and baskets, and careless and insufficient picking of the

eggs; it is likewise sometimes caused by too sluggish a current in the troughs, too small a supply of feed water, lack of aeration, or from using the water over too many times. In many cases fungus will not occur if troughs and baskets are kept clean and the water is properly filtered.

The troughs are designed to hold five baskets each, allowing for the necessary space between each for division plates, as well as the compartments at each end for receiving and aerating and discharging the flow of water. The aerators are of tin of the usual pattern and distribute the water well; at the opposite end of the trough is the usual arrangement of drainage plugs. The division plates are arranged according to the so-called Williamson system; that is, the first plate rests on the bottom of the trough with the water flowing over it, and, a short distance beyond, the second plate comes flush with the surface, but allows the flow to pass under it, the most



Plan of Richardson filter troughs.

approved method of conducting feed water through salmon eggs. Instead of rigid plates sliding in grooves at set intervals, division plates of light galvanized sheet iron, thickly asphalted, are used; these are half an inch longer than the width of the trough and are snapped or sprung in at any point desired. A drop of about 1½ inches is given each trough, and the water is used four times before discharging into the waste trough.

The waste trough is a continuous wooden box, built of heavy redwood boards, which passes under the lower, or fourth, trough of each set and carries off the entire waste of the hatching-house; it passes around the south wall and part of the east wall and thence into the reservoir, where it discharges.

The baskets are 24 inches long, 15 inches wide, and 6½ inches deep, inside measurement, made of galvanized-wire netting secured to a single wooden frame. The

frames are of clear sugar pine and redwood, 1½ inches wide by five-eighths inch thick. The netting is five-eighths inch in the length of the mesh and 6 meshes to the inch, which is found the best size for redfish eggs; netting with 5½ meshes per inch has been used, but this is a trifle large. Baskets with a single wooden frame around the top are found quite rigid enough and have a great advantage in the small space occupied by a large number when stored away, the absence of the lower frame admitting of very snug nesting.

While the capacity of each trough is 5 baskets, it is preferred to use not more than 4 per trough, reserving the fifth space for "fleeting" in cleaning. It has been found that redfish eggs require the cleanest of troughs and baskets, as well as the most careful handling. The troughs are therefore cleaned as frequently as circumstances will admit, never less than once a week, and as often as every other day when possible. Thus, by having the fifth space unoccupied the entire trough can be thoroughly scrubbed without lifting a single basket of eggs; all the baskets are moved one space toward the lower end of the trough and returned to their original positions one at a time as their respective spaces are cleaned. By fleeting in this manner jars are avoided and the eggs remain water-borne at all times—an especially essential desideratum during the tender period.

As previously mentioned, a full basket of redfish eggs is reckoned as containing 75,000. Thus, with 51 troughs equipped with 4 baskets each, or 204 baskets, the hatching-house capacity may be conservatively given as 15,300,000 eggs; and by crowding in 5 baskets to a trough, making a total of 255 for the house, the capacity can be increased to more than 19,000,000. These figures merely show the number of eggs which may be placed in the baskets at one time, or what the hatching-house will hold without using the baskets over again. Generally it does not follow that this is the capacity for the season, but unfortunately it does at Karluk. Here the period of incubation is so long that eggs taken at the very opening of the salmon run, say the latter part of May, will not be hatched out until the close of the season, late in September, after which but a trifling percentage of the spawn is taken. The number of eggs basketed prior to July 1 is also quite small, and the gain in capacity is therefore too trifling to be taken into consideration. Hence these figures may be accounted correct as they stand.

It is unfortunate that a full series of data is not available for an analysis of the period of incubation under the various prevailing conditions. Until this season (1900) the superintendent has been unable to keep complete records of anything beyond the merest outline of the season's work. A detailed record of temperatures and the duration of the various stages of incubation, representative of baskets of normal eggs taken at regular intervals during the stripping season, is being kept now, and it is believed this material will be available for study later. These observations will be carried on until the last of the fry shall have been planted. Such data, however, as could be obtained is herewith submitted, believing that much of it will be of interest and that possibly some of it may prove of value in the future.

In 1896 spawn-taking commenced on August 29 and was continued at intervals of two or three days until November 28, 3,200,000 eggs, in fair condition, being basketed during this time. Considering the diseased state of most of the stock fish secured, that this was the first season of operation, and that the plant was still in

a partially unfinished state, the result was deemed good. Impregnation by the methods at first employed was not always assured, and the losses were in consequence somewhat augmented.

After stripping began daily temperature observations of the hatchery water were recorded, from which the table below has been condensed. The highest temperature recorded during the summer (1896) was 48° F., and the lowest, during the following winter, 33° F.

Month and year.	Temperature of hatchery water.			Month and year.	Temperature of hatchery water.		
	Max.	Min.	Mean.		Max.	Min.	Mean.
	°	°	°		°	°	°
Sept., 1896	45	36	42.5	Jan., 1897	35	33	+34
Oct., 1896	40	35	39	Feb., 1897	35	33	+34
Nov., 1896	36	33	35.2	Mar., 1897	34	33	33.8
Dec., 1896	35	33	+34				

These figures represent the temperature of the feed water as it came from the creek under natural conditions. During part of the time the water in the hatching-troughs was warmed artificially and the temperature there was somewhat higher. Unfortunately no exact data of thermal conditions during the forcing or hastening process were kept, but it is stated that the temperature was slowly raised 10° or 12° above that then prevailing, and then kept at that point, about 46° to 48° F.

The temperature of the air outside of the hatchery for November and December, 1896, and January, February, and March, 1897, is summarized as follows:

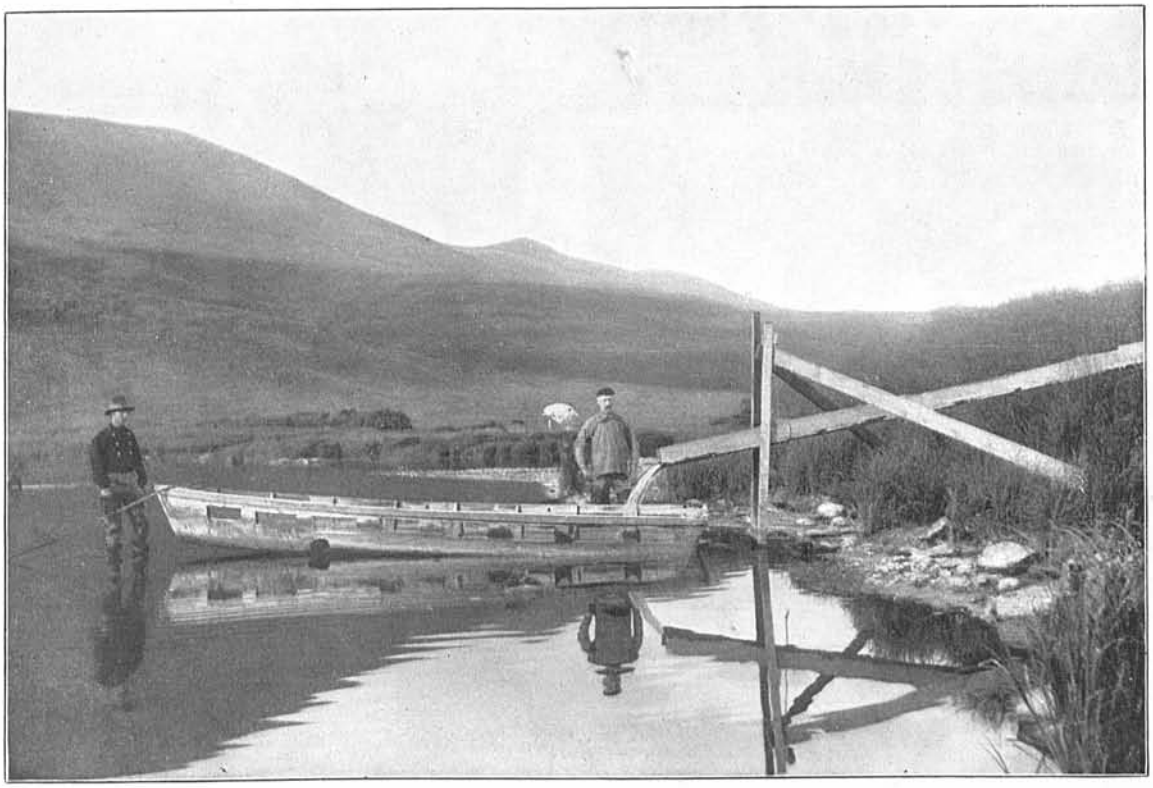
Temperature.	Period.	
	Days.	*hrs.*
Between 10° below and zero	2	15
Between zero and 10° above	5	21
Between 10° and 20° above	21	7
Between 20° and 30° above	41	11
Between 30° and 40° above	71	4
Between 40° and 50° above	8	14

The eggs taken August 29, 1896, eyed in 60 days, with the water in the troughs ranging between 45° and 35° and the mean 40.5° F. These eggs hatched out in 165 days. The eggs taken September 16 eyed in 100 days, with the temperature ranging between 44° and 33° and the mean 36.2° F. These also hatched in 165 days, but during the last 42 days of the incubating period artificial heat was used. The eggs taken September 23 were eyed in 111 days, temperature ranging between 43° and 33° and mean 34.5° F. Artificial heat was employed to hasten development during a period of about six weeks at the latter end of this period.

In 1897 spawn-taking was carried on from August 19 to December 9, and 2,285 females were stripped. Less than 1 per cent of them were spawned in August, about 85 per cent in September, and 14 per cent in October, November, and December. From September 6 to 20, only 15 days, 65.5 per cent of the salmon were spawned. The greatest number spawned in one day was 224, on September 25.

Concerning the relative proportion of males to females taken and their mortality in the stock ponds, or corrals, the following note is of interest: Of 6,640 salmon

TRANSFERRING STOCK FISH TO CORRALS AT KARLUK HATCHERY, KADIAK ISLAND.



METHOD OF DRAWING OFF FRY FROM NURSERY POND, KARLUK HATCHERY, KADIAK ISLAND.

impounded in the river corral, 4,170 were males and 2,470 females. Of 3,292 dead salmon removed from the corral, representing the loss in the inclosure for the season, 1,998 were males and 1,294 females.

The amount of spawn placed in baskets during the 1897 season was not learned, but the superintendent stated that "fully 6,000,000 fry were 'turned out' from the eggs taken in 1897." To this should be added the amount of eggs lost in the hatchery troughs, say 20 per cent, and the loss from malformations, etc., say 6 to 10 per cent. It is estimated that about 5,000,000 fry were planted.

The facilities of the establishment had been much improved since the preceding year, spawn-taking was conducted under much better circumstances, and the experience gained may also be considered a material factor in this season's hatching-house results. It was observed that the fry hatched were more vigorous and healthy in appearance, though hatching more slowly. The eggs taken August 19 were *hatched* in 210 days; those taken October 7 and November 2 were 123 and 138 days, respectively, in simply *eyeing out!* No artificial heat was used in hastening the development of the ova that year—season 1897. Beyond the foregoing there are no data available concerning the hatching period, etc.

Preparations were being made at the time of my visit to increase the hatching-house capacity by 13 more troughs, to bring the total up to 64; to extend Sugarloaf Ditch so as to tap the waters of another stream farther to the eastward, a mile or more; to extend the nursery system, and to improve the present retaining or ripening ponds in the manner previously outlined.

The following shows the temperature recorded in the hatching-house feed water:

Month and year.	High.		Low.		Mean.	Month and year.	High.		Low.		Mean.
	Max.	Mean.	Min.	Mean.			Max.	Mean.	Min.	Mean.	
	°	°	°	°	°		°	°	°	°	°
Apr., 1897 ...	37	−37	33	34.7	35.8	Nov., 1897....	39	+36	33	35.1	35.5
May, 1897 ...	47	43	34	37.7	40.3	Dec., 1897....	39	36	33	35.3	35.6
June, 1897...	50	47.7	40	42.5	45.1	Jan., 1898	36	34.8	33	34.3	34.5
Sept., 1897 ..	52	46.3	37	42.8	44.5	Feb., 1898....	36	34.6	33	34.2	34.4
Oct., 1897 ...	45	39.1	33	37.7	38.9	Mar., 1898....	39	36	33	34.6	35.3

The temperature of the air, dry bulb, outside the hatchery during the winter is summarized as follows, for November and December, 1897, and January, February, and March, 1898:

Temperature.	Period.	
	Days.	*hrs.*
Between 10° below and zero	0	2
Between zero and 10° above	12	13
Between 10° and 20° above	11	19
Between 20° and 30° above	31	22
Between 30° and 40° above	83	20
Between 40° and 50° above	10	20

The records for the spawning season of 1898 are again woefully incomplete. Some fish are reported as spawned in June, and from July 5 to November 30, 5,000,000 eggs were placed in baskets. Of the latter 80 per cent were taken prior to October 4; the remainder were obtained in gradually diminishing numbers until November 30.

No temperature records whatever are available, but the hatching periods were noted as per table below. The lack of thermal data is deplored, but is accounted for by the unavoidable absence of the regular superintendent the greater part of the time.

Eggs taken in 1898.	Hatched first.		Hatched last.		Mean hatching period.	Range in hatching.	Eggs taken in 1898.	Hatched first.		Hatched last.		Mean hatching period.	Range in hatching.
	Date.	Days.	Date.	Days.				Date.	Days.	Date.	Days.		
July 5..	Oct. 19, 1898	106	.....	.....	.....	.....	Sept. 9.	Feb. 14, 1899	158	.....	.....	.....	.....
July 8..	Oct. 20, 1898	104	Nov. 20, 1898	135	120	31	Sept. 10.	Feb. 18, 1899	161	May 15, 1899	247	204	86
July 11..	Oct. 21, 1898	102	.....	.....	.....	.....	Sept. 12.	Feb. 19-20, '99	160	May 15, 1899	245	203	85
July 15..	Nov. 6, 1898	114	.....	.....	.....	.....	Sept. 14.	Feb. 26, 1899	165	May 22, 1899	250	208	85
July 17..	Nov. 7, 1898	113	Dec. 6, 1898	148	132	35	Sept. 15.	Feb. 22, 1899	160	.....	.....	.....	.....
July 19..	Nov. 9, 1898	113	.....	.....	.....	.....	Sept. 16.	Feb. 21, 1899	158	.....	.....	.....	.....
July 21..	Nov. 12, 1898	114	.....	.....	.....	.....	Sept. 19.	Feb. 26, 1899	160	May 23, 1899	246	203	86
July 23..	Nov. 26, 1898	116	.....	.....	.....	.....	Sept. 22.	Feb. 23, 1899	154	.....	.....	.....	.....
July 25..	Nov. 27, 1898	125	Jan. 10, 1899	169	147	44	Sept. 27.	Mar. 3, 1899	157	.....	.....	.....	.....
July 29..	Nov. 30, 1898	124	.....	.....	.....	.....	Sept. 28.	Apr. 11, 1899	195	.....	.....	.....	.....
Aug. 3..	Dec. 28, 1898	147	.....	.....	.....	.....	Sept. 30.	Apr. 10, 1899	192	.....	.....	.....	.....
Aug. 14..	Dec. 27, 1898	135	Jan. 20, 1899	159	147	24	Oct. 4..	May 1, 1899	209	.....	.....	.....	.....
Aug. 26..	Jan. 6, 1899	133	Apr. 11, 1899	228	182	95	Oct. 7..	May 3, 1899	208	.....	.....	.....	.....
Aug. 30..	Jan. 6, 1899	129	Apr. 11, 1899	224	177	95	Oct. 10..	May 5, 1899	197	.....	.....	.....	.....
Sept. 5..	Jan. 15, 1899	132	Apr. 18, 1899	225	179	93	Oct. 13..	May 8, 1899	207	.....	.....	.....	.....
Sept. 6..	Jan. 30, 1899	146	May 3, 1899	239	193	93	Oct. 20..	May 6, 1899	198	.....	.....	.....	.....

From this record the following summary has been prepared:

Eggs taken in 1898.	Hatch first (in days).	Hatch last (in days).	Average hatching period.	Average range in hatching.
July	113	151	133	37
August	136	204	169	71
September	161	242	198	88
October	204	(?)	(?)	(?)

In 1899 there were spawned 2,837 red salmon, as follows:

Spring run.		Fall run.	
Date.	No.	Date.	No.
June 27-30	14	Aug. 28-31	23
July 1-31	1,357	Sept. 1-30	1,178
Aug. 1-10	60	Oct. 1-31	195
		Nov. 3	10
Total	1,431	Total	1,406
			1,431
Grand total for season, 1899			2,837

Of the season's take the spring run therefore amounted to 50.4 per cent as against 49.6 per cent for the fall run. Considering the season as a unit, the monthly percentages of fish spawned are as follows: June, 0.5 per cent; July, 47.9 per cent; August, 2.9 per cent; September, 41.5 per cent; October, 6.8 per cent; November, 0.4 per cent.

Taken at the usual hatchery count of 3,000 eggs per average spawn fish, there should have been basketed more than 8,500,000 eggs, but the superintendent has only credited the hatching-house with 6,000,000, "owing to shrinkage in various ways."

The first eggs were taken June 27 from a few fish, but were not basketed; the milt curdled when it came in contact with the eggs, and it was not thought impregnation would take place. Spawning was again carried on June 30, when the milt once more curdled upon contact with the eggs, and none of the latter were basketed. July 3 the first eggs were placed in the troughs, although the same condition of milt was met with. This curdling tendency continued in a diminishing degree for about a week longer, when it ceased; strange to say it did not affect the vitality of the sperm as far as could be judged. Spawning was carried on about every other day in July, the run slacking up toward the latter part of the month; in August eggs were taken three times up to the 10th, from which time until the 28th none were taken. With the beginning of the fall run work went on once more every other day until the end of September; during October spawn was taken on an average of about once a week, and the last stripping of 10 fish was done November 3. On the last-mentioned date about 40 adult salmon, still unripe, were released from the reservoir and turned into the river.

The period of incubation varies with the temperature of the water, of course, but it is also believed to be of less duration with eggs taken from the spring run than is the case with those of the later or fall run. That is, the eggs of the spring run of redfish seem to have a more vigorous vitality, hatching more rapidly under similar thermal conditions; but this is still a matter of opinion and must remain so until the collection of sufficient data from which to draw careful conclusions.

From the meager figures at hand for the 1899–1900 season the following table has been prepared:

Eggs taken in 1899.	Eyed.	Hatching period.			Hatching range.	Premature births.	Remarks.
		First.	Last.	Mean.			
July 3	30	74	109	92	35	23	
July 13	40	.....	125	.....	.....	.....	
July 15	.....	109	132	121	23	.....	
July 31	.....	93	185	139	92	62	Delicate period, Sept. 1–Oct. 15.
Aug. 3	.....	.....	.....	.....	.....	90	
Aug. 10	.....	127	202	165	83	75	
Aug. 28	65	126	199	163	73	74	Delicate period, Oct. 20– ?
Sept. 7	64	161	206	184	45	.....	
Sept. 10	62	158	214	186	56	.....	
Sept. 14	75	154	218	186	64	.....	
Sept. 20	81	162	223	193	61	.....	
Sept. 30	89	207	237	222	30	.....	
Oct. 14	110	199	230	215	31	.....	
Oct. 27	125	186	.....	.....	.....	.....	
Summary.							
July 3–15	35	91	122	107	31	.....	Spring run.
July 31–Aug. 10	.....	110	193	151	83	.....	
Aug. 28–Sept. 20	69	152	212	182	60	.....	Fall run.
Sept. 30–Oct. 27	108	197	233	215	36	.....	

Eggs taken in 1899.	Eyed.	Hatching period.			Hatching range.
		First.	Last.	Mean.	
Spring run	35	100	158	129	58
Fall run	88	174	222	198	48
Season	61	137	190	163	53

NOTE.—In the above table a day of 24 hours is the unit.

It would appear from the above that the eggs eye very much faster with the spring run, and that the hatching range covers a much longer period. It is also apparent that in considering the hatching of redfish at Karluk the two runs must be treated separately—the runs are so marked and the prevailing conditions so radically different. For example, eye-spots have appeared in 30 days in spring-run eggs, and have with fall-run eggs been as long as 138 days before being visible. With the early run eye-spots are looked for between 35 and 40 days, the interval advancing with the season; with fall eggs the eye-spots are not expected until more than two months have passed, the time again increasing with the advancement of the season. The "tender stage" is a variable quantity, difficult to calculate; it is carefully looked for within about three weeks from the stripping, but may not occur for as many months. Its duration is also variable, anywhere from one to five or six weeks, depending upon the temperature, and it is thought, other conditions not yet known. This season, 1900, no tender condition had made its appearance up to August 8.

The period of incubation ranged in 1899 from 74 days to 237 days, and there is a maximum record for some prior season of 244 days. The early run in 1899, under natural conditions of temperature, hatched in an average of 129 days, whereas the fall run required 198 days. Seven months is supposed to be the period of incubation under natural conditions, with the temperature at a mean minimum during the coldest months of between 33° and 35° F., and this seems to be a fairly correct approximation, judging from the record of the October eggs of 1899 and the following temperature record:

Temperatures in hatching troughs, winter 1899–1900.

Month.	Mean maximum.	Mean minimum.	Mean.
	°	°	°
October, 1899	42	40	41
November, 1899	40	38	39
December, 1899	+37	36	−37
January, 1900	−37	+35	36
February, 1900	37	35	36
March, 1900	38	36	37
April, 1900	39	36	+37

In 1900 the seining crew delivered into the river corrals 79,753 adult salmon. Of this number 13,123 escaped from time to time through the water gate when opened to admit live-cars, and through breaks in the corral fences during the time the corrals were in use, 114 days; there were also lost 7,334 stock-fish at a time when the fencing of one of the corrals blew down. The proportion of males to females among these 20,457 fish which escaped alive is, of course, unknown. The remaining 59,296 comprised 33,523 males and 25,773 females, which are accounted for as follows:

	Males.	Females.	Total.
Died on hand	14,324	19,498	33,822
Returned to river alive	19,199	6,275	25,474
Total	33,523	25,773	59,296

Of these fish 7,270 males and 15,579 females, or a total of 22,849, were transferred to the ripening-ponds during the season, as follows:

Month.	Males.	Females.	Total.
June	1,931	3,974	5,905
July	2,296	5,574	7,870
August	2,225	3,658	5,883
September	818	2,373	3,191
Total	7,270	15,579	22,849

No report of the egg-take for the season has been received, but 5,524 females were spawned in all. Applying the usual Karluk hatchery factor of 3,000 per average fish, the take would appear to have been 16,582,000 eggs. Allowing, however, for "other shrinkage in various ways," and judging from the hatchery capacity, 15,000,000 eggs would appear to be a fair estimate.

According to a report from the hatchery, under date of November 3, 1900, all the June eggs and part of the July eggs had hatched out, producing an excellent lot of healthy fry. It was found (1900) that the earlier eggs and the September eggs were the best, while a portion of those taken during the middle of the season were of indifferent quality.

The following temperatures of the water in the hatching-troughs are recorded:

Month.	High.		Low.		Mean.	Remarks.
	Max.	Mean.	Min.	Mean.		
	°	°	°	°	°	
May, 1900	48	43	36	38.7	40.9	
June, 1900	57	49.3	39	41 7	45.5	57° June 28.
July, 1900	57	51	43	45	48	57° July 9.
August, 1900	56	50.2	42	46.3	48.2	
September, 1900	48	46.1	39	43.1	44.6	
October, 1900	46	41	34	40	40.5	
November, 1900	39	36.6	34	36.1	36.3	
December, 1900	38	35.3	33	34.7	35	33° Dec. 22 and 31.
January, 1901	36	34.4	34	34.3	34.3	

The eggs of the redfish readily admit of forcing, but to what extent is not known. Judging from the fact that "freaks" or malformations and prematures occur anywhere from 20 to 80 days, 90 days would seem the limit of safety, but at what temperature the limit is reached is not yet known. At Karluk fall-run eggs have been successfully forced to hatch in 165 days, or say 45 days sooner than would have been the case under natural conditions. To do this the temperature during the last 42 to 45 days—that is, after the one hundred and twentieth day—was artificially raised to 46° and 48°, or 10° to 12° higher than otherwise would have obtained. It has been observed that during warm misty or rainy weather eggs which are nearly ready to hatch will be hastened by several days.

After a basket of eggs has been placed in a trough at the Karluk hatchery it receives the most tender care. For the first two or three days the basket is not touched, but remains "buried" under the canvas tarpaulin; it is then handled once a day for the next four or five days by the superintendent himself, who merely floats the eggs once, very gently, and picks off the dead eggs and "empties" showing on top; after

this, and until the "unctuous" stage has passed, an expert egg-picker removes the bad eggs, the superintendent having previously floated them on top. When the unctuous stage, lasting from eight to twenty days, during which the eggs are very delicate and have a certain indescribable oily appearance, has passed, the basket is henceforth in the hands of one of the hatching-house force, who is responsible for it until the end.

Ordinary tin forceps are employed in picking, but they are critically examined by the superintendent before they are used, to see that there are no sharp edges or corners to cut the tender skin of an egg. Frequent inspection of the forceps continues throughout the season. The eggs are picked very thoroughly until the second tender period begins, usually a short time before eyeing takes place; after this stage has passed the eggs may be handled with greater freedom, but vigilance and tender care are observed throughout the season. Jars, sudden knocks, rapid changes in temperature, or other shocks are particularly guarded against, and a basket of eggs is never lifted from a trough when it can be avoided. In affixing to the trough the small pasteboard tag describing the basket, no hammer is used, but the broad-headed and short, sharp-pointed tack is forced home with the thumb. Great care is taken to keep the troughs and baskets clean, and to have the feed water well filtered. As yet there has not been the least trouble from fungus. There is a slimy vegetable growth which forms on the sides of the troughs under certain conditions, which must be removed, but which does not spread to the eggs like fungus; it is probably some species of fresh-water algæ.

After the fry are hatched out they escape to the bottom of the trough, there being one-half inch clear space on either side of the basket, somewhat more than that under it, and in addition there is the large area at the end of each trough created by the removal of the fifth basket; this gives the fry plenty of room, and they do very well in the troughs. As they age they require more space, but they are usually held in the parent trough until the egg—or umbilical—sac is absorbed, a period of about ten weeks, depending upon the temperature of the water.

The fry must then be fed, which is sometimes done in the trough and sometimes in the reservoir pond. The only food ever used at Karluk has been tinned salmon flesh, "do-overs," furnished from the canneries at Karluk Spit. This is removed from the can, thoroughly desiccated, and then ground up in a fine-cutting sausage mill. For some reason the fry do not seem to thrive on this diet, refusing to take it after ten days or two weeks, and it is therefore the endeavor to plant them as soon after becoming free feeders as is possible; it makes a wonderful difference in the quick growth and development of the fry if they can obtain natural food. The fry appear to be of a generally dormant temperament during the time the sac is being absorbed, and there has been very little loss at Karluk during this period; the greatest losses to fry occur at the time of first feeding.

As they become free feeders they are allowed to escape from the troughs via the wasteway into the reservoir pond, and thence through the ditch into the rearing or nursery pond—a large, irregular-shaped excavation, with an area of about three-fourths of an acre. Owing to the cannibalistic tendencies of the larger fry, the young with the egg sac still attached are kept by themselves. The tiny free feeders, however, seem pretty well able to take care of themselves. As opportunity offers, the fry are taken

from the large nursery pond and planted; or, if the nursery be frozen over, they are taken from the reservoir and parent troughs, where they have been held on this account. After the fry are three or four months old it has been observed that they seem to deteriorate in the nursery ponds, and they are never held beyond this time.

When the ponds and upper part of the lagoon are frozen over, the fry are placed in tanks prepared for them, transported on sleds to the open water, and planted. These tanks are made of clean, strong, salt-salmon barrels thickly coated with asphaltum varnish and rigged with handles, or beckets, of rope. Three of these are a sled load, and comprise a "plant," which usually numbers about 100,000 by this method. When the ponds and lagoon are open and free from ice, the fry are driven out of the rearing-pond at high water, through a short flume, into a live-car made of an old skiff. This skiff, which has a number of square ports cut in its sides, covered with fine mesh wire netting, is brought directly under the short flume, which leads from one corner of the pond to the lagoon beach. It has a capacity of over 200,000 fry. When the live-car is loaded the wire-screen gates are let down across the inner end of the flume and the further exit of fry stopped.

Planting is done at high water along the shores of the lagoon between the mouth of the river and the upper end of the village at Karluk. The location selected depends upon the existing conditions, ice, waves, and the movements of predatory species being considered. As far as possible a rocky shore whose crevices afford safe retreats, away from the entrance of fresh water where trout are attracted, is chosen, and the fry released without further preliminaries. It is claimed that no salmon fry has ever been planted at Karluk with the egg sac not entirely absorbed.

The superintendent firmly believes that the strong free-feeding fry early crave salt water, and he usually has a barrel containing a small quantity of salt submerged in the large nursery pond. It has been observed that the fry collect about this like flies after sweets, and the salt appears to act upon them like a tonic, making them more sprightly and vigorous in their movements.

After being set free the fry have been observed to work downstream alongshore toward the salter portions of the lagoon, which is fairly brackish except at the higher tides, when it is quite salt, or at the lowest tides when the river is full, when the lagoon is practically fresh. Later the fry are seen along the outside beaches in the vicinity of the shaded rocky points, but return to the lagoon at frequent intervals, working in and out with the tides for a long time, or until late in the fall following their birth. Some fry are much stronger and larger than others and grow very rapidly. Two or three were seen in the nursery pond August 8, 1900, which were from 2 to 3 inches in length and very timid. In April, 1897, fry from 1½ to 1¾ inches long were seen in small schools passing seaward from Karluk River, and the fry hatched in the spring of 1898 were from 1½ to 1¾ inches, some 2 inches, in length in the nursery pond in August.

Trout are believed to be the most destructive natural enemies the fry have to contend with. An individual (*Salvelinus malma*) only 2½ inches in length which once found its way into the nursery pond had 12 tiny fry in its maw when captured. The trout are not such active feeders in the winter, and are more sluggish in movement, and it is therefore deemed advisable at Karluk to plant fry at this season. Other natural dangers are also believed to be lessened at this time.

After the trout the greatest enemies to fry are perhaps the sea birds. Flounders and sculpins are too sluggish in their movements, besides being bottom fish, to be very destructive. Sudden storms, raising a heavy sea on the shore along which the fry are schooling, are also dangerous.

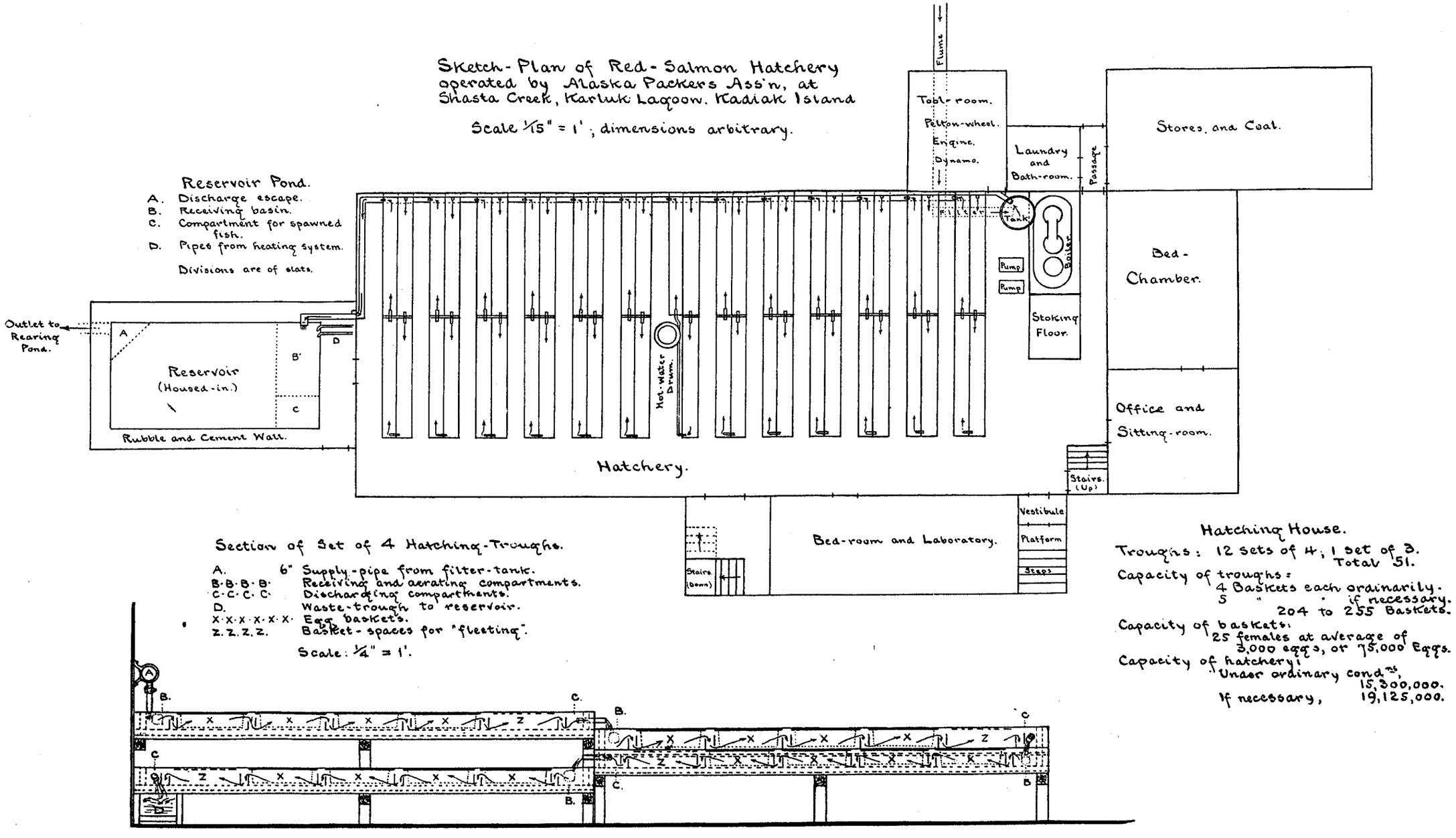
The loss of the hatchery in the ratio of fry planted to the number of healthy eggs basketed it is believed at present will not amount to 25 per cent from all causes, although during the first season it was figured at not far from 40 per cent. The greatest present loss is from dead eggs and "empties," or unfecundated eggs. This is not now as much as 15 per cent, and gradually diminishing as experience is gained. The loss from freaks and abortions and premature births, all combined, is nominal, but is greatest in the eggs of the spring run. It is not of itself considered a factor, but is lumped with the losses from other causes. Deaths due to smothering of the tiny fry during the period of absorption of egg sac, through injuries received in various ways while in the troughs and reservoir, with the other losses just mentioned, will make up a conservative total loss of 25 per cent. The superintendent believes his 1900 loss should not be much in excess of 20 per cent unless from some unlooked-for calamity.

The superintendent believes in the *parent region* theory, and thinks that the Karluk fishery has already this year (1900) felt the value and effects of artificial propagation. He thinks that the largest and strongest of the fry planted in the winter of 1896–97 and spring of 1897 have become matured, that this year they returned as breeders, and that their numbers were sufficient to make an appreciable increase in the runs of salmon schooling off Karluk Head, and possibly Ayakulik River. He believes they first put in an appearance as grilse, invariably males, which are thoroughly matured, and that these grilse are 2 years old, that is, from birth. Part of the breeders, he thinks, return in three years, while others of slower development return in four or five years, and it is not beyond the bounds of reason to presume that some may be delayed for an even longer period before reaching full maturity.

In 1897 the adipose fin was cut from 513 fry, part of which were liberated in Karluk River and part in the lagoon.

The approximate output of the Alaska Packers Association's redfish hatchery at Karluk is estimated as follows:

	Fry liberated.
Season 1896–97	2,000,000
1897–98	5,000,000
1898–99	5,000,000
1899–1900	6,000,000
1900–1901	12,000,000
Total output	30,000,000


Sketch-Plan of Red-Salmon Hatchery operated by Alaska Packers Ass'n, at Shasta Creek, Karluk Lagoon, Kadiak Island
Scale 1/15" = 1'; dimensions arbitrary.
Reservoir Pond.
A. Discharge escape.
B. Receiving basin.
C. Compartment for spawned fish.
D. Pipes from heating system.
Divisions are of slats.
Outlet to Rearing Pond.
Reservoir (Housed-in.)
Rubble and Cement Wall.
Hot-water Drum.
Hatchery.
Flume
Tool-room.
Pelton-wheel.
Engine.
Dynamo.
Laundry and Bath-room.
Passage
Stores, and Coal.
Filter
Tank
Boiler
Pump
Pump
Stoking Floor.
Bed-Chamber.
Office and Sitting-room.
Stairs. (Up)
Stairs. (Down)
Bed-room and Laboratory.
Vestibule
Platform
Steps
Section of Set of 4 Hatching-Troughs.
A. 6" Supply-pipe from filter-tank.
B·B·B·B· Receiving and aerating compartments.
C·C·C·C· Discharging compartments.
D. Waste-trough to reservoir.
X·X·X·X·X·X· Egg baskets.
Z.Z.Z.Z. Basket-spaces for "fleeting".
Scale: 1/4" = 1'.
Hatching House.
Troughs: 12 sets of 4; 1 set of 3. Total 51.
Capacity of troughs:
4 Baskets each ordinarily.
5 " " if necessary.
204 to 255 Baskets.
Capacity of baskets:
25 females at average of 3,000 eggs, or 75,000 Eggs.
Capacity of hatchery:
Under ordinary cond^ns, 15,300,000.
If necessary, 19,125,000.

SALMON INVESTIGATIONS OF THE STEAMER ALBATROSS IN THE SUMMER OF 1901.

By JEFFERSON F. MOSER,
Commander, United States Navy, Commanding.

After refitting during the winter of 1900–01, at Sausalito, Cal., the *Albatross* left that point, April 23, for Puget Sound, under instructions to dredge along the coast in depths greater than 1,000 fathoms. Upon the completion of this work a special report relating to it was made, and the records are printed in the report of the United States Commissioner of Fish and Fisheries for 1901.

Owing to the strikes and the disturbed condition of labor on the coast at this time, the vessel was detained for docking and painting until May 22, when departure was taken from Seattle. After coaling at Union Bay, British Columbia, the vessel arrived, May 29, at Hunter Bay, Prince of Wales Island, Southeast Alaska, and the same day field operations were commenced. The work for the season, under the Commissioner's instructions, consisted in a continuation of the explorations of the salmon streams and lake systems of Alaska on the lines carried out during previous years, and an examination of the canneries and hatcheries along the route.

During the progress of the work in Prince William Sound a case of small-pox appeared among the crew, causing an earlier return to Puget Sound, for quarantine and fumigation, than was contemplated. The stream and lake work had been practically completed, but the early return did not permit an examination of all the new canneries. After obtaining pratique at the quarantine station at Port Discovery the season was too far advanced to return to Alaska, and the vessel was accordingly detailed for special work extending from Puget Sound to Monterey.

Owing to my early detachment from the command of the *Albatross* and the lack of facilities for making a complete report consequent thereto, many of the details previously referred to have been omitted, and this paper will be largely confined to descriptions of the streams and lake systems explored by the party during the season.

It is desired in this connection to express my appreciation of the work performed by the officers of the *Albatross*, and of the courtesies extended by those interested in the canneries. Lieut. Hugh Rodman, U. S. N., Ensign A. J. Hepburn, U. S. N., Ensign C. R. Miller, U. S. N., and Ensign C. S. Kempff, U. S. N., in addition to their duties on board the vessel, conducted the stream and lake examinations. Mr. A. B. Alexander collected statistics, Mr. F. M. Chamberlain made the photographic plates, and Mr. H. C. Fassett assisted me and, under my direction, made special investigations. My thanks are due to the different companies operating canneries in Alaska for courtesies extended during our investigations, particularly to the Alaska Packers' Association, which has, through the president, Mr. Henry F. Fortmann,

placed at our disposition the facilities of its various plants and rendered most efficient assistance.

The following is the itinerary of the Alaska cruise:

Southeast Alaska:
- Hunter Bay, Prince of Wales Island.....May 29-31.
- Niblack Anchorage, Prince of Wales Island .....May 31-June 1.
- Moira Sound, Prince of Wales Island....June 1.
- Tamgas Harbor, Annette Island.....June 1-3.
- Metlakahtla, Annette Island .....June 3.
- Ketchikan, Tongass Narrows, Revillagigedo Island.....June 3-5.
- George Inlet, Revillagigedo Island.....June 5.
- Mary Island Anchorage .....June 5-6.
- Kah-Shakes Cove, entrance to Boca de Quadra .....June 6.
- Smeaton Bay, Behm Canal .....June 6-7.
- Checats Cove, Behm Canal .....June 7.
- Yes Bay, Cleveland Peninsula.....June 7-8.
- Loring, Naha Bay.....June 8-10.
- Ketchikan, Tongass Narrows, Revillagigedo Island .....June 10.
- Steamer Bay, Etolin Island.....June 10-11.
- Kunk Creek, Etolin Island .....June 11.
- Wrangell, Wrangell Island .....June 11-13.
- Salmon Bay, Prince of Wales Island.....June 13.
- Conclusion Island (off Kuiu Island) ....June 13-14.
- Point Barrie, Kupreanof Island.....June 14.
- Port Protection, Prince of Wales Island..June 14-15.
- Shakan Bay, Kosciusko Island .....June 15-17.
- Kell Bay, Kuiu Island.....June 17-18.
- Killisnoo Harbor, Kénasnow Island.....June 18-19.

Southeast Alaska—Continued.
- Kook (Basket) Bay, Chichagof Island...June 19.
- Pablof Harbor, Freshwater Bay.....June 19-21.
- Juneau.....June 21-24.
- Hunter Bay, Admiralty Island .....June 24-25.
- Bartlett Bay, Icy Strait.....June 25-27.
- Dundas Bay, Icy Strait .....June 27-29.
- Yakutat.....June 30-July 7.

Prince William Sound:
- Orca .....July 8-10.
- Port Gravina.....July 10-11.
- Naked Island Anchorage.....July 11.
- Herring Bay, Knight Island.....July 11-15.
- Naked Island Anchorage.....July 15-18.
- Port Valdez.....July 18-21.

Southeast Alaska:
- Sitka.....July 23-25.
- Nakwashina Bay, Baranof Island.....July 25-Aug. 3.
- Schultze Cove, Baranof Island .....Aug. 3-4.
- Hanus Bay, Baranof Island .....Aug. 4-5.
- Sitkoh Bay, Chichagof Island .....Aug. 5-6.
- Hoggatt Bay, Baranof Island.....Aug. 6-7.
- Baht Harbor, Zarembo Island .....Aug. 7-8.
- Steamer Bay, Etolin Island.....Aug. 8-11.
- Ward Cove, Tongass Narrows, Revillagigedo Island .....Aug. 11-12.

Washington:
- Port Discovery, Quarantine Station.....Aug. 17.

Before the opening of the season it was believed that there would be a very large number of new canneries operating during the summer, but the drop in the price of salmon made it difficult for some prospective canners to raise sufficient funds on futures to place them on a working basis, while others feared that overproduction beyond the world's demand would bear market prices below cost; nevertheless, there was a large addition, which will be referred to later. It had been the intention early this year to form a trust of the Pacific salmon canneries, but failing to make terms with the largest operating company, the scheme resulted simply in a consolidation of a portion of the canneries.

An organization under the title of the Pacific Packing and Navigation Company, incorporated under the laws of New Jersey and backed by eastern capitalists, was formed during the spring of 1901. Its object is given in a "statement," under date of March 12, 1901, in which it is said:

> It is proposed to consolidate into one corporation the properties and privileges of these companies and firms, thereby controlling about four-fifths of the canned-salmon product of the world. * * * It is proposed to capitalize the new corporation as follows: 6 per cent debentures, $7,000,000; 7 per cent cumulative preferred stock, $12,500,000; common stock, $12,500,000.

The Alaska Packers Association, whose output in past years has been about 70 per cent of the Alaska salmon pack, demanded of the trust a cash payment for their business at their own valuation. The trust offered the amount, but payment to be made partly from the sale of this season's product and the remainder in mortgages on their own property and stock in the new company, which offer was declined.

The Pacific Packing and Navigation Company acquired the following properties, and they are now operated by that organization:

ALASKA.

Canneries of Pacific Steam Whaling Company at Nushagak, Bristol Bay; Chignik, Alaska Peninsula; Uyak, Kadiak Island; Kenai, Cook Inlet; Orca, Prince William Sound; Hunter Bay, Southeast Alaska.
Hume Bros. & Hume, with canneries at Chignik, Alaska Peninsula, and Uyak, Kadiak Island.
Thlinket Packing Company, canneries at Gerard Point and Santa Anna Bay, Southeast Alaska.
Western Fisheries Company, with a cannery at Dundas Bay, Icy Strait.
Chilkoot Packing Company, with a cannery at Chilkoot Inlet.
Taku Packing Company, with a cannery at Taku Inlet.
Taku Fishing Company, with a cannery at the entrance to Port Snettisham.
Boston Fishing & Trading Company, with a cannery at Yes Bay.
Chatham Straits Packing Company, with a cannery at Sitkoh Bay.
Icy Strait Packing Company, with a cannery at Petersburg, Wrangell Narrows.
Quadra Packing Company, with a cannery at Mink Bay, Boca de Quadra.

PUGET SOUND REGION, WASHINGTON.

Pacific-American Fisheries Company, with canneries at Fairhaven and one at Friday Harbor.
Ainsworth & Dunn, with canneries at Seattle and Friday Harbor.
Fairhaven Canning Company, with a cannery at Fairhaven.

The new concern also acquired a hatchery near the entrance to Freshwater Bay and one in the Boca de Quadra, Alaska.

As the histories of the Alaska canneries have been given in my former reports, reference will be made here to the canneries located in Washington and absorbed by the new company.

The Pacific American Fisheries Company was incorporated in 1899 under the laws of New Jersey. This company purchased at the time of its organization the cannery and trap properties of the Island Packing Company, San Juan Island, and the cannery of the Franco-American North Pacific Packing Company at Fairhaven, the latter concern having been promoted the year previous. The "P. A. F.," as it was locally known, also acquired about thirty independent trap locations in the adjacent waters of Washington.

Ainsworth & Dunn had one cannery at Blaine and one at Seattle, and a number of trap locations. This business had grown up gradually, during a period of seven or eight years, from a small beginning in the fresh-fish trade to a prominent position in the Puget Sound salmon industry.

The Fairhaven Canning Company was a Washington State corporation, owning one cannery at Fairhaven and several trap locations.

The Pacific Packing and Navigation Company therefore represents a combine of twenty-three canneries with their equipage. The company claims an Alaska pack for 1901 of about 700,000 cases, and expects to increase its output so as to have a total capacity of 1,000,000 per season.

Returning to the cannery conditions in Alaska, there are now two large corporations and sixteen independent canneries. The Alaska Packers' Association easily leads in this enterprise, with a pack this year of 50 per cent of the total. The Pacific Packing and Navigation Company follows with about 30 per cent. The remaining 20 per cent are distributed among the following independent concerns: Alaska Salmon Company, Columbia River Packers' Association, Portland-Alaska Packers' Association,

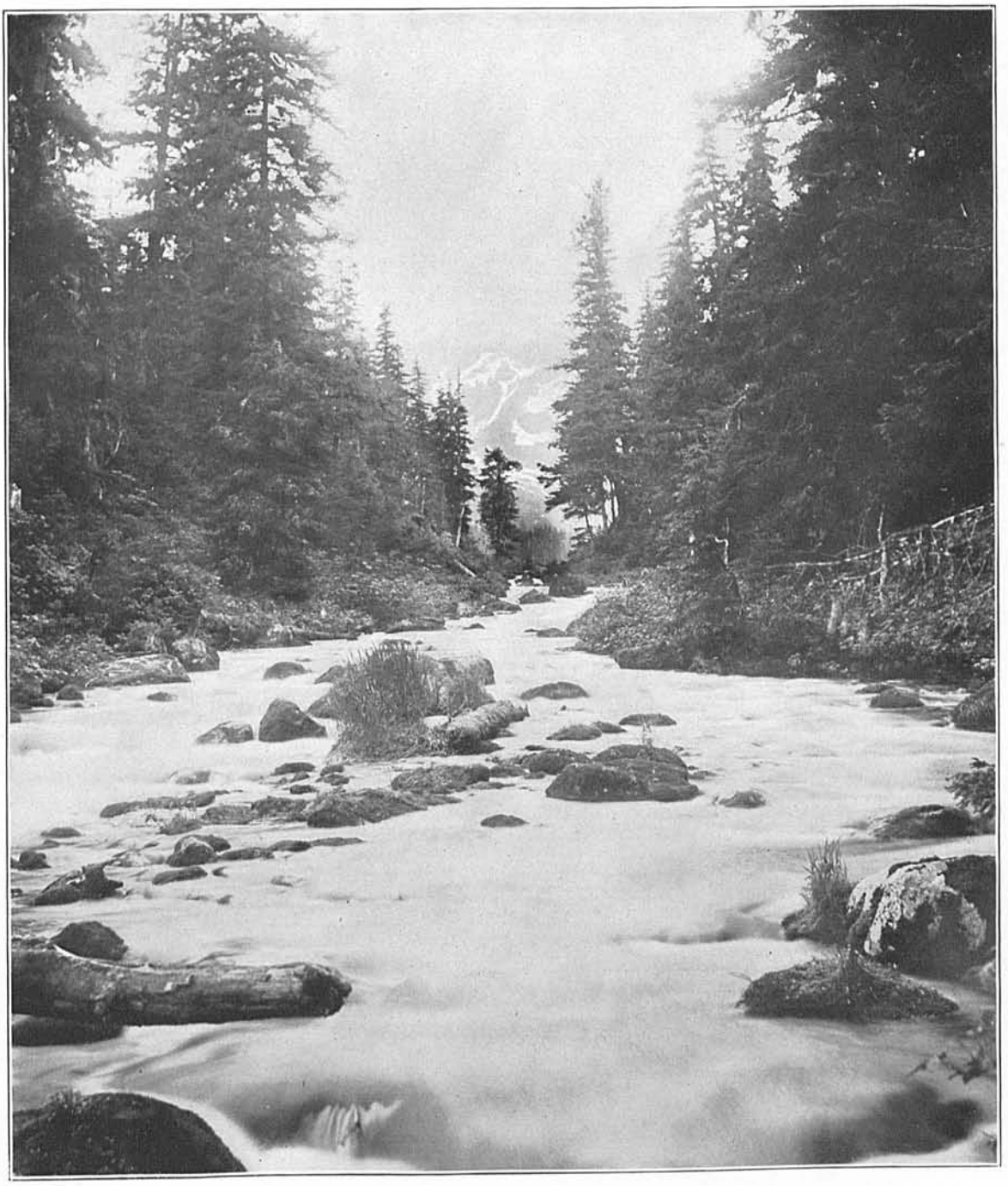
and Alaska Fishermen's Packing Company, all on the Nushagak; North Alaska Salmon Company, on the Kvichak; Naknek Packing Company, on the Naknek; Bristol Packing Company and Red Salmon Packing Company, on the Ugashik; Alaska Salmon Association, on Cook Inlet; Fidalgo Island Canning Company, Ketchikan; Metlakahtla Industrial Company, Metlakahtla; North Pacific Trading and Packing Company, Klawak; Pacific Coast and Norway Packing Company, Blunt Point, Wrangell Narrows; Union Packing Company, Kell Bay; San Juan Fish and Packing Company, Taku Harbor; and F. C. Barnes & Co., Lake Bay, Prince of Wales Island.

NEW CANNERIES IN SOUTHEASTERN ALASKA IN 1901.

In southeastern Alaska six new canneries were built and operated and two were rebuilt during the season, as follows: Thlinket Packing Company, in addition to their cannery at Gerard Point, at the mouth of the Stikine River, erected and operated a plant called No. 2 in Santa Ana Bay, Seward Passage. The Pacific Coast and Norway Packing Company, which during 1900 operated a salting plant in Wrangell Narrows, erected and operated a cannery in the Narrows at Blunt Point. The Chatham Straits Packing Company, a branch of, or promoted by, the Icy Strait Packing Company, operated a cannery on the southern shore of Sitkoh Bay, about 4 miles from Point Craven. The Union Packing Company built and operated a cannery in Kell Bay, Kuiu Island. Canneries were also built and operated at Lake Bay, Prince of Wales Island, by F. C. Barnes & Co., and in Taku Harbor, by the San Juan Fish and Packing Company. The Alaska Packers Association rebuilt their canneries at Loring and Wrangell and installed modern plants at both places. Three new canneries only were visited in southeastern Alaska, as time did not permit our calling at all the points.

Union Packing Company.—This company, with home address at Tacoma, was organized under the laws of the State of Washington, and built a cannery during the spring of the year on Kell Bay, an arm of Affleck Canal, on the southern end of Kuiu Island. The buildings are located on the southern arm of the bay inside a cluster of islands. The capacity of the cannery is placed at 600 cases per day. The outfit was for 25,000 cases, with a Chinese guaranty of 20,000 cases. The Chinese contract was 44 cents per case, with the usual conditions. The fishermen contracted for their transportation and board, $35 per month, and for each crew of 7 men, collectively, a bonus of 1 cent for each redfish and coho, $4 per thousand for dog salmon, and $2 per thousand for humpbacks. Transportation by calling freight steamers of a regular line. If the conditions should hold good, it was the intention to fish for halibut after the close of the salmon-packing season.

Alaska Salmon Packing and Fur Company (A. P. A.), Loring.—During the spring of 1901 the old cannery buildings were pulled down, new buildings were erected, and new machinery installed on the old site for a first-class three-filler plant. The main cannery building is 240 feet by 50 feet, of which 70 feet is two-story; parallel to it and connected by a broad platform is a two-story warehouse, 170 feet by 60 feet, with an ell 120 feet by 40 feet. Part of the old building, 60 feet by 35 feet, has been retained for a box-house. There are two wharves—the upper one having sufficient depth alongside for vessels to lie while loading, the lower one is used for berths for the cannery tenders. The Y slip for discharging fish from the tenders, referred to in my 1900 report has been extended.



CHENIGA STREAM, PRINCE WILLIAM SOUND, ALASKA.

The following canning machinery is installed: 2 cutters, 3 fillers, 3 toppers, 3 solderers, 10 retorts, 2 sets of canmakers (complete with 2 toppers and 2 solderers), and 2 fish-cleaning machines. The cannery has a capacity of 2,400 cases a day, and was ready for operation for the first run of fish this season. All the tins were made at the cannery, of 100-pound domestic plate. The canning machines were run at the rate of 55 per minute for each set.

Glacier Packing Company (A. P. A.), Point Highfield, Wrangell.—As the old cannery was no longer suitable for the purpose, it was pulled down during the season and a new enlarged cannery with the latest machinery was constructed on the site of the old plant. The cannery building proper, a structure 238 feet by 50 feet, of which 138 feet is two-story, was ready for the season's pack, and the warehouses and other buildings were erected during the season and after the runs were over. All cans were made by hand at the cannery, except 1,200 cases of flats which were carried from San Francisco. The tin plate was of domestic manufacture, 100-pound weight.

Several of the older canneries were visited in southeastern Alaska, but no marked changes were noted from conditions existing in 1900, except a general tendency to improve methods, better machinery, and increased facilities for making a larger pack.

It may be of interest here to note that during our visit in the vicinity of Burroughs Bay it was learned that the Indians during the past two years have taken quite a number of shad.

NEW CANNERIES, WESTERN ALASKA, 1901.

From Cross Sound to Bering Sea there were no additions to the canneries, but the latter district received six new ones and enlargements to several old plants.

The Portland-Alaska Packers' Association built a cannery at Snag Point, on the Upper Nushagak Bay. The location is in front of the village, a short distance above the A. P. A. cannery known as the Alaska Packing Company, or the Johnson plant.

The Columbia River Packers' Association constructed a cannery at the mouth of Clark Creek, above the Nushagak Canning Company's reserve plant (A. P. A.).

The Alaska Salmon Company erected a canning plant on the right bank of Wood River, about 2 miles from the mouth, and abreast of the lower point of the first island in the river.

The Red Salmon Packing Company built and operated a cannery on the Ugashik River, about half a mile above the site of the old Bering Sea Packing Company.

The Alaska Packers' Association built an additional three-filler cannery on the Ugashik, on the site of the old Bering Sea Packing Company, and have retained the latter name for the new cannery.

Under the name of the Guardian Packing Company the A. P. A. built a four-filler cannery on the Naknek, about 2 miles below their old cannery, which is operated under the name of the Arctic Packing Company.

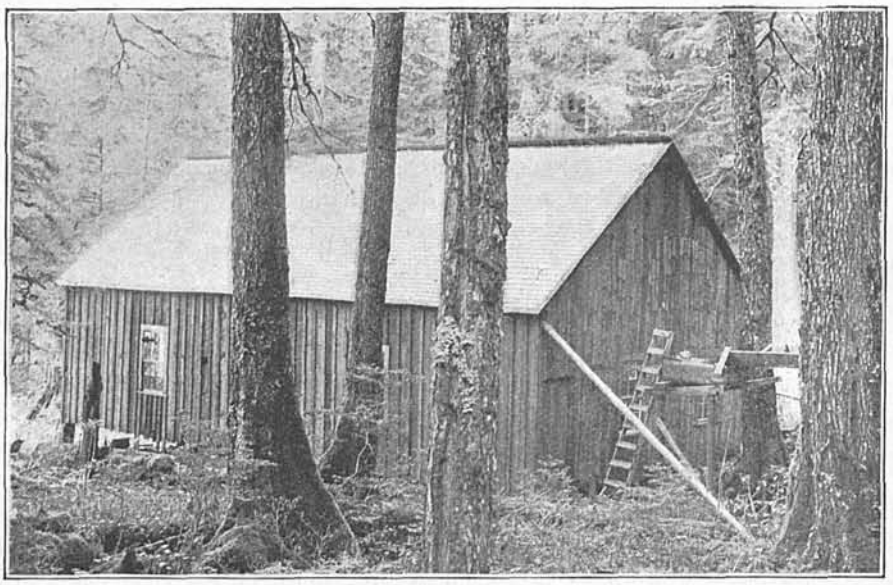
The Alaska Packers' Association has also laid the foundation for a large addition to their plant below Koggiung, which was constructed and operated in 1900. In my last report this was called the Kvichak Packing Company, but since then the name has been changed to the Horseshoe Fishing and Mining Company. This addition is to have four fillers and to be ready for operation during the season of 1902.

The Alaska Packers Association have erected a large salmon hatchery on the Naha Lake System, at the head of the Third Lake, within the mouth of the stream

which forms the outlet to the Fourth Lake. This hatchery was located during the season and obtained 12,000,000 redfish eggs.

The association also operated the Callbreath hatchery, on Etolin Island, obtaining about 6,000,000 redfish eggs. At Karluk hatchery, where the run of redfish this season was very large, 32,800,000 eggs were obtained, making the total number of redfish eggs placed in the hatcheries of the Alaska Packers' Association 50,800,000. Counting upon a loss of 20 per cent, this corporation expects to liberate over 40,000,000 fry in the waters of Alaska.

The following is an account of the streams and lakes examined during the season, together with a few remarks on special features of the salmon fisheries.



Pacific Steam Whaling Company's hatchery Hetta Lake.

SOUTHEAST ALASKA.

PACIFIC STEAM WHALING COMPANY'S HATCHERY, HETTA LAKE.

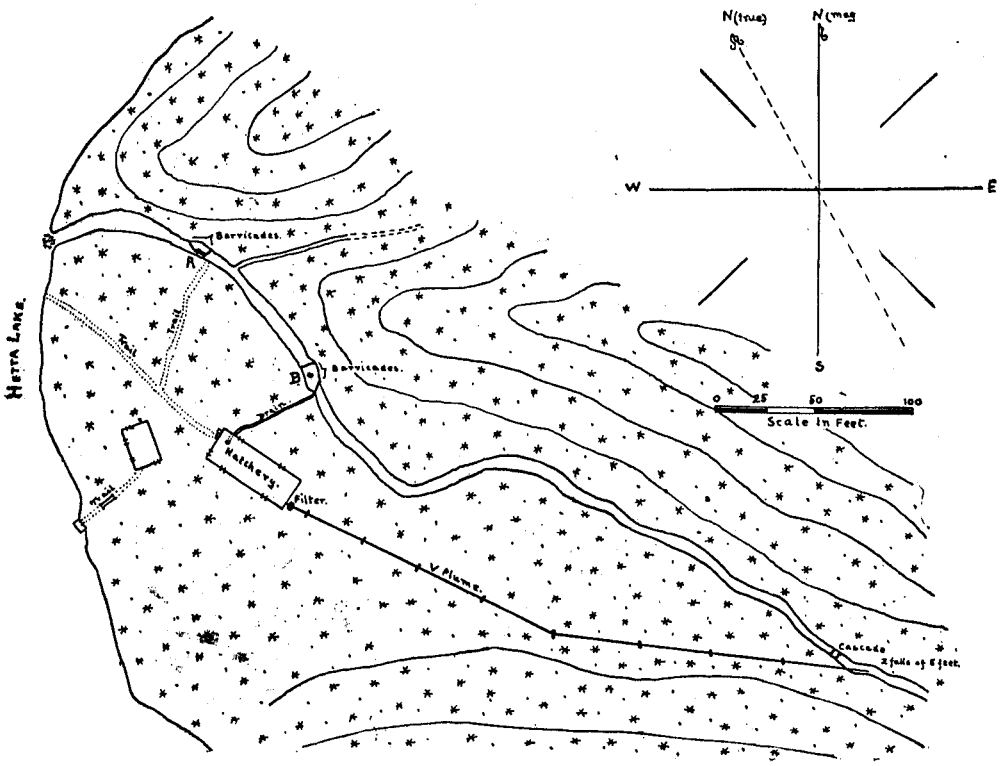
Hetta Stream and Lake were described in my report for 1897 (p. 73–75), and the hatchery was referred to in my report for 1900, but not visited until June 5, 1901, when it was examined by Ensign Kempff and Mr. Chamberlain. For a description of the locality reference is made to former reports.

The hatchery, consisting of hatchery house, dwelling, and boathouse, is located on low, rolling, and heavily wooded land on the southeast shore of the lake, on the left bank of a feeder, from which the hatchery receives its supply of water. The hatchery site is reached from the mouth of Hetta Stream by trail to the lake and by boat across the latter. This feeder is about 10 feet wide, 6 inches deep, and flows with a strong current in a general west-northwest direction, emptying into the lake

about 100 feet to the northward of the main building. The bottom is gravelly, with rocky outcrops in places. There is a cascade of two falls of 5 feet each about 200 yards from the mouth, and about 100 feet beyond this point the stream receives a small tributary from the eastward, the bottom of which is gravelly. Temperature of feeder 43° F.; temperature of lake water 43° F., of lake outlet 50° F.

The hatchery supply is carried from a point just above the cascade for a distance of 325 feet in a flume, the drop of the flume being 12 feet in its length. Outside the hatchery the water is received in a settling tank, 2 feet by 4 feet by 1 foot, partially filled with gravel. A spout 2½ inches by 3 inches leads from the tank into the building, dropping 2½ feet to the head trough.

In the feeder near the hatchery are two nursery pools (A and B), formed by



Sketch of Hetta Hatchery, Prince of Wales Island, Alaska.

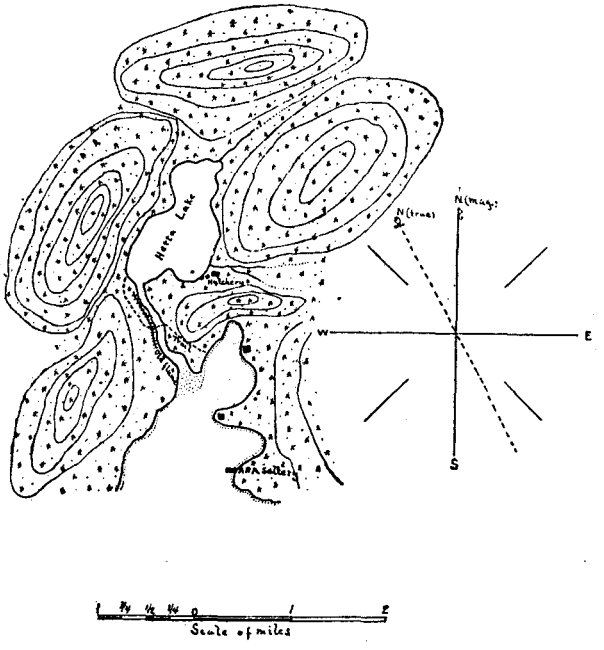
double barricades, and covered with boughs to shade the fry and protect them from birds.

The hatchery building is 50 feet by 26 feet, with side walls 10 feet high, of plank. There are 10 troughs, each 20 feet long, the bottom 12 inches wide, being set in the sides, which are 8 inches deep. They are arranged in 4 batteries, 3 of two troughs each and 1 of four troughs, that is, a double run. They extend lengthwise of the building and are equally distant from each other and from the sides of the building.

The basket divisions are 2½ feet in length, and the division plates, 4 inches apart, are made of light-weight iron, asphalted. The head trough is of the same material

as the hatching-troughs. It is of 12-inch stuff and the sides and bottoms are of the same dimensions. The gates are made by cutting out and resetting the block, leaving a space at the bottom of three-fourths inch by 4 inches. The outflow is controlled by a sheet-iron drop gate. A short tin spout carries water into the troughs, falling about 4 inches. In the double-run battery a similar spout carries the water into the second section with a fall of 2 inches. The troughs drop about 6 inches in their length. The baskets are 24 inches by 11 inches by 5 inches, of the usual material, two-tenths-inch by three-fourths-inch mesh. Wooden battens are secured to the two long sides and the ends protected by a fold of tin nailed to the battens. The corners are interlaced. The baskets are supported in the troughs either by the wooden battens or upon four small blocks one-half inch high, nailed to the bottom of the trough. There were 70 baskets in the house, each having a capacity of 50,000 eggs.

The stock fish are seined in the lake and kept in a retaining pond until fully ripe. The seine used is 30 fathoms by 2 fathoms by 2½-inch mesh. The fish are spawned by the wet process. The spawning pans are tin saucepans, 8 inches in diameter, asphalted. The period of incubation is 90 to 120 days.



Sketch of Hetta Lake and Stream, Prince of Wales Island, Alaska.

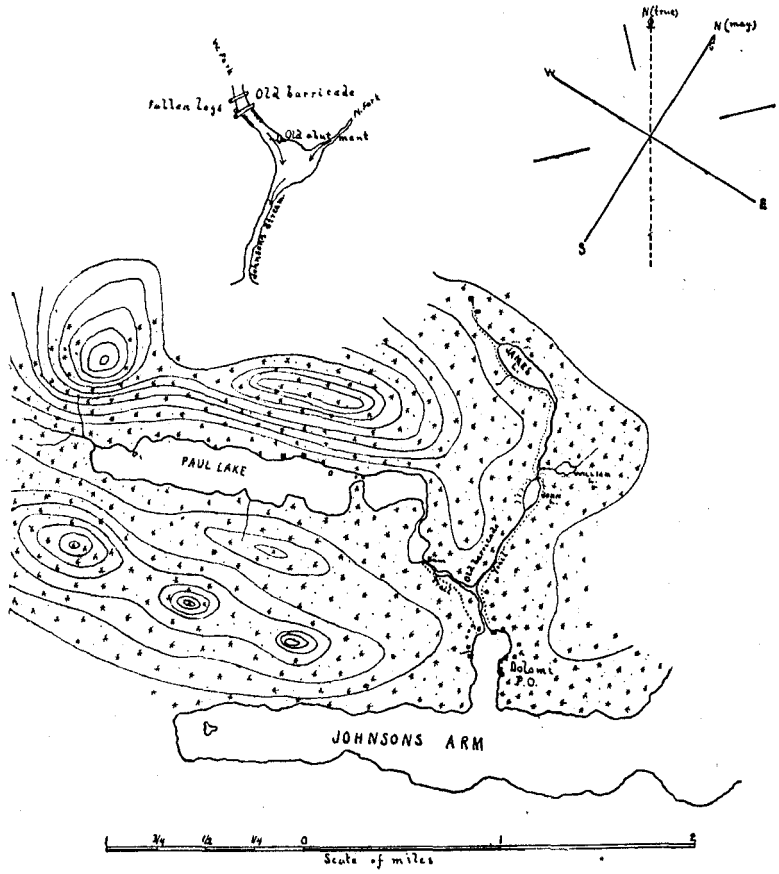
The data from this hatchery is exceedingly meager, and not reliable enough for record. It is said that in 1899, 2,800,000 eggs gave 2,600,000 fry (a loss of 7.14 per cent), but this can hardly be correct; in 1900, 1,800,000 eggs were placed in baskets. Very cold weather during the winter of 1900–1901 froze many of the eggs. The output is not definitely known.

PETER JOHNSON STREAM AND LAKE.

This stream is known to cannery people as one of the Moira Sound streams. In conducting the examination of that locality in 1897 it was missed, but it was visited

this season by a party from the *Albatross*, under Lieutenant Rodman, on June 1. It is referred to on page 83 of the 1897 report.

On the eastern side of Prince of Wales Island, between the Wedge Islands and Adams Point, is the approach to a narrow arm, about 2 miles in length, running east and west (true), and now known as Johnson Arm or Inlet. On the northern shore, midway of its length, is a narrow inlet, making to the northward for a distance of about three-eighths of a mile, around which is the new mining camp and post-office called Dolomi, with weekly mail from Ketchikan. The head of this small inlet receives the waters of Peter Johnson Stream, which is the outlet for several small lakes.



Sketch of Peter Johnson Stream and Lake, Johnson Arm, Prince of Wales Island.

The main stream flows in a general southeasterly direction from the main lake for a distance of rather less than a mile, over a bottom which is generally rocky. About one-third mile from the mouth, at a point called The Forks, it receives a small tributary from the northward which itself is the outlet to three small lakes. At the forks a small basin is formed about 75 feet wide and 14 inches deep, the lower end of which is reached by high-water spring tides. The main stream is from 10 to 12 feet wide, and 15 to 20 inches deep; from its source to near the forks it is full of ripples, flowing with a strong current to a broken fall of 4 feet drop about 50 yards above

the forks; thence to the mouth it flows over a series of small rapids. At no point, however, are there any natural obstructions to the ascent of salmon. Near the lake a dam has been constructed across the stream to raise the lake level. It has a board face, sloping at an angle of about 45°, and is arranged to contract the usual flow of water to a width of about 6 feet, which forms a runway. With a full stream it probably is not an obstruction to the ascent of salmon.

About 30 yards above the forks are the remains of an old barricade and a runway formerly used in connection with the funnel-shaped baskets or traps employed by the natives of this vicinity. At the forks are the remains of an abutment probably used formerly in some sort of barricade.

The larger lake, from which the main stream has its source, is known as Paul Lake; it is about 2 miles long and one-fourth mile wide, with the major axis in a WSW. and ENE. direction. It is quite deep, one point, it is said, reaching a depth of 120 fathoms. It is 75 feet above sea level and on June 1 the water, which appeared clear and pure, had a surface temperature of 52° F. Its range in water level is about 4 feet. High hills and mountains border the northern and southern sides. Along the shore the bottom is of gravel with occasional sections of rock and some mud. At the western end the lake receives a feeder in which are spawning-beds for a distance of about one-fourth of a mile. A number of salmon fry were seen in the lake and there were a few small trout above the dam.

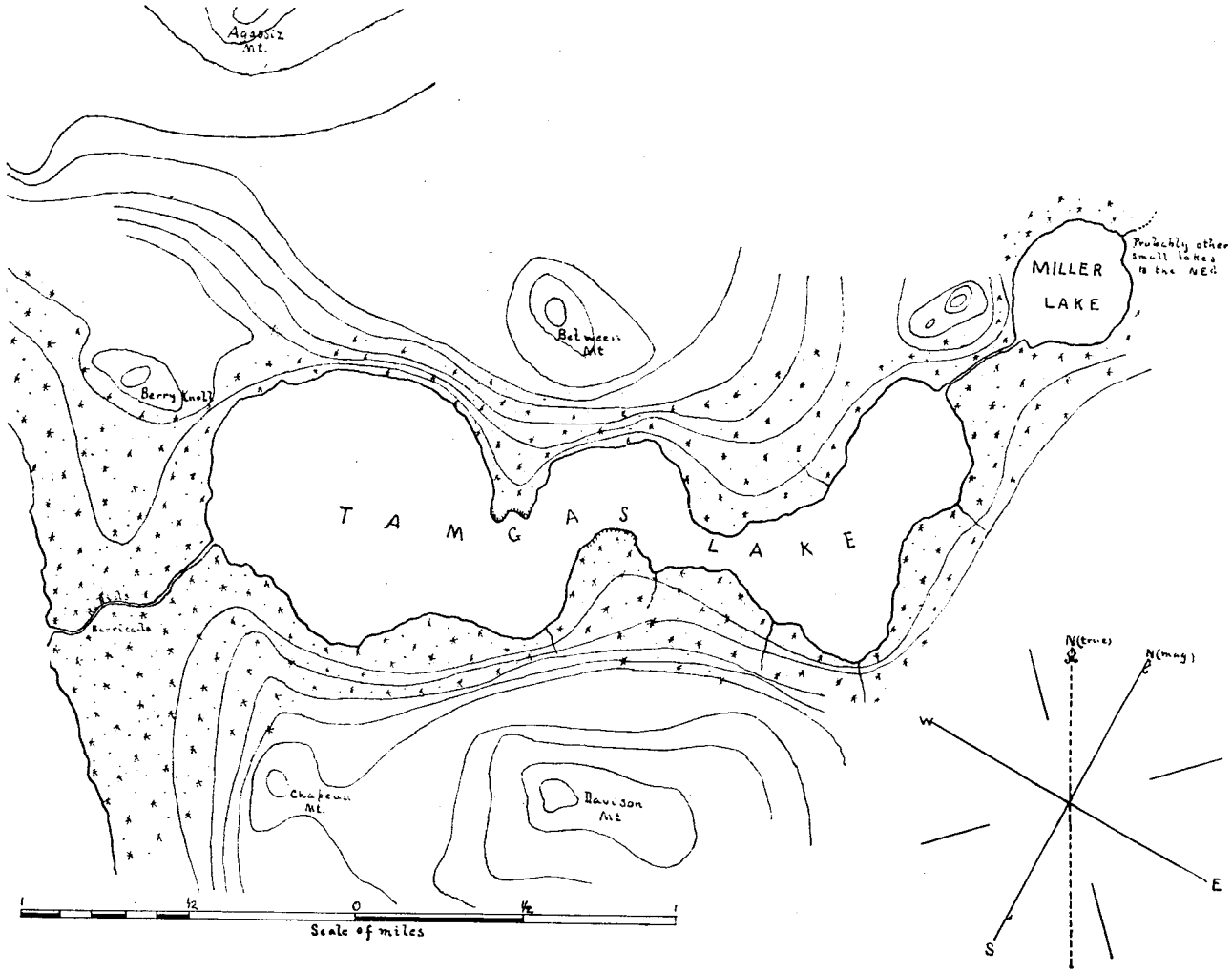
The small tributary, previously referred to as joining the main stream at the forks, is about half a mile long, 6 to 25 feet in width and 2 to 10 inches in depth, and flows but a small amount of water. It drains three shallow ponds known as John, William, and James lakes, surrounded by low banks, and full of pond lilies which grow from a muddy bottom.

Lake John is one-half mile from the forks and is 300 yards long and 100 yards wide, with its major axis in a NNW. and SSE. direction; it is reported to have a depth of about 12 feet. The elevation is 25 feet above high-water mark and the temperature of the surface water, June 1, was 53° F.

A shallow streamlet one-half mile in length and with a few unimportant rapids, connects Lake John with Lake James. The latter is about four-tenths mile long, by 175 yards wide, and lies in a general W. by N. and E. by S. direction. It is shallow, and has an elevation of 55 feet. Temperature of surface water, June 1, 52° F.

Lake William is a shallow pond, 250 yards long by 90 yards wide; it has a short outlet, 2½ feet wide by 8 inches deep, flowing through the left bank of the streamlet connecting Lake John with Lake James and very near the former. It has an elevation of 28 feet, and the temperature of the surface water on June 1 was 52° F.

The country surrounding the Peter Johnson stream and lake system is well wooded and covered with the usual growth of the region. This stream is claimed by a native, from whom it derives its name, and furnishes fish to the canneries at Metlakahtla and Loring, although prior to 1896 all of these fish were purchased at Metlakahtla. It is remarkable for the small redfish which it carries, and it is said there is no deviation, from one year to another, in their average weight, which is from 3½ to 4 pounds each. The redfish from this stream are frequently quoted by those who propound the parent-stream theory in support of the argument.



SKETCH OF TAMGAS LAKE AND STREAM SYSTEM, EAST SIDE OF TAMGAS HARBOR, ANNETTE ISLAND, ALASKA.

The following is the record of the fish taken from this stream so far as any data are available:

Year.	Redfish.		Cohoes.		Humpbacks.	
	Dates.	No.	Dates.	No.	Dates.	No.
1892....	July 8-Aug. 18	8,434	Aug. 6-Aug. 18	1,310	.....	.....
1893....	July 10-Aug. 29	17,154	.....	.....	Aug. 5-Aug. 15	1,754
1894....	July 18-Aug. 23	15,525	July 25-Aug. 25	2,329	.....	.....
1895....	July 6-Aug. 16	17,874	July 26-Aug. 30	1,979	July 24-Aug. 2	1,465
1896....	July 8-Aug. 2	21,700	-Sept. 10	1,900	Aug. 3-Aug. 21	8,000
1897....	July 6-Sept. 2	26,310	July 19-Sept. 9	2,957	July 20-Aug. 21	10,016
1898....	July 13-Sept. 27	14,279	July 16-Sept. 29	4,324	July 26-Aug. 29	15,596
1899....	July 6-Sept. 1	25,018	July 19-Sept. 1	399	July 19-Aug. 25	11,223
1900....	July 7-Sept. 1	19,036	July 28-Sept. 1	343	July 23-Sept. 1	11,758

TAMGAS STREAM AND LAKE.

Annette Island on its southern side has a deep bay, 5 miles in length, which affords good anchorage in its upper part and is known as Tamgas Harbor. On the eastern side, midway the length of the bay, at Creek Point, is the mouth of a stream, a lake outlet, carrying redfish which are supplied to the cannery at Metlakahtla. Ensign Miller and Mr. Chamberlain examined this system on June 2.

The stream is over half a mile in length and at its head is 30 feet wide, 1 foot deep, and flows with a current of 2 to 3 knots, over a rocky and bowlderous bed, between moderately high banks covered with the usual growth of the country. About 200 yards from the lake the bed narrows, the stream flowing 400 yards through a ravine, at the end of which, and about 400 yards from the beach, is a barricade partially dismantled but appearing as if recently used. Tide water ascends about 200 yards from the beach. Temperature of water, June 2, 51° F.

The first lake is irregular in form, lies in a basin in a general NE. and SW. direction, and is surrounded by high snow-covered peaks, from which it receives numerous streamlets, carrying surface drainage and melting snow. It is about 2 miles long, from three-fourths to one-eighth mile in width, is apparently shallow, and elevated 75 feet above tide water. There are a few gravel beaches and the immediate shore is well wooded. At the head of the lake, in the northern corner, is the mouth of a stream which enters through a delta 200 yards long, and which is the outlet to a second lake. This stream is 600 yards long, and at the head of the delta is 10 feet wide, 1 foot deep, with a current of 3 to 4 knots. For the greater part of its length it flows over a bowlderous bed through a rocky ravine, though near the mouth it broadens over gravelly beds suitable for spawning.

The second lake is 600 yards long, 400 feet wide, and elevated 90 feet above the first lake. At its head is a feeder that may lead to a third lake, but want of facilities prevented a further examination. It is probable that salmon ascend to the second lake. The color of the water throughout the system is clear and of brownish tinge. The shores are wooded.

A hatchery site could probably be found at the head of the first lake, near the mouth of the connecting stream.

The redfish from this stream are very small and average in weight about the same as the Peter Johnson stream, viz, 3½ to 4 pounds. The stream may be rated as having a value of 10,000 redfish under average conditions.

The following table shows the catch from this stream since 1892:

Year.	Redfish.		Cohoes.		Humpbacks.	
	Dates.	No.	Dates.	No.	Dates.	No.
1892	June 28–Aug. 5	6,114				
1893	July 8–28	2,328			July 19–30	3,543
1894	July 7–Aug. 11	12,032			Aug. 6–11	2,686
1895	July 2–Aug. 9	12,357			July 17–Aug. 9	5,449
1896	July 1–Aug. 12	8,795			July 24–Aug. 18	2,982
1897	July 7–Aug. 26	13,430		40	July 21–Aug. 26	21,918
1898	July 8–Aug. 17	22,678			Aug. 9–17	4,151
1899	July 8–Aug. 29	11,026	Aug. 24–29	282	July 21–Aug. 26	29,115
1900	July 7–Sept. 1	9,517	Sept. 4	300	July 24–Sept. 1	17,743

GEORGE INLET STREAM AND LAKE.

The southern side of Revillagigedo Island is penetrated by three deep inlets, the western one of which is known as George Inlet. At its head a small cove, making to the northward immediately west of Bat Point, receives the waters of a stream, a lake outlet, which carries redfish.

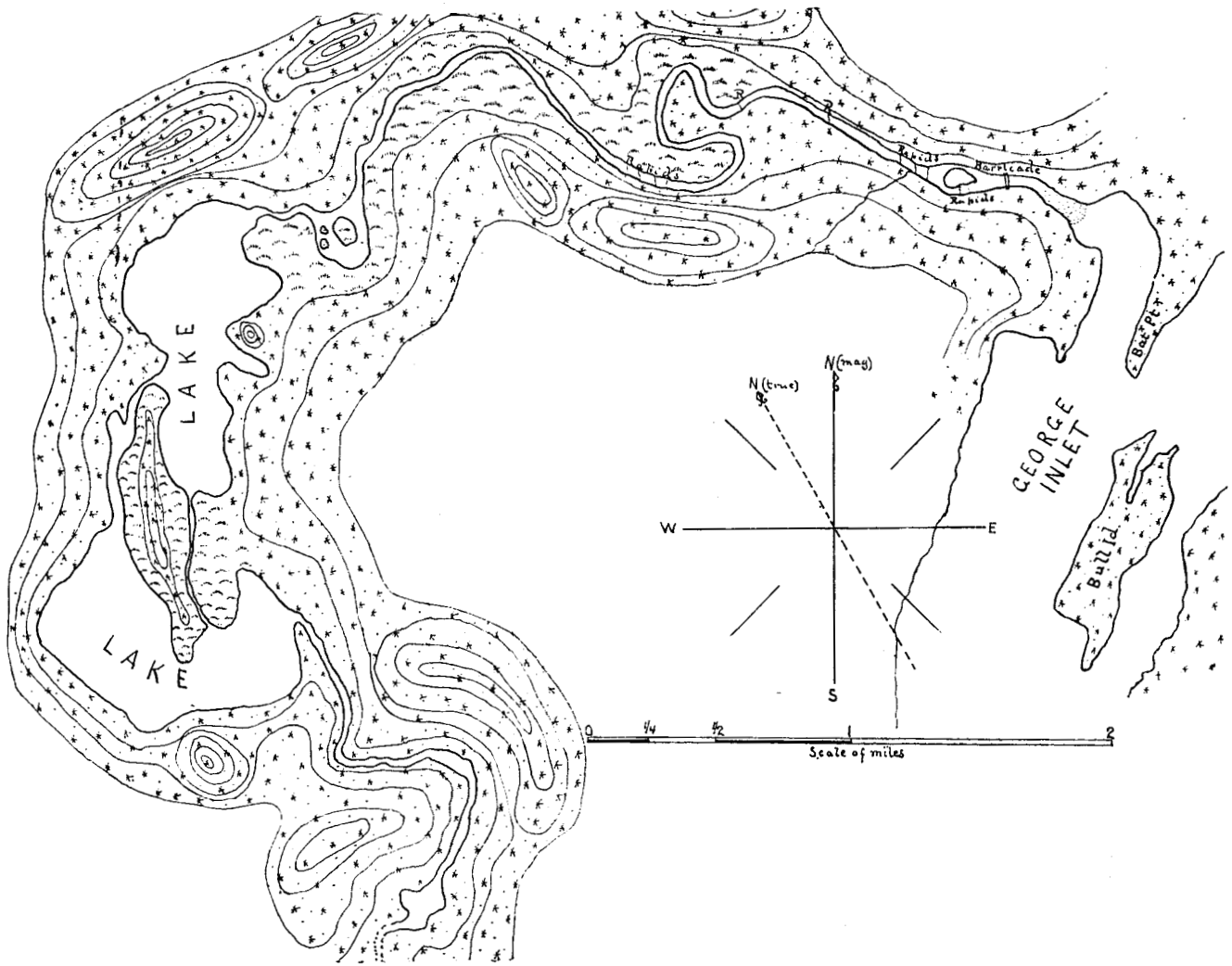
This stream was examined, by a party in charge of Ensign Kempff, on June 5. It flows in a tortuous channel in a general easterly direction, at first, upon leaving the lake, through low grassy flats, while nearer the mouth it passes between rugged hills carrying in the lower half of its course numerous rapids. It is about 4 miles long, 50 feet wide, and 1½ feet deep, with a current of 3 to 4 knots. The bed throughout the rugged hills is of rock, slate, and gravel, while that portion through the flats is largely of mud. The water is clear, of brownish tinge, and on June 5 had a temperature of 59° F.

There is an island half a mile from the mouth and another the same distance from the lake. About one-fourth of a mile above the lower island a small tributary, 3½ feet wide and 4 inches deep, enters from the SW. About one-fourth of a mile above the mouth are the remains of a barricade. The log was in place, but most of the rails that had supported a lath fencing had been swept away. Some of the fencing, interwoven with wire, was near at hand.

The first lake is about one mile in length with an extreme width of two-thirds of a mile, the main axis lying in a general north-and-south direction. It lies in a low basin and has a shallow appearance, pond lilies in places extending 200 yards from the shore line. The beaches consist of rock, gravel, and mud. A conical hill, about 250 feet high, rises over a prominent point on the eastern shore. The lake has an elevation of 240 feet above tide water, and the temperature of the surface water was 59° F. on June 5.

On the eastern side, one-half mile from the extreme southern end, is a stream connecting Lake No. 1 with No. 2. It is one-half mile long, 30 feet wide, from 2 to 6 feet deep, and runs with a strong current over a gravel and mud bottom. The water has a brownish tinge, and on June 5 had a temperature of 59° F. The lakes are also connected by a slough, which enters the first lake at its southern end.

Lake No. 2 is of irregular form and has an extreme length of 1¼ miles by an extreme width of one-half mile. It has a rather shallow appearance, but is deeper apparently than the first lake. The beaches are of rock, gravel, and mud; elevation above tide water, 245 feet; temperature, June 5, 59° F.



SKETCH OF GEORGE INLET, LAKES AND STREAM, REVILLAGIGEDO ISLAND, ALASKA.

At the eastern end this lake receives from the southward the waters of a feeder, which was examined for a distance of 1½ miles to a deep pool, which had an elevation of 265 feet above tide water. This feeder is 12 feet wide, 12 inches deep, and flows with a strong current through a tortuous channel, over a gravelly bottom. It has a number of deep pools. The water has a brownish tinge, and on June 5 the temperature was 49° F.

A dead king salmon was found on the banks of the main stream, 2 miles from the mouth. It was probably a straggling fish.

George Inlet stream was fished for the Metlakahtla cannery from 1892 to 1896, and in 1900 by the Fidalgo Island Canning Co. For a number of years it was also fished by Clark & Martin. Under average conditions it may yield 6,000 redfish. The following are the only statistics obtainable:

Year.	Redfish.		Cohoes.		Humpbacks.	
	Dates.	No.	Dates.	No.	Dates.	No.
1892	June 23–July 29	9,061			July 27–Aug. 3	4,875
1893	July 7–Aug. 1	3,191			July 26–Aug. 16	9,518
1894	July 9–Aug. 15	3,219	July 11–Aug. 15	1,426	July 24–Aug. 17	11,247
1895	July 3–Aug. 6	3,787	July 17–Aug. 6	854	July 17–Aug. 6	7,905
1896	July 1–Aug. 1	2,142		531	July 21–Aug. 1	1,576
1898	July 20	225				
1900	July 8–Aug. 1	6,949	July 25–Sept. 6	2,358	July 20–Sept. 4	39,085

KAH-SHAKES STREAM AND LAKE.

About 2 miles south from the entrance to the Boca de Quadra, and opening upon the Revillagigedo Channel, is a cove named after Kah-Shakes, a chief living in the vicinity. From the northeast end of this cove a shallow tidal lagoon extends in an easterly direction for a distance of 1¼ miles. It has a width of 25 yards to 75 yards, and receives at its head the waters of a redfish stream, having a lake source which was examined by a party in charge of Lieutenant Rodman on June 6. The banks of the lagoon are rocky, well wooded, and the bottom generally muddy. Spring tides reach the head of the lagoon, which point may properly be called the mouth of the stream.

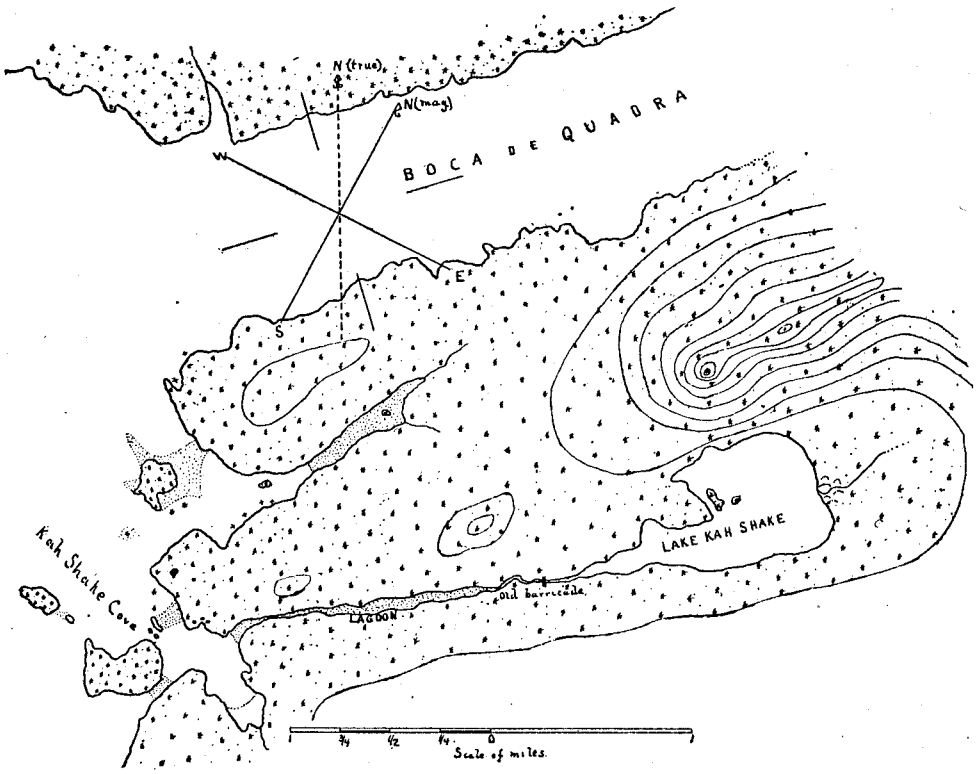
The stream proper is one-fourth mile long, 12 to 15 feet wide, 12 inches deep, and flows over a rough, rocky bottom with a slack current, forming here and there a pool. There are no decided rapids. There are many fallen trees, but no obstacle to the movement of fish in ascending. Halfway up the stream are the remains of a barricade built in the usual form of a braced log and split rails.

The lake is pipe-shaped, about 1¼ miles long in a northeasterly and southwesterly direction, expanding at its upper end into a broad basin, and receives at its eastern end, through a low, grassy flat, the main feeder. This stream is 8 feet wide, from 6 to 8 inches deep, and flows with a slack current over a gravelly bottom, which probably forms the main spawning-ground. In it and in the lake numerous small fry were noticed. The shores of the lake are low and wooded, grassy around the edges, with beaches of rock, gravel, and sand. The vegetation common to the country surrounds the system. Elevation of lake, 10 feet. Temperature of lake water, 64° F.; temperature of water of feeder, 50° F.; temperature of water in lagoon, 65° F.

This stream has been fished by the canneries at Quadra, Metlakahtla, Loring, and Ketchikan. Its value, under average conditions, may be placed at 12,000 redfish.

The following, collected from all available sources, will furnish a fair idea of the capacity of Kah-shakes stream. There are no data available for 1896:

Year.	Number of redfish.	Dates.	Year.	Number of redfish.	Dates.
1892	9,218	July 12–Aug. 17	1897	8,000	July 9–Aug. 16
1893	14,399	July 8–Aug. 28	1898	14,100	July 10–Aug. 22
1894	10,579	July 12–Aug. 16	1899	15,000	July 9–Aug. 26
1895	16,181	July 13–Aug. 15	1900	15,600	July 10–Aug. 15



Sketch of Kah-Shakes Lake and Stream, near Boca de Quadra, Alaska.

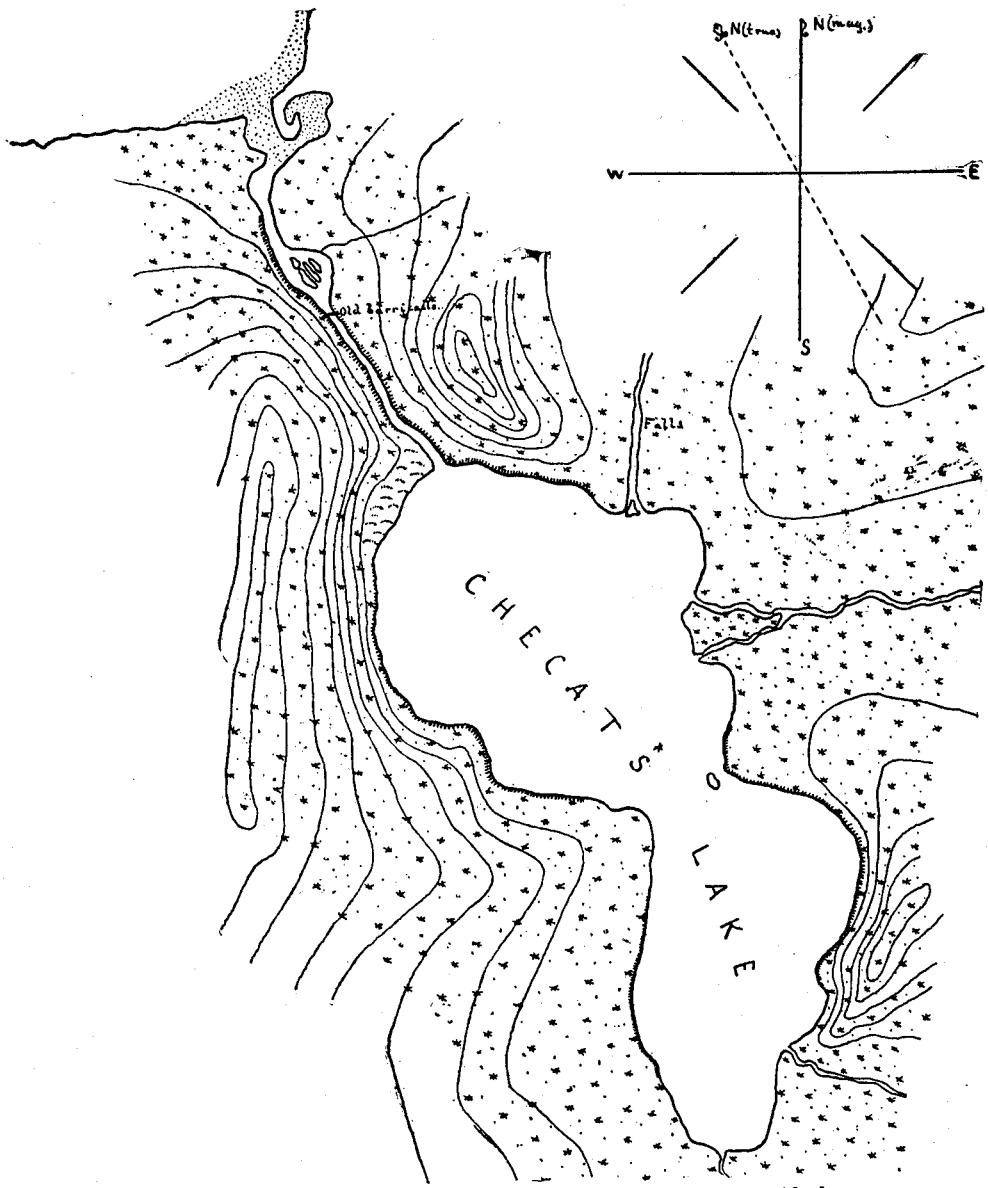
CHECATS STREAM AND LAKE.

Checats Stream empties into the southeast corner of Checats Cove, a small indentation on the eastern shore of Behm Canal, about 12 miles north of Smeaton Inlet, and was examined by a party in charge of Ensign Hepburn, on June 7. It is the outlet of a lake lying about three-fourths mile in a SSE. (mag.) direction from the mouth of the stream. The course of the stream is fairly straight from tide water to the lake. About one-fourth mile from the mouth of the stream is a small island or cluster of islands around which the water flows, the larger volume going to the westward of the island. Abreast the head of this island, on the left bank, was found a panel of rails, evidently used as a barricade when fish are running. A fallen tree spanning the stream at this point probably furnishes the support for it. Aside from this artificial obstruction the stream was found clear and clean until the lake is

KAH-SHAKES LAGOON, REVILLAGIGEDO CHANNEL, MAINLAND, SOUTHEAST ALASKA.

CHECATS STREAM, BEHM CANAL. SITE OF BARRICADE, MAINLAND, SOUTHEAST ALASKA.

reached. There are no falls, cascades, or heavy rapids, although half the length of the stream, from the mouth up, might be called a continuous rapid. The water is of good depth and the current not strong enough to prevent the ascent of salmon. The bottom is stony, with bowlders in the rapid parts; near the lake, where the current



Sketch of Checats Lake and Stream, east side of Behm Canal, Alaska.

is sluggish, there are some pebbly parts, but generally it is of mud or sand, with much water-logged timber and bark. The water has a brownish tinge, and on June 14 had a temperature of 55° F. The banks are steep and thickly wooded with spruce, pine, devil's club, and berry bushes, with an unusual number of large trees. Tide water

extends 150 yards upstream from the low-water mouth. The average width of the outlet is 40 feet, depth 18 inches, and current 3 knots.

The lake is of an irregular, hour-glass shape, about 1½ miles long, and from one-fourth to one-half mile broad. It has four well-defined feeders. The shores, except for a short stretch near the middle of the eastern side and at the southern end, are very steep and thickly wooded, and drop off into deep water a few feet from the beach, except at the mouths of the feeders and on the northwestern end, where there are sandy shoals. Across the outlet is a large drift of big trees, but the water here is several feet deep and fish can readily pass underneath. The bottom, where it can be seen, is generally of sand, sometimes of pebbles or rock, and at the southern end, where a small feeder enters, of mud with water-logged bark. The temperature of the water was 52° F. The lake has an elevation above sea level of 60 feet.

The principal feeder enters on the northeastern side about one-fourth mile from the outlet. It is a stream 30 feet wide, 12 inches deep, with a current of 4½ knots, and flows over a stony and pebbly bottom in a general southwesterly direction. The water is dark and clear, a little lighter in shade than the lake water, and has a temperature of 49° F. About 200 yards from the mouth of this feeder there are heavy falls, which, it is believed, the salmon can not pass.

The next feeder in point of size enters the lake at a point about 400 yards south of the mouth of the stream just described, near the narrowest part of the lake. This stream has two mouths, forming a delta of considerable extent. The division of the main stream occurs about 300 yards from the lake shore. It flows in a tortuous channel through a rather low country in a general westerly direction. Half a mile from the lake the ground rises sharply, and here is a series of cascades and falls insurmountable for any fish, the water in places spreading out and rushing over huge, smooth, sloping rocks with great velocity and a depth of only one or two inches for many feet. The water is very clear and cold, temperature 39° F., and apparently comes from the melting snows on the mountains. The average width of this stream is 25 feet, depth 10 inches, and current 4 knots; bottom stony and gravelly. In late summer this volume must be very much reduced.

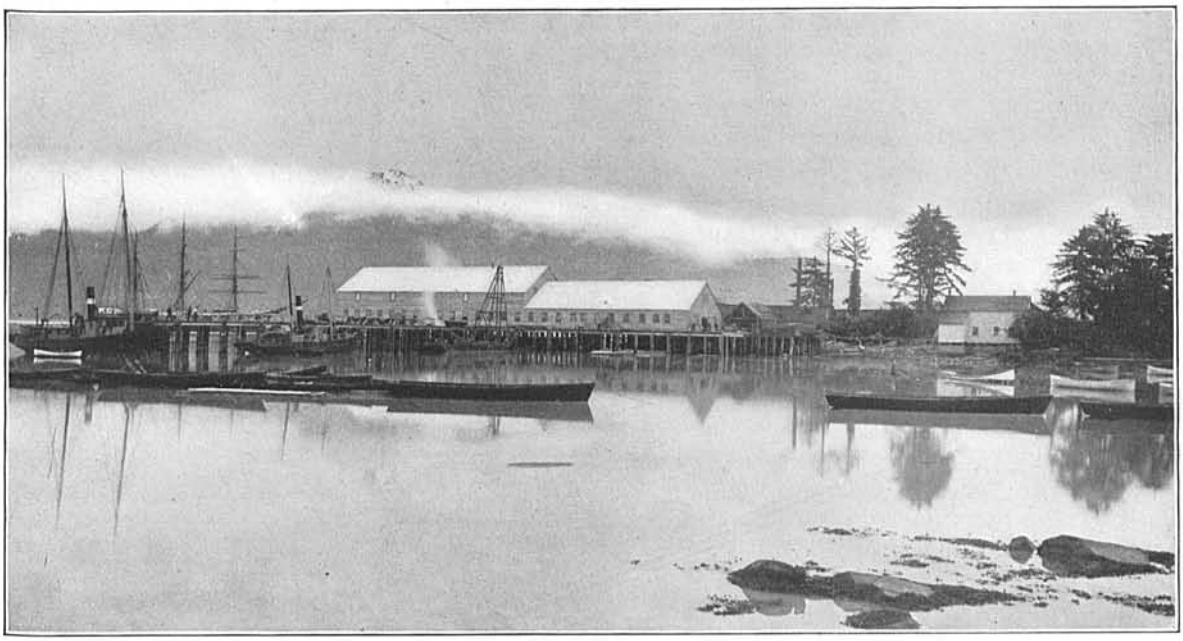
A small feeder enters the lake on the southeastern side. It is inconsiderable in size and is apparently formed by seepage from the hills.

Another small feeder enters at the head of the lake in its extreme southern part. It is a small stream flowing through a narrow valley, low and flat near the lake but rising to an altitude of 250 feet within 1 mile. Temperature of the water, 52°.

A few trout or, possibly, young salmon, about 4 inches long, were seen near the drift of logs around the outlet.

A good site for a hatchery could be found at the mouth of either of the two feeders first mentioned. The ground around the mouth of the second stream is better adapted for building purposes, and the supply of water there is at present ample, but this supply must be greatly reduced at times if, as is supposed, the stream is only the result of melting snow. The volume of the first feeder is greater, and the water in it has the appearance of being that of a lake outlet.

Checats Stream was referred to in my report for 1897, page 100, and was then fished by canneries at Loring and Yes Bay. Since 1897 it has been fished by Loring only. Under average conditions, it may yield 12,000 to 15,000 redfish per season.



CANNERY OF ALASKA PACKERS ASSOCIATION, POINT HIGHFIELD, WRANGELL ISLAND, SOUTHEAST ALASKA.

KUNK LAKE, LOOKING UP, ETOLIN ISLAND, SOUTHEAST ALASKA.

The following are the only statistics that can be obtained of Checats Stream:

Year.	Species.	Total number.	Average number per case.	Season of run.	Canneries to which consigned.
1895	Redfish	9,680			Yes Bay.
1896	Redfish	10,712		July 12–Aug. 12	Yes Bay and Loring.
	Redfish	15,229	9	July 10–Aug. 28	Do.
1897	Cohoes	489	6	Aug. 26–Sept. 1	Yes Bay.
	Humpbacks	20,682	15	July 21–Aug. 15	Yes Bay and Loring.
	Dog salmon	821	6	July 23–Aug. 2	Yes Bay.

Year.	Redfish dates.	No.	Coho dates.	No.	Humpback dates.	No.
1898	July 13–Aug. 17	19,821	Sept. 6–Sept. 10	2,157	July 13–Aug. 26	24,168
1899	July 13–Sept. 2	11,816	Aug. 9–Sept. 2	6,071	July 17–Aug. 20	32,382
1900	July 13–Aug. 15	4,165	July 26–Sept. 7	3,994	July 15–Aug. 16	13,591

KUNK (KONKE) STREAM AND LAKE.

On the east side of Etolin Island, about midway between Chichagof Pass and Anita Bay and opposite a point projecting from Wrangell Island, is a small stream which carries redfish and discharges its waters into Zimovia Strait. It was examined by a party in charge of Ensign Miller on June 11.

This stream is the outlet to a lake lying about 1½ miles WSW. from the mouth. It is 20 feet wide and 12 inches deep, with a strong current and a temperature, June 11, of 52° F. It flows over a rocky and bowlderous bed having at intervals small areas of gravel and sand. About 150 yards from tide water are the remains of a barricade and three-fourths of a mile from the same point, on the left bank, a tributary enters; this is about one-third the size of the main stream and has an elevation at the junction of 110 feet above tide water and a temperature, on June 11, of 45° F. From this point to the lower arm of the lake, a distance of three-fourths of a mile, the main stream flows through a deep ravine in which there is a series of rapids; the greatest fall is about 7 feet, but is much broken and presents no serious obstacle to the ascent of salmon. As the head is reached the stream widens into the lower arm of the lake, which is 1½ miles long and 300 yards wide, with an elevation above tide water of 270 feet and a temperature of 58° F.; this arm narrows at the head and then opens upon the main body of water.

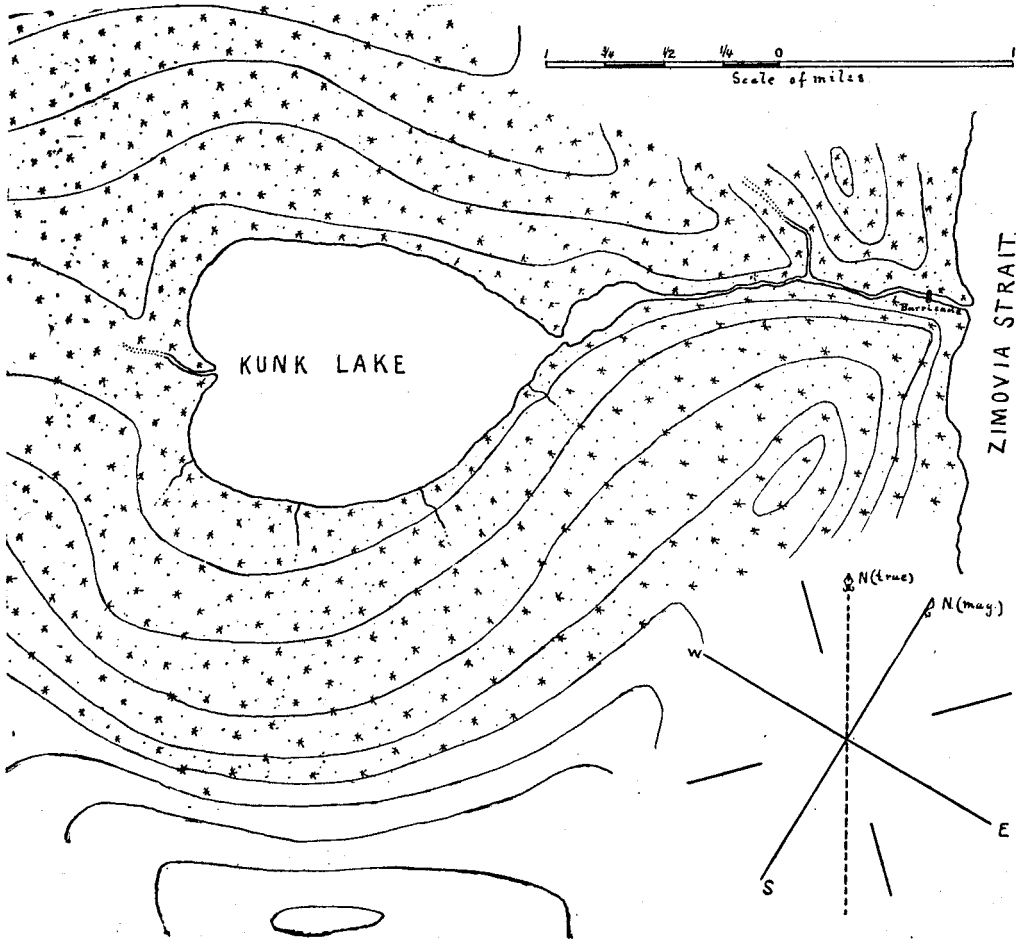
The main lake is heart-shaped, 1½ miles long by about the same width. At the head of the lake, the western end, is the main feeder, which flows through a narrow valley and is about 18 feet wide, 5 inches deep, and has a 3 to 4 knot current; the temperature, June 11, was 45° F.

On the southern side are four small streams together carrying a volume of water into the lake equal to that of the main feeder and draining the melting snow from the high mountains on that side. The vegetation around the streams and lake is dense and consists of large trees and the usual scrub growth. At a few points on the upper end of the lake there are small grassy flats. A few pond lilies were noticed near the shore and numerous small fry were seen, probably salmon. The level of the lake seemed to be at its highest point, and, from the appearance of the shore line, it probably falls several feet during a dry season. Near the mouth of the large feeder a site for a small hatchery might be found.

There are no records available for Kunk stream. It is one of the small redfish streams and yields 2,000 to 5,000 of that species during a season. It has been fished by the Wrangell cannery and on their books is classed as transient.

SALMON BAY STREAM AND LAKE

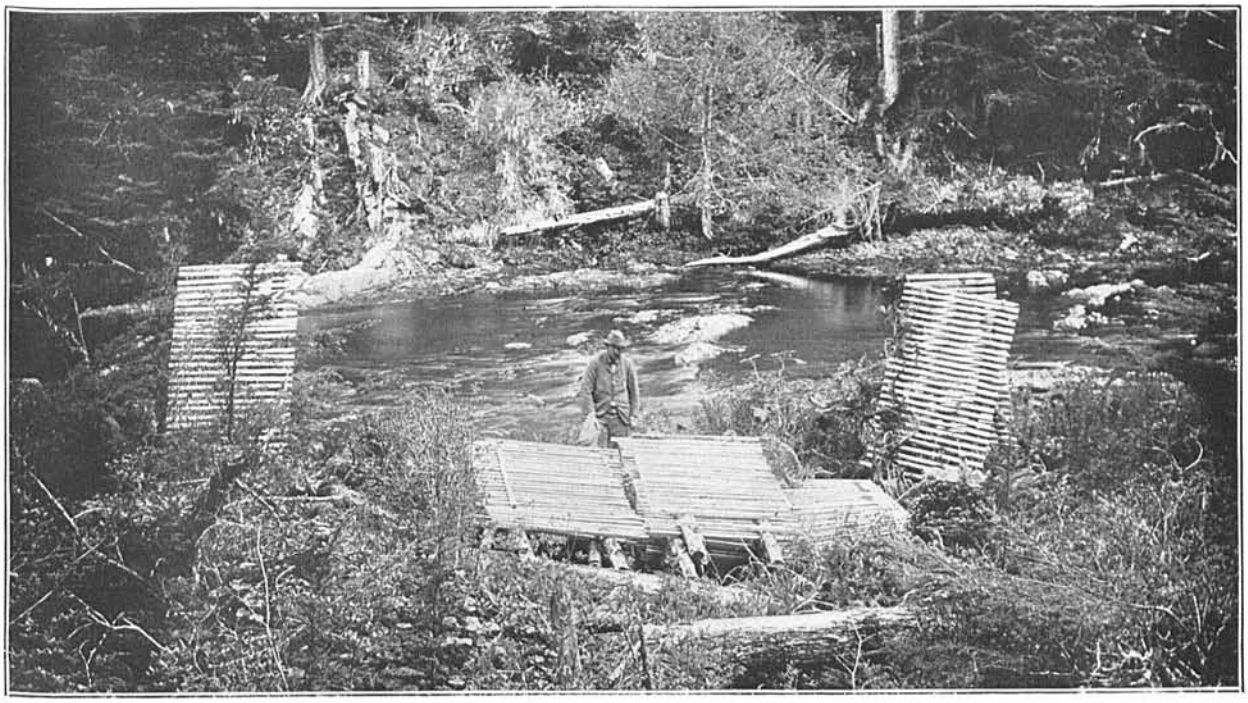
Salmon Bay is on the northeastern end of Prince of Wales Island near the junction of Clarence and Sumner straits and about 7 miles to the eastward of Red



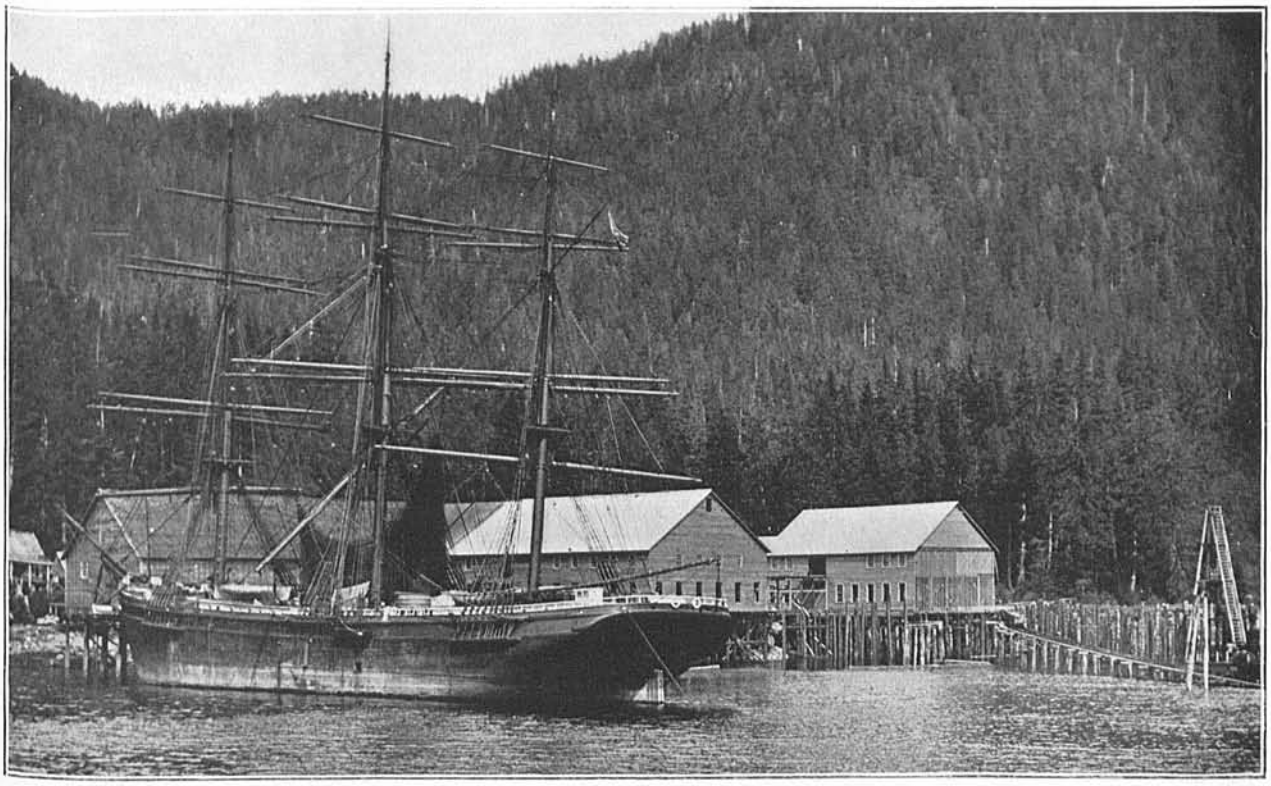
Sketch of Kunk Lake and Stream, Etolin Island, Alaska.

Bay, and receives at its head the waters of a redfish stream, which is a lake outlet. This stream was examined during the season of 1900 for a distance of 3½ miles, but unfavorable conditions prevented the continuation of the work at that time, and it was again visited this year. A description of the lower part of this stream is contained in my report for 1900, and from that point is continued here.

It was examined by a party in charge of Ensign Kempff, who found that at the point "F" the stream forked, the eastern branch being the outlet to the lake. It



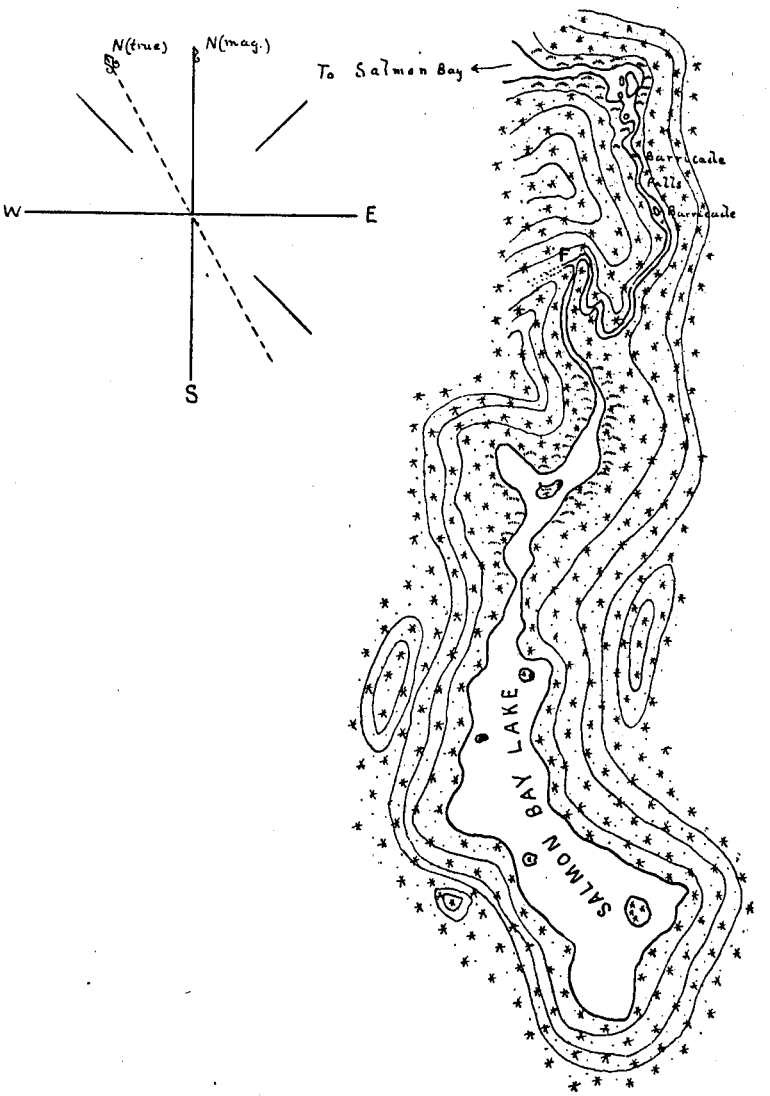
RACKS USED TO BARRICADE KUSHNEAHIN STREAM, KUPREANOF ISLAND, SOUTHEAST ALASKA.



CANNERY OF ALASKA PACKERS ASSOCIATION, LORING, NAHA BAY, REVILLAGIGEDO ISLAND, SOUTHEAST ALASKA.

flows in a general northerly direction over a muddy bottom between low grassy banks which become wooded and rocky as the forks are approached. Three-fourths of a mile above the forks the stream widens to about 50 yards and seems deep-flowing, with little current. The water has a brownish tinge, and on June 14 had a temperature of 61° F. There are no obstructions of any kind in the upper part of the stream.

Near the source it widens into a shallow lake with a mud bottom and covered



Sketch of Salmon Bay, Lake, and Stream, Prince of Wales Island, Alaska.

with pond lilies. This small lake lies in a general NNE. and SSW. direction, and is about 1 mile long with an arm, rather less than one-half mile in length, extending to the NW. Near the center is a large grassy islet. The banks, which are low and grassy, have wooded flats extending back from them. The elevation is 145 feet; temperature of the water, 61° F.

To the southward, and connected with the small mud lake by a short passage, is the main lake, which lies in a general north-and-south direction and is about 3 miles long with an extreme width of three-fourths of a mile. The banks slope from the wooded hills to the rocky beaches, and the lake is apparently quite deep.

For want of facilities the lake could not be examined in its entire length, but no feeders were observed in its northern half. An Indian who hunts the region during the winter stated that several feeders of considerable size entered the lake near the southern end, and it is probable that these feeders form the redfish spawning-ground.

The available statistics to 1900 are given in my 1900 report, page 267.

KUSHNEAHIN STREAM AND LAKE.

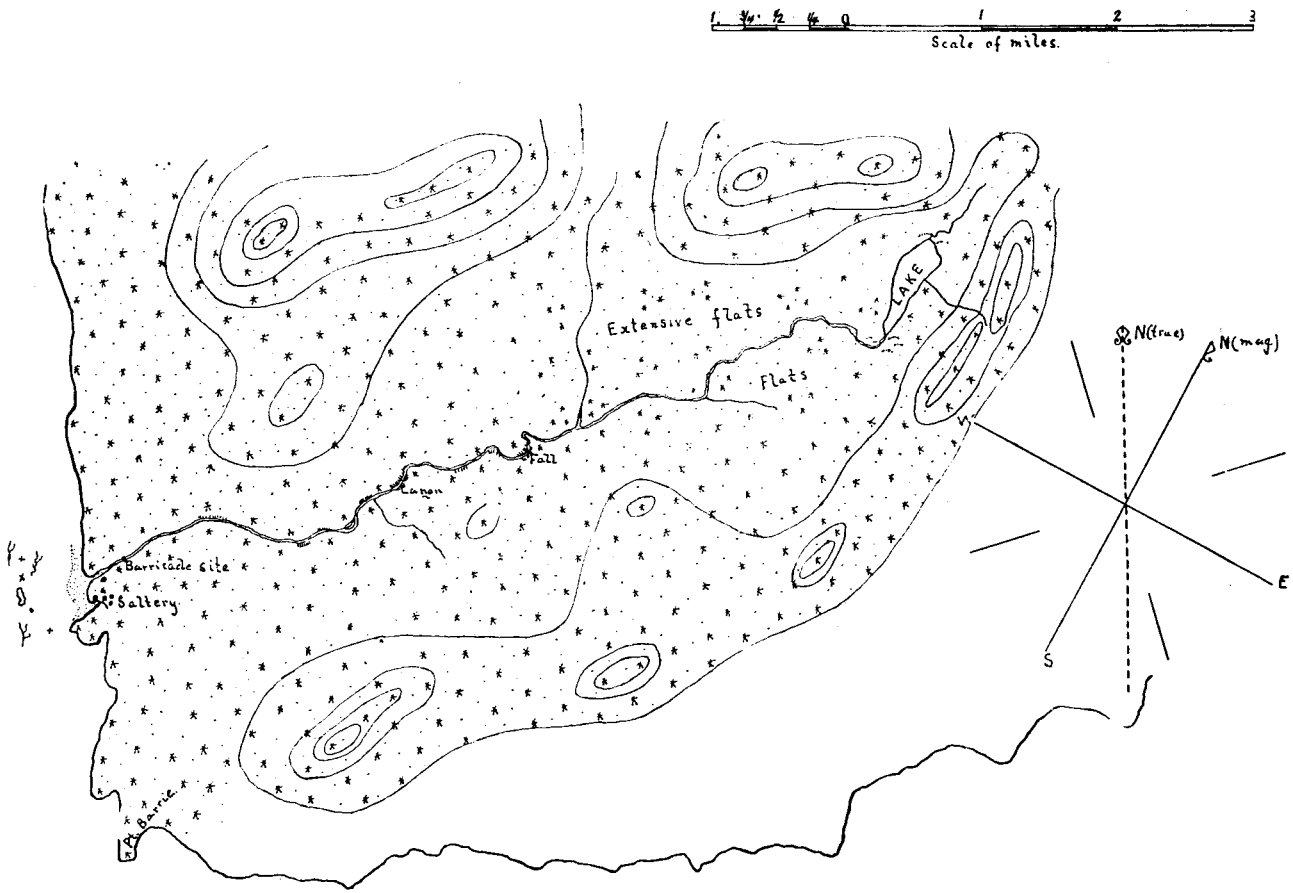
On the southwestern end of Kupreanof Island and a mile NNW. from Point Barrie is a small rocky indentation which receives the waters of a redfish stream. The mouth lies opposite a small wooded islet which is joined to the main shore on its northern side by a line of kelp-covered sunken reefs. This stream, known as Kushneahin, is referred to in my 1897 report, p. 108. As it is in an exposed and dangerous locality the conditions did not at that time, nor last year, permit an examination, but it was examined on June 14 by a party in charge of Lieutenant Rodman.

Kushneahin Stream is a lake outlet and along its bed is 8 miles in length, though in a straight line the distance to the lake is 25 per cent less; the general direction of the flow is southwest. At the mouth, where it is spread out and the current sluggish, the stream is about 40 feet wide, from 1 to 12 inches in depth, and temperature of water 53° F. Two miles above, where it is contracted in a narrow channel of uniform depth, it is 14 feet wide and 3 inches deep.

About 4 miles from the mouth is a broken fall 8 to 10 feet high, which, however, forms no serious obstacle to the ascent of fish. From the sea to this point, which is 245 feet above tide water, the bed rises gradually and is rocky and stony, with a little gravel along the banks. The latter are generally low with occasional bluffs rising from 10 to 100 feet. One mile below the falls the stream flows through a cut about 150 yards long and 30 to 40 feet wide, the water lying in deep pools between the bluffs, which are from 20 to 70 feet high. Except the falls there are no strong rapids in the stream. In the upper half the stream flows through a low flat country with a sluggish current over a gravelly bottom. The hills in this section recede fully a mile. Half a mile above the falls it receives from the northward the main tributary which rises in the hills forming the northern part of a valley. At the mouth it is 6 feet wide, 3 inches deep, and so far as examined it flows over a rocky and gravelly bed. The water is clear, and on June 14 had a temperature of 46° F. The water in the main stream above the principal tributary is tinged dark brown.

All other tributaries are insignificant, though two on the left bank may afford spawning-beds for humpback salmon. The channel of the main stream below the falls follows gentle curves, while above it is more tortuous and meandering, winding through low, extensive flats or tundra. Except over the open flats and tundra, the vegetation is of the usual type, heavy woodland and dense undergrowth.

On the bank and 100 yards above tide water, which ascends 200 to 300 yards from the mouth, there were 24 frames, 7½ feet by 4 feet, in good condition, neatly piled, with some old webbing near by, evidently to be used in barricading the stream



SUMNER STRAIT

SKETCH OF KUSHNEAHIN LAKE AND STREAM, KUPREANOF ISLAND, ALASKA.

as soon as the run set in; 50 yards above this, in the stream, is a log crib, ballasted with stone and probably used in the barricade. The frames were burned.

Numerous small fry were seen in the pools.

The lake is about three-fourths of a mile long by one-eighth to one-fourth of a mile wide and lies with the major axis in a north-and-south direction. The western shore is low with scattering trees, while the eastern shore is high and densely wooded. The lake appears shallow, an abundance of pond lilies cropping out, especially around the lower end. The beaches, and bottom where it could be seen, are stony, with gravel and some mud. The elevation is 315 feet. Temperature of water June 14, 64° F. A small sluggish stream apparently enters the upper end, but for lack of facilities a proper examination could not be made. It is believed the locality would not afford a good hatchery site.

There are no stream data available for Kushneahin. Formerly it was fished at times by the cannery at Redfish Bay. It is believed the stream is good for 10,000 redfish under average conditions.

POINT BARRIE SALTERY.

About one-fourth of a mile below the mouth of the stream (Kushneahin) is the Point Barrie saltery, formerly operated by Mr. Cyrus Orr. It is located on a small indentation and consists of the saltery building, store, dwelling, and wharf. The place was closed at the time of our visit. In the saltery proper were 15 tanks of 20 barrels capacity each, all clean and in good condition, a quantity of salt, a number of casks, barrels, tubs, and an outfit of nets, webbing, etc.

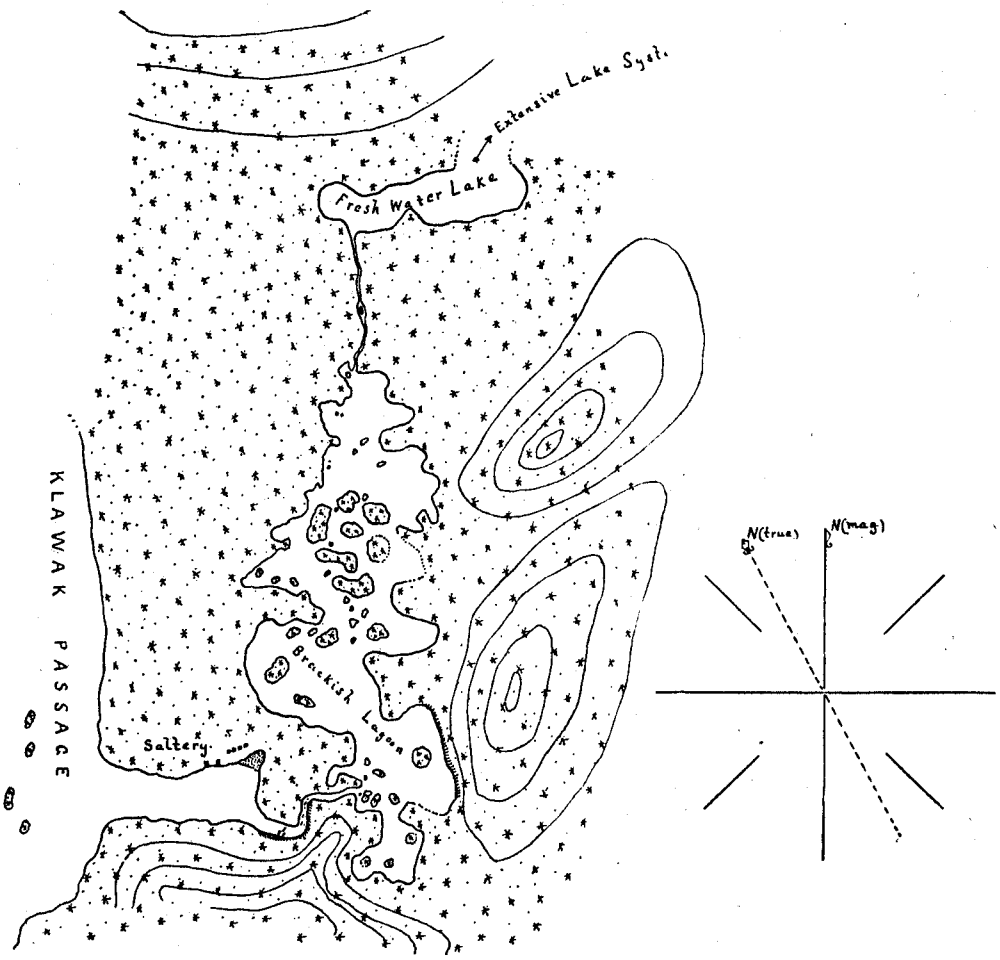
SAR-KAR STREAM AND LAKE.

On the eastern side of Klawak Passage, western side of Prince of Wales Island, and about 20 miles from Shakan village, is a small inlet one mile long and about three-eighths mile wide, with a general east and west (mag.) direction. On the northern side of this inlet, near the eastern end, are located the Brockman saltery and a small Indian village. A narrow, crooked, salt-water strait, the outlet of a brackish lagoon, enters the inlet at the southeastern end. From its mouth this outlet extends ESE. (mag.) for three-eighths mile, turns sharply to the northward one-fourth mile, and then, with another turn to the eastward, enters the brackish lagoon. The southern shore, as far as the lagoon and a little inside, is bluff, the northern shore low. In the stretch from the lagoon entrance to the second turn are large rocks.

About three-fourths of the distance from the entrance to the first turn is the piling for a trap which extends entirely across the strait. The saltery owner stated that this trap had not been used for four years. From the surrounding conditions it is believed that fishing by any other means would be very expensive.

The brackish lagoon extends in a north (mag.) direction about 3 miles from the strait and three-fourths of a mile south from it. The shores are low and flat except for two small hills on the east and a part of the southern shore. The western shore was followed from the strait northward to the mouth of the stream and the sketch shows its general outline, but the lagoon is so filled with islands and the channels between are so narrow that the view is restricted in every direction, and what is sketched as the eastern shore of the lagoon may be additional islands. The shores are rocky, apparently limestone, low and flat, covered with spruce and hemlock, and

in almost every cove are grassy flats. Temperature of water, 66° F. The lagoon is 2 to 4 feet in depth except near the middle channels, where it appears quite deep. At its northern end a small fresh-water stream enters, which is the outlet of a chain of lakes lying to the northward. From its mouth it extends in a general northerly direction for a distance of about 1 mile, with a gently winding course. Two hundred yards from the lagoon is a small cascade. The banks are generally low and flat near the mouth, rising gradually toward the lake, where the stream



Sketch of Sar-kar Lake and Stream, Klawak Passage, Prince of Wales Island.

flows between low bluffs. The bottom is stony and pebbly, gravelly sometimes in the deeper pools, and the water dark brown and not very clear.

From the head of the stream the first lake extends to the ENE., apparently for about one mile, with a width of from one-fourth to one-half mile. The bottom is gravelly, the shores low and well wooded with spruce, hemlock, and berry bushes. Elevation, 40 feet; temperature, 60° F. The Indians state that there is a system of

lakes and sloughs extending a very long distance, and that there is another outlet to this system on the other side of the island. It is said that the salmon do not spawn in the lower but ascend to the upper series of lakes. Redfish were just beginning to run and a few were seen jumping in the lagoon outlet.

Sar-Kar stream is fished by Mr. Fred Brockman, who has lived here many years. All the fish that are called for are sold fresh to the cannery at Klawak, and the remainder are salted. This stream was referred to in my report of 1897, p. 116, to which further reference is made, but it was not visited at that time. The examination was made by Ensign Hepburn on June 15 and 16.

The value of this stream, under average conditions, is from 18,000 to 20,000 redfish per season. The following is the available stream record of fish taken:

Year.	Redfish.		Cohoes.	
	Dates.	Number.	Dates.	Number.
1887	July 3 to Aug. 4	6,476		
1888	June 28 to July 11	6,834	Aug. 7 to Sept. 8	14,528
1889	July 3 to Aug. 30	11,555		
1890	July 6 to Aug. 16	16,267	July 25 to Sept. 6	15,331
1891	June 23 to Aug. 21	35,033	Aug. 19 to Sept. 10	9,033
1892	June 24 to Aug. 19	24,024	July 27 to August 23	4,700
1893	June 24 to July 30	9,797		
1894	July 7 to Aug. 2	12,678		
1895	June 26 to Aug. 31	11,636	July 21 to Sept. 4	3,830
1896	June 18 to Aug. 2	20,480	Aug. 2 to Sept. 2	9,643
1897	June 25 to Aug. 17	21,667	Aug. 17 to Sept. 1	8,207
1898	June 20 to Aug. 18	24,974	Aug. 16 to Sept. 6	10,423
1899	June 15 to Aug. 10	36,000	Aug. 15 to Sept. 8	7,000
1900	June 19 to Aug. 4	26,021	Aug. 14 to Sept. 16	12,000

Average weight of redfish, 5½ pounds; of cohoes, 9 pounds; of humpbacks, 3¼ pounds.

FRED BROCKMAN SALTERY.

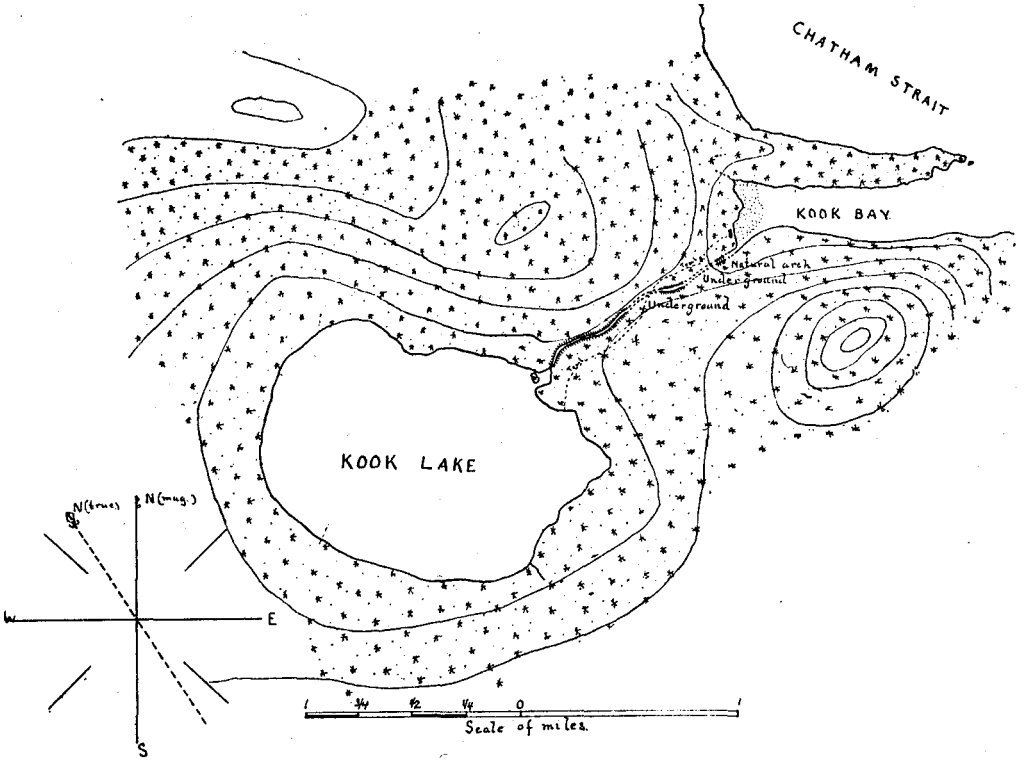
This saltery is located on the northern side of Sar-Kar Inlet and consists of two small buildings on piling, each 25 feet by 40 feet, and a cooper shop. There are 14 tanks of 20 barrels capacity each. All the redfish and most of the cohoes are sold fresh to the Klawak cannery, which calls on alternate days, so that all the salting done here in recent years has been in cohoes and humpbacks. It is estimated that the saltery has a capacity of 200 half-barrels of redfish, 360 half-barrels of cohoes, and 120 half-barrels of humpbacks, but this total has never been reached here. Transportation is through the Klawak cannery. The salting from 1889 to 1898 has averaged less than 100 barrels a year. Salted 50 half-barrels of whole humpbacks and 150 half-barrels of humpback bellies in 1898; 250 half-barrels of humpback bellies in 1899, and 250 half-barrels of humpback bellies in 1900.

Most of the humpbacks used at the saltery are taken at a stream about 7 miles to the northward of Sar-Kar, on Kosciusko Island, known as Tok-Hene, which has a capacity of about 80,000 humpbacks. A few cohoes are obtained from a stream known as Sar-Hene, on Klawak Passage, about 8 miles below the saltery.

KOOK (BASKET) BAY, STREAM, AND LAKE.

Kook, or Basket, Bay is a narrow indentation or inlet about 1 mile in length, extending into the eastern side of Chichagof Island and opening upon Chatham Strait about 11 miles to the northward of Point Hayes. At the head of the bay is the mouth of a stream, the outlet to a lake, which carries a few redfish. It was examined by Ensign Miller on June 19. This stream flows from the lake in a general ENE. direc-

tion through a heavily wooded country, and is about a mile long, with a width at the head of 30 feet, depth 1 foot, and a very strong current. Commencing at the lake, from which the head of the stream is screened by a small wooded islet, it flows over a bowlder bed through a deep ravine for one-half mile, when the water disappears in the face of a rock mass about 60 feet high, which appears to be thrown across the gulch. Three hundred yards beyond the water reappears and flows through a chasm for an equal distance, after which it is again lost in a subterranean channel for another 300 yards. At the point where it again emerges the channel is choked by massive bowlders, and on the adjoining bank were found a number of the slat frames commonly used for barricading. From here the stream flows with a sluggish current for 100



Sketch of Kook Lake and Stream (Basket) Chichagof Island, Alaska.

yards through a deep cut having nearly perpendicular rock walls, and then for 50 yards under a fine arch rock, the top of which is about 4 feet above the highest tides; 50 yards beyond it enters the bay. Temperature of water June 19, 47° F.

The lake is 35 feet above tide water. It is round in shape, about 1½ miles long by 1 mile wide, and lying in a heavily wooded basin, having at the western end a wide depression through which the main feeder probably flows.

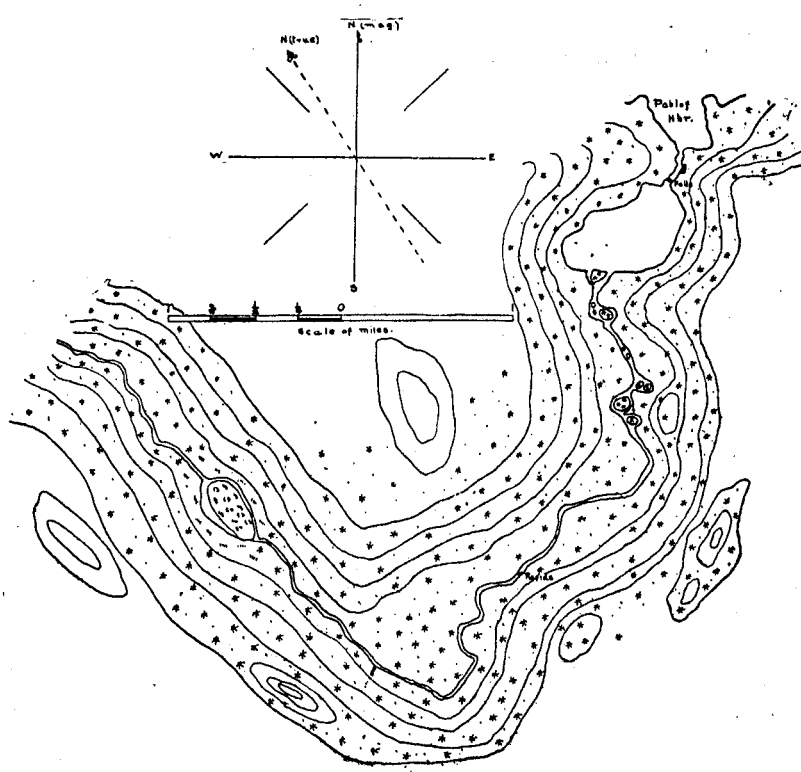
Around the flats at the mouth of the stream the Indians had planted some heavy wooden posts, though for what purpose could not be learned. As they were removed upon the approach of the boat, it is possible that a trap was in course of construction.

The only record available for this stream is from the books of the Baranof Packing Company, namely: In 1896, 21,175 redfish were taken July 12 to July 27.

FRESHWATER BAY, STREAM, AND LAKE.

On the eastern side of Chichagof Island, about 12 miles below Point Augusta, a deep inlet makes in to the westward known as Freshwater Bay. On the southern side of this bay, 4 miles within the southern entrance point (East Point), is a cove known as Pablof Harbor, which affords a good anchorage, and receives at its head the waters of a stream carrying redfish, and known among fishermen as the Freshwater Bay stream. It was examined by a party in charge of Ensign Kempff on June 20.

Near the mouth on the southern side is the old site of the cannery of the Astoria and Alaska Packing Company, which made a pack in 1889 and then moved to the South Bay of Pillars, where it was destroyed by fire in 1892.



Sketch of Stream, Lake, and Feeder, Pablof Harbor, Chichagof Island, Alaska.

Freshwater Bay stream, the outlet to a lake, is less than one-fourth mile long, 100 feet wide, 9 inches deep, and flows with a strong current over a rocky and gravelly bottom, between rocky, well-wooded banks. Just without the lake the water flows over a broken fall, 10 feet high, but so stepped that fish may easily ascend at high water. There are no barricades. Temperature of water, 43° F.

The lake is three-fourths of a mile long and one-half of a mile wide, with the major axis NE. by E. and SW. by W. The shores are low, grassy in places, with heavily wooded areas in the background; the beaches are muddy, and the body of water seems moderately deep. Temperature of water near the shore, 45° F. Elevation, 20 feet.

A large feeder, which enters the lake at the southern end, around an islet in its mouth, was examined for a distance of 5½ miles.

It flows in a winding channel, through a gradually rising country, in two general directions from the highest point reached, first to the SE. and then to the NNE. At a point measured it was 100 feet wide, 9 inches deep, with a strong current. In the lower course are numerous wooded islands, and about 4 miles from the mouth is an extensive flat, the stream at this point flowing around a low island, nearly one-half mile long. The banks here are grassy, with much elder, while in other places they are heavily wooded. Except through the flats the stream bed is rocky, with intervals of gravel patches. The water has the brownish tinge usual to lake water in Southeast Alaska, and had a temperature of 40° F. Elevation of highest point reached, 180 feet. At this point there were no signs of a second lake; later, however, some Indians stated that there was a second lake beyond, to which salmon ascended. Inaccessibility would make the second lake unsuitable as a hatchery site, while on the first lake difficulty would probably be encountered in securing mature fish and pure water for hatchery purposes.

There is no record available for this stream, but from the best authorities it is stated that it will produce 50,000 redfish per season under good conditions.

BARTLETT BAY, STREAM, AND LAKE.

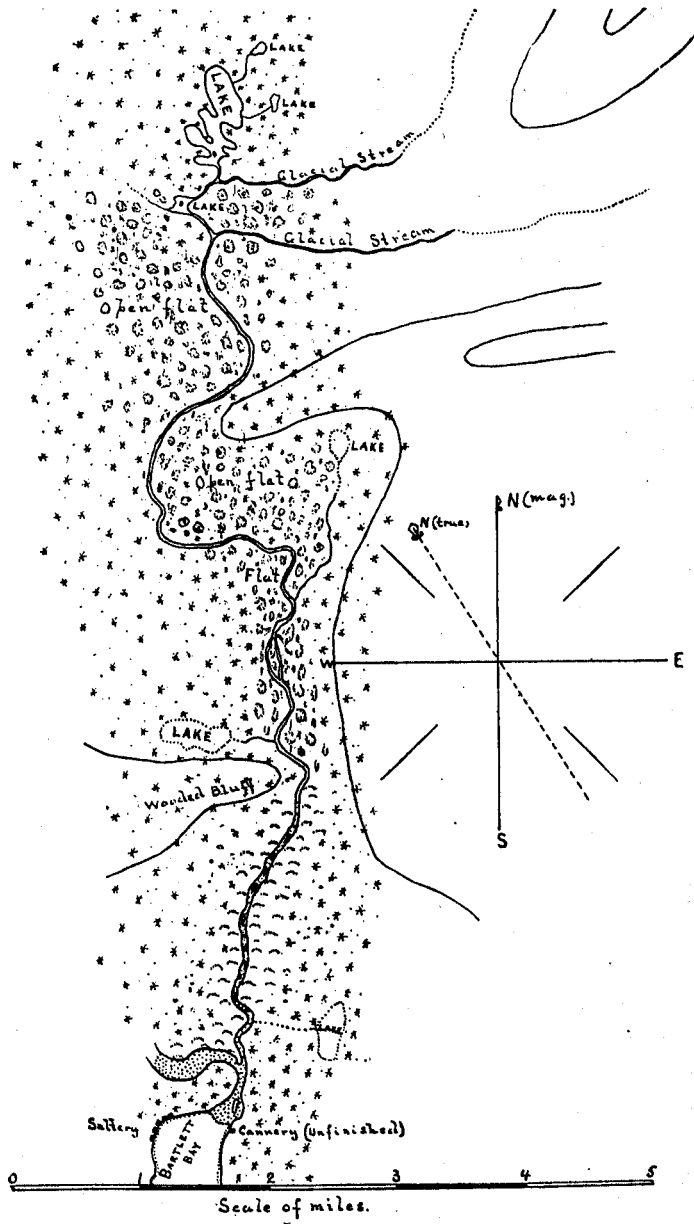
Bartlett Bay or Cove is on the eastern side of Glacier Bay, about 4 miles to the northward of Point Adolphus, and is formed by the southernmost of the Beardslee Islands and a projection from the mainland. The head of the bay receives the main body of water flowing from a redfish stream, a portion of which, however, empties into Glacier Bay to the northward of the Beardslee Islands. The stream was examined by a party in charge of Lieutenant Rodman on June 26.

The main supply of water in the stream comes from two branches which flow from glaciers in the mountain ranges to the eastward, the water received from streams having a lake source forming only a small portion. The stream is about 9 miles long from its mouth to the upper lake, the width varying from 15 yards in the upper reaches to 150 yards in the lower, and the depth from a few inches to several feet; the general direction of the flow is south. The stream bed is gravel, sand, mud, and bowlders. As far as the wooded bluff, which is reached by high-water tides, and where the first rapids begin, the stream flows through low grass-covered flats with the tree line receding for one-fourth mile. In this section there are numerous sand bars, mud flats, islands, and pools. From the bluff to the lake the rapids are frequent, but not very strong, and the stream meanders through low flats covered with pussy willow and cottonwood, with scattering spruce, hemlock, alders, and elders. Over the flats are great areas of strawberries, which are sought by the Indians during the latter part of July and August.

Three-fourths of a mile above the bluff is an island about one-fourth mile long, and in the first bend below is a V-shaped runway in which traps were formerly used. There is no evidence of barricading, though the stream could easily be closed by nets at the head of tide water.

Immediately above the wooded bluff a small tributary enters from the westward, 2 feet wide, 4 inches deep, temperature 56° F., which is said to drain a small lake about half a mile long. One-half mile above the large island is another tributary,

flowing from the eastward, which is 6 feet wide, 8 inches deep, temperature 56° F., and also said to drain a lake. The sources of both these tributaries are reported to furnish a moderate area of spawning-ground for redfish.



Sketch of Bartlett Bay, Lake, and Stream, Glacier Bay, Alaska.

The water of the main stream is glacial in appearance, and at a point measured was 48 feet wide, 20 inches deep, current strong. Temperature of the water at the mouth, 46° F.; 5 miles above, 40° F.; and below the lake outlet, 39° F.

The main lake sought by redfish lies a short distance to the northward of the mouth of the glacial streams which furnish the main body of water. The lake lies in a low basin at the foot of a high mountain system, at an elevation of 95 feet above tide water. The temperature of the surface water was 56° F. It is an irregularly shaped body of water, less than a mile in length, lying in a general north-and-south direction. The bottom is sand and gravel. The banks are heavily wooded with the usual growth, and on the water near the shore are large areas of a mossy scum. It is said the lake receives two small feeders, the outlets to two small lakes, but there are no large feeders. A number of small fry were seen in the lake.

Immediately below the main lake, and between the mouths of the glacial streams, is a small lake or pond in which it is probable that some fish spawn.

There are no available data from which the value of this stream can be estimated; it is said to vary considerably. During a good season it may yield 50,000 redfish.

BARTLETT BAY SALTERY AND CANNERY.

On the northern side of Bartlett Bay, about half a mile from the mouth of the stream, is a saltery which was owned by the Icy Strait Packing Company and operated by that organization in 1900. As a branch of their Petersburg cannery, which was acquired by the Pacific Packing and Navigation Company this spring, it is understood that the Bartlett Bay property was included in the transfer. At the date of our visit, June 25, it was stated that the saltery would not be operated during the season, but that all fish taken would be transported by steam tenders to the new cannery of the Chatham Straits Packing Company at Sitkoh Bay. The saltery has 12 tanks of 12 barrels capacity each. A crew of 8 men, with 2 boats, arrived on the ground June 20, and to the 25th had taken 80 redfish.

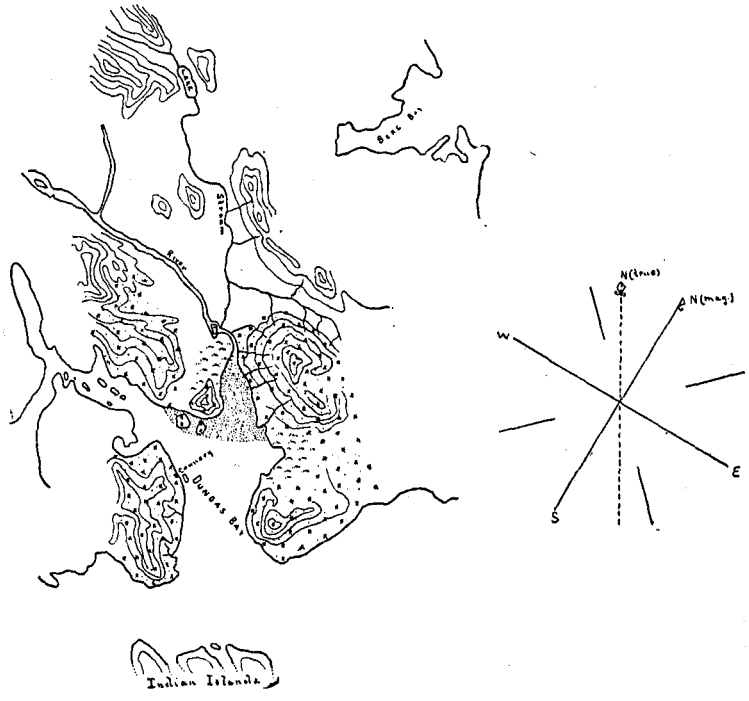
During the season of 1900 the Icy Strait Packing Company erected a cannery building on the southeastern shore of Bartlett Bay, opposite the saltery, expecting to install machinery in time to operate it during 1901. At the time of our visit the plant consisted of a simple cannery building, 150 feet long, projecting on piles over the water. No machinery had been installed, and it was stated that no additions would be made during the season. Like the saltery, it is believed to have been acquired by the new combine.

DUNDAS BAY STREAM.

The Western Fisheries Company, located at Dundas Bay, obtains some redfish from around the mouth of a stream at the northern end of Dundas Bay, the value of which is unknown. An examination of the lower course of this stream was made by Ensign Hepburn on June 28.

A broad, flat valley makes to the northward of Dundas Bay which is drained by two streams, one a glacial stream with a width varying between 60 and 100 yards, an average depth of 2 feet, and a strong current flowing in a general ESE. direction; the other is a much smaller stream, the outlet of a lake lying about 10 miles NNW. from the center of the mouth of the valley. Three miles from the northern shore of Dundas Bay these streams join at a point where the two parts of the glacial stream unite again after flowing around a large island. From this point of junction the two streams flow SSE. (mag.) for about a mile between well-defined banks and then spread out over a large triangular gravel flat about 2 miles long and extending across the

valley. Through this loose gravel the stream is continually cutting new channels, making islands and sweeping them away. For this reason it is very difficult to carry a boat upstream. Even when the depth continues sufficient the current is too strong to pull against, and tracking becomes necessary, which is very trying in the icy glacial waters. Above the gravel flats the banks are steep, from 6 to 12 feet high, muddy, covered with a dense growth of scrub alder and berry bushes, and the current in places runs fully 6 knots. As far as could be seen, the valley continued broad and flat for a distance of at least 8 miles. The mountains on each side appear moderately well wooded with spruce and hemlock, while throughout the center of the valley, except near the streams, are many sandy and grassy flats. No fish were seen,



Sketch showing position of Dundas Bay cannery and stream, Icy Strait, Alaska.

nor were there any obstructions. Tide water extends about a mile upstream from the bay shore.

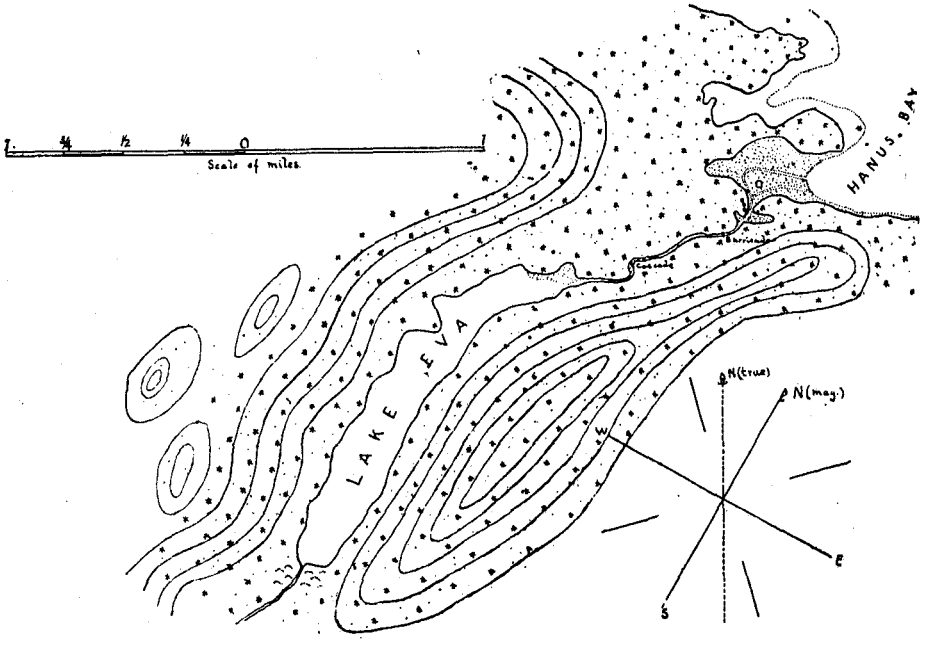
WESTERN FISHERIES COMPANY, DUNDAS BAY.

The cannery of this company, referred to in my report of 1900, is on the western side of Dundas Bay, about 4 miles within the entrance. With the machinery installed this year it was claimed to have a capacity of 500 cases per diem. Fish are pewed from boats to hand carts and wheeled up an inclined plane to the fish-house at the seaward end of the cannery. The transportation is by regular line of freight steamers. The localities fished for redfish in 1900 and 1901 were Bartlett Bay, Dundas Bay, Taylor Bay, Glacier Bay, Surge Bay, Dry Bay (Alsek River Delta), Excursion Inlet, Cape Spencer, Hocktaheine, and Takanis; humpbacks were obtained in Mud Bay and

Port Althorp. The redfish value of these localities is unknown, but, excepting the Alsek, is not believed to be large. In 1900 this cannery took from the various localities 67,000 redfish, but as fishing was to be carried on more vigorously in 1901 better results were expected.

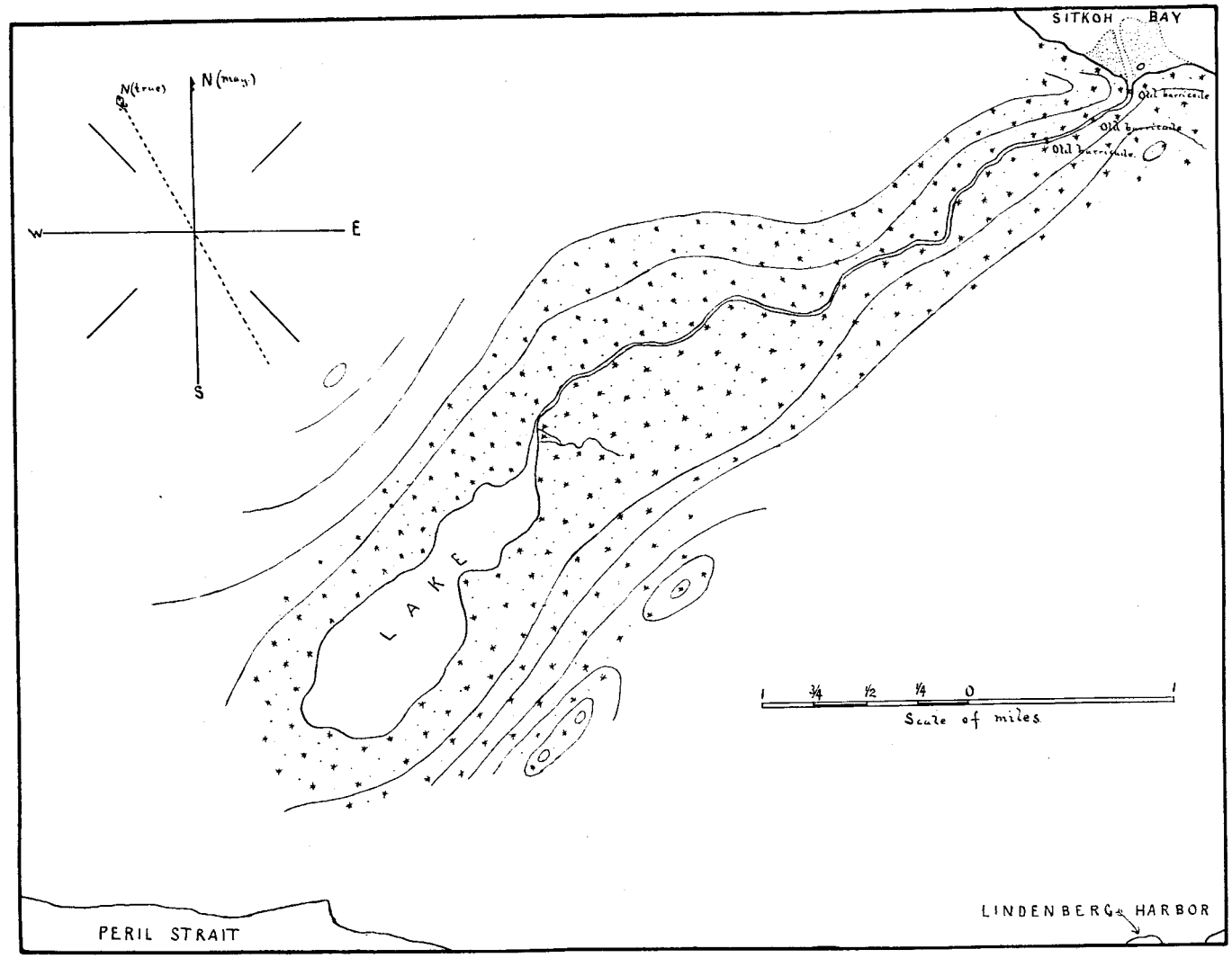
HANUS BAY, STREAM, AND LAKE.

In the eastern part of Peril Straits, opposite Lindenburg Head, on the Baranof Island shore, is a wide bight, known as Hanus Bay, which receives, in its shallow southwestern arm, the waters of a stream, a lake outlet, carrying a few redfish. This system was examined by a party in charge of Lieutenant Rodman, on August 5.



Sketch of Hanus Bay, Lake, and Stream, Baranof Island, Alaska.

From the lake to tide water the stream is about three-fourths mile long, and at a point measured was 45 feet wide, 12 inches deep, flowing in a general northeasterly direction, with a strong current. In the upper reaches the stream bed is solid rock, and in the lower portion is of rock, sand, and gravel. The stream proper empties into a small tidal basin, about 350 yards by 100 yards, which leads by a narrow passage to Hanus Bay. Spring tides ascend to the rapids about 200 yards above the tidal basin. At this point are the remains of a barricade; the framework is standing, but the slats have been removed. About one-third mile above the barricade is a series of rapids, or cascades, having a drop of about 10 feet, which, however, offer no serious obstruction to the ascent of salmon. Above this the stream makes a double bend and one-fourth mile beyond emerges from the lake. Between the rapids the stream varies from 50 to 150 feet in width, from 4 inches to 3 feet in depth, and flows with a slack current over a sandy bottom. The water is clear, rather lighter in color than most lake outlets, and had a temperature of 53° F.



SKETCH OF SITKOH BAY, STREAM, AND LAKE, CHICHAGOF ISLAND, ALASKA.

Between the barricade and the cascade the banks of the stream are low and marshy; in other places they are high. The vegetation is that usual in the forests of Southeast Alaska and is very dense. Back from the stream on both sides are high hills; those on the eastern side come closer to the stream and continue to the head of the lake. On the western side, between the lake and tide water, is quite an extensive flat. The lake is about 15 feet above high water, is slightly crescent-shaped, extending in a general northeast and southwest direction for about 1¾ miles, and has in no place a greater width than one-fourth mile. It is apparently deep, except near the outlet, and the water is clear. The main feeder is at the head and appears to carry a large body of water, much of which is probably received from the melting snows of the surrounding mountains. A good hatchery site might be obtained on this feeder.

The run of redfish was evidently over, humpbacks were very abundant, and there were many Dolly Varden and cut-throat trout, with a few of the rainbow species. It is stated that on July 4, 1895, redfish were running in the stream, that many were seen on that date in the lake, and that the Indians were using their funnel-shaped traps in the stream below the barricade.

There is no available record of this stream, but it may be said to have a value of 10,000 redfish during the season.

SITKOH BAY, STREAM, AND LAKE.

At the eastern entrance to Peril Straits, on the northern side, between Point Craven and Point Hayes, a deep indentation makes to the northwest, which is known as Sitkoh Bay. Within the bay, and 4½ miles from Point Craven, on the southern side, is a stream carrying redfish, which was examined on August 5 by a party in charge of Ensign Miller. This stream is a lake outlet, is about 4 miles long with a width at the mouth of about 30 feet and a depth of 6 inches; temperature of water 57° F. It flows with a strong current, in a general northeasterly direction, through a wide valley, over a rocky bed having at intervals areas of sand and gravel. There are no strong rapids or falls, and tide water ascends about 700 yards within the mouth. There are two small tributaries which enter from the southeastward, one near the lake having a temperature of 50° F., and the other, about midway of its length, a temperature of 55° F. The remains of three barricades were seen, located respectively 100 yards, 500 yards, and 1,000 yards within the mouth, none of which, however, had any indication of recent use.

The lake lies in a general northeast and southwest direction, is about 2 miles long, and from one-fourth to one-half mile wide. It has an elevation of 190 feet; temperature 55° F. at time of visit. The surrounding country is heavily wooded and near the upper part of the stream the borders are level with large flats at different points around the lake. The beaches are usually of sand and gravel.

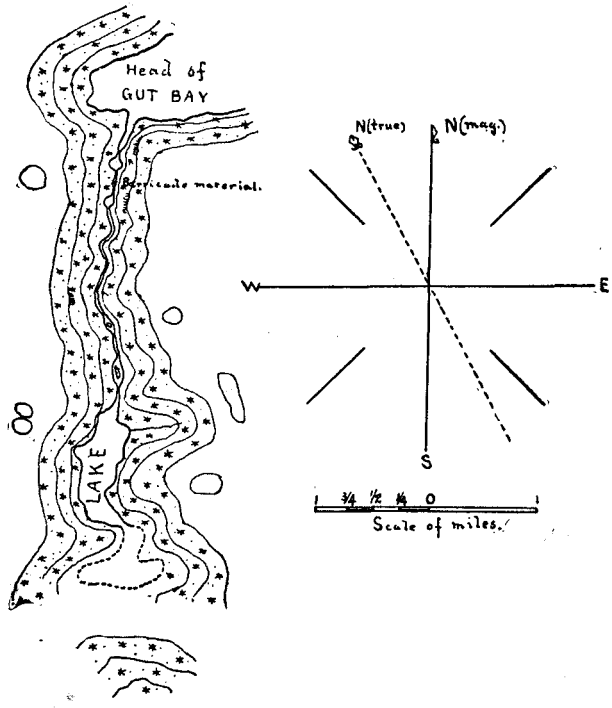
The only records of this stream available are from the books of the old Baranof Packing Company, as follows:

Year.	Species.	Date.	Number.
1890	Redfish	July 13–Aug. 4	4,902
1895	do	July 10–Aug. 8	4,260
1896	do	July 19–Aug. 11	15,794
1897	do	July 25	566
1890	Cohoes	Sept. 2–Sept. 17	2,354
1895	do	Sept. 5	1,252

GUT BAY, STREAM, AND LAKE.

On the eastern side of Baranof Island, 34 miles north from Cape Ommaney, a long, narrow bay makes to the westward for a distance of 4 miles. It opens on Chatham Strait and at its entrance is less than half a cable in width. At the head of the bay, on the southwest side, is the mouth of a small redfish stream, a lake outlet, which was examined by a party in charge of Ensign Kempff on August 6.

The stream flows from the lake in a general northerly direction for about 2 miles, in a channel marked by easy curves, over a bowlderous bottom, having in the lower reaches intervals of sand and gravel patches. At its mouth it broadens into a tidewater pool, largely bare at low water, and then widens to a narrow inlet which leads to Gut Bay. The stream is about 25 feet wide, 6 inches deep, and flows with a strong current, though there are no marked rapids or falls. The water is clear and



Sketch of Gut Bay, Lake, and Stream, Baranof Island, Alaska.

had a temperature of 51° F. There are two small wooded islands in the upper reaches, one near the head and the other one-half mile below. One-fourth mile above the tidewater pool referred to at the mouth, the stream widens into a pool 200 feet in diameter, with an average depth of 6 inches. Below this pool, on the western bank, were all the materials for a barricade, but the stream when visited was free from obstructions that would prevent the ascent of salmon. The wooded valley through which the stream flows is strewn with large bowlders. The mountains rise abruptly from the eastern side, while on the western side a wooded and bushy flat, about one-fourth mile in width, intervenes between the stream and the mountains.

The lake is elevated 100 feet above sea level, and, as far as could be examined, extends in a southerly direction for a distance of 1½ miles, with a width not exceeding one-half mile. The shores are in the main steep and rocky, though at the lower end there are generally mud beaches. A small feeder enters the lake from the eastward near the outlet, but it is probable that the main supply enters near the head, which point could not be reached. The temperature of the water was 55° F. No site suitable for a hatchery was noticed, but it is probable upon special examination that a location could be found. A large number of humpbacks were seen throughout the system.

The stream has never been regularly fished for cannery purposes, a seining crew simply calling from some cannery during the fishing season, and its value in redfish is therefore unknown, but it may be classed as one of the numerous small streams that may yield anywhere from 2,000 to 8,000 redfish a season. The only records available are the following, from the books of the old Baranof Packing Company:

Year.	Species.	Dates.	No.
1892	Redfish	June 14–June 26	1,673
	Cohoes	Aug. 27–Sept. 8	970
1893	Redfish	July 3–Aug. 19	2,766
	Cohoes	Aug. 30	293
1894	Redfish	July 30	630
1895	do	July 4–Aug. 2	6,716
1896	do	July 1–July 20	2,326

PRINCE WILLIAM SOUND.

FROM CROSS SOUND TO PRINCE WILLIAM SOUND.

After leaving Dundas Bay, in Cross Sound, there are no canneries until Prince William Sound is reached. There are, however, a number of streams, for the most part small (though the Alsek and several adjoining rivers are of considerable size), which carry commercial salmon. These streams, as a rule, empty directly into the sea and are inaccessible for commercial fisheries, though cannery experts have been in the field, and it is believed by next season fisheries in the Alsek region will be attempted.

Rounding Cape Spencer to the northward, about 4 miles, is an indentation which at its head is said by the Indians to receive the waters of a stream called Nook-hook-keen; this is the outlet to a system of three lakes, and is said to carry a few redfish. It is probably the stream which supplies a few redfish to the Dundas Bay cannery, and known to them as Cape Spencer.

About 3 miles to the northward of the stream just mentioned the Indians report a small stream with lake source, carrying a few redfish, and known as An-nock-seck.

Continuing to the northward, the Indians report a small redfish stream having a lake source midway between Icy Point and Harbor Point, and known as Ghow-nar-har, and about 6 miles above Harbor Point another outlet to a lake known as Hawg-heen, which is also said to carry a few redfish. These streams are for the most part inaccessible, and from all reports can hardly be classed as having any commercial importance, even if the fisheries could be properly conducted.

The next region to the northward carrying salmon is the Alsek which, with the streams between it and Yakutat, will be treated under one head.

ALSEK REGION.

About 60 miles southeast from Ocean Cape, which forms the southern entrance point to Yakutat Bay, the high mountain range of the Fairweather system recedes from the present coast line for a distance ranging from 6 to 14 miles, forming wooded plains, with gentle slopes ascending to the base of the mountain system. It is probable that the sea, during an earlier geological period, lapped the foot of the mountains and that the numerous glaciers, now visible on every hand, discharged directly into the ocean. The plain now fringing the mountain system is formed from the glacial débris, by moraine deposit and by stream detritus brought from the glaciers and thrown back by the sea. Through this action the coast line is undoubtedly extending seaward constantly, for the streams which drain the glaciers debouch directly upon the ocean and bring down a large amount of sediment to be deposited and cast up. The plains are traversed by numerous streams having their sources frequently in lakes and ponds, which receive the glacial drains, though there are some tributaries which drain the glaciers direct. These streams ramify in all directions, even to the extent of occasionally forming connecting passages with each other.

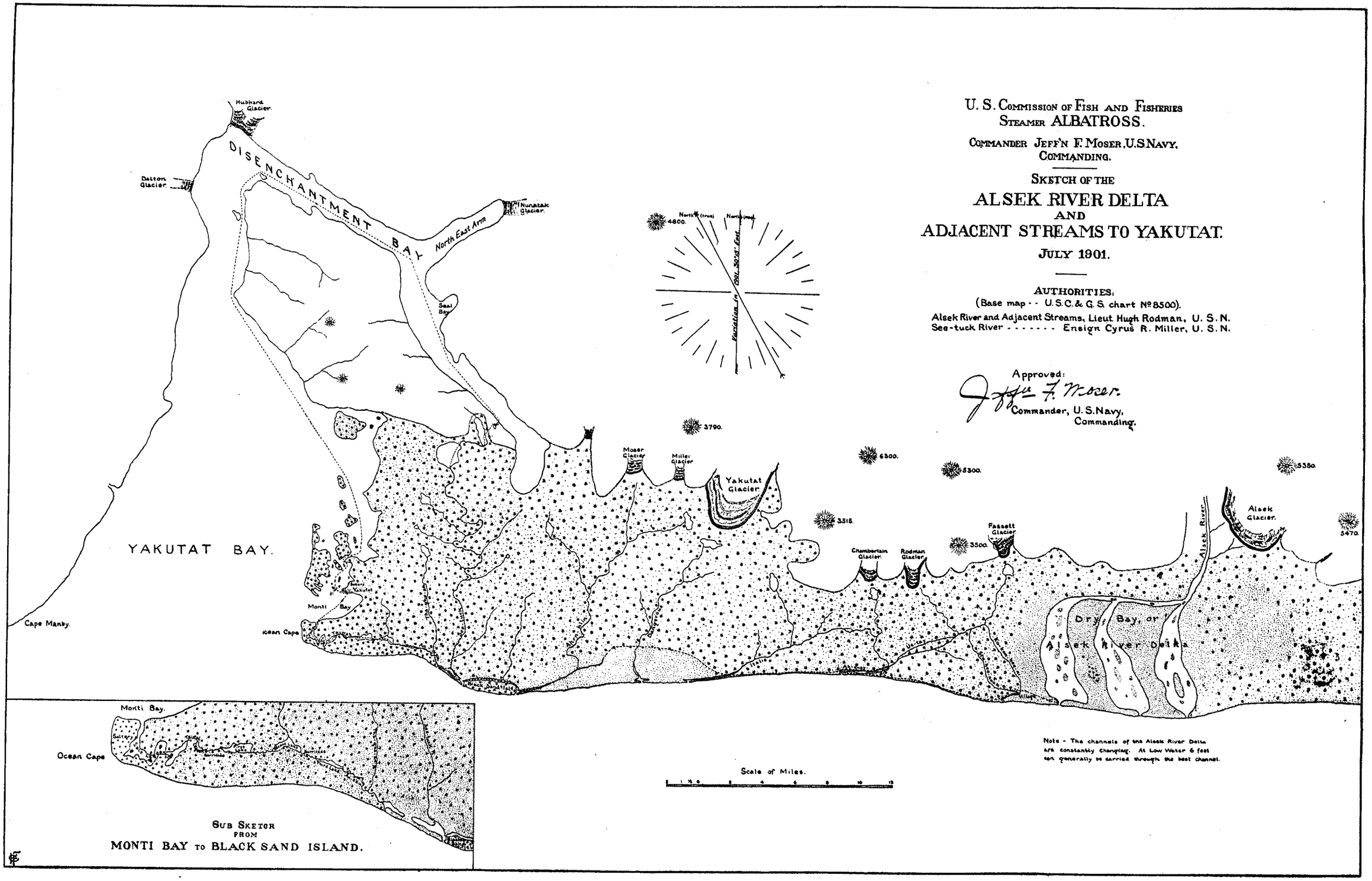
The Alsek, which is at the eastern end of these plains and debouches at Dry Bay, is independent, though it possibly receives some slight drainage water from the plains in its lower course before it forms the delta. This river drains the great ice fields north of the St. Elias and Fairweather ranges, one branch dipping around to the westward and tapping the St. Elias region, and another branch extending more to the northward into the Chilkat country. It breaks through the range back from Dry Bay, and, after cutting a large glacier lying near the northern end of the bay, forms its delta, which is really Dry Bay.

The Alsek and adjacent rivers to Yakutat all have runs of salmon, and in some all species are represented. According to the Indian reports and the statements of some fishermen who have visited the locality, salmon are very plentiful.

In order to have a better understanding of the region, Lieutenant Rodman and Mr. Chamberlain, with Indian guides and canoes, from July 1 to 6, made a trip from Yakutat Bay to the Alsek, and Ensign Miller, from the head of Disenchantment Bay, made a portage with Indian guides to the headwaters of the See-Tuck, and descending that stream returned to Yakutat through the chain of lakes and lagoons to Monti Bay. From the notes of these officers and from other sources the following is obtained:

It has been reported that by means of the lagoons, lakes, and intersecting streams an inside waterway exists from Yakutat Bay to Dry Bay, but such is not the case. It is true, however, that by waiting for the top of high water and making long detours, a canoe can be carried through by making several portages, but the route is impracticable for a boat of any size.

On the southern shore of Monti Bay, 2½ miles from the village of Yakutat, and a mile from Point Carrew, Cape Phipps Peninsula is penetrated by a shallow inlet, about 2½ miles in length, and on the charts misnamed Ankau Creek. From Monti Bay, it first tends to the southward, then to the eastward, and terminates in a T-shaped head, which lies in a general northeast-and-southwest direction. This inlet is very irregular in shape, and broken by islands and shoals, having narrow shallow channels between them. In entering, about 3 feet of water can be carried at half tide to the first turn to the eastward, when up to three-fourths tide there is a rapid.


U. S. COMMISSION OF FISH AND FISHERIES
STEAMER ALBATROSS.
COMMANDER JEFF'N F. MOSER, U.S.NAVY,
COMMANDING.
SKETCH OF THE
ALSEK RIVER DELTA
AND
ADJACENT STREAMS TO YAKUTAT.
JULY 1901.
AUTHORITIES:
(Base map - - U.S.C.& G.S. chart Nº 8500).
Alsek River and Adjacent Streams, Lieut Hugh Rodman, U. S. N.
See-tuck River - - - - - - - Ensign Cyrus R. Miller, U. S. N.
Approved:
Jeff'n F. Moser.
Commander, U.S.Navy,
Commanding.
DISENCHANTMENT BAY
North East Arm
Hubbard Glacier
Dalton Glacier
Nunatak Glacier
Seal Bay
YAKUTAT BAY.
Cape Manby
Ocean Cape
Monti Bay
Moser Glacier
Miller Glacier
Yakutat Glacier
Chamberlain Glacier
Rodman Glacier
Fassett Glacier
Alsek Glacier
Alsek River
Dry Bay, or Alsek River Delta
4800.
3790.
6300.
5300.
5350.
3515.
3500.
5470.
Variation in 1901, 30½° East.
Note - The channels of the Alsek River Delta are constantly changing. At Low Water 6 feet can generally be carried through the best channel.
Scale of Miles.
Monti Bay.
Ocean Cape
SUB SKETCH
FROM
MONTI BAY TO BLACK SAND ISLAND.

At the head of the northeast arm the inlet receives the waters of a small stream called Ta-wah, which drains to the westward a system of shallow ponds and lakes, the latter having also an eastern drainage along the coast in the An-kau (On-cow) River.

Spring tides ascend the Ta-wah to a pond with which it is directly connected. This stream is less than half a mile in length and at low water is only about 6 feet wide and 3 inches deep. The rocks and bowlders have been removed from the bed and piled along the side, forming a shallow channel up which canoes are tracked at low water, but may be poled at high water. The bed is stony, with some sand and gravel, and the current sluggish. Temperature of the water July 1, 56° F.

The pond with which the Ta-wah is directly connected is a shallow pool 300 yards long, from a few inches to 2 feet deep, bottom rocky, with sand and gravel, over which there is a growth of grass and moss; a loaded canoe may be pulled and poled across. At the head of this pond are the remains of a slat barricade. The eastern end receives the waters of a small stream several hundred yards long, which connects the pond with what is known as the first lake. This connecting stream just permits a canoe to be hauled through, and is tortuous, with a sluggish current.

The first lake has its major axis east and west, and is about a mile long, with a width varying from several hundred yards at the western end to one-third of a mile at the eastern end; the depth varies from a few inches to 4 or 5 feet. The bottom is composed of sand and gravel, over which a few logs were noticed and much grass; a canoe may be pulled across. The first lake is connected with the second by a small stream or brook one-third to one-half mile in length, 6 feet wide, and 4 inches to 2 feet deep, which meanders through a low, flat country, and carries just sufficient water for a loaded canoe to be hauled through. Temperature of water, 54° F.

The second lake is slightly crescent-shaped, with the cusps to the southward, and lies in a general east-and-west direction. It is about 1¼ miles long, with a width varying from 100 yards to one-third of a mile, and has a depth of from 1 inch to 24 inches. The bottom is sand and gravel, with an abundance of grass and pond lilies growing over it. A canoe may be pulled across. The main feeder of this lake enters on the northern shore near the western end. It is said to rise back of Yakutat village and to be 3 or 4 miles long, 10 feet wide, and 8 inches deep, flowing with a sluggish current, through a winding channel, over a sand and gravel bottom. The water is clear and the stream bed is said to afford the main spawning-ground for this system. On July 6 it was full of redfish. This second lake forms the dividing line in this system, and drains both to the westward, as previously described, and to the eastward through the An-kau and connecting waters.

At the eastern end of the second lake is a small stream draining the system to the eastward. It flows in a general easterly direction through a narrow, tortuous channel for about a mile, when the so-called third lake is reached. A loaded canoe may be tracked through this connecting stream. The remains of a slat barricade are visible. This third lake consists of a series of small pools and swamps ramifying for a distance of 1½ to 2 miles in a general easterly direction, varying in width from 20 yards to one-third of a mile. It is full of small, low marshy islands and has a large growth of weeds, grass, and water plants. The bottom is muddy and there is a slight current. A loaded canoe may be poled through.

The eastern end of the third lake narrows into the An-kau River, which is a

fair-sized stream about 3 miles long, from 15 feet to 30 or 40 feet wide, and from 6 inches to 4 feet deep, flowing with a moderate current in a general SE. direction to the sea, into which it empties about 9 miles east from Ocean Cape. The channel is tortuous and the bottom is of sand and gravel. Tide water extends about 2 miles upstream, above a point where three houses and some drying frames are located on the southern bank and where the natives cure fish during the season.

About a mile above its mouth the An-kau receives a tributary, the Tha-ghe-an, about one-third the size of the main stream. It is said to drain a small lake 6 miles to the northward, which has redfish and coho spawning-grounds.

The mouth of the An-kau expands into a tide-water basin fully one-half mile in length at high water and formed by the action of the sea. At high water a canoe can be pulled from the mouth to a point near the third lake, and at any stage of the tide above the houses, beyond which point poling must be resorted to with some tracking.

Throughout this system from Monti Bay to the mouth of the An-kau many salmon were seen jumping. In the lower part of the An-kau redfish were very abundant on July 1, though the natives say there are more cohoes, which species they prefer for drying. With the spear the native is usually able to obtain all the fish he wants.

See-tuck River.—The next river to the eastward is the See-tuck, which has its origin in two connecting lakes, and receives in its course tributaries having lake sources. The upper lake of the main stream lies near the head of Disenchantment Bay and about 1 mile from it, opposite the fourth glacier and across the mountain range bordering the western side of the bay. It is 190 feet above the sea and lies in a basin whose walls rise from 500 to 2,000 feet. It is 1½ miles in length in a SE. direction, 200 yards to 700 yards wide, and had water of a greenish color, with a temperature of 45.5° F. on July 3. At the head is the main feeder, about 20 feet wide and 1 foot deep, flowing with a strong current a clay-colored water from the melting snow. The lake also receives the waters from numerous rivulets around the border. At the southern end is an outlet connecting it with the lower lake. This stream is 20 feet wide, 2 feet deep, and flows with a very swift current over a rocky and bowlderous bed having in places small areas of sand and gravel. The water has a milky tinge, and on July 3 had a temperature of 45° F. It has but one rapid, with a drop of about 4 feet. It retains its narrow bed, except at a few points, where it broadens out into shallows. After meandering westerly for about 4 miles the stream enters the lower or main lake.

This lake is circular, about 2 miles in diameter, and is 110 feet above the sea, and has clear water; temperature, July 3, 60° F. On the northern shore is a mountain about 2,500 feet high, and the eastern and western shores are covered with dead spruce and hemlock, caused, it is said, by a subsidence due to an earthquake in September, 1899. The outlet is on the southern side, and is the See-tuck River, which at the head is 50 feet wide, 2 feet deep, with a strong current. It flows through a winding channel to the sea, distant in a direct line about 13 miles. The water is clear and has a temperature of 60° to 62° F. The bottom at first is rocky and bowlderous, quickly changing to gravel and finally to sand and mud, as the sea is reached. The banks are low and covered with brush, giving ample evidence of a much larger stream during periods of freshets. About one-third its length from the lake the river receives from the westward the On-klat, a small tributary said to have a lake source. Two

more tributaries are received from the westward and two from the eastward, along the middle third of its length, draining ponds and marshes. It is said that salmon spawn in these tributaries and their sources. About 2 miles from the sea the Ku-na-yosh, about half the size of the See-tuck, joins the latter from the eastward. It is said to carry many redfish. There are several small islands in the See-tuck, but no natural or artificial obstructions to prevent the free ascent of fish.

Numerous king salmon and redfish and a few of the other species were seen in the river and a few redfish and one king salmon were seen jumping in the lakes.

A hatchery site might possibly be found in the locality, but inaccessibility would probably be a bar to its successful operation.

The mouth of the See-tuck is about 120 feet wide and 14 inches deep. It widens into a broad, sandy, tidal basin, full of bars, which connects with the sea by a channel having strong currents, in which it is said 6 feet can be carried at low water. This basin is connected, by a slough inside the coast line, with another tidal basin formed at the mouth of the Ahrn-klin, the next large stream to the eastward, and together they form an island called Black Sand Island. This slough is about 3 miles in length, 60 to 200 yards in width, and 12 to 15 inches deep at low water, with a tidal current which enters at either end. It forms a connecting canoe passage along the coast. At high water a canoe can be tracked from the An-kau basin into the See-tuck basin, but at any other time of tide it is quicker to make a portage from one-half to three-fourths mile across the flat from the An-kau basin to the See-tuck River proper, aiming to strike a point on the river where it leaves the tree line. No difficulty is experienced in passing from the See-tuck to the Ahrn-klin by the slough referred to.

The Ahrn-klin is said to receive the main body of water from three sources. First from a lake on the western foot of Yakutat Glacier, which is grayish in color, cold, and deep, and receives part of the drainage from the glacier. The outlet, after flowing to the southwest about 4 miles, is joined by a stream from the northward, of equal length, draining Moser Glacier; they flow together about 4 miles and form a junction with a stream flowing from the northwest, which is the outlet to a clear lake, about 3 miles southeast from Disenchantment Bay, which is said to be about 1 mile long, three-fourths mile wide, and to form a favorite spawning-ground.

There are several other small tributaries, some of which have clear water and drain ponds and small lakes, but none of importance.

The general course of the Ahrn-klin system is a little to the westward of south until within a mile of the coast, when it turns abruptly to the westward and follows the coast just inside a sand bar, where it forms a tidal basin. This basin is full of bars and strong currents, from which a channel, in which it is said 6 feet may be carried at low water, leads to the sea at the eastern end of Black Sand Island.

The Ahrn-klin is slightly larger than the See-tuck and is similar in its general characteristics, except that the water is glacial in color. Temperature, 51° F.

The mouths of the See-tuck and Ahrn-klin, as well as the connecting slough, were full of jumping salmon. It is said that king salmon, redfish, and cohoes ascend the Ahrn-klin, but that the See-tuck carries more redfish. The natives say they have taken 10,000 redfish from the See-tuck; if this is true, the stream must have a large fish value, as the natives have only very primitive appliances and take only sufficient for their wants. The fact is that the value of these streams is entirely unknown, as the natives obtain all the fish they want from the streams near their villages; and as

there are none of the latter between Dry Bay and Yakutat, the stream values for commercial purposes must yet be ascertained.

Dangerous River is the next to the eastward and is well named from the fact that it is full of quicksands, has numerous bars and islands, strong currents, and is ever changing its bed. It is considered a very treacherous stream and is feared by the natives. From an account given by the latter, it has its source in a lake about 1½ miles long by 1 mile wide, lying about 1½ miles from Yakutat Glacier. It flows with a strong current, in a general SSW. direction, carrying a large volume of water, and has a width in places of 150 yards and a depth ranging from a few inches to 4 feet. The water is very muddy and heavily charged with glacial detritus. Temperature, 47° F. It has several small feeders. The natives state that this river carries no redfish, but a few cohoes. It is doubted, however, if anything is known of its fishing value, as aside from the difficulty in operating a fishery there are no natives in the vicinity. It empties into a tidal basin which discharges into the sea in a manner similar to the other rivers. It can not be navigated above the basin except by a very small canoe, and even this is considered hazardous.

The canoe passage from the mouth of the Ahrn-klin is made by ascending that river and taking the first big slough on the eastern side to its head. Here a portage must be made across a small plain to Dangerous River, which can be done in from 45 minutes to 60 minutes, and thence by canoe across the river.

The *Italio River*, the next to the eastward, has its source in a lake, about 1½ miles long by 1 mile wide, which lies about 4 miles southeast from Yakutat Glacier. From the lake it flows in a southerly direction to a point where it is joined by a stream draining a pond, or small mud lake, lying more to the eastward. From this point of junction, which is about 7 miles from the mouth, it flows to the southwest; when near the coast it is deflected more to the westward and parallel to the ocean beach, from which it is separated by a low sandspit, about one-eighth of a mile wide, for a distance of 3 miles, when its channel leads into the sea. At the seaward end is a tidal basin, and it is probable that at high water with much surf on the outer beach the sea may break into the lower reach. It is said that the channel leading to the sea is working to the westward. There seems to be no reason why the river should not break through at any point along the low sandspit under conditions favorable for it. At the time visited the river 1½ miles above the seaward channel appeared more like a lagoon, one-eighth of a mile wide, 8 inches deep, with sandy bottom and feeble current, and was free from mud and plants. The volume of water is said to be about the same as in the See-tuck. It has the appearance of being a fine stream, clean and clear, and is said to carry about as many redfish as the See-tuck, many cohoes, and a few king salmon. The redfish are said to spawn in the lake and feeders lying toward Yakutat Glacier. Temperature of water, 50° F.

The canoe route from Dangerous River is to drop to the mouth of that stream and pass to the eastern end of the tidal basin; here a long portage must be made to the tidal basin of the Italio. The quickest and safest way is to cache the canoe at Dangerous River and pack across the sand plain to the Italio, skirting the tree line and fording the river; the depth is less than 2 feet.

The Ah-quay River is the next eastward and has its source in a lake, about 1¼ miles long by 1 mile wide, lying about 1 mile south from Chamberlain Glacier;

from the lake it flows with many bends and curves over a generally gravel bottom until within one mile of the coast line, where it is joined from the eastward by the Us-tay and is deflected around a high wooded point through 180°; it then follows the coast to the westward for 3¾ miles, when it breaks into the sea.

The Us-tay has its source in a lake about a mile in diameter, which lies under Fassett Glacier, and 6 miles below it gives off a branch called the Ko-kon-hee-ni (Stickleback), which flows SSE. The main stream continues to the southwest for a mile, when it gives off another branch called the Stu-hee-nook, which flows SSE. and unites with the first branch near the village near the western side of Dry Bay, and together they flow to the westward about a mile and empty into the sea. The combination of the three rivers forms an island with the village on the southeast side.

The Us-tay, after giving out the branches just mentioned, receives a tributary from the northwest which flows from the Rodman Glacier and immediately below it divides, flowing as two streams and uniting a short distance above its junction with the Ah-quay, thus forming an island about 4 miles in length.

All these streams are glacial. Below the junction of the Us-tay with the Ah-quay the stream is from 75 yards to one-fifth mile in width, from 4 inches to 4 feet in depth, and of a character similar to Dangerous River. The Ah-quay above the junction is about the size of the Italio. Its mouth, around which were many seals, narrows to 75 yards and is moving to the westward. The Ah-quay and the Us-tay are said to carry large numbers of king salmon, redfish, and cohoes, and the former has a run of eulachon in the early spring. In the lower Ah-quay gill nets could be used, and higher up seines, but navigation is hazardous on account of numerous bars and quicksands, which have but slight surface indications.

The Stu-hee-nook is a small stream about 15 yards wide, a few inches deep, and flows with a sluggish current, while the *Ko-kon-hee-ni* is probably three times as large. Both carry redfish and cohoes in large numbers, and at their junction, on July 4, several canoes were employed spearing redfish. This whole system, called the Ah-quay, is said to carry a very large number of king salmon, redfish, and cohoes.

The canoe route from the mouth of the Italio River is to ascend that river, keeping in the tributary that flows from the ENE. to the small mud lake. Here a hard portage through the timber to a small tributary of the Ah-quay is necessary; thence the route is down that stream to its junction with the Us-tay, up the latter to the Ko-kon-hee-ni, and down this stream to the village.

If, however, it is concluded to pack from Dangerous River, then, after crossing the Italio at the point previously described, take the outside beach to the Ah-quay, following the right bank of that river for about 3 miles from the mouth, or until the first wooded belt, a broad, treeless, sand plain, and then the second wooded belt are passed, where there is a low, grassy plain, and where the river can be forded when it is under normal conditions. Caution, however, must be used, as there is considerable quicksand, but by using a pole and sounding ahead a passage can be made. A canoe is usually kept on the eastern side of the Ah-quay, near its junction with the Us-tay, for ferrying. Having passed the Ah-quay, the sea beach affords an excellent highway, particularly at low water, and can be followed to the mouth of the Ko-kon-hee-ni, whence a well-defined trail leads to the village.

Dry Bay, which is the delta of the Alsek River, covers from 80 to 100 square miles, the river flowing into the sea by three separate channels. After passing the

glacier previously referred to, the main body of water is deflected to the westward after giving one branch to the southward. A few miles beyond another part breaks to the southward, while the remaining portion continues yet a few miles when it, too, turns to the southward and enters the sea. From the point of departure from the main stream the branches form very large basins which close in toward the sea and empty through narrow channels. These basins are filled with bars and small islands with ramifying channels, all changing from day to day, and even from hour to hour. The only permanent feature in the delta appears to be a large, rocky, wooded island between the western and middle basins, which, on range with the Alsek Glacier, leads close to the western mouth. On July 4, 1901, the western channel was the largest, about 400 yards across, and on June 8 had the best water—6 feet on the bar at mean low water. The middle channel, 5 miles distant, was about 200 yards wide, and the eastern channel, 3 miles beyond, was 350 yards wide. Neither the width, depth, nor position, can be depended upon, as a week later the best water may have been in one of the other channels. The natives state that the current usually flows out and that an anchorage may be made by small craft in from 8 to 9 feet inside the western bar.

The bed of the river above the glacier is rocky and bowlderous, with areas of sand and gravel. The current is very strong, but a good boat can be hauled and poled upstream a considerable distance. The water temperature July 4 was 54° F. The Alsek is highest in the spring and lowest in September. It is said that salmon ascend the Alsek for 50 miles and that there is a large, clear lake in the interior.

The natives fish the Alsek but little, as the smaller streams, which furnish them with all the fish they can use, are more accessible, but they all agree that king salmon, redfish, and cohoes, ascend the Alsek in countless thousands. The idea of abundance as expressed by a native, however, must be received with caution, as he usually has no idea of the great capacity of a large cannery.

In the Alsek the natives report the king salmon as commencing to run about the last of April, and with them are found a few redfish, which species, however, does not run strong until July 1; the cohoes follow during the early part of August.

In a cursory examination of this kind it is impossible to state anything definite in regard to hatchery sites. It is probable that upon thorough investigation such sites could be located, but much difficulty would be encountered in obtaining pure water, as all of these streams are more or less glacial in origin. Outside of these facts, however, is the question of accessibility. There are no villages or permanent habitations between Yakutat and Dry Bay, and the journey, even in summer, with a light two-man canoe, is not an easy one, and is accompanied by some risk.

The plain between Yakutat and the Alsek, and bordering the mountain system to the sea, is for the most part wooded with spruce, hemlock, alder, and cottonwood, with a smaller growth of willows and elder, accompanied by the usual berry bushes, devil club, etc. From Black Sand Island to the mouth of the Italio there is an extensive treeless sand plain reaching several miles back from the coast line. This plain is cut up by small, shallow, spreading streams, having little or no current, with some shallow ponds, and a portion of it has a scant growth of grass and weeds. In very dry weather sand storms occur, and it is said they are at times dangerous.

The coast seaward appears to have no outlying dangers.

Since the apparent decline of the salmon fisheries on the western coast of the United States attention has been called to Alaska, and the Alsek region has not escaped the eye of the canner. The locality has been visited during the past two years by several individuals with the idea of obtaining the salmon in the streams, but as yet no steps have been taken to even prospect the region. It is reported that cannery sites have been selected in Monti Bay with the idea of conveying the catch from the Alsek and adjacent streams to that point, while other sites have been selected in the vicinity of the Alsek. Either proposition presents conditions difficult to overcome, and some very wild schemes are spoken of—one to build a railway from Monti Bay to the Alsek; another to transport the fish by trolley, and another, and the only feasible plan, to build light-draft surf tugs to cross the different bars. There is no feasible inside water route nor can one be made and maintained at a sum which the fisheries would warrant.

It is believed, through the reports made by the Indians and from the number of fish seen jumping by those who have visited the section, that there are a great many salmon of all species in the Alsek and adjacent streams to Yakutat, but nothing is definitely known of the abundance. Yet it may be conceded that there are sufficient salmon in these streams to supply several large canneries. To catch them legally, to collect them at certain centers for transportation, and to transport them are propositions that will tax the resources of the canner to the utmost.

A cannery is generally located at a point accessible to the home transporting vessels in preference to a locality at the fisheries and inaccessible to the transports; so that Monti Bay would probably be the most feasible point for a cannery location.

All these streams have tidal basins, greater or less in extent, into which they discharge and from which a channel leads into the open sea, usually over a bar over which about 6 feet may be carried at low water. The gill-netter will find the waters here shallow and the channels obstructed by bars and quicksands; the trap-man will find that his piling will not stand, and the drag-seine man will find the banks giving away under his feet. To find better conditions the higher reaches will be resorted to. The weather in summer along the coast is usually good and the surf on the bars is not heavy, but as fishing for king salmon would commence the last of April or early in May gales may be expected that would interfere with transportation. In fact, even under fair conditions it would be a question whether many fish would reach the cannery in Monti Bay in good condition. Experience in the locality may solve many of the questions now presented, but at best the pack will be an expensive one.

The small steamer *Beaver* and a large naphtha launch belonging to the Western Fisheries Company, at Dundas Bay, both crossed the Alsek bar during June and carried a few king salmon to their cannery. The *Beaver* made one trip and the naphtha launch at least two. The last time the latter crossed she rolled over and filled, but was floated, with the loss of her upper works. This cannery expects next year to fish the Alsek, making a sea run from the cannery of from 90 to 100 miles.

YAKUTAT.

There do not appear to be any streams in Yakutat or Disenchantment Bay that carry salmon in sufficient quantities for cannery purposes, but the prospects of the Alsek and the adjacent streams have been an inducement for the location of several

salteries in Monti Bay each with a cannery as an objective if the fisheries should prove of sufficient value.

Saltery of F. A. Fredericks Company.—This company hails from Seattle, Wash., and during the fall and winter of 1900, in the schooner *Martha W. Tuft*, salted 1,285 barrels of herring in the vicinity of Yakutat. In the spring of 1901 this company built a large saltery on the northern side of the head on which the village of Yakutat is now located. The intention was to salt herring, and if salmon could be obtained to extend their operations to that species.

Saltery of See & Flenner.—Messrs. A. L. See and A. Flenner, at the time of our visit (July 3), had in course of construction a saltery on the western point of the entrance to An-kau Creek, about 2 miles from Yakutat post-office. One building, 20 feet by 40 feet, had been erected in a bight within the entrance to the creek, and another was in course of construction on the point, which was to be connected with the first by a tramway 1,700 feet long. It was the intention to salt herring, and salmon also if they could be obtained; for the latter, 2 salting tanks had been provided. No salting had been done at the date of our visit.

Cannery and railroad proposition, Yakutat Bay to Alsek River Delta.—In the fall of 1900 and spring of 1901 a gentleman from San Diego, Cal., prospected this region with a view of establishing a cannery. He visited the Alsek and adjacent streams, and concluded that there was an abundance of fish, but that it is impracticable to transport them by water if the cannery were located in Monti Bay; also, that it is impracticable to handle the cannery equipment and the pack over the Alsek Bar if the cannery were located in that vicinity.

At Yakutat it was reported that a party in Seattle was interested in and intended raising money for the purpose of building a railroad from Monti Bay to the Alsek, a distance of about 60 miles, to carry the fish from the Alsek district. At a location on the southern side of Monti Bay, in a bend about one-half mile from the mission, a wharf 300 feet long, to accommodate steamers, is to be built, and whenever the railroad is completed a cannery plant is to be erected. This is mentioned simply to indicate the wild schemes spoken of in Alaska. At the time of our visit all there was in the locality to give the project any credence was a small bunk-house and a wharf about 100 feet long built from the bank to the high-water mark.

South Alaska Packing Company.—During the season of 1900 a fisherman by the name of Flemming examined the stream conditions from Yakutat to the Alsek. Upon his report a Mr. Shaw went over the ground during the spring of 1901, on the part, it is said, of an organization called the South Alaska Packing Company. Mr. Shaw had returned south before our arrival, but it was reported in Yakutat that several sites for canneries had been located. Inquiry in San Francisco elicited the information that the company no longer existed.

PRINCE WILLIAM SOUND STREAMS.

The streams and fisheries of this district were referred to in my report of 1897, pages 137–139, and as there has been no material development or change, the general conditions need not be repeated here. At the time of our former visit we were unable to make an examination of the streams and lake systems on account of the lateness of the season, and therefore accepted this work as a part of the examination

to be conducted this year. The streams are similar to those of Southeast Alaska, but in proportion to the territory covered are far less prolific in choice commercial salmon. If all the streams in the sound proper, at least so far as known, were fished legally throughout the season, it is doubted if 100,000 redfish and 50,000 cohoes could be taken under average conditions. The humpbacks are more plentiful and, as far as our personal observation goes, they seemed quite abundant.

The time of runs in Copper River is early, and that in Prince William Sound corresponds with Southeast Alaska, so that when the redfish have stopped running in the first-named locality they commence running in the second, and the canneries then pick up a few redfish in connection with the humpbacks, which are packed as soon as fishing on Copper River ceases. Were it not for this difference in time of runs it is doubted if any redfish would be taken from the sound, particularly as the redfish streams are from 60 to 100 miles from the canneries.

All these streams have been barricaded, the evidences of which still exist, and it is possible that this practice is still resorted to during the fishing season.

The stream at Cheniga, which produces more redfish than the combined output of all the other streams, it is said, was tightly dammed for many years, and it is frequently referred to as an example by those who argue against the parent-stream and four-year theories.

CHENIGA STREAM AND LAKE.

In the western end of Prince William Sound, opposite Herring Bay, on Knight Island, a point projects from the mainland known as Point Nowell. Rounding this point to the northward is an indentation in two parts. The outer is a round bay, about 1½ miles in diameter, connected by a narrow passage with a tidal lagoon of irregular form, about 3 miles long, which receives at its head the waters of Cheniga stream, the most productive redfish stream in Prince William Sound. It is a lake outlet, and was examined by Ensign Hepburn on July 12.

The stream is about one-half mile long, 30 feet wide, 10 inches deep, and flows with a strong current over a stony bottom in a NE. direction, which is the line of bay and stream system. The water is clear and had a temperature of 55° F. The upper half of the stream is quite straight, and the lower half gently curving, and, as there is a fall of 110 feet from the lake to the mouth, its course is almost one continuous rapid, but there are no serious obstructions to the free ascent of fish.

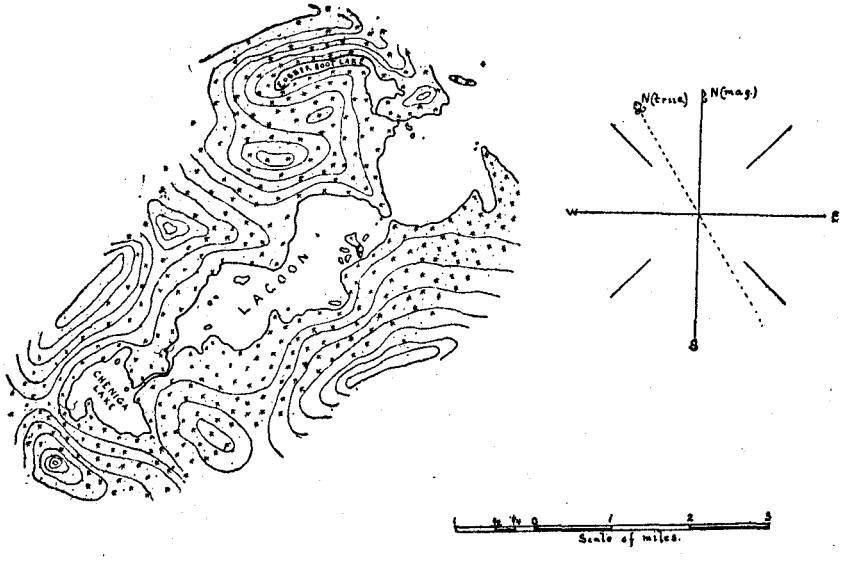
The mountains forming the valley through which the stream runs lie well back on each side with occasional projecting spurs through which the stream has cut its way so that the banks are alternately low and flat, and steep but not very high. The vegetation is that common to Southeast Alaska, although the forest trees are nearly all small spruce, with a heavy undergrowth of berry bushes, devil's club, and coarse grass. At the head of tide water, and ranging across the stream, are three triangular log cribs, substantially built and filled with rocks, and on the left bank is a pile of poles that may be used for the barricade. This stream was tightly barricaded for many years, and it is probable when the fishing gangs arrive that the stream is closed during the season. There is a log jam near the lake, but it forms no serious obstruction to the passage of fish.

The lake is an irregular, triangular-shaped body of water, about a mile in length on each side. The water is clear and the bottom, wherever it could be seen, is sandy.

The lake is walled in by high mountains, and from the general features it is likely that there is no other lake in the system, nor any feeders that may be used for spawning, as the shores descend very abruptly. Temperature of water, 55° F.; elevation, 110 feet. A few small fish were seen in the lake and redfish were seen jumping around the mouth of the stream. The streams in Prince William Sound give such poor returns that they are only resorted to by the canneries when the catch at Copper River runs short or the season there is over. No accurate values therefore can be given.

The Pacific Steam Whaling Company's cannery keeps no record of catches by streams and has rarely fished in Cheniga. It is believed if Cheniga were fished legally throughout the season it might yield, under average conditions, 40,000 redfish. The catch for 1896 was an exceptional one. The following data are from the books of the Alaska Packers' Association cannery:

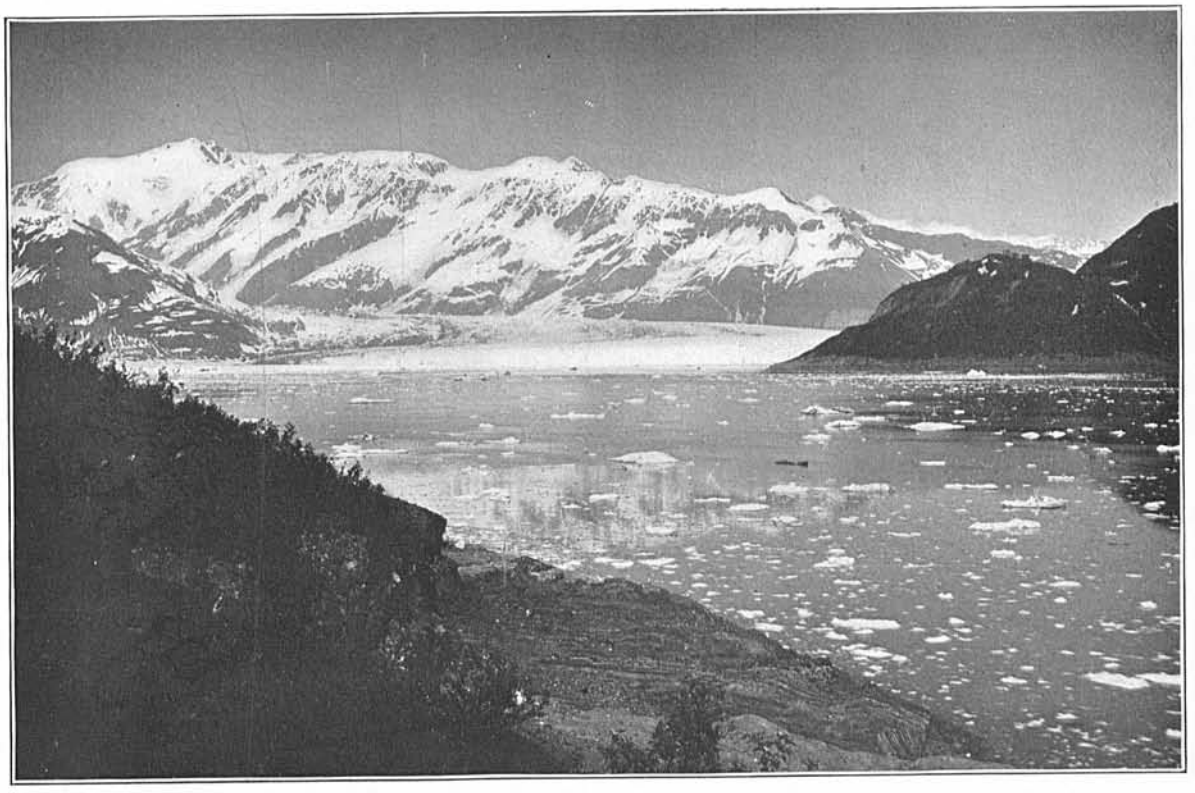
Year.	Dates.	No. of redfish.
1896	July 4-Aug. 24	77,866
1897	July 1-Aug. 10	23,363
1898	July 5-31	2,893
1899	July 5-Aug. 2	7,396
1900	July 11-27	18,587



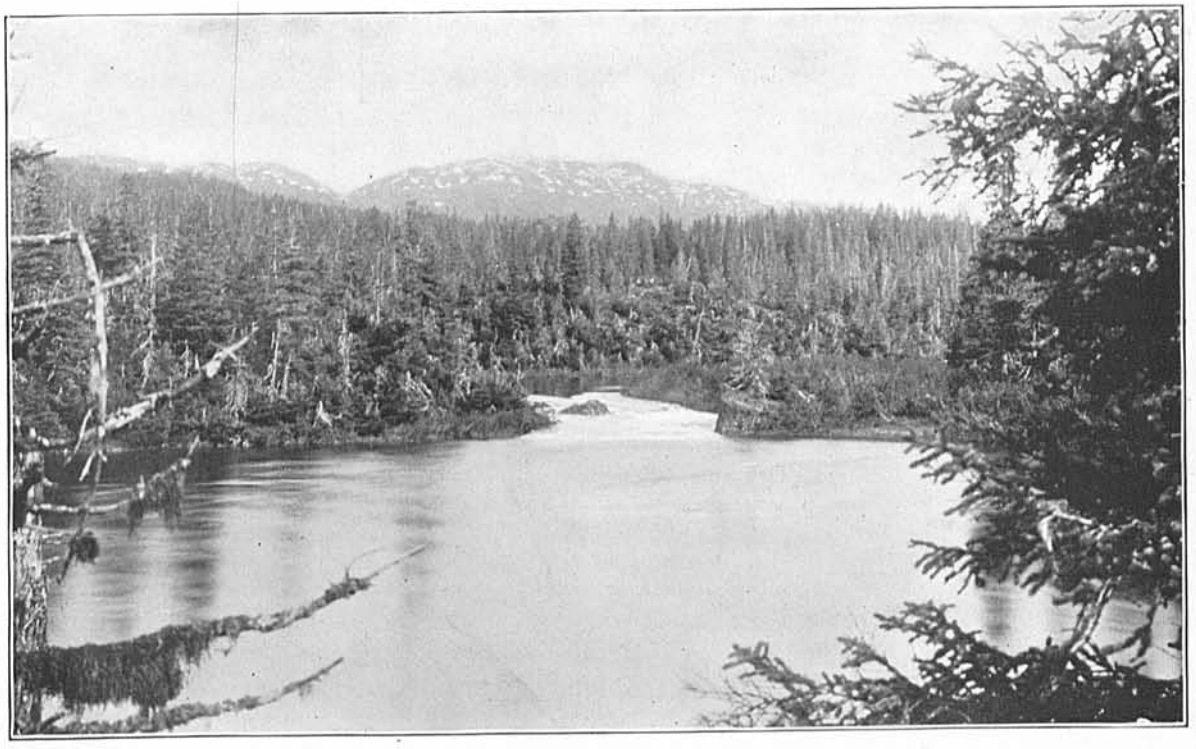
Sketch of Rubber Boot and Cheniga Lakes, Prince William Sound, Alaska.

RUBBER BOOT STREAM AND LAKE.

This stream, a lake outlet, discharges into the northwestern side of the outer bay described under Cheniga, and was examined July 12 by a party in charge of Ensign Hepburn. It is a small stream, about 250 yards long in a direct line, 12 feet wide and 6 inches deep, and flows with a very strong current over a rocky bottom on a fairly straight SE. course. The fall from the lake is about 50 feet and the stream is one continuous rapid, which salmon can probably ascend, but with some difficulty. The banks are heavily wooded with a scrub growth, bordered near the stream by a grassy



HUBBARD GLACIER, YAKUTAT BAY AND VICINITY, ALASKA.



FOURTH LAKE, JACK POT SYSTEM, PRINCE WILLIAM SOUND, ALASKA.

flat. The water is clear, slightly tinged, and has a temperature of 58° F. Tide water extends about 20 yards within the mouth to a point where the remains of a barricade, consisting of the usual felled trees and split poles, were found.

The lake is an irregular-shaped body of water, enlarging near the source of the outlet to about one-half mile in diameter, from which a curving arm, walled in by high mountains, extends over a mile to the westward. The bottom is muddy and stony and the banks are steep. There is a small wooded islet near the center of the eastern part of the lake. For want of facilities the lake could not be examined in all parts, but a number of very small feeders were noticed flowing in on the western side; from the configuration of the country it is not believed there is any feeder of considerable size or other lake connection. No fish were seen in the stream or lake, but a few redfish were jumping around the mouth of the outlet. This stream, if regularly fished, might yield under average conditions from 3,000 to 5,000 redfish during a season. The following are the only stream records available:

Year.	Dates.	No. of redfish.
1896	July 24	1,759
1897	July 15–Aug. 10	3,625
1898	July 5–July 31	2,338
1899	July 5–July 18	881
1900	July 11	142

JACK-POT STREAM AND LAKE.

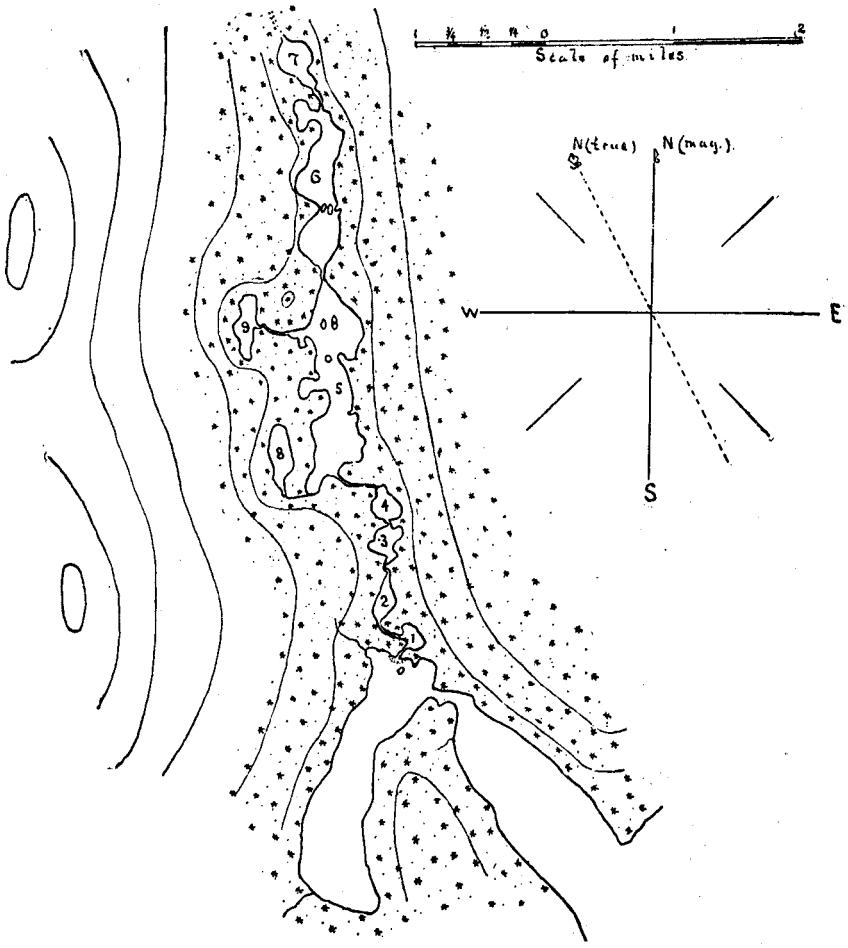
On the mainland, in the southwest end of Prince William Sound, opposite the lower end of Cheniga Island, is a deep bay making to the northwest for several miles, and then, by a narrow passage, connecting with a large bay extending some distance to the southward. Beyond the connecting passage, on the northern shore, is the outlet to a system of lakes and ponds, carrying a few redfish; this was examined by a party in charge of Ensign Miller on July 15. The series consists of 9 lakes, lying in a narrow valley in a general north-and-south direction, 7 connected on line, and 2 sublakes connected with No. 5. Nos. 5 and 6 are quite large; the rest are small. Very little current was noticed in the lakes, but the connecting streams have rapids, though the fall is not great, as No. 7 has an elevation of only 60 feet. Temperature of No. 7, 57° F. No. 9 is elevated about 50 feet above No. 5.

Lake No. 1 is small and is reached by tide water. It is about 200 yards from the bay, and at high water 4 or 5 feet can be carried in, while at low water there is a fall of from 10 to 12 feet. The outlet is about 50 feet wide, 18 inches deep, and had a temperature of 46° F. Fishing operations are carried on in Lake No. 1, and in the passage connecting No. 1 with No. 2 the remains of a barricade were found.

The system is bordered by hills, about 300 feet high, behind which lie high mountains. Occasional flats border the hills. The banks are rocky where observed, and the bottom is of the same nature, though doubtless there are areas of sand and gravel. The vegetation is of the usual Southeast Alaskan type. There are no obstructions to prevent the ascent of fish. Humpbacks were seen spawning in the middle lakes. No feeders of any importance were noticed, though it is probable that there is a large stream at the head of No. 7. The system was visited after prolonged rains, and it was with the greatest difficulty that the party was able to traverse the western side, and it was impossible to cross to the other side.

It is estimated that by fishing throughout the season 7,000 redfish might be obtained under average conditions. The following are the only data available:

Year.	Dates.	No. of redfish.
1896	July 22 and 24	3,332
1899	July 11 and 15	307
1900	July 11	142



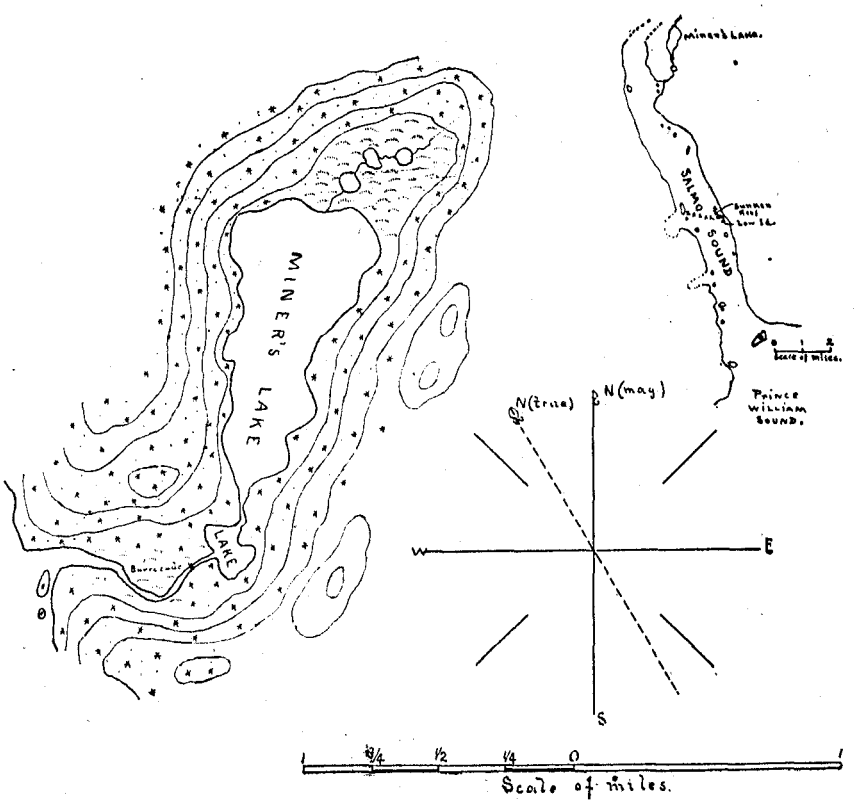
Sketch of Jack-Pot Lake and Stream System.

MINERS STREAM AND LAKE.

On the northern side of Prince William Sound, west from Glacier Island, is a wide, deep inlet known as Salmo Sound. About 10 miles from the entrance to this sound, on the eastern side, is an indentation marked on the southern side by a steep, bare hill of brownish rock behind two wooded islands, which receives the waters of a stream carrying a few redfish. This stream was examined by a party in charge of Ensign Kempff on July 16, and is the outlet to two lakes lying in a north-and-south direction in a broadening valley.

The upper lake has an elevation of 25 feet, and is about 1½ miles long, with an extreme width of ½ mile. The shores, except at the northern and southern ends, are steep and rocky, and bordered by hills from 300 to 400 feet high, back of which the land rises to the higher snow-covered mountains. At the northern end is a series of ponds, lying in the lowlands and connected with each other and the lake. The water is glacial, and had a temperature of 44° F., which was that of the whole system.

The upper lake is connected with the lower one at the southern end by a stream, which is 75 yards long, 35 feet wide, about 9 inches deep, and flows with a strong current over a bowlderous bed in a general south direction. The lower lake, about



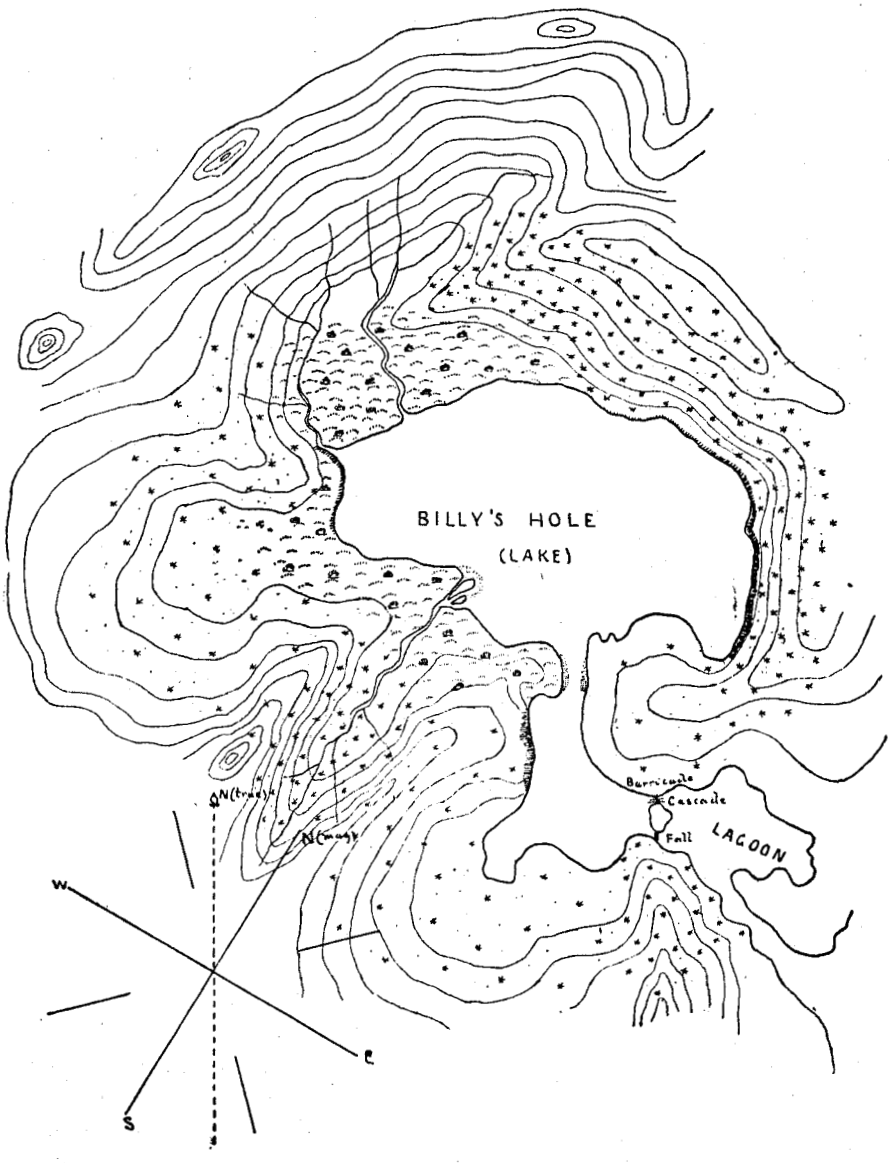
Sketch of Miners Stream and Lakes.

one-fourth mile in diameter, is shallow, and surrounded by wooded and grassy flats. The beaches are of mud and rock; the water is glacial. This lower lake empties into the inlet through a stream one-fourth mile long, 50 feet wide, and about 6 inches deep, flowing in a southwest direction with a very strong current over a bowlderous bed. There are two rapids a short distance below the lake. A few redfish were seen jumping near the mouth of the stream, but none were seen in the stream or lakes. The spawning-beds are in the streams and ponds at the head of the upper lake.

There is no stream record available. It is estimated by those acquainted with the locality that it should yield, under average conditions, 10,000 redfish by fishing throughout the season.

BILLYS HOLE LAKE AND OUTLET.

On the northern shore of Prince William Sound, northwest from Glacier Island, is a large bay. It is the second indentation west from Point Fremantle, the western entrance point to Port Valdes and about 8 miles from it. At the head of the bay a



Sketch of Billy's Hole and Outlet (Lake), Prince William Sound, Alaska.

narrow strait runs about due west for 400 yards and connects with a small salt-water lagoon which receives the discharge from a lake and carries redfish. It was examined July 17 by Ensign Hepburn.

There is no stream of well-defined limits which forms the outlet, the waters of the lake falling directly into the western end of the lagoon with a drop of about 6 feet at high water. In the middle of the outlet, surmounting the brink of the fall, is an island that divides the discharge into two equal parts. That part south of the island has a sheer fall and is not passable to salmon. The western portion is a cascade up which salmon can run when it is not barricaded. Some logs, evidently the remains of a barricade, were found across the top of the cascade and some wire netting lay on the bank near by, but when visited there was no obstruction to the passage of fish. The lake is in two parts, or it may be said there are two lakes connected by a short broad stream. The smaller and lower lake is irregular in form, one-fourth of a mile in length by half that width, with gently sloping banks except on the western shore, where there are precipitous cliffs. In the center it appears rather deep. The bottom consists principally of smooth, sloping rocks with sandy and gravelly spaces between. The larger lake, lying just north of the smaller, extends in a WSW. and ESE. (mag.) direction for about three-fourths mile, with a greatest breadth of one-half mile. The eastern and about half of the northern shores are steep and densely wooded with a tangled undergrowth. Around the western end there are flats extending from one-eighth to one-half mile back to the foot of the mountains and hills forming the lake basin. These flats are covered with grass and bushes and dense thickets of scrub alder. Two feeders enter the lake on the northwestern side. They both flow through a large valley extending almost north and south (mag.) and are formed from the melting snows. The stream flowing down the eastern side of the valley is the larger. It flows over a stony bed with a strong current, has a width of 15 feet and an average depth of 5 inches. It had a temperature of 46° F. The other stream in this valley is much smaller. It has a width of from 3 to 20 feet, depth from 2 inches to 1 foot, and a moderate current. A third, formed largely by draining the melting snows, enters the lake on the southern shore. It flows through a deep and very narrow valley extending to the southward, has an average breadth of 20 feet, depth 4 inches, and a strong current; temperature, 43° F. The lake water had a temperature of 50° F. and is very clear. The bottom appears to be mainly of rock, with some sand and mud patches. The bones of fish were seen scattered all along the shores of the lake, but no live fish were seen, except a few red salmon jumping in the lagoon.

A hatchery might be located at the mouth of the feeder on the southern shore, though the question of a sufficient supply of water during a dry season might need further investigation.

There is no record of this stream available. It is usually fished by the cannery located at Orca. It is believed by those competent to judge that the stream, under average conditions, should yield 20,000 redfish during the run.

PRINCE WILLIAM SOUND CANNERIES.

The two canneries operating in this locality—the one by the Alaska Packers Association (Pacific Packing Company) at Odiak and the other by the Pacific Steam Whaling Company at Orca—are each in about the same working condition as noted in former reports, to which reference is made. In the Alaska Packers Association cannery fish-cleaning machines have been introduced, but it is understood they are still in the experimental stage and require some changes before they can be

pronounced a success. One set of can-makers was in operation in this cannery this year, which averaged over 40,000 cans per diem. All the cans were made on the ground except 10,000 cases which were carried from San Francisco; 100-pound domestic plate was used throughout. The Chinese and fishermen contracted on practically the same terms as given in my previous reports.

Halibut and cod are common around the canneries and trout are abundant in the streams of Prince William Sound. Early in the spring a few steelheads are taken in the delta of the Copper River.

The following averages per case of fish taken in the Copper River delta during different years may be of interest as indicating the possible variations from year to year: King salmon, $3\frac{7}{9}$, $4\frac{1}{8}$, 4, $4\frac{1}{8}$; redfish, $9\frac{3}{4}$, $11\frac{1}{7}$, $10\frac{1}{2}$, $11\frac{1}{2}$, $11\frac{2}{3}$.

COPPER RIVER DELTA.

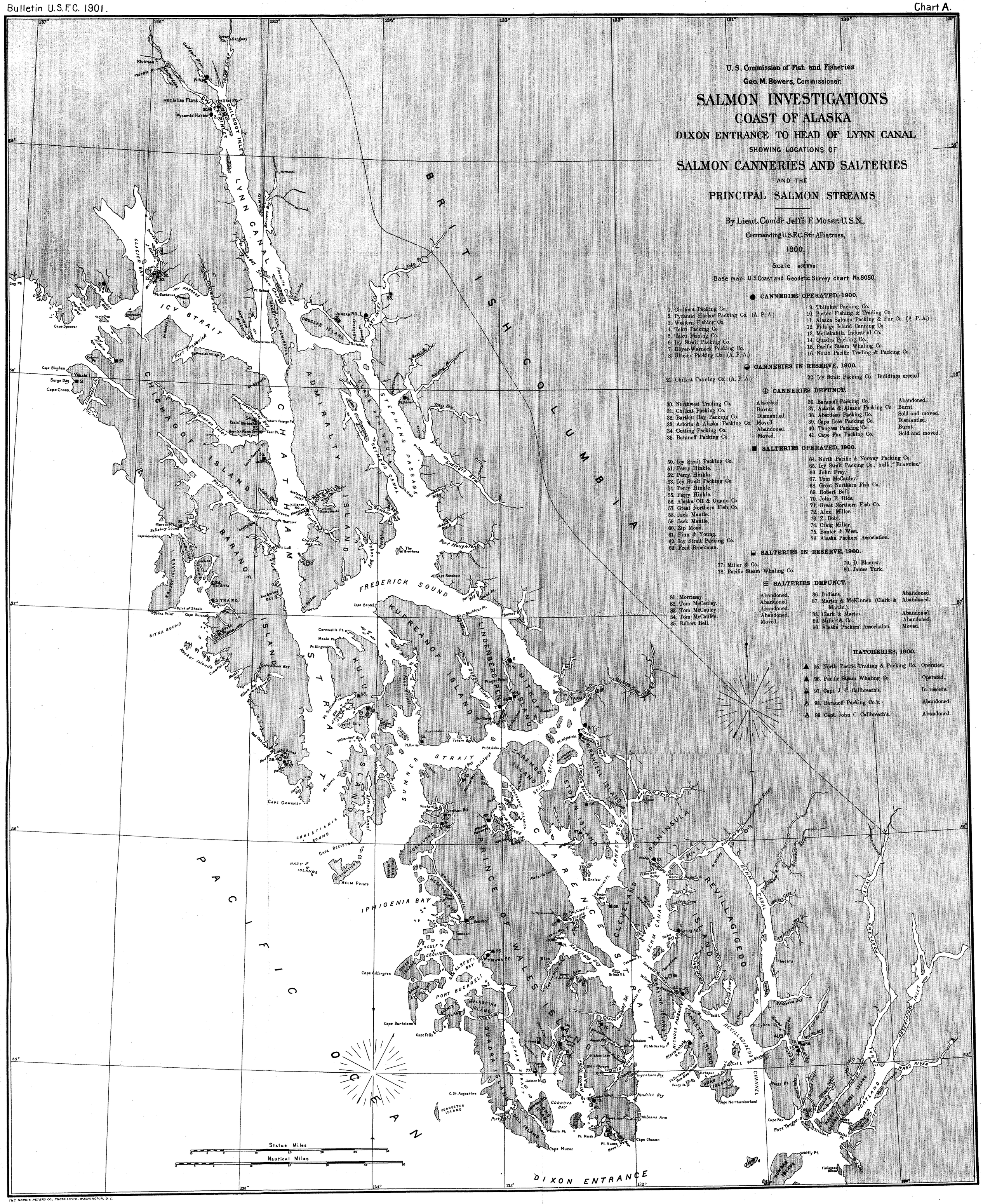
The conditions in this locality were fully described in my report for 1897, pages 129–139, and reference here will only be made to changes and additional information noted. The United States Coast and Geodetic Survey has extended its work over the delta as far as Cottonwood Point, and the location of sloughs with their distance from the canneries can now be indicated with accuracy. The mining excitement throughout this section has caused quite an influx of people, and communication is therefore much better and more reliable.

The cannery of the Peninsula Trading and Fishing Company at Coquenhena, referred to in my former reports, has been dismantled and the available machinery utilized in the Pacific Steam Whaling Company's cannery at Kenai, Cook Inlet.

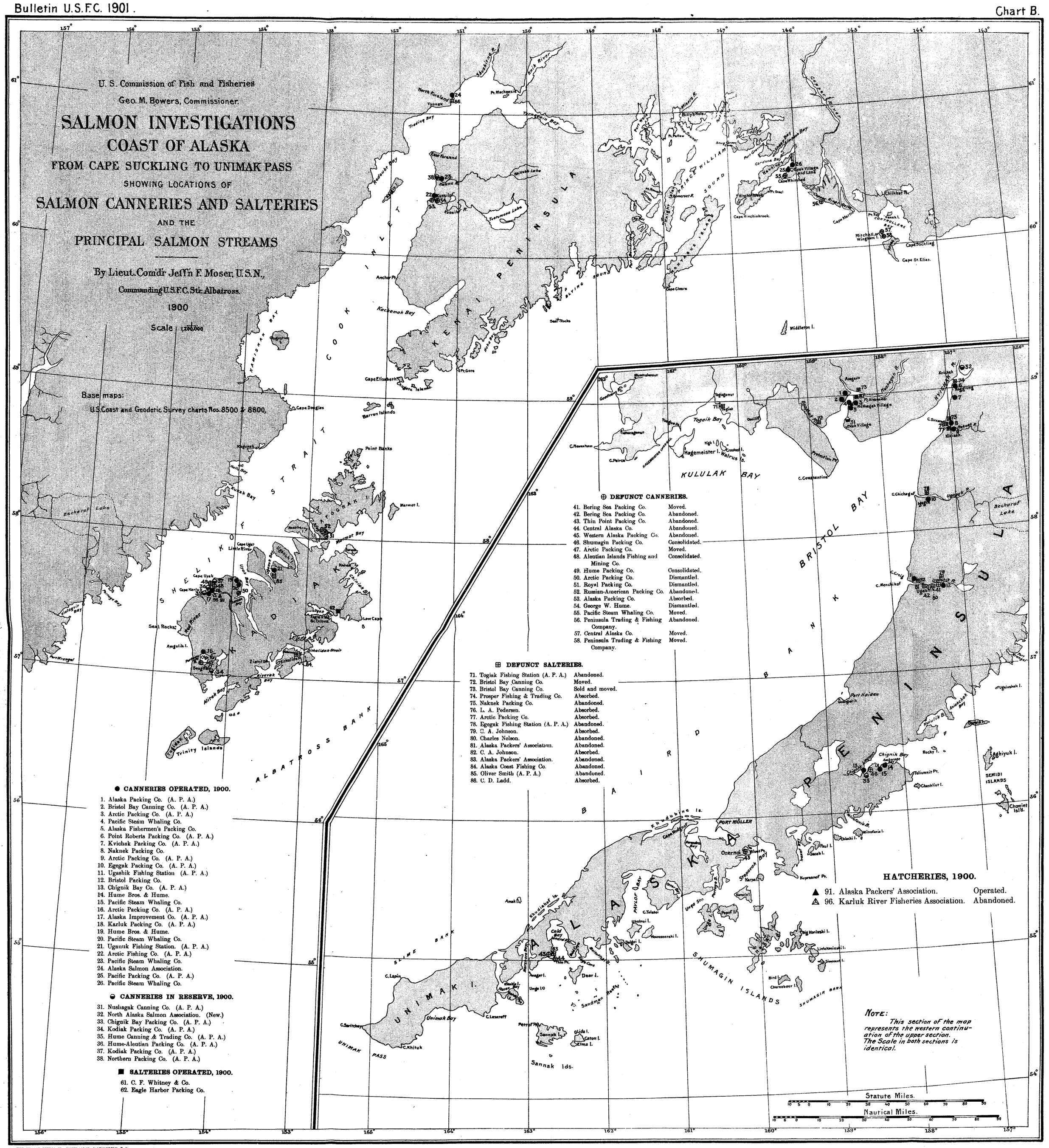
The fishing localities in the delta are unchanged, except that the Chilkat River east of the delta is now more vigorously fished. Cannery steamers capable of going to sea carry the fish from the mouth of the river to the delta, and transfer them to stern-wheel steamers, which carry them to the canneries.

The value of the Chilkat River is unknown, but the following data, from the books of the Alaska Packers Association, may be of interest:

Year.	Dates.	Redfish.
1896	June 27 to July 15	23,980
1897	June 15 to June 29	39,269
1898	June 20 to June 29	39,383
1899	June 16 to July 4	27,072
1900	June 19 to July 6	106,167



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.


U. S. Commission of Fish and Fisheries
Geo. M. Bowers, Commissioner.
SALMON INVESTIGATIONS
COAST OF ALASKA
FROM CAPE SUCKLING TO UNIMAK PASS
SHOWING LOCATIONS OF
SALMON CANNERIES AND SALTERIES
AND THE
PRINCIPAL SALMON STREAMS
By Lieut. Com'dr Jeff'n F. Moser, U.S.N.,
Commanding U.S.F.C. Str. Albatross.
1900
Scale 1/1,200,000
Base maps:
U.S. Coast and Geodetic Survey charts Nos. 8500 & 8800.
● CANNERIES OPERATED, 1900.
1. Alaska Packing Co. (A. P. A.)
2. Bristol Bay Canning Co. (A. P. A.)
3. Arctic Packing Co. (A. P. A.)
4. Pacific Steam Whaling Co.
5. Alaska Fishermen's Packing Co.
6. Point Roberts Packing Co. (A. P. A.)
7. Kvichak Packing Co. (A. P. A.)
8. Naknek Packing Co.
9. Arctic Packing Co. (A. P. A.)
10. Egegak Packing Co. (A. P. A.)
11. Ugashik Fishing Station (A. P. A.)
12. Bristol Packing Co.
13. Chignik Bay Co. (A. P. A.)
14. Hume Bros. & Hume.
15. Pacific Steam Whaling Co.
16. Arctic Packing Co. (A. P. A.)
17. Alaska Improvement Co. (A. P. A.)
18. Karluk Packing Co. (A. P. A.)
19. Hume Bros. & Hume.
20. Pacific Steam Whaling Co.
21. Uganuk Fishing Station. (A. P. A.)
22. Arctic Fishing Co. (A. P. A.)
23. Pacific Steam Whaling Co.
24. Alaska Salmon Association.
25. Pacific Packing Co. (A. P. A.)
26. Pacific Steam Whaling Co.
◒ CANNERIES IN RESERVE, 1900.
31. Nushagak Canning Co. (A. P. A.)
32. North Alaska Salmon Association. (New.)
33. Chignik Bay Packing Co. (A. P. A.)
34. Kodiak Packing Co. (A. P. A.)
35. Hume Canning & Trading Co. (A. P. A.)
36. Hume-Aleutian Packing Co. (A. P. A.)
37. Kodiak Packing Co. (A. P. A.)
38. Northern Packing Co. (A. P. A.)
■ SALTERIES OPERATED, 1900.
61. C. F. Whitney & Co.
62. Eagle Harbor Packing Co.
⊕ DEFUNCT CANNERIES.
41. Bering Sea Packing Co. Moved.
42. Bering Sea Packing Co. Abandoned.
43. Thin Point Packing Co. Abandoned.
44. Central Alaska Co. Abandoned.
45. Western Alaska Packing Co. Abandoned.
46. Shumagin Packing Co. Consolidated.
47. Arctic Packing Co. Moved.
48. Aleutian Islands Fishing and Mining Co. Consolidated.
49. Hume Packing Co. Consolidated.
50. Arctic Packing Co. Dismantled.
51. Royal Packing Co. Dismantled.
52. Russian-American Packing Co. Abandoned.
53. Alaska Packing Co. Absorbed.
54. George W. Hume. Dismantled.
55. Pacific Steam Whaling Co. Moved.
56. Peninsula Trading & Fishing Company. Abandoned.
57. Central Alaska Co. Moved.
58. Peninsula Trading & Fishing Company. Moved.
⊞ DEFUNCT SALTERIES.
71. Togiak Fishing Station (A. P. A.) Abandoned.
72. Bristol Bay Canning Co. Moved.
73. Bristol Bay Canning Co. Sold and moved.
74. Prosper Fishing & Trading Co. Absorbed.
75. Naknek Packing Co. Abandoned.
76. L. A. Pedersen. Absorbed.
77. Arctic Packing Co. Absorbed.
78. Egegak Fishing Station (A. P. A.) Abandoned.
79. C. A. Johnson. Absorbed.
80. Charles Nelson. Abandoned.
81. Alaska Packers' Association. Abandoned.
82. C. A. Johnson. Absorbed.
83. Alaska Packers' Association. Abandoned.
84. Alaska Coast Fishing Co. Abandoned.
85. Oliver Smith (A. P. A.) Abandoned.
86. C. D. Ladd. Absorbed.
HATCHERIES, 1900.
▲ 91. Alaska Packers' Association. Operated.
△ 96. Karluk River Fisheries Association. Abandoned.
NOTE: This section of the map represents the western continuation of the upper section. The Scale in both sections is identical.
Statute Miles.
Nautical Miles.
KOOK INLET
KENAI PENINSULA
PRINCE WILLIAM SOUND
KODIAK ISLAND
SHELIKOF STRAIT
ALASKA PENINSULA
BRISTOL BAY
KUKULAK BAY
ALBATROSS BANK
UNIMAK I.
UNIMAK PASS
SHUMAGIN ISLANDS
SEMIDI ISLANDS
Sannak Ids.
Cape Douglas
Point Banks
Marmot I.
Cape Suckling
Cape St. Elias
Cape Hinchinbrook
Cape Cleare
Middleton I.
Cape Elizabeth
Barren Islands
Cape Uyak
Cape Karluk
Low Cape
Trinity Islands
Cape Newenham
Cape Peirce
Cape Constantine
Cape Menshikof
Cape Lazareff
Cape Sarichef
Cape Khituk
Cape Lapin
Port Moller
Port Wrangel
Port Heiden
Chignik Bay
Tuliumnit Pr.
Chankliut I.
Kupreanof Pr.
Karpa I.
Sandman Reefs
Deer I.
Sannak I.
Caton I.
Elma I.
Chowiet Isl'd.
Ugaiushak I.
Aghiyuk I.
Rocky I.
Hagemeister I.
Walrus Is.
Togiak Bay
Togiak
Nushagak Village
Kvichak
Naknek
Kodiak Village
Cordova Bay
Cordova
Chignik
Ugashik
Uganuk
Becharof Lake
Kukak Bay
Marmot Bay
Uyak Bay
Kiavak Bay
Alitak Bay
Seal Rocks
Ayagulik I.
Sitkalidak Strait
Ziarita
Ursinalliak
Kaguyak
Kodiak
Chiniak Bay
Kockemak Bay
Anchor Pt.
Tustumena Lake
Kasilof R.
Redoubt Bay
Tyonek
Trading Bay
North Foreland
Pt. Mackenzie
Turnagain Bay
Knik River
Shuckitna R.
Cook Inlet
Cape Fiddle
Port Graham
Snug Corner
Port Wells
Port Nellie Juan
Billys Hole
Hinchinbrook
Pt. Steel
Chilkhat R.
Controllers Bay
Mitchell or Wingham I.
Pr. Ray
Isanak I.
Cape Marsh
Cape Fairweather
Yakutat Bay
Icy Bay
Yakutat
Lituya Bay
Dixon Entrance
Chatham Strait
Sumner Strait
Frederick Sound
Stephens Passage
Lynn Canal
Taku Inlet
Taku Village and Lake
Cape Whitshed
Pt. Gardner
Pt. Pybus
Pt. Ashby
Pt. Bella Bella
Pt. Hecate
Pt. Mulgrave
Pt. Pavlof
Pt. Kupreanof
Pt. Ivan
Pt. Gore
Pt. Hallow
Pt. Kaye