

ALASKA FISHERY AND FUR-SEAL INDUSTRIES IN 1920.¹

By WARD T. BOWER, *Agent, Alaska Service.*

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¹ Appendix VI to the Report of the U. S. Commissioner of Fisheries for 1921. B. F. Doc. 909.

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INTRODUCTION.

The Bureau's work in Alaska was conducted along the usual lines in the calendar year 1920. Shortage of funds handicapped the work of the fisheries service early in the season before the new appropriations became available July 1. A force of temporary stream watchmen was again made use of during the active fishing season, working under the direction of the Bureau's permanent employees in the patrol of the fishing grounds for the enforcement of the laws and regulations. Vessels of the subchaser type and one mine sweeper were stationed in southeastern Alaska to aid in law enforcement.

A further study was made of the condition of the salmon fishery of the Yukon River, and an expedition was sent into the Bristol Bay region which did excellent work in the destruction of predatory fishes and gathered certain information in regard to the spawning beds and runs of red salmon in streams tributary to Bristol Bay. Five hearings were held by the Bureau at Cordova and Seattle late in the year, and further restrictions imposed on commercial fishing for salmon in Alaska.

Private salmon hatcheries were inspected as usual, and work was continued by the Bureau at its hatcheries on McDonald Lake and at Afognak. Excellent progress was made in the marking of the mouths of salmon streams, one vessel in the southeastern district being almost exclusively engaged in the work. Detailed statistics of the fishery industry of Alaska were collected and compiled as heretofore.

In accordance with the recommendation repeatedly made by the Secretary of Commerce and the Commissioner of Fisheries, the Department of Commerce has been relieved of jurisdiction over certain minor fur-bearing animals in Alaska. The act of May 31, 1920, contained a section placing the land fur-bearing animals of Alaska under the control of the Bureau of Biological Survey, of the Department of Agriculture, and transferred to the Department of Commerce jurisdiction over walruses and sea lions. The Department of Commerce retains jurisdiction over the fur seals and sea otters, and over the blue fox herds of the Pribilof Islands. The Bureau's files and all matters pertaining to the land fur-bearing animals, including the leasing of islands for fur-farming, were promptly delivered to the Bureau of Biological Survey, which assumed jurisdiction upon the approval of the act. This report, therefore, does not contain a section dealing with the protection of the so-called minor fur-bearing animals of Alaska. Employees of this Bureau in Alaska have cooperated with representatives of the Bureau of Biological Survey whenever possible in the establishment of their work.

The Bureau's activities in connection with the taking of fur-seal skins and administration of the natives' affairs on the Pribilof Islands were carried on in the usual manner. The total take of sealskins in the calendar year 1920 was 26,648, having an estimated value of about \$1,000,000. The take of blue fox skins on the Pribilofs in the winter of 1920-21 was the largest for nearly 30 years, totaling 1,125 blues and 14 whites, with an estimated value of about \$100,000.

Transportation of necessary food, fuel, and supplies for the natives and white employees on the Pribilof Islands, together with return of products, was afforded through the courtesy of the Navy Department and the Coast Guard.

Two sales at public auction of sealskins taken on the Pribilof Islands were held at St. Louis in 1920 by the selling agents of the Bureau. The sale of fox skins was postponed because of low prices, but was held early in 1921.

The author of this report is greatly indebted to Assistant Agent E. M. Ball for compilation of statistics of the fisheries and preparation of accompanying text. Acknowledgment is also made to C. E. Crompton for assistance in the preparation of statistics and text in regard to the fur-seal industry.

REGULAR EMPLOYEES, ALASKA SERVICE.

During the year 1920 the following regular employees have been identified with the Alaska service of the Bureau:

REGULAR EMPLOYEES IDENTIFIED WITH THE ALASKA SERVICE IN 1920.

Name.	Position.	Headquarters or chief place of duty.
Ward T. Bower.....	Chief agent.....	Washington, D. C.
Edward M. Ball.....	Assistant agent.....	Juneau.
Harry J. Christoffers.....	do.....	Seattle.
Calvin F. Townsend.....	Inspector.....	Fairbanks.
Shirley A. Baker.....	Assistant agent.....	Cordova.
Lemuel G. Wingard.....	do.....	Naknek. (Promoted Oct. 1, 1920, from warden.)
A. H. Proctor.....	Superintendent.....	St. Paul Island. (Promoted July 1, 1920, from agent and caretaker, St. Paul Island.)
Charles E. Crompton.....	Agent and caretaker.....	St. George Island.
Henry D. Aller.....	do.....	St. Paul Island. (Promoted July 1, 1920, from storekeeper, St. Paul Island.)
G. Dallas Hanna.....	Storekeeper.....	St. Paul Island. (Resigned Jan. 15, 1920.)
Edward C. Johnston.....	do.....	St. George Island. (Promoted Apr. 16, 1920, from school-teacher.)
Henry C. Scudder.....	do.....	St. Paul Island. (Resigned as warden Apr. 23, 1920. Reinstated, assistant agent, July 1, 1920. Promoted Oct. 1, 1920.)
John J. Richstein.....	Physician.....	St. Paul Island. (Resigned June 30, 1920.)
Henry H. Stromberger.....	do.....	St. Paul Island. (Reinstated July 1, 1920. Resigned Aug. 4, 1920.)
W. C. Huyler.....	do.....	St. Paul Island. (Appointed Oct. 5, 1920. Resigned Nov. 18, 1920.)
George B. Bowly.....	do.....	St. Paul Island. (Appointed Nov. 19, 1920.)
William M. Murphy.....	do.....	St. George Island.
Herschel Silversfone.....	Assistant to agent.....	St. Paul Island. (Resigned Sept. 30, 1920.)
Henry Mygatt.....	do.....	St. Paul Island. (Appointed Oct. 1, 1920.)
George Haley.....	School-teacher.....	St. Paul Island. (Resigned July 19, 1920.)
Lols L. Proctor.....	do.....	St. Paul Island.
Richard Culbertson.....	do.....	St. Paul Island. (Appointed July 20, 1920.)
Carl E. Fletcher.....	do.....	St. George Island. (Appointed May 29, 1920. Resigned Oct. 9, 1920.)
John M. Orchard.....	do.....	St. George Island. (Appointed Oct. 12, 1920.)
Michael J. O'Connor.....	Warden.....	Juneau.
Fred H. Gray.....	do.....	Wrangell.
Phillip R. Hough.....	do.....	Juneau. (Resigned June 30, 1920.)
Joseph N. Braun.....	do.....	Ikatan. (Appointed May 1, 1920.)
William E. Baumann.....	do.....	Afognak. (Appointed July 20, 1920.)
Chauncey C. Combs.....	do.....	Haines. (Appointed July 28, 1920. Resigned Sept. 30, 1920.)
James K. Nevill.....	do.....	Wrangell. (Appointed Aug. 1, 1920.)
Arthur L. Mellick.....	Master power vessel Eider.....	Unalaska.
Edwin Hofstad.....	Master steamer Osprey.....	Wrangell.
Jesse L. Nevill.....	Master patrol vessel Auklet.....	Do.
George G. Naud.....	Master patrol vessel Murro.....	Juneau.
Albert K. Brown.....	Clerk.....	Washington, D. C.
Mary S. Haines.....	do.....	Do.
William P. Rasin.....	do.....	Do.
Marguerite McBride.....	do.....	Washington, D. C. (Transferred to Coast and Geodetic Survey, Feb. 3, 1920.)
E. Elaine Bell.....	do.....	Seattle.
Gladys M. Gamlen.....	do.....	Seattle. (Resigned Mar. 6, 1920. Reinstated June 8, 1920.)

REGULAR EMPLOYEES AT GOVERNMENT HATCHERIES IN ALASKA IN 1920.

Location and name.	Position.
Afognak:	
Edwin Wentworth.....	Superintendent.
Harry J. Heuver.....	Foreman.
Russel Noyes.....	Fish-culturist. (Resigned June 30, 1920.)
Fred R. Lucas.....	Fish-culturist.
Thomas H. Morton.....	Fish-culturist. (Promoted Mar. 16, 1920 from apprentice fish-culturist at Afognak to fish-culturist at McDonald Lake. Transferred Sept. 16, 1920, to Afognak.)
Alfred Nelson.....	Apprentice fish-culturist.
Nicolai Boskofsky.....	Apprentice fish-culturist. (Appointed Oct. 6, 1920.)
Mildred I. Morton.....	Apprentice fish-culturist. (Appointed Nov. 4, 1920. Resigned Dec. 31, 1920.)
F. J. Stewart.....	Cook. (Resigned Dec. 31, 1920.)
McDonald Lake:	
C. H. Van Atta.....	Superintendent.
Calvin D. Ryan.....	Foreman.
William L. Stiles, Jr.....	Fish-culturist. (Transferred Mar. 1, 1920, to Leadville, Colo.)
Thomas H. Morton.....	Fish-culturist. (Promoted Mar. 16, 1920, from apprentice fish-culturist, Afognak. Transferred Sept. 16, 1920, to fish-culturist, Afognak.)
Albert L. Carlton.....	Fish-culturist.
Everett V. Campbell.....	Apprentice fish-culturist. (Resigned Apr. 30, 1920.)
Lawrence T. Hopkinson.....	Apprentice fish-culturist. (Appointed June 5, 1920. Transferred Sept. 1, 1920, to statistical agent, Washington, D. C.)
Clarence Houts.....	Apprentice fish-culturist. (Resigned Aug. 14, 1920.)
Anton Hougen.....	Apprentice fish-culturist. (Appointed Nov. 1, 1920.)
Barney Sevisen.....	Do.
Casper Udstrand.....	Apprentice fish-culturist. (Appointed Nov. 6, 1920.)
Stella A. Campbell.....	Cook. (Resigned Apr. 30, 1920.)
John P. Mobley.....	Cook. (Appointed May 1, 1920.)

FISHERY INDUSTRIES.

As in corresponding reports for previous years, the Territory of Alaska is here considered in the three coastal geographic sections generally recognized, as follows: Southeast Alaska, embracing all that narrow strip of mainland and the numerous adjacent islands from Portland Canal northwestward to and including Yakutat Bay; central Alaska, the region on the Pacific from Yakutat Bay westward, including Prince William Sound, Cook Inlet, and the southern coast of Alaska Peninsula, to Unimak Pass; and western Alaska, the north shore of the Alaska Peninsula, including the Aleutian Islands and Bristol Bay and the Kuskokwim and Yukon Rivers.

Detailed reports and statistical tables dealing with the various fishery industries are presented herewith, and there are also given the important features of certain subjects which were the objects of special investigation or inquiry.

WATERS CLOSED TO COMMERCIAL FISHING.

Section 6 of the act approved June 26, 1906, for the protection and regulation of the fisheries of Alaska, is as follows:

SEC. 6. That the Secretary of Commerce may, in his discretion, set aside any streams or lakes as preserves for spawning grounds, in which fishing may be limited or entirely prohibited; and when, in his judgment, the results of fishing operations in any stream, or off the mouth thereof, indicate that the number of salmon taken is larger than the natural production of salmon in such stream, he is authorized to establish close seasons or to limit or prohibit fishing entirely for one year or more within such stream or within five hundred yards of the mouth thereof, so as to permit salmon to increase: *Provided, however,* That such power shall be exercised only after all persons interested shall be given a hearing, of which due notice must be given by publication; and where the interested parties are known to the Department they shall be personally notified by a notice mailed not less than thirty days previous to such hearing. No order made under this section shall be effective before the next calendar year after same is made: *And provided further,* That such limitations and prohibitions shall not apply to those engaged in catching salmon who keep such streams fully stocked with salmon by artificial propagation.

Pursuant to the provisions of this section, action was taken in 1920 in regard to waters of southeastern Alaska; waters between Cape Spencer and Cape Newenham, including Bering and Copper Rivers, Kuskokwim River, and Yukon River.

Under date of May 22, 1920, announcement was made of a hearing to be held to consider the necessity or desirability of making changes in the regulations in regard to the Yukon River. The text of the announcement was as follows:

It having been recommended that the Secretary of Commerce amend the order of December 14, 1918, limiting or prohibiting fishing for salmon in the Yukon River, Alaska, its tributary waters, and the waters of its delta, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An act for the protection and regulation of the fisheries of Alaska," that a hearing, for the purpose of eliciting information as to what,

if any, changes in the present Yukon River regulations are necessary or desirable, will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 23, 1920, at 10 o'clock a. m., at which time and place all interested persons will be heard. All persons having pertinent information are particularly invited to be present and to impart such information.

Under date of May 25, 1920, announcement was made of a hearing to be held in respect to fishing in the Kuskokwim River. The text of the announcement was as follows:

It having been recommended that the Secretary of Commerce limit or prohibit fishing for salmon or other fishing in the prosecution of which salmon are taken or injured, in the Kuskokwim River, Alaska, its tributary waters, and within the area 500 yards outside the mouth of that river, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of limiting or prohibiting fishery operations in the waters in question will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 30, 1920, at 10 o'clock a. m., at which time and place all interested persons will be heard. All persons having pertinent information are particularly invited to be present and to impart such information.

Under date of August 18, 1920, announcement was made of hearings to consider the necessity or desirability of changing the regulations regarding fishing in Copper River waters. The text of the announcement was as follows:

It having been recommended that the Secretary of Commerce amend the order of December 20, 1918, limiting or prohibiting fishing in the Copper River, Alaska, and its delta and all tributary waters, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An act for the protection and regulation of the fisheries of Alaska," that hearings for the purpose of eliciting information as to what, if any, changes in the present Copper River regulations are necessary or desirable will be held at Cordova, Alaska, on October 5, 1920, at 10 o'clock a. m., and at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on November 18, 1920, at 10 o'clock a. m., respectively, at which all interested persons will be heard. All persons having pertinent information are particularly invited to be present and to impart such information.

Under date of October 30, 1920, announcement was made of a hearing to be held in respect to amending the order of November 30, 1917, in regard to fishing in Bering River. The text of the announcement was as follows:

It having been recommended that the Secretary of Commerce amend the order of November 30, 1917, the provisions of which are continued in the order of December 23, 1919, prohibiting commercial fishing operations in Bering River and its tributary waters, including Bering Lake, above a line extending at right angles across Bering River from a point approximately 800 feet northwesterly from the mouth of Gandil River, Alaska, notice is hereby given under the provisions of section 6 of the act of Congress approved June 26, 1906, entitled "An act for the protection and regulation of the fisheries of Alaska," that a hearing to determine the advisability of further limiting or prohibiting fishing operations in Bering River and its tributary waters, including Bering Lake, will be held at the office of the Bureau of Fisheries, 1217 L. C. Smith Building, Seattle, Wash., on December 3, 1920, at 10 o'clock a. m., at which time and place all persons interested will be heard.

Following the hearings on October 5, November 18, 23, and 30, and December 3, the Department, under date of December 18, 1920, promulgated the following order:

Hearings having been given, after due notice in accordance with law, for the purpose of determining the advisability of limiting or prohibiting fishing in

certain waters in Alaska, and to amend or modify certain existing regulations, and all persons having had full opportunity to be heard, it is hereby ordered, by virtue of the authority vested in me by section 6 of "An act for the protection and regulation of the fisheries of Alaska," approved June 26, 1906, that until further notice all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, in all hereinafter-described waters of Alaska be and is hereby made subject to the following limitations and prohibitions in addition to the general restrictions already applicable by virtue of existing laws and regulations.

1. Waters east of the longitude of Cape Spencer:

(a) All fishing is prohibited in all salmon streams and their tributaries and lakes.

(b) All fishing, except with purse seines and drift gill nets, is prohibited within 500 yards of the mouths of all salmon streams.

(c) All fishing with purse seines and drift gill nets is prohibited within 200 yards of the mouths of all salmon streams, and all fishing with purse seines and drift gill nets as well as with all other apparatus is prohibited within 500 yards of the mouths of Chilkat River, Chilkoot River, Anan Creek, Hetta Creek, Sockeye Creek, and Naha Stream.

2. All fishing is prohibited in all salmon streams, their tributaries and lakes, and within 500 yards of the mouths of such streams, flowing into the Pacific Ocean or Bering Sea between Cape Spencer and Cape Newenham, except as follows:

(a) Fishing is permitted in Copper River and its tributaries in accordance with the terms of the order promulgated December 20, 1918, which order is continued in full force until September 1, 1921, upon which date said order of December 20, 1918, becomes of no further force or effect, and on and after September 1, 1921, and until further notice, all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, in the Copper River, its tributaries and lakes, and within 500 yards of each mouth of the Copper River, is prohibited.

(b) Fishing is permitted at Karluk beyond the zone 100 yards outside the mouth of Karluk River where it breaks through Karluk Spit into Shelikof Strait.

(c) Fishing is permitted in Ugashik River below a line extending at right angles across the Ugashik 500 yards below the mouth of King Salmon River.

3. On and after September 1, 1921, all fishing is prohibited in the Kuskokwim River, its tributaries and lakes, and within 500 yards of the mouth of the Kuskokwim for other than local use in Alaska.

4. Fishing is permitted in the Yukon River and its tributaries in accordance with the terms of the order promulgated December 14, 1918, which order is continued in full force until September 1, 1921, on which date said order of December 14, 1918, becomes of no further force or effect, and on and after September 1, 1921, and until further notice, all fishing for salmon, or other fishing in the prosecution of which salmon are taken or injured, in the Yukon River, its tributaries and lakes, and within 500 yards of each mouth of the Yukon, is prohibited for other than local use in Alaska.

5. The driving of salmon downstream and the causing of salmon to go outside the protected area at the mouth of any salmon stream are expressly prohibited.

6. This order does not apply to persons taking salmon with rod, hand line, or spear for their personal or family use and not for sale or barter.

7. The waters of the Afognak Reservation are covered by presidential proclamation of December 24, 1892, and the regulations promulgated by authority thereof are not modified or affected by this order but remain in full force.

8. All previous orders of the Secretary of Commerce imposing limitations or prohibitions upon fishing in the waters covered by this order, except as hereinbefore indicated, are hereby superseded.

9. This order becomes effective January 1, 1921.

Limitations and prohibitions upon fishing are applicable in the waters of the Yukon and Copper Rivers by virtue of previous orders of the Secretary of Commerce. Limitations have been placed upon fishing by Executive order or proclamation in the following additional waters: Afognak Reservation, Aleutian Islands Reservation, Yes Bay and Stream, and the Annette Island Fishery Reserve.

STREAM MARKING.

In order to make more effective the closing order of December 23, 1919, and to serve as a helpful guide to the fishermen, it was considered advisable to indicate by appropriate notices at suitable places on shore the protected waters off the mouth of each salmon stream in which fishing is prohibited. Though these notices in themselves could not prevent unlawful encroachments on the streams, they would serve as guides to those instinctively law-abiding and as warning to those having no respect for the fishery laws and regulations. Thus no one could plead in extenuation of a violation of the regulations that there were no visible means defining the bounds wherein operations would be illegal.

The placing of markers at the mouths of streams is therefore intended to be helpful to the fishermen in enabling them to locate the outer boundary of the protected area of each stream, and at the same time the markers serve the further purpose of making more certain to those engaged in the enforcement of the law and regulations that encroachments upon prohibited waters are not accidental.

The procedure generally followed in southeast Alaska in locating markers has been to define arbitrarily the mouths of streams at the line of mean low tide, unless physical conditions rendered such action impracticable. This is the case at some streams where considerable areas of silt have been deposited, which at low tide are exposed as comparatively extensive mud flats. Owing to the varied conditions encountered, no inflexible rule could be laid down for the determination of stream mouths, but as far as practicable the mouth of each stream was to be fixed at the line of mean low tide. Where this could not be done, authority was given to mark the mouths of such streams at the line of mean high tide.

Gratifying progress was made in the work of marking stream mouths in southeast Alaska. Signboards were erected at 189 streams. Of that number the mainland is credited with 21 streams, Chichagof Island with 60, Yakobi Island 2, Baranof Island 18, Admiralty Island 28, Kupreanof Island 5, Zarembo Island 1, Wrangell Island 2, Etolin Island 5, Mitkof Island 1, Kosciusko Island 6, and Prince of Wales Island 40. There are several hundred more salmon streams in southeast Alaska which have not been marked, but which will be given attention as funds may be available for such work.

In central Alaska markers were placed in 1920 at Eyak River, Mountain Slough, and Glacier River, all of which are streams of the delta of the Copper River, the several other outlets of the Copper having been marked in 1919. The Karluk River was also marked in 1920.

The salmon streams in western Alaska are comparatively large and few in number. Of those tributary to Bristol Bay seven were marked in 1920. They are as follows: Nushagak, Snake, Igushik, Kvichak, Naknek, Egagik, and Ugashik Rivers. The mouth of the Yukon River was marked in 1919.

STREAM WATCHMEN.

No more important work than the watching of salmon streams engages the attention of the Alaska service. The preservation of the

salmon runs may depend largely upon the degree of protection afforded in this manner, for experience has shown beyond doubt that most satisfactory results are thus obtained. The duty of stream watchmen is to prevent unlawful fishing in the streams where they are stationed and within the proscribed area off the mouths thereof.

In 1920 six men were employed as stream watchmen, of whom Fred W. Dost, Eric N. Aldrich, Earl C. Nelson, and John F. Ross were assigned to the southeastern district. The other two, Kenneth C. Cole and John J. Folstad, were stationed at Abercrombie and Karluk, respectively. By consent of the governor of Alaska, Joseph A. Bourke, a Territorial officer, was detailed to fishery work in the Prince William Sound region during the fishing season.

Three other men, Chauncey C. Combs, James K. Nevill, and William E. Baumann, began work in July as stream watchmen, but they were soon appointed permanent wardens in the Alaska fisheries service, and are therefore not to be counted in this category. The regular force of the service, including these three wardens, numbered 11 men, which, with the 6 stream watchmen and the 1 special assistant previously referred to, constituted a service of 18 men actively engaged in the protection of the fisheries of Alaska. In addition there were, of course, the men engaged in operating the several vessels used in protective work.

FISHERY PATROL.

BUREAU PATROL BOATS.

Five boats, owned by the Bureau, were used in patrolling the fishing grounds of Alaska in 1920. Three of them, the steamer *Osprey* and the power boats *Auklet* and *Murre*, operated in southeastern Alaska, while the other two, the *Swan* and *Tern*, were used on the Yukon River and tributaries, cruising together during much of the season. In addition the launch *Dixie* and the power boats *Anthouette* and *Try It* were chartered in July, August, and September for patrol service in the Juneau district. The launch *Prospector* was chartered in June and July for similar service on Prince William Sound and the Copper River flats.

The *Osprey* was transferred from the central district to southeastern Alaska in July, where it was used almost entirely in the work of marking the mouths of salmon streams. While being beached near Cordova, preparatory to having her hull cleaned and copper painted, the *Osprey* settled in the gravel and turned over on May 25, falling away from the shore at low water. The boat did not right itself on the flood tide, but filled with water and remained in this partly submerged condition for about a week until assistance was rendered by the Coast Guard cutter *Algonquin*, then in the vicinity. The following extract from a report by the Commodore Commandant of the Coast Guard describes the circumstances attending the salvage of the *Osprey*:

On May 30, while on her way to Latouche, the *Algonquin* received a dispatch from the headquarters of the Coast Guard at Washington, stating that the Bureau of Fisheries had requested her assistance in salvaging the steamer *Osprey*, ashore at Cordova. The cutter immediately headed for the stranded vessel and found her in Orca Inlet, 5 miles north of Cordova. She was lying

on her side, full of water. It was decided that a barge or scow was necessary to float the vessel, so the *Algonquin* proceeded to Cordova in search of one. A suitable scow, belonging to the Bering River Coal Co., was obtained, brought to the steamer *Osprey*, and hauled alongside her. On June 3 the *Osprey* was righted, floated, and made fast to a dolphin. The water was then bailed out of her.

In April the *Murre* was seriously damaged by striking a rock in Keku Strait while engaged on census work for the Bureau of Education. She was towed to Wrangell by the *Auklet* and repaired at a cost of \$1,623.87.

The following statement shows the mileage made by the patrol boats owned by the Bureau in their cruises of 1920: *Auklet*, 7,616; *Murre*, 6,635; *Osprey*, 3,793; *Swan*, 3,067; *Tern*, 2,367; total mileage, 23,478. In addition to the foregoing, extensive mileage was made by chartered patrol boats, especially the *Diavie*.

NAVAL AND OTHER PUBLIC VESSELS.

In March, 1920, a rather elaborate program was arranged between the Governor of Alaska and the Navy Department, Treasury Department, and the Department of Commerce, whereby certain vessels under the direction of each department were to participate in fishery patrol work in Alaska. The original order as approved by the heads of the three departments designated the following vessels to constitute a fleet for the protection of the fisheries of the Territory:

Naval vessels: *Eagle 57*, submarine chaser *No. 294*, and submarine chaser *No. 309*. (Subchaser *No. 310* was detailed instead of *No. 309*.)

Coast Guard vessels: *Bothwell*, *Algonquin*, *Bear*, *Earp*, and *Unalga*.

Coast and Geodetic Survey vessels: *Explorer*, *Lydonia*, *Surveyor*, and *Wenonah*.

Eagle 57 and two subchasers, *No. 294* and *No. 310*, were in Alaska during the summer months. The chasers reached Alaska in May and remained until the end of the fishing season. Subchaser *No. 294*, while commanded by Lieut. Thompson, United States Navy, made an energetic patrol of the district south of Petersburg, and did much to suppress trap robberies and illegal fishing generally. Subchaser *No. 310* was similarly engaged in the district north of Petersburg, though much less actively. *Eagle 57* struck a reef at Gambier Bay July 3, en route from Bremerton to Juneau, and lost her propeller. On July 4 the vessel was towed to Juneau by the *Explorer* and several weeks later was towed to the Puget Sound Navy Yard by a naval tug. Thus *Eagle 57* performed no service in the interest of the fisheries of Alaska and was replaced on August 1 by the mine sweeper *Swallow*.

The commanding officer aboard each of these naval vessels was authorized by the Secretary of Commerce, under date of April 23, 1920, to make searches, arrests, and seizures in accordance with the provisions of the Alaska alien fisheries act of June 14, 1906. They, or other officers of the Navy assigned to this patrol, were also commissioned as deputy United States marshals, and at least one officer was appointed a United States commissioner.

The vessels of the Coast Guard were primarily in Alaskan waters to carry on the Bering Sea patrol for the protection of the fur-seal

herds annually resorting to the Pribilof Islands. A statement regarding this patrol appears in the fur-seal section of this report.

The vessels of the Coast and Geodetic Survey were engaged in the vitally important work of that service in different coastal districts of Alaska and therefore could not be expected to have opportunities to do much for the fisheries.

WAR DEPARTMENT REGULATIONS.

Early in 1920 a rather general protest was registered before the Chief of Engineers of the War Department by various interests in Alaska against the location of floating fish traps in offshore positions, it being contended that such traps were a menace to navigation. After considerable inquiry into the matter, the Acting Chief of Engineers issued, on April 22, 1920, a temporary order for the regulation of floating traps, as follows:

During the calendar year 1920 no floating pound net or fish trap in the navigable waters of Alaska shall exceed 2,400 feet in length over all nor be constructed and operated in more than 100 feet depth of water at the outer end of the net or trap at mean high tide according to the United States tide tables; with the exception that a floating pound net or fish trap may be constructed and operated in a greater depth of water, provided the extension, measured from the shore line, at mean high-tide line, does not exceed 1,000 feet over all.

At the same time announcement was made that public hearings would be held during the year to determine the advisability of continuing or modifying the order. Accordingly two hearings were held in 1920—one at Juneau on September 14 and the other at Seattle on November 19—as a result of which the War Department continued without modification the order of April 22. On January 5, 1921, new regulations were issued prescribing the conditions under which fishery operators may construct and maintain fish traps in the navigable waters of Alaska. The regulations are as follows:

WAR DEPARTMENT, OFFICE OF THE CHIEF OF ENGINEERS, *Washington, January 5, 1921.*

NOTE.—It is to be understood that this authority does not give any property rights either in real estate or material, or any exclusive privileges; and that it does not authorize any injury to private property or invasion of private rights, or any infringement of Federal, Territorial, or local laws or regulations, nor does it obviate the necessity of obtaining Territorial assent to the work authorized. It merely expresses the assent of the Federal Government so far as concerns the public rights of navigation. (See *Cummings v. Chicago*, 188 U. S., 410.)

To whom it may concern:

The attention of those fishing in the waters of the coast of the Territory of Alaska, and in the navigable waters tributary thereto, is called to the provisions of section 10 of the river and harbor act of March 3, 1899, as follows:

"SEC. 10. That the creation of any obstruction not affirmatively authorized by Congress to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any * * * weir * * * or other structure in any * * * navigable river or other waters of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War."

In accordance with the above provision of law, and until further notice, all fishermen who desire to operate in the waters above described, and under conditions stated as follows, but not otherwise, and whose written applications may receive the approval of the district engineer of the engineer department at large, in charge of the locality, are hereby authorized by the Secretary of War to construct and maintain fish weirs, traps, or pounds erected in the usual manner as heretofore, subject to the following conditions:

CONDITIONS.

1. All persons desiring to erect and maintain fish weirs, traps, or pounds under this authority shall make application to the District Engineer, United States Engineer Office, Seattle, Wash., giving their names, their addresses, the proposed location of their weir, trap, or pound, and evidence that the proper license has been granted by the Territory of Alaska.

2. That no floating fish trap shall exceed 2,400 feet in length over all, nor be constructed and operated in more than 100 feet depth of water at the outer end of the trap at mean high tide, according to the United States tide tables, with the exception that a floating trap may be constructed and operated in a greater depth of water, provided the extension measured from the shore line at mean high tide does not exceed 1,000 feet over all.

3. That all the apparatus used and the work herein authorized shall be subject to the supervision and approval of the aforesaid district engineer, who may temporarily suspend the work at any time if, in his judgment, the interests of navigation so require.

4. That no weir, trap, or pound shall be located or built in such place or manner as to unreasonably obstruct or interfere with navigation.

5. That on the outer end of the weir, trap, or pound the permittee or owner shall maintain a sign inscribed with the license number in numerals not less than 6 inches in height, capable of being readily read from passing vessels, and failure to keep such sign conspicuously displayed shall be sufficient reason for the cancellation of this authority and for prosecution as provided in the next paragraph. All renewals of the Territorial license shall be reported to the aforesaid district engineer when they occur, together with the Territorial license number. All changes of ownership shall also be reported to him immediately, and the permit shall be returned to him for proper notation thereon of such changes.

6. That upon the abandonment of the location or upon ceasing to use any weir, trap, or pound, as hereby authorized, the permit and the map or maps attached thereto shall be immediately returned to the aforesaid district engineer, with notice of the abandonment, and the owner shall immediately remove the structure at his own expense, including all piling, stakes, etc., to the satisfaction of the aforesaid district engineer. Failure to so remove the same shall be considered good ground for prosecution of the permittee or owner for maintaining an illegal structure endangering navigation, as set forth in sections 10 and 12 of the river and harbor act of March 3, 1899: *Provided*, That if the use of said structure is suspended temporarily it may be maintained in whole or in part if the license number is conspicuously displayed and the trap is properly lighted or otherwise marked, as may be necessary to prevent unreasonable obstruction to navigation. Any fish weir, trap, or pound allowed to go into a condition of disrepair so that it can not be readily seen, or on which the license number is not conspicuously displayed, will be regarded as abandoned, and if not promptly removed or marked as above provided will subject the permittee or owner to prosecution, and any trap not in use on which the license number is not displayed will be subject to removal by the United States at any time.

7. That if future operations by the United States require an alteration in the position of the weir, trap, or pound, or if the latter, in the opinion of the Secretary of War, shall cause unreasonable obstructions to the free navigation of the said waters, the permittee will be required, upon due notice from the Secretary of War, and within 30 days thereafter, to remove or alter the weir, trap, or pound, or obstruction caused thereby, without expense to the United States, so as to render navigation reasonably free, easy, and unobstructed. No claim shall be made against the United States on account of such removals or alterations.

8. That fishing structures and appliances in navigable waters of the United States shall be lighted for the safety of navigation, as follows:

"The lights shall be displayed between sunset and sunrise. They shall be placed at each end of the structure, excepting where the inner end terminates in such situation that there is no practicable navigation between it and the high-water line of the adjacent coast, in which case no inner light shall be displayed. The outer light shall be white and the inner light shall be red. The size, capacity, and manner of maintenance of the lights shall be such as may be specified in the War Department permit authorizing the erection of the structure or appliance.

"When several structures or appliances are placed on one line with no navigable passage between them they will be considered, for lighting purposes, as one structure."¹

9. That there shall be installed and maintained on the weir, trap, or pound, by and at the expense of the permittee, such additional lights and signals as may be prescribed by Bureau of Lighthouses, Department of Commerce, and that provision shall be made by watchman or otherwise for proper attendance of lights and signals; so that they will at all times be in effective condition.

10. That this authority is revocable at will by the Secretary of War, and unless otherwise specified in the permit, or unless previously revoked under paragraph 7 above, shall cease and be null and void. (Date to be specified by the district engineer, not more than five years after date of issuance of permit.)

Recommended:

LANSING H. BEACH,
Major General, Chief of Engineers.

Approved:

W. R. WILLIAMS,
Assistant Secretary of War.

ALASKA FISHERY INTELLIGENCE SERVICE.

Through the cooperation of the Alaska Military Telegraph & Cable System, information was sent to and posted at frequent intervals in the telegraph offices at Wrangell, Petersburg, Craig, Sitka, Juneau, Cordova, and Seward, reporting the price of fresh halibut, sablefish, and red rockfish at Ketchikan. At less frequent intervals the price of pickled salmon and herring was also reported. In like manner the Seattle price for the same fresh and pickled fish was reported to those towns and to Ketchikan. This service is understood to have been of real value to the fishermen in enabling them to take advantage of the best market for their products, and it was continued for their benefit.

INSPECTION OF CANNERIES.

Canneries in Alaska are subject at all times to inspection by employees of the Alaska service of the bureau, but this inspection is limited chiefly to an examination of the fish with reference to the time they have been dead. The inspection also includes the wanton waste of food fish in Alaska, whether at the fishery establishments or on the fishing grounds.

There is also a cannery inspection service authorized by the National Cannery Association but supported largely if not entirely by the packing companies operating canneries in Alaska or by as many of them as contribute to the maintenance of the service. The plants of companies which do not contribute are not inspected by employees of that service. This work is somewhat in its infancy, having been started rather experimentally two years ago chiefly, it is understood, to reduce the fire risk at the canneries, to further provide for satisfactory sanitation at the plants, and to promote the general welfare and comfort of employees. The work of this service is no doubt well worth while, although it has no mandatory authority to prevent the

¹ Regulations of Department of Commerce, approved June 19, 1913.

canning of fish which in the judgment of its employees should not be canned. The superintendent of the plant is ordinarily the responsible head of affairs, with absolute control of operations, and is thus not definitely bound by the actions, recommendations, or suggestions of the inspectors.

In 1920 this private inspection service was competently conducted under the supervision of Dr. E. D. Clark, of Seattle, who for many years was identified with the U. S. Bureau of Chemistry. Its personnel was made up chiefly of students from the Fisheries College at the University of Washington. The Government has no direct connection with the inspection service thus maintained under the auspices of the National Cannery Association but approves of its general purposes and objects.

VIOLATIONS OF FISHERIES LAWS AND REGULATIONS.

Fishery work before the courts of Alaska in 1920 involved prosecutions for failure to close the tunnels and open the heart walls of traps during the weekly close season, fishing in streams and lakes closed to commercial operations, fishing within 500 yards of the mouths of salmon streams, disregard of the lateral distance interval between fixed appliances, and the wanton waste of salmon. It also covered the completion of prosecutions begun in 1919. In most cases the penalties imposed were fines, though in one case the sentence was imprisonment for one month. Fines aggregated \$6,480.95, of which amount \$101 was imposed in central Alaska, \$158.80 in western Alaska, and \$6,263.15 in the southeastern district. Costs of prosecutions, which ordinarily follow the judgments, are included in these amounts, as far as they were reported, but the record is incomplete as in several instances the costs had not been computed at the time reports were made. The total amount of penalties would therefore be increased somewhat by including these costs.

On September 13, 1919, William Strong was indicted at Juneau as an alien, having engaged in fishing in Taku River August 3, 1919. The case came to trial on March 4, 1920, at which time Strong pleaded guilty and was fined \$100.

The Alaska Pacific Fisheries was indicted in 1919 for not opening the heart walls of two traps on Sunday, August 3, 1919, and tried at Ketchikan. The jury failed to agree on a verdict. On April 28, 1920, the case was again tried in the district court at Ketchikan and resulted in an acquittal of the company.

On July 17 the Alaska Pacific Fisheries was accused in a complaint filed before the United States commissioner at Juneau of failing to close the tunnel of its trap at Neck Point, Chichagof Island, during the weekly close period on July 11. The case was tried on August 6, but the jury did not agree on a verdict. Subsequently the case was dismissed on motion of the United States attorney.

The case against the Ward's Cove Packing Co., indicted in the fall of 1919 for fishing with two traps on Sunday, August 3, 1919, was called for trial at Ketchikan, April 26, 1920. The company pleaded guilty and was fined \$200 and costs.

On November 23, 1920, the Ward's Cove Packing Co. was indicted at Ketchikan for illegally fishing with a trap in Clarence Strait 4

miles north of Dall Head on August 2. The case was continued to the March, 1921, term of court.

At the April term of court in Ketchikan, Gus Starkloff, who was indicted the previous fall for unlawful fishing in Staney Creek, Prince of Wales Island, September 22, 1919, was arraigned, pleaded guilty, and paid a fine of \$50.

At the same term of court Jack Peratovich and five other natives were arraigned under an indictment accusing them of fishing with a seine in Staney Creek in 1919 contrary to law. They pleaded guilty and were each fined \$50.

In October, 1919, T. Kato, a Japanese, was indicted as an alien for fishing with a gill net in the waters of southeastern Alaska on June 5, 1919. The case was called for trial at Ketchikan on April 30 and resulted in an instructed verdict for the defendant, it having been testified that he was not fishing, but was merely demonstrating the use of a gill net.

Jenkins & Jenkins were indicted in 1919 at Ketchikan for having driven a trap within a lateral distance of 600 yards of a floating trap then in operation. The case was tried in Ketchikan in April, 1920, resulting in an acquittal of the defendants on the ground that the floating trap was movable, and that therefore only the lateral distance interval of 100 yards was applicable in this instance.

At the September, 1919, term of the district court held at Juneau, Tony Flagas was indicted for fishing in Berners Bay during the close season on September 15, 1919. Counsel for the defendant demurred to the indictment for the reason that it did not state that Flagas was fishing for salmon. The demurrer was sustained, and the violation is therefore in the status of having been unreported.

On Sunday, May 23, Paul Rappas was found fishing with a gill net in Shoemaker Bay. On May 24 a complaint was filed against Rappas before the United States commissioner at Wrangell, whereupon he pleaded guilty and was fined \$120 and costs of \$8.

On September 15, 1919, Pete Knutsen and Ole Knutsen were indicted on two counts for (a) fishing in Petersburg Creek with a gill net covering more than one-third the width of the stream and (b) fishing with a gill net extending across more than one-third the width of the water of the estuary at Petersburg Creek. They were tried at Ketchikan on November 8, 1919, and convicted on the second count. On November 15 motion for a new trial was made. It was denied on November 13, 1920, and a fine of \$250 and costs was imposed. Notice of an appeal was then given but was not completed, and the fine and costs of \$56.65 were paid later.

The case against the Hidden Inlet Canning Co., indicted in the fall of 1919 for constructing in Peril Strait, near False Island, a fish trap within 500 yards of the mouth of a salmon stream, was tried at Juneau October 11, 1920, and resulted in an acquittal of the company, there being no satisfactory evidence presented to the jury that the stream was used by salmon.

In September two indictments were returned against the Hidden Inlet Canning Co. The first covered two counts and accused the company of not closing the tunnels of two traps on Sunday, July 18. Both traps were located on Chichagof Island, one being one-fourth of a mile south of White Rock and the other 2 miles north of Basket Bay. A plea of guilty on each count was entered when the case was called for trial in October, and a fine of \$50 for each offense

was imposed. The second indictment alleged that the company had not closed on Sunday, July 25, the tunnel of a trap located on Chichagof Island $3\frac{1}{2}$ miles south of South Passage Point. Upon being arraigned the company pleaded guilty and was fined \$100. This violation was originally reported in a complaint filed before the United States commissioner at Juneau on August 31, but it was subsequently reported to the grand jury upon dismissal of the complaint.

On September 13 complaint was made before the United States commissioner at Juneau against Libby, McNeill & Libby charging it with failure to close the tunnel of its Douglas Island trap, near Shoal Point, during the weekly close season on September 5. Arraignment was made immediately upon issuance of the complaint. The company pleaded guilty and was fined \$100 and costs of \$2.85. Complaint was also made against Paul Benson and John Smith, watchmen at the trap. Both men pleaded guilty and paid a fine of \$25 each and costs of \$2.85.

In November, F. Lloyd was indicted at Ketchikan for illegally operating a floating trap near Harry Bay, during the weekly close period on July 31, by not opening the heart walls and not closing the tunnel. On December 9 the case was called and a plea of guilty was entered. The defendant was fined \$50 and paid costs of \$90.65.

On August 2, a trap on the west shore of Gravina Island, 3 miles north of Dall Head, belonging to Rounsefell & Co., was found in full fishing order. Report was made to the grand jury at Ketchikan, and, on November 23, a true bill was returned. The case was called for trial in December and the company pleaded guilty. A fine of \$100 and costs of \$21.05 were imposed.

On Sunday, August 1, a trap of the Jensen Fish Co. located in Nichols Passage near Blanks Inlet was found with heart walls closed and tunnel only partly closed. These facts were presented to the grand jury in Ketchikan on November 23 and an indictment resulted. The company pleaded guilty on December 8, and was fined \$100 and costs of \$45.

On July 7 complaint was filed before the United States commissioner at Juneau, charging that the Marathon Fishing & Packing Co. had not closed on Sunday, July 4, the tunnel of a trap operated by it on Admiralty Island, $1\frac{1}{2}$ miles south of Gambier Bay. The case was called for trial on August 19, when the defendant pleaded guilty and paid a fine of \$200.

On July 7 the Petersburg Packing Corporation was accused in a complaint filed at Juneau before the United States commissioner of not closing, on July 4, the tunnel of its pile trap located on the south shore of Admiralty Island, one-half mile northeasterly from Deep-water point. Similar complaints were made against A. J. Young and Jesse Fowler, watchmen at the trap. The cases were called for trial on August 2. The company pleaded guilty and was fined \$200 and costs of \$5. The complaints against the watchmen were dismissed for the reason that they claimed it was impossible for them to close the tunnel.

On July 7 complaint was filed before the United States commissioner at Juneau, charging the Petersburg Packing Corporation with failure to close on Sunday, July 4, the tunnel of a floating trap

located 1 mile southeast of Point Brightman, Admiralty Island. The case was dismissed on motion of the United States attorney.

On July 7 complaint was filed before the United States commissioner at Juneau alleging that the Washington Bay Packing Co. had not closed the tunnel of a trap on the southeast shore of Admiralty Island, one-half mile southeast of Point Brightman, supposedly owned and operated by that company, on Sunday, July 4, though at that time the trap bore no name, number, or other means of identification. The complaint was subsequently withdrawn, as the company disclaimed ownership of the trap. However, on July 23, when the trap was again inspected, it carried the name of the Washington Bay Packing Co. In view of that fact, the matter was presented, on September 17, to the grand jury at Juneau, and an indictment resulted. The case was tried October 28, and the company was acquitted.

On September 17 the Washington Bay Packing Co. was also indicted for not having closed on Sunday, July 4, the tunnel of its trap located on the south shore of Admiralty Island, 2½ miles northeast of Woewoodsy Harbor. When the case was called for trial in October, the company pleaded guilty and was fined \$100 and costs.

On July 7 the Southern Alaska Canning Co. was accused in a complaint filed before the United States commissioner at Juneau of not closing on Sunday, July 4, the tunnels of two of its floating traps, one of which was located at Point Napean and the other at Point Wilson, on the south and west shores, respectively, of Admiralty Island. Trial was had July 20, when a plea of guilty was entered. A fine of \$400 and costs of \$8.60 were paid. A similar complaint was made against Lenard Ekholm, watchman at the Point Wilson trap, but it was dismissed on condition that he should not again violate the law by leaving the tunnel open during the remainder of the close seasons of the year.

On August 31 the Southern Alaska Canning Co. was further accused in a complaint filed before the United States commissioner at Juneau of having failed to provide during the weekly close season beginning July 24 an opening for the free passage of salmon and other fish through the heart of its trap located 1 mile north of Point Gardiner, Admiralty Island. The peculiarity of this case was that the company technically complied with the law by opening the heart walls, but it had, in fact, obstructed the passage of fish through the opening thus made by extending a jigger from the heart to the pot, thus, in effect, circumventing the law. Prosecution was vigorously contested, but a conviction resulted, whereupon the company was fined \$350.

On July 7 the Sanborn-Cutting Co. was accused in a complaint filed before the United States commissioner at Juneau of having violated the law in two instances, Sunday, July 4, in not closing the tunnels of two of its floating traps, located, respectively, in Herring Bay, Admiralty Island, and Frederick Sound north of Carroll Island. The case was called for trial July 17, at which time the company pleaded guilty and paid a fine of \$250 and costs of \$8.70. D. Simmons, watchman at the Herring Bay trap, against whom a complaint was also made, pleaded guilty and was fined \$100 and costs of \$35.30. There was no watchman at the other trap.

On July 7 the Fidalgo Island Packing Co. was accused in a complaint filed at Juneau before the United States commissioner of not closing on Sunday, July 4, the tunnel of a trap on the southern shore of Admiralty Island. Upon being arraigned July 26 the company pleaded guilty and paid a fine of \$150 and costs of \$8.

On August 31 the Fidalgo Island Packing Co. was further accused in a complaint filed before the United States commissioner at Juneau of not closing the tunnels of two traps on the southern shore of Admiralty Island during the weekly close season July 24. The traps were located one-third and $1\frac{1}{4}$ miles, respectively, northeast of Murder Cove. The company pleaded guilty to both offenses on September 9 and paid a fine of \$200 and costs of \$3.85.

On July 17 a complaint was filed before the United States commissioner at Juneau accusing the Booth Fisheries Co. of not closing the tunnel of two of its traps on Sunday, July 11. Both traps were located on the northern shore of Chichagof Island, one near Point Augusta and the other seven-eighths of a mile southeasterly from Pulizzi Island. The case was tried August 6 and resulted in an acquittal of the company. A complaint was also filed against Carl Edensword and Karl Christensen, watchmen at the Point Augusta trap, similarly charging them, but they were likewise acquitted. There was no watchman at the other trap.

On July 17 the Deep Sea Salmon Co. was accused in a complaint filed before the United States commissioner at Juneau of not closing the tunnels of two of its traps on Sunday, July 11. Both traps were located on the northern shore of Chichagof Island, one near White-stone Harbor and the other near Spasskaia Bay. When the case came up for trial July 19 the company pleaded guilty and was fined \$100 and costs of \$4.20. Complaint was also made against Theodore Thorsen, watchman at one trap. Upon being arraigned, he pleaded guilty and was fined \$100 and costs of \$5. No watchman was found at the other trap.

On August 31 the Wilson Fisheries Co. was accused in a complaint filed before the United States commissioner at Juneau of two violations of the law in that two of its traps were not closed on Sunday, July 25. The traps were located at or near Wilson Cove, Admiralty Island. The case was called on September 14 but was dismissed on motion of the United States attorney, as the Government had but one witness.

A complaint filed before the United States commissioner at Juneau on August 31 accused the Standard Salmon Packers (Inc.) of failing to close on Sunday, July 25, the tunnel of its trap in Tenakee Inlet, 4 miles west of South Passage Point. Upon being brought to trial September 3 the company pleaded guilty and paid a fine of \$50 and costs of \$3.85.

On August 27 the Auk Bay Salmon Canning Co. and Charles Smith, owner and watchman, respectively, were accused in a complaint filed before the United States commissioner at Juneau of not closing the tunnel of the company's trap at Outer Point, Douglas Island, during the weekly close season on August 7. The case was called for trial on August 28, when both defendants pleaded guilty. The company was fined \$100 and costs of \$2.85, and the watchman \$25 and costs of \$2.85.

On July 17 P. E. Harris & Co. was accused in a complaint filed before the United States commissioner at Juneau of five violations of the law on Sunday, July 11, in that the tunnels of five of its traps on the western shore of Mansfield Peninsula were not closed. The trial was held on August 6 and resulted in a conviction on one count and disagreement on the other four. The company was fined \$500, upon payment of which the four other counts were dismissed.

On August 31 P. E. Harris & Co. was accused in a complaint filed before the United States commissioner at Juneau of not closing on Sundays, August 1 and 8, the tunnel of one of its floating traps on the western shore of Mansfield Peninsula. The case was tried on September 3 and resulted in a conviction and fine of \$350 and costs. An appeal was taken. A complaint was also made against D. A. Demick, trap watchman, but it was dismissed. Subsequently the same information was laid before the grand jury and an indictment returned. These cases were consolidated and tried before the district court on November 5 and 6, and a conviction again secured. Motion for a new trial being denied, the court imposed a fine of \$350 and costs against the company and a fine of \$50 and costs against Demick.

P. E. Harris & Co. and Jack Carlson, owner and watchman, respectively, of a trap located $3\frac{1}{2}$ miles north of Hawk Inlet on the western shore of Mansfield Peninsula, were indicted separately by the grand jury at Juneau in September for not closing the tunnel of the trap on Sunday, August 1. The original action in respect to this violation was the filing of a complaint against the company and watchman before the commissioner at Juneau, but on motion of the United States attorney the complaints were dismissed and the matter presented to the grand jury, thus avoiding retrial in event of a conviction in the lower court and appeal to the district court. The company was tried on November 3 and 4 and acquitted. The bench warrant for Jack Carlson was returned unserved, he having left Alaska before the date of his indictment.

In September P. E. Harris & Co. was indicted for not closing on Sunday, August 8, the tunnel of its pile trap located $2\frac{1}{4}$ miles south of Hawk Inlet, Admiralty Island. This case was first taken before the United States commissioner at Juneau on a complaint filed August 31, but that action was dismissed on September 11.

At the same term of court another indictment was returned against P. E. Harris & Co., alleging that this same trap did not have its tunnel closed on Monday, August 9, during the close season on that day. The indictment contained a further count which alleged that the tunnel of a floating trap owned by this company and located one-half mile north of Hawk Inlet was not closed during the same close season. As in similar cases, complaints were first filed before the commissioner at Juneau alleging the commission of offenses as above indicated, but they were dismissed in order that the facts could be presented to the grand jury with the result as noted.

On August 31 two complaints were filed before the commissioner at Juneau accusing P. E. Harris & Co. of not closing on Sundays, August 15 and 22, the tunnel of a pile trap located $2\frac{1}{4}$ miles south of Hawk Inlet. These complaints were dismissed, and the information they contained was laid before the grand jury with the result that a

true bill was returned. These three cases were tried on November 1, 3, and 4, and an acquittal secured in each one.

On August 16 Ben Fox and Bert Dennis, natives, were charged in a complaint filed before the United States commissioner at Haines with having on that day fished with a gill net in Chilkoot River. They pleaded guilty and were each fined \$5.

On August 31 C. H. Gallagher was accused in a complaint filed before the United States commissioner at Juneau with not closing on Sundays, August 15 and 22, the tunnel of his trap located on the northern end of Chichagof Island between Hoonah Island and Flynn Cove. The case was called for trial September 7. Gallagher pleaded guilty and was fined \$25 and costs amounting to \$41.85.

On August 23 the Beegle Packing Co. was accused in a complaint filed before the United States commissioner at Ketchikan of fishing with a floating trap on the southern shore of Revillagigedo Island west of Coho Cove during the weekly close season of August 22. The company pleaded guilty when the case was called for trial and paid a fine of \$100.

On August 27 the Alaska Sanitary Packing Co. was charged in a complaint filed before the United States commissioner at Wrangell with having failed to open during the close season on August 7 the heart walls of two traps located on Prince of Wales Island 4 miles north of Point Baker. The company claimed extenuating circumstances in defense, but pleaded guilty and paid a fine of \$25 for each trap and total costs of \$9.20.

Charles Norberg was accused in a complaint filed before the United States commissioner at Petersburg on August 30 of fishing with a purse seine within the prohibited distance of the mouth of Blind River, Mitkof Island, on August 3. He pleaded guilty and was fined \$30 and costs.

By a complaint filed before the United States commissioner at Petersburg on August 30 Jack Hollingstad was also accused of fishing with a purse seine within the closed area at the mouth of Blind River on August 7. Upon arraignment he pleaded guilty and paid a fine of \$40 and costs.

In September Chester Worthington, a native of Wrangell, was accused by the grand jury at Juneau of illegal fishing August 24 in a salmon stream of Port Houghton. The case was tried at Juneau, October 15, and resulted in a conviction. On October 19 Worthington was sentenced to serve one month in the Federal jail at Juneau.

The Pacific American Fisheries was indicted in September for not closing on August 14 the tunnel of one of its pile traps located on the southern shore of Pleasant Island. The case was called at Juneau on October 22, and the trial ended in a conviction of the company. Motion for a new trial being made and denied, the company, on November 13, was fined \$300 and costs of \$42. Notice of an appeal was entered, but upon the expiration of the period in which a bill of exception might be filed the company paid the fine, thus closing the case.

On August 7 Jack David and Patty Gonate, natives, were caught fishing with gill nets in Chilkoot Lake. They were so accused in a complaint filed that day before the United States commissioner at Haines. Both men pleaded guilty, and each paid a fine of \$20 and costs of \$16.

On November 23 complaint was filed in the United States commissioner's court at Ketchikan accusing the Fresh Fish Co. of fishing during the weekly close season on August 1 with a trap located on the eastern shore of Prince of Wales Island, $3\frac{1}{2}$ miles north of Cape Chacon. The company pleaded guilty and paid a fine of \$50 and costs of \$5.50.

The Starr-Collinson Packing Co. was indicted at the November term of court in Ketchikan for not opening the heart walls of its trap No. 748, Prince of Wales Island, during the weekly close season on August 1. The case has not been tried.

On July 21 a complaint was filed before the United States commissioner at Latouche accusing the Copper River Packing Co. and Kentuck Graves and Edward Hammer, two of its fishermen, of setting a gill net in Eshamy Lagoon on July 15 a distance of 192 feet from a net of the Kenai Packing Co. Upon trial, pleas of guilty were entered and a fine of \$25 and cost was imposed.

A second complaint was filed on July 21 in the same court, charging the Copper River Packing Co., Kentuck Graves, and Edward Hammer with setting another gill net a distance of 182 feet from the net of the Kenai Packing Co. Graves assumed responsibility and pleaded guilty when the case was called for trial. He was fined \$25 and costs.

On July 1 a complaint was filed before the United States commissioner at Valdez, charging the Copper River Packing Co. with having set a trap within 500 yards of the mouth of a salmon stream on Chenega Island. The trial of the case began August 10 and continued until noon August 12. The defendant company was acquitted, the court holding that the mouth of the stream was above the lagoon, a distance of more than 500 yards, and, further, that the stream was not one in which salmon could spawn or would be chosen by salmon for spawning.

On July 21 a complaint was filed before the United States commissioner at Latouche, accusing the Copper River Packing Co., Kentuck Graves, and Edward Hammer of setting a net on July 15 within 500 yards of the mouth of a red salmon stream emptying into Eshamy Lagoon. When the case came up for trial, July 24, the defendants produced as witness a surveyor who disputed the measurements made by a witness for the Government. The case was finally dropped on condition that the company vacate the site, which it did.

On July 21 complaint was filed before the United States commissioner at Latouche charging that A. Gustofson and J. S. Groll had fished with two traps at the entrance of Eshamy Lagoon on Sunday, July 18. Gustofson assumed responsibility, pleaded guilty, and was fined \$1 and costs for each offense.

On July 21 the King Salmon Fisheries Co. was accused in a complaint filed before the commissioner at Latouche of having set on July 14 two nets within 500 yards of the mouth of Miners River, a red salmon stream tributary to Unakwik Inlet, Prince William Sound. J. S. Groll, superintendent for the company, H. L. Neilson and W. St. Clair, fishermen, appeared as defendants in the case. Pleas of guilty were entered, and a fine of \$25 and costs was imposed in each case.

During the weekly close season on Saturday, July 10, a trap at Knowles Head belonging to the Moore Packing Co. was found to

be fishing. Complaint was entered before the United States commissioner at Cordova, and the case tried on August 6. The company was acquitted.

The Carlisle Packing Co. was accused in a complaint filed before the commissioner at Cordova of fishing with a trap at Porcupine Point during the weekly close season on Saturday, July 10. The case was tried August 6 at Cordova, but the jury failed to agree on a verdict. On motion of the assistant United States attorney the case was dismissed.

At the October term of the district court at Valdez the grand jury indicted the Kenai Packing Co. and the Copper River Packing Co. for the wanton waste of salmon. The Copper River Packing Co. was also indicted for not opening the heart walls of its trap in Prince of Wales Passage during the weekly close season on August 15. The cases will not be tried until 1921.

On July 27 the Bristol Bay Packing Co. was accused in a complaint made in the United States commissioner's court at Koggiung of fishing on July 5 with a gill net in Naknek River, contrary to the closing order of December 18, 1920. A plea of guilty was entered and a fine of \$38.60, being the costs of the prosecution, was imposed.

On July 28 another complaint, charging that two boats belonging to the Bristol Bay Packing Co. and the Red Salmon Canning Co. were fishing in Naknek River on the night of July 12, was entered before the commissioner at Koggiung. The accused pleaded guilty and were fined the costs of the prosecution, amounting to \$66.60.

On July 29 a complaint filed before the commissioner at Koggiung alleged that the Alaska Packers Association had fished with a drift gill net in Naknek River on July 5. When the case was called a plea of guilty was entered, and a fine of \$10 and costs of \$43.60 was imposed.

The Circuit Court of Appeals of the Ninth Circuit, sitting at San Francisco, affirmed the sentence and judgment imposed on the Canoe Pass Packing Co. and the Northwestern Fisheries Co., jointly indicted in October, 1918, and convicted in the district court at Valdez in October, 1919. These companies were indicted on four violations of the regulations affecting fishing in Copper River by having set four nets in Miles Lake, which is a part of the river, within the prohibited distance of other nets previously set. The trial court imposed a fine of \$1,000 and costs against each company, or \$250 for each count in the indictment.

TERRITORIAL TAX LAW UPHELD.

In October, 1919, an action was brought in the Supreme Court of the United States on writ of error from a judgment of the District Court for the District of Alaska, Division Number One, dismissing the suit of the Alaska Fish Salting & By-Products Co., plaintiff in error, against Walstein G. Smith, treasurer of Alaska, defendant in error, to recover money paid as taxes by the plaintiff to the defendant for the tax years 1917 and 1918 under chapter 74, Alaska Session Laws, 1917, enacted by the Alaska Territorial Legislature.

There were originally two suits. The first one was brought in 1918 to recover the 1917 tax of \$2 per barrel on 4,112 barrels of fish

oil, amounting to \$8,224, and the tax of \$2 per ton on 1,037 tons of fish meal, amounting to \$2,074, making a total tax of \$10,298, for which judgment was asked, together with interest thereon at 8 per cent per annum from January 14, 1918. The second suit, for 1918 taxes, was filed on February 17, 1919, to recover the tax of \$2 per barrel on 2,720 barrels of fish oil, amounting to \$5,440, and the tax of \$2 per ton on 645 tons of fish meal, amounting to \$1,290, making a total tax of \$6,730, for which judgment was asked, together with interest thereon at 8 per cent per annum from January 15, 1919.

Eight assignments of error were presented and based on the action of the trial court in sustaining demurrers, dismissing the complaints, denying plaintiff's motion for judgment, and rendering judgment against the plaintiff, and thus upholding the constitutionality and validity of the act of the Territorial Legislature and the taxes imposed thereby. The plaintiff company, through its attorney, filed a brief before the United States Supreme Court on December 2, 1920, setting forth at length the contention that the legislation imposing the tax, to avoid which this litigation was had, contravened and violated the Constitution of the United States, particularly the fifth and fourteenth amendments, in that the plaintiff was denied the equal protection of the law and was deprived of its liberty and property without the process of law; that the legislative classification of plaintiff's business was so arbitrary and unreasonable as to constitute class legislation, and that the tax was confiscatory and prohibitive, and that it was not laid on other businesses or industries which were essentially the same as plaintiff's business; that the legislation was a clear abuse of the Territory's legislative authority, and that it accomplished, by means of an intentionally arbitrary and confiscatory exaction imposed under the guise of a tax, the unauthorized destruction and confiscation of a lawful pursuit; that the legislation was a clear, arbitrary discrimination against the manufacture of fish oil and fish meal from herring in whole or in part, although there was no reasonable distinction between that business and other businesses in all essentials similar thereto carried on in Alaska upon which no tax whatsoever was laid; that the legislation, if deemed to be a police regulation, was unreasonable and unauthorized, as Congress had expressly reserved police supervision and control of the fisheries to itself; that the legislation was extortionate, unfair, and prohibitive, and so confiscatory as to result in a tax of 113.64 per cent of the net profits for one year; and that the legislation and the taxes imposed thereby violated the Alaska Organic Act in that they were not uniform on all occupations or businesses, nor were they uniform on all businesses of the same class; that the tax exceeded 1 per cent of the actual value of plaintiff's property, and that it was not levied or assessed on the actual value of the property, but was purely an arbitrary imposition in utter violation of the constitutional limitations of the Alaska Organic Act.

On January 31, 1921, the Supreme Court handed down a decision affirming the judgment of the trial court. In view of its interest to the fishery industry of Alaska the opinion is here quoted in full, as follows:

This is an action to recover the amount of taxes levied under statutes of Alaska which the plaintiff alleges to be contrary to the act of Congress of August 24,

1912, c. 387, § 3, 37 Stat. 512, creating a legislative assembly in the Territory of Alaska, and to the Constitution of the United States. Judgment was given for the defendant upon demurrer to the complaint, the parties agreeing that the foregoing grounds of recovery were the only matters in dispute. The statutes attacked, viz: May 1, 1913, April 29, 1915, and May 3, 1917, levy license taxes of two dollars a barrel and two dollars a ton respectively, upon persons manufacturing fish oil, fertilizer and fish meal in whole or in part from herring. The Act of Congress after giving effect to the Constitution and laws of the United States in the Territory provides that the authority therein granted to the legislature "to alter, amend, modify, and repeal laws in force in Alaska shall not extend to the * * * fish * * * laws * * * of the United States applicable to Alaska, or to the laws of the United States providing for taxes on business and trade * * * Provided further, that this provision shall not operate to prevent the legislature from imposing other and additional taxes or licenses." Some reliance is placed also upon § 9 that all taxes shall be uniform upon the same class of subjects, &c., and that no tax shall be levied for territorial purposes in excess of one per centum upon the assessed valuation of property therein in any one year.

The complainant alleges that the tax will prohibit and confiscate the plaintiff's business, which is that of manufacturing fish oil, fertilizer, fish meal and by-products from herring either in whole or in part; that the tax unreasonably discriminates against the plaintiff, as it levies no tax upon the producers of fish oil, &c., from other fish, and is otherwise extortionate; and that it contravenes the Act of Congress in lack of uniformity and in exceeding one per centum of the actual value of the plaintiff's property. The prophecies of destruction and the allegations of discrimination as compared with similar manufactures from salmon are denied by the Attorney General for Alaska, the latter denial being based upon a comparison of the statutes which of course is open. We are content however to assume for the purposes of decision that, not to speak of other licenses, the questioned Acts do bear more heavily upon the use of herring for oil and fertilizer than they do upon the use of other fish. But there is nothing in the Constitution to hinder that. If Alaska deems it for its welfare to discourage the destruction of herring for manure and to preserve them for food for man or for salmon, and to that end imposes a greater tax upon that part of the plaintiff's industry than upon similar use of other fish or of the offal of salmon, it hardly can be said to be contravening a Constitution that has known protective tariffs for a hundred years. *Rast v. Van Deman & Lewis Co.*, 240 U. S. 342, 357. Even if the tax should destroy a business it would not be made invalid or require compensation upon that ground alone. Those who enter upon a business take that risk. *McCray v. United States*, 195 U. S. 27. See *Quong Wing v. Kirkendall*, 223 U. S. 59; *Mugler v. Kansas*, 123 U. S. 623; *Louisville & Nashville R. R. Co. v. Mottley*, 219 U. S. 467, 482. We need not consider whether abuses of the power might go to such a point as to transcend it, for we have not such a case before us. The Acts must be judged by their contents not by the allegations as to their purpose in the complaint. We know of no objection to exacting a discouraging rate as the alternative to giving up a business, when the legislature has the full power of taxation. The case is different from those where the power to tax is limited to inspection fees and the like, as in *Postal Telegraph & Cable Co. v. Taylor*, 192 U. S. 64, 72.

But it is said that however it may be with regard to the Constitution taken by itself, the statutes brought into question are contrary to the Act of Congress from which the local legislature derives its power. In the first place they are said to be an attempt to modify or repeal the fish laws of the United States. The Act of Congress of June 6, 1900, c. 786, § 29; 31 Stat. 321, 331; Alaska Compiled Laws, § 2569; imposes a tax on fish oil works of ten cents per barrel and on fertilizer works of twenty cents per ton, repeated in slightly different words by the Act of June 26, 1906, c. 3547; 34 Stat. 478; Alaska Compiled Laws, § 259. But these are not fish laws as we understand the phrase. It is argued, however, that at least they import a license, *License Tax Cases*, 5 Wall. 462, 470, and that a tax alleged to be prohibitory flies in their teeth. It would be going far to say that a tax on fish oil works in general terms imported a license to a specific kind of works deemed undesirable by the local powers, and when we take into account the express and unlimited authority to impose additional taxes and licenses we are satisfied that the objection should not prevail. We confine our decision to the statutes before us, repeating in this connection that

they must be judged by their contents not by the characterization of them in the complaint.

The requirement of uniformity in § 9 is disposed of by what we have said of the classification when considered with reference to the Constitution. The legislature was warranted in treating the making of oil and fertilizer from herring as a different class of subjects from the making of the same from salmon offal. The provisions against taxing in excess of one per centum of the assessed valuation of property does not apply to a license tax like this. This is not a property tax, *Alaska Pacific Fisheries v. Territory of Alaska*, 236 Fed. Rep. 52, 61. The objection that the plaintiff in error is doubly taxed, first by the United States and then by the Territory, is answered by the express authority to levy additional taxes to which we have referred heretofore. Without going into more detail we are of opinion that the tax must be sustained.

ROBBERY OF FISH TRAPS.

The fishing season of 1920 was marked by a renewal in southeast Alaska of the piratical operations of 1919, which caused the packers considerable loss of salmon. The regions chiefly affected were the Cape Fox district, Craig and vicinity, Icy Strait, and the northern part of Chatham Strait. The first robberies were reported in June, and from that time until the middle of August depredations occurred at short intervals. Calls for assistance in putting down the disorder were made to officials of the district court and to the governor of Alaska, who was instrumental in securing the presence in Alaskan waters of certain vessels of the Navy, supposedly for the better enforcement of all laws and especially the suppression of this particular form of lawlessness.

Subchaser *No. 294* was almost constantly engaged in patrolling the southern districts while subchaser *No. 310* made infrequent cruises into the northern localities. But with all these activities the unlawful taking of salmon was not stopped thereby. In September information was presented by one packing company to the grand jury at Juneau which indicted four men who had operated in the Icy and Chatham Straits region, but when the case came on for trial it was dismissed against three of them for lack of sufficient evidence while the other one was tried and acquitted.

Investigation has shown that much of this so-called piracy was the purchase of salmon from dishonest trap watchmen. Negotiations were unsuccessful when they were undertaken with faithful, upright watchmen. In some instances salmon were taken from unwatched traps, but the number so secured must have been small, as all traps making even fair catches of salmon were watched by one or more men.

Of further interest in this connection is the fact that salmon were taken chiefly from floating traps, owing to the ease with which fish could be removed from such apparatus, there being no material change of conditions at any stage of the tide. With but occasional exceptions, it is improbable that more than a few hundred salmon were taken or purchased at any one time, for the boats engaged in the business were small and manned by very few men. Most reports of large losses of salmon from this cause must be regarded as exaggerated, for in view of the scarcity of salmon many traps making even moderate catches were carefully guarded by reliable employees, who in some instances are said to have easily frightened away would-be thieves by the discharge of firearms.

In the last analysis, the suppression of this business appears to be almost wholly in the hands of the cannerymen and the operators of traps themselves. It seems reasonable to conclude that refusal to purchase salmon from suspicious sources and the employment of honest watchmen will make it unprofitable and cause the entire cessation of the reprehensible practice.

TERRITORIAL FISH COMMISSION.

The Alaska Territorial Fish Commission was created by the legislature at its session early in 1919, and at the same time the sum of \$80,000 was appropriated for its work during the ensuing biennium. The efforts of the commission have been devoted chiefly to fish-cultural work, the removal of natural barriers in salmon streams, and the destruction of predatory trout. The commission has issued two printed reports covering its activities during each of the two years ending March 31. According to the report for the biennium ending March 31, 1921, there was expended in the first year \$27,901.24, and in the second year \$40,143.66, thus leaving an unexpended balance of \$11,955.10. Of the \$27,901.24 expended in the first year, \$12,072.08 was spent for fish-cultural work, \$6,373.98 for stream improvement, and the balance for general expenses, permanent improvements, etc. Of the \$40,143.66 spent in the second half of the biennium, \$16,573.71 was chargeable to propagation and \$19,695.90 to stream improvement and the destruction of predatory fish, the balance going for general expenses.

According to the reports of the commission, stream improvement work in 1919 was accomplished as follows: Juneau district, seven streams; Ketchikan district, eight; Cordova district, three; and Seward district, three. In 1920 this work was upon a more extensive scale, being reported as follows: Juneau district, seven streams; Ketchikan district, various streams south of Wrangell Narrows, number not stated; Cordova district, five; and Seward district, eight. It is reported also that in the Juneau district 10,000 predatory fish were destroyed, and in the Cordova district 13,648 were destroyed. Mention is made also of the destruction of a considerable number of predatory fish in the Bristol Bay district. Figures in respect to this, however, are covered by the report by Dennis Winn, field superintendent of fish-cultural work for the Bureau, appearing on page 31. The Territory contributed \$2,000 toward the fund for conducting this work in Bristol Bay.

Details as to the fish-cultural and hatchery work of the commission will be found in the section of this report devoted to hatcheries.

TERRITORIAL LICENSE TAX.

Under the laws of Alaska a tax is levied on certain fishery products and apparatus, and it is payable annually to the treasurer of Alaska. On May 11, 1921, the treasurer furnished a statement showing the collections as made to that date for the fiscal year ending December 31, 1920. As compared with collections for 1919, the revenues of the Territory fell off \$51,901.14, which amount is almost covered, however, by delinquent taxes for 1920.

FISHERY LICENSE TAXES COLLECTED BY TERRITORY FOR FISCAL YEAR ENDED DEC. 31, 1920.

Schedule.	Division No. 1.	Division No. 2.	Division No. 3.	Total.
Salmon canneries.....	\$52,460.26	\$1,260.04	\$38,474.61	\$142,195.81
Herring canneries.....	71.95		.10	72.05
Clam canneries.....	3.58		58.48	62.06
Salteries and mid-cure plants.....	923.73	123.25	4,625.14	5,672.12
Fish traps.....	55,800.00		23,500.00	79,300.00
Fish-oil works and fertilizer and fish-meal plants.....	18,199.73		1,168.00	19,287.73
Cold-storage plants.....	1,500.00		510.00	2,010.00
Whale-oil plants.....			100.00	100.00
Total.....	128,879.25	1,384.19	118,436.33	248,699.77
Additional tax ¹				700.66
Delinquent whale products tax.....				21,696.00
Estimated delinquent canned salmon tax.....				30,000.00
Grand total.....				301,096.43

¹ Additional tax of 1 per cent of their annual net incomes collected from salmon canneries (not possible to segregate by divisions).

DESTRUCTION OF PREDATORY FISHES IN BRISTOL BAY REGION.

During the season of 1920 the Bureau cooperated with salmon packers in the Bristol Bay region by organizing a force for the destruction of predatory fishes in certain waters of the district. Part of the expenses of the expedition were paid from a fund made up by the fishery companies and the governor of Alaska. Field Superintendent Dennis Winn, of the Bureau's fish-cultural service, was in charge of the work. Mr. Winn's report is as follows:

In Seattle equipment was purchased and the services secured of J. W. Gardner, a practical fish-culturist, of the Bureau of Fisheries; A. T. Loeff, of the College of Fisheries, University of Washington, who has had considerable experience in commercial fishing; and Harry Savage, a practical fisherman. All proved excellent men for the work to which they were assigned. Men and equipment were transported from Seattle on the *Libby Maine*, which vessel arrived at Bristol Bay on May 25, and we were put ashore at Libbyville the same evening.

Our equipment was taken ashore at the cannery of the Naknek Packing Co. the evening of June 4, and the following morning we moved the entire equipment with supplies to the cannery of the Alaska-Portland Packers' Association farther up the Naknek River, where it was divided into three lots, one for each location to be operated. Camps were established on the Upper Naknek River, Lake Aleknagik, and Iliamna Lake. Mr. Loeff was in charge of the crew at Naknek, Mr. Savage at Aleknagik, and Mr. Gardner at Iliamna. Each camp was moved several times in order to facilitate the work, as local conditions and possibilities were recognized.

NAKNEK SECTION.

Mr. Loeff, taking with him his portion of the equipment, one white man and two Indians, was immediately transferred upriver, where camp was established that evening about 2 miles below the foot of the rapids. His operations extended from the rapids to about 5 miles below the camp, near the mouth of Ralph River. But few trout were observed below that point. A spoon troll was used en route to the camp site, and several steelheads and one lake trout were caught, all above Ralph River.

In making a survey of the vicinity we found we were late for the migrating salmon, arriving at the latter end of the period, which extended only through the month of May and early June. Good numbers of lake trout, however, were taken in the vicinity of our camp, these weighing from 6 to 12 pounds, and all had fish in their stomachs—young salmon, smelts, and whitefish. It is safe to

say that this species is as detrimental to the salmon industry as is the Dolly Varden, if not more so. One specimen was taken with two whitefish over 12 inches in length in its stomach without distending it. The trout follow the migrating salmon to tidewater and gradually work back into the lake when the young salmon have passed. We found this species distributed through the entire main river above Ralph River and up through the rapids into the lake, but not in extremely large numbers. Steelhead trout were more abundant in the river, as were also grayling and whitefish, the latter, especially, appearing in great numbers.

After the river was thoroughly cleared in the vicinity of our operations camp was moved to the lake outlet, where fair numbers were taken, but, owing to the difficulties of seining and to the salmon ascending, a survey was made of the entire lake with a view to finding more suitable operating points. Camp was finally located at the mouth of Kidawik Creek, on the south side of the lake near the entrance to the east arm, where good numbers of lake trout and some Dolly Vardens were taken. The lake entrance would be an excellent location when the young salmon are descending early in the season, but none were in evidence at that date, June 17.

Practically all the fish entering Naknek Lake either pass up Kidawik Creek or Simenoffsky River at the extreme head of the east arm. The lake shore, with the exception of a few miles along the south shore, offers no inducement for spawning fish owing to the amount of ashes accumulated from the eruption of 1912 distributed along the shore line. All other tributaries are thickly impregnated with ashes. While our arrival was late and help of little account, about 16,600 pounds were destroyed, mostly lake trout.

Kidawik Creek is an ideal salmon stream with fine spawning bottom its entire length of about 2 miles. It connects Naknek Lake with Toms Lake, which is 12 by 4 miles in extent, the greater portion being clear and suitable for spawning grounds. About midway between the two lakes there is a waterfall from 5 to 8 feet high, over which it would be impossible for fish to ascend during low-water stage. It is a stone shelf of volcanic formation extending clear across the river, and, having no powder, we felt that a cut could be made with steel bars, etc. We therefore secured several stone-cutting gads, a steel bar, top maul, hammer and pick, and, after diverting the flow of water near one side of the stream, a cut was made 10 feet in width, sloping back about 15 feet, through which the fish could easily pass.

The salmon made their appearance in the mouth of the creek July 8, the number increasing gradually. A good run entered July 15, which was the date the cut was complete. There were fair numbers that found and passed through the cut, but the majority worked continuously at the center of the fall, many being injured and floating downstream. As the water rose, some of the fish were noticed passing over the top of the dam, and with high water they had no trouble in passing over. The cut makes it possible for them to ascend at any time. Fishing at this point was conducted in conjunction with the work of making a passageway through the dam. The trout taken were chopped fine and used to bait certain suitable seining points, where the fish gathered in numbers, and a seine was slipped around them.

As this point was the only one where the fish could be observed, owing to the murky water, we endeavored to keep a check on the new arrivals from day to day in order to estimate the approximate escapement. From such observations it is estimated that about 150,000 fish entered the lake. This estimate must of necessity be rough, as the water was so badly discolored. There was no way by which we could intelligently estimate the number entering Simenoffsky River, as the water at that point was thick with ashes, but indications were of less fish than at Kidawik, and an average was accepted of from one-half to two-thirds. This would place the total escapement at the figure mentioned, which we consider as near an average as could be secured with our opportunities.

On two occasions the camp was visited by bears, when all the crew were absent, and the tent was slashed down the side. While bears were observed from time to time in the vicinity, none of the men was ever threatened.

WOOD RIVER SECTION.

On the evening of June 8, accompanied by Mr. Savage and another white man, I left on the Alaska-Portland Packers' Association boat *North King*, en route to Lake Aleknagik. We arrived at Dillingham the morning of the 9th,

where supplies were purchased and the services engaged of two natives to assist Mr. Savage. However, we were forced to discharge these men after three days' service. One native was later secured who qualified and remained to the completion of the work at that point.

Men and equipment were transferred from Dillingham on the Alaska-Portland Packers' Association power boat *Eluk* to Lake Aleknagik, where camp was established June 10 at the lake outlet. A survey was made of this lake to determine its possibilities for trout operations. It was learned that the only suitable places lay at the lake outlet and the mouth of the river between Aleknagik and Nerka lakes.

Set and drift gill nets, in connection with seine and troll lines, were used and the early work centered at the lake outlet, where a considerable number of Dolly Vardens were taken, weighing from two to seven pounds each. The stomachs of these fish were all well filled with migrating salmon, Nos. 2½ and 3 in size, 25 or more young salmon being counted in a stomach. The habits of the trout were observed closely. It was noticed that they met the salmon schools at the inlet and outlet of the lake, where the bar drops off into deep water, a certain number of trout accompanying and feeding on the salmon.

In connection with the Dolly Vardens working on the young salmon in deep water, the terns are almost equally severe at the surface. The salmon migrate in enormous schools, making them easy prey for trout, and the work of the latter forces the young salmon to the surface, where the terns take their toll. Large flocks of from 500 to 1,000 were noticed actively feeding whenever a school passed certain points. After several days' operations at the lake outlet the catch of trout became almost negligible, and it was noticed that while the terns were present in large numbers and would become excited and active on sighting a school of young salmon, their success in catching was materially lessened, the fish not coming close enough to the surface. No trout other than Dolly Vardens were taken in this section, and very few under 2 pounds were captured. All averaged 3 and 4 pounds, and specimens weighing 7 pounds were common.

Through the courtesy of Capt. Williams, of the Alaska Packers Association, we were supplied with a tally scow, and, with the assistance of Mr. Daly, of the Alaska-Portland Packers' Association, this scow was towed into the lake. We were comfortably housed and easily moved. When the trout became scarce at the lake outlet the camp was moved to the upper end of the lake, where the scow was placed in the mouth of the river connecting with Nerka Lake. At this point good results were secured, and it was here that the bulk of the trout was taken. It is estimated that from 35,000 to 40,000 pounds of trout were destroyed. Many were diseased, wormy, and emaciated, but always ready to feed.

The migrating season of salmon in this district extends over a period of about three months, and, figuring an average of 15 to 20 migrating salmon for each trout per day—which represents but one feed for the average trout taken—the number of trout destroyed would mean a saving of more yearling salmon than could be handled in any of our hatcheries during a season, not to mention the expense of feeding, etc., and this without taking into consideration the serious depredations of the terns.

Our point of vantage in the scow enabled us to keep a close tally on the adult salmon ascending to the spawning grounds, together with the proportion of loss from fungus growth, due to gill-net injuries. No large run of salmon was ever observed ascending, but a steady line was noticed from July 5 to July 20, gradually tapering off to small numbers at the date of our departure, July 28. Some were noted ascending prior to July 5, but in negligible numbers. As consistent a check as possible was kept on the ascending fish. The salmon came along the shore of the lake, entered the river, and passed into the strong river current in the rear of our scow, where the current and scow created smooth water. Dolly Varden trout as large as the salmon were noticed passing upstream with the latter in a ratio of about 2 to 4 per cent. As no small trout were taken throughout the season it is believed that all spawn in the upper lakes. Those taken by us were principally sea-run fish. It was impossible to use gill nets without injury to the salmon, and the trout operating in deep water made it necessary to devise some other means of capture. Mr. Savage devised a mold in the shape of a fish, and this was poured full of lead over the stem of a large, long-shank fishhook, which was used as a troll and

fished among the migrating salmon. With this crude device two men succeeded in taking $1\frac{1}{2}$ tons of trout in one day. As fishing continued the numbers taken gradually decreased several hundred pounds each day to the time of our departure, when the best capture possible was from 300 to 1,000 pounds per day.

A check was made from time to time, in 5-minute periods, on the numbers of salmon ascending during the height of the run, and it was estimated that about 400,000 fish passed upstream during the period of 20 days. This constituted the run, figuring a steady escapement during the whole 24-hour day. This figure, while not absolutely correct, we feel is as close an estimate as can be made under the circumstances.

The salmon afflicted with fungus were closely checked by myself and each employee individually, and we estimated that 5 per cent unable to swim the current in the river would die in the lower lake in a very short time. A wound caused by gill nets in salt water rapidly becomes covered with fungus after the fish enters fresh water. When the fish is badly cut the wound putrefies rapidly, and on arrival at the head of the first lake there will be a circle of fungus one-half inch or more in depth and several inches wide around the body of the fish. Another 5 per cent were noticed with numerous gill-net marks around the body, but in these the fungus was not in an advanced stage. However, while these fish have strength to ascend the river, I am positive that few, if any, ever reach the spawning stage.

KVICHAK AND ILIAMNA SECTION.

It was planned to operate early on the Kvichak River, but owing to the impossibility of securing help and an accident to one of our boats en route, which was repaired at the cannery of the Alaska-Portland Packers' Association, that plan was necessarily abandoned.

For various reasons it was impossible for Mr. Gardner, who had his equipment assembled at Naknek, to reach the Iliamna district before June 27, and at that date the water was extremely high in the streams with occasional floods overflowing the banks. Very little help was possible, but every effort was made with gill nets; seines could not be used owing to the high water. Good work was accomplished by Mr. Gardner under discouraging conditions.

The writer divided his time between the Wood River and Naknek fields until it was necessary for employees at those points to discontinue work, owing to the departure of cannery boats on which they had passage to the States; then he proceeded to Iliamna, arriving August 10. On the Iliamna River, where our first camp was established, but few large trout were taken, and those mostly at the mouth of the river in the lake. All taken here were Dolly Vardens, with the exception of a few steelhead trout and whitefish. The high water had the effect of scattering the schools and but small numbers were noticed gathering in the pools. The trout, unlike those captured in other localities, were long and slender, which made it impossible to gill many in our nets, and, moreover, the ascent of the salmon necessitated the removal of the nets from the water so as to prevent injuring the ascending salmon.

As the water receded the trout were noticed schooling in the eddies. Traps were improvised, about 5 feet long and 2 feet in diameter, from wooden hoops covered with chicken wire, with an opening in one end similar to the opening in lobster pots. These traps were baited and set in the pools where they caught many thousand fish. In the first one set we took 150 fish in two hours. Many worked through the wire mesh, necessitating doubling the wire screen, thus making the mesh smaller, and no further trouble was experienced. These bait traps have the advantage of catching the predatory fish without in any way attracting or interfering with the salmon. They can also be fished in any water and are efficient up to the time of active spawning.

The people in the vicinity were impressed with these traps and wished to use this method in their own fishing. Therefore, on our departure, we distributed the traps on hand and supplied the other residents with material to make one or two each.

After the pools in the vicinity were cleared of trout, which work was accomplished in short order without interfering with the salmon, it became necessary to seek new locations for operations, and the near-by creeks and rivers were examined with this end in view, and also to obtain all salmon data possible.

In accordance with previous plans, we arranged to proceed to Lake Clark, arriving at the portage between Iliamna Lake and Newhalen River on August

21, where we were storm bound for several days. Supplies and equipment were packed over the portage mainly by myself and assistants, as the Indian packers who perform this kind of work are absolutely undependable, especially as they had considerable money from the summer's work at the canneries, and most of their time was occupied in celebrating. We proceeded upriver en route to Lake Clark on August 28. We learned from natives and prospectors that no Dolly Varden trout are ever taken in Lake Clark, and that there is but one stream in that locality which is inhabited by this species, namely, Kegik Creek.

A thorough survey was made of the entire lake and tributaries, our party passing up the east shore and returning on the opposite side. No trout in quantities were observed, and the possibilities of stream spawning were found to be very limited. It was noticed that the salmon spawn earliest near the outlet of the lake and later as they proceed up the lake. The prospectors and natives were fishing the mouths of the creeks and also directly on the spawning grounds preparing dog feed. Streams were visited in the following order:

Tazimina River is an ideal salmon stream with suitable sloughs for spawning red salmon, but not more than 50 were noticed. A high waterfall about 5 miles from the mouth blocks the ascent of fish.

Tarnalia River is a good stream but contained no salmon. We were advised by prospectors living at its mouth that few salmon ever enter, even in good years. There are falls about 4 miles up and no fish above.

Current Creek is a good spawning stream for the first mile, but unsuitable farther up. It contained no fish.

A small creek at the head of Little Lake Clark could accommodate fair numbers, which are in evidence in good years, but none have appeared for the last two seasons.

Big River, at the junction of Big and Little Lake Clark, is the largest stream tributary to the lake. It is glacial fed and few salmon ever enter.

Portage Creek is small, with no possibilities.

Kegik Creek is a fair-sized stream with good possibilities. It has a lake at its head and is recognized as the best salmon stream in that locality, the fish ascending into the lake. A trip was made to the lake and but few salmon noticed, none being found in the small tributaries at its head which are thoroughly suitable for spawning. I was advised by prospectors in the vicinity that some spawning red salmon were noticed in the lake in December and spawned-out fish still active in January of some years, which would indicate an extremely late run.

Chulitna River has no salmon possibilities. It is a shallow river and heads in a marsh containing large numbers of pike.

Practically all the salmon spawn along the shore of the lake and nearly the entire shore is suitable. Many miles of ideal spawning grounds were noticed along the lake shore. The Indian fish villages, now deserted, scattered along gave positive evidence as to the best spawning locations in former years. Lake trout, especially during the spring months, are numerous and easily taken; specimens reported weighing 40 pounds or more were common. Very little use is ever made of them by the natives, and only in emergency cases are they ever considered. As our time was limited and lake trout were not abundant, we continued back to Iliamna and finished the season with a survey of that lake, with the exception of the west shore, which was too dangerous at that time of year to undertake in a small boat.

The Newhalen River, which connects Iliamna Lake and Lake Clark, has a series of falls and rapids about 2 miles from its mouth, but these are not of sufficient size to hinder the ascent of the fish. The formation, however, renders it easy for the Indians to catch their supply with large hooks on the end of long poles, as the fish must of necessity pass through certain small channels between the rocks. The rapids are about 500 yards long, passing through narrow channels at the upper end and widening to about 300 feet in rapids below, which end in a further widening of the river to about one-half mile. This portion of the river is shallow for about one-quarter of a mile, with ideal spawning bottom, on which some fish were spawning. The major portion of the fish taken by the natives in this locality were captured either in the rapids or on these spawning grounds.

The channel between the river and Iliamna Lake is about 200 yards wide and broadens immediately on entering the river to about one-half mile. This channel

would be an ideal place for the capture of trout with any kind of gear through the spring months.

A good run of salmon was found in Kokhonak Creek, with the usual native family catching them on the spawning beds and drying them as food for the family and dogs. Here we captured a number of steelhead trout in nets, and great numbers were noticed on the beds with salmon, feeding on their eggs. No Dolly Vardens were taken or seen. A trip was made to the lake at the head of the stream, a distance of 6 miles, and it was observed that the stream was well seeded the entire way. The stomachs of the fish taken at this point were filled with decomposed salmon and spawn, and on account of the unlimited supply our bait traps did not appeal.

All streams in Kokhonak Bay were visited, but no fish were noticed in any streams other than Kokhonak Creek and Kokhonak River. A fall 20 feet high in the mouth of Kokhonak River prevents the ascent of fish. From 400 to 500 red salmon were observed endeavoring to pass over this obstruction, but they could not proceed over halfway. It was believed that after being unsuccessful in negotiating the falls they would drop back and spawn. After careful search they were located spawning about 100 feet from the falls, close to a straight rock bluff, in 9 feet of water, and between large bowlders where there were suitable gravel spots. Some lingcod and steelhead trout were observed working in the beds for eggs, and each specimen taken had salmon eggs in its stomach. An efficient fishway can be installed at small expense, providing it is undertaken in the spring, when the water is low. Its installation would open miles of perfect spawning area in the river, and would also permit the fish to pass up as far as Kokhonak Lake. This river is one of the best streams for salmon tributary to Iliamna Lake.

On the Iliamna River trips of observation were made about 12 miles upstream, the first on August 14, when not over 1,000 salmon were seen on the beds; on the second trip, September 17, no salmon were noticed in localities visited in August, but about 500 were found spawning 4 miles from camp. These represented the entire run in Iliamna River for the season. There was always a sprinkling of Dolly Vardens with the salmon, some of them spawning, but they were so scattered as to render capture in any numbers impossible.

Pile River was not visited, but the natives reported no fish there.

A fair run of fish entered Chekok River, from which the majority of the natives in the Iliamna River district obtained most of their fish supply.

The last few days in the field were spent at Iliamna, where we set bait traps and caught several hundred Dolly Vardens, thereby again clearing the pools.

SUMMARY.

Our work was severely handicapped owing to late arrival, the impossibility of securing suitable help, and the necessity of familiarizing ourselves with conditions, each locality having a distinct problem to solve in the capture of trout. We were compelled to pay top wages for native help, and most of the natives were worthless, necessitating their discharge at the earliest moment possible without embarrassment to the work. At no time was suitable help available, except at Iliamna late in the season after the canneries had closed. Our equipment, too, was inadequate; while we expected that gill nets of 3-inch and 3½-inch mesh would be suitable, we found the trout usually too large to gill.

Our experience this year will enable us to wage an extensive and aggressive campaign another season. At Naknek the work can be best accomplished in the early spring months, or up to the time salmon enter the stream. After this, if desirable, some of the operators could be used as stream watchmen through the cannery season. In the Aleknagik Lake section excellent results could be obtained throughout the entire season, or until the canneries close, necessitating departure. Good work can be accomplished in the Iliamna district up to the period of spawning, or the middle of August.

The salmon run was spasmodic in all but the Wood River section, but at no time were there indications of an abundance of salmon in any portion of the districts operated. While the escapement into Wood and Naknek Rivers was greater than that of the previous year, a greatly insufficient number reached the spawning grounds to insure a normal pack and allow sufficient escapement for the future. Our judgment would indicate a totally inadequate supply for even a small year, to say nothing of normal.

In the Kvichak and Iliamna sections the spawning beds were nearly destitute of spawning salmon. I am positive that the storms, which interfered some-

what with the commercial catch, were the salvation of the situation, for if but a slightly increased pack had been made the escapement would have been practically nil and the beds would have been left nearly or wholly bare, with an absolutely discouraging outlook for the future.

We are thoroughly convinced that the predatory fishes, together with the terns mentioned heretofore, constitute one of the most serious menaces facing the salmon industry. In small years, such as 1919 and 1920, they will practically eliminate the cycle runs by their depredations, first on the eggs on the spawning beds, next on the young fish in the first year or two spent in the lakes, and last, but not least, on the migrating fish descending to the ocean. The only hope of curtailing this loss is by waging a constant, aggressive and extensive campaign against these marauders. In the performance of this work a close tally can be kept on the escapement and spawning grounds, which is the only method by which the industry can be advised with any degree of assurance and safety. Our work of extermination this year will surely be of invaluable aid to the future, and its continuance with an enlarged scope will show its value within the next cycle. We also feel at this time that it is one of the greatest hopes for the industrial future of the salmon industry.

RECOMMENDATIONS.

I would respectfully recommend that this work be continued on as extensive a scale as possible for the elimination of predatory fishes and birds.

I recommend the purchase of three power boats of Columbia River type, one for each section operated, with living quarters aboard for three or four people. They would facilitate the work of transferring crews to different localities, and it would not then be necessary to embarrass the different cannery superintendents with requests for the use of a launch when same is needed for cannery work. It would also insure comfortable living and sleeping quarters for the crew and thus eliminate the discomforts of tents and sleeping on the ground, which is nearly impossible in that section during heavy rains. With such a boat many localities could be profitably operated with seines, set and gill nets, and bait traps, necessitating but a small crew at any point of operation. Such a boat would also be of special value to stream watchmen. As efficient work at the different points would cease at about the time the commercial season began, I would suggest that the boats be utilized by some of our men who would be employed as stream watchmen.

Good work can be effectively continued with jigger trolls and bait traps during the period the salmon are running. A small crew can profitably operate as much of this gear as can be efficiently utilized, thus releasing a portion of the crew with the power boats for stream police duty without detriment to the predatory fish work.

Three new 20-foot fishing skiffs are needed, together with several gill nets of large mesh, and material for making a number of bait traps, and three larger and deeper seines, one for each locality. These added to our present equipment will meet any emergency pertaining to our work as outlined.

I would further recommend that employees be engaged in the States and that they reach the different localities in Bristol Bay as early as possible in the spring months. They should be on the first boats reaching the region. Employees should go to the Upper Iliamna by the regular steamship line to Cook Inlet, thence to Iliamna Bay and Iliamna village, arriving about May 1. At that time the water is low and the trout schooling in large numbers. Seines can then be used to advantage, also the bait traps and gill nets. The necessity of reaching Iliamna by Cook Inlet is due to the fact that passage can not be made from Bristol Bay through the lower end of Iliamna Lake before late in the season owing to the ice in that locality.

A fishway should be installed in Kokhonak River.

These recommendations are made to meet conditions as they exist in the sections operated this season, but they can be enlarged in accordance with any plan formulated to broaden the scope of the work.

AFOGNAK RESERVATION.

Historical data have been published year after year showing the establishment of the Afognak Fishery Reservation by presidential proclamation in 1892 and the object that was hoped to be attained

by its creation. From the date of the establishment of the reserve until the spring of 1912 all commercial fishing in Afognak waters was prohibited, but the order was not obeyed and no attempt was made to enforce it. Though those waters were nominally closed to all commercial fishing and the two canneries on Litnik Bay suspended operations and were dismantled and sold, pickling operations were carried on by local parties at the most important streams of the island until 1912, when by departmental order the reservation was opened to the native inhabitants of the region under such terms and conditions as seemed necessary to safeguard the runs of salmon. Although the fishery resources of Afognak were well known, the mere fact that fishing was authorized coincident with the opening of a salmon cannery at Kodiak was sufficient inducement for the entire native population of the island to seek and secure fishing privileges. The legalization of fishing did not, however, increase the supply of salmon in those waters, though on the face of returns that might appear to have been the case. The catch in 1912 was larger than any year since 1892, but it was so for no other reason than that more fishing was done. Yet, on the whole, results were disappointing, and it was early apparent that the island fisheries alone could not support the natives of Afognak. It was further evident, after a few seasons had passed, that the salmon runs would suffer serious depletion if the original scale of operations was allowed to continue. Accordingly a limit was placed on the number of fishermen, who were divided into small gangs, to each of which certain fishing grounds were assigned. Experience taught that where unnecessary numbers of fishermen congregate at one place fishing is much more intensive. This evil was easily corrected by limiting the number of men who might operate at each place and by shortening the fishing season. Authority was therefore given that not to exceed 55 natives were to be licensed to fish in Afognak waters in 1920.

The issuance of licenses was placed in the hands of the superintendent of the fish-cultural station at Afognak until July 10, when William E. Baumann was put in charge of patrol work about the island. He took over the licensing of fishermen for the remainder of the season.

Fishing began May 11 and continued until September 9. Salmon were taken at seven localities, the total catch being 125,538, all species except kings being taken. This catch was sold to the Kodiak Fisheries Co., at Kodiak.

The following table shows the total take of salmon for commercial uses in the Afognak Reservation:

COMMERCIAL CATCH OF SALMON IN WATERS OF AFOGNAK RESERVATION IN 1920.

Locality.	Coho.	Chum.	Humpback.	Red.	Total.
Little Afognak.....	5, 128		34, 374	8, 556	48, 058
Danger Bay.....	840				840
Litnik Bay.....	6, 194			7	6, 201
Paramanoff Bay.....		35	15, 385	18, 009	33, 429
Seal Bay.....			190	11, 733	11, 923
Mallina Bay.....			10, 995	10, 728	21, 723
Izhut Bay.....				3, 364	3, 364
Total.....	12, 162	35	60, 944	52, 397	125, 538

As compared with the catch in 1919, cohos increased approximately 16.7 per cent, humpbacks increased 164.2 per cent, and reds declined 50.9 per cent. Chum salmon were taken in negligible quantities, while no kings were obtained.

ALEUTIAN ISLANDS RESERVATION.

The report in regard to permits for fishery operations in the Aleutian Islands Reservation in 1919 stated that at the end of the calendar year 1919 there were 20 permits remaining in effect. Permit No. 18, granted June 22, 1917, to Andrew C. Smith for salmon and cod operations at Unalaska Island, was canceled late in the year. During 1920 the following permits were canceled: No. 21, granted September 19, 1917, to Paul Buckley for whaling operations; No. 35, granted November 6, 1918, to Samuel Applegate for commercial fishery operations at Umnak Island; and No. 41, granted September 6, 1919, to Lars Mikkelsen for cod operations on Unalaska, Akun, and Tigalda Islands. These four permits were canceled upon request of the holders for reissuance in other names. Four additional permits were granted during 1920, which with the 16 remaining in effect made a total of 20 outstanding at the end of the calendar year 1920.

PERMITS FOR FISHERY OPERATIONS IN ALEUTIAN ISLANDS RESERVATION GRANTED DURING CALENDAR YEAR 1920.

No.	Date.	Grantee.	Location and scope of operations.
42	Apr. 9	American Whale Products Co.	Whaling plant. Udagak Bay, Unalaska Islands.
43	Sept. 16	American Fishing & Packing Co.	Blorli, Rootok, Avatanak, Ugamak, Unalga, and Unalaska Islands. Cod stations.
44	Oct. 11	A. C. Goss.....	Umnak Island. Commercial fishery operations; erection of salmon cannery prohibited.
45	Oct. 23	Bering Sea Fisheries Co..	Six locations on Unalaska Island, Akun Island, and Tigalda Island. Cod stations.

Two permits were granted jointly by the Departments of Agriculture and Commerce in connection with certain stock-raising and mining activities within the reservation. Four grazing permits previously granted remained effective.

JOINT PERMITS IN ALEUTIAN ISLANDS RESERVATION GRANTED IN CALENDAR YEAR 1920.

Date.	Grantee.	Purpose and location.
Jan. 14	L. A. Lavigne.....	To raise sheep and cattle on Unalga Island.
Oct. 29	Alaska Sulphur Co.....	For construction of an aerial tramway for mining operations on Akun Island.

ANNETTE ISLAND FISHERY RESERVE.

By presidential proclamation of April 28, 1916, Annette Island and neighboring small islands were made a fishery reserve for the exclusive benefit of the Metlakatla Indians then living thereon, and

for such other Indians of Alaska as might desire to establish their homes in the reservation. The Bureau of Education, Department of the Interior, administers the affairs of the reserve for the Indians residing therein.

In 1918 fishing privileges in the reserve were leased to the Annette Island Packing Co. under a five-year contract, which provided that the company should pay to the Metlakatlans a royalty of 1 cent per fish for all salmon taken by traps in the coastal waters of Annette Island and a fee of \$100 for each trap operated, and that all labor in connection with the catching and canning of salmon, except that of a few skilled mechanics, should be performed by the Indians. The company was also to employ the Indians at all common labor required in the maintenance and upkeep of the cannery. The season of 1920 was the third year of operations by the company in accordance with the terms of the contract.

Seven traps were operated by the company, for which a fee of \$700 was paid. The catch of salmon by traps was 967,600, for which the Indians received \$9,676; contract labor in the cannery brought them a return of \$36,298.88, while payments for 75,268 salmon taken by purse seines and for labor on buildings and docks, including material, such as lumber and piling, further increased the income of the Metlakatlans by \$24,391.86. The total disbursement of money to the Indians by the Annette Island Packing Co. was \$71,066.74, or \$18,966.14 less than in 1919.

COPPER RIVER FISHERY.

The importance and peculiar geographical conditions of the Copper River fishery again warrant special mention. In 1920 this fishery produced 946,452 salmon of all species as compared with a catch of 1,307,401 in 1919 and of 869,350 in 1916, the year in which the progenitors of the 1920 run made their appearance.

In all, nine packing companies took salmon from the Copper River in 1920, eight of which carried on fishing in the delta district, while one operated exclusively in the lake and canyon sections. Those operating on the delta were the Canoe Pass Packing Co., Carlisle Packing Co., Eyak River Packing Co., Alaska Sea Food Co., Hoonah Packing Co., Pioneer Packing Co., Hillery-Scott Co., and Hayes-Graham Fish Co. The only operator in the up-river district was F. H. Madden, who packed at the cannery formerly listed under the name of the Abercrombie Packing Co. It is of interest also to record that the Hayes-Graham Fish Co. operated a floating cannery on the delta at the entrance to Pete Dahl Slough.

There were 46,000 fathoms of gill nets used in the delta fishery and 4,227 fathoms in Miles Lake, a total of 50,427 fathoms for the river as a whole. This is a decrease in nets at the delta of 18,800 fathoms, or approximately 28.8 per cent, and an increase at the lake of 977 fathoms of nets, or approximately 30 per cent. Practically no change in the number of dip nets was noted between 1919 and 1920.

The following table shows the catch of salmon by districts and species during the five years from 1916 to 1920, inclusive:

CATCH OF SALMON IN COPPER RIVER FROM 1916 TO 1920, INCLUSIVE.

District and species.	1916	1917	1918	1919	1920
Delta district:					
Chums.....	79,306	55,564	36,247	24,872	55,484
Kings.....	5,440	5,134	4,232	8,972	15,086
Reds.....	300,157	455,001	745,522	1,096,090	700,342
Humpbacks.....	31,578				
Total.....	416,571	515,600	786,061	1,129,934	770,912
Lake and Canyon district:					
Chums.....	36,034	36,839	25,509	15,778	18,440
Kings.....	8,785	8,050	14,806	4,092	6,345
Reds.....	407,980	309,324	484,607	157,597	150,755
Total.....	452,799	354,213	524,922	177,467	175,540
Grand total.....	869,350	869,812	1,310,983	1,307,401	946,452

On October 5, 1920, a preliminary hearing was held at Cordova, Alaska, to consider the advisability of amending the order of December 20, 1918, limiting or prohibiting fishing in the Copper River, and a further hearing on the same matter was held at Seattle, Wash., on November 18, 1920. As a result of these hearings the order of December 20, 1918, was continued in force until September 1, 1921, on and after which date all commercial fishing in the Copper River, its lakes and tributaries, and within 500 yards of the mouth of its outlets is prohibited. The closing order is given in full on page 11 of this report.

YUKON RIVER FISHERY.

The Carlisle Packing Co. carried on practically all the commercial fishing for salmon for export from the Yukon River in 1920. The cannery was located at Kwiguk Slough, and operations were restricted to the south mouth of the river below the junction of the Clear River, and to the waters of Bering Sea more than 500 yards off the mouth of the Yukon.

The total catch of salmon by this company was 214,122, of which 155,655 were chums and 58,467 were kings. Of these, 105,218 chums and 40,493 kings, or approximately 68 per cent, were taken in outside waters beyond the jurisdiction of the Department. The catch in the river was 50,437 chums and 17,974 kings. The pack consisted of 12,876 cases of chums, 15,961 cases of kings, and 145 tierces and 20 barrels of mild-cured and pickled king salmon. These operations gave employment to 176 whites, 53 natives, and 41 Japanese, or a total of 270 persons. The investment was \$534,000; the value of all products was \$349,356. Fishing apparatus consisted of 2 fish wheels and 12,000 fathoms of gill nets.

During the summer of 1920 the Yukon River was visited by Dr. Charles H. Gilbert, of Stanford University, and Henry O'Malley, field assistant of the Bureau, who made an examination of the river from Dawson, Yukon Territory, to the delta. They collected much information and data regarding the runs of salmon and the number of fish used by the residents of the Yukon Valley. They were accompanied by Inspector Calvin F. Townsend, who gave particular attention to the enforcement of the fishery laws and regulations in that region from the middle of June to the end of July. The Bureau's

boats *Swan* and *Tern* were used in cruising the Yukon and some tributaries. The report by Dr. Gilbert and Mr. O'Malley is published in full elsewhere in this document.

In line with the recommendation in their report that all commercial fishing in the Yukon be suspended, a public hearing was held in Seattle, Wash., on November 23, 1920, to consider the advisability of such action. Satisfactory information was presented at that hearing in support of the opinion generally expressed that commercial fishing for export could not be continued without seriously depleting the runs of salmon and jeopardizing the lives of the native inhabitants of the region and their indispensable dogs. Accordingly the Secretary of Commerce issued an order on December 18, 1920, prohibiting the taking of salmon for other than local use from the Yukon River, its tributaries, and the waters within 500 yards of the mouth thereof after August 31, 1921.

HATCHERIES.

EXTENT OF OPERATIONS.

The two Federal salmon hatcheries in Alaska, one on McDonald Lake, in the southeast district, and the other on Afognak Lake, in the central district, were operated in 1920, except that at the station first named no eggs were collected during the year. In addition, two private hatcheries were operated in southeast Alaska, one a few miles from Loring, owned by the Alaska Packers Association, and the other at Quadra, owned by the Northwestern Fisheries Co. All of these hatcheries were engaged chiefly in the propagation of red salmon.

The Territorial Fish Commission of Alaska also operated a hatchery at Juneau, the collection of eggs being made at two field stations, one of which was on the mainland of Alaska, a few miles north of Juneau, while the other was at Auk Cove, on the north shore of Admiralty Island, about 25 miles southwest of Juneau.

Exclusive of the number collected by the Territorial commission, the total take of red-salmon eggs by the Federal and privately owned hatcheries hereinbefore mentioned was 99,990,000, or 19,070,000 less than the number collected in 1919. This smaller collection is accounted for by the total suspension of operations at the McDonald Lake station, where important repairs to the plant were being made, and also by the washout of retaining racks at the Afognak station during the spawning season.

OPERATIONS OF FEDERAL AND PRIVATE HATCHERIES IN ALASKA IN 1920.

Station.	Red or sockeye salmon eggs taken in 1919.	Red or sockeye salmon liberated in 1919-20.	Red or sockeye salmon eggs taken in 1920.
McDonald Lake.....	9,752,000	9,387,000	.....
Afognak Lake.....	179,178,000	61,324,000	62,300,000
Fortmann.....	18,420,000	17,070,000	18,240,000
Quadra.....	11,710,000	11,357,000	19,450,000
Total.....	110,060,000	99,338,000	99,990,000

¹7,000,000 eyed eggs transferred to the Federal hatchery at Quinault, Wash., and 3,000,000 to the State hatchery at Bonneville, Oreg.

HATCHERY REBATES.

Under the law of 1906 for the protection and regulation of the fisheries of Alaska, the owners of privately operated hatcheries in Alaska are exempt from the payment of all taxes and license fees on their catch and pack of salmon at the rate of 40 cents per 1,000 red or king salmon fry liberated, which is equivalent to the tax of 4 cents per case on 10 cases of canned salmon. This rebate is obtained by the operators filing with the clerk of the district court of the judicial division of Alaska in which the hatchery is located an affidavit showing the number of red and king salmon fry planted in the waters of Alaska in the year covered by the affidavit. The clerk of the court then issues certificates to the owners of the hatcheries for the number of fry liberated, and these in turn are accepted by the Government in payment of taxes and licenses as aforesaid.

Rebates due private hatchery operators are shown in the following table:

REBATES CREDITED TO PRIVATE SALMON HATCHERIES DURING FISCAL YEAR ENDED
JUNE 30, 1920.

Owner.	Location.	Red-salmon fry liber- ated.	Rebate due.
Alaska Packers Association.....	Naha Stream.....	17,070,000	\$6,828.00
Northwestern Fisheries Co.....	Hugh Smith Lake.....	11,357,000	4,542.80
Total.....		28,427,000	11,370.80

HATCHERY OPERATIONS.

M'DONALD LAKE.

In 1919 a collection of 9,752,000 red-salmon eggs was made at the McDonald Lake station, from which 9,387,000 fry were hatched and planted in contiguous waters. There was a loss of 365,000 eggs and fry, or approximately 3.8 per cent.

No eggs were collected at that station in 1920, owing to the fact that the water-supply pipe line had to be renewed, an entire complement of new hatching troughs provided, and a new foundation put under the hatchery building. As this work could be done satisfactorily only in the summer months, it was necessary to suspend fish-cultural work for the season.

AFOGNAK.

Out of the 79,178,000 red-salmon eggs taken at the Afognak station in 1919, a shipment of 7,000,000 eyed eggs was made to the Bureau's station at Quinault, Wash., and another of 3,000,000 to the Oregon State hatchery at Bonneville. From the eggs remaining there were hatched and liberated in Afognak Lake 61,524,000 fry. The loss was 7,654,000 eggs and fry, or approximately 9.6 per cent.

In 1920 a total of 62,300,000 red-salmon eggs was collected by September 24. Spawn taking was stopped at that time by high water, which damaged the retaining racks and allowed the escape of all un-

spawned salmon, thus materially affecting the possible take of eggs. The run of salmon was reported as being equal to that of 1919, or sufficient to have yielded a quantity of eggs far in excess of the capacity of the hatchery.

FORTMANN.

The Alaska Packers Association operated the hatchery at Heckman Lake, on Revillagigedo Island, as heretofore. In 1919 a collection of 18,420,000 red-salmon eggs was made, from which 17,070,000 fry were hatched and planted in the Naha stream system. The loss during incubation was 1,350,000, or approximately 7.3 per cent.

Egg collecting in 1920 began September 4 and ended November 11. In that time 18,240,000 red-salmon eggs were obtained. In addition 360,000 humpback-salmon eggs were also taken.

QUADRA.

The Quadra hatchery on Hugh Smith Lake is owned by the Northwestern Fisheries Co. Out of the 11,710,000 red-salmon eggs taken in 1919, there were hatched and liberated 11,357,000 fry, the loss being 353,000, or 3 per cent.

Egg taking in 1920 began August 5 and ended October 28, resulting in a collection of 19,450,000, an increase of more than 71 per cent over 1919.

JUNEAU.

The Alaska Territorial Fish Commission operates a hatchery in a rented building at Juneau. The plant appears to be modern and is equipped with concrete troughs. No ponds, however, are available for rearing purposes. The commission began this work in 1919, and in 1920 the capacity of the hatchery was enlarged to handle 10,000,000 salmon eggs.

In 1919 the commission reported the collection of salmon eggs as follows: Cohos, 10,540,000; chums, 3,425,000; and humpback, 890,000—a total of 14,855,000. Of the resulting product, 6,815,000 were distributed as eyed eggs and 5,250,000 as fertilized eggs, while 2,110,000 were distributed as fry. The loss in eyeing and hatching was 680,000. The distributions occurred in waters on Admiralty and Baranof Islands and streams on the mainland in the Juneau region.

In 1920 the commission reported a collection of 17,020,000 salmon eggs, of which 6,460,000 were cohos, 5,250,000 chums, 4,640,000 humpbacks, and 670,000 reds. Of these, irrespective of species, 4,885,000 were planted as eyed eggs, 6,500,000 as fertilized eggs, and 2,919,000 were distributed as fry. The loss of eggs held through the period of incubation was 846,000, or a little more than 8 per cent. By species, these distributions were cohos, 5,730,000; chums, 5,000,000; humpbacks, 3,410,000; and reds, 134,000. The fry remaining in the hatchery totaled 1,900,000.

GENERAL STATISTICS OF THE FISHERIES IN 1920.

The total investment in the fisheries of Alaska in 1920 was \$70,986,221, or \$3,195,339 less than in 1919. Approximately 89 per cent

of this amount was invested in the salmon industry. Employment was given to 27,482 persons or 1,052 less than in 1919. The total value of the products in 1920 was \$41,492,124, a decrease of \$8,789,940, or approximately 17½ per cent. The important factor in this reduced production was the smaller pack of salmon in southeast Alaska.

SUMMARY OF INVESTMENTS IN THE FISHERIES OF ALASKA IN 1920.

Industries.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Salmon canning.....	\$30,153,798	\$14,058,952	\$18,337,977	\$62,550,727
Salmon mild-curing.....	213,632			213,632
Salmon pickling.....	9,800	500	288,321	298,681
Salmon dry salting.....			45,232	45,232
Salmon by-products.....	375,127			375,127
Halibut fishery.....	2,270,722			2,270,722
Herring fishery.....	443,346	949,006	4,260	1,396,612
Cod fishery.....		1,639,453	418,275	2,057,728
Whale fishery.....	535,709	88,904	1,076,297	1,700,910
Crab fishery.....	550	200		750
Shrimp fishery.....	76,100			76,100
Total.....	34,078,784	16,737,075	20,170,362	70,986,221

SUMMARY OF PERSONS ENGAGED IN THE FISHERIES OF ALASKA IN 1920.

Races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Whites.....	6,029	3,048	5,775	16,052
Natives.....	2,442	874	417	3,733
Chinese.....	1,115	563	691	2,369
Japanese.....	1,071	273	101	1,445
Filipinos.....	862	358	367	1,587
Mexicans.....	278	174	1,227	1,679
Negroes.....	24	53	230	307
Miscellaneous.....	184	19	107	310
Total.....	12,605	5,962	8,915	27,482

SUMMARY OF PRODUCTS OF THE ALASKAN FISHERIES IN 1920.

Products.	Quantity.	Value.
Salmon:		
Canned.....cases	4,429,463	\$35,602,800
Mild-cured.....pounds	1,857,800	364,219
Pickled.....do	964,400	104,873
Frozen.....do	1,916,595	161,143
Fresh.....do	3,248,081	283,264
Dry salted.....do	224,840	37,535
Dried and smoked.....do	20,000	3,250
By-products, oil.....gallons	39,052	16,370
By-products, fertilizer.....pounds	1,773,000	88,382
Halibut:		
Fresh.....do	7,500,763	1,034,380
Frozen.....do	7,788,017	692,343
Canned.....do	720	75
Herring:		
Canned, 1-pound cans.....cases	3,602	28,980
Fresh for food.....pounds	2,400	105
Fresh for bait.....do	1,559,100	21,167
Frozen for bait.....do	2,525,700	20,027
Pickled, Scotch cure.....do	8,223,480	490,485
Pickled, spiced.....do	8,000	400
Pickled, Norwegian cure.....do	314,619	22,109
Fertilizer.....do	6,078,000	316,161
Oil.....gallons	681,067	404,090

SUMMARY OF PRODUCTS OF THE ALASKAN FISHERIES IN 1920—Continued.

Products.	Quantity.	Value.
Cod:		
Dry salted.....pounds..	10, 837, 321	\$932, 110
Pickled.....do.....	1, 895, 638	181, 647
Fresh.....do.....	565	23
Stockfish.....do.....	12, 775	2, 300
Tongues.....do.....	17, 600	1, 384
Whales:		
Oil.....gallons..	765, 309	304, 256
Sperm oil.....do.....	343, 611	131, 783
Fertilizer, meat.....pounds..	2, 436, 000	101, 105
Fertilizer, bone.....do.....	754, 000	18, 815
Bone.....do.....	17, 484	6, 118
Ivory.....do.....	750	225
Clams.....cases..	6, 833	46, 812
Trout:		
Canned.....do.....	470	2, 384
Fresh and frozen.....pounds..	74, 470	11, 128
Pickled.....do.....	2, 000	150
Sablefish.....do.....	584, 251	28, 544
Crabs:		
Canned.....cases..	70	1, 050
Fresh.....pounds..	6, 350	690
Shrimps.....do.....	112, 045	49, 123
Miscellaneous fresh fish.....do.....	11, 073	229
Total.....		1 41, 492, 124

¹ These figures represent the value of the manufactured product. It is estimated that the value of the catch to the fishermen is approximately \$12,000,000.

SALMON INDUSTRY.

The most prominent features of the salmon industry growing out of the operations of 1920 are (1) the continued falling off in the catch of salmon in southeast Alaska and (2) the increase in production in both central and western Alaska. But the catch of salmon in any district may not be a sufficient indicator of the condition of the fisheries therein unless considered in connection with the character of fishing activities, the amount of gear used, length of season, and the intensiveness of operations. Nor can an accurate analysis of the condition of the fisheries be made until the position and influence of these factors are determined; and even then there are other factors of less prominence which may have an important bearing on the question, as, for instance, the application of restrictive measures designed to afford more protection to the runs of salmon.

Consideration of certain pack figures in the southeastern district for a number of years back may be of interest. From 1912 to and including 1920 the pack of canned salmon in southeast Alaska did not vary markedly, except from 1916 to 1917 and from 1919 to 1920. The first of these movements was upward, with an increase of more than 1,000,000 cases in 1917; the second marked change occurred in 1920, when there was a decrease of almost 900,000 cases from the previous year. In the three seasons of 1917, 1918, and 1919 the production of salmon in southeast Alaska reached its peak. In 1920 the production may be considered as normal, upon the basis of the general average pack for a series of years, and was not exceeded in the period from 1910 to 1916, inclusive, except in 1915.

In central Alaska there was an increase in the pack of all species of salmon except chums, and the total catch of salmon in that dis-

tract in 1920 has been exceeded but once, and then in 1918, when the necessities of war seemed to demand the largest possible output.

Results in the Bristol Bay district of western Alaska show an improvement over 1919. To a large extent the increased pack was due to a much larger run of salmon in the Port Moller region than for several years. The pack in other parts of western Alaska, particularly the Yukon and Kuskokwim Rivers, was less than in 1919.

SALMON CATCH AND FORMS OF GEAR.

Approximately 99 per cent of the commercial catch of salmon in Alaska in 1920 was made by seines, gill nets, and pound nets, while less than 1 per cent was taken with dip nets, lines, and wheels. Records show that 712 seines were used in 1920, the total length of which was 117,111 fathoms. This is 88 less than the number operated in 1919, and a decrease of 20,173 fathoms in the total length of seines. Of the number used, southeast Alaska was credited with 510, central Alaska with 189, and western Alaska with 13. There were 88,013 fathoms of seine webbing used in southeast Alaska, and the average length of each seine was 172 fathoms; in central Alaska 25,698 fathoms were used, the average per seine being 136 fathoms; in western Alaska 3,400 fathoms were operated, with an average of 261 fathoms per seine.

Statistics show that 4,597 gill nets, having a total length of 475,214 fathoms, were used in the salmon fisheries of Alaska in 1920. Of this number, 351 nets, or 41,780 fathoms of webbing, were used in southeast Alaska; 1,469 nets, or 89,217 fathoms, were used in central Alaska; and 2,777 nets, or 344,217 fathoms, were operated in western Alaska. This is an increase of 477 gill nets, or 15,277 fathoms, over the number used in 1919, when 4,120 nets, or 459,937 fathoms of webbing, were operated.

Statistics also show that 653 pound nets were operated in the salmon industry in 1920, as compared with 630 in 1919. There were 445 driven traps, a decrease of 39, and 208 floating traps, an increase of 62. Southeast Alaska leads with 287 driven traps, 14 less than in 1919, and 197 floating traps, an increase of 54 over the number used in the preceding season; central Alaska had 150 driven and 11 floating traps, which was, respectively, 22 less and 8 more than the number used in 1919; western Alaska had 8 driven traps, or 3 less than in 1919. The rapidly increasing use of floating traps in southeast and central Alaska and the decreasing use of pile traps in all districts are noteworthy developments of the year.

Considering Alaska as a whole, the number of fathoms of seines used in 1920 was approximately 15 per cent less than in 1919; there was an increase of 3 per cent in the number of fathoms of gill nets and 3½ per cent increase in the number of pound nets operated in 1920 over that of 1919.

Of the total catch of salmon in 1920, seines took 26½ per cent, gill nets approximately 20 per cent, and pound nets approximately 53 per cent. In 1919 the catch by apparatus was: Seines 36 per cent, gill nets 19 per cent, and pound nets 42 per cent. The change in 1920 was a decrease in catch by seines of 9½ per cent and an increase by gill nets of 1 per cent and by pound nets of 11 per cent. The following

table shows the proportionate catch by districts according to the principal kinds of apparatus:

PERCENTAGE OF SALMON CAUGHT IN EACH ALASKA DISTRICT, BY PRINCIPAL FORMS OF APPARATUS.

Apparatus.	Southeast Alaska.		Central Alaska.		Western Alaska.	
	1919	1920	1919	1920	1919	1920
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Seines.....	46	30	31	34	3	6
Pound nets.....	49	66	50	59	4	8
Gill nets.....	2	2	18	7	92	86

In 1920 the production of salmon in Alaska was 65,080,539 as compared with 58,172,665 in 1919, an increase of approximately 12 per cent. The decrease in southeastern Alaska was 6,446,220, or a little more than 16 per cent. In central Alaska there was an increase of 9,836,712, or approximately 101 per cent; in the western district the increase was 3,517,382, or approximately 40 per cent. The striking development of the season was the large catch of salmon in central Alaska, it being next to the largest ever recorded for that district, the catch of 1918 alone exceeding it. Considering Alaska as a whole, the 1920 catch shows that in comparison with that of 1919, cohos decreased 538,987, chums decreased 2,065,483, humpbacks increased 6,217,635, kings decreased 192,525, and reds increased 3,487,194.

SALMON TAKEN IN 1920, BY APPARATUS AND SPECIES, FOR EACH GEOGRAPHIC SECTION OF ALASKA.

Apparatus and species.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Seines:				
Coho, or silver.....	284, 106	85, 014	2, 790	371, 910
Chum, or keta.....	4, 264, 032	308, 537	3, 622	4, 576, 191
Humpback, or pink.....	4, 618, 516	4, 362, 069	.....	8, 980, 585
King, or spring.....	6, 540	2, 187	8, 257	16, 984
Red, or sockeye.....	795, 631	1, 864, 565	701, 682	3, 421, 878
Total.....	9, 968, 825	6, 622, 372	776, 351	17, 367, 548
Gill nets:				
Coho, or silver.....	163, 521	130, 211	160, 125	453, 857
Chum, or keta.....	60, 243	6, 002	581, 470	647, 715
Humpback, or pink.....	73, 898	74, 940	937, 335	1, 086, 173
King, or spring.....	60, 295	22, 320	189, 252	271, 867
Red, or sockeye.....	392, 882	1, 113, 349	8, 787, 047	10, 294, 178
Total.....	750, 839	1, 346, 822	10, 656, 129	12, 753, 790
Pound nets:				
Coho, or silver.....	552, 972	445, 828	6, 360	1, 005, 160
Chum, or keta.....	3, 884, 559	1, 163, 062	42, 110	4, 889, 731
Humpback, or pink.....	16, 232, 881	5, 546, 058	266, 914	22, 045, 853
King, or spring.....	54, 080	48, 550	11, 816	114, 446
Red, or sockeye.....	1, 441, 224	4, 268, 363	649, 867	6, 359, 454
Total.....	21, 065, 716	11, 471, 861	977, 087	34, 414, 664
Lines:				
Coho, or silver.....	44, 710	.....	.....	44, 710
King, or spring.....	366, 510	.....	.....	366, 510
Total.....	411, 220	.....	.....	411, 220

SALMON TAKEN IN 1920, BY APPARATUS AND SPECIES, FOR EACH GEOGRAPHIC SECTION OF ALASKA—Continued.

Apparatus and species.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Dip nets:				
Coho, or silver.....		15, 202		15, 202
King, or spring.....		5, 660		5, 660
Red, or sockeye.....		112, 415		112, 415
Total.....		133, 277		133, 277
Wheels: Chum, or keta.....	40			40
Total:				
Coho, or silver.....	1, 045, 309	676, 255	169, 295	1, 890, 859
Chum, or keta.....	8, 008, 874	1, 477, 601	627, 202	10, 113, 677
Humpback, or pink.....	20, 925, 295	9, 983, 067	1, 204, 249	32, 112, 611
King, or spring.....	487, 425	78, 717	209, 325	775, 467
Red, or sockeye.....	2, 629, 737	7, 358, 092	10, 199, 496	20, 187, 925
Grand total.....	33, 096, 640	19, 574, 332	12, 409, 567	65, 080, 539

SALMON CANNING.

CHANGES IN CANNERIES.

Three changes occurred in the ownership of canneries in Alaska in 1920. The plant of the Tee Harbor Packing Co., at Tee Harbor, was purchased by the Alaska Pacific Fisheries; the Pavlof Harbor Packing Co. acquired the cannery of the Alaska Packing & Navigation Co. at Pavlof Harbor; the Tenakee Fisheries Co. transferred its plant at Tenakee to the Standard Salmon Packers (Inc.); and the Sockeye Salmon Co. leased its cannery on Isanotski Strait to P. E. Harris & Co. The Everett Packing Co. operated its cannery at Herendeen Bay in the interest of the Herendeen Bay Consolidated Canneries. The Thlinket Packing Co. changed its name to the Thlinket Packing Corporation.

NEW CANNERIES.¹

There were 16 new salmon canneries in Alaska in 1920, 8 of which were opened and operated in southeast Alaska.

In the central district seven new canneries were operated in 1920.

In western Alaska one new cannery, which had been constructed by the Alaska Packers Association in 1919, was put in operation in 1920.

In addition to these plants Robert J. Peratovich put up a small pack by hand at Bayview, Prince of Wales Island, and W. J. O'Connor packed a few cases on the Yukon River delta.

CANNERIES NOT OPERATED.

There were 10 idle canneries in Alaska in 1920, of which 5 were in southeast Alaska, 2 in central, and 3 in western Alaska. The cannery of the Fidalgo Island Packing Co., at Herendeen Bay, was

¹ New canneries are indicated by an asterisk (*) in the table on page 50.

dismantled and will not be operated again. The inactive plants were owned and located as follows:

Alaska Fish Co.....	Waterfall.
Cape Fanshaw Fish & Packing Co. (Inc.).....	Cape Fanshaw.
Columbia Salmon Co.....	Craig.
Southern Alaska Canning Co.....	Quadra Bay.
Northwestern Fisheries Co.....	Hunter Bay.
	Orca.
	Seldovia.
Nelson Lagoon Packing Co.....	Nelson Lagoon.
Phoenix Packing Co.....	Herendeen Bay.
Midnight Sun Packing Co.....	Kotzebue Sound.

TOTAL CANNERIES OPERATED.

There were 146 salmon canneries operated in Alaska in 1920, as compared with 134 in 1919, of which 82 were located in southeast Alaska, 36 in central Alaska, and 28 in western Alaska. This is an increase of six in both the southeastern and central districts, while the number in western Alaska remains unchanged.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH, 1920.

[New canneries indicated by (*).]

Company.	Canneries.		Pound nets.
	Num-ber.	Location.	
Southeast Alaska:			
Ainsworth-Dunn Co.....	1	Floating *	1 20
Alaska Herring & Sardine Co.....	1	Port Walter.....	1 9
Alaska Pacific Fisheries.....	3	Chomley.....	1 6
		Tee Harbor.....	1 13
		Yes Bay.....	1 11
Alaska Packers Association.....	2	Loring.....	1 8
		Wrangell.....	1 8
Alaska Salmon & Herring Packers.....	1	Tyce.....	1
Alaska Sanitary Packing Co.....	2	Cape Fanshaw.....	5
		Wrangell.....	5
Alaska Union Fisheries (Inc.).....	1	Port Conclusion *	2
American Packing Co.....	1	Juneau.....	1 2
Anacortes Fisheries Co.....	2	Kasaan.....	1 8
		Shakan.....	1 3
Annette Island Packing Co.....	1	Metlakatla.....	7
Astoria & Puget Sound Canning Co.....	1	Excursion Inlet.....	1 12
Auk Bay Salmon Canning Co.....	1	Auk Bay.....	6
Baranof Packing Co.....	1	Red Bluff Bay.....	1
F. C. Barnes Co.....	1	Lako Bay.....	1
Beauclaire Packing Co.....	1	Port Beauclere.....	2
Beegle Packing Co.....	1	Ketchikan.....	1 5
Burnett Inlet Packing Co.....	1	Burnett Inlet.....	1 6
Cape Flattery Fisheries Co.....	1	Floating *	1
John L. Carlson & Co.....	1	Auk Bay.....	1 5
Chilkat Packing Co.....	1	Haines *.....	1 1
Columbia Salmon Co.....	1	Tenakee Inlet.....	1 8
Deep Sea Salmon Co.....	2	Ford Arm.....	1 8
		Port Althorp.....	1 25
Douglas Island Packing Co.....	1	Douglas.....	1
Fidalgo Island Packing Co.....	2	Ketchikan.....	1 12
		Pillar Bay.....	1
George Inlet Packing Co.....	1	George Inlet.....	2
Haines Packing Co.....	1	Latinkof Cove.....	1
P. E. Harris & Co.....	1	Hawk Inlet.....	10 19
Hidden Inlet Canning Co.....	2	Hidden Inlet.....	1 5
		Hood Bay.....	1 4
Hood Bay Packing Co.....	1	Hood Bay.....	1

¹ Seventeen floating.

² Four floating.

³ Three floating

⁴ Eight floating.

⁵ Six floating.

⁶ Seven floating.

⁷ One floating.

⁸ Two floating.

⁹ All floating.

¹⁰ Nine floating.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH, 1920—Continued.

Company.	Canneries.		Pound nets.
	Number.	Location.	
Southeast Alaska—Continued.			
Hoonah Packing Co.	2	Gambier Bay	15
		Hoonah	13
G. W. Hume Co.	2	Nakat Harbor	6
		Scow Bay	3
Karheen Packing Co.	1	Karheen	5
Ketchikan Packing Co.	1	Ketchikan	2
Libby, McNeill & Libby.	2	Taku Harbor	18
		Yakutat	
Marathon Fishing & Packing Co.	1	Cape Fanshaw	3
Mount Baker Packing Co.	1	Floating *	
Mountain Point Packing Co.	1	Wrangell Narrows	
Mutual Packing Co.	1	Floating *	
Geo. T. Myers & Co.	1	Chatham	10
Northern Packing Co. (Inc.)	1	Juneau	
North Pacific Trading & Packing Co.	1	Klawak	31
		Dundas Bay	9
		Quadra	7
		Roe Point	7
Northwestern Fisheries Co.	4	Santa Ana	
		Steamboat Bay	
		Floating	
		Excursion Inlet	13
Noyes Island Packing Co.	1	Pavlof Harbor	
Olympic Fisheries Co.	1	Pavlof Harbor	
Pacific American Fisheries	1	Petersburg	13
Pavlof Harbor Packing Co.	1	Washington Bay	9
Petersburg Packing Corporation.	2	Point Warde	
		Ketchikan	15
Point Warde Packing Co.	1	Sitka	3
Pure Food Fish Co.	1	Ketchikan *	
Pybus Bay Fish & Packing Co.	1	Kake	14
Pyramid Packing Co.	1	Sitka	
Revilla Packing Co.	1	Ketchikan	8
Sanborn-Cutting Co.	1	Big Port Walter	10
Sitka Packing Co.	1	Rose Inlet	5
J. L. Smiley & Co.	1	Tenakee Inlet	2
Southern Alaska Canning Co.	2	Moira Sound	
		Skowl Arm	
Standard Salmon Packers (Inc.)	1	Wrangell Narrows*	
Starr Collinson Packing Co.	1	Ketchikan	8
Straits Packing Co.	1	Heceta Island	13
E. R. Strand	1	Funter Bay	21
Sunny Point Packing Co.	1	Todd	5
Swift Arthur Crosby Co.	1	Union Bay	5
Thlinket Packing Corporation	1	Ward Cove	3
Todd Packing Co.	1		
Union Bay Fisheries Co.	1		
Ward's Cove Packing Co.	1		
Central Alaska:			
Alaska Packers Association	4	Alitak	16
		Chignik	4
		Kasilof	14
		Larsen Bay	
Alaska Sea Food Co.	1	Point Whitsbed	74
Alitak Packing Co.	1	Lazy Bay	4
Arctic Packing Co.	1	English Bay *	
Bainbridge Fisheries Co.	1	Evans Island **	1
Canoe Pass Packing Co.	1	Shepard Point	5
Carlisle Packing Co.	1	Cordova	8
Central Alaska Fisheries	1	Drier Bay*	1
Columbia River Packers' Association.	1	Chignik	4
Copper River Packing Co.	1	McClure Bay	7
Eyak River Packing Co.	1	Eyak River	
Fidalgo Island Packing Co.	1	Port Graham	7
P. E. Harris & Co.	1	Isanotski Strait	3
Hayes-Graham Fish Co.	1	Floating*	
Hillery-Scott Co.	1	Cordova	1
Hoonah Packing Co.	1	Bering River	4
Kadiak Fisheries Co.	1	Kodiak	1
Kenai Packing Co.	1	Drier Bay	2
King Salmon Fisheries Co.	1	Unakwik Inlet*	74
Libby, McNeill & Libby.	1	Kenai	13
F. H. Madden	1	Abercrombie	
Moore Packing Co.	1	Orca Inlet	3

1 One floating.
 2 Five floating.

3 All floating.
 4 Four floating.

5 Six floating.
 6 Three floating.

7 Two floating.
 8 Twelve floating.

COMPANIES CANNING SALMON IN ALASKA, NUMBER AND LOCATION OF CANNERIES OPERATED, AND NUMBER OF POUND NETS OWNED BY EACH, 1920—Continued.

Company.	Canneries.		Pound nets.
	Number.	Location.	
Central Alaska—Continued.			
Northwestern Fisheries Co.	3	Chignik	4
		Kenai	14
		Uyak	7
Pacific American Fisheries	2	Ikatan	7
		King Cove	9
Pioneer Packing Co.	1	Cordova	7
San Juan Fishing & Packing Co.	1	Seward	2
Shumagin Packing Co.	1	Squaw Harbor*	6
Surf Packing Co.	1	Chisik Island	2
Valdez Packing Co.	1	Valdez	15
Seldovia Canning Co.	1	Seldovia*	3
Western Alaska:			
Alaska Packers Association	9	Kvichak River (2)	
		Naknek River (3)	
		Nushagak River (2)	1
		Ugagak River	
		Ugashik River*	
Alaska-Portland Packers' Association	2	Naknek	
		Nushagak Bay	2
Alaska Salmon Co.	1	Wood River	
Bristol Bay Packing Co.	1	Kvichak River	
Carlisle Packing Co.	1	Kwiguk Slough	
Columbia River Packers' Association	1	Nushagak Bay	
Everett Packing Co.	1	Herendeen Bay	
		Ekuk	
		Kvichak Bay	
Libby, McNeill & Libby	6	Libbyville	
		Lockanok	
		Nushagak	
		Ugagak River	
Naknek Packing Co.	1	Naknek River	
Northwestern Fisheries Co.	2	Naknek River	
		Nushagak	
Pacific American Fisheries	1	Port Moller	5
Red Salmon Canning Co.	2	Naknek River	
		Ugashik River	

* One floating.

LOSSES AND DISASTERS IN THE SALMON-CANNING INDUSTRY.

The loss of property by those interested in the salmon industry of Alaska in 1920 was unusually heavy. Four disastrous fires occurred in the southeastern district. The first fire occurred on May 25, before canning had commenced, and it destroyed the cannery of the Mountain Point Packing Co., on Wrangell Narrows, which with the machinery, fishing gear, and floating equipment was valued at \$60,998. The plant was not rebuilt during the season.

The other three fires occurred in August, and entailed considerably heavier losses, being the cause of the destruction of much larger plants at each of which several thousand cases of salmon had been packed and were stored. All of these canneries were located in the southern part of the southeastern district, and were burned in the same month.

The cannery of the Straits Packing Co., at Skowl Arm, including warehouse and equipment, fishing gear in stock, all other stock, and 4,000 cases of canned salmon, was burned on August 6. The total loss was reported as being \$150,000.

On August 20 practically the entire plant of the Hidden Inlet Canning Co. at Hidden Inlet was destroyed by fire, entailing a loss in buildings, supplies, equipment, and canned salmon of \$217,823.

The burning of the Nakat Inlet cannery of the G. W. Hume Co. occurred on August 28. Buildings and fishing gear valued at \$75,000 were lost.

The Chinese quarters at the Roe Point cannery of the Northwest Fisheries Co. were burned, at a loss of \$4,635.

The vessel losses in southeastern Alaska aggregated \$35,660, chief of which was that of the barge *Dashing Wave*, owned by Libby, McNeill & Libby, and valued at \$15,000.

A rather heavy loss of fishing apparatus was also reported, which in the aggregate was valued at \$80,288. Of this amount, \$67,238 represented the value of traps that were destroyed.

Property losses in central Alaska amounted to \$22,544, the major part of which consisted of fishing apparatus. In western Alaska losses of property having a total value of \$126,966 were reported, of which \$88,802 was charged under vessels and floating equipment, \$31,664 to fishing apparatus, and \$6,500 to buildings and wharves. The notable item in these losses was that of the ship *Chas. E. Moody*, owned by the Northwestern Fisheries Co., and valued at \$80,000.

In 1920 the total loss of property in the salmon industry throughout Alaska was reported as \$773,914, of which approximately 81 per cent was sustained by operators in the southeastern district. The loss of life in this industry was considerably greater than in 1919. In southeastern Alaska 1 fisherman, 3 shoresmen, and 1 transporter met accidental death; in central Alaska 2 shoresmen and 1 transporter were killed and 2 transporters were drowned; in western Alaska 11 fishermen and 2 shoresmen were drowned and 2 shoresmen were killed.

STATISTICS.

There were operated in Alaska in 1920 a total of 146 salmon canneries, 12 more than in 1919. Several of them were small floating plants. The investment in the salmon-canning industry was \$62,550,727, a decrease of \$3,944,444. There was a decline of \$3,588,093 in southeast Alaska and \$1,517,356 in western Alaska. In central Alaska the investment increased \$1,161,005.

The canning industry gave employment to 24,423 persons, or 1,076 less than in 1919. Whites decreased 345, natives 126, Chinese 401, Japanese 39, and Mexicans 214. Filipinos increased 10, and miscellaneous, including Negroes, 39.

The pack of canned salmon was 4,429,463 cases, valued at \$35,602,800, a decrease of 154,225 cases in the pack and of \$7,662,549 in value of the products of 1920 as compared with those of 1919. This is a decline of approximately $3\frac{1}{2}$ per cent in production and $17\frac{3}{4}$ per cent in value from 1919. These decreases in quantity and value of products are directly and entirely due to the smaller pack in southeast Alaska, as in both the other districts the pack was larger than in 1919. A comparison of the pack in 1920 with that in 1919, by districts, shows that southeast Alaska dropped from 3,119,260 cases to 2,225,011, a decrease of 894,249 cases; central Alaska increased from 771,907 to 1,337,448, a gain of 565,541 cases; and western Alaska

increased from 692,521 to 867,004, an advance of 174,483 cases. A further comparison of the pack by species for 1919 and 1920 in Alaska as a whole shows that cohos decreased from 232,870 to 192,085 cases, a decline of 40,785 cases; chums decreased from 1,365,563 to 1,033,517, a drop of 332,046 cases; humpbacks decreased from 1,611,608 to 1,593,120, a drop of 18,488 cases; kings increased from 95,986 to 110,003, a gain of 14,017 cases; and reds advanced from 1,277,661 to 1,500,738, a gain of 223,077 cases.

INVESTMENT IN THE SALMON-CANNING INDUSTRY IN 1920.

Item.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Canneries operated.....	82	\$6,914,906	36	\$2,832,902	28	\$4,885,074	146	\$14,632,882
Working capital.....		10,350,339		4,702,152		3,764,804		18,817,295
Wages paid.....		5,635,911		3,337,521		4,567,020		13,540,452
Vessels:								
Power vessels over								
5 tons.....	382	2,801,915	110	1,023,750	75	1,939,076	567	5,764,741
Net tonnage.....	7,405		2,613		7,664		17,682	
Sailing.....	2	65,000	7	325,199	32	1,295,300	41	1,685,499
Net tonnage.....	3,004		10,788		47,220		61,012	
Barges.....	1	6,377					1	6,377
Net tonnage.....	1,354						1,354	
Launches, under								
tonnage.....	131	157,919	171	180,874	42	146,801	344	485,594
Boats, row and sail	1,234	100,135	915	128,720	1,538	651,074	3,687	885,929
Lighters, scows,								
and houseboats.....	430	420,359	270	288,417	197	445,910	897	1,154,716
Pile drivers and								
pile pullers.....	68	505,491	44	212,715	25	85,905	137	804,111
Apparatus:								
Beach seines.....	107	50,954	115	47,043			222	97,997
Fathoms.....	11,643		14,959				26,602	
Purse seines.....	402	332,824	73	40,543	13	22,700	488	396,067
Fathoms.....	76,295		10,689		3,400		90,394	
Gill nets.....	343	65,492	1,469	140,163	2,616	499,313	4,428	704,968
Fathoms.....	39,455		89,217		332,275		460,947	
Pound nets, driven	285	2,157,806	150	767,083	8	35,000	443	2,959,889
Pound nets, float-								
ing.....	197	582,340	11	28,511			208	610,851
Dip nets.....			184	603			184	603
Lines.....				2,756				2,756
Total.....		30,153,798		14,058,952		18,337,977		62,550,727

PERSONS ENGAGED IN THE SALMON-CANNING INDUSTRY IN 1920.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Fishermen:				
Whites.....	1,832	1,283	2,802	5,917
Natives.....	1,240	292	75	1,616
Miscellaneous ¹	74			74
Total.....	3,155	1,575	2,937	7,667
Shoresmen:				
Whites.....	2,628	1,156	2,251	6,035
Natives.....	1,085	539	227	1,851
Chinese.....	1,115	593	691	2,399
Japanese.....	1,018	273	101	1,392
Filipinos.....	892	358	397	1,587
Mexicans.....	264	174	1,214	1,652
Negroes.....	24	53	230	307
Miscellaneous ¹	59	18	106	183
Total.....	7,055	3,134	5,187	15,376

¹ Koreans, Porto Ricans, Kanakas, etc.

PERSONS ENGAGED IN THE SALMON-CANNING INDUSTRY IN 1920—Continued.

Occupations and races.	Southeast Alaska.	Central Alaska.	Western Alaska.	Total.
Transporters:				
Whites.....	812	295	204	1,311
Natives.....	17	18	6	41
Miscellaneous ¹	26	1	1	28
Total.....	855	314	211	1,380
Grand total:				
Whites.....	5,272	2,734	5,317	13,323
Natives.....	2,351	849	308	3,508
Chinese.....	1,115	563	691	2,369
Japanese.....	1,018	273	101	1,392
Filipinos.....	862	358	367	1,587
Mexicans.....	264	174	1,214	1,652
Negroes.....	24	53	230	307
Miscellaneous ¹	159	19	107	285
Total.....	11,065	5,023	8,335	24,423

¹ Koreans, Porto Ricans, Kanakas, etc.OUTPUT OF CANNED SALMON IN 1920.¹

Product.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Cases.	Value.	Cases.	Value.	Cases.	Value. ^b	Cases.	Value.
Coho, or silver:								
½-pound flat.....	7,602	\$91,541	1,267	\$14,733	46	\$55	8,915	\$106,832
1-pound flat.....	8,395	80,295	1,314	14,454	1,037	10,997	10,746	105,746
1-pound tall.....	95,951	831,599	64,660	595,230	11,813	114,463	172,424	1,541,292
Total.....	111,948	1,003,435	67,241	624,417	12,896	126,018	192,085	1,753,870
Chum, or keta:								
½-pound flat.....	53	394					53	394
1-pound flat.....	44,582	154,353	1,585	7,291			46,167	161,644
1-pound tall.....	792,480	3,298,390	141,715	620,692	53,102	255,531	987,297	4,174,613
Total.....	837,115	3,453,137	143,300	627,983	53,102	255,531	1,033,517	4,336,651
Humpback, or pink:								
½-pound flat.....	18,277	145,749	693	5,900			18,970	151,649
1-pound flat.....	58,265	324,353	17,752	81,659			76,017	406,012
1-pound tall.....	931,095	5,112,406	498,532	2,662,343	68,506	386,640	1,498,133	8,161,389
Total.....	1,007,637	5,582,508	516,977	2,749,902	68,506	386,640	1,593,120	8,719,050
King, or spring:								
½-pound flat.....	5,203	85,533	1,922	32,042	3,071	52,812	10,196	171,287
1-pound flat.....	3,611	45,344	1,887	21,677	12,821	194,872	18,319	261,893
1-pound tall.....	37,316	313,552	18,769	158,435	25,403	302,061	81,488	774,048
Total.....	46,130	444,429	22,578	213,054	41,295	549,775	110,003	1,207,228
Red, or sockeye:								
½-pound flat.....	46,031	847,564	43,867	773,138	11,818	226,040	101,716	1,846,742
1-pound flat.....	21,378	277,802	51,497	693,054	47,272	630,700	120,147	1,601,556
1-pound tall.....	154,772	1,776,092	491,988	6,280,839	632,115	8,080,772	1,278,875	16,137,703
Total.....	222,181	2,901,458	587,352	7,747,031	691,205	8,937,512	1,500,738	19,586,001
Grand total.....	2,225,011	13,384,967	1,337,448	11,962,387	867,004	10,255,446	4,429,463	35,602,800

¹ Cases containing ½-pound cans have been reduced one-half in number, and thus, for the purpose of affording fair comparison, all are put upon the basis of 48 1-pound cans per case.

OUTPUT OF CANNED SALMON IN ALASKA, 1914 TO 1920.¹

Product.	1914	1915	1916	1917	1918	1919	1920	Total.
<i>Coho, or silver:</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>	<i>Cases.</i>
½-pound flat.....	4, 379	2, 050	13, 145	30, 412	26, 238	8, 719	8, 915	95, 058
1-pound flat.....	285	2, 338	8, 101	302	12, 786	10, 438	10, 746	45, 140
1-pound tall.....	152, 199	119, 880	240, 573	162, 457	179, 934	212, 713	172, 424	1, 240, 180
Total.....	157, 063	124, 268	261, 909	193, 231	218, 958	232, 870	192, 085	1, 380, 384
<i>Chum, or keta:</i>								
½-pound flat.....	373		1, 423	26, 760	3, 559	3, 981	53	36, 149
1-pound flat.....	5, 868	317		2, 530	2, 096		46, 167	57, 578
1-pound tall.....	657, 918	479, 629	722, 692	877, 457	1, 358, 405	1, 361, 582	987, 297	6, 444, 980
Total.....	663, 859	479, 946	724, 115	906, 747	1, 364, 960	1, 365, 563	1, 033, 517	6, 538, 707
<i>Humpback, or pink:</i>								
½-pound flat.....	2, 103	4, 325	41, 491	91, 403	63, 557	28, 185	18, 970	250, 034
1-pound flat.....	9, 286	3, 508	14, 796	6, 014	20, 215	7, 553	76, 017	137, 389
1-pound tall.....	974, 660	1, 867, 683	1, 681, 506	2, 199, 559	2, 355, 182	1, 575, 870	1, 498, 133	12, 152, 593
Total.....	986, 049	1, 875, 516	1, 737, 793	2, 206, 976	2, 438, 954	1, 611, 608	1, 593, 120	12, 540, 016
<i>King, or spring:</i>								
½-pound flat.....	3, 143	2, 404	2, 617	12, 973	6, 000	7, 584	10, 196	44, 917
1-pound flat.....	4, 804	3, 755	3, 804	5, 133	5, 267	11, 532	18, 319	52, 614
1-pound tall.....	40, 092	82, 092	59, 452	43, 845	37, 959	76, 870	81, 488	421, 798
Total.....	48, 039	88, 251	65, 873	61, 951	49, 226	95, 986	110, 003	519, 329
<i>Rod, or sockeye:</i>								
½-pound flat.....	53, 825	52, 033	81, 565	124, 309	137, 008	122, 236	101, 710	672, 692
1-pound flat.....	64, 671	112, 847	86, 395	89, 612	151, 864	110, 491	120, 147	736, 027
1-pound tall.....	2, 083, 147	1, 765, 139	1, 936, 971	2, 274, 460	2, 244, 865	1, 944, 934	1, 278, 875	12, 628, 391
1½-pound nominals.....		2, 293						2, 293
2-pound nominals.....			6, 006					6, 006
Total.....	2, 201, 643	1, 932, 312	2, 110, 937	2, 488, 381	2, 533, 737	1, 277, 661	1, 500, 738	14, 045, 409
Grand total.....	4, 056, 653	4, 500, 293	4, 900, 627	5, 947, 286	6, 605, 835	4, 583, 688	4, 420, 463	35, 023, 845

¹The number of cases shown has been put upon the common basis of 48 1-pound cans per case.

AVERAGE ANNUAL PRICE PER CASE OF FORTY-EIGHT 1-POUND CANS OF SALMON, 1910 TO 1920.

Product.	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
<i>Coho, or silver.....</i>	\$4.89	\$5.67	\$4.44	\$3.45	\$4.39	\$4.31	\$5.34	\$8.76	\$9.15	\$11.27	\$9.13
<i>Chum, or keta.....</i>	3.04	3.72	2.37	2.21	3.37	2.59	3.34	6.14	6.27	6.82	4.19
<i>Humpback, or pink.....</i>	3.15	3.94	2.55	2.58	3.50	2.78	3.64	6.44	6.58	8.35	5.47
<i>King, or spring.....</i>	5.34	6.48	5.37	4.04	5.01	4.63	5.36	10.40	9.85	13.13	10.97
<i>Red, or sockeye.....</i>	5.30	6.33	5.45	4.54	5.58	5.82	6.04	9.48	9.44	12.98	13.05

MILD CURING OF SALMON.

The business of mild curing salmon in Alaska fell off materially in 1920, evidence of which is found not only in the smaller pack but also in the withdrawal of six of the largest operators in 1919. Conspicuous among those who withdrew were the Pacific Mild Cure Co., with eight plants, the Columbia & Northern Fishing & Packing Co., Vendsyssel Packing Co., Columbia Salmon Co., and M. B. Dahl & Co. H. R. Thompson, of Ketchikan, was the only important mild curer of last year who continued operations in 1920. The mild curers of 1920 who packed more than 100 tierces each are shown in the following list:

Wrangell Cooperative Association.....	Wrangell.
Atlantic & Pacific Fisheries Co.....	Port Alexander.
Alaska Union Fisheries (Inc.).....	Port Alexander.

H. R. Thompson.....Ketchikan.
 Karl Hansen.....Port Alexander.
 Carlisle Packing Co.....Yukon River.

The total investment in the mild-cure salmon industry was \$213,632. Employment was given to 357 persons. The mild-cure products were 2,295 tierces of king salmon, valued at \$364,219, of which 2,120 tierces were prepared in southeastern Alaska, 26 in central, and 149 in the western district.

INVESTMENT, PERSONS ENGAGED, AND PRODUCTS OF ALASKA SALMON MILD-CURING INDUSTRY IN 1920.

Items.	Tierces.	Number.	Value.
INVESTMENT.			
Plants (all floating).....		4	\$5,600
Operating capital.....			149,677
Vessels:			
Power, over 5 tons.....		7	28,200
Net tonnage.....		86	
Launches under 5 tons.....		4	5,700
Other boats and skiffs.....		12	5,850
Lighters.....		1	1,500
Apparatus:			
Lines.....		657	1,405
Gill nets.....		8	3,700
Fathoms.....		2,325	
Pound nets.....		2	12,000
Total.....			213,632
PERSONS ENGAGED.¹			
Fishermen:			
Whites.....		306	
Natives.....		10	
Total.....		316	
Shoresmen: Whites.....		28	
Transporters: Whites.....		13	
Grand total.....		357	
PRODUCTS.			
Southeast Alaska: King salmon.....	2,120	<i>Pounds.</i> 1,717,800	341,429
Central Alaska: King salmon.....	26	20,800	5,000
Western Alaska: King salmon.....	149	119,200	17,790
Total.....	2,295	1,857,800	364,219

¹ Southeast Alaska only.

SALMON PICKLING.

The pickling of salmon as a branch of the salmon industry is rapidly losing its importance. Since 1918 there has been a shrinkage in investment of \$1,064,836, or 78 per cent, and in production from 56,890 barrels of salmon to 4,822 barrels, or 91.6 per cent. As compared with the situation in 1919, the investment fell off approximately 50 per cent, or from \$590,422 to \$298,681, and production 41 per cent, from 8,110 barrels valued at \$195,447 to 4,822 barrels valued at \$104,873. From an industry employing 815 men in 1918 and 267 in 1919, it has shrunk until only 157 were employed in 1920, all but 2 of whom were credited to western Alaska. The most noticeable changes occurred in central Alaska. In 1919 that district showed approximately 40 per cent of the capital invested in this industry, whereas in 1920 no salteries were operated and no investment reported. Of the two companies listed in that district a year ago, the

Shumagin Packing Co. changed to the canning business, while the Universal By-Products Co. did not operate. Western Alaska produced 85 per cent of the pack of pickled salmon in 1920, the most conspicuous operators being Libby, McNeill & Libby, Bering Sea Salmon Packing Co., Golden Gate Salmon Co., Peter M. Nelson, and Alaska Salmon Co.

Statistics regarding the salmon-pickling industry in 1920 appear in the following table:

INVESTMENT, PERSONS ENGAGED, AND PRODUCTS OF ALASKA SALMON-PICKLING INDUSTRY IN 1920.

Items.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
INVESTMENT.								
Salteries.....	No. 1	\$3,000			No. 6	\$70,547	No. 7	\$78,547
Operating capital.....						106,336		106,336
Vessels:								
Sailing.....					2	50,000	2	50,000
Net tonnage.....					719		719	
Launches.....	1	1,500	1	\$500	11	34,056	13	36,056
Gill net boats.....					33	10,175	33	10,175
Rowboats and skiffs.....					8	615	8	615
Lighters and scows.....					5	3,900	5	3,900
Pile drivers.....					1	250	1	250
Apparatus:								
Haul seines.....	1	300	1	60			2	360
Fathoms.....	75		50				125	
Gill nets.....					161	11,942	161	11,942
Fathoms.....					9,620		9,620	
Wheels.....					2	500	2	500
Total.....		9,800		560		288,321		293,681
PERSONS ENGAGED.								
Fishermen:								
Whites.....			2		60		62	
Natives.....					3		3	
Total.....			2		63		65	
Shoresmen:								
Whites.....					43		43	
Natives.....					26		26	
Mexicans.....					13		13	
Total.....					82		82	
Transporters: Whites.....					10		10	
Grand total.....			2		155		157	
PRODUCTS.¹								
	<i>Barrels</i>		<i>Barrels</i>		<i>Barrels</i>		<i>Barrels</i>	
Coho, or silver.....	110	2,160	183	3,880	109	2,090	402	8,130
Chum, or keta.....	105	1,400			119	2,360	224	3,760
Humpback, or pink.....	61	882			135	1,400	166	2,282
King, or spring.....	100	2,000	8	160	144	3,201	252	5,361
Red, or sockeye.....	164	3,280	6	150	3,678	81,910	3,748	85,340
Total.....	540	9,722	197	4,190	4,085	90,961	4,822	104,873

¹ Each barrel holds 200 pounds of fish.

SALMON FREEZING.

The freezing of salmon in 1920 was carried on as a business of secondary importance by six companies primarily engaged in other branches of the fishery industry of Alaska. These companies, operating seven plants, reported an output of frozen salmon of 1,916,595

pounds, valued at \$161,143, an increase of 364,115 pounds in production and \$30,788 in value over corresponding quantities and values for 1919. This business represents no investment as distinguishable from that of the major activities of the companies concerned.

The output of frozen salmon was prepared by the following companies: Libby, McNeill & Libby, Sunny Point Packing Co., National Independent Fisheries Co., New England Fish Co., San Juan Fishing & Packing Co., and Booth Fisheries Co.

QUANTITY AND VALUE OF SALMON FROZEN IN ALASKA IN 1920, BY SPECIES.

Species.	Pounds.	Value.
Coho, or silver.....	134, 134	\$10, 624
Chum, or keta.....	448, 634	19, 049
Humpback, or piuk.....	105, 816	7, 276
King, or spring.....	1, 143, 765	115, 770
Red, or sockeye.....	84, 246	8, 424
Total.....	1, 916, 595	161, 143

FRESH SALMON.

The trade in fresh salmon in Alaska declined markedly in 1920 as compared with 1919, a condition doubtless due to the shortened supply and the greater demand for salmon by the canneries. As heretofore, this business was carried on almost wholly in southeastern Alaska and by operators more particularly engaged in other branches of the fishery industry. The bulk of the trade was represented by the business of the firms listed below:

Hoonah Packing Co.....	Hoonah.
Wrangell Cooperative Association.....	Wrangell.
Annette Island Packing Co.....	Metlakatla.
National Independent Fisheries Co.....	{ Juneau.
H. Bergman.....	{ Ketchikan.
Atlantic & Pacific Fisheries Co.....	{ Ketchikan.
Petersburg Cooperative Association.....	{ Port Alexander.
Ripley Fish Co.....	{ Douglas.
H. R. Thompson.....	{ Petersburg.
Juneau Cold Storage Co.....	{ Wrangell.
San Juan Fishing & Packing Co.....	{ Petersburg.
Karl Hansen.....	{ Ketchikan.
	{ Ketchikan.
	{ Juneau.
	{ Ketchikan.
	{ Port Alexander.

The total quantity of salmon sold fresh was 3,248,081 pounds, valued at \$263,264. This is 38 per cent less than the production in 1919.

PRODUCTS OF ALASKA FRESH-SALMON TRADE IN 1920.

Species.	Pounds.	Value.
Coho, or silver.....	273, 020	\$11, 784
Chum, or keta.....	242, 444	9, 052
Humpback, or piuk.....	203, 444	3, 122
King, or spring.....	2, 474, 733	234, 474
Red, or sockeye.....	54, 440	4, 832
Total.....	3, 248, 081	263, 264

DRY SALTING OF SALMON.

The Kuskokwim Salmon Co., which was formed as a consolidation of the interests of the Kuskokwim Fishing & Transportation Co. and the Northern Fisheries (Inc.), on the Kuskokwim River, was engaged in the packing of dry-salted salmon in Alaska in 1920. The investment in miscellaneous supplies, small boats, fishing apparatus, and wages amounted to \$45,232. Employment was given to 28 whites and 15 natives. The products were as follows:

PRODUCTS OF THE DRY-SALTING SALMON BUSINESS IN ALASKA IN 1920.

Species.	Pounds.	Value.
Coho, or silver.....	42,200	\$4,642
Chum, or keta.....	7,800	881
King, or spring.....	152,640	28,440
Red, or sockeye.....	22,200	3,572
Total.....	224,840	37,535

There was an increase in production over 1919 of 12,596 pounds of dry-salted salmon, and in value of \$19,934.

DRYING AND SMOKING OF SALMON.

As a commercial undertaking the drying and smoking of salmon in 1920 was unimportant; the only reported products of that kind were 15,000 pounds of kippered salmon, valued at \$3,000, prepared by the Juneau Cold Storage Co., at Juneau, and 5,000 pounds of humpback salmon, valued at \$250, dried at Uyak by Peter Petrovsky.

Whites and natives living along the larger rivers of Alaska dry or smoke considerable quantities of salmon annually for local uses, but reliable figures of the number so used were not obtainable. These methods of preparing salmon were practiced chiefly in the Yukon Valley, where the inhabitants depend largely on such products for human needs and for dog food. In the coastal regions of Alaska, particularly those localities where winter temperatures are comparatively moderate, very limited quantities of salmon are dried or smoked. The possibility of taking cod and other sea foods at practically any time of the year obviates the necessity of preparing other fishery products for winter use.

SALMON BY-PRODUCTS.

The utilization of offal and waste material at the salmon canneries in Alaska in the manufacture of oil and fertilizer as a branch of the salmon industry revived somewhat in 1920, and was centered wholly in the southeastern district. Three companies were engaged exclusively in this business, while four were primarily concerned in the canning of salmon. In the first category are the Fish Canners' By-Products Co., which resumed operations at Ward Cove; the Alaska Reduction Co., which established a plant at Hawk Inlet; and the Petersburg By-Products Co., which operated at Scow Bay; in the other class were the Alaska Herring & Sardine Co., at Port

Walter; John L. Carlson & Co., at Auk Bay; Hoonah Packing Co., at Hoonah; and the Pacific American Fisheries, at Excursion Inlet and Ikatan.

The investment in this industry amounted to \$375,127. Employment was given to 90 whites, 23 natives, 13 Mexicans, and 13 others, or a total of 139 men.

In 1920 there were produced as salmon by-products 889 tons of fertilizer, valued at \$88,382, and 39,052 gallons of oil, valued at \$16,370. The total value of these products was \$104,752, an increase of \$85,106 over the value of similar products in 1919.

HALIBUT FISHERY.

Halibut are taken on banks of the North Pacific Ocean by vessels from ports of Washington, British Columbia, and Alaska. American vessels deliver their fares indiscriminately in those regions, controlling factors in the selection of a port of delivery being the market price of halibut and the cost of supplies. As the bulk of the catch of halibut in 1920 from Pacific waters was made on the high seas, beyond the jurisdiction of any country, Alaska is credited only with so much of the catch as was landed at her ports. Ordinarily this apportionment of the catch would tend to reduce the amount shown as the product of Alaska, for in recent years there was a marked diversion of fares to the more southerly ports, but in 1920 this condition was not so evident, there being a notable increase in the quantity of halibut handled through Alaskan ports. Deliveries in 1920 exceeded those of 1919 by 1,016,709 pounds.

STATISTICAL SUMMARY.

In arriving at the investment in the halibut industry as credited to Alaska an estimate was made of the value of all vessels, including apparatus, which made one or more landings of fares at ports in Alaska. In the same manner an estimate was made of the number of persons employed in this industry. On this basis the investment is given as \$2,270,722, an increase of \$291,265. The number of persons employed in the halibut fishery was 768, as against 867 in 1919. The production in 1920 was 15,295,500 pounds, valued at \$1,726,798, as compared with 14,278,791 pounds, valued at \$1,550,605, in 1919.

The companies which handled the bulk of the halibut exported from Alaska were the National Independent Fisheries Co., at Juneau and Ketchikan; Jack Bailey, Pacific Sea Products Association (Inc.), New England Fish Co., and the Ripley Fish Co., at Ketchikan; San Juan Fishing & Packing Co., at Seward and Ketchikan; and the Booth Fisheries Co., at Sitka.

INVESTMENT, PERSONS ENGAGED, AND PRODUCTS OF ALASKA HALIBUT FISHERY
IN 1920.

Item.	Quantity.	Value.	Item.	Quantity.	Value.
INVESTMENT.			PERSONS ENGAGED.		
Fishing vessels:	<i>Number.</i>		Whites.....	<i>Number.</i>	
Steam and gas.....	102	\$1,281,246	Natives.....	744	
Net tonnage.....	1,954			24	
Launches.....	35	53,400			
Dories and scows.....	155	11,700	Total.....	768	
Fishing apparatus.....		86,124			
Shore property.....		357,833	PRODUCTS.		
Cash capital.....		480,419		<i>Pounds.</i>	
Total.....		2,270,722	Fresh (including local).....	7,506,763	\$1,034,380
			Frozen.....	7,788,017	692,343
			Canned (15 cases).....	720	75
			Total.....	15,295,500	1,726,798

HERRING FISHERY.

In the aggregate, the production of herring in Alaska in 1920 was greater than ever before, but there was a wide variation in the quantity of certain products as compared with the previous year. In 1919 approximately 52 per cent of the catch of herring was used in the preparation of pickled and canned herring and other food products. In 1920 almost 80 per cent of the catch of herring was used as bait or in the manufacture of fertilizer and oil. Of 15 companies handling herring in southeast Alaska, 7 were primarily operators of reduction plants, 6 were handling herring exclusively for bait, and 2, the smallest operators of all, were engaged wholly in the preparation of food products. In central Alaska the situation was decidedly different. There were 13 operators, all of whom were chiefly engaged in the preparation of food products, while 2 operated reduction works in connection with or supplemental to the packing of pickled herring. All herring taken in western Alaska were pickled; the limited output resulted from the operations of three packers at Golovin Bay.

STATISTICAL SUMMARY.

The herring industry shows an investment in Alaska of \$1,396,612, an increase of 55 per cent over the investment in 1919. Employment was given to 376 persons, as compared with 427 in 1919. Products were valued at \$1,303,614, as against \$1,676,170 in 1919, a decrease of \$372,556. Out of a total of 8,751,405 pounds of food products, approximately 94 per cent was prepared as Scotch-cured herring. This was an increase from 7,718,985 pounds in 1919 to 8,223,490 pounds in 1920, or 6½ per cent.

In the same period the Norwegian-cured product decreased from 2,216,120 pounds to 344,619 pounds, or approximately 84½ per cent.

INVESTMENT, PERSONS ENGAGED, AND PRODUCTS OF ALASKA HERBING FISHERY IN 1920.

Item.	Southeast Alaska.		Central Alaska.		Western Alaska.		Total.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
INVESTMENT.								
Plants operated.....	5	\$139,670	7	\$284,828	2	.....	14	\$424,498
Operating capital.....		243,694		549,443		\$3,050		793,187
Vessels:								
Power vessels over 5 tons.	8	35,433	11	63,500			19	98,933
Net tonnage.....	195	2,000	233	8,300			428	10,300
Launches under 5 tons.	1	1,400	6	2,835			7	4,315
Boats, row and seine.	15	4,900	36	9,100	1	80	52	14,000
Lighters and scows.	3	1,500	1	3,000			11	4,500
Pile drivers.....	1	.....	1	.....			2	.....
Apparatus:								
Beach seines.....	4	2,300	9	7,050			13	9,350
Fathoms.....	215	.....	1,135	.....			1,350	.....
Purse seines.....	8	12,449	9	18,500	1	350	18	31,299
Fathoms.....	1,510	.....	1,770	.....	100	.....	3,380	.....
Gill nets.....			17	2,450	24	780	41	3,230
Fathoms.....			850	.....	400	.....	1,250	.....
Total.....		443,346		949,006		4,260		1,396,612
PERSONS ENGAGED.								
Fishermen:								
Whites.....	52	.....	67	.....			119	.....
Natives.....	2	.....		.....	1	.....	3	.....
Others.....	4	.....		.....			4	.....
Total.....	58	.....	67	.....	1	.....	126	.....
Shoemen:								
Whites.....	42	.....	166	.....			208	.....
Natives.....	27	.....	1	.....	2	.....	30	.....
Others.....	8	.....		.....			8	.....
Total.....	77	.....	167	.....	2	.....	246	.....
Transporters: Whites.....			4	.....			4	.....
Grand total.....	135	.....	238	.....	3	.....	376	.....
PRODUCTS.								
Canned (1-pound cans).....							1,362	28,980
Fresh for food.....							2,400	105
Fresh for bait.....							1,559,100	21,167
Frozen for bait.....							2,525,700	20,027
Pickled for food, Scotch cure.							8,223,490	490,485
Pickled for food, spiced.							8,000	400
Pickled for food, Norwegian cure.							344,019	22,199
Fertilizer.....							6,078,000	316,161
Oil.....							681,067	404,090
Total.....								1,303,614

¹ Cases.² Pounds.³ Gallons.

COD FISHERY.

The changes of note in the cod industry of Alaska in 1920 were increases in production of 17 per cent, 14 per cent in number of persons employed, and 60 per cent in investment. These expansions are recorded notwithstanding the withdrawal of J. A. Matheson, of Anacortes, Wash., who for many years was listed as an important operator in the vessel fishery of western Alaska. The Bering Sea Fisheries Co. appears as a new concern in this industry, but in reality it is understood to be only an organization of the interests previously

shown under the name of Lars Mikkelsen. Operations by the Pacific American Fisheries in the vicinity of Unimak Island and W. J. Erskine Co. in the Kodiak region account largely for the increased production of cod in 1920 over that of 1919. It is noteworthy that approximately 28 per cent of the cod taken in Alaskan waters was reported as of shore-station catch. Generally the smaller producers of cod are the operators of shore stations only.

The Alaska cod industry is facing a decline of serious proportions in view of the active competition which has developed rather recently through deliveries of cod by Japanese vessels. Under present conditions this competition bids fair to increase to the great disadvantage of the Alaska cod industry.

VESSEL FISHERY.

Owing to the withdrawal of J. A. Matheson, the schooner *Fanny Dutard* does not appear in the list of vessels forming the cod fleet of 1920. The *Chas. R. Wilson*, a schooner heretofore listed as one of the vessels of the Pacific Coast Codfish Co., was also withdrawn from the Alaska field. Offsetting these withdrawals are two notable additions to the list of vessels in the fleet of 1920. One was that of the schooner *S. N. Castle*, belonging to the Alaska Codfish Co., and the other that of the schooner *Carolyn Frances*, owned by the Union Fish Co., which company further increased its fleet by adding the schooners *Eunice*, *Mary E.*, *Chas. E. Brown*, and the power schooner *Progress*. The W. J. Erskine Co. reported nine small vessels engaged in cod fishing at Kodiak, two of which were listed in 1919. The Alaska Codfish Co. added the *Alasco IV* to its fleet of small power vessels in Alaska.

The fleet in 1920 was composed of 36 vessels, 16 of which were schooners of more than 100 tons register. This is an increase of 11 over the number listed in 1919. The total tonnage of the fleet in 1920 was 5,171 net tons, as compared with 4,234 net tons in 1919.

SHORE STATIONS.

The important shore stations of Alaska were operated and located as follows: O. Kraft & Son at Kodiak; the Union Fish Co. and the Alaska Codfish Co. at several stations in the Shumagin and Sanak Islands; the Bering Sea Fisheries Co. at Unga; and four stations in the Aleutian Islands Reservation.

ALASKA COD FLEET IN 1920.

Name.	Rig.	Net tonnage.	Operators.
City of Papeete.....	Schooner.....	370	Alaska Codfish Co., San Francisco, Calif.
Glendale.....	do.....	281	Do.
Maweema.....	do.....	392	Do.
S. N. Castle.....	do.....	464	Do.
Alasco.....	Power schooner.....	23	Do.
Alasco II.....	do.....	5	Do.
Alasco III.....	do.....	8	Do.
Alasco IV.....	do.....	14	Do.
Trio.....	do.....	9	Alaska Ocean Food Co., Seattle, Wash.
Dora.....	Steamer.....	217	Bering Sea Fisheries Co., Seattle, Wash.
Lister.....	Power schooner.....	15	W. J. Erskine Co., Kodiak, Alaska.
Pilgrim.....	do.....	8	Do.
Northern King.....	do.....	8	Do.
Patmos.....	do.....	17	Do.

ALASKA COD FLEET IN 1920—Continued.

Name.	Rig.	Net tonnage.	Operators.
Edith.....	Power schooner.....	7	W. J. Erskine Co., Kodiak, Alaska.
Buffalo.....	do.....	15	Do.
Flossie.....	do.....	6	Do.
Nimrod.....	do.....	8	Do.
North Star.....	do.....	15	Do.
John A.....	Schooner.....	235	Pacific Coast Codfish Co., Seattle, Wash.
Maid of Orleans.....	do.....	171	Do.
Alice.....	do.....	220	Robinson Fisheries Co., Anacortes, Wash.
Wawona.....	do.....	413	Do.
Golden State.....	Power schooner.....	223	Union Fish Co., San Francisco, Calif.
Eunice.....	Schooner.....	35	Do.
Progress.....	Power schooner.....	115	Do.
Mary E.....	do.....	21	Do.
Chas. E. Brown.....	Schooner.....	64	Do.
Carolyn Frances.....	do.....	422	Do.
Sequola.....	do.....	324	Do.
Gallice.....	do.....	328	Do.
Boulah.....	do.....	339	Do.
Louise.....	do.....	328	Do.
Martha.....	do.....	14	Do.
Pirate.....	Power schooner.....	30	Do.
Union Flag.....	do.....	7	Do.

STATISTICAL SUMMARY.

The total investment in the cod industry of Alaska in 1920 was \$2,057,728, as compared with \$1,286,075 in 1919, an increase of \$771,653. Employment was given to 803 men, as against 702 in 1919. The production of cod in 1920 was 12,763,899 pounds, valued at \$1,117,464, being an increase over the output of 1919 by 1,870,587 pounds and \$291,474 in value.

INVESTMENT, PERSONS ENGAGED, AND PRODUCTS OF ALASKA COD FISHERY IN 1920.

Item.	Quantity.	Value.	Item.	Quantity.	Value.
INVESTMENT.			PERSONS ENGAGED—contd.		
Value of shore stations.....	<i>Number.</i>	\$405, 583	Transporters: Whites.....	<i>Number.</i> 41	.....
Cost of operations.....		490, 220	Grand total.....	803	.....
Wages paid.....		440, 384	PRODUCTS.		
Vessels:			Vessel catch:	<i>Pounds.</i>	
Power vessels over 5 tons.....	20	232, 912	Dry-salted cod.....	8, 887, 330	\$712, 948
Net tonnage.....	767		Pickled cod.....	168, 730	10, 123
Sailing.....	16	380, 074	Fresh cod.....	565	23
Net tonnage.....	4, 400		Tongues.....	10, 600	1, 244
Launches.....	115	67, 373	Total.....	9, 073, 234	724, 338
Dories.....	371	17, 761	Shore-station catch:		
Pile drivers.....	3	3, 603	Dry-salted cod.....	1, 949, 082	219, 162
Apparatus:			Pickled cod.....	1, 726, 908	171, 524
Seines (75 fathoms).....	1	250	Stockfish.....	12, 775	2, 300
Gill nets (75 fathoms).....	1	105	Tongues.....	1, 000	140
Lines.....	472	19, 364	Total.....	3, 690, 665	393, 126
Total.....		2, 057, 728	Total:		
PERSONS ENGAGED.			Dry-salted cod.....	10, 837, 321	932, 110
Fishermen:			Pickled cod.....	1, 895, 638	181, 647
Whites.....	695	.....	Fresh cod.....	565	23
Natives.....	38	.....	Stockfish.....	12, 775	2, 300
Total.....	733	.....	Tongues.....	17, 600	1, 384
Shoresmen:			Grand total.....	12, 763, 899	1, 117, 464
Whites.....	27	.....		
Natives.....	2	.....		
Total.....	29	.....		

The known losses in the cod industry were comparatively small. Three fishermen were drowned and one shoresman was accidentally killed. The loss of small boats and fishing tackle, valued at \$10,461, and the loss of the steamer *Dora*, owned by the Bering Sea Fisheries Co., and valued at \$50,000, were reported. The *Dora* was wrecked on December 20, 1920, at Hardy Bay, on the northeast coast of Vancouver Island, B. C., and thus, after 40 years of almost continuous service, at times under very trying conditions, there was lost the most historic vessel plying Alaskan waters.

WHALE FISHERY.

SHORE STATIONS.

Whaling operations in Alaska in 1920 were carried on by four companies, namely, United States Whaling Co., at Port Armstrong; North Pacific Sea Products Co., at Akutan; J. A. Magill & Co., at Beluga River, on Cook Inlet; and the Arctic Whaling & Fishing Co., at Golovin Bay.

The North Pacific Sea Products Co. operated four steam whaling vessels, the *Kodiak* and *Unimak* (each 99 tons net), *Tanginak* (71 tons net), and the *Paterson* (77 tons net). It also used the barge *Fresno* (1,149 tons net) and the steamer *Elihu Thomson* (449 tons net) as transporting vessels. Its operations were carried on in the waters of the Pacific Ocean and Bering Sea contiguous to the Aleutian Islands. Four species of whales were taken—the finback, humpback, sulphur-bottom, and sperm—almost half of the catch being finbacks. A total of 290 whales was taken by this company.

The United States Whaling Co. operated in the coastal waters of southeastern Alaska from Dixon Entrance to Cross Sound, the important hunting ground paralleling the coast at an approximate distance of 25 miles. Three steam whaling vessels were engaged in the hunting of whales. They were *Star I* (133 tons net) and *Star II* and *Star III* (each 97 tons net). A total of 139 whales was taken. Five species were represented, the sei whale being secured in addition to the four species taken in western Alaska.

J. A. Magill & Co. operated the plant on Beluga River, formerly controlled by the Beluga Whaling Co. This company captured 100 belugas or white whales, this being by far the most successful season experienced at that station.

The Arctic Whaling & Fishing Co. operated in the vicinity of Nome and succeeded in capturing 136 belugas.

STATISTICAL SUMMARY.

The whaling industry of Alaska shows an investment of \$1,700,910 in 1920, a decrease of \$89,957 from 1919. It gave employment to 318 men, or 7 more than in 1919. Whale products were valued at \$562,302, as compared with \$1,027,200 in 1919. The total number of whales taken was 665, or 85 more than in the preceeding season.

INVESTMENT, PERSONS ENGAGED, AND PRODUCTS OF ALASKA SHORE WHALING OPERATIONS IN 1919.

Items.	Number.	Value.	Items.	Number.	Value.
INVESTMENT.			PRODUCTS.		
Vessels:			Whales:		
Steam and gas.....	9	\$471,000	Finback.....	179	
Net tonnage.....	1,121		Humpback.....	75	
Barge.....	1	30,000	Sulphur-bottom.....	81	
Net tonnage.....	1,149		Sperm.....	90	
Launches under 5 tons.....	5	6,400	Sei.....	4	
Row boats.....	19	1,360	Beluga.....	236	
Scows.....	5	2,800	Total.....	665	
Pile driver.....	1	150			
Value of plants.....		368,246	Whale oil.....	1 765,309	\$304,250
Cash capital.....		546,946	Sperm oil.....	1 343,611	131,783
Wages paid.....		276,008	Fertilizer, meat.....	2 1,218	101,105
Total.....		1,700,910	Fertilizer, bone.....	3 377	18,816
PERSONS ENGAGED.			Whalebone.....	2 17,484	6,118
Whites.....	239		Ivory, sperm.....	3 750	225
Natives.....	46		Total.....		562,302
Japanese.....	33				
Total.....	318				

1 Gallons.

2 Tons.

3 Pounds.

CLAM CANNING.

A few years ago the canning of clams in Alaska gave promise of becoming an industry of some consequence, as it was then generally held that the areas occupied by clams were reasonably extensive, fairly accessible, and that they might support an independent industry for some time to come; but to date almost no attempt has been made to develop clam fisheries at any other locality than the Cordova district. Production in that field began to decline in 1919. The results of operations in 1920, with only one company packing clams at Cordova as against three in 1918, show that this decline is still in progress. In addition to the exhaustion of the clam beds it was also apparent that the increasing cost of the raw product to the packers was a vital factor in the life of the industry. Owing to the diminution in the supply of clams the diggers encountered greater difficulty in making wages, which necessitated a demand from them for a higher rate per pound for clams.

Clam canning was carried on by the Pioneer Packing Co., at Cordova; Surf Packing Co., at Chisik Island, Cook Inlet; and the Douglas Island Packing Co., at Douglas. These companies were also engaged in canning salmon, for which reason the plant investment is credited to that industry. There were employed 57 diggers, to whom wages amounting to \$9,387 were paid. A total of 6,833 cases of clams and clam juice was prepared, the value of which was \$46,812.

PRODUCTS OF ALASKA CLAM-CANNING INDUSTRY IN 1920.

Items.	Cases.	Value.
Minced clams:		
1-pound cans (48 per case).....	424	\$3,384
No. 1 eastern oyster cans (48 per case).....	5,876	41,132
1-pound cans (48 per case).....	17	136
2-pound cans.....	380	1,748
Clam juice, 8-pound cans.....	136	412
Total.....	6,833	46,812

MINOR FISHERIES.

TROUT.

The output of trout in Alaska in 1920 was practically equal in quantity and value to that of 1919, when it was valued at \$13,155 as against \$13,662 in the past year. Southeastern Alaska led in production, as approximately but 20 per cent of the catch came from central and western Alaska, as compared with 27 per cent from those districts in 1919 and 79 per cent in 1918. The chief factor contributing to this result was the continued closure of the cannery of the Midnight Sun Packing Co., at Kotzebue Sound, where a few thousand cases of Dolly Vardens were canned annually prior to 1919.

The bulk of the catch of both steelhead and Dolly Varden trout was handled as fresh or frozen fish by the Ripley Fish Co., and Libby, McNeill & Libby, in southeastern Alaska. All canned trout came from central and western Alaska. No investment is credited to this business, as all operations were incidental to halibut and salmon industries.

PRODUCTS OF ALASKA TROUT FISHERY IN 1920.

Section and species.	Fresh.		Frozen.		Pickled.		Canned.	
	Pounds.	Value.	Pounds.	Value.	Barrels.	Value.	Cases.	Value.
Southeast Alaska:								
Steelhead.....	26,751	\$1,414	17,344	\$2,601	.....	.....	.....	.....
Dolly Varden.....	26,326	6,726	250	25	5	\$75	.....	.....
Total.....	53,077	8,140	17,594	2,626	5	75	.....	.....
Central:								
Steelhead.....	.....	.....	.....	.....	.....	.....	427	\$2,126
Dolly Varden.....	3,420	342	379	20	5	75	.....	.....
Total.....	3,420	342	379	20	5	75	427	2,126
Western Alaska: Dolly Var-								
den.....	.....	.....	.....	.....	.....	.....	43	258
Grand total.....	56,497	8,482	17,973	2,646	10	150	470	2,384

SABLEFISH.

As may be generally known, the catch of sablefish each year is made almost wholly by halibut fishermen operating in the offshore waters of Alaska, and the quantity reported annually fluctuates with market demands and the willingness of the fishermen to utilize space in their boats for sablefish which might be filled more profitably with

halibut. In 1920 the production of sablefish reached a total of 584,251 pounds, valued at \$28,544. There was an increase of 74,882 pounds in products but a decline of \$6,941 in value from the corresponding figures reported in 1919. Statistics show that 565,926 pounds, valued at \$27,770, were frozen; 3,000 pounds, valued at \$140, were pickled; and 15,325 pounds, valued at \$634, were shipped fresh to the States.

CRABS.

Some change was noted in 1920 with respect to the utilization of crabs in Alaska. The Arctic Packing Co. and Eda O. Kitzman canned experimentally a few cases of crabs at Seldovia, in central Alaska. John Murphy, at Tenakee, was the only operator engaged in crab fishing in southeastern Alaska. The investment in the crab fishery was \$750. The products were 70 cases of canned crabs, valued at \$1,050, and 6,350 pounds of crabs sold fresh for \$690. The total value of all crab products was \$1,740.

SHRIMPS.

Encouraging interest in the shrimp fishery of southeastern Alaska was manifested in 1920 by the Alaskan Glacier Sea Food Co., at Petersburg. The investment in the shrimp industry was reported as \$76,100, of which amount \$24,500 was paid in wages to 14 whites, 5 natives, 20 Japanese, and 1 Mexican. Four boats and six trawls, valued at \$29,600, were operated in this fishery. The total production of shrimp was 112,045 pounds, valued at \$49,123. The products of this fishery were more than double those of 1919, and it would therefore seem that the competition of the southern shrimp fisheries had not seriously affected operations in Alaska.

MISCELLANEOUS FISHERY PRODUCTS.

This classification of products includes red rockfish, flatfish, and smelts. Products aggregated 11,073 pounds, valued at \$229, practically all of which were frozen.

FUR-SEAL INDUSTRY.

PRIBILOF ISLANDS.

GENERAL ADMINISTRATIVE WORK.

In 1920 the work of the Bureau at the Pribilof Islands was carried on in the usual manner. Sealing operations were upon practically the same scale as in the previous year, but a more extensive study of experimental methods in taking and curing skins was made, the results of which will be applied upon a commercial scale in succeeding seasons. The take of pelts from the blue fox herds was the largest for many years. Progress was made in construction work, additional housing facilities being provided for natives on St. Paul Island and increased salt house and workshop space on both islands to handle larger takes of fur-seal and fox skins. The census of the fur-seal herd was taken as usual. The annual supplies for the islands were transported chiefly by the Navy Department, but considerable assistance was given by Coast Guard vessels, and the Bureau's vessel *Eider* rendered valuable service between Unalaska and the Pribilofs.

PERSONNEL.

Effective July 1, Agent and Caretaker A. H. Proctor, of St. Paul Island, was appointed to the new position of superintendent, Pribilof Islands, to have general direction of the work on the two islands. Storekeeper H. D. Aller, who had been detailed to the Washington office during the previous winter, was appointed agent and caretaker of St. Paul Island, arriving there October 26 on the U. S. S. *Saturn*. When Agent and Caretaker Charles E. Crompton left for the States September 9 on the *Saturn*, St. George Island was placed in charge of Storekeeper E. C. Johnston. After taking leave of absence, Mr. Crompton proceeded east via St. Louis, arriving at the Washington office January 5, 1921, for duty through the winter. School-teacher E. C. Johnston, of St. George Island, was appointed storekeeper, effective April 27; he was succeeded by Carl E. Fletcher, who reached the island on the *Saturn* June 16, and, having tendered his resignation, left on the same vessel in October. John M. Orchard was then appointed school-teacher of St. George Island and arrived there on the *Saturn* October 29. Herschel Silverstone, assistant to the agent on St. Paul Island, tendered his resignation and left by the Coast Guard cutter *Bear* in October. Mr. Silverstone was succeeded by Henry Mygatt, who arrived on the *Saturn* October 26. Assistant Agent H. C. Scudder was appointed storekeeper on St. Paul Island, arriving there October 26. George Haley resigned as school-teacher

on St. Paul Island and left the islands on the *Saturn* in June. Mr. Haley was succeeded by Richard Culbertson, who arrived at St. Paul Island on the *Saturn* June 17. Dr. Washington C. Huyler was appointed physician for St. Paul Island, but resigned soon after his arrival and returned on the *Saturn* in November. Dr. J. J. Richstein, resigned, left St. Paul Island at the same time. Dr. G. B. Bowlby was appointed to succeed Dr. Huyler and was en route to the island via Kodiak at the close of the year. Warden Joseph N. Braun arrived at St. George Island on the *Algonquin* September 19, having been detailed for general duty there during the winter.

In the list of temporary employees was Dr. G. Dallas Hanna, curator of invertebrate paleontology at the California Academy of Sciences and formerly in the Alaska service of the Bureau, who arrived at the islands on the *Saturn* June 16 and left on the same vessel September 9; in the interim he was engaged in taking the annual census of fur seals, making several trips between the islands. Dr. H. A. Swanson was employed as a dentist for several months, spending part of his time on each island. W. C. Allis, special assistant on St. Paul Island, left there in October for a winter in the south, having been on the island since early in 1919. H. A. Peterson, sealing assistant, arrived on the *Saturn* in June and remained for the winter. Messrs. W. P. Zschorna, F. L. Milligan, O. E. Klockenbrink, M. Syron, and J. H. Quatmann, employees of Funsten Bros. & Co., of St. Louis, spent the summer on the island in connection with experimental work in improving methods of handling and salting seal-skins. Mr. Milligan spent part of his time on St. George Island. Andrew Pearson and Ole Holum, carpenters, were on hand from May until November; the former was continuously on St. Paul Island but the latter was sent to St. George Island for a few weeks.

Ward T. Bower, of the Washington office, visited the islands during the summer for the purpose of getting in closer contact with the activities there, reaching the islands July 1 and leaving July 18. Passage between the islands and King Cove was furnished by the Bureau's vessel *Eider*, and between King Cove and Seattle by commercial vessels.

PURCHASE AND TRANSPORTATION OF SUPPLIES.

As in previous seasons, printed schedules of annual supplies of general merchandise required for the Pribilof Islands were prepared and competitive bids received for the sale and delivery of the goods at Seattle, Wash. Through the courtesy of the Navy Department the radio tender *Saturn* was made available for the transportation of the annual supplies, the vessel making two trips to the islands to complete the work.

On the first trip the *Saturn* had considerable cargo for the radio stations, hence only part of the Bureau's supplies could be taken. On this voyage the vessel sailed from Seattle August 8, carrying 260 tons of general supplies, 77,000 feet of lumber, and 225 tons of coal for St. George Island; and a shipment of empty barrels, 80 tons of coal, and a few tons of general merchandise for St. Paul Island. Owing to unusually severe weather conditions, however, but very little of this cargo was discharged at the Pribilofs, the major portion

being unloaded at Dutch Harbor. The vessel then returned to Bremerton and Seattle, leaving the latter place October 13 with the balance of the supplies. This cargo, and a part of that which had been left at Dutch Harbor, was landed at the islands under adverse conditions. The lumber and some of the coal purchased for St. George Island remained at Dutch Harbor.

During the summer and fall the vessels *Unalga* and *Algonquin* of the Coast Guard very courteously assisted the islands in the transportation of coal and much-needed supplies from Unalaska and Dutch Harbor.

The Bureau's tender *Eider* made a trip to the islands in the month of September and again in October, carrying staple foodstuffs and coal to relieve the shortage which existed until the arrival of the *Saturn* on her second trip.

POWER SCHOONER "EIDER."

The Bureau's power schooner *Eider*, which was purchased and sent to Alaska late in 1919 as a tender for the Pribilof Islands, thoroughly demonstrated its value in the calendar year 1920, making in all 11 round trips between Unalaska and the islands and 2 trips to King Cove from Unalaska before it became necessary in November for the vessel to proceed to Kodiak for certain urgent repairs. All told, 7,959 miles were covered during the year. As Bering Sea is not generally navigated during the winter months and a vessel operating there would be unable to secure assistance in distress, all precautions possible were taken for the safety of the craft during periods of severe weather. Trips to the islands were made as follows: One in January, two in April, one in May, one in June, three in July, one in August, one in September, and one in October. Trips to King Cove were made in June and July.

Early in April the *Eider* transported a special shipment of 1,312 fur-seal skins and 938 fox skins from the islands to Unalaska, from which place they were taken by the commercial steamer *Victoria* to Seattle. The second trip in April from Unalaska to the islands was chiefly to deliver fuel oil for the naval radio stations. During the season the vessel transported general cargo and carried passengers for the radio stations as well as white employees and native workmen of the Bureau's service between Unalaska and the islands, and was also used at St. Paul Island to transfer salted sealskins from Northeast Point to the village. Naval stores were carried on a number of trips by the vessel. The better mail service between the islands and Unalaska, the nearest post office, was of special value.

On October 18 the *Eider* was placed under quarantine for smallpox, of which there was a rather serious outbreak at Unalaska. After the quarantine was lifted the vessel aided in landing cargo from the *Saturn* and otherwise acted as tender for that vessel until again quarantined when a case of smallpox developed aboard the *Eider* November 10. After clearing the second quarantine the *Eider* left for Kodiak November 28 for repairs and to furnish transportation to a physician for St. Paul Island on the return trip. The vessel was at Kodiak at the end of the year.

The officers and crew of the *Eider* deserve commendation for making hazardous trips to the islands during the winter season and at times of the year when no vessel ever before was at the Pribilofs.

DEPARTMENTAL ORDER REGARDING VISITING OF FUR-SEAL ROOKERIES.

For the purpose of definitely regulating the movements of persons temporarily or otherwise present at the Pribilof Islands, the following order was issued by the Secretary of Commerce on March 2, 1920, and the regulations therein were put into effect at the islands during the summer of 1920:

Section 293, Compiled Laws of Alaska, 1913, provides that it shall be unlawful for any person to land or remain on any of the Pribilof Islands, except through stress of weather or like unavoidable cause or by authority of the Secretary of Commerce.

In order that the interests of the Government may be properly served in the matter of protecting the fur-seal rookeries from unnecessary disturbance and in the matter of avoiding the driving of hauling-ground seals into the water, the following regulations are hereby promulgated:

1. Persons lawfully landing, whether to remain temporarily or otherwise, must confine themselves to their lawful activities, and any visiting of rookeries or hauling grounds of seals or sea lions must first be authorized by the Department's agents in charge.

2. In order that persons authorized or permitted to land may have an opportunity to observe seal life, the Department's agents in charge will provide escorts, when practicable, to accompany interested persons to proper observation points. No side digressions from the designated observation points will be permitted. There will be no visiting of rookeries except under such escorts. On St. Paul Island the usual observation point for persons temporarily present shall be what are commonly known as "Observation Rocks" at Gorbatch rookery.

3. Persons authorized to land at St. Paul Island, whether to remain temporarily or otherwise, are required, except under circumstances specifically authorized by the Department's agent in charge, to remain on that portion of the island in and about the village of St. Paul which is bounded by the shore line, including that of the salt lagoon and its outlet, and two straight lines running approximately as follows: The first from the shore at Black Bluffs to the southerly portion of the salt lagoon, passing to the eastward of the natives' cemetery, the natives' wells, and the by-products plant; the second to cut across the isthmus at Zolotoi Sands. The land lines as described will be indicated by notices posted at suitable intervals.

4. Any person willfully violating these regulations will be regarded as a trespasser and will be required to leave the islands at the first opportunity, or will be subject to such other action as may be deemed appropriate.

The above rules have become necessary primarily because of the great importance of nondisturbance of hauling ground seals during the few weeks of active commercial sealing when a thoughtless intrusion upon the seals of that class might mean a large financial loss to the United States. The unnecessary disturbance of seals on their breeding areas is also quite undesirable. Signs designating the limits of the unrestricted district in the vicinity of the village were posted on St. Paul Island, and on St. George Island a definite observation point was selected and marked where visitors, under escort, might see the rookery life without disturbing seals of any class.

CONSTRUCTION WORK.

Considerable construction work has been accomplished at the Pribilofs during the year. On St. Paul Island a new salt house was com-

pleted, a concrete native dwelling was built, and two frame houses for natives were completed. Some of this work had been started the previous year. A garage to house the four tractors on St. Paul Island was built. A concrete extension to the wharf was completed. There is more work to be done along this line as soon as time and funds permit. Various repairs to native dwellings, improvements at the by-products plant, the construction of outhouses, and minor matters were given attention. A road grader was sent to St. Paul Island and some work in improving roads was undertaken.

On St. George Island an extension to the wharf was completed and the landing slip was enlarged, thus facilitating the discharge of small boats lightering cargo ashore. Also some blasting was done at East Landing, thus making possible the construction of a short roadway for handling boats. Preliminary work, including completion of excavation, was done toward the construction of a combined shop and warehouse urgently necessary to provide storage and handling space for the increased take of fox skins. The kenches in the old salt house were transferred to the new salt house, thus bringing sealskin work into a single building. Alterations were made at the fox house to allow trapping, regardless of the direction of the wind.

USE OF TRACTORS.

The four tractors which were forwarded to St. Paul Island on the supply vessel late in 1919 were used during the season of 1920 with satisfactory results. They were employed, with trailers, for general hauling in and about the village, hauling sealskins from the killing fields to the salt houses and moving carcasses to the by-products plant. Also they were found to be of great value in handling the large quantities of lumber, coal, and general cargo landed from the supply ship, and which, owing to the uncertainty of weather conditions in Bering Sea, must be landed and stored as rapidly as possible. In conjunction with a road grader and trailers the tractors rendered good service in the construction of roads.

BY-PRODUCTS PLANT.

The by-products plant on St. Paul Island was operated during a part of the summer of 1920. A shortage of coal made it necessary to close the plant much earlier than had been originally intended. During the period the plant was in operation it produced approximately 19,000 pounds of fertilizer meal and 1,853 gallons of oil, of which 361 gallons were No. 1, 1,299 gallons No. 2, and 193 gallons No. 3. A shipment of 15,393 pounds of meal produced this season was sold at Seattle for \$68 per ton, bringing a total of \$523.36; the remainder of the meal is still at the island. The oil is in storage at Seattle pending decision as to its most advantageous disposition; the market for this product was very poor at the close of the year.

During the summer of 1920 an experiment was conducted to determine the comparative values of oil rendered from the carcasses of seals which had been dead for different lengths of time. It was considered possible that in the cool climate of the Pribilofs the factor of decomposition might be of less consequence than is the case where

animal oils are handled in warmer regions. Accordingly samples were taken of oil rendered from carcasses of seals which had been dead 1, 2, 3, 4, 5, 6, 7, 10, 11, and 12 days, and these were later forwarded to the Bureau of Standards.

The report on the analyses showed that with seal blubber, as in other animal fats, a decided increase in free fatty acids takes place within a very few days. The acid number of the seal oil samples ranged from a minimum of 2.8 for the first two days to a maximum of 13.3 on the tenth day after killing. Reference to the New York market quotations at the end of the year showed a price of 45 cents per gallon for herring oil containing less than 5 per cent of acids, while only 28 cents per gallon was offered for the same oil containing between 5 and 10 per cent of acids. The seal-oil samples taken 10, 11, and 12 days after killing showed an average acid number of 11.2, and the samples for the third, fourth, fifth, sixth, and seventh days had an average acid number of well over 5. In view of the great depreciation in value of oils having a high acid content, it is of primary importance that the oil be rendered from the animal tissues as early as practicable. Other features of the analyses did not show progressive changes on which sound conclusions could be based.

IMPROVED SEALING METHODS.

With a view to securing improvement in the quality of the sealskins prior to the dressing and dyeing processes, the study of sealing methods at the islands was continued in 1920. W. P. Zschorna, who carried on preliminary work in 1919 for the Bureau, was in charge of experimental work this year for Funsten Bros. & Co. Four other employees of the company, namely, Michael Syron, Oliver E. Klockenbrink, Frank L. Milligan, and J. H. Quatmann, were detailed for duty at the Pribilofs during the active sealing season and assisted in this special work. Particular attention was given the features of blubbering and washing the raw pelts before salting, and of salting the skins only once instead of twice, as formerly. While this work was of an experimental character, it was on a scale sufficiently large to warrant its being used as the basis for making changes if any were found to be desirable.

The method of handling raw sealskins in effect for many years was to allow them to lose their natural heat while lying on the killing field. They were then taken to the salt houses, and at the end of five days were removed, examined for faulty curing, and returned to the salt to await shipment, usually at least five or six weeks later. In the summer of 1920, however, 1,000 skins were given different treatment on St. Paul Island. Immediately after killing, or as soon as they could be hauled in from the killing fields, these skins were cooled in a tank of running sea water; all blubber and meat was carefully removed, they were again washed, and then were stretched and placed in salt to remain until removed for shipment. Advance reports on these skins indicate that they are of such an improved quality as to warrant the extension of the washing, blubbering, and stretching of the pelts to the whole take of skins.

A feature of the new plan is the taking of sealskins by the so-called rough method, which consists in leaving considerable quanti-

ties of blubber and meat on the pelt when it is removed from the animal. In addition to securing more evenly cured skins, the new method does away with the chances for cutting or flaying the skins on the killing field as the subsequent removal of the blubber and meat makes it unnecessary for the skinner to cut close to the pelt. The following comments by the Gibbins & Lohn Dressing & Dyeing Co., of St. Louis, in regard to the blubbered and washed skins of 1920, show some of the practical advantages of the new treatment:

The benefit of the better curing and more uniform condition of the pelts is apparent throughout the various dressing processes. The washing is rendered easier, more efficacious, and safer than on ordinary skins. The better condition of the pelts is also felt in the unhairing process. The hair on the yellow spots is always quite difficult to remove. It is generally necessary on such pelts to loosen the hair by a slight and controlled sweating action, which can not be advantageous, for it has a tendency to loosen fur as well as hair. It was found that in the white-blubbered pelts the hair could be loosened by the unhairing process and the fur left firmer and set tighter when the process was finished. In other words, the hair was easier to remove because the fur held firm. Another result is that more of the fine hair is removed during the unhairing. While this fine hair can be clipped out during the subsequent machining process, a better finished product is obtained if it is removed during the unhairing.

In addition to the skins which were washed and blubbered, a portion of the catch was handled in the usual manner and then cooled by washing before salting; others were given no special treatment beyond a stretching at the time of salting. Various small lots of skins were treated in different ways, the entire effort being toward developing improved methods.

It is probable that the blubbering, washing, stretching, and single salting will be conducted on a larger scale in the season of 1921, as there is every reason to believe that the new methods result in a superior finished product.

NATIVES.

HEALTH CONDITIONS.

The maintenance of good health among the natives on the Pribilof Islands is not only one of the responsibilities resting upon the Bureau in its administration of affairs there, but it is greatly to the interest of the Government to give the best of care to the communities which perform the bulk of the manual labor incidental to the valuable and remunerative industries centering on the islands.

A resident physician is stationed on each of the two islands primarily for the purpose of attending to the health of the natives. Well-stocked dispensaries are provided and a small hospital is available on St. Paul Island. A building to contain hospital facilities is to be constructed on St. George Island in the near future.

During the summer and fall of 1920 a dentist was employed to give attention to the needs of the natives and others on the Pribilofs and he was fully occupied during his entire stay. Another dentist will be secured for the coming year to continue this important work.

It is especially noteworthy that on St. George Island, with a population of about 135 persons, no deaths occurred for a period of 15 months ending June 19, 1920. This is unprecedented in the history of the Pribilofs.

SCHOOLS.

St. Paul Island.—The senior school on St. Paul Island, under the direction of George Haley, was opened on September 22, 1919, and continued until May 28, 1920. The enrollment consisted of 66 pupils. The usual methods were followed in the teaching of the children, particular stress being placed upon subjects which would tend to bring about the increased use of the English language. In resigning at the close of the session, Mr. Haley terminated a period of service in the island schools extending over six years.

St. George Island.—On St. George Island the senior school was opened on October 7, 1919, and closed May 14, 1920, with an enrollment of 34 pupils. The percentages of attendance and punctuality were 99.45 and 99.52, respectively. In discussing the methods of instruction and administration used in the school, Mr. Johnston states:

The pupils were divided into five general classes and again subdivided where necessary. These subdivisions varied with the different subjects of instruction, but were determined more by the intelligence and capabilities of the pupils.

The use of English was always required in the schoolroom. Several days sometimes passed without a word of Aleut being spoken. At recess and at home the pupils were encouraged to speak English.

When the Aleut children can understand English with more ease and quickness, especially as it is spoken, they will advance in their other studies at a surprisingly rapid rate. This inability to understand many explanations given by the teachers, no matter how simple they are, makes such studies as arithmetic difficult. In every recitation the study and use of English was of paramount importance.

In the fourth and fifth reading classes the text was discussed and commented upon by the pupils so that they would understand the English phraseology. The lower classes were given drills in vocabulary and pronunciation. Compositions on stories in the readers were rather poor, as it seemed hard for most of the children to grasp the important points of a story. The following will illustrate: In the geography textbook a paragraph would describe a river system. The final sentence of the description would be: "This is called a river system." The pupils, in spite of continuous instruction, would give the sentence quoted above as the definition of a river system.

Compositions were frequently called for, the subjects being chosen by the pupils or by the teacher. Letters were written to friends at other places. All written work was corrected and handed back to be rewritten or discussed in class.

During the second half of the term the fifth class kept individual diaries. They understood the purpose of the diary easily, and noted many details which most children would not remember. The diaries were examined once a week and individual instruction was given to the writer on his mistakes in grammar, spelling, etc.

It was not necessary to inflict corporal punishment at any time. Standing up in front of the school, staying in at recess, etc., proved sufficient. Strange to say, the pupils did not like to be sent home from school, a fact used to advantage in inflicting punishment.

In addition to the senior school, classes for small children were conducted by Mrs. Ella J. Johnston. This junior school was carried on between the dates given above for the session of the larger school. The enrollment was made up of six girls and five boys. Simple work, similar to that given in kindergarten classes, forms the basis of the work in the junior school. These classes are very valuable in preparing the children for entrance into the senior school and enabling them to take up their work to greater advantage than would otherwise be the case. Mr. Johnston's report comments upon the work of the junior school as follows:

The value of this preparatory course can be realized best by those who take up the child's instruction in the senior school. Last term one of the boys com-

ing to the junior school for the first time was so frightened that he cried lustily until one of his sisters stood beside him. He continued to do this for six weeks. At the end of that time he became interested, and it was hard to persuade him to go home at the end of the period. Without this experience in the junior school, the boy would have caused considerable trouble in the senior school, besides delaying his own advancement.

Sewing classes were also conducted for the larger girls by Mrs. Johnston, various practical stitches being taught. Useful articles, such as sewing bags, needlecases, and aprons were made, and interest was stimulated by the fact that the girls were allowed to keep the articles made.

ATTENDANCE AT SALEM INDIAN TRAINING SCHOOL, CHEMAWA, OREG.

Several native students from the Pribilof Islands are at the Salem Indian Training School at Chemawa, Oreg. None of the pupils returned to the islands, nor were any enrolled during the year; the list of pupils, therefore, remains the same as at the close of 1919.

PRIBILOF ISLANDS NATIVES AT SALEM INDIAN TRAINING SCHOOL, DEC. 31, 1920.

Fratris, Akallna ¹ -----	Resident of St. Paul Island.
Fratris, Ouliana-----	Do.
Stepetin, Nicolai-----	Do.
Stepetin, Vasilii-----	Do.
Lekanof, George-----	Resident of St. George Island.
Mercurief, Laurence-----	Do.

Ouliana Fratris has completed a course of study at the school and has since been given the responsibilities of acting as matron in one of the buildings for the smaller girls. It is doubtful whether she or her mother will ever return to the Pribilof Islands.

On November 18, 1920, Agent Crompton made an official visit to Chemawa for the purpose of later making recommendations regarding the policy of sending natives from the Pribilof Islands to that school. The following is extracted from his report:

Rumors had reached the island that the natives who were at Chemawa were not receiving good care, that their food was not plentiful and was of poor quality, and that the sleeping quarters were poorly heated. At first but little attention was paid to these reports, but they became quite persistent and resulted in my request for authority to investigate the matter. In addition there was a question regarding the general policy of sending natives to the States for their schooling.

I arrived at Chemawa late in the evening of November 17, 1920, and spent the entire following day at the school.

The superintendent, Mr. Harwood Hall, showed me through the classrooms of the institution during the forenoon, and the remainder of the day was spent in the various workshops and other buildings.

During the day all of the Pribilof boys were separately questioned regarding their comforts and treatment. They were informed that my visit was for the purpose of hearing their grievances if they had any, but they were unanimous in praise of their treatment, and in addition seemed to have a strong "school spirit" of pride in the institution. The boys were told that if they ever had any real grievances the agents at the Pribilof Islands wished to know of them, but that they should not worry their parents by writing about petty matters. Though I observed closely, nothing seemed to indicate that they were not well cared for in all respects. The food was inspected and the dormitories seen, and all was on an equality with conditions in first-class boarding schools.

¹ Mother of Oullana Fratris and employed at the school.

The question of sending natives from the Pribilofs to Chemawa, then, becomes one of policy rather than one of doubt regarding the care they might receive while there. In the writer's opinion it is not to the interest of the United States to send them to outside schools, and there is doubt that it adds to the ultimate happiness of the individuals. * * *

It is recommended that no more children be sent to the Chemawa school at the instigation of the Bureau.

SAVINGS ACCOUNTS.

Certain of the Pribilof Islands natives have personal funds in the custody of the United States Commissioner of Fisheries as trustee. These funds are still on deposit with the Washington Loan & Trust Co., Washington, D. C., and draw interest at 3 per cent per annum, calculated on monthly balances.

The condition of the account as a whole on December 31, 1920, is shown in the statement which follows:

Balance on hand Jan. 1, 1920.....	\$3,093.57
Interest earned from Jan. 1 to Dec. 31, 1920.....	89.92
	3,183.49
Withdrawn by natives during above period.....	343.62
	2,839.87

An itemized statement of the account showing the individual balances of the natives is as follows:

PRIBILOF ISLANDS NATIVES' SAVINGS ACCOUNTS IN CUSTODY OF THE UNITED STATES COMMISSIONER OF FISHERIES, AS TRUSTEE, DEC. 31, 1920.

ST. PAUL ISLAND.			
		Merculieff, Paul A.....	\$15.16
Bourdukofsky, Apollon.....	\$90.42	Pankoff, Agrippina.....	235.69
Bourdukofsky, Peter.....	60.70	Pankoff, Maria M.....	43.13
Fratiss, Agrifina ¹	92.90	Sedick, Feofania.....	13.47
Fratiss, Akalina ¹	547.73	Sedick, Lavrenty.....	13.47
Fratiss, Martha ¹	92.91	Sedick, Leonty.....	13.47
Fratiss, Ouliana ¹	92.91	Sedick, Marina.....	.38
Gromoff, Iuliania.....	348.70	Tetoff, Vikenty M.....	43.12
Kozloff, Parascovia.....	7.28		
Krukoff, Ekaterina ²	197.91	ST. GEORGE ISLAND.	
Krukoff, Iuleta.....	8.90	Borenien, Zoya ³	235.97
Mandregan, Alexandra M.....	10.23	Galanin, Mary.....	155.75
Melovidov, Alfey.....	43.13	Lestenkof, Michael.....	118.10
Melovidov, Anton.....	3.70	Merculief, Agrippina.....	64.54
Melovidov, Iosef.....	43.13	Merculief, Joseph.....	24.28
Merculieff, Agafia ³	38.67	Merculief, Polyxenia.....	12.28
Merculieff, Dosofey.....	38.67	Shane, Michael.....	29.65
Merculieff, Makary.....	38.67	Zacharof, Emanuel.....	.45
Merculieff, Marlamna ⁴	64.40		
		Total.....	2,839.87

PAYMENTS FOR TAKING SEALSKINS.

Following the plan of the two preceding seasons, funds for paying certain persons engaged in the sealing operations at the Pribilofs in 1920 were advanced by Funsten Bros. & Co., and the firm was

¹ Not living on islands in 1920.

² New account; formerly account of Alexey Emanoff, deceased.

³ New account; formerly account of Terenty Merculieff, deceased.

⁴ Includes \$24.98 transferred from account of Auxenia Dikanoff (Mrs. C. H. Hope).

⁵ Includes \$115.14 transferred from account of Mary Philemonoff, deceased. Zoya Borenien was formerly Zoya Philemonoff; now deceased and estate undivided.

duly reimbursed from the proceeds of the sale of the dressed and dyed skins. Under this arrangement the funds are deposited in a Seattle bank to the credit of the Bureau's authorized and bonded agent at the Pribilofs, who issues checks against the deposit covering accounts payable therefrom.

The practice of paying the island natives for their labor in taking commercial skins was continued. They were paid on the basis of 50 cents each for skins taken from seals up to and including the 6-year-old class, and \$1 each for skins taken from seals of 7 years and upward. No payments are made for labor in taking the skins of seals which are killed primarily for food.

During the calendar year 1920 and through January 31, 1921, the following payments were made from funds advanced by Funsten Bros. & Co.:

SALARIES OF SEALING ASSISTANTS, ST. PAUL ISLAND.....	\$3,079.49
WAGES OF ALEUTIAN ISLANDS NATIVES AT ST. PAUL ISLAND.....	4,275.43
AMOUNT EARNED BY ST. PAUL NATIVES, 1920.....	11,112.00
AMOUNT EARNED BY ST. GEORGE ISLAND NATIVES, 1920.....	2,127.00
Total	20,593.92

In addition to the above total, the sum of \$645 was paid the natives of St. Paul Island during 1920, this amount representing an unpaid credit for the year 1919, which was entered as an undivided credit in the list of expenditures for that year.

Owing to the death of Peter Tetoff, one of the natives at St. Paul Island, there remains an unpaid balance of \$246.50 on account of the sealing work for 1920 on that island; this amount will be paid to the estate of the deceased when it is settled, thus closing the account.

St. Paul Island.—Of the 22,220 skins taken on St. Paul Island during the calendar year 1920, the native workmen received payment for 21,097 skins at the rate of 50 cents each and 710 skins at the rate of \$1 each; the other skins were from seals killed for food for which no payment was made. The fund was divided among the participating natives according to their ability, as follows:

DISBURSEMENTS TO ST. PAUL NATIVES FOR SEALING OPERATIONS, CALENDAR YEAR 1920.

Classification.	Number of men.	Share of each.	Total.	Classification.	Number of men.	Share of each.	Total.
First class.....	28	\$246.50	\$9,902.00	Fifth class.....	3	\$99.50	\$298.50
Second class.....	13	197.50	2,567.50	Additional compensation ¹			100.00
Third class.....	7	160.00	1,120.00	Total	54		11,358.50
Fourth class.....	3	123.50	370.50				

¹ Allowed 2 native foremen.

St. George Island.—Of the 4,428 skins taken on St. George Island during the calendar year 1920, 4,030 were paid for at the rate of 50 cents each and 12 at the rate of \$1 each; the balance of the year's take was composed of skins from seals killed for food for which no credit was allowed. The resulting fund was divided among the natives who took part in the operations according to the extent and

proficiency of their work. The division was made as shown in the following table:

DISBURSEMENTS TO ST. GEORGE NATIVES FOR SEALING OPERATIONS, CALENDAR YEAR 1920.

Classification.	Number of men.	Share of each.	Total.	Classification.	Number of men.	Share of each.	Total.
First class.....	14	\$110.00	\$1,540.00	Boys' class.....	3	\$10.00	\$30.00
Second class.....	3	79.00	237.00	Additional compensation ¹			100.00
Third class.....	1	62.50	62.50	Total.....	24		2,127.00
Fourth class.....	3	52.50	157.50				

¹ Allowed 2 native foremen.

PAYMENTS FOR TAKING FOX SKINS.

Following the plan of past seasons, natives at the Pribilofs were paid for their labor in taking fox skins during the winter of 1919-20 on the basis of \$5 for each skin secured. The funds are credited to each community as a whole and are later divided among the participating workmen according to the extent and skill of their work. On St. Paul Island 188 skins were taken, resulting in a total credit of \$940 to be divided among 43 men. On St. George Island 750 skins were obtained, making a total credit of \$3,750 to be divided among 30 men. These sums will be paid from the proceeds of the sale of the skins, in February of 1921.

CENSUS.

The usual annual census of native inhabitants of the Pribilof Islands was taken on March 31, 1920. The following recapitulation shows a total of 336 natives accredited to the two islands, 4 of whom are attending the Salem Indian Training School at Chemawa, Oreg. The census of 1920 gives the same number of resident inhabitants for St. Paul Island as were present on March 31, 1919. On St. George Island a gain of 6 inhabitants is shown in the number actually resident:

RECAPITULATION OF CENSUS OF NATIVES, MAR. 31, 1920.

St. Paul Island:	
Resident population Mar. 31, 1919.....	188
Births in year ended Mar. 31, 1920.....	9
	197
Arrivals in year.....	14
	211
Deaths in year.....	7
	204
Departures in year, permanent—To Biorca Island.....	3
	201
	201

Departures in year, temporary—	
To Unalaska	11
To St. George Island	2
	13
Total native resident population Mar. 31, 1920	188
Natives at Salem Indian Training School, Chemawa, Oreg	4
Others temporarily residing elsewhere	14
	206
St. George Island:	
Resident population Mar. 31, 1919	122
Births in year ended Mar. 31, 1920	8
	130
Arrivals in year (from St. Paul Island)	2
	132
Deaths in year	0
	132
Departures in year, permanent—To Seattle, Wash	1
	131
Departures in year, temporary—	
To Chemawa, Oreg	1
To St. Paul Island	2
	3
Total native resident population Mar. 31, 1920	128
Natives at Salem Indian Training School, Chemawa, Oreg	2
	130

FUR-SEAL HERD.

QUOTA FOR KILLING.

On May 26, 1920, the Bureau made recommendation to the Secretary of Commerce regarding the number of male seals which might be authorized for killing at the Pribilof Islands during the calendar year 1920. The Bureau's recommendation, approved by the Secretary May 26, 1920, was as follows:

QUOTA OF SEALS FOR KILLING IN 1920.

Age class.	St. Paul.	St. George.	Total.
3-year-olds.....	15,830	2,900	18,730
4-year-olds.....	4,400	1,100	5,500
7-year-olds and over.....	10,770		10,770
Total.....	31,000	4,000	35,000

The foregoing figures are those which were given the Bureau's representatives at the Pribilofs for their general guidance, the numbers to be killed being subject to revision should conditions observed at the islands during the progress of operations indicate

the necessity therefor. As the season advanced it seemed wise to modify the original instructions, and accordingly, on July 22, the Acting Secretary of Commerce authorized the killing of 3,000 more seals of the 3-year-old class and 1,000 of the 4-year-old class. This was later modified to include only those seals of the 3-year-old class whose length was 43 inches or over. The instructions were conveyed by telegraph.

Killings of previous years having reduced the numbers of seals in the 5-year-old and 6-year-old classes of 1920 rather close to the reserve required by law, it was thought best not to draw further on these classes. A return to the desirable proportion of adult males to females is now reported on both islands, and upon the recommendation of the superintendent at St. Paul Island the killing from this class was stopped on July 23, after 703 skins had been secured.

KILLINGS OF SEALS.

St. Paul Island.—In a total of 54 drives during the period from January 22 to November 29, inclusive, 22,220 seals were secured on St. Paul Island during the calendar year 1920.

St. George Island.—The first drive was made on St. George Island on May 31 and the last on November 19; in a total of 35 drives, 4,428 seals were killed during the calendar year 1920.

The total number of seals killed on both islands during the calendar year was 26,648. Details regarding the killings are shown in the following tables:

SEAL KILLINGS ON PRIBILOF ISLANDS IN 1920.

ST. PAUL ISLAND.

Date.	Serial No. of drive.	Hauling ground.	Skins secured.	Date.	Serial No. of drive.	Hauling ground.	Skins secured.
Jan. 22	1	Sea Lion Rock.....	08	July 17	30	Morjovi and Vostochni....	1,344
Jan. 30	2	do.....	4	July 19	31	Reef and Gorbatch.....	1,309
May 18	3	do.....	58	July 20	32	Zapadni, Little Zapadni, and Zapadni Reef.....	466
June 4	4	do.....	97	July 21	33	Tolstoi, Lukanin, and Kitovi.....	251
June 11	5	Reef.....	225	July 23	34	Reef and Gorbatch.....	607
Do.....	6	Tolstoi.....	85	July 27	35	Morjovi and Vostochni....	1,432
June 14	7	Morjovi.....	417	July 29	36	Gorbatch.....	428
Do.....	8	Vostochni.....	41	July 30	37	Reef.....	259
June 19	9	Zapadni.....	357	Do.....	38	Lukanin and Kitovi.....	89
June 21	10	Reef.....	541	Aug. 2	39	Tolstoi.....	210
June 23	11	Morjovi and Vostochni....	574	Aug. 3	40	Zapadni, Little Zapadni, and Zapadni Reef.....	225
June 24	12	Polovina.....	295	Aug. 4	41	Morjovi and Vostochni....	406
June 25	13	Tolstoi.....	242	Do.....	42	Gorbatch.....	257
Do.....	14	Lukanin.....	114	Aug. 5	43	Polovina.....	323
June 26	15	Zapadni.....	384	Aug. 6	44	Tolstoi.....	70
June 28	16	Reef and Gorbatch.....	1,127	Do.....	45	Lukanin and Kitovi.....	40
June 30	17	Morjovi.....	436	Aug. 7	46	Zapadni.....	49
Do.....	18	Vostochni.....	496	Aug. 8	47	Reef and Gorbatch.....	101
July 1	19	Polovina.....	270	Aug. 10	48	Polovina.....	143
July 2	20	Tolstoi.....	315	Do.....	49	Morjovi and Vostochni....	257
July 3	21	Reef and Gorbatch.....	840	Oct. 23	50	Reef.....	175
July 5	22	Zapadni, Little Zapadni, and Zapadni Reef.....	421	Nov. 9	51	do.....	34
July 7	23	Morjovi and Vostochni....	2,000	Do.....	52	Lukanin.....	23
July 9	24	Lukanin and Kitovi.....	99	Nov. 20	53	Reef.....	34
Do.....	25	Tolstoi.....	399	Nov. 29	54	Gorbatch.....	18
July 10	26	Reef and Gorbatch.....	1,333			Total.....	22,220
July 11	27	Zapadni, Little Zapadni, and Zapadni Reef.....	669				
July 14	28	Reef and Gorbatch.....	1,181				
Do.....	29	Tolstoi, Lukanin, and Kitovi.....	382				

SEAL KILLINGS ON PRIBILOF ISLANDS IN 1920—Continued.

ST. GEORGE ISLAND.

Date.	Serial No. of drive.	Hauling ground.	Skins secured.	Date.	Serial No. of drive.	Hauling ground.	Skins secured.
May 31	1	North.....	5	July 13	19	Zapadni.....	36
June 7	2	East Cliffs and Staraya Artil.....	22	July 15	20	North and Staraya Artil.....	206
June 9	3	North.....	26	July 17	21	East Reef.....	354
June 12	4	East Cliffs.....	20	July 19	22	North and Staraya Artil.....	224
June 16	5	North, Staraya Artil, and East Cliffs.....	131	July 22	23	East Reef and North.....	430
June 19	6	East Cliffs.....	11	July 24	24	North and Staraya Artil.....	277
June 21	7	North and Staraya Artil.....	100	July 26	25	East Reef.....	103
June 25	8	East Cliffs and North.....	58	July 29	26	North and Staraya Artil.....	269
June 28	9	East Reef and North.....	117	July 31	27	East Reef.....	163
June 29	10	Zapadni.....	58	Aug. 2	28	North and Staraya Artil.....	26
June 30	11	Staraya Artil.....	130	Aug. 4	29	East Reef and North.....	80
Do.....	12	North.....	88	Aug. 9	30	do.....	104
July 3	13	East Reef.....	11	Oct. 20	31	East Cliffs and North.....	199
July 5	14	North.....	170	Oct. 23	32	do.....	53
July 6	15	Zapadni.....	37	Nov. 2	33	do.....	63
July 7	16	East Reef and North.....	175	Nov. 17	34	North and Staraya Artil.....	69
July 10	17	North and Staraya Artil.....	521	Nov. 19	35	East Cliffs.....	12
July 12	18	East Reef.....	90			Total.....	4,428

AGE CLASSES OF SEALS.

The present method of classifying seals of unknown age has been developed from experimental work conducted since the summer of 1912, when a large number of male and female pups of that season were branded with a permanent distinctive mark. A few of these animals have been killed in each season since 1912 and the body lengths—from tip of nose to root of tail—and other data have been recorded. On the basis of the growth attained by these seals in each of the several years, limits of carcass length have been adopted for each year of age, and seals are now classified in accordance with the position their respective carcass lengths occupy in the scale taken from the branded animals. The limits now in use are as follows:

AGE STANDARDS OF BODY LENGTHS OF SEALS.

Age.	Lengths of summer seals.	Lengths of fall seals.	Age.	Lengths of summer seals.	Lengths of fall seals.
	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>Inches.</i>
Yearlings.....	Up to 36.75	Up to 38.75	4-year olds.....	46 to 51.75	48 to 53.75
2-year olds.....	37 to 40.75	39 to 42.75	5-year olds.....	52 to 57.75	54 to 59.75
3-year olds.....	41 to 45.75	43 to 47.75	6-year olds.....	58 to 63.75	60 to 65.75

AGES OF SEALS KILLED ON PRIBILOF ISLANDS, CALENDAR YEAR 1920.

Age.	Summer (Jan. 1-Aug. 10), 1920.			Fall (Aug. 11-Dec. 31), 1920.			Grand total.
	St. Paul.	St. George.	Total.	St. Paul.	St. George.	Total.	
Yearlings.....	7		7				7
2-year olds.....	166	194	360	2	26	28	388
3-year olds.....	15,014	2,917	18,831	233	312	545	19,376
4-year olds.....	4,988	843	5,831	46	44	90	5,921
5-year olds.....	45	61	106	2	3	5	111
6-year olds.....	39	4	43				43
7-year olds and over.....	709	12	721	1		1	722
Cows ¹	68	11	79		1	1	80
Total.....	21,936	4,042	25,978	284	386	670	26,648

¹ The few cows reported above, about one-third of 1 per cent of the total take, were accidentally and unavoidably killed. Every possible effort is made to avoid the killing of cows, but persons familiar with conditions at the islands will readily appreciate that once in a great while a cow is killed.

BRANDED SEALS.

Fifteen 8-year-old male seals, bearing the brand placed upon them as pups in 1912, were killed during the calendar year 1920. Of this number six were taken on St. Paul Island and nine on St. George Island.

It is from the 1912 series of branded seals that the data were obtained from which the age classification standards now in use were developed. Observations have also been made as to the development and movements of female seals bearing the 1912 brand. It is believed that more dependable information has been obtained as a result of the branding done in 1912 than from any similar work done in the past.

The following table shows certain information secured from the animals killed this season:

RECORDS OF BRANDED 8-YEAR-OLD MALE FUR SEALS KILLED ON PRIBILOF ISLANDS, CALENDAR YEAR 1920.

Serial No. of skin.	Date of killing.	Island.	Carcass weight. ¹	Carcass length.	Green- skin weight.	Trade classifi- cation.
			Pounds.	Inches.	Pounds.	
	1920					
AP6828	June 28	St. Paul.....	282	59.50	15 $\frac{1}{2}$	Wig.
AP8829	July 10	do.....	288	70.00	27	Do.
AP8830	July 14	do.....	309	72.75	50	Do.
AP8831	July 23	do.....	271	73.25	41	Do.
AP8885	Aug. 4	do.....	251	69.25	27	Do.
AP7380	Oct. 23	do.....	297	73.50	33	Do.
G6150	June 21	St. George.....	249	69.25	24	Do.
G6158	July 5	do.....	351	72.25	38	Do.
G6159	July 15	do.....	280	69.50	37	Do.
G6160	July 19	do.....	243	68.25	23	Do.
G6161	do.....	do.....	273	69.25	35	Do.
G6162	do.....	do.....	286	73.00	43	Do.
G6163	July 22	do.....	259	73.50	37	Do.
G6164	Aug. 9	do.....	322	75.50	32	Do.
G6165	do.....	do.....	252	72.00	42	Do.

¹ Seals were bled before being weighed.

The above table presents information comparable with that secured from the branded seals of 1912 killed in past years. These earlier

data may be obtained by reference to the Alaska fisheries and fur industries reports for the years since the branding was done.

In order to add to the data already secured, it is the purpose of the Bureau to kill some of these male seals in each of the years they may continue to exist, but to insure an adequate remainder for observation during that period it will probably be necessary to reduce the number to be killed to three or four animals in each season.

CENSUS.

Following the practice of previous years a census of the fur-seal herd was taken in the summer of 1920. Details are contained in the report, printed on pages 104 to 120, by Dr. G. Dallas Hanna, who has been in local charge of the census work for a series of years beginning in 1915. Edward C. Johnston, storekeeper on St. George Island, assisted in the actual census work in 1920 on both islands. The growth of the herd from year to year renders it increasingly difficult to enumerate the animals, but, on the other hand, the observations of each year add to the concrete information available as a basis of computation and enable the determination of relatively accurate percentages of loss for the different age classes.

The following is a comparative statement of the numerical strength of the various elements of the herd in the years 1912 to 1920, inclusive:

GENERAL COMPARISON OF RECENT CENSUSES OF THE SEAL HERD.

Class of seals.	1912	1913	1914	1915	1916	1917	1918	1919	1920
Harem bulls.....	1,358	1,403	1,559	2,151	3,500	4,850	5,344	5,158	4,066
Breeding cows.....	81,984	92,269	93,250	103,527	116,977	128,024	142,915	157,172	167,527
Surplus bulls.....					8,977	17,110	9,619	6,115	
Idle bulls.....	113	105	172	673	2,632	2,706	2,444	2,239	1,161
Young bulls (chiefly 5-year-olds).....	199	259	1,658						
6-year-old males.....					11,167	15,397	13,755	8,991	4,153
5-year-old males.....				11,271	15,494	14,813	11,941	5,282	5,007
4-year-old males.....	100	2,000	9,939	15,848	15,427	16,631	7,114	5,747	5,667
3-year-old males.....	2,000	10,000	13,880	18,282	19,402	19,507	9,117	13,596	10,749
2-year-old males.....	11,000	15,000	17,422	23,990	24,169	20,815	30,159	33,081	39,111
Yearling males.....	13,000	20,000	23,068	30,307	33,645	38,013	41,595	46,444	51,074
2-year-old cows.....	11,000	15,000	17,422	23,990	24,245	26,917	30,415	33,287	39,480
Yearling cows.....	13,000	20,000	23,067	30,306	33,646	38,018	41,608	46,447	51,081
Pups.....	81,984	92,269	93,250	103,527	116,977	128,024	142,916	157,172	167,527
Total.....	215,738	268,305	294,687	363,872	417,281	468,692	496,432	524,235	552,718

SPECIMENS FOR SCIENTIFIC PURPOSES.

For use in the preparation of a natural history group at the American Museum of Natural History in New York, several specimens of fur seals were collected at the Pribilofs during 1920. Thirteen skins were furnished the museum, one from an adult bull and eight from pups, all found dead on St. Paul Island, and one from a pup found dead and three from cows unintentionally killed in the sealing work on St. George Island. The collection was appraised at \$29, which amount was paid by the museum and properly deposited in the United States Treasury.

FOXES.

The foxes on the Pribilof Islands have regularly been the source of considerable revenue to the United States. The animals run at large on both islands and call for scarcely any outlay of funds and comparatively little labor.

One of the paradoxical features of the fox life on these islands is that the larger island, with a greater abundance of seal meat and more accessible beaches, has constantly furnished a smaller number of skins than St. George Island. Immediate conditions can not be assigned as the reason for this peculiar difference because of the fact that the situation has remained the same over a period of more than 40 years. Methods of feeding adopted on St. George Island in more recent years have caused a still greater contrast in the size of the catches on the two islands.

In the assumption that the foxes obtain sufficient food from the seal bodies remaining on the killing fields and from the natural food on the seashore, no special effort to feed the animals is made on St. Paul Island. The foxes are trapped with common steel traps during a short season in the early winter. When possible it is always planned to do this trapping before the heavier snowfalls take place, so that the runways may be observed and the traps placed on the ground. The time for trapping is usually selected with respect to the condition of the ground surface and the outlook of the weather.

TRAPPING SEASON OF 1920-21.

During the trapping season of 1920-21 a total of 1,125 blue and 14 white fox skins was taken on the two islands. Of this number 123 blue and 13 white skins were taken on St. Paul Island and 1,002 blues and 1 white on St. George. In addition, there were reserved for breeding purposes on the latter island 242 male and 240 female foxes, making a grand total of 1,485 animals handled there during the winter. The above take is the largest since the winter of 1892-93 when 373 animals were caught on St. Paul Island and 928 on St. George; during that year no reservation of breeders was made, however. The gain in this season's take, as in several past, comes entirely from St. George Island where the herd has been growing rapidly for a number of years.

With respect to the methods in use at St. George Island, Agent C. E. Crompton has recently submitted a detailed report as follows:

METHODS EMPLOYED IN THE MANAGEMENT OF THE BLUE FOXES ON ST. GEORGE ISLAND, ALASKA.

The blue foxes of St. George Island, Alaska, are the stock of what is probably the most successful fox farm in the country at the present time, if not the most promising in the world. The history of the ebb and flow of fox life on that island and the relation of that fluctuation to the influences which man has directly or indirectly brought to bear form a very interesting nature study.

History states that the furs of the seals, sea otters, and foxes were much exploited during the years immediately following the Russian discovery of the island, but no authentic records prior to 1840 are available. James Judge states that during the 19 years ending with 1860 the average annual catch was over 1,200 animals; during the first 19 years of the American tenure of the island the average catch was approximately 1,000 each season. Trapping was conducted during but four of the six winters from 1890 to 1896, inclusive, and

with such poor results that a total of only 2,325 pelts was secured. These latter years mark the most important changes in the history of the herd.

During the years preceding 1896 the foxes had always been forced to seek their winter food from the summer's accumulation of fur-seal carcasses on the killing fields, and up to the year 1885 had probably secured an abundance of food therefrom. Coincident with the decline of the seal herd, however, and particularly during the *modus vivendi* of 1891-1893, which restricted the land killing of seals to 7,500 annually, pending the award of the Tribunal of Fur-Seal Arbitration at Paris, the number of foxes became rapidly smaller. The situation, however, was not immediately recognized as a shortage of food, the agents of the Government placing the blame on excessive trapping by the lessees.

The state of affairs was probably first seen in its true light by Treasury Agent James Judge, who, in the summer of 1896, prepared a quantity of surplus seal meat by lightly salting and storing the food in the manner of ensilage. The experiment was successful, and Mr. Judge immediately recognized the possibility of selective killing by catching the animals in box traps instead of the steel traps which had always been used theretofore. A trapping house, with a wire cage adjoining, was the final outcome of the above-described experiment. The foxes came readily to the cage to obtain the much-needed food and were caught when the cage door was closed by a rope leading from within the house.

The methods of trapping outlined in the following pages are based on the work of James Judge, to whom much credit is due. That his principle was right and that it has been properly carried out was shown by the catch of 1919-20, when 750 pelts were secured and 454 animals released as breeders; the largest number of skins obtained since 1892-93, and, with a single exception, the largest total of animals caught in any season since the inauguration of the present system.

Food.

The natural food of the blue fox of the Pribilof Islands is made up of birds, eggs, insects, berries, miscellaneous bits of animal matter cast up by the sea, and occasionally dead seals, sea lions, walruses, or whales. While such food is plentiful during the milder seasons, it is reduced to the single item of beach food during the winter, when the shore is at times in the grip of frozen spray for long periods. Drift ice also closes the beaches for days at a time and usually large deposits of ice are left stranded, and these hinder the foxes in their search for food. It is at once apparent that comparatively few animals would survive a severe winter without a reserve supply of food.

In ordinary seasons the foxes of St. George Island are dependent upon a reserve supply of seal meat as food from September 15 to April 30. These dates are very safe and they will, of course, vary as the seasons are mild or severe, early or late, but will in most instances mark the period of need. "Open" or unfrozen beaches during the winter time often furnish much additional food, and during such intervals the foxes feed but lightly on the seal meat. On the other hand, a protracted period of cold prevents the animals from obtaining the natural food of the seashore, and they then visit the feeding ground in large numbers, consuming surprising quantities of meat. This feeding is necessary by reason of the fact that there are on the island at the present time many more foxes than the comparatively small supply of natural food in the winter season can support, and the size and rate of growth of the herd are primarily limited by the number which can be sustained during that trying period.

Preparation of food.—Seal meat has been found to be a successful and most readily obtainable food for use as a reserve. The foxes use all the seal meat which is not consumed by the native inhabitants of the island. After a killing of seals has been made the natives cut up the carcasses, remove the choicest portions for their own immediate and future needs, and the surplus is stored for winter fox food. At a suitable time (usually the day following the killing) the carcasses are eviscerated and emptied of free blood clots to retard putrefaction. If large, the carcasses are cut into sections, but if the seals are of a size readily handled they may be stored whole. It is not a good practice to store the meat before it has cooled, nor should it be left on the field through a hot, sunny day.

The carcasses are deposited in a large pit or silo, which is cut into the side of a hill of hard, scoriaceous earth. The outer side of this pit is bulkheaded

with strong planks and a small doorway, closed by means of flashboards, is placed near the center of the base of the bulkhead. This door serves both as a drain for the effluent water and oil and as a port from which the meat may be drawn as needed.

As the meat is thrown into the pit it must be spread about evenly and sprinkled with a small amount of half-ground salt. Salt which has already served a part of its usefulness in the sealskin kenches is entirely satisfactory for salting fox food. It is of great importance to have the meat spread in such a manner as to leave as little air space as possible; the principle is primarily that of ensiling rather than salting. It is surprising how well the meat will be preserved with but very little salt if the air is properly excluded.

After the summer's sealing has been completed the silo is covered with a sectional hatch, which rests on the edges of the pit. It is not of advantage to store the seal meat resulting from the fall killings, as the natives take large quantities for salting and freezing and the foxes will consume the fresh remains in a short time.

Before the feeding of the reserve food begins it should be freshened by the passage of fresh water through the pit. This is done by laying a pipe line to a siphon, which draws the water from a lake near by. The water should run at least two weeks steadily, but must not be turned on until the time for feeding draws near, else the food will begin to decompose unnecessarily.

Feeding.—Having decided that feeding should begin, a supply of the prepared meat is removed from the silo to the food kenches in the trapping house, where it may be drawn upon with ease as required. The native foreman is then instructed to put out a small experimental amount in the neighborhood of the building and to report the following morning as to the quantity consumed. Upon receiving this report the agent will know how to proceed the following evening. It is a commendable practice to provide for a remainder of food each morning, except during the active trapping season, when the animals must not become satiated. The foreman details a single workman to the work of setting out the food for a week at a time, after which that man is relieved by some one who does the work for a similar period.

The feeding is continued in the neighborhood of the trapping building until two weeks or more before it is expected to begin trapping, at which time it is placed within the cage. Much smaller quantities of food are then put out, and it may be well, in the case of a mild season, to suspend feeding for a day or two, putting out only enough food to attract the animals to that vicinity. This must be decided and gauged by the manner in which the foxes have been feeding during the interval immediately preceding, and it is largely a matter of judgment.

When the beginning of trapping has been decided upon all waste bits of meat and bone are gathered together and stored in barrels in an inaccessible place, where they will not draw the foxes from the lure within the cage. After trapping has started, food is placed only within the cage and the accumulation of bones therein is cleaned out from time to time and disposed of as stated above. Bits of food which have been dragged outside the cage must not be allowed to accumulate, as the more timid foxes will feed on them in preference to entering the cage.

Trapping.

Season.—The season for trapping prime-furred foxes varies in direct relation to the degree and duration of cold weather. Ordinarily the best of the pelts will be secured between December 1 and February 1, though prime furs may be taken on either side of these extremes.

Toward the latter part of November a few foxes may be caught and the fur examined as to its marketable condition. The extent of growth of the guard or crown hairs is a very good guide, as when these hairs have reached a length extending well beyond the heavier fur the pelt takes on its well-known silkiness and luster so highly valued by the trade. The guard hairs are seldom, if ever, fully extended before the fur beneath has become prime. Many skins vary as to fur; some have a heavy growth of dark fur, while others may have comparatively thin coats of light color, but the primeness consists in a uniform growth of whatever class of fur the animal happens to have, accompanied by the full growth of guard hairs. Animals are occasionally seen with no visible growth of guard hairs, but these are presumed to be diseased and are so few in number as to be negligible.

During mild seasons it will be noted that some of the pelts have a decided reddish tinge to the guard hairs, and while the exact effect of this condition is not known to the writer, it appears that its presence is not of sufficient importance to warrant the cessation of trapping. In the two seasons of 1915-16 and 1919-20 this "rusty" condition was particularly noticeable, but on both of these occasions the furriers subsequently stated that the value of the skins was but slightly lessened thereby. While the darkest furs are the most desirable, a good pelt commands a fair price even though the reddish tinge is in evidence.

The approach of the end of the season and the lapse of primeness in the skins can not be determined by any rule. The condition of the fur must be carefully watched, for rubbed or felted patches about the throat or rump are a certain indication of unprimeness. The observations must naturally be made before the fox is killed.

Weather conditions.—There is probably no single indirect factor having a more important bearing on the outcome of the season's trapping than that of weather. Clear, cold nights, with moderate winds from points in the north or east, are the conditions under which trapping may best be conducted at the village. Western winds favor the Zapadni cage. High night tides are advantageous, low ones the contrary. While moonlight makes the trapping work easier, the animals may be seen without difficulty on the darkest night if there is a little snow on the ground. The lower the temperature and the longer the period of cold, the more favorable is the situation; the cold keeps the beaches frozen and the continuation of it forces the most timid animals to visit the cage in search of food. Storms do not necessarily preclude trapping if the winds are from favorable directions and are not exceedingly strong. Wet snow or rain is unfavorable, as the furs become wet and soiled on such occasions; this dampness is very undesirable when the skins are made ready for stretching. Trapping may, however, be conducted with fair results during mild weather when rain is not falling. Persistence is required if a large catch is to be made.

Location of traps.—Two cage traps are used at the present time, one at the village, the second at Zapadni. The advisability of installing a third is doubtful. The second trap was the natural outcome of the feeding of foxes at Zapadni and it is useful when winds are unfavorable for work at the village. The desirability of securing the largest number of pelts at the village trap is readily seen.

The village trap is the original building set up by James Judge shortly after his experiment of 1896, and, like all cage traps, it is near the shore line. The second is simply a wire cage set up in 1919 close by the Zapadni watch house. Efforts are occasionally made to secure foxes at Garden Cove (on the southern shore) by means of string or noose traps, but the results are quite disproportionate to the labor involved. It should also be mentioned that the foxes having their homes in the immediate vicinity of the village form a distinct colony, the members of which rarely visit the cage trap and must be obtained by noose traps placed within the village and operated from the windows of the village buildings.

Description of traps.—Herewith is a diagram showing the arrangement of the village trap. The drop door "F," sliding in a groove, is operated by a man stationed within the darkened room "B," who watches the animals through the small window "H," which commands a view of the trap interior. The Zapadni trap is on the same general plan, the cage standing apart from the house and being operated from the window. At Zapadni the foxes must be caught and removed from the trap by hand, while at the village it is much more readily done, as will be seen later.

The noose trap is a very simple arrangement. A small doorway is cut in the end of a common packing case, which is then placed with its open face to the ground, the door remaining open on the end of the case. Some bait having a strong odor, such as old seal meat or seal oil, is placed within the box, and a noose is hung about the doorway. As the fox endeavors to investigate the contents of the box, the noose is closed about his neck by an operator stationed within a near building. This trap is an unsatisfactory arrangement to use outside the precincts of the village, as when an animal is captured the resulting commotion frightens other foxes away from that neighborhood. Furthermore, but a single fox can be caught at each operation.

Operation of traps.—It must be borne in mind during the trapping season that the foxes are largely dependent upon the seal meat for their sustenance,

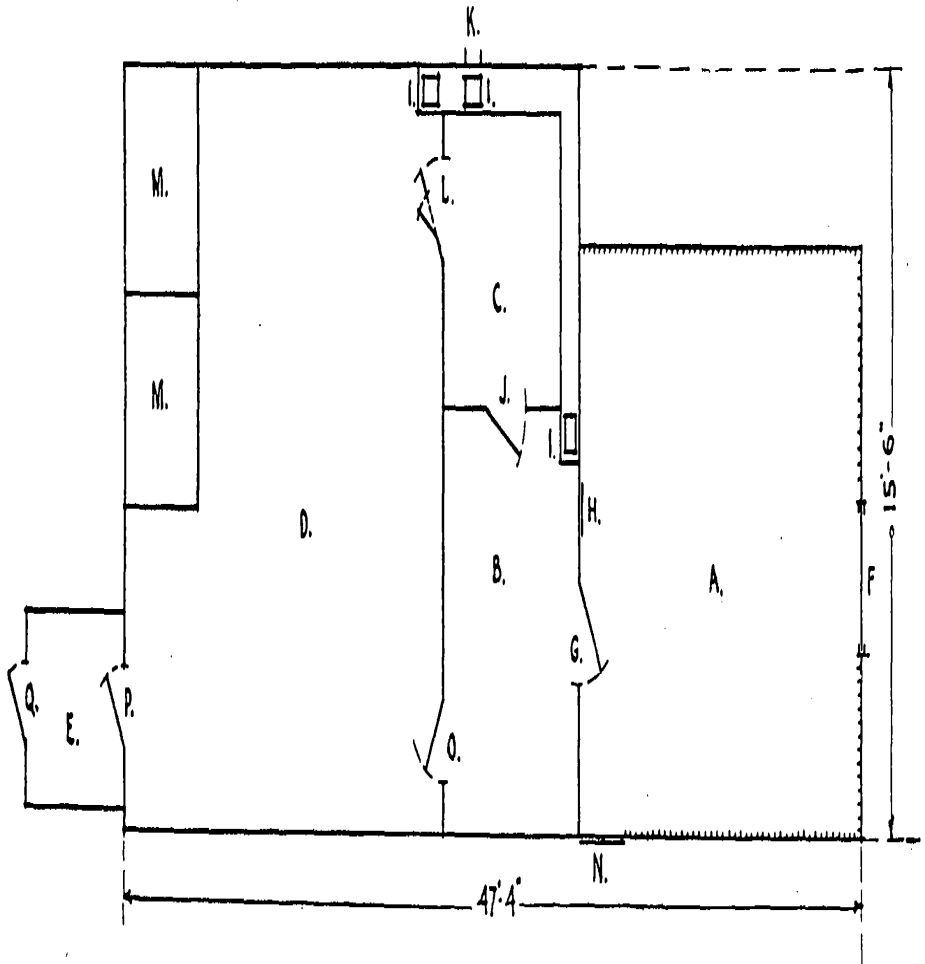


FIG. 1.—INTERIOR ARRANGEMENT OF FOX-TRAPPING HOUSE.

- | | | |
|-------------------------------|-----------------------------------|---------------------------|
| A. Wire cage trap. | G. Trap outlet. | M. Food benches. |
| B. Trapping room. | H. Small window. | N. Food door. |
| C. Retaining room. | I. Exits for releasing foxes. | O. Door to trapping room. |
| D. Killing and skinning room. | J. Door to retaining room. | P. Entrance. |
| E. Vestibule. | K. Final exit for released foxes. | Q. Storm door. |
| F. Sliding drop door. | L. Special door to skinning room. | |

and, while large numbers of animals visit the cage in the morning after an evening's trapping, continuous operation of the trap over too long a period will cause the foxes to abandon their trips to the cage for food. Such a practice forces the foxes to search for food elsewhere and also prevents any record being made of those animals, either for their pelts or as breeders. The more timid foxes may be seen to wander about the trap for long periods before entering, and each time the trap is sprung these animals are frightened off. The writer believes that the trap should be left open to the foxes at least two full nights in seven, and if all-night trapping is practiced the feeding nights should be increased to three in each week. These precautions are not so necessary if the beaches are unfrozen.

The actual trapping of the foxes may be begun as early as 4.30 p. m. and continued as late as seems desirable. A responsible native, with an assistant, takes up his position in the trapping room opposite the small window and opens the sliding door by means of a rope. The opening of the door by the trapper exposes the food for the first time on any trapping night, so that no foxes will have previously satisfied their hunger. The trapper maintains a constant watch of the trap, and when several foxes are in the cage he lowers the door and imprisons them. This moment for dropping the door must be properly judged. There should be no foxes so near the door that they will be in danger of injury when it drops; the door should not be closed in the face of animals too near the trap, as they would only be unnecessarily frightened thereby; on stormy nights the door may be so carefully closed that even the foxes within the trap are not aware of the change. Only responsible natives should ever be left in charge of the trap rope; such men understand the foxes and do the work well.

After closing the trap the operator sends his assistant into the cage and the foxes are driven through the open doors "G" and "J" into the retaining room "C," where they are held until a sufficient number has been caught to warrant further attention. After closing the doors to the retaining and trapping rooms the cage door is raised and the operation is repeated.

Handling of animals.—It is not advisable to hold more than 20 foxes in the retaining room at one time, as the animals have a tendency to clamber about and will pile up and become overheated, particularly in mild weather. On the opening night of the season the foxes can be caught almost as rapidly as the skins can be handled, the trap taking as high as 10 or 12 in a single operation. Later in the season the more timid foxes appear and only 2 or 3 are taken at intervals of an hour or more.

When a suitable number of foxes has been caught, the skimmers and other men take up their places in the large room "D" and the work begins. Two or three men, armed with forked sticks, are sent into the retaining room, where they catch the foxes by pressing them down to the floor until a proper hold has been secured with the hands; the animal is grasped about the neck from behind. This work must be done with as much care as is consistent with a fair degree of speed, as some of the animals are to be reserved as future breeders and must not be injured by unnecessarily rough handling. If any marked breeders are found, they are liberated through the door "I" and the exit "K."

After catching the fox the native passes it through the opening in the special door "L," whereupon a man on the opposite side takes it from him, holding the animal in the same manner. Another man examines the fox and calls out its sex that it may be written down by the agent. The latter then examines the teeth by pushing back the lips or opening the jaws with a soft gag.

The weigher now places the fox's tail in the loop of a broad strap attached to a spring balance and the head of the fox is then carefully lowered so that the animal hangs to the scale by its tail. The fox must not be dropped into a hanging position, as the sudden snap might injure the bone or cartilage of the tail. The weight is then called out and the agent makes note of it; he then notifies the weigher whether the fox is to be killed or released. If to be released, the animal is marked and dropped through the door "I" and makes its escape through the exit "K." If to be killed, it is passed to another man (the fox is still held by the tail) who strikes it a smart blow on the head with a light club. After the fox has been stunned in this manner, its neck is broken by manipulation. The skinner waits a few moments to make certain that the animal is dead, after which he removes the pelt while the body is yet warm.

Handling of Skins.

Skinning.—Fox skins are removed much in the same manner as those of most fur-bearing animals that are prepared for the market. The tail is split for a few inches on the lower side, the cut beginning at the anus; cuts are then made along the inner side of each hind leg, these incisions extending from the heel (the lower end of the metatarsal bones) to the anus. The pelt is first loosened around the base of the tail, the tail is then pulled from its sheath of skin, and the entire pelt is removed by pushing it loose from the fat and flesh with the fingers, a knife being used only about the head. After the skin has been loosened from the posterior part of the body it is simply everted over the head, so that the nose is the last part to be severed. The forelegs are pulled out of the skin without any cutting, except where a knife may be needed to separate the pelt from the tougher subcutaneous tissues.

While the skin is being drawn off there is some danger of tearing it or of forcing a finger through it, but such holes are usually the result of haste or carelessness. However, tears are sometimes made by the best of skinners, and in a large catch it may be difficult to secure perfect work throughout. Naturally, the pressure is always toward better workmanship.

After the skin has been entirely removed by the method outlined above, it is turned right side out and hung up on a peg or nail. When the work of the evening is over, the skins are counted, but are left in the trap building until ready for cleaning and stretching; the skins must be kept as cool as possible during this time.

During the first few killings of the season it is advisable to examine the flesh side of the skins, as the color found there is a good guide to the degree of primeness of the furs as a whole. The earliest skins may be found to be rather dark on the flesh side because of the roots of the growing hair and fur. This color fades as the season advances. While the writer has seen skins having what appeared to be fully prime pelage with the flesh side quite dark, it is not advisable to take any large number of skins during that part of the season when the bluish color on the flesh side of the skin is most pronounced.

The flesh side again darkens with the approach of unprimeness, but it has been observed on St. George Island that felted patches and rubbed spots are the first indication of the change. The fact that decision must be made before the fox is killed makes this a valuable point.

Cleaning.—The morning after the trapping the skins are taken to another building where the cleaning, stretching, and drying is done. The more skillful men sit in a row behind a beam which is placed in a horizontal position about 2 feet above the floor. A nail or peg is fixed in the beam opposite each man. The skin is turned flesh side out, the nose is placed over the peg and all the fat and flesh is removed with a very sharp skinning knife having a curved blade about 6 inches in length. The tail is split and all the fatty tissue removed from it; the forelegs can be cleaned without splitting. The work described here requires genuine skill with the knife.

After the pelt has been thus cleaned it is taken by one of the other workmen who turns the skin, rubs dry corn meal through the fur for the purpose of removing free grease or dampness, and then shakes it out. It is now turned again and searched for holes and if any are found they are sewed up. Small sticks are then inserted within the skin of the forelegs and bound in place; the tail is spread and bound round a larger stick and the skin is then ready for the stretching frame.

Stretching.—The stretching frame is a very simple arrangement of two light boards (1-inch material is usually used) put together on an acute angle, the length of the sides being in the neighborhood of 4 feet. The boards are joined edgewise, the nails of the joint being carefully toed; no third piece enters into the construction. After the joint has been secured, the boards are planed so that the edges form a smooth wedge with a rounded point. Properly made frames will last many years.

The skin is drawn on by inserting the smaller end of the frame in the opening across the hind legs and then slowly forcing it down the frame until the nose fits snugly. The entire surface of the pelt is then gently stretched downward with the palms of the workman's hands, and when it is well in place the hind legs are spread and bound to the sides of the frame in the manner shown in figure 3. The lips have been previously stitched together to prevent distortion of that part of the skin, and after the whole pelt has been well rubbed with corn meal it is set up for drying.

Drying.—The drying may be done in any large room where an even temperature can be maintained. It is always desirable to dry the skins slowly and with as little artificial heat as possible. The present method is to lay the frames in rows across light racks suspended from the ceiling at suitable intervals, the remainder of the frames being stood up about the walls. With the improvement of facilities this practice may be bettered.

After a lapse of from four to six days on the stretching frames the skins may be examined, and if dry all over, may be removed. The nose is one of the last parts of the skin to become fully dry. The skin should also be examined for excessive grease, and if any is found it must be removed with corn meal, for if it is left it will putrefy and weaken the skin. In taking the skin from the frame the hind and fore legs and tail are unbound and the skin gently started with the palms of the hands, after which it may be pulled off by the nose. When the skin has been removed from the frame a tag, bearing the date of capture, is tied into the mouth or eyeholes and the skin is hung up in the drying room for a few days, or until a sufficient number of pelts has accumulated for removal to the storage room.

Storing.—The two most important requirements for a storage room are dryness and darkness. The necessity for keeping the skins dry is apparent; the darkness is a safeguard against the fading of the fur, as the darkest furs command the highest prices. In storing the skins they are usually tied through the nose into clusters of 10 skins each, and these bunches are carefully tallied when stored. All the skins are again counted at the close of the season so as to verify the record of animals killed.

Shipping.—Fox skins are packed and shipped in boxes made of 1-inch boards of spruce or Douglas fir (spruce is preferable), with inside dimensions of 58 inches in length, 16 inches in width, and 12 inches in depth. The case is provided with a set of battens near each end, which lend rigidity to the whole and at the same time prevent any face of the box from coming into solid contact with a flat surface.

The packing of the skins is usually done within a day or two of the time shipment is to be made. The cases are lined with tarred building paper and relined with wrapping or newspaper as a protection against insects and dampness. The skins are carefully counted and laid flat in the case; unnecessary folding or creasing is to be avoided. The skins are shipped pelt side out. From 40 to 45 skins may be packed in a case such as the one described above.

After the proper number of skins has been packed in the box, the top is closed with the layers of paper and then the cover. The cover is nailed to the sides and ends of the case and to the battens on the sides. All cracks and holes are then closed by tacking on strips of galvanized iron or sheet zinc. The cases should be marked on both sides with the name and address of the consignee, the serial number and gross weight of the case, the number of skins it contains, and the legends, "Keep Away From Boiler Bulkheads" and "Keep Dry."

Disposition of Carcasses.

The disposition of fox carcasses is a matter of some importance. It is well known that foxes are, as a general rule, infested with parasites and intestinal worms of various kinds, and it should always be the effort of the agent to see that the carcasses of foxes killed are disposed of in such a manner as to prevent any possibility of infection from that source. The bodies of foxes found dead should be handled in a similar manner when practicable. The method now in use is that of putting the bodies into a covered pit, a practice both simple and effective.

Breeding Reserve.

Selection of animals.—The breeding foxes must be selected with care. The points of judgment are: (1) The condition of the teeth; (2) depth of color and condition of fur, short fur or white patches indicating an undesirable animal; and (3) weight, reserved males to weigh not less than 11 pounds and females not less than 8½ pounds. Cripples are always killed, though a short-tailed fox may be released if the animal appears to be a particularly desirable one from other points of judgment.

Since the beginning of the present method of handling foxes on St. George Island it has been constantly the purpose to eliminate the white foxes. That it has been partially successful is shown by the presence of only 4 white

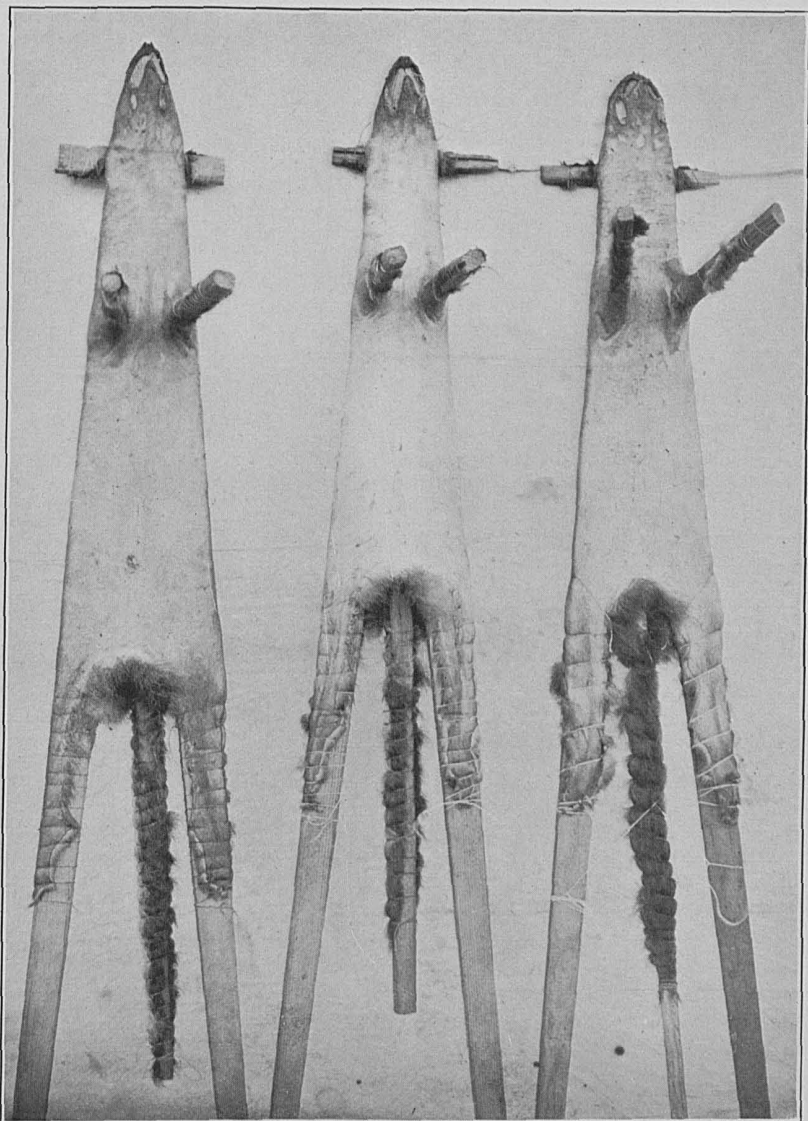


FIG. 2.—NATIVE METHOD OF STRETCHING AND DRYING BLUE FOX SKINS, PRIBILOF ISLANDS, ALASKA.

skins in a catch of 750 taken during the season of 1919-20, as against 15 white pelts in a total of 486 secured in the season 1903-4. On St. Paul Island, where steel traps are being used and the selective killing is not carried on, 33 white animals appeared in a catch of 188 during the winter of 1919-20. The fight against white foxes on St. George Island has in recent years been extended against blue foxes which bear white marks of any kind.

After the selection of the breeder it is marked by clipping the fur of the tail and is then released. This mark is a notch near the tip of the tail in the case of a male and near the middle of the tail for a female. No such marked foxes are killed intentionally, and to avoid the possibility of such error it is a good plan to make the mark sufficiently plain to preclude any chance that the weigher may not notice it. Light marks made early in the season may grow to be almost indistinguishable before trapping stops.

The blue fox of St. George Island is monogamous, and because of this fact the sexes must be released in equal numbers when the reserve is made.

Size of reserve.—The amount of food available during the winter months is the factor which controls the size to which the herd may be allowed to grow. The release of 200 pairs of breeding animals for a number of years past has provided a steady supply of skins, but this number must be gradually increased in proportion to the food supply if a sound policy of growth is to be carried out. During the season of 1919-20 a reserve of 225 pairs was made with a view to such a growth, and it is intended that the reserve be further increased each season that the food situation will allow.

A consideration of the reserve naturally must bring in the factors of the number of young which reach maturity for each pair released and the percentage of natural mortality for all classes of foxes. It is to be deplored that we know little of these factors, except as light has been thrown upon them by the growth or decline of the herd. From the past rate of growth we may assume a given number of maturing young and a given death rate, both of which are subject to an unknown correction of animals not caught, but such figures are somewhat arbitrary and must be used with caution. We can not place dependence on the uncertain figure of the number of maturing young or the unknown reserve of animals not handled; the only reliable figures are those from known reserves, and it is upon these we must base our policy.

REINDEER.

In August of 1911, 40 reindeer were brought to the Pribilof Islands to determine whether these animals would thrive and eventually provide a source of fresh meat for the Government employes and natives stationed there. Twenty-one cows and 4 bulls were landed on St. Paul Island and 12 cows and 3 bulls on St. George Island.

The experiment has proved entirely successful. While the herds have become quite wild and difficult to handle through lack of time for attending them, fairly accurate counts at the close of the calendar year 1920 showed 192 deer on St. Paul Island and 125 on St. George Island. The herds are becoming regularly more valuable as a meat supply, the number used for this purpose being larger each year. On St. Paul Island 22 reindeer were killed for food during the calendar year 1920 and on St. George Island 31 were so used. In the previous year 14 on St. Paul and 22 on St. George were killed for food.

SHIPMENTS OF FUR-SEAL AND FOX SKINS FROM PRIBILOF ISLANDS IN 1920.

Fur-seal skins.—Three shipments of sealskins were made from the Pribilof Islands in the calendar year 1920. The first of these was made up of 900 skins in 47 casks from St. Paul Island and 412 skins in 11 casks from St. George Island, the number from the latter place being the entire remainder of the catch of 1919 on that island. The

shipment left the islands April 7 on the Bureau's tender *Eider*, was transferred to the Alaska Steamship Co.'s steamship *Victoria* at Unalaska on April 19 for shipment to Seattle, Wash., and left the latter place on April 27 for St. Louis by freight via Northern Pacific to Minnesota Transfer and Chicago, Burlington & Quincy, arriving at St. Louis May 20.

On June 22 the U. S. S. *Saturn* took the remainder of the 1919 skins from St. Paul Island; the shipment was made up of 37 casks containing 505 skins. The *Saturn* proceeded to Bremerton, Wash., from which place the skins were forwarded July 7 to St. Louis by the same route as the first shipment. They arrived at St. Louis July 26.

The third shipment consisted of 476 casks containing 21,929 skins from St. Paul Island and 24 casks containing 1,133 skins from St. George Island; all were skins of the 1920 take. The skins were placed on board the *Saturn* November 25 for transportation to Seattle, Wash., left that place December 6, and arrived at St. Louis December 15, having been shipped by freight via Northern Pacific to Billings, and Chicago, Burlington & Quincy to St. Louis. This shipment made remarkably good time between Seattle and St. Louis, arriving in a little less than nine days.

Thirteen specimen skins were also shipped during the year. Four of these were from St. George Island and nine from St. Paul Island. The skins were brought south on the *Saturn*, arrived at Seattle September 26, and were shipped from there by express to the American Museum of Natural History at New York City.

Fox skins.—A single shipment of fox skins was made during 1920. This shipment consisted of 4 cases containing 155 blue and 33 white fox skins from St. Paul Island and 18 cases containing 746 blue and 4 white skins from St. George Island, a total of 938 skins. These cases were shipped in the same manner as the first shipment of seal-skins as far as Seattle, via the Bureau's vessel *Eider* and the commercial steamer *Victoria*, and from Seattle to St. Louis by express, where they arrived May 3.

SALES OF FUR-SEAL SKINS.

Two sales of dressed, dyed, and machined fur-seal skins from the Pribilof Islands were held in St. Louis during the calendar year 1920. One was on February 2 and the other May 10, at which times 9,100 and 5,752 skins were sold at auction for totals of \$1,282,905 and \$424,166, respectively.

The highest price secured at the February sale was for a lot of 70 skins, which brought \$177 each; the average price obtained was \$140.97, an increase of nearly 55 per cent over the average price at the preceding sale in September, 1919. At the sale in May the maximum price was \$125 per skin on two lots of wigs, 50 skins in each lot. The average price for the May sale was \$73.74, showing a decrease of about 48 per cent as compared with the February sale.

The first two of the following tables show details regarding the prices secured for each lot of skins in the two sales; the third table is a summary showing prices obtained for the skins in the various trade classes, with the percentages which the number of the skins in these several classes bore to the totals in each sale.

SALES OF DRESSED, DYED, AND MACHINED PRIBILOF FUR-SEAL SKINS AT ST. LOUIS, 1920.

SALE OF 9,100 SKINS, ST. LOUIS, FEB. 2, 1920.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.	Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
1	50	Wigs.....	\$152.00	\$7,600.00	73	70	Extra large; cut, scarred, etc.....	\$127.00	\$8,890.00
2	50	do.....	157.00	7,850.00	74	70	do.....	129.00	9,030.00
3	50	do.....	155.00	7,750.00	75	70	do.....	130.00	9,100.00
4	50	do.....	137.00	7,850.00	76	80	Large.....	160.00	12,800.00
5	50	do.....	158.00	7,900.00	77	80	do.....	157.00	12,560.00
6	50	do.....	158.00	7,900.00	78	80	do.....	164.00	13,120.00
7	50	do.....	158.00	7,900.00	79	80	do.....	162.00	12,960.00
8	50	do.....	158.00	7,900.00	80	80	do.....	162.00	12,960.00
9	50	do.....	162.00	8,100.00	81	80	do.....	161.00	12,880.00
10	50	do.....	162.00	8,100.00	82	80	do.....	161.00	12,880.00
11	50	do.....	163.00	8,150.00	83	80	do.....	160.00	12,800.00
12	50	do.....	167.00	8,350.00	84	80	do.....	159.00	12,720.00
13	50	do.....	169.00	8,450.00	85	80	do.....	160.00	12,800.00
14	50	do.....	168.00	8,400.00	86	80	do.....	161.00	12,880.00
15	50	do.....	169.00	8,450.00	87	80	do.....	162.00	12,960.00
16	50	Wigs; cut, scarred, etc.....	115.00	5,750.00	88	80	do.....	162.00	12,960.00
17	50	do.....	116.00	5,800.00	89	80	do.....	161.00	12,880.00
18	50	do.....	115.00	5,750.00	90	80	do.....	160.00	12,800.00
19	50	do.....	117.00	5,850.00	91	80	do.....	161.00	12,880.00
20	50	do.....	120.00	6,000.00	92	80	do.....	160.00	12,800.00
21	50	do.....	118.00	5,900.00	93	80	do.....	163.00	13,040.00
22	60	Extra extra large.....	167.00	10,020.00	94	80	do.....	165.00	13,200.00
23	60	do.....	170.00	10,200.00	95	80	Large; cut, scarred, etc.....	116.00	9,280.00
24	60	do.....	167.00	10,020.00	96	80	do.....	118.00	9,440.00
25	60	do.....	166.00	9,960.00	97	50	do.....	116.00	9,280.00
26	60	do.....	168.00	10,080.00	98	80	do.....	116.00	9,280.00
27	60	do.....	171.00	10,260.00	99	80	do.....	125.00	10,000.00
28	60	do.....	172.00	10,320.00	100	80	do.....	115.00	9,200.00
29	60	do.....	170.00	10,200.00	101	80	do.....	116.00	9,280.00
30	60	do.....	170.00	10,200.00	102	80	do.....	119.00	9,520.00
31	60	do.....	171.00	10,260.00	103	90	Mediums.....	124.00	11,160.00
32	60	do.....	168.00	10,080.00	104	90	do.....	126.00	11,340.00
33	60	do.....	167.00	10,020.00	105	90	do.....	123.00	11,070.00
34	60	do.....	174.00	10,440.00	106	90	do.....	123.00	11,070.00
35	60	do.....	170.00	10,200.00	107	90	do.....	122.00	10,980.00
36	60	do.....	173.00	10,380.00	108	90	do.....	121.00	10,890.00
37	60	do.....	171.00	10,260.00	109	90	do.....	121.00	10,890.00
38	60	do.....	169.00	10,140.00	110	90	do.....	122.00	10,980.00
39	60	do.....	168.00	10,080.00	111	90	do.....	121.00	10,890.00
40	60	do.....	172.00	10,320.00	112	90	do.....	121.50	10,935.00
41	60	do.....	172.00	10,320.00	113	90	do.....	120.00	10,800.00
42	60	do.....	172.00	10,320.00	114	90	do.....	123.00	11,070.00
43	60	do.....	171.00	10,260.00	115	90	do.....	122.00	10,980.00
44	60	do.....	171.00	10,260.00	116	90	do.....	123.00	11,070.00
45	60	Extra extra large; cut, scarred, etc.....	124.00	7,440.00	117	90	do.....	122.00	10,980.00
46	60	do.....	131.00	7,860.00	118	90	do.....	100.00	9,000.00
47	60	do.....	127.00	7,620.00	119	90	Mediums; cut, scarred, etc.....	99.00	8,910.00
48	60	do.....	130.00	7,800.00	120	90	do.....	102.50	9,225.00
49	60	do.....	127.00	7,620.00	121	90	do.....	104.00	9,360.00
50	60	do.....	131.00	7,860.00	122	90	do.....	105.00	9,450.00
51	60	do.....	130.00	7,800.00	123	90	Small mediums.....	90.00	8,100.00
52	60	do.....	131.00	7,860.00	124	90	do.....	90.00	8,100.00
53	60	do.....	132.00	7,920.00	125	60	Small mediums; cut, scarred, etc.....	70.00	6,300.00
54	90	do.....	132.00	7,920.00	126	90	do.....	71.00	6,390.00
55	70	Extra large.....	161.00	11,270.00	127	50	III wigs.....	71.00	3,550.00
56	70	do.....	169.00	11,830.00	128	50	do.....	71.00	3,550.00
57	70	do.....	173.00	12,110.00	129	60	do.....	82.00	4,920.00
58	70	do.....	172.00	12,040.00	130	70	III extra extra large.....	64.00	4,480.00
59	70	do.....	170.00	11,900.00	131	60	III-25 extra large, 45 large.....	57.00	3,420.00
60	70	do.....	174.00	12,180.00	132	20	III-50 mediums, 10 small mediums.....	56.00	1,120.00
61	70	do.....	171.00	11,970.00	9,100	.....	IV-9 wigs, 3 extra extra large, 2 extra large, 2 large, 4 mediums.....	.....	.....
62	70	do.....	173.00	12,110.00	.....	.....	.....	.....	.....
63	70	do.....	168.00	11,760.00	.....	.....	.....	.....	.....
64	70	do.....	169.00	11,840.00	.....	.....	.....	.....	.....
65	70	do.....	170.00	11,900.00	.....	.....	.....	.....	.....
66	70	do.....	168.00	11,760.00	.....	.....	.....	.....	.....
67	70	do.....	168.00	11,760.00	.....	.....	.....	.....	.....
68	70	do.....	168.50	11,795.00	.....	.....	.....	.....	.....
69	70	do.....	177.00	12,390.00	.....	.....	.....	.....	.....
70	70	Extra large; cut, scarred, etc.....	134.00	9,380.00	.....	.....	.....	.....	.....
71	70	do.....	130.00	9,100.00	.....	.....	.....	.....	.....
72	70	do.....	128.00	8,960.00	.....	.....	.....	.....	.....

SALES OF DRESSED, DYED, AND MACHINED PRIBLOF FUR-SEAL SKINS AT ST. LOUIS, 1920—Continued.

SALE OF 5,752 SKINS, ST. LOUIS, MAY 10, 1920.

Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.	Lot No.	Number of skins.	Trade classification.	Price per skin.	Total for lot.
1	50	Wigs	\$125.00	\$6,250.00	49	80	Large	\$81.00	\$6,480.00
2	50	do.	125.00	6,250.00	50	80	do.	81.00	6,480.00
3	50	do.	123.00	6,150.00	51	80	do.	81.00	6,480.00
4	50	do.	123.00	6,150.00	52	80	do.	80.00	6,400.00
5	50	do.	122.00	6,100.00	53	40	do.	81.00	3,240.00
6	50	Wigs cut, scarred, etc.	70.00	3,500.00	54	80	Large; cut, scarred, etc.	57.00	4,560.00
7	50	do.	72.00	3,600.00	55	80	do.	52.00	4,160.00
8	50	do.	74.00	3,700.00	56	80	do.	50.00	4,000.00
9	50	do.	70.00	3,500.00	57	80	do.	50.00	4,000.00
10	60	Extra extralarge	124.00	7,440.00	58	80	do.	49.00	3,920.00
11	60	do.	121.00	7,260.00	59	70	do.	49.00	3,430.00
12	60	do.	120.00	7,200.00	60	90	Mediums	71.00	6,390.00
13	60	do.	117.00	7,020.00	61	90	do.	68.00	6,120.00
14	60	do.	113.00	6,780.00	62	90	do.	65.00	5,850.00
15	60	do.	114.00	6,840.00	63	90	do.	66.00	5,940.00
16	60	do.	112.00	6,720.00	64	90	do.	63.00	5,670.00
17	60	do.	112.00	6,720.00	65	90	do.	65.00	5,850.00
18	60	do.	111.00	6,660.00	66	90	do.	64.00	5,760.00
19	60	do.	115.00	6,900.00	67	90	do.	66.00	5,940.00
20	60	Extra extralarge; cut, scarred, etc.	90.00	5,400.00	68	90	Mediums; cut, scarred, etc.	50.00	4,500.00
21	60	do.	79.00	4,740.00	69	90	do.	45.00	4,050.00
22	60	do.	72.00	4,320.00	70	90	do.	44.00	3,960.00
23	60	do.	67.00	4,020.00	71	90	do.	44.00	3,960.00
24	60	do.	64.00	3,840.00	72	90	do.	46.00	4,140.00
25	60	do.	64.00	3,840.00	73	90	Small mediums	55.00	4,950.00
26	30	do.	64.00	1,920.00	74	70	Small mediums; scarred, etc.	39.00	2,730.00
27	70	Extra large	108.00	7,560.00	75	50	III Wigs	40.00	2,000.00
28	70	do.	98.00	6,860.00	76	50	do.	41.00	2,050.00
29	70	do.	93.00	6,510.00	77	50	do.	41.00	2,050.00
30	70	do.	92.00	6,440.00	78	50	do.	41.00	2,050.00
31	70	do.	92.00	6,440.00			III Extra extra large	37.00	1,350.00
32	70	do.	91.00	6,370.00	79	60	III Extra large	37.00	2,220.00
33	70	do.	91.00	6,370.00	80	60	III Large	36.00	2,160.00
34	70	do.	93.00	6,510.00	81	70	III Mediums	26.00	1,820.00
35	70	do.	93.00	6,510.00	82	30	III Small mediums	19.00	570.00
36	70	Extra large; cut, scarred, etc.	65.00	4,550.00	83	50	IV Wigs	10.00	500.00
37	70	do.	60.00	4,200.00	84	50	IV—3 extra extra large, 10 extra large, 10 large, 10 mediums, 8 small mediums	21.00	1,050.00
38	70	do.	60.00	4,200.00			Skins—4 extra large, 4 large, 3 mediums, 1 small medium	53.00	636.00
39	70	do.	59.00	4,130.00					
40	70	do.	50.00	4,130.00					
41	80	Large	92.00	7,360.00					
42	80	do.	86.00	6,880.00					
43	80	do.	84.00	6,720.00	87	12			
44	80	do.	83.00	6,640.00					
45	80	do.	81.00	6,480.00					
46	80	do.	82.00	6,560.00					
47	80	do.	81.00	6,480.00					
48	80	do.	81.00	6,480.00		5,752			424,166.00

COMPARATIVE VALUES BY GRADES AND SIZES, WITH PERCENTAGES EACH SIZE OF SEALSKINS SOLD IN 1920.

Classes and sales.	Grade.	Number.	High.	Low.	Average.	Total.	Total number.	Average.	Total price.	Percentage.
Wigs:										
Feb. 2.	I and II... Cut, etc.	750	\$169.00	\$152.00	\$160.20	\$120,150.00	1,159	\$140.47	\$162,804.00	12.74
	III	300	120.00	115.00	116.83	35,050.00				
	IV	100	71.00	71.00	71.00	7,100.00				
		9	56.00	56.00	56.00	504.00				
May 10.	I and II... Cut, etc.	250	125.00	122.00	123.60	30,900.00	630	81.38	52,900.00	11.31
	III	200	79.00	72.00	77.00	15,400.00				
	IV	150	41.00	40.00	40.66	6,100.00				
		50	10.00	10.00	10.00	500.00				

COMPARATIVE VALUES BY GRADES AND SIZES, WITH PERCENTAGES EACH SIZE OF SEALSKINS SOLD IN 1920—Continued.

Classes and sales.	Grade.	Number.	High.	Low.	Average.	Total.	Total number.	Average.	Total price.	Percentage.	
Extra extra large:											
Feb. 2.	I and II.	1,380	\$174.00	\$166.66	\$169.91	\$234,480.00	2,043	\$155.06	\$310,788.00	22.45	
	Cut, etc.	600	132.00	124.00	128.70	77,220.00					
	III.	60	82.00	82.00	82.00	4,920.00					
	IV.	3	56.00	56.00	56.00	168.00					
May 10.	I and II.	600	124.00	111.00	115.90	69,540.00	1,043	95.43	99,533.00	18.14	
	Cut, etc.	390	90.00	64.00	72.00	28,080.00					
	III.	50	37.00	37.00	37.00	1,850.00					
	IV.	3	21.00	21.00	21.00	63.00					
Extra large:											
Feb. 2.	I and II.	1,050	177.00	161.00	170.10	178,605.00	1,497	156.83	234,777.00	16.45	
	Cut, etc.	420	134.00	127.00	129.67	54,460.00					
	III.	25	64.00	64.00	64.00	1,600.00					
	IV.	2	56.00	56.00	56.00	112.00					
May 10.	I and II.	630	108.00	91.00	94.55	59,570.00	1,063	78.66	83,611.00	18.48	
	Cut, etc.	350	65.00	59.00	60.80	21,210.00					
	III.	60	37.00	37.00	37.00	2,220.00					
	IV.	19	21.00	21.00	21.00	399.00					
Large:	Odds skins.	4	53.00	53.00	53.00	212.00					
	Feb. 2.	I and II.	1,520	165.00	157.00	161.11	244,880.00	2,207	146.42	323,152.00	24.25
		Cut, etc.	640	125.00	115.00	117.63	75,280.00				
		III.	45	64.00	64.00	64.00	2,880.00				
IV.		2	56.00	56.00	56.00	112.00					
May 10.	I and II.	1,000	92.00	80.00	82.71	82,080.00	1,544	70.80	109,332.00	26.85	
	Cut, etc.	470	57.00	49.00	51.21	24,070.00					
	III.	60	36.00	36.00	36.00	2,160.00					
	IV.	10	21.00	21.00	21.00	210.00					
Mediums:	Odds skins.	4	53.00	53.00	53.00	212.00					
	Feb. 2.	I and II.	1,440	128.00	121.00	122.22	175,995.00	1,944	115.75	225,014.00	21.36
		Cut, etc.	450	105.00	99.00	102.10	45,945.00				
		III.	50	57.00	57.00	57.00	2,850.00				
IV.		4	56.00	56.00	56.00	224.00					
May 10.	I and II.	720	71.00	63.00	66.00	47,520.00	1,253	56.12	70,319.00	21.77	
	Cut, etc.	450	60.00	44.00	45.80	20,610.00					
	III.	70	26.00	26.00	26.00	1,820.00					
	IV.	10	21.00	21.00	21.00	210.00					
Small mediums:	Odds skins.	3	53.00	53.00	53.00	159.00					
	Feb. 2.	I and II.	150	90.00	90.00	90.00	13,500.00	250	81.48	20,370.00	2.75
		Cut, etc.	90	70.00	70.00	70.00	6,300.00				
		III.	10	57.00	57.00	57.00	570.00				
IV.		90	55.00	55.00	55.00	4,950.00					
May 10.	I and II.	70	39.00	39.00	39.00	2,730.00	199	42.57	8,471.00	3.45	
	Cut, etc.	30	19.00	19.00	19.00	570.00					
	III.	8	21.00	21.00	21.00	168.00					
	IV.	1	53.00	53.00	53.00	53.00					
Feb. 2.						9,100	140.97	1,282,905.00	100.00		
May 10.						5,752	73.74	424,166.00	100.00		
Both sales						14,852	114.94	1,707,071.00	100.00		

SUMMARY OF FUR-SEAL SKINS SHIPPED TO FUNSTEN BROS. & CO.

The table published in the report on the Alaska Fisheries and Fur Industries in 1919, stated that at the end of the calendar year 1919 there were on hand at St. Louis in all 47,615 fur-seal skins from the Pribilof Islands. Of these 43 were so-called food skins, taken during the close season ended August 24, 1917, and the remaining 47,572 were commercial skins taken after that date. A letter of February 17, 1921, from Funsten Bros. & Co., the Bureau's selling agents, stated that in unpacking the shipment received in November, 1919, one more skin was found than was reported shipped. This made the grand

total on hand January 1, 1920, 47,616 skins. The following table shows shipments received and sales of skins by the firm during the calendar year 1920:

SUMMARY OF PRIBILOF ISLANDS FUR-SEAL SKINS RECEIVED AND SOLD BY FUNSTEN BROS. & CO., ST. LOUIS, MO., AND BALANCES IN FIRM'S CUSTODY, CALENDAR YEAR 1920.

Receipts.			Sales.				Balances on hand.		
Date of shipment from Pribilofs.	Date of receipt by firm.	Number of skins.	Date of sale.	Number of skins.			Food skins. ¹	Commercial skins. ²	Total.
				Food skins. ¹	Commercial skins. ²	Total.			
			Jan. 20	31		31	43	47,573	47,616
			Feb. 2		9,100	9,100	12	47,573	47,585
Apr. 6	May 20	1,312	May 10	12	5,740	5,752	12	38,473	38,485
June 22	July 30	505						39,785	39,797
Nov. 25	Dec. 15	23,062						34,045	34,045
								34,550	34,550
								57,612	57,612

¹ Skins taken from seals killed for natives' food prior to the termination on Aug. 24, 1917, of the 5-year period of restricted killings provided by the act of Aug. 24, 1912.

² Skins taken subsequent to Aug. 24, 1917.

FUR-SEAL SKINS ON HAND DECEMBER 31, 1920.

As in the published report for the preceding calendar year, a statement as to the number of fur-seal skins handled during the year and the number on hand, both at the Pribilof Islands and at St. Louis, at the end of the calendar year 1920 is submitted as follows:

ST. LOUIS RECORD OF SEALSKINS.

On hand Jan. 1, 1920	47,616
Shipments received in 1920:	
May	1,312
July	505
December	23,062
	<u>24,879</u>
Total	72,495
Sales during 1920:	
January ²	31
February	9,100
May	5,752
	<u>14,883</u>
Balance on hand at St. Louis Dec. 31, 1920	<u>57,612</u>

PRIBILOF RECORD OF SEALSKINS.

On hand Jan. 1, 1920:	
St. Paul Island	1,405
St. George Island	412
	<u>1,817</u>

¹ The preceding report for 1919 gave the number on hand as 47,615, but when the shipment received November, 1919, was unpacked in 1920, one more skin was found than was reported shipped, thereby increasing the number on hand by 1.

² Funsten Bros. & Co. paid the Government at the rate of \$80 each for 31 sealskins, of which the firm reported 17 spoiled in work and 14 prepared for exhibition purposes.

Skins taken in 1920:		
St. Paul Island.....	22, 220	
St. George Island.....	4, 428	
		26, 648
Total.....		28, 465
Shipments during 1920:		
St. Paul Island.....	23, 334	
St. George Island.....	1, 545	
		24, 879
Balance on hand at Pribilofs Dec. 31, 1920.....		3, 586
Grand total on hand Dec. 31, 1920.....		61, 198

SALE OF FOX SKINS POSTPONED.

The 901 blue and 37 white fox skins taken at the Pribilofs in the winter 1919-20 were not sold during the year 1920, the condition of the fur market making it advisable to defer their sale.

PATROL OF NORTH PACIFIC OCEAN AND BERING SEA.

As in previous years, a patrol was maintained by the Coast Guard for the protection of the migrating fur-seal herd and the prevention of poaching in the vicinity of the Pribilof Islands. Numerous courtesies in the way of transportation of passengers, mail, and freight for the Bureau are also gratefully acknowledged. The following extracts from a statement prepared by the Coast Guard relate in detail the work performed during the year:

MEMORANDUM CONCERNING OPERATIONS OF THE COAST GUARD IN CONNECTION WITH PATROLLING THE NORTH PACIFIC OCEAN AND BERING SEA DURING THE SEASON OF 1920.

The North Pacific Ocean and Bering Sea patrol, commanded by Commander J. H. Brown, United States Coast Guard, for the season of 1920 was made by the Coast Guard cutters *Unalga*, *Algonquin*, *Bear*, and *Bothwell*. These vessels were actively engaged during the season on patrol and in such additional work as furnishing transportation to various persons, including natives, civil authorities, school-teachers, and destitutes; delivering United States mail, food, and supplies to isolated settlements; assisting distressed vessels; extending succor to persons in need; furnishing medical treatment to natives; and enforcing the laws.

The *Unalga*, in command of Lieut. Commander B. L. Brockway, left Seattle on April 28, 1920, for Unalaska. The cutter had on board seven passengers for transportation to various points in Alaska, four of whom were employees of the Bureau of Fisheries. On May 7 she arrived at Unalaska, where all passengers left the vessel. The medical officer attached to the *Unalga* inspected the town of Unalaska and found the health and sanitary conditions to be good.

On May 14 the *Unalga* left Unalaska on her first cruise in Alaskan waters. She proceeded to Unimak Pass, cruised along the southern shore of Unimak Island, then visited Davidson Bank, and traveled along the fishing banks as far east as Sannak Islands. During this trip no fishing vessels were sighted.

On June 18 she left Unalaska for a cruise in the vicinity of Slime Bank. The only vessel seen on this trip was the American schooner *Wawona*, to which mail was delivered and to the crew of which medical treatment was afforded. The cutter later left for the Pribilof Islands and cruised in that vicinity for more than a week, but found no vessels in need of assistance. Two more trips were made to the Pribilof Islands and Slime Bank and to other fishing banks in Bristol Bay as far east as Ugashik River. While on one of these cruises the American schooner *City of Papeete* was boarded and medical treatment given to some members of her crew.

On August 14 the commanding officer of the *Unalga*, while serving in the capacity of United States commissioner, acted as arbitrator in a labor dispute at the Wood River cannery of the Alaska Salmon Co. Through his efforts a reconciliation was effected and the men returned to work. * * * On August 18 the *Unalga* cruised over the fishing grounds off Hagemeister Island, but sighted no fishing vessels while on this trip.

On October 20 Mr. A. H. Proctor, superintendent, Pribilof Islands, and several natives, were transported to the northeast point of St. Paul Island to obtain a quantity of salted sealskins, the motor boat of the Bureau of Fisheries being disabled at the time. * * * On November 23 the cutter proceeded to Sand Point, where the medical officer vaccinated a number of persons. The vessel then left for Port Townsend and arrived there on December 1, 1920.

The *Algonquin*, in command of Lieut. Commander W. A. Wiley, left Port Townsend on April 30, 1920, on her cruise in Alaskan waters, and arrived at Hydar, Alaska, on May 4. Four days later she proceeded to Ketchikan, where she remained until the 20th, awaiting the arrival of supplies forwarded to her from Seattle. On May 20 she left Ketchikan and took up the seal patrol the following day. Two herds, containing about eight seals each, were sighted off Sitka in the evening. The cutter continued the patrol until May 24, when she was called to Yakutat to transport a badly wounded Indian to the nearest hospital. * * * A rumor that about 500 fur seals had wintered in the vicinity of Attu was investigated, with the result that the report was found to be erroneous.

On July 6 Lieut. Commander W. A. Wiley, having become ill, was forced to relinquish command of the *Algonquin*, whereupon Lieut. Commander W. T. Stromberg assumed command. Lieut. Commander Wiley was invalided home.

During the months of June, July, and August the *Algonquin* made a number of cruises in the vicinity of the Pribilof Islands and to other places. While on these cruises she carried United States mail, transported passengers, delivered supplies for the Bureau of Education and others, and afforded medical aid to the sick.

On September 11 the *Algonquin* left Unalaska for a cruise to Unimak Island. Among others taken aboard for transportation to various points was Warden J. N. Braun, Bureau of Fisheries, who desired passage to St. George Island. On her return trip to Unalaska the cutter afforded transportation to Mr. H. Silverstone, of the Bureau of Fisheries.

On September 27, in compliance with the request of Mr. A. H. Proctor, superintendent Pribilof Islands, a board was appointed to examine and report upon the machinery of the U. S. F. S. *Eider*. The board recommended that urgent repairs be made to the vessel.

On October 10 the *Algonquin*, with the cutter *Bear* in tow, the latter having become disabled, set a course for Seattle and arrived there on October 20. * * * Preparations being completed, the cutter left Seattle October 28 on her return to Bering Sea and arrived at Unalaska on November 5. * * * Her duties being completed, the *Algonquin* left Unalaska on November 12 for Seattle. On her return trip she stopped at Akutan, Lost Harbor, the canneries at Ikatan and King Cove, Unga Harbor, Valdez, Juneau, and other places. * * * On November 28 the *Algonquin* left Juneau and arrived at Seattle on December 2, 1920.

The *Bear*, in command of Lieut. Commander F. S. Van Boskerck, sailed from Seattle on May 8, 1920, for Alaskan waters. While en route the commanding officer became ill, which necessitated the vessel's stopping at Alert Bay, British Columbia, where he disembarked to await transportation to Seattle. The executive officer, Lieut. Commander C. G. Roemer, then assumed command. The cutter left Alert Bay on May 18 and arrived at Unalaska on May 27, where she delivered the United States mail.

On June 6 she left for a cruise to the Pribilof Islands. A number of natives were afforded transportation on this trip. Navigation, especially in the vicinity of Nome, was rendered extremely difficult, owing to the prevalence of ice. On June 13 Lieut. Commander F. S. Van Boskerck boarded the vessel at Nome and resumed command. The *Bear* left for a cruise to St. Lawrence Island on June 22, but owing to severe ice conditions, it was found impossible to make a landing, so she returned to Nome, arriving there on September 21. * * *

On October 10 the *Bear*, in tow of the *Algonquin*, left Unalaska. On October 19 the cutter *Snohomish* made contact with the vessels and relieved the *Algonquin* of the tow, arriving at Bremerton Navy Yard on October 23, 1920.

The *Bothwell*, as part of the Bering Sea patrol force, reported for duty at Unalaska on August 1, 1920. This cutter made cruises to Bogoslof Island, Akutan, False Pass, King Cove, Latouche, and other places. While on these cruises the *Bothwell* collected certain geographic information, made reconnaissances of harbors, and delivered United States mail. On September 8 the *Bothwell* left Latouche on her return trip and arrived at Seattle on September 14, 1920.

In his report on the Bering Sea patrol Commander J. H. Brown states that the fishing fleets were not operating during the season in accordance with their usual schedule, and because of this fact but few of these vessels were fallen in with. He further states that there were no fishing vessels operating on the Sunnak and Davidson Banks and but few on Sline Bank.

SEALING PRIVILEGES ACCORDED ABORIGINES.

One thousand two hundred and eighty-five fur-seal skins were taken by Indians off the coast of Washington during the months of April, May, and June, 1920. These skins, together with two more taken in June, 1919, were properly authenticated through the cooperation of A. D. Dodge, superintendent of the U. S. Indian School at Neah Bay, Wash. These seals were taken by Indians of the Washington coast in accordance with the privilege granted by the North Pacific Sealing Convention of July 7, 1911, and the act of Congress approved August 24, 1912. Of the total of 1,287 skins, 656 were from male seals, 630 from females, and one from a seal whose sex was not recorded.

JAPANESE SEALSKINS DELIVERED TO THE UNITED STATES.

On January 17, 1921, the Bureau was advised that 56 fur-seal skins, constituting 10 per cent of the total number taken from the Japanese herd on Robben Island in the season of 1920, were ready for delivery to a representative of the United States. Under the convention of July 7, 1911, the United States receives a share of skins taken from the Japanese herd. Instructions were issued for the shipment of these skins, and they reached San Francisco April 15, being forwarded at once to the Bureau's agents at St. Louis, where they were received on April 26. They will be dressed, dyed, and machined in the usual manner and sold for the account of the Government.

FUR-SEAL CENSUS, PRIBILOF ISLANDS, 1920.

By G. DALLAS HANNA.

I landed at the Pribilof Islands on June 16, 1920, from the U. S. naval radio tender *Saturn* for the purpose of making a census of the Alaska fur-seal herd which resorts there to breed. In order to complete the work it was necessary at various times to travel from St. Paul Island to St. George Island and vice versa. This was effected through the courtesy of the commanding officers of the *Saturn*, the Coast Guard cutter *Algonquin*, and the Bureau of Fisheries vessel *Eider*, to all of whom my appreciation is extended.

The census was made possible through the active cooperation of the superintendent of the Pribilof Islands, A. H. Proctor, in furnishing material and labor on St. Paul Island when necessary. C. E. Crompton, agent and caretaker, did likewise on St. George Island. E. C. Johnston, storekeeper on St. George Island, ably assisted in the actual census work as much as possible.

The methods used in counting and computing the various classes as given below were similar to those which have been in use for several years and which were outlined in the report of the Alaska Fisheries and Fur Industries in 1918, page 116.

PUPS.

DISTRIBUTION OF PUPS IN 1920.

Rookery.	Date of counts.	Living pups.	Dead pups.	Total pups.	Per cent dead.
ST. PAUL ISLAND.					
Kitovi.....		3,718	46	¹ 3,764	1.22
Lukanin.....		2,853	79	¹ 2,932	2.69
Gorbach.....		9,970	281	¹ 10,251	2.74
Ardiguen.....		1,163	17	¹ 1,180	1.44
Reef.....		23,048	590	¹ 23,638	2.50
Sivutch.....		8,281	94	¹ 8,375	1.12
Lagoon.....	Aug. 12	333	8	341	2.35
Tolstoi.....		16,898	388	¹ 17,286	2.24
Zapadni.....		16,031	368	¹ 16,399	2.24
Little Zapadni.....		12,214	280	¹ 12,494	2.24
Zapadni Reef.....	Aug. 12	525	7	532	1.32
Polovina.....	Aug. 11	5,794	212	6,006	3.53
Polovina Cliffs.....	do.	2,511	62	2,573	2.41
Little Polovina.....		1,690	21	¹ 1,711	1.23
Morjovi.....	Aug. 10	2,818	118	¹ 2,936	4.02
Vostochni.....		31,708	1,149	¹ 32,857	3.50
Total.....		139,555	3,720	143,275	2.60
ST. GEORGE ISLAND.					
North.....		8,944	182	¹ 9,126	1.99
Staraya Artil.....		5,781	163	¹ 5,944	2.74
Zapadni.....	Aug. 4	894	13	907	1.43
South.....	do.	98	1	99	1.01
East Reef.....	Aug. 5	2,543	28	2,571	1.09
East Cliffs.....		5,493	112	¹ 5,605	2.00
Total.....		23,753	499	24,252	2.06
Total, both islands.....		163,308	4,219	167,527	2.52

¹ Based on estimated average harem.

The chief object in the counting of pups is the determination of the average number of cows to each bull, or the average harem. Since birth is given to but one young each year it follows that the determination of the number of young will give the number of breeding females, and by dividing this by the number of harem bulls found earlier in the season the average harem is determined.

Obviously the greater the number of pups counted the greater the accuracy of the census as a whole. Up to and including 1916 it was possible to count this class on all of the rookeries. In 1917, however, the greatly increased number of bulls prevented pup counting until such a late date that breeding areas could not all be gone over. The increase in size of the herd has further complicated matters. While it is not physically impossible to make a complete pup count when bulls are present in no greater numbers than in 1920, still a much larger force of counters would be required for the work than has heretofore been available.

Since 1917 a comparatively small proportion of the pups has been counted. Rookeries have been chosen, however, which were believed to represent the herd as a whole with regard to growth. They have been, in the main, the smaller ones, in order to reduce to a minimum the danger of loss from trampling by bulls and from smothering.

Neither of these factors enters largely into the operations if a competent force of white men is performing the work, because there are expedients which can be used in emergencies which effectually prevent deaths. For instance, if pups have piled up in the counting and are in danger of smothering, they can be scattered by a man wading into the mass. There is no other known means whereby the animals can be spread out quickly enough to prevent loss on a warm day. It so happens that the natives are entirely too irresponsible to be depended upon in such an emergency. In seven years of counting I have never seen one offer to do the scattering in such an emergency. It is obviously impossible for the person who does the actual counting to keep constant watch of the "podding" ahead of him, and if there should be no one else looking after that part of the work danger is sure to result; this is particularly true on the larger rookeries. Unfortunately the natives allowed eight pups to smother on Zapadni Reef rookery during the work on St. Paul in 1920. They have been included among the live pups on that rookery in the table because it is desirable to have the number of dead represent the natural loss only.

In selecting rookeries for counting in 1920 it seemed desirable in many ways to choose those which were counted in 1919. The working out of the average harem for those uncounted rookeries would then give results which were more strictly comparable than if new territory were selected.

While it seems reasonable to suppose that any one rookery would grow at the same rate as the herd, this is unfortunately far from the case. There is great variation among the several rookeries and on any one from year to year. This makes the estimating of the average harem on rookeries where pups have not been counted more or less uncertain. But unless all rookeries are counted—a manifestly impracticable task with a limited force and a large herd—no way to avoid the difficulty is known, and the matter must devolve upon the best judgment of those who have it in hand.

INCREASE OR DECREASE IN NUMBER OF PUPS IN 1920 FROM 1919.

Rookery.	Total pups, 1919.	Total pups, 1920.	Numerical increase.	Increase (+) or decrease (-).
ST. PAUL ISLAND.				<i>Per cent.</i>
Kitovi.....	3,565	3,764	199	+ 5.58
Lukanin.....	2,788	2,932	144	+ 5.16
Gorbatch.....	12,308	10,251	-2,057	-16.65
Ardiguen.....	1,150	1,180	30	+ 2.61
Reef.....	22,457	23,638	1,181	+ 5.26
Sivutch.....	7,015	8,375	1,360	+19.39
Lagoon.....	1,445	1,341	- 104	-23.37
Tostoi.....	16,027	17,286	1,259	+ 7.86
Zapadni.....	14,300	16,399	2,099	+14.68
Little Zapadni.....	10,145	12,494	2,349	+23.15
Zapadni Reef.....	1,604	1,532	- 72	-11.92
Polovina.....	15,794	16,006	212	+ 3.06
Polovina Cliffs.....	12,209	12,573	364	+16.48
Little Polovina.....	1,203	1,711	508	+42.23
Morjovi.....	13,041	12,936	- 105	- 3.45
Vostochni.....	30,863	32,857	1,994	+ 6.40
Total.....	133,914	143,275	9,361	+ 6.99
ST. GEORGE ISLAND.				
North.....	8,802	9,126	324	+ 3.68
Staraya Artil.....	15,746	5,944	198	+ 3.14
Zapadni.....	1,857	1,907	50	+ 5.83
South.....	198	199	31	+45.59
East Reef.....	12,367	12,571	204	+ 8.62
East Cliffs.....	5,418	5,605	187	+ 3.45
Total.....	23,258	24,252	994	+ 4.27
Total, both islands.....	157,172	167,527	10,355	+ 6.59

¹Pups counted.

It will be noted that upon some of the eight rookeries counted there has been no gain, whereas on others it has been considerable, and again that the gain on the lot has been only 3.77 per cent. This latter fact indicates very strongly that the gain of breeding cows has not been the 9 per cent which has been considered to be the normal rate.

It is true that the smaller rookeries do not increase as rapidly as the large ones, but there should not be this much discrepancy even though it is possible. It is entirely possible for the rookeries counted to have lost and the herd as a whole gain the normal amount, but it is not probable. The abnormal gain on the other rookeries would have been a noteworthy feature to a person who had had them in view during successive years. After a consideration of all of the factors which enter into the problem, the gains on the several rookeries have been estimated as shown in the above table. This, of course, is made up largely from the data on average harems (p. 116). It shows the gain of pups (and breeding cows) for the entire herd to be 6.59 per cent.

A noteworthy feature of the rookeries on which counts were made is the actual decrease in the number as well as the percentage of pups found dead in spite of an actual increase of total pups. This is entirely in accordance with predictions as to what would happen when the size of the harem would be increased. By using the figures of dead pups found on the various rookeries the numbers have been estimated for those which were not counted. This is shown in the table

above and illustrates the value of having a comparatively large average harem. The various proportions of massed areas where death rates are high to scattered rocky areas where they are low have been taken into consideration in arriving at the percentages. Also of prime importance in this connection is the fact that the size of the average harem in 1920 stands almost halfway between the figures for 1915 and 1916. It is reasonable to suppose that the percentage of dead pups would be governed thereby.

In the early days of pelagic sealing, when large numbers of dead pups were washed up by the surf, the impression was general that the animals were drowned by storms. The matter entered into international negotiations when it was maintained by the representatives of the Government of Great Britain that this was a prime cause of pup mortality. The fact that starvation was the cause of death as a result of the mothers having been killed by pelagic sealers was thereby concealed.

Dr. F. A. Lucas¹ has shown the subject in its true light and commented on the fallacy of the much-flaunted "deadly surf nip." By actual autopsy he demonstrated that the number of young animals drowned was insignificant.

I personally had never had an opportunity to make any observations on the subject until 1920, because violent storms had never occurred at the proper season during my seven years of work. But this year a heavy gale from the southwest drove an enormous surf into English Bay for three days during the latter part of July. It was precisely the time for deaths from drowning to occur, if such ever occur. Some pups are then dabbling in the edge of the water, while many others are young and weak.

After the storm thorough search of the entire stretch of English Bay beach was made, where over a thousand had been counted at one time during the days of pelagic sealing, but only 17 dead pups were found there. Not one of these 17 animals had drowned, and the majority of them were in an advanced stage of decomposition. They were simply some of the usual dead which had been washed off the rookery.

Thus the findings of Dr. Lucas in this respect are completely confirmed. Drowning is the cause of a very insignificant portion of the loss of fur seals.

The intestinal parasite *Uncinaria* may be present among the pups and may cause a few of the deaths recorded from year to year. Autopsies were made in a few cases in 1920 where decomposition had not proceeded too far, but in no instance could death be attributed to this cause. It may be that the parasite is epidemic at periodical intervals and will recur some time in the future. It is a point well worth keeping in mind by future investigators.

In 1915 the presence of a considerable number of animals, both young and adult, was noted and recorded which had the mange or some skin affection allied to it to a greater or less degree. Each year a few cases are seen, and they are usually marked by the presence of small, round, hairless spots. These are known in the fur trade by

¹ Fur Seal Investigations, 1890-97, pt. 3, pp. 83-84.

the erroneous term "rubbed spots." These are usually on portions of the anatomy which could not be "rubbed" under any circumstances. The number of cases of this disease gradually decreased to a minimum by 1917, which remained constant through 1920.

Ectoparasites of the fur seal are very rare, although the enormous amount of scratching which is visible in any "pod" would leave the casual observer with the impression that the opposite is the truth. In 1899 a louse, *Hæmatopinus callorhini* Osborn, was described from "a number of examples from the northern fur seal." And at the same time a tick, *Ixodes arcticus* Osborn, was described from a single individual.¹ I have made repeated search for these parasites, and several years ago located the louse on pups. Not all are afflicted by any means, but occasionally a few specimens can be secured from the eyelids and less often in the fur of the head. No positive information regarding the tick could be secured. A reward of \$1 per louse and \$5 per tick has been offered to the native workmen who kill and skin some 25,000 animals each year, but there have been only negative results. This leads me to believe that the louse is almost, if not wholly, confined to the pups, and very serious doubt is cast upon the *Ixodes arcticus* being a parasite of the fur seal at all.

COWS.

The number of breeding cows in the herd corresponds to the number of pups, since the one is derived directly from the other. There naturally exists in any year an excess of adult females over young, because there are always a few barren animals. The number, however, has never been considered other than inconsequential and is very properly ignored. The increase or decrease, in fact the existence of the species, is dependent upon the fertile cow; the others in no known way enter into commercial operations of man.

Formerly it was supposed that the cows which resorted to the hauling grounds with the bachelors were barren, but this is not the case at all. Thirteen cows which had been accidentally killed on the fields during the past four years have been examined and only one was found barren. Several of them had already given birth to young, but others had not, while the majority were 2-year-olds with reproductive organs normal in every way.

LOSS OF COWS ON THE ISLANDS.

The spreading of the bulls incident to the larger average harem produced a noticeable decrease in the death rate of cows on the breeding grounds. Since much of the turmoil and fighting of the past three years was thus done away with, such a result would be naturally expected. During the counting of 15,965 pups 9 dead cows were found. This is a percentage of 0.000563, which applied to the entire herd gives 94 as the total number. Comparable figures for preceding years were: 195 in 1919, 213 in 1918, 129 in 1917, and 39 in 1916. It shows that in spite of the increase in the herd there

¹ Fur Seal Investigations, 1896-97, pt. 3, p. 553.

has been an actual decrease in the number of dead cows, and it constitutes, along with the low death rate of pups, the strongest argument in favor of a reasonably large harem.

In addition to the decrease in number of dead cows found, there was a very noticeable decrease in the number of those which had been bitten and torn by the bulls. In no instance was an injury seen which was believed to be serious.

The closing of commercial operations on July 31 instead of August 10 is even more necessary now than heretofore, and it is again urged that this action be delayed no longer. It is well known that up to 1910 the Government prohibited the leasing companies almost every year from conducting sealing after July 31 on account of the number of cows which would otherwise be driven and unavoidably killed. This was a very efficient and sensible regulation and should by all means be inaugurated in the work of the Government.

During the commercial operations of 1917, 1918, and 1919 it has been pointed out many times that the resorting of the cows to the hauling grounds of the bachelors after August 1 interfered considerably with the work and caused the death of some of them. This flocking of the females to the hauling grounds is due chiefly to the fact that the breeding season has passed and they are free to move wherever they will. When bulls were abundant to replace each other on the rookeries, they held the cows longer in the harems. But the increase in the average harem in 1920 gave the cows a great deal more freedom than they had had for three years. This was evidenced by their flocking to the hauling grounds in greatly increased numbers. It was no uncommon thing on St. Paul for 250 cows to come up in a single drive after August 1. And on St. George they were so abundant that work was very seriously hampered. Naturally some of them were killed; not a large number, to be sure, but it is impossible to conduct the killing with reasonable dispatch so that all will be spared. Some accidents are unavoidable, because the 3-year-olds of both sexes are almost indistinguishable even to the practiced eye. The native workmen are ashamed of the work and unless importuned will not report the killing of a cow.

We may grant that the number of females killed by the extension of the season to August 10 is insignificant. Their value to the herd may not be as great as the increased revenue secured by the additional take of males; a simple calculation will demonstrate that. But the driving of these several thousand mothers, heavy with milk, is very inhumane to say the least. And if we may judge by the effect of similar exertion upon domestic animals permanent injury in many cases results. The long drives particularly tire them to the point of exhaustion, sometimes even to death. In dry weather the skin is worn from the flippers and leaves them raw or bleeding. All of these details are better left untold, but are given in hopes that the real importance of the situation will become apparent and that 1921 will see no driving permitted after July 31. We all of course know that it is not necessary to drive after that date in order to reduce the excess number of males satisfactorily. Forty years of commercial work has demonstrated that point.

LOSS OF COWS AT SEA.

It has been ascertained several times the past few years that the loss of cows at sea the first three years is approximately 50 per cent of all of those born. No data have come to hand which call for a revision of this result. It is an enormous death toll, and though it is almost certainly due to the work of some pelagic enemy, we know very little of it. Killer whales are known to devour the animals and are suspected of being their only enemy, yet proof is not to be had. Bryant has recorded the taking of 18 and 24 fur-seal pups, respectively, from the stomachs of two killers—\$2,000 meals, each of them. The investigation of this matter is one of the important tasks for the future. There are few studies which promise such fruitful results as would attend the successful solving of this problem. The protection afforded the cows and the consequent increased rate of growth of this class would be the permanent and most important benefit to the species and to man.

Actual figures as to the number of fur seals killed at sea under the treaty provisions allowing aborigines to hunt them are not yet available to me. Dispatches in the daily press, however, indicate that they are assuming proportions little short of alarming.

The proportions of the sexes taken in this pelagic catch are not known, but there is good reason to suppose that it consists largely of females. For the sake of convenience it may be assumed that 2,000 females were killed altogether on all coasts. This would reduce the Pribilof herd by double the number, or 4,000 in 1920, because the unborn pup is destroyed with the mother. In other words, the mainstay class of the herd has been reduced in a single season by over 1 per cent.

This matter is called to attention in the hope that a beginning may be made in solving the difficulty. Rather than have cows slaughtered it would be far preferable, if skins the Indians must have, to do as we have with Great Britain and Japan, give them an equivalent number of males from the land catch.

BRANDED ANIMALS.

Cows bearing the inverted T brand of 1912 on the top of the head were, as usual, in evidence on many of the rookeries. At Lukanin on St. Paul Island one was noted which was not believed to have been many hours out of the water. Two days later she had given birth to her pup but was located in a harem two bulls removed from where she was first seen. She was then seen each day until the eighth after her arrival. She could not be located later on the rookery, although she must have returned to nurse her pup. This confirms almost exactly a record made by W. I. Lembkey on the same rookery in 1902.

Further information was gained regarding those branded animals which may be conveniently classed as the 1902 series. A close study of them was begun in 1918 and the subject is dealt with at some length in the Alaska report for that year, pages 121 and 122.

The brands of this series consisted of one or more bars burned across the back or in a few cases with a longitudinal bar on the side combined with a cross bar. The work had for its object at the time of its inception the depreciation of the skin of the female to such an extent that it would be unprofitable for pelagic hunters to take it. The first experimental brands were put on in 1896, and when the operation was found to be practicable it was continued each season thereafter until 1902 on St. Paul Island and to 1903 on St. George Island, when it was abandoned. W. I. Lembkey states¹ that it was stopped in 1903 by departmental order. It was found a useless procedure in so far as the original objective was concerned.

A table was published in the 1918 report, page 122, which showed the totals branded each year on St. Paul. It included St. George also for 1896 and 1897. Subsequent records for the latter island could not then be located. Mr. C. E. Crompton has since found some of them and has kindly furnished them to me for use in this report. His records show the brandings on the smaller island for 1901 to 1903, inclusive, and they are embodied in the tables given below. Thus we now have the complete record of this work in so far as the island journals are kept, except for St. George Island, for the three years 1898, 1899, and 1900.

The records secured by Mr. Crompton failed to include one for October 12, 1903, of which I find a published statement in Appendix A to Hearings before House Committee on Expenditures in the Department of Commerce, page 100. It is there stated by Chichester that 274 pups were branded on that date. These have been added to the St. George totals for that year.

FEMALE PUPS BRANDED 1896 TO 1903.

Year.	St. Paul Island.	St. George Island.	Total.
1896.....	1 315	1 62	377
1897.....	2 5,371	1,880	7,251
1898.....	2,363	(¹)	2,363
1899.....	2,191	(¹)	2,191
1900.....	1,698	(¹)	1,698
1901.....	4,173	686	4,859
1902.....	1,416	1,325	2,742
1903.....	(¹)	1,352	1,352
Total.....	17,527	5,306	22,833

¹ Jordan and Clark, Fur Seal Investigations, 1896-97, p. 326.

² Murray, *ibid.*, pp. 337, 338.

³ Judge, *ibid.*, p. 338.

⁴ No record.

It seems desirable to record here the character of brands used when it has been possible to ascertain them. During several years when branding was done, a few cows were also captured and received the mark, but the number was so insignificant as to need no further mention in this connection.

¹ Appendix A, Hearings House Committee on Expenditures, Department of Commerce, p. 388. 1911.

FEMALE PUP FUR SEALS BRANDED ON ST. PAUL AND ST. GEORGE ISLANDS,
1896 TO 1903.

Year.	Unknown. ¹	Single bar. —	Double bar. =	Triple bar. ≡	Quadruple bur. ≡≡	Triple crossbar. ≡≡≡	Single diag- onal bar. /
1896		191	2	62	9	124	
1897		5,389	1,133	847			
1898		2,029					334
1899		2,191					
1900	1,076	629					
1901	4,888						
1902	2,245	497					
1903	1,370						

¹ Believed to have been single bar across back.

² All cows.

³ Includes 18 cows.

⁴ Includes 100 cows.

⁵ Includes 7 cows.

⁶ Includes 29 cows.

Many records of "branding" after 1903 have been made, but they refer in every case, it is believed, to the marking of a bachelor reserve. This was first undertaken in 1904 and continued up to and including 1911. In every case, with the possible exception of the first year and irregular branding on St. George from time to time, permanent brands were not used. The hair was simply clipped from a spot on the back of the head so as to make the animal recognizable the remainder of that season. Unfortunately this process has been called "branding" almost always and has so confused the record of the real hot-iron work that the truth is in some cases in doubt.

A journal entry on September 25, 1901, was found which stated " * * * one [cow was seen] with a brand just behind its front flippers and another running parallel to its backbone, but a little to one side." In commenting upon this, C. E. Crompton says: "I positively saw [a cow with] this same brand at Staraya Artil while counting pups this year [1919]."

No record of the use of this brand has been found, but it was probably in 1898, or else no record was made when the work was done. Unfortunately the journal entries are usually very brief and do not describe the character of mark at all. As, for instance, "October 10, 1901, branded seals at Little East, 127 branded."

To have been a cow in 1901, the animal must have been born in 1898 or earlier. It is not likely that the odd brand was used on more than one batch of pups, nor in more than one year. This would make the cow seen by Mr. Crompton in 1919 at least 21 years of age. This is three years more than the maximum age which has heretofore been ascribed to a fur seal.

In all, seven cows of the 1902 series were seen on the various rookeries in 1920. Facilities for observation over the great mass of rookery areas are so poor, however, that this can represent but a small fraction of the number which must have actually been in existence.

It is most important to note that these animals were 18 years old, unless by possible chance they were all from the lot branded on St. George in 1903, when they would be 17. This is so highly improbable that it may be dismissed. Thus the maximum age of the cow is several years more than the most sanguine have previously suspected.

This leads to interesting speculation upon the comparative mortality of the sexes. But it will be sufficient here to dismiss the subject with the observation that no record is known to me of any individual bull having returned to the rookeries for more than three successive years. It is believed, however, that in the majority of cases they do return for at least five years.

Undoubtedly a mistake was made once in the branding in sorting the sexes, and a male pup got the mark across his back. He developed and occupied the same position on East Cliffs Rookery for three successive years, 1913, 1914, and 1915. In his last year he had to be at least 12 years old.

BULLS.

HAREM AND IDLE BULLS.

At the height of the breeding season the bulls which had harems and those usually termed idle were counted with the greatest possible accuracy. Steps have already been taken to adopt certain rookery improvements whereby this important count can be continued in the future, regardless of how large the herd becomes. Experiments with a stable skeleton tripod in 1920 demonstrated the superiority of such a structure over any form of elevating apparatus previously tried. The manner in which this was used is shown in figure 3.

By placing such a tripod near the beach line and having a skeleton walkway leading to it over the seals, a cheap and very effective means of counting large flat areas will be provided. It is expected that this will be tried out thoroughly in 1921. A few permanent markers on the breeding areas to divide them into sections should enable the enumerator to have absolute confidence in his result.

On account of the absence of some trustworthy manner to get up high enough to view the rookeries the harem counts since 1917, when bulls became very abundant, have not been as good on the large rookeries as desired. Many expedients have been used to help, such as counting from a boat, erecting markers of driftwood, climbing a long ladder, as well as natural elevations, which are sometimes reached with great danger; but all were more or less makeshifts, which it is planned shall be abandoned.

Although there doubtless is an error in the number of harems given for the larger rookeries, it is really very small and is conservatively estimated to be not greater than one-half of 1 per cent. The desirability of having even this small variation corrected is due to the fact that this is the basis of the census. A small error here will multiply throughout the computations.

The decrease in the number of bulls from 1919 was apparent not only in the records; on the rookeries it was very much safer to approach counting points, and disturbance of even the rear harems rarely resulted. There appeared to be a general "loosening up" of the compact areas maintained when the bulls were stationed closer together, so that the increase of area over 1919 appeared to be more than the figures indicated had been the increase in cows.

If it is possible to do so in the future, the counting dates on St. George Island should be set back to correspond with the beginning of the count on St. Paul Island. It has heretofore been customary to

make it after the St. Paul count, when one person was obliged to do both; and in 1920 it was thought best to continue the usual dates. However, if there is some one on the smaller island to whom the work can be delegated, it should be done. It was quite evident that harems had begun to break up, and some of the bulls which had completed their duties had resorted to the hauling grounds and elsewhere before the count was finished. Their places had been filled, of course, but it is better that the count be made just as the first harem masters are leaving.

Before the count was made it was plainly to be seen that the class formerly called "surplus bulls" was not large enough to warrant much killing. It had been the practice in 1917, 1918, and 1919 to class those animals which were found in apparently permanent position as "idle bulls" and others which evidently moved from place to place as "surplus bulls." Naturally, these latter did not constitute the whole of the class, because there were always some on the hauling grounds and in the water in front of the rookeries. Since conditions in 1920 had closely approached those of 1916 in this respect, it seemed entirely proper to follow the former practice and spare the class in the killings. By doing this there is a "margin of safety" for the breeding males which is maintained without entering into the computations.

HAREM AND IDLE BULLS AND PERCENTAGE OF IDLE BULLS TO HAREM BULLS COMPARED TO AVERAGE HAREM, 1920.

Rookery.	Date.	Harem bulls.	Idle bulls.	Total.	Idle bulls to harem bulls.	Average harem.
ST. PAUL ISLAND.						
Kitovi.....	July 18	132	57	189	<i>Per cent.</i> 43.18	28.52
Lukanin.....	do.	95	28	123	29.47	30.86
Gorbatach.....	July 19	253	40	293	15.81	40.52
Ardiguen.....	do.	40	7	48	20.00	29.50
Reef.....	do.	528	80	598	13.26	44.77
Sivutch.....	do.	190	60	250	31.58	44.08
Lagoon.....	July 20	14	3	17	21.43	24.36
Tolstoi.....	do.	408	65	473	15.93	42.37
Zapadni.....	do.	423	85	508	20.09	38.77
Suthetunga.....	do.		16			
Little Zapadni.....	do.	297	62	359	20.88	42.07
Zapadni Reef.....	do.	28	5	33	17.86	19.00
Polovina.....	July 18	177	75	252	42.37	33.63
Polovina Cliffs.....	do.	86	24	110	27.91	29.92
Little Polovina.....	do.	49	48	97	97.96	34.92
Morjovi.....	July 17	97	99	196	102.06	30.27
Vostochni.....	do.	725	333	1,058	45.93	45.32
Total.....		3,542	1,078	4,620	30.43	40.45
ST. GEORGE ISLAND.						
North.....	July 23	199	17	216	8.54	45.86
Staraya Artill.....	do.	112	20	132	17.86	53.07
Zapadni.....	July 22	27	5	32	18.52	33.59
South.....	do.	4		4		24.75
East Reef.....	do.	67	28	95	41.79	38.37
East Cliffs.....	do.	115	13	128	11.30	48.74
Total.....		524	83	607	15.84	46.28
Total, both islands.....		4,066	1,161	5,227	28.55	41.20

A comparison of the foregoing table with the corresponding one for 1919 shows that there has been a reduction of harem bulls of 1,092 and of idle bulls of 1,078. There were even fewer animals in

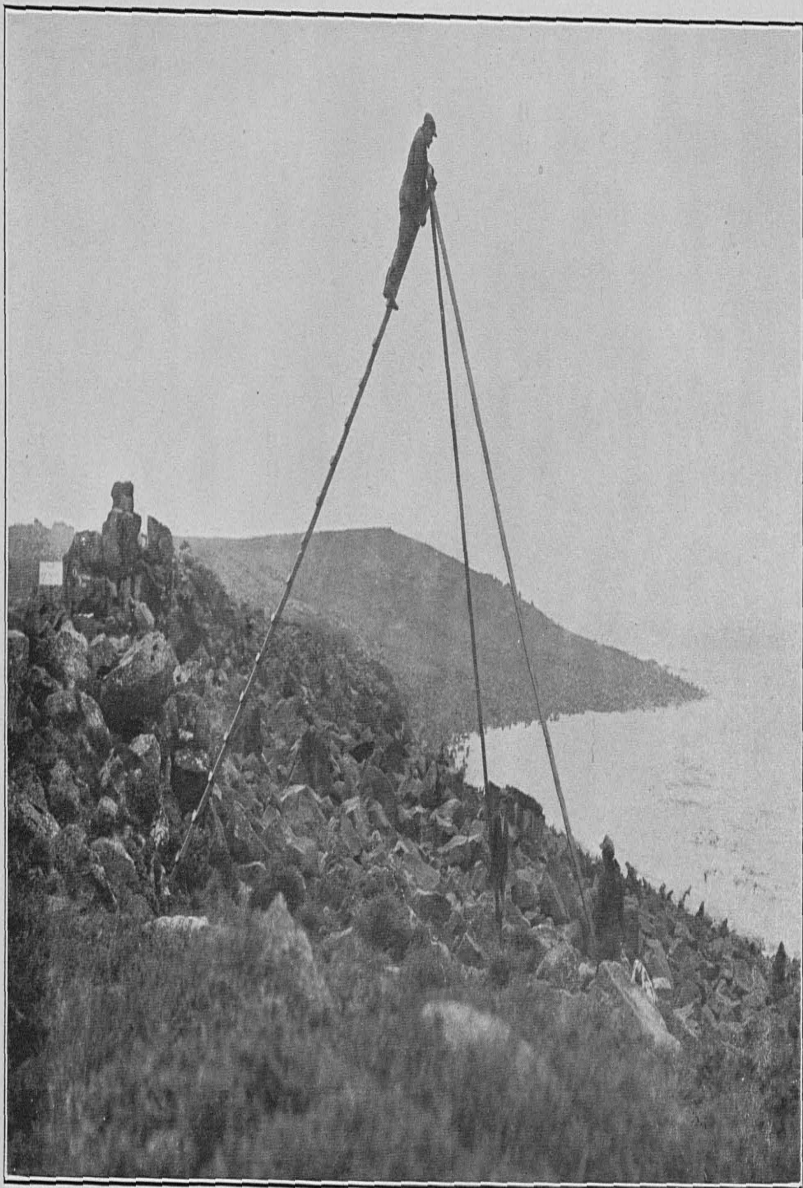


FIG. 3.—OBSERVATION TRIPOD FOR USE IN TAKING FUR-SEAL CENSUS.

these classes in 1920 than there were in 1917. Actual numbers, however, mean nothing in this connection. The important features are the ratio of idle bulls to harem bulls and the average harem. Conditions for the series of years 1912 to 1920 are best shown in tabular form as follows:

VARIATIONS IN ADULT BULL CLASSES AND RATIO OF IDLE TO HAREM BULLS, 1912 TO 1920.

Year.	St. Paul Island.				St. George Island.				Both Islands.			
	Harem.	Idle.	Ratio.	Average harem.	Harem.	Idle.	Ratio.	Average harem.	Harem.	Idle.	Ratio.	Average harem.
1912..	1,077	93	<i>Per ct.</i> 8.63	65.0	281	20	<i>Per ct.</i> 7.11	42.5	1,358	113	<i>Per ct.</i> 8.32	60.4
1913..	1,142	77	6.74	69.6	261	28	10.72	49.1	1,403	105	7.48	65.8
1914..	1,316	159	12.0	60.3	243	13	5.3	57.1	1,559	172	11.0	59.8
1915..	1,789	546	30.52	49.27	362	127	35.08	42.61	2,151	673	31.28	48.13
1916..	2,948	2,278	77.27	33.53	552	354	64.13	32.82	3,500	2,632	75.20	33.42
1917..	4,166	2,341	56.19	26.08	684	365	53.36	28.26	4,850	2,706	55.79	26.39
1918..	4,610	2,245	48.69	26.59	734	199	27.11	27.65	5,344	2,444	45.73	26.74
1919..	4,573	2,158	47.19	29.28	585	81	13.84	39.76	5,158	2,239	43.40	30.47
1920..	3,542	1,078	30.43	40.45	524	83	15.83	46.28	4,066	1,161	28.55	41.20

Thus the average harem has increased from 26 to 41, whereas there are 28 per cent as many idle bulls as harem bulls. When this is compared with average harems of 60 and 65 and with percentages of idle bulls from 8 to 11 found in 1912 to 1914, it is at once seen there was still a small oversupply of males in 1920 if conditions in the former years be considered ideal. It has not been contended that there were too few bulls in those years for breeding requirements, although it is generally believed that the ideal average harem is between 40 and 50. This was the condition in 1920, and if it can be maintained with about the same averages and ratios throughout commercial operations, those having charge of the business may well feel gratified at their success.

If we pass without comment on the good or bad judgment shown in creating the enormous surplus of male life with the closed season of 1912 to 1917, still those who have had the administration of the herd in hand deserve great commendation for bringing back an ideal condition in the short space of three years.

AVERAGE HAREM.

The average harem was determined from actual pup counts in 1920 on the same rookeries as in 1919. The gains shown on these rookeries were used as the basis in the computation of the average harem for all rookeries. Due consideration was given in every case to the topography of the various breeding areas, since it is well known that harems are smallest on rough, rocky places. Also it is known that large massed areas grow more rapidly than small scattered ones. Thus, while the harem increased but 6 on the small rookeries counted, it was computed to have increased by 10 for the herd as a whole. A good illustration of this point may be seen in the figures for 1913, when there were over 80 cows to each bull on the average for four rookeries, while many of the smaller ones ran below 40. For purposes of comparison the average harems in 1919 are given, showing graphically the increase in size of harems.

AVERAGE HAREM IN 1920 FOR ALL ROOKERIES.

Rookery.	Breeding cows.	Harem bulls.	Average harem 1920.	Average harem 1919.
ST. PAUL ISLAND.				
Kitovi.....	3,764	132	1 28.52	1 23.00
Lukanin.....	2,932	95	1 30.86	1 25.34
Gorbatch.....	10,251	253	1 40.52	1 34.00
Ardiguen.....	1,180	40	1 29.50	1 25.00
Reef.....	23,638	528	1 44.77	1 31.19
Sivutch.....	8,375	190	1 41.08	1 30.50
Lagoon.....	341	14	1 24.36	1 26.18
Tolstoi.....	17,286	408	1 42.37	1 29.79
Zapadni.....	16,399	423	1 38.77	1 26.19
Little Zapadni.....	12,494	297	1 42.07	1 29.49
Zapadni Reef.....	532	28	1 19.00	1 21.57
Polovina.....	6,006	177	1 33.93	1 30.18
Polovina Cliffs.....	2,573	86	1 29.92	1 23.01
Little Polovina.....	1,711	49	1 34.92	1 31.66
Morjovi.....	2,936	97	1 30.27	1 20.69
Vostochni.....	32,857	725	1 45.32	1 30.74
Total.....	143,275	3,542	40.45	29.28
Total for rookeries counted.....	12,388	402	30.82	25.19
ST. GEORGE ISLAND.				
North.....	9,126	199	1 45.86	1 39.12
Staraya Artil.....	5,944	112	1 53.07	1 46.34
Zapadni.....	907	27	1 33.59	1 31.74
South.....	49	4	1 24.75	1 13.60
East Reef.....	2,571	67	1 38.37	1 31.56
East Cliffs.....	5,005	115	1 48.74	1 42.00
Total.....	24,252	524	46.28	39.76
Total for rookeries counted.....	3,577	98	36.50	39.42
Total, both islands.....	167,527	4,066	41.20	30.47

¹ Estimate.² Pups counted.

LOSSES OF BULLS AND YOUNG MALES.

In 1911 and 1912, when legislation was proposed which would prohibit the killing of the surplus males of the fur-seal herd on land, the principal objection raised was that a vast oversupply of breeding males would result. In view of the fact that commercial operations were curtailed for six years, it will be profitable to review conditions from the standpoint of the effect of the class on the herd.

The law which established the closed period of 1912 to 1917 became effective on August 24 of the former year. The action had been anticipated, however, and, since the intention of Congress was obvious, it was put into effect in the killing season of 1912. This made the closed period cover six seasons. It will be recalled that the herd had been reduced to its lowest point during American ownership in 1911 through the activities of vessel killings at sea. The major portion of the pelagic catch consisted of females. The surplus males up to 1910 were taken on land by private corporations which had leased the privilege, and in 1910 and 1911 by the agents of the Government. Under those methods over 95 per cent of the males were removed and there were left for breeding an average of approximately 1 male to 60 females. Investigators generally agreed that this ratio was sufficient.

On account of the low figure to which the herd had been reduced, however, it was feared that the vitality of the species had been

impaired. It was argued that the herd would be benefited by leaving it unmolested by man for a period of years and allowing natural selection to become effective for a time in reducing the number of males.

In a state of nature the polygamous habits of the animals are such that the removal of the excess number of males is effected by fighting. It was believed by some that only the most virile of the males would survive the battles which would inevitably result from the failure of man to remove the excess. An improvement in the breeding stock was thus anticipated. Apparently the fact was overlooked that when a finish fight between bulls takes place neither the victor nor the vanquished is of much value thereafter as a breeder. Both are exhausted.

When the law of 1912 became effective there were 1,358 harem bulls in the herd, or 1 to 59.8 cows. Naturally, no immediate increase in the number of bulls nor reduction in the average harem could be expected, hence we find practically the same condition in 1913 and 1914. It was necessary to wait until those animals 3 years old and over in 1912 became old enough and strong enough to enter the rookeries before any result would become noticeable.

In 1915 we find a slight increase in the number of bulls. The average harem was 48.13. But since those animals 3 years old in 1912 could not have entered the rookeries until they were 8 years old, or in 1917, the cause of this increase in bulls must be looked for elsewhere than from the closed season. It could not possibly result from anything but ample reserves made by the Government agents during the commercial operations in the seasons immediately preceding 1912.

The same is true for the season of 1916, when there was a further decrease in the average harem. This was undoubtedly the result of reserves made during the season of 1911 and previously.

In 1917 there was an enormous increase in the number of bulls. This was the first influx due to the closed season. The average harem went down to 26.39, which we now know to be about as small as it can go, regardless of the number of males present. The habits of the bulls are such that the massed areas would be the scene of continual and disastrous fighting if the males were separated by much less than the space occupied by the minimum average harem.

A further large increase in males in 1918 was due to the absence of killing in 1913. This increase, however, failed to reduce the size of the average harem from the minimum found the previous year. There was thus built up an enormous excess of male life, which no known means enabled us to estimate with reasonable accuracy. There were no data upon which to estimate a natural loss. Fortunately for these computations, we have had the ages of animals killed determined for several years. This is accomplished on the killing fields by measuring the length of the freshly killed animal by means of a pair of beam calipers. The measuring of a series of branded males of known age permitted the establishment of standards showing the prevailing body length for each age, and the recording, in the proper categories, of field measurements of seals killed completed the classification.

By consistent efforts the greater portion of the excess of males had been removed by 1920, so that the average harem increased to

41.20. Recently acquired information enabled the computation with reasonable accuracy of the number of adults in existence in addition to the harem bulls and idle bulls. And since we know the number of births, it now becomes possible for the first time to compute the average natural loss from the third year to maturity. It gives the first concrete information ever available upon the size of a reserve which should be made in the third year to supply the herd with stock at maturity.

In order to present the figures intelligibly, the following table has been prepared. The figures have been taken from the various census reports since 1914. Nothing has been deducted for natural mortality from the third year on. Only animals killed have been removed from the various classes.

ASSUMED MALE STRENGTH OF HERD IN 1920 EXCLUSIVE OF NATURAL LOSS.

Class.	Number in 1916.	Killed in census year. ¹					Remain der less killings.
		1916	1917	1918	1919	1920	
3-year-olds in 1912.....	2,005						2,005
3-year-olds in 1913.....	11,271	104					11,167
3-year-olds in 1914.....	15,848	354	97	647			14,750
3-year-olds in 1915.....	18,282	2,855	614	1,058	4,302		9,453
3-year-olds in 1916.....	19,402	(*)	2,771	4,690	2,950	2,001	6,990
Total.....	66,808	Total bulls remaining in 1920 if no natural loss occurred.....					44,365

¹ Animals killed in the fall of one year have been added to the killings of the following summer.

² Killings already deducted.

This table shows that out of a stock of 66,808 animals which reached the age of 3 years from 1912 to 1916, inclusive, there would remain in 1920, 44,365 if there had been no natural loss. These animals would all be 7 years old or over in 1920. The younger ages do not enter into consideration here because they could not have been counted among rookery bulls that season.

It now remains to properly divide this total among the various years and classes and derive the percentage therefrom. The problem is difficult because so many factors enter therein to modify the result, and it is necessary to take these into consideration.

As an illustration, we may consider the 3-year-old class of 1914. The animals composing it were not subjected to any unusual conditions until the seventh year. Only the usual rate of natural mortality would therefor apply during these years. But when they were approaching maturity in numbers vastly exceeding the requirements of the cows, fighting for elimination began. The younger animals would naturally be vanquished. Thus the loss during the seventh year would be excessive and still more so during the eighth and ninth. In later years the percentage of loss would doubtless increase at a regular rate and 100 per cent would be reached at maximum old age. This, unfortunately, is not known and a figure must be assumed therefor. At the present time we seem not to have any good grounds to believe many bulls exceed 15 years. This, of course, is less than the

age of females, but there are so many differences between the sexes of this species that the age of the male can no longer be based upon that of the female.

The conditions outlined above are those which are believed to exist when there is a great excess of males. If they had been removed by man so that only approximately enough remained for breeding purposes, the losses during the seventh, eighth, and ninth years would not be so heavy. Also it is probable that the bulls live longer when there is no fighting than when they have to wear themselves out in maintaining a harem position.

It, therefore, becomes apparent that conditions which obtained during 1917, 1918, 1919, are not normal and may never occur again. Everything now indicates that the younger animals suffered a practically constant mortality until the seventh year, and then their losses amounted to 50 per cent or more annually. Under normal conditions with the great excess removed by man, the loss after the seventh year would be variable and dependent upon the care given to the reserving of a proper number of bulls.

It seems unnecessary here to make arbitrary assumptions for the annual losses of the class which was termed in 1917-1919 "surplus bulls." It is definitely known that they were greater than the losses assumed and deducted. Thus in 1919, 50 per cent was estimated to have been the loss from the third year to and including the surplus bull class; that is, animals 7 years old and over. If the loss had been estimated at 50 per cent from the third year to the seventh and at least that much annually thereafter, it would have come nearer the actual condition. But there was nothing until 1920 which would cause one to suspect that the loss had been so enormous.

It now remains to determine what the annual loss of males is from the third year on, when average conditions accompanying commercial work exist. A division which is more or less arbitrary for all ages is as follows: First year, 35 per cent; second, 15 per cent; third, 10 per cent; fourth, 10 per cent; fifth, 10 per cent; sixth, 20 per cent; seventh, 20 per cent; eighth, 25 per cent; ninth, 30 per cent; tenth, 40 per cent; eleventh, 50 per cent; twelfth, 60 per cent; thirteenth, 70 per cent; fourteenth, 80 per cent; fifteenth, 100 per cent.

Considerable of the above is conjecture, but it is believed to represent fairly accurately the conditions existing in 1920. It will be noted that there is a slight revision of the percentages lost from the first to the third year. This does not materially affect the result and gives a working basis for the future. Doubtless additional investigation will adjust any irregularities in the table. It has been used in the preparation of the final census for 1920.

These new percentages of loss were obtainable in 1920, because early in the season it was seen that the surplus believed to be in existence from the accumulation of the closed period did not appear. It was evident that if the bulls were coming at all they would have been at the islands before the middle of July. Since they did not appear at that time it was recommended that no more be removed from the herd. As it turned out the counts at the height of the season showed that a few more could have been removed with safety.

COMPLETE CENSUS OF FUR SEALS AS OF AUGUST 10, 1920.

Pups, counted and estimated.....	167,527	
Breeding cows, 3 years old and over, by inference.....	167,527	
Harem bulls, counted.....	4,066	
Idle bulls, counted.....	1,161	
Yearlings, male and female, estimated:		
Pups born in 1919.....	157,172	
Deduct 35 per cent for natural mortality.....	55,010	
Yearlings, both sexes, beginning 1920.....	102,162	
Yearling females, 50 per cent, Aug. 10, 1920.....	51,081	51,081
Yearling males, beginning of 1920.....	51,081	
Yearling males killed in 1920.....	7	
Yearling males, Aug. 10, 1920.....		51,074
2-year-olds, male and female, estimated:		
Yearling females, Aug. 10, 1919.....	46,447	
15 per cent deducted for natural mortality.....	6,967	
2-year-old females, Aug. 10, 1920.....		39,480
Yearling males, Aug. 10, 1919.....	46,444	
Yearling males killed, fall of 1919.....	7	
Yearling males, end of 1919.....	46,437	
15 per cent deducted for natural mortality.....	6,966	
2-year-old males, beginning of 1920.....	39,471	
2-year-old males, killed in 1920.....	360	
2-year-old males, Aug. 10, 1920.....		39,111
3-year-old males, estimated:		
2-year-old males, Aug. 10, 1919.....	33,081	
2-year-old males killed, fall of 1919.....	214	
2-year-old males, end of 1919.....	32,867	
10 per cent deducted for natural mortality.....	3,287	
3-year-old males, beginning of 1920.....	29,580	
3-year-old males killed in 1920.....	18,831	
3-year-old males, Aug. 10, 1920.....		10,749
4-year-old males, estimated:		
3-year-old males, Aug. 10, 1919.....	13,596	
3-year-old males killed fall of 1919.....	820	
3-year-old males, end of 1919.....	12,776	
10 per cent deducted for natural mortality.....	1,278	
4-year-old males, beginning of 1920.....	11,498	
4-year-old males killed in 1920.....	5,831	
4-year-old males, Aug. 10, 1920.....		5,667
5-year-old males, estimated:		
4-year-old males, Aug. 10, 1919.....	5,747	
4-year-old males killed fall of 1919.....	66	
4-year-old males, end of 1919.....	5,681	
10 per cent deducted for natural mortality.....	568	
5-year-old males, beginning of 1920.....	5,113	
5-year-old males killed in 1920.....	106	
5-year-old males, Aug. 10, 1920.....		5,007

6-year-old males, estimated:		
5-year-old males, Aug. 10, 1919.....	5,282	
5-year-old males killed fall of 1919.....	37	
5-year-old males, end of 1919.....	5,245	
20 per cent deducted for natural mortality.....	1,049	
6-year-old males, beginning of 1920.....	4,196	
6-year-old males killed in 1920.....	43	
6-year-old males, Aug. 10, 1920.....		4,153
Surplus bulls (7-year-olds and over), estimated:		
6-year-old males, Aug. 10, 1919.....	8,991	
6-year-old males killed fall of 1919.....	300	
6-year-old males, end of 1919.....	8,691	
20 per cent deducted for natural mortality.....	1,738	
7-year-old males, beginning of 1920.....	6,953	
Surplus bulls, Aug. 10, 1919.....	9,619	
Surplus bulls killed fall of 1919.....	980	
Surplus bulls, end of 1919.....	8,639	
30 per cent deducted for natural mortality.....	2,592	
Remaining surplus bulls for 1920.....	6,047	
Breeding bulls of 1919.....	7,397	
30 per cent deducted for natural mortality.....	2,219	
1919 bulls remaining in 1920.....	5,178	
Breeding bulls in 1920.....	5,227	
1919 bulls remaining, deducted.....	5,178	
Increment of new bulls in 1920.....	49	
7-year-old males computed for 1920.....	6,953	
Surplus bulls computed for 1920.....	6,047	
Total theoretical surplus bull stock for 1920.....	13,000	
7-year-olds and over killed in 1920.....	721	
Total surplus in 1920.....	12,279	
Increment of new breeding bulls in 1920, deducted.....	49	
Surplus bulls in 1920.....	12,230	
50 per cent deducted for abnormal losses due to excessive number of bulls.....	6,115	
Surplus bulls, Aug. 10, 1920.....		6,115

RECAPITULATION.

Pups.....	167,527
Cows.....	167,527
Harem bulls.....	4,066
Idle bulls.....	1,161
Yearling females.....	51,081
Yearling males.....	51,074
2-year-old females.....	39,480
2-year-old males.....	39,111
3-year-old males.....	10,749
4-year-old males.....	5,667
5-year-old males.....	5,007
6-year-old males.....	4,153
Surplus bulls (males 7 years old and over).....	6,115
Total.....	552,718

NATURAL-HISTORY RECORDS OF PRIBILOF ISLANDS.

By G. DALLAS HANNA.

It seems to be highly desirable that there shall be published in a readily accessible place a résumé of the scientific work which has been done in connection with the biology of the Pribilof Islands. This group of islands has been more intensively studied than any other similar area in Alaska and will continue, doubtless, to attract attention in the future. Records of publications on the various groups of plants and animals are often widely scattered, and employees of the Bureau stationed on the islands have little opportunity to search for them.

The last bibliography of the subject was published in 1915 in a report by Osgood, Preble, and Parker.¹ This list was known to be incomplete at the time of its preparation and was intended to cover the subject "fur seals" only. Yet it is very valuable to anyone who has occasion to study the literature of the Pribilof Islands.

The following list is the result of note taking through several successive years and is intended to cover the general natural history of the islands in so far as I have the records. It also is known to be incomplete, but it takes up the most important work which has been done since the appearance of the above-mentioned bibliography. In some cases papers published prior to 1914 are included because of their interest to island students.

It should be explained that in addition to the following titles many Pribilof Islands records are contained in general publications which are not listed. For instance, Dall² has mentioned a large number of marine mollusks from the Pribilofs in his work on Northwest Coast Shells. The same is true of birds in Ridgway's "Birds of North and Middle America,"³ Hamilton's "Coleoptera of Alaska,"⁴ Evermann and Goldsborough's "Fishes of Alaska,"⁵ and others. A new work is expected from the National Herbarium soon and it will contain full records of Alaska plants, including those from the Pribilof Islands.

The report of Alaska Fisheries and Fur Industries in 1918 (Bureau of Fisheries Document No. 872, pp. 105-107) contained a check list of birds of the Pribilof Islands, Alaska, with the names of persons first recording the species from the islands. This list contained names of 129 species and subspecies. It has been increased by six, the first three added in 1920, the fourth restored on evidence col-

¹ The Fur Seals and Other Life of the Pribilof Islands, Alaska, in 1914. Bulletin, Bureau of Fisheries, Vol. XXXIV, 1914 (1916), pp. 149-167. Washington, 1915.

² U. S. National Museum, Bulletin 112. 1921.

³ U. S. National Museum, Bulletin 50.

⁴ Transactions, American Entomological Society, Vol. XXI, pp. 1-38. 1894.

⁵ Bulletin, U. S. Bureau of Fisheries, Vol. XXVI, pp. 219-300. 1906.

lected during the winter of 1919-20, and the remaining two recorded in 1921:

- Limnocyptes gallinula*, European Jack-snipe.^{1, 2}
Macrorhamphus griseus scolopaceus, Long-billed Dowitcher.²
Passerella iliaca unalascensis, Shumagin Fox Sparrow.³
Corvus corax principalis, Northern Raven.
Micropus pacificus, Japanese Swift.^{2, 3}
Loxia leucoptera leucoptera, White-winged Crossbill.²

This brings the total number of species known from the Pribilof Islands up to 135. All but six of these records are supported by specimens in some public museum. Since the 1918 list was compiled the little brown crane has been collected, but the restoration of the raven keeps the number of uncollected species the same as at that time.

In the paper by Mailliard and Hanna⁴ a few corrections of former records were made. It was decided that the citation of *Arquatella maritima couesi*, Aleutian sandpiper, from the Pribilof Islands, by Seale⁵ was unwarranted, and the record would have to be based on later work. A specimen taken on St. George Island February 12, 1917, by G. Dallas Hanna, was referred to in support of the record. The specimen is now in the National Museum.

The credit for recording *Pisobia acuminata*, sharp-tailed sandpiper, was given to Bishop⁶ in the 1918 list as Grinnell⁷ had done. Seale, however, had recorded it three years previously.⁴

The record of *Larus hyperboreus hyperboreus*, glaucous gull, by Oberholser, cited in the 1918 list, is rather obscure. It is to be found in *The Auk*, Volume XXXV, No. 4, page 470, October, 1918. The subspecies *L. h. barovianus*, first taken by Palmer, is also listed by Oberholser from the Pribilofs on page 473 of his article.

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¹ Hanna, G. Dallas: New and interesting records of Pribilof Island birds. *Condor*, Vol. XXII, No. 5, pp. 173-175, September, 1920.

² New to North America.

³ Mailliard, Joseph, and G. Dallas Hanna: New bird records for North America with notes on the Pribilof Islands list. *Condor*, Vol. XXIII, No. 3, pp. 93-95. 1921.

⁴ Seale, Alvin: Notes on Alaskan water birds. *Proceedings, Academy of Natural Sciences*, Philadelphia, Vol. 50, 1898, p. 130.

⁵ Bishop, Louis B.: Birds of the Yukon region, with notes on other species. *North American Fauna*, Vol. 19, p. 66. 1901.

⁶ Grinnell, Joseph: Record of Alaskan Birds in the collection of the Leland Stanford Junior University. *Condor*, Vol. III, p. 19. 1901.

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- 1905: pp. 157-208.
- 1906: pp. 260-319.
- 1907: Preliminary, pp. 482-485; annual, pp. 486-533. Also published as Senate Document No. 376, 60th Cong., 1st sess.
- 1908: pp. 593-653. Also published as House Document No. 63, 62d Cong., 1st sess.
- 1909: pp. 746-787. A summary appears on pp. 722-725.
- 1910: pp. 1011-1044. Uncorrected page proof. Also published as U. S. Bureau of Fisheries Document No. 749 and *in* *Fur Trade Review*, December, 1911, and succeeding numbers.

[While these reports are largely of an administrative character, they contain a great deal of information on the censuses of fur seals for the several years mentioned.]

MARSH, M. C.

1911. Report of the census of fur seals in 1906 and other matters. Appendix A, hearings before the Committee on Expenditures in Department of Commerce and Labor, pp. 351-371. Comments thereon by Lembkey, pp. 373-375.

PARKER, GEO. H.

1915. The problem of adaptation as illustrated by the fur seals of the Pribilof Islands. *Proceedings, American Philosophical Society*, Vol. LIV, pp. 1-6, 1915.
1917. The fur seals of the Pribilof Islands. *Scientific Monthly*, Vol. IV, pp. 385-409, 1917. [A popular well illustrated account.]
1918. The growth of the Alaska fur-seal herd between 1912 and 1917. *Proceedings National Academy of Sciences*, Vol. IV, pp. 163-174, 1918.

SIMS, E. W.

1911. Report on conditions on the fur-seal islands. Dated August 31, 1906; appendices omitted. Appendix A, hearings before the Committee on Expenditures in Department of Commerce and Labor, pp. 378-402. Criticism and comment, pp. 403-434, and on p. 459. [This important document was published separately, but is exceedingly rare. It probably did more to secure the abolishment of pelagic sealing and provide adequate patrol than any other work.]

FOXES.

JUDGE, JAMES.

1909. The blue foxes of the Pribilof Islands. Report of American Breeders' Association, Vol. V, pp. 325-340. Also in *Fur farming in Canada*, by J. Walter Jones, pp. 71-80; published by Commission of Conservation, Ottawa, Canada, 1914. [This article gives an account of the methods of farming blue foxes which were developed by Mr. Judge on St. George Island. The Judge method is the only one which has proved successful with this species and the results now being reaped are a tribute to the zeal of the man who had the courage to overcome the obstacles in his way.]

MERRIAM, C. HART.

1902. Four new Arctic foxes. Proceedings Biological Society of Washington, Vol. XV, pp. 167-172, 1902. On page 171 *Vulpes pribilofensis* is described as new from St. George Island. This is listed as *Alopex pribilofensis* (Merriam) by Miller in his *North American Land Mammals in Bulletin No. 79*, U. S. National Museum, p. 82, 1912.

BIRDS.

EVERMANN, BARTON WARREN.

1913. Eighteen species of birds new to the Pribilof Islands, including four new to North America. *The Auk*, Vol. XXX, No. 1, pp. 15-18, January, 1913.

HANNA, G. DALLAS.

1916. Records of birds new to the Pribilof Islands, including two new to North America. *The Auk*, Vol. XXXIII, No. 4, pp. 401-403, 1916. [Thirteen species new to the islands are here recorded.]
1919. Additions to the avifauna of the Pribilof Islands, Alaska, including species new to North America. *Journal, Washington Academy of Sciences*, Vol. IX, No. 6, p. 176, 1919. [Here appears a list of the new birds for the Pribilof Islands, recorded in greater detail in *The Auk*, Vol. XXXVII, pp. 248-254, 1920. Also see *The Auk*, Vol. XXXIII, p. 443, 1919.]
- 1919a. Check list of birds of the Pribilof Islands, Alaska, with the names of persons first recording the species from the islands. In *Alaska fisheries and fur industries in 1918*, by Ward T. Bower, Appendix VII, Report, U. S. Commissioner of Fisheries, 1918, pp. 105-107.
1920. Additions to the avifauna of the Pribilof Islands, Alaska, including four species new to North America. *The Auk*, Vol. XXXVII, pp. Vol. XXII, pp. 173-175, 1920. [Three species new to the islands are here recorded.]
- 1920a. New and interesting records of Pribilof Islands birds. *The Condor*, Vol. XXII, pp. 173-175, 1920. [Three species new to the island list are here recorded, including one new to North America. Another species is restored to the list, and there is given in tabular form a list of the breeding species on each of the five islands of the group.]
- 1920b. Birds of the Alaska fur-seal islands. *The Gull*, Vol. 2, No. 12, 1920. [Abstract of lecture given before the Audubon Association of the Pacific.]
1921. The Pribilof sandpiper. *The Condor*, Vol. XXIII, pp. 50-57, 1921. [An account of the nesting habits, migrations, etc., with a photograph of the eggs.]

JUDGE, JAMES.

1911. A report on Walrus Island. Appendix A, Hearings before the Committee on Expenditures in Department of Commerce and Labor, pp. 907-912. [A detailed account of this wonderful bird rookery and its birds. Additional information on natives' eggling expeditions is given on p. 1180.]

MAILLIARD, JOSEPH, and G. DALLAS HANNA.

1921. New bird records for North America, with notes on the Pribilof Island list. *The Condor*, Vol. XXIII, pp. 93-95, 1921. [Two species new to the Pribilofs are here recorded, and the entire list is corrected up to date, as shown in the notes herewith.]

OBERHOLSER, HARRY C.

1918. Subspecies of *Larus hyperboreus*. *The Auk*, Vol. XXXV, p. 470, 1918. [Two subspecies of the glaucous gull are recorded here from the Pribilofs, one of them for the first time.]

RILEY, J. H.

1917. A bird new to the North American fauna. *The Auk*, Vol. XXXIV, p. 210. [The Kamchatkan pine grosbeak, collected by A. H. Proctor, is here recorded from St. George Island.]

MISCELLANEOUS.

ALLEN, J. A.

1902. The hair seals (family Phocidae) of the North Pacific Ocean and Bering Sea. *Bulletin, American Museum of Natural History*, Vol. 16, pp. 459-499, 1902. [On page 495 is described *Phoca richardii pribilofensis*, a new subspecies from the Pribilof Islands, collected by C. H. Townsend. On page 493 *Phoca richardii* is recorded from the islands, and on page 475 True's record of the ribbon seal *Histiophoca fasciata* is repeated. Allen does not mention the bearded seal (*Erignathus barbatus*) from the Pribilofs; it is known to have been taken on St. George Island on two occasions, however, the first authentic record having been made by C. E. Crompton from a specimen taken in the winter of 1917-18.]

BANKS, NATHAN; HARRISON G. DYAR; TREVOR KINCAID; THEODORE PERGANDE; E. A. SCHWARZ; WILLIAM HARRIS ASHMEAD; and JUSTUS WATSON FOLSOM.

- 1900-1902. A series of papers by the above entomologists appeared in *Proceedings, Washington Academy of Sciences*, Vols. II and IV, recording insects collected by the Harriman Expedition in Alaska. The papers were reprinted verbatim in Vols. VIII and IX of the reports of the Harriman Expedition, published by the Smithsonian Institution in 1910. To them was added a paper on Myriapoda by O. F. Cook in which three species were listed from St. Paul Island, one of them new. [Many Pribilof species of insects are mentioned in the above series of papers and they will be found invaluable to those making a study of the insect life of the islands.]

CARDOT, JULES, and I. THÉRIOT.

- 1900-1902. Mosses of Alaska. *Proceedings, Washington Academy of Sciences*, Vol. IV. A joint paper on mosses collected by the Harriman Expedition.

CHAMBERLAIN, RALPH V.

1921. Linyphiidae of St. Paul Island, Alaska. *Journal, New York Entomological Society*, Vol. XXIX, No. 1, pp. 35-42, Plates III and IV, March, 1921. [A collection of spiders made on St. Paul Island in 1910 by Harold Heath is here described. Eleven species are listed of which six are described as new; four of them represent new genera, which are also described.]

COCKEBELL, T. D. A.

1898. New North American insects. *Annals and Magazine of Natural History*, Ser. 7; Vol. II, p. 324, 1898. [On page 324 is described *Bombus lincaidii*, a new species of bumblebee from St. Paul Island, Alaska.]

DALL, WM. H.

1915. A new species of *Modiolaria* from Bering Sea. *The Nautilus*, Vol. XXVIII, No. 138, 1915. [*Musculus phenax* is described as new from specimens collected on kelp roots at St. George Island by G. Dallas Hanna.]

DALL, WM. H.—Continued.

1916. A new species of Onchidiopsis from Bering Sea. Proceedings, Academy of Natural Sciences, Philadelphia, 1916, p. 376. [*Onchidiopsis (Atlantolimax) hannai*, a new sea slug, is described as new from specimens collected on St. Paul Island in 1914 by G. Dallas Hanna.]
1919. Paleontology. Journal, Washington Academy of Sciences, Vol. IX, No. 1, pp. 1-3, 1919. [A list of the fossil mollusks from two deposits on the Pribilof Islands is here given; 44 species are listed, seven of them mentioned as new but only one of which, *Chrysodomus solutus cordatus*, is named. The deposits are located at Tolstoi Points, St. Paul and St. George Islands, and the material was collected by G. Dallas Hanna.]
- 1919a. New shells from the northwest coast. Proceedings, Biological Society of Washington, Vol. 32, pp. 249-252, December, 1919. [On page 251 *Nodulus palmeri* and *Skencopsis alaskana*, two marine shells, are described as new from material collected by William Palmer and A. G. Whitney on St. Paul Island.]
1920. A new Alaska Chiton. Nautilus, Vol. XXXIV, p. 22, July, 1920. [*Schizoplaea multicolor* is described as new from St. Paul Island, Alaska.]

FRANKLIN, HENRY J.

1912. The Bombidae of the New World. Transactions, American Entomological Society, Vol. XXXVIII, Nos. 3-4, 1912. [On p. 295 the description of *Bombus kincaidii* (Cockerell) from St. Paul Island is repeated.]

HANNA, G. DALLAS.

1914. Interesting mammals of the Pribilof Islands. Proceedings, Biological Society of Washington, Vol. XXVII, No. 218, 1914. [Polar bear, walrus, and sperm whale mentioned from St. George Island.]
1919. The introduction of *Acanthinula harpa* (Say) and *Circularia vancouverensis* (Lea) into St. Paul Island, Alaska. The Nautilus, Vol. XXXII, p. 148, April, 1919. [An account of the introduction of two land snails from Unalaska is here given.]
- 1919a. Geological notes on the Pribilof Islands with an account of the fossil diatoms. American Journal of Science, Vol. XLVIII, pp. 216-224, 1919.

HARRING, HARRY K.

1917. A revision of the rotatorian genera Lepadella and Lophochasis with descriptions of new species. Proceedings, U. S. National Museum, Vol. LI, pp. 527-568, 1917. [On p. 550, Plate 92, figs. 13-16, is described *Lepadella borealis*, a new species of rotifer from Ice House Lake, St. Paul Island, collected by Geo. H. Parker in 1914.]

MALLOCH, J. R.

1920. A synoptic revision of the Anthomyiidian genus Hydrophoria Robineau-Devoidy (Diptera). Canadian Entomologist, Vol. LII, pp. 253-257, 1920. [On page 257 appears the description of *Hydrophoria alaskensis*, a new species from St. George Island, Alaska, collected by G. Dallas Hanna and on St. Paul Island by the same and Harold Heath.]
1921. A synopsis of the North American species of the genus Helina R.-D., Sens. Lat. (Diptera: Anthomyiidae). Ibid., Vol. LIII, No. 5, pp. 103-109, 1921. [*Helina hannai*, a species of Diptera, is described as new from St. George Island, Alaska.]

PEARSE, A. S.

1913. Notes on a small collection of amphipods from the Pribilof Islands, with descriptions of new species. Proceedings, U. S. National Museum, Vol. XLV, pp. 571-573, 1913. [Five species are listed from St. Paul Island, two of which are described as new. They were collected by M. C. Marsh and W. L. Hahn.]

STERKI, V.

1917. A new mollusk of the genus *Pisidium* from Alaska, with field notes by G. Dallas Hanna. Proceedings, U. S. National Museum, Vol. LI, pp. 475-477, figs. 1-2, 1917. [*Pisidium hannai*, a minute fresh-water bivalve shell, is described as new from Ice House Lake, St. Paul Island, collected by G. Dallas Hanna.]

INVESTIGATION OF THE SALMON FISHERIES OF THE YUKON RIVER.

By CHARLES H. GILBERT and HENRY O'MALLEY.

OUTLINE OF PROPOSED INVESTIGATIONS.

An exhaustive investigation of the problems presented by the salmon run of the Yukon River obviously would require practical and scientific inquiry extending over a series of years. During the few summer months no very ambitious program could be attempted. Many of the most important problems must remain untouched. Time would not permit an examination of the tributaries with their spawning beds. No study could be made of spawning habits nor observation of the fate of eggs and fry where these must lie beneath the gravel of the ice-locked streams during the long severe winter and spring. Yet the possible destruction of eggs by freezing may be an important factor in limiting the size of salmon runs in far northern rivers and may, indeed, be responsible for the practical elimination of salmon from the streams that enter the Arctic Ocean. If natural propagation on the Yukon is rendered relatively ineffective because of severe climatic conditions, the operation of hatcheries would here produce proportionately greater results than in more temperate regions. To the extent that natural propagation in any region is wasteful and unproductive do the advantages of artificial propagation appear.

In a single short season it could not be hoped to carry out more than the following program:

1. To inspect the spawning runs as these enter the mouth of the river and to ascertain by microscopic examination of the scales as much as this method can furnish of the life history of the Yukon salmon.

2. To examine the fishery operations carried on by the Carlisle Packing Co., in the Delta of the Yukon, this being the only cannery which packs salmon bound for the spawning beds of the Yukon.

3. To investigate the consumption of fresh and dried salmon by the resident population of the Yukon Valley and to estimate the importance to them of this salmon supply.

4. To draw such conclusions as the facts warrant concerning the magnitude of the Yukon salmon run and its adequacy to support cannery operations in addition to meeting the needs of the local population and providing a sufficient spawning reserve.

ITINERARY.

In carrying out the program above outlined the writers arrived in Skagway on May 12 and crossed White Pass and Lake Lebarge in time to take the first steamer down the Yukon, close behind the running ice of the spring breakup. At Tanana, which was reached May 31, transfer was made to the gasoline launches of the Bureau of

Fisheries, and from June 8 to 13, in company with C. F. Townsend, inspector, Alaska Fisheries Service, the party proceeded by launch to the mouth of the river, arriving June 13 at the entrance to Kwiguk Channel, where was located the floating cannery of the Carlisle Packing Co.

From this date until August 1 attention was given to the fishing grounds located in the Kwikluak mouth of the river and in the offshore district beyond this mouth, and to the principal channels of the delta which are closed to commercial fishing. From June 25 to July 1 the party proceeded by launch from Kwiguk to Holy Cross and return, to inspect the fishing camps of the lower river during the height of the king-salmon run. From July 5 to 7 a trip was made by launch from Kwiguk to the middle mouth of the Yukon, traversing both the Kwikpak and the Kawanak Passes, returning by way of Old Fort Hamilton, and inspecting en route the run of salmon in these channels. From July 23 to 29 a trip was made by steamer from Kwiguk to St. Michael and return, passing through the Apoon mouth. During the fishing season in the delta careful scrutiny was given daily to the salmon runs, and scale data were secured from extensive series of the different species of salmon which comprise the run.

From August 2 to 20 visits were made to fishing camps along the river from Kwiguk to Rampart, an approximate census secured of the amount of dried salmon, and fishermen interviewed concerning the runs of 1919 and 1920. Having proceeded by steamer from Rampart to Dawson, August 23 to 31, the return was made by launch from Dawson to Tanana, September 1 to 5, visiting on the way the fishing camps of the upper river. This phase of the inquiry terminated at Fairbanks on September 11, after ascending the Tanana River by launch as far as Nenana.

IMPORTANT SPECIES OF SALMON WITH DATA CONCERNING RUNS.

All five of the species of salmon known on the Pacific coast of North America make their appearance at the mouth of the Yukon and ascend that stream for a greater or less distance. Two of these species, however, the humpback salmon and the red or sockeye salmon, are present in such limited numbers as to have no practical significance. The three other species, namely, coho or silver, king, and chum or dog salmon, have substantial runs in the Yukon River, the latter two being of real economic importance.

RED OR SOCKEYE SALMON.

During the entire fishing season of 1920 the Carlisle cannery secured only 5 cases of sockeye salmon, in the neighborhood of 60 fish. As the majority of these were taken on the flats outside the mouth of the river, there might seem warrant to consider them as strays which had wandered from the Kuskokwim, or from some other stream to the southward which possesses a well-marked run of this species. In that case they might not even be entering the river, but playing about for a time in brackish water before finally resorting to their native streams for spawning purposes. In favor

of this theory stands the fact that no breeding ground of the red salmon has yet been reported from any part of the Yukon Basin. The breeding ground of this species could be looked for only in connection with some lake, as the red salmon will not spawn under other than lake conditions. And the males of the species, when on the spawning grounds along the shores of a lake, or in the shallows of the creeks which enter it, are of such brilliant color as invariably to attract attention. It may be, therefore, that no permanent colony of red salmon exists in the Yukon, and that the major portion of the individuals observed off the mouth of the river would not enter and ascend the stream. Occasional individuals do, however, ascend the Yukon, for the writers learned of their infrequent occurrence from observers acquainted with the different species of salmon, and one specimen (a male, decidedly pink in color) was seen at Ruby on August 14. During the much longer fishing season of 1919, 20 cases of red salmon were packed by the cannery.

HUMPBACK SALMON.

The humpbacks appear at the mouth of the river more numerous than the red salmon, but never in sufficient numbers to constitute a run, even of small dimensions. It was noticeable that they were far advanced toward spawning in July, often with liquid milt and partly free eggs. It would be impossible for them to ascend the river far with their spawning period so close at hand. In fact, there were no reports of their occurrence above Andreefski, where a ripe male was observed on August 3.

COHO SALMON.

The least in value of the three principal species is the coho, which runs much less numerous than the other two, and, in addition, is the latest to appear, often not presenting itself in any numbers in the middle and upper reaches of the river until the ice is forming in the fall. This species is little dried on account of its late appearance, but may be fed fresh to the dogs or frozen for later consumption. It seems not to be highly valued for human food.

During the season of 1920 it was entering the mouth of the river in very limited numbers during the last week in July, but nothing approximating a run had at that time developed. The individuals then entering were bright silvery on the sides of the body, without trace of the red coloration which later appears, and the jaws of the male had developed no hook. Later, while inspecting the fishing camps between the mouth of the river and Tanana, from August 2 to 15, everywhere occasional individuals of this species were being taken. At Ruby on August 14 the fish wheels were catching from one to six cohos each day; but at the Ramparts above Tanana on August 20 the species had not yet put in an appearance, nor could anything be learned of its occurrence in the main river above Tanana up to the date of the party's return from Dawson on September 5. The individuals observed below Tanana were running principally along the left (south) limit of the river, and it was reported that their main run was always along the left bank in company with the bright chums ("silver") and such king salmon as run late. To what

extent the early cohos turn into the Tanana it was impossible to determine.

In the lower two or three hundred miles of the river the cohos during the early days of August may maintain the bright silvery coloration with which they enter from salt water, but soon a pinkish tinge appears, which becomes intensified to a bright red before Ruby is reached. At the same time the upper jaw of the male becomes bluntly hooked over the lower jaw, producing the characteristic snub-nosed appearance of this species on the spawning grounds, and the enlarged teeth of the males are soon in evidence. These changes in appearance may have already occurred before entering the river in the case of the latest individuals to enter.

It is most unfortunate that the only name by which the coho salmon is commonly known on the Yukon is "chinook," which is the special name of the king salmon of the Columbia River and is totally inapplicable to the coho. Near the mouth of the Yukon, where the influence of the cannery has been felt, the coho is generally and properly designated as the silver salmon, which is one of the two names by which the species is known in other fishing centers of Alaska. Unfortunately, as will later appear, elsewhere throughout the Yukon the term "silver salmon" is generally but mistakenly applied to an entirely different species. To avoid confusion, therefore, it is suggested that this species be known on the Yukon as the coho, a name by which it is generally known to the trade.

KING SALMON.

The king salmon appears at the river mouth shortly after the ice has run out—in the last week of May or the early days of June. The numbers rapidly increase, the run culminates quickly, and then almost as quickly declines. During the season of 1920 the first king salmon was obtained on June 13, although nets had been set to test the grounds for five days prior to that date. The rapidity with which the run sets in is well shown by the records of the first few days at the cannery. On June 15, 34 king salmon were obtained; on June 16, 175; June 17, 1,639; and on June 18, 5,228, this being the next to the largest take on any day during the season. The largest capture of king salmon in any one day was 6,104 on June 21. In no other day, except the two above mentioned, did the number captured quite reach 4,000. The run may be said to have begun on June 15 and to have culminated within the first week. It continued for some 10 days thereafter at a high level, and then registered unmistakable decline. The average take at the cannery for the best consecutive 16 days of the run was a little more than 3,000 fish per day.

The experience during the previous season, 1919, was very similar as regards the beginning, culmination, and decline of the king salmon run. The fish appeared during the second week in June, ran most abundantly during the following week, continued at a high level for two weeks more, and then rapidly fell off.

The average size of the 1920 king salmon was greater than that of 1919, as is shown by the average number required to make a case in each of the two years. The average number in 1919 was 3.54 to the case, while in 1920 it required but 3.03. The difference was even

greater than is indicated by these figures, for in 1919 comparatively few fish of larger size were taken out for mild curing, while in 1920 there were put up 145 tierces of mild-cured kings, with 800 pounds to the tierce. These were all selected from the larger sizes and would have materially diminished the number required per case if all had been canned.

During the early part of the fishing season the king salmon were silvery in color, without trace of red; the testes are small, hard, and purplish in color; the eggs are always small, not more than half the size when mature. The snout of the males was then so little produced as to give no certain indication of sex. This condition continued during the greater part of June, near the latter end of which the run indicated a decided falling off. But on June 29 a second run appeared of small dimensions, and it was at once apparent that these fish were further along in their development. The jaws of the male were now somewhat prolonged and hooked, and the enlarged teeth had begun to show. They were now reddish in color, and the bellies were so thin that they were little valued for mild-cure purposes. These changes were abrupt and coincided with the sudden increase in the run.

The natural enemies which left traces of their presence on the entering salmon were the white whales, or belugas, and the lamprey eels. Belugas were very much in evidence in the lower river channels during the latter part of the season, the size of their schools increasing as the salmon were running more abundantly. Undoubtedly they were feeding on the salmon, and it is safe to assume that they captured and devoured a very large proportion of those on which they succeeded in closing their jaws. But the number of salmon which appeared on the cannery floor bearing unmistakable tooth marks of the beluga was surprising. The sides were scored lengthwise by widely spaced lines, which usually described a gentle curve, but were occasionally angulated. Evidently these salmon had escaped from the very jaws of their pursuers.

Other marks which attracted universal attention and were usually mistaken for hatchery brands were the scars made by the lamprey eel. This slender eel-shaped animal has an oval sucker-shaped mouth provided with rows of rasping teeth. By means of the sucker mouth it attaches itself to the salmon and may rasp off the skin and even deeper-lying tissues for food. A scar is left which often reproduces with great fidelity the details of the mouth, with its outer fringe of filaments and its inner groups of teeth, which in the scar often give the impression of printed characters.

Such lamprey scars have been occasionally observed in other rivers, but never before in such abundance as on the Yukon. This fact probably stands related to the large lamprey run which is indigenous to this stream. They enter the mouth of the river in the fall after the surface has frozen and run up under the ice, to the under surface of which they often attach themselves when resting. Although the run lasts but few hours at any locality, it is of enormous dimensions and furnishes tons of food to those who dip them up through holes cut in the ice.

Like the salmon, the lampreys enter the river for purposes of propagation, and all die after the eggs are laid. The young soon

after hatching burrow in the mud of the river banks and live like earthworms for an indefinite period of two or more years. After this they pass out to sea when some 6 inches long, and spend the remainder of their life in the ocean. So far as known to the writers, the lamprey scars have been found on salmon exclusively, and on the Yukon never on chums or dog salmon. Some king salmon would have two or even three scars and one was found on a sockeye, but among the thousands of Yukon chums that we inspected there was not one that had been attacked by a lamprey. It is an interesting question whether the Yukon lampreys follow the king salmon of their own river on their feeding grounds and prey on them. It is not known that their attacks are ever dangerous. The salmon observed seemed in no case to have been seriously injured.

That the king salmon ascend the Yukon at a high rate of speed has been accepted generally. An attempt was made to secure reliable records of their first appearance at a large number of localities along the river. Wireless messages were sent to a number of points during the early days of the run before the dates should be forgotten. And, in addition, a number of important records were secured during visits to the fishing camps, some of these giving the catch in detail day by day throughout the season. While it is recognized that the capture of the first salmon of the season at different points along the river may vary within a day or two in relation to the beginning of the run, an examination of the data indicates that this source of error is not serious and that reliable conclusions concerning the rate of travel can be drawn from the table presented. In this table, when two or more records have been obtained from the same locality, the earliest has been selected as giving the first appearance of the king salmon in that portion of the river.

DATE OF CAPTURE OF FIRST KING SALMON AT LOCALITIES ON YUKON RIVER, SEASON OF 1920.

Locality.	Date.	Approximate distance traveled.
		<i>Miles.</i>
South mouth of river.....	June 13	.....
Run begins south mouth.....	June 15	.....
Pilot Station.....	June 20	107
Marshall.....	do.	144
Russian Mission.....	June 21	204
Tucker's fish camp.....	June 23	221
Palmtut.....	June 22	259
Holy Cross.....	June 23	279
Halls Rapids, above Anvik.....	June 24	346
Camp 51 miles below Kaltag.....	June 27	440
Kaltag.....	June 28	491
Koyukuk.....	June 29	555
Whisky Creek, above Loudon.....	June 27	622
Ruby.....	do.	659
Tanana.....	June 28	804
Fish Creek, above Rampart Rapids.....	July 3	851
Circle.....	July 11	1,227
Charlie Creek.....	July 12	1,317
Eagle.....	July 13	1,402
De Wolf's fish camp.....	July 14	1,478
Dawson.....	do.	1,504

Inspection of the above table shows the slowest rate of travel in the first hundred miles of the river above its mouth. From the entrance of the South Mouth to Pilot Station is approximately 130 miles, but it was five days after the run began in the mouth of the river before the first king salmon appeared at Pilot Station, indicating a rate of about 30 miles per day. Between Pilot Station and Tanana, on the other hand, the rate of travel was slightly more than 80 miles per day. This discrepancy is probably due to the habit of playing back and forth in brackish water, on entering the river mouth, before beginning their serious ascent of the river. It is well known to the fishermen at the mouth of the river that salmon enter the gill nets as numerously from the upstream as from the downstream side. They pass back and forth on the tides, lingering within the fishing district, thus giving the nets many more opportunities to capture them than would be the case if they pursued a direct course on entering the stream.

Three records below Tanana, those of the camp 51 miles below Kaltag, Kaltag itself, and Koyukuk, do not align themselves with the remainder of the series. At the average rate of travel king salmon should have reached Kaltag by the 24th instead of the 28th and Koyukuk by the 25th instead of the 29th. In both of these localities the capture of king salmon was considered of little relative importance, and the records are doubtless defective.

Above Tanana the current of the river increases materially, rapids are encountered, and the intricate channels of the Yukon Flats are to be threaded. It is not surprising to find that the rate of travel in the upper portion of the river becomes reduced. Not only are the difficulties of ascent increased but the potential store of energy in the fish approaches exhaustion. When they enter the mouth of the river they are the richest in oil of any salmon known, but by the time they reach Dawson their flesh is comparatively dry and flavorless, the oil having been expended to supply the energy needed in ascending 1,500 miles against the current and in carrying forward at the same time the sexual changes which precede the act of spawning. The average rate of travel from Tanana to Dawson was slightly less than 45 miles per day, while from Pilot Station to Dawson, involving practically the entire length of the river below Dawson, the average rate was 57 miles per day.

No record of any other river approaches this in completeness nor in the high rate of travel indicated. The unexampled speed with which salmon ascend the Yukon is doubtless associated with the great distances to be traversed before reaching their upper spawning areas, taken in connection with the shortness of the northern summer.

Inasmuch as the investigators were compelled to restrict their attention to the main river, they are unable to designate the principal spawning areas of the king salmon. Limited numbers of kings are reported to turn aside into all the principal tributaries of the lower and middle sections of the river, but it is believed that a relatively large proportion of the run passes beyond the mouth of the Porcupine into the upper portion of the basin.

CHUM OR DOG SALMON.

Although the king salmon is an important source of food to the natives and the white population, it is far surpassed in value by the

chum or dog salmon, which must be considered the principal food product of the Yukon River.

It makes its appearance off the mouth of the river only a few days later than the advent of the king salmon. In 1920 the first chum was obtained June 17, and from the 17th to the 19th, 138 became entangled in the coarse mesh of the king salmon nets set outside the mouth of the river; but none apparently had as yet entered the stream. On June 20, 2 were reported inside the river; June 21, 82; and June 22, 26; but during these three days 856 were taken in the outside nets, indicating clearly that the chums were beginning to school in some abundance outside the river, but that few were entering up to June 22, when the run up the river may be said to have begun. It became greatly accelerated on June 29 and maintained itself with minor fluctuations, until the cannery ceased operations the middle of July. No strictly quantitative results concerning the run of chums could be obtained from the cannery records during this season, as nets with appropriate mesh for capture of chums were not employed until the last week in June. For this reason, the apparent increase in size of run during the latter days of June is certainly overemphasized by the cannery statistics.

The first chums to arrive were further advanced toward sexual maturity than were the king salmon. In the latter the testes and ovaries were small and the snout so little produced in the males that there was no certain external evidence of the sex of the individuals examined. But in the case of the chums, even those earliest to run had the milt white in color and obviously enlarged, and the large eggs were already loosening in the ovary. The jaws of the males were not hooked, but were showing a slight sharpening and elongation, so that sex determination could usually be made from the appearance of the head. All the early chums were bright silvery in color, with abundant oil, and pinkish flesh which turned a deeper red on drying. All of them were in such condition that they would have been classed as "silvers" rather than as "dog salmon" by fishermen of the upper river.

But changes in the appearances of the chums were soon apparent. At first, as in the case of the king salmon, rare individuals, usually males, showed themselves in an advanced stage of development, with brightly colored bars on the sides of the body and long hooked jaws. They stood out conspicuously from their fellows, which were still in the "silver" stage.

But by the last of June, when a great increase suddenly occurred in the take of chum salmon, obvious seasonal changes had appeared in this species, as in the king salmon running at the same period. It was now the rule for the males to exhibit elongated jaws provided with canine teeth, and to show the beginnings of the conspicuous color marks which characterize the spawning males of this species. During the first days of July the run of chums again fell off, accompanied by a further increase in the matured appearance of the fish. As this occurred at the same time in chums and in king salmon, it appeared to the fishermen that the end of the run was in sight.

On July 7 a new run of chums suddenly set in, the great majority of which were of bright silvery appearance and with no further seasonal advancement than had been shown by the fish that ran first in June. Among them were a few stragglers of the previous run, the

males and females equally conspicuous among their silvery companions. On subsequent dates these stragglers became more rare, and when the party left for the upriver on August 2 the few chums that were then running were almost wholly of the pronounced silvery type.

It is unfortunate that confusion should have arisen in the Yukon from a failure to recognize that the dog salmon and the so-called "silvers" represent different phases in the development of one and the same species.

The "dog salmon" are the individuals furthest advanced toward spawning. They exhibit the elongated hooked jaws and enlarged teeth in the male, the bright nuptial coloration, and the impoverished condition of the flesh, which is light in color, largely devoid of oil, and possessing very little substance when dried.

In the "silvers" the eggs and milt are less developed, the jaws of the male are little or not at all hooked, the external coloration is silvery, or with a light flush of red, and the meat is red in color when dried, rich in oil, and valuable both for human food and for dogs.

In general, the "dog salmon" along any stretch of the river consist of those individuals which will turn into some adjacent tributary to spawn, while the "silvers" are on their way to the upper reaches of the river, show relatively little of the sexual changes they will exhibit on their spawning beds, and are still richly provided with the oil which serves as fuel and principal source of nourishment during the long journey still before them.

Many fishermen recognize the difficulty of distinguishing sharply between "dogs" and "silvers" and relieve their embarrassment by recognizing a third class, the "half-breeds." But the term "silver salmon" has acquired a fairly definite and useful significance in the trade. "Dog salmon" are so poor in nourishment that they have different value even for dog feed, and will not be purchased except during times of extraordinary scarcity. The natives will feed them to their dogs, but will not eat them themselves unless king salmon and "silver salmon" are unobtainable.

The use of the term "silver salmon" for bright silvery chums, still rich in substance, is so universal and of such long standing in the interior of Alaska that it seems useless to attempt to supplant it with any other name. Confusion will inevitably result owing to the presence of the totally different species, the coho, which is commonly known in outside waters as the silver salmon. It is proposed, therefore, that the term "silvers," when referring to the Yukon basin, be restricted to the chums known commercially by that name, while the three species of salmon of importance on that stream be known as the king, the chum, and the coho.

It became evident, as we were ascending the river in August, that the "dogs" and the "silvers" were in general keeping apart from each other and were following distinct migration routes. Throughout the entire lower course of the Yukon, from Tanana at least as far as Anvik, the "dogs" predominated on the right (north limit) of the river and the "silvers" on the left limit. This is generally recognized by all the fishermen of that region, who also agree that the "dog salmon" turn into all the creeks and smaller tributaries, while the silvers "dislike the taste of fresh water," as a native fisherman stated the case. It is also recognized that a heavier run of kings and

of cohos is found in company with the "silvers" along the left limit of the river. It appears, therefore, that there is a prevailing use of the left shore by those fish which are bound for the upper reaches of the river. This may have connection with the fact that the majority of the tributaries of the lower river enter on the right bank.

The run of chums is not of uniform character and quality throughout the season. Fishermen recognize a succession of phases in the run, characterized by fish which on the average are recognizably different. In general, it is stated that the run of chums which accompany the king salmon are of relatively small size and poor quality, commonly known as dog salmon. Following these is a run of bright fish of good quality but inferior size, known as "silvers," while the last chums to run, late in August and early in September, are the finest of all, the "silvers" par excellence, a bright rich form distinctly of larger size. This last run of "silvers" ordinarily is of short duration, but is frequently of great intensity, and furnishes the most highly prized fish of the season.

As it was necessary to make a canvass of the entire river before the fishing season had come to a close, the writers were unable to observe the alleged succession of forms of the chum salmon at any locality. Distinct differences in the character and quality of the fish appeared at the various camps visited, but these differences were apparently dependent either on the proximity of the camp to important tributaries into which spawning chum salmon would pass, or, more especially, on the location of the camp with reference to the river itself, whether on the right bank or the left. In general when following up the right (north) bank of the river the quality of the fish became poorer as one approached the mouths of the tributaries. The impression was strong that the fish destined for these tributaries were farther advanced than those with which they were associated on the same side of the river bound for more distant spawning grounds. A further more detailed study of the characteristics of the chums at different times and in different localities and the distribution of the various strains to their respective spawning areas would offer results of importance equally from the biological and from the strictly practical point of view. During the season of 1919 the bright chums, or "silvers," were said to be almost wholly wanting. If these were the fish bound for the more distant spawning beds, then the upper sections of the river must have remained largely unseeded in 1919 and incapable of producing their quota of a subsequent season's supply. In 1920 the run of chums was peculiar, in that it lasted longer than is usual in good years, but was of less intensity, and the August run of "silvers" failed to attain its usual proportions. In subsequent years the late run of "silvers" should be carefully noted. If there is evidence of a progressive decline, steps should be taken to protect this most important part of the run. To accomplish this result information should be obtained concerning the spawning beds which are resorted to by this large and valuable race of chums.

The chums travel up the river at a rate approximately equal to that of the king salmon. In 1920, as has been shown, they were schooling on the tide-flats off the mouth of the river nearly a week before they began to ascend the stream in any numbers on June 22. Adopting the latter date as the beginning of the run, it appears that they

started about a week later than the king salmon. In the section of the river between Loudon and Tanana, they were reported as 8 to 10 days behind the kings, and in the district between Circle and Dawson, the first chum was recorded 11 to 17 days later than the first king. It is evident, therefore, that the chum salmon, also, although apparently far less vigorous than the king, ascend the river at an astonishing rate of speed, maintained without cessation for well over a month, under the necessities imposed on them by the short summer and the rigorous fall climate of the Yukon.

The opinion has already been recorded that the king salmon of the Yukon is the richest in oil of any known king salmon. The same statement, made with even greater emphasis, may be advanced regarding the Yukon chums. This species is noted in other localities for its poor oil and poor color. The canned product is the reverse of attractive in color or in richness, and occupies the lowest rank in the markets of the world. In other river basins the chums do not travel far from the sea, but enter late in the season and seek spawning beds not far inland. But the best of the Yukon chums travel 1,000 to 2,000 miles up a river known for its consistently rapid current. They form a rich table fish in the lower section of the Yukon, where the king salmon, to ordinary palates, contains a superabundance of oil. No more striking evidence of the richness of the king salmon can be found than that presented in the smokehouses of natives in the lower river. Here the drying salmon constantly drip a pure, clear red oil, which is collected in vessels and preserved for winter use. At the village of Ohogamute, above Marshall, we observed some 30 quart bottles filled with red salmon oil, secured this season from drying king salmon.

YUKON DELTA, ITS PRINCIPAL CHANNELS, AND ROUTES MAINLY FOLLOWED BY SALMON.

The Yukon River subdivides numerous within its extensive delta, and sends its waters to the sea through a large number of distinct channels. Many of these are narrow winding canals, which meander in every direction interminably through the flat lands, before they attain the outer edge of the delta. Through all of them, doubtless, some salmon pass, but three of the channels so far transcend the others in size and importance that for practical purposes they may be considered as forming the mouths of the Yukon and the main migration routes of the entering salmon. The channels in question, in order of importance, are Kwikluak Pass, or south mouth, with its important branch, the Kwiguk Pass; Kawanak and Kwikpak Passes, which coalesce before entering the sea and form together the middle mouth; and Apoon Pass, or north mouth.

Much the smallest of the three is the Apoon Channel, which traverses the northern sector of the delta, and forms the most direct route for river steamers bound to and from St. Michael. Although exclusively used as a steamer channel, it is poorly adapted for this purpose, being so shallow both within and without the mouth that light-draft boats have quite the habit of going aground there and waiting until a favoring tide shall float them.

Few salmon apparently find their way through Apoon Pass. A few families of natives from Kotlik village had established a fish

camp on the shore just outside the mouth of the river, but the drying frames were scantily supplied with salmon when they were seen in the last week of July. Between the mouth of the pass and old Fort Hamilton no fishing stations were occupied, and the nets operated by the white trader at old Fort Hamilton were having no success. The general belief that Apoon Pass is of little importance as a fishway seemed wholly justified by observations. It has probably no greater importance than have some of the subsidiary channels through the delta.

The lower Kwikpak and the Kawanak Passes, which together constitute the middle mouth, are the least known of the three main divisions of the river. No steamers traverse them and very few natives have their summer fishing camps along their banks. The Kawanak is a stream of large size and fair depth of water and the lower Kwikpak, although choked with sandbars, carries a considerable current.

This middle mouth was visited July 5 to 7, at a time when the Carlisle Packing Co., on request, was testing the run of salmon by setting nets in the lower Kawanak Channel. Two nets were set along the left bank and two others were set offshore along the edge of a bank. This test was made during a slack period in the run in the south mouth, when the king salmon especially were running in greatly reduced numbers and the chums were not coming in full force. During 14 hours' fishing in the Kawanak Channel the four nets took 3 king salmon and 67 chums. In a second test of equal length the following day the showing was even less favorable.

One native fishing camp, which obviously has been occupied for many years, is located on the upper point of the long island which separates the Kawanak and Kwipak channels, immediately below their first confluence near the mouth. Four families were encamped at this place, and reported a favorable catch of king salmon during the preceding two weeks. The run had now slackened, they said, and the chums were just beginning to appear. They had found the season thus far very much better than the preceding year, when they had fished in the same locality. During the season of 1919 they had been unable to secure many more salmon than they had needed for their summer's use. At the time the camp was visited they had caught enough king salmon to fill one rack and two smokehouses, and had made use of two short gill nets of their own make set in an eddy along the bank of the island. The nets were not more than 25 feet long. Later, when a fresh run had entered the south mouth, word was received that the native fishermen in the middle mouth were again making good catches. It seemed, therefore, that the runs in the two mouths were well synchronized, the fluctuations during different seasons and between different days of the same season, following each other closely. This was well shown in a test made in the middle mouth, on request, during the earlier part of the season, when king salmon were running abundantly in the south mouth. This test was made on June 25 and 26, and resulted in a satisfactory catch of king salmon, with very few chums.

In view of the tests here indicated and observations at the fishing camp, it can not be said that the middle mouth lacks importance as a route for salmon. Yet it is considered to be very far indeed behind the south mouth in this respect. It is doubtful whether it equals in

importance the subsidiary channel known as the Kwiguk, which branches off from the Kwikluak Pass, a few miles above its mouth. It may safely be inferred that the native fish camps are located at the most favorable fishing sites. These are occupied year after year and generation after generation by the same families and their descendants. Where native fishing villages are most thickly grouped will be found the largest and most unfailing supply of salmon. With this as a basis, the writers are compelled to conclude that the south mouth serves as the migration route for the greater part of the Yukon run. While no data are available for an estimate, it is not considered beyond the bounds of probability that nine-tenths of the entire run enter by the Kwikluak Pass and its subsidiary channel, the Kwiguk. About 100 families of natives were fishing in this district in 1920, while not to exceed 10 families were seen in the middle mouth below Dogfish Village. In no case did the latter families have equal success with those camped on the Kwikluak Pass.

It is on the Kwiguk Channel, just below its emergence from the Kwikluak, that the floating cannery of the Carlisle Packing Co. has been located during the two seasons of its operation in the delta. Protected from the heavy southerly winds which blow up the main channel during the summer months, this site is within easy distance of the main fishing grounds in the lower part of the Kwikluak Channel and among the offshore shoals and islands. Inasmuch as the Yukon salmon appear largely to travel along the banks, in the eddies, and along the margins of submerged banks, it is believed possible during a favorable fishing season to secure from this location as a base a very considerable proportion of the salmon of the Kwikluak Channel. Fortunately, no commercial fishing for export is permitted in the Kwiguk Channel. Several native families were located on this channel in 1920, and one white trader maintained a wheel. Good catches of king salmon and chums were secured at all of these camps, but it was believed that the run of kings was proportionally not as heavy as in the main channel.

COMMERCIAL FISHERY OPERATIONS IN YUKON DELTA IN 1920.

The fishery operations of the Carlisle Packing Co. in 1920 were conducted principally in the south or Kwikluak mouth of the river and beyond that mouth among the seaward channels which diverge from it. The mouth of the Kwikluak Channel was designated as it was during the previous season by a stake set in the right or northern bank on the projecting point of land at Ingrakaklak (see U. S. C. & G. S. chart 9373) and by a stake set on the left or southern bank of the channel at the entrance to the well-marked lagoon some half mile below Nilak.

A few fishing camps were established by the company as far up the Kwikluak Channel as Dogfish Village, where the main river makes its first grand division into the Kwikluak Channel and a channel which later divides to reach the middle and the Apoon mouths. Above Dogfish Village no fishing camps were established by the company, but they purchased limited numbers of salmon from a few independent fishermen, who operated at points below the mouth of Clear River near Andreafski.

Commercial fishing for export was thus carried on exclusively in the main Yukon, between the mouth of Clear River and Dogfish Village and below Dogfish Village, in the main Kwikluak Channel and its seaward extensions. All subsidiary channels branching off from the Kwikluak were closed to commercial fishing, whether these served as communicating links between larger channels, as in the case of Aproka Pass, or, as in the case of the Kwiguk Channel, secured independent egress to the sea.

But in no case were the salmon which entered through these protected channels given unimpeded access to the upper river. All of them must pass through the 40 or 50 mile stretch of the main river between Dogfish Village and Andreafski, where they were exposed to capture for commercial purposes; and those that enter through the important Kwiguk Channel must in addition run the gauntlet of a further 40 miles of river between the Kwiguk entrance and Dogfish Village. During the past season very little commercial fishing was in fact carried on in the stretch of river above Dogfish Village, but this was of choice and not from necessity, for no restrictions are there imposed by existing regulations.

During the season of 1919, 65 per cent of the king salmon and 61 per cent of the smaller fish—chums, cohos, and sockeyes—were taken beyond the mouth of the river, while in 1920 the proportion was even greater, 69 per cent of the king salmon and 68 per cent of the chums being taken outside.

The fishing grounds in 1920 extended much farther away from the river than in 1919. During a part of the season 12 fishing boats were located between 10 and 20 miles outside Nilak, along the shallow banks bordering the Acharon Channel on the mainland side (U. S. C. & G. S. chart 9373). The outermost stations were for a time the most successful, meeting the Yukon salmon well down the coast toward the mouth of Black River. How much farther in the direction of the Kuskokwim the advancing schools may be encountered in numbers adequate to warrant commercial fishing is as yet undetermined. An expedition which they sent down the coast to Cape Romanof testifies to the interest of the Carlisle Packing Co. in this question.

The fishing methods employed by the company in 1920 did not differ from those in use in 1919. Almost their sole dependence was on gill nets, set in convenient lengths in the eddies and on shallow banks along the main channels. For the most part these were set nets or anchored gill nets, with one end made fast to the shore and the outer end anchored. But during the latter end of the season, when the river was no longer at flood, it became possible to fish on shallow banks, which were not available during the height of the king salmon run. Stake nets were then used in larger numbers and would unquestionably have been availed of more extensively throughout the season had the stage of water permitted.

The gill nets used were of two kinds, the king salmon nets of 8 $\frac{1}{4}$ -inch mesh and the nets for chums and other small salmon of 5 $\frac{1}{4}$ -inch mesh. As the company from the beginning of the season contemplated fishing largely, if not exclusively, for the king salmon, only nets of the larger mesh were issued during the height of the king salmon run, which lasted up to the last days of June. After this

date the smaller mesh nets were also issued, but the number of these on hand was not adequate to supply all the fishermen.

Forty-one boats in all were employed in fishing, 34 of these throughout the season, the remainder for varying periods. Four of them were engaged so short a time and obtained so few fish that they may well be omitted from consideration. To each boat was issued 200 fathoms of king salmon net, and subsequently 200 fathoms of the small mesh salmon net, to the extent that this was obtainable.

In addition to the gill nets, renewed attempts were made in 1920 to use fish wheels. Two of these were constructed by the company, but were no sooner placed for fishing than they were put out of commission by the heavy drift which was running during the early days of the fishing season.

In addition to the above, nine wheels were privately owned and operated within the area open to commercial fishing, and the catch of seven of these was sold in whole or in part to the cannery. A very limited number of salmon were obtained from independent fishermen using nets. The number thus purchased from independent operators using wheels or nets amounted to some 7,400 kings and 27,000 chums, out of a total number handled by the cannery of 58,467 kings and 155,655 chums.

The fishing gear operated by the cannery and by private parties occupied only a narrow fringe along the margins of the channels. No attempt was made to fence or block the main channels in any manner, nor could such an attempt at any time be successful.

The employees at the cannery numbered 254. Of these, 122 were brought in from Seattle, including 40 Orientals and 44 fishermen. Of the 132 Alaskans, 40 were employed as fishermen, while 48 were natives, of which the first crew of 25 ceased work in the middle of the season. It was pleasing to learn from the superintendent that the Alaskan fishermen gave a good account of themselves and would hereafter be preferred by the company.

The pack put up by the cannery in 1920 was far less extensive than in the previous year, as is shown by the following table:

PACK OF SALMON BY YUKON CANNERY IN 1919 AND 1920.

Product.	1919	1920
Canned (cases):		
King salmon.....	28,582	15,934
Chums.....	24,543	12,819
Cohos.....	3,181	0
Reds.....	28	5
Mild-cure (tierces).....		145

The comparative lack of success in 1920 was due in part to the unfavorable fishing conditions and in part to voluntary shortening of the fishing season. In 1919 fishing was continued until the close of August, but in 1920 only until the middle of July, as the low market price for chums did not warrant the company in continuing to operate after the run of king salmon was over. The season of 1920 was extremely late on the Yukon, and the king salmon entered with a rush, while yet the river was very high and was carrying down enor-

mous quantities of drift, which clogged the nets and rendered them inefficient. Also, during July the weather was unusually stormy, interfering with the fishing and endangering both fishing gear and the lives of the fishermen exposed on the flats beyond the river's mouth. From the cannery standpoint, the season was a failure, redeemed from actual loss—if such indeed was the case—by the extremely high price quoted this year for king salmon. Yet the cannery pack of 28,758 cases fell short only 1,242 cases of the maximum number of salmon which had been designated by the Secretary of Commerce as safely to be spared for commercial purposes from the Yukon River run.

No fish intended for export from Alaska were salted on the Yukon River in 1920.

SUPPLY OF DRIED SALMON PREPARED ON YUKON RIVER IN 1920.

On the voyage down the Yukon from Lower Lebarge to the delta, following close behind the running ice, May 24 to June 13, few indications could be observed of preparation for the fishing season. Here and there a white fisherman was engaged in constructing his fish wheel in time for the short king salmon run, but the native fish camps were unoccupied. Later it was evident that in comparatively few instances did the natives have wheels in the water in time to obtain any considerable number of king salmon.

On the lower river, below Holy Cross or Paimiut, the natives belong to the Innuite stock, and fish much less extensively with wheels than do the Indians of the upper river. They employ for the most part short lengths of homemade gill nets, which they set in eddies behind projecting points of the shore. As favorable localities are found almost exclusively along the high right (north) bank of the lower river, the fishing villages are confined to that side.

Above Holy Cross the use of nets becomes less and less an important factor, and wheels are relied on almost exclusively for the capture of salmon. Rarely was the primitive fish trap or basket or the dip net seen in use. The small fish wheels, which seem to have been introduced on the Tanana River in 1904, have been generally adopted on the upper river by whites and natives alike. They cost about \$50 each, in addition to the labor of building them, and are wonderfully effective when skillfully placed.

In the section of the river between Holy Cross and Rampart little dependence is placed by the natives on the king salmon. There is an early short run, and the natives are traditionally dilatory in making preparations. By the time their wheels are in the water the king salmon run is largely over. It is also true that the king salmon are more difficult to preserve, being larger in size and richer in oil. Those that are put up by the natives are kept largely for their own consumption and for this purpose are most highly prized. Taking the river as a whole, a distinct hardship is imposed on whites and natives alike when the king salmon run is below normal.

Unquestionably, however, the chum furnishes by far the larger share of the dried salmon. Along some stretches of the river almost complete dependence is placed on this species, locally known as the dog salmon and the "silvers." The higher grade of chums, known as "silvers," form the staple dog food throughout the Yukon country.

All the traders handle them and may deal in from 5 to 50 tons in a year. But they refuse to purchase dog salmon except as a last resort. The majority of the natives at the close of the fishing season sell a portion of their salmon supply to the trader with whom they deal, frequently leaving themselves without adequate provision for their families and their dogs. Later in the year they are often compelled to repurchase dried salmon at an advanced price, paying for it with the proceeds of their winter trapping. They are, of course, more or less improvident, as in the case of other primitive peoples. Their sale of salmon in the fall is frequently to liquidate their debts to traders who had extended them credit earlier in the season.

In the section of the main river below Rampart, where salmon are still rich in oil and the rainfall during the summer months is usually heavy, resort is had to smoking the salmon in order to preserve them. There is no commoner sight along the Yukon than the cluster of white tents in some picturesque nook among the hills of the right bank, and with them one or more high, barnlike smokehouses, which emit a faint blue vapor. There will be a fish wheel turning in the current along the rocky shore and a number of open-air racks, more or less protected from the weather, on which the salmon are hung for a time until partially dried and ready to be smoked. The picture is, of course, not complete without the native men, women, and children of the summer camp, nor without the invariable row of dogs closely tethered to stakes driven near the water's edge. Here the dogs fatten on the salmon heads and back bones and other refuse. They scratch out shallow holes to lie in alongside their stakes or burrow deep into the adjacent bank, if one be at hand, to escape the implacable swarm of mosquitoes.

Along the Tanana and the upper Yukon is a region of less rainfall, in which also the salmon have relatively dry meat, which is easily preserved. Here smoking is frequently dispensed with and dependence had entirely on air drying. But, by whatever method prepared, the fish of the upper river, of the Innoko, the Koyukuk, and the Tanana, are of inferior grade, and bring a lower price than do fish imported into these districts from the main river. The best product of all is secured from the Rampart Rapids. Here the "silvers" are said to average larger and fatter than in any other section. It is not improbable that inferior strains of dogs and "silvers" have turned into the lower tributaries, leaving at the rapids almost exclusively high-grade fish bound far up the river.

In the coastal district when salmon are running abundantly trenches are often dug in the soil by natives and hundreds of salmon are thrown in without preparation of any kind. They are then covered with earth and nature is permitted to have her unrestricted way with them. When the contents of these trenches are scooped out at some convenient season, perhaps in midwinter, they are said to make acceptable dog feed and to be not wholly shunned by the natives themselves.

The king salmon intended for their own food is often carefully prepared and stored away by natives of the lower river. When sufficiently dried and smoked, the sides are cut into pieces of convenient size and packed solidly in large baskets made for the purpose of woven grass, or willow roots, or frequently of salmon skins which

are neatly fitted together and sewed with sinew. The dog and "silver" salmon are tied in bundles weighing about 60 pounds and stored away in the caches in this shape. King salmon are also put in bundles on the upper river. Mention has been made of the salmon oil obtained as drippings from king salmon. In addition to this product, the eggs are very generally saved, being closely packed in any convenient receptacle, without special attempt at preservation.

During the early part of the king salmon run, from June 25 to July 1, a launch trip was made from Kwiguk to Holy Cross and return for the purpose of inspecting the condition of the salmon racks and obtaining a clue to the extent of the king salmon run along the river. The run had been on in this district about one week, and all the fish racks along the river contained considerable numbers of king salmon. The opinion was general that the season was opening favorably. It is in the delta and along this stretch of river that fishing is conducted largely with short lengths of gill nets set in eddies, and in this district the run of king salmon is a very important factor in providing the winter's supply of food.

In addition to the native camps, there are numerous fishing stations occupied by white men. Many of these men are married to native women, and some of them are found in native camps, dividing the proceeds with the native families. In such cases we observed commonly that the efficiency of the camp was increased. The white men operating on the largest scale were usually holders of winter mail contracts, which necessitated the use of large numbers of dogs. One such mail carrier keeps some 60 dogs and requires annually for their feed from 12 to 14 tons of dried salmon. As these are exclusively dog or "silver" salmon, the number used is between 15,000 and 20,000.

Other white men take dogs to board during the summer and sell all salmon they are able to put up beyond their own needs. Many of the more intelligent natives now count on doing the same. There is a wide and legitimate demand for dried salmon, for use during the winter season when all travel in the interior of Alaska must be by dog team. As it is impossible to carry enough salmon for a long journey, all "dog mushers" depend on the country they pass through. The road houses maintain a supply for this purpose, the dried salmon taking the place of hay and grain in regions where horses are employed, and being equally indispensable.

During the month of August and the first 10 days of September the Yukon was traversed from the delta to Dawson and the Tanana as far upstream as Nenana, traveling in a launch and calling at the fish camps on the way. The number of families was ascertained as accurately as possible, the number of wheels engaged in fishing, and the total amount of dried salmon prepared for the season. In practically every native camp visited, one or more persons had a sufficient understanding of English to enable them to furnish the required information. In the majority of instances the racks, smoke-houses, and caches were inspected, and finally some facility was acquired in verifying by observation the estimates furnished.

By this method the writers are enabled to present an estimate of the dried salmon prepared on the Yukon in 1920, which is based on

more extended data than any heretofore furnished. That it is an understatement of the amount of salmon actually captured and used on the river is obvious from the following considerations:

1. The lower river was canvassed from the 1st to the 15th of August, and there was a later run of "silvers" of limited extent, of which the figures give no account. A message from Holy Cross, dated September 15, indicated a medium run of "silvers" for some three weeks after that point was passed. The still later run of cohos is also not included in the estimates.

2. No clue could be obtained as to the number of salmon eaten fresh during the season, but this must be a considerable item.

3. None of the tributaries of the Yukon were visited, with the exception of the Tanana below Nenana, yet some of these, like the Innoko, the Koyukuk, the Porcupine, and the Stewart, are important streams. The natives in these regions draw on the rivers for their supply of dried salmon, and the white prospectors and miners out on the creeks may obtain their dog feed from the very spawning beds. To what extent spawning beds are invaded for this purpose is not known, but from reports that have been received it would seem probable the figures may reach dimensions of some local importance.

On the Yukon River, from the mouth to Dawson, 97 native fish camps were observed, each of which contained from 1 to 15 families. Three hundred and seventy families were listed, who were engaged in fishing, but the matter was sometimes obscure and the number of families may have been somewhat greater than this. The natives operated 166 wheels, in addition to the short gill nets of the lower river, which were not enumerated. The dried salmon put up by them amounted approximately to 350 tons, or nearly 1 ton to each known family. Many families had less than this amount, but others compensated for the deficiency by harvests of 3, 4, or even 5 tons. The younger generation gives promise of being more provident than the old. Some of them put up large surplus stocks for sale and carry over fish from one season to the next. There is some apparently well-founded complaint that sufficient care is not always given to curing the salmon, so that in rainy seasons like 1920 large stocks may be offered for sale which are rendered almost worthless by mold and decay. One Japanese fisherman operated a wheel on the river and put up 1,200 pounds.

There were 76 white fishing camps, usually with a single white man in a camp, but in a few instances two white men were working in partnership, or a white man in conjunction with natives. There were 91 white men in all, and they prepared approximately 190 tons of dried fish.

On the Tanana River below Fairbanks there were 24 native fishing camps, operating 24 fish wheels and containing approximately 30 tons of salmon. There were also 26 white fishing camps, with 34 wheels and some 52 tons of salmon.

Altogether, on the Yukon and the Tanana, 301 fish wheels were operated in 1920 and resulted in a take of 622 tons. Of this amount 8 per cent were king salmon and 92 per cent were chums. If an allowance of 100 tons is made for the tributaries not visited and for the later runs on the Yukon which were not seen—and this allowance

is almost certainly inadequate—there would be a total provision of dried salmon for the Yukon and its tributaries in 1920 amounting to 722 tons.

The only previous estimate known, based on a partial canvass of the fishing camps, was that prepared by Messrs. H. J. Christoffers and C. F. Townsend, of the Bureau of Fisheries, in 1918 for the purpose of the Yukon hearing of that year. They enumerated 393 fish wheels and a total product of 650 to 700 tons for the Yukon and Tanana Rivers, exclusive of Yukon Territory. Mr. Volney Richmond, manager of the Northern Commercial Co. stores, basing his estimate on conditions throughout the Yukon Valley, intimately known by him for many years, gave 600 tons as a fair annual provision of dried salmon for the region. It is possible that more salmon were dried in 1920 than would represent a fair average for the river, inasmuch as the previous year had been largely a failure, prices for dried salmon had risen to unheard of figures, and all reserve stocks had been exhausted.

Estimating the average dried king salmon at 5 pounds, and the average chum at $1\frac{1}{2}$ pounds, there were about 23,000 kings and 1,000,000 chums put up on the Yukon in 1920 for local use.

COMPARISON OF 1920 WITH 1919.

At all fish camps visited expressions of opinion were invited as to the relative size of the runs in 1920 and in 1919. The evidence given was overwhelmingly in favor of the run of 1919 being considered one of the worst if not the very worst ever known on the Yukon. Natives and whites all were practically a unit in this belief. Those who believed the cannery was not responsible for the shortage were as well satisfied on the subject of the shortage itself as were those who laid the entire responsibility at the door of the cannery. Those who did put up fairly satisfactory supplies of salmon recognized that they were especially favored in their locations, but thought that the river as a whole was relatively bare of fish.

In the lower section of the river more fish would have been prepared if storms had not broken the wheels and interrupted the fishing. Storms also broke wheels and interrupted fishing along this section of the river in 1920, but racks and smokehouses were not empty of fish. The natives about Nulato and Koyukuk would have made better provision for the winter of 1919 had they fished diligently throughout the season instead of potlatching as they did. They would unquestionably have had more fish, but it is doubtful whether they could have secured enough even had they fished consistently with as much diligence as they ever display. It was impossible to doubt, after interviewing several hundred people distributed along the entire length of the Yukon, that the run of 1919 was phenomenally deficient; and, furthermore, that if this condition should become permanent, or should frequently recur, a very serious condition would arise in the interior of Alaska.

No basis is available for a well-founded estimate of the amount of dried salmon put up in 1919, but we believe that 150 or 200 tons would be an outside estimate for the entire river. The price rose to 25, 30, and 35 cents per pound, with no stocks available even at those prices. Men compelled to travel during the winter experienced

the utmost difficulty in securing substitute dog feed. Fresh meat was used, although this is by no means satisfactory, and deplorable numbers of caribou were slaughtered by natives and others for this purpose. Cereals and bacon were made use of, and stores and trading posts soon found their stocks running low. The natives killed, or permitted to die of starvation, half or more than half of their dogs, and many white men were compelled to adopt the same course. Undoubtedly the best dogs were retained and the least valuable were culled out of the teams. But the general opinion entertained by those best acquainted with the natives and their needs was to the effect that the great reduction in the size of their dog teams was disastrous and the dog shortage was sure to hamper them in their efforts to make a living during the coming winter.

There were no reported cases of starvation or of serious suffering among the natives during the winter of 1919 because of the shortage of salmon, although they might well have occurred in outlying districts if help had not been given by white traders and by others. At Tanana rations were issued from the military post at Fort Gibbon, intended to relieve distress among the sick and aged natives of that vicinity. But the winter was in some respects unusually favorable. On the upper river heavy snows drove the caribou to the lowlands near the river, where natives could hunt them without making long sledge journeys with their dog teams into the mountains. Commissioner Mackenzie at Dawson said that had it not been for this fortunate coincidence the Indians in that vicinity would have suffered severely. In the Tanana-Fairbanks district moose were abundant and were easily captured in the deep snows. And farther down the river, in the Nulato-Koyukuk region, the grouse, which had been scarce for a number of years, had begun to come back in their former abundance. Here again had the season not been unusually favorable for securing fresh meat near at hand severe suffering would have been experienced. Such favorable conditions can not be expected to recur should the salmon supply again fail.

To resume, it does not admit of doubt that there was a most serious scarcity of salmon last winter, nor that this was occasioned primarily by an equally serious shortage in the run. By no other theory can so general a failure in the river fishing be explained. The lower and middle sections of the river, the Ramparts and Upper Yukon, the Porcupine, the Tanana, and the Koyukuk, all tell the same story. Dogs were sacrificed in large numbers, which were neither useless nor superfluous, and the natives were saved from serious suffering only by a series of happy coincidences, which could not again be expected.

TO WHAT EXTENT WAS YUKON CANNERY RESPONSIBLE FOR 1919 SHORTAGE?

As the cannery of the Carlisle Packing Co. at the mouth of the Yukon did not operate prior to 1917, and as neither the king, chum, nor coho salmon matures in two-year cycles, it is evident that the cannery could have had no influence on the size of the run which presented itself at the mouth of the river in 1919 and sought access to the spawning beds. The individuals which comprised this run

had all been derived from eggs deposited in the Yukon gravels before ever the cannery was established. There could be no question, therefore of impairment of the run having resulted in 1919 from previous cannery operations.

The only possible effect of the Carlisle cannery up to the present time has been to diminish, by the number of salmon captured, the runs which enter the river and are available to the native and white inhabitants of the valley. In 1919 the company reported the capture of 101,107 king salmon and 357,081 small salmon, largely chums. If these had been captured upriver and dried, the king salmon would then have averaged about 5 pounds each and the chums $1\frac{1}{4}$ to $1\frac{3}{4}$ pounds. Adopting the lower figure, the cannery pack, dried, would have amounted to 252 tons of king salmon and 223 tons of the smaller varieties, or 475 tons altogether. This is held to be more than twice any possible estimate of the amount of dried salmon actually put up during that season on the entire river.

If the 100,000 kings and the 350,000 chums taken by the cannery had been permitted to ascend the river, to what extent, we may ask, would the situation have been helped? It would depend on the size of the run and the proportion which, under the conditions of 1919, would escape capture at the hands of the river fishermen. If the fishing camps along the river were catching 50 per cent of the run, the cannery fish would have added some 235 tons, and the catch would thus have been more than doubled. If they were capturing a third of the run, the cannery fish would have increased their small catch by over 150 tons.

Data for such an estimate are not available. In the muddy waters of the Yukon the schools of salmon are invisible, and no direct estimate can be formed of their numbers. There is abundant evidence, however, that a large majority of the king salmon running in 1919 were captured in nets or encountered nets and escaped from them on the way into the river. White fishermen and natives, practically without exception, including those who felt no hostility to the cannery, agreed that the king salmon averaged smaller in size than ever before and that the relatively few larger individuals were net marked in the majority of cases. The same fishermen, operating in the same localities in 1920, state almost without exception that the king salmon in 1920 averaged large in size, and the number of net-marked fish was so small as to be negligible.

Many opportunities have occurred to observe elsewhere salmon caught in wheels or traps above a district heavily fished with gill nets. The results are always the same. The smaller salmon filter through the nets, which screen out the larger sizes, leaving the average size of the escaping fish always greatly diminished. And many of the fish escape through the web after being temporarily captured, the twine having become so tightly constricted about the body as to leave permanent marks that can not be mistaken. At the rack which was maintained in Wood River above the Nushagak fishing district there was opportunity to examine the fish escaping from gill nets that were capturing from 75 to 90 per cent of the running fish, but never were the escaping sockeyes so extensively net marked as the Yukon king salmon are credibly reported to have been in 1919.

Not all the screening out of the larger sizes and the net marking was due to the operations of the cannery. Natives in the lower river also fish for king salmon with nets, but the extent of their operations is so very small compared with that of the cannery in 1919 that the effect was negligible. Fishermen interviewed stated that they had in previous years seen a few net-marked fish prior to the opening of the cannery, but never anything to compare with the condition observed in 1919. The prevalence of small-sized king salmon in 1919, taken in connection with the extent of the net marking, may justly be considered a measure of the closeness with which these salmon were fished in 1919.

What was true of the king salmon was true also, it is believed, of the run of chums. Fishing for these was prosecuted during the months of June, July, and August. Conditions at the mouth of the river were comparatively favorable for a maximum catch throughout the season. As the salmon move back and forth with the tides, passing up and down the banks where nets are staked, and loitering in the eddies where other nets are anchored, the cannery gear has repeated chances to ensnare them. One of the principal deficiencies in the 1919 run in the upper river was the almost total failure of the "silvers." These, it will be recalled, are the bright chums of high quality which run after the king salmon have passed. It was to these that the cannery devoted its attention after the king salmon nets had been retired. In 1919 the king salmon run had materially declined by July 5, and it was after this date that 272,717 out of the total 357,081 small salmon (principally chums) were taken. It is considered certain that the operations of the cannery in 1919 very materially added to the scarcity of fish on the river. Had the fish captured by the cannery been free to enter the river, the run would still have been below the normal size, but the distress and inconvenience occasioned to the interior of Alaska by the salmon shortage would have been largely mitigated.

EFFECT OF CANNERY IN 1920.

The run of 1920 has been universally approved by fishermen as the most favorable since 1916. Salmon were abundant, of good average size, and of excellent quality. Some fishermen acclaimed it the largest run they had ever seen on the river, but the majority called it a fair average run of the better class of years. Certain it was there was no necessary lack of dried salmon anywhere on the main river as far upstream as Dawson. Some complaint was heard of insufficient fish supply on the Yukon Flats in the vicinity of Fort Yukon, and it was noted in certain native villages between Circle and Forty-Mile that scant provision seemed to have been made for the winter. But it was not evident that there was any lack of salmon. All white fishermen and some natives in these districts made good catches and reported the fish abundant. At Dawson, where serious complaints were heard the previous year, sufficient supplies were secured in 1920. Such slackness as apparently existed in certain native camps may find its explanation perhaps partly in the effects of the "flu," which ravaged some of these communities in the spring of the year, partly in superabundance of money, owing to high prices received for muskrat pelts, and partly, in some com-

munities, to a general shiftlessness, which habitually leads to privation and suffering in the winter.

A similar condition was observed in certain fish camps on the lower Tanana, in which natives seemed obviously less intelligent and less efficient than in the great majority of camps on the main river. In a few of these was heard the complaint that there were no fish, but it is believed that their scant supply was due to other causes. It is of course true that any scarcity will first declare itself on the upper river and among the tributaries, after the salmon, which run in a single channel in the main river, have distributed themselves over a far wider area. It is regretted that reliable reports could not be obtained from the Innoko, the Koyukuk, and the Porcupine.

In comparing the effects of the cannery in 1920 with those in 1919 conditions are met in the two years that were the very reverse of one another.

In 1919 the total run of salmon was far below normal, the conditions for fishing at the mouth of the river were favorable, the cannery catch was very large, and considered in relation to the number of salmon running it was far larger.

In 1920 there was at least a fair average run of the better class, and not improbably it was one of the best runs that can be expected in the Yukon; but the cannery was unsuccessful, owing to adverse fishing conditions. It obtained little more than half as many kings as in 1919 and less than half as many chums. Had the 58,000 kings and 155,000 chums been permitted to enter the river more salmon undoubtedly would have reached the spawning grounds, but the amount of dried salmon would not have been greatly increased. In the first place the number released would bear a small ratio to the total number running in so good a year; and, furthermore, along that section of the river which put up by far the larger amount of dried salmon, wheels, if operated more than a few hours each day during the height of the run, caught more fish than could be cleaned and prepared for drying. It does not then appear that with a large run of salmon and a relatively small cannery pack the latter has any recognizable effect in lessening the dried salmon supply of the Yukon. We are not prepared, however, to venture the assertion that such would have been the case had the cannery pack in 1920 reached as large proportions as it attained in 1919. But even had the cannery put up the full 60,000 cases in 1920, for which it made preparations, it would not have reproduced the severe conditions which existed on the river in 1919. These, as has been shown, were the result of a phenomenally poor season, made much worse by a large cannery pack.

GENERAL DISCUSSION AND RECOMMENDATIONS.

The dependence of the native and white population on the salmon supply of the Yukon admits of no question in the minds of any who have acquaintance with the conditions of life in the great interior of Alaska. The natives have other sources of food, but the salmon form their main provision for the winter—their insurance against starvation when other sources of food fail them, as they not infrequently do. No one who inquires into the matter can doubt that if

the supply of Yukon salmon should become seriously curtailed widespread suffering and death would in many seasons be visited on the natives.

The question of furnishing food for the whites is less urgent, but is not without importance. It was brought to our attention that with the price of all articles of food rapidly rising, while wages in the interior of Alaska have shown practically no increase during recent years, the presence of a cheap source of food is of value.

But one of the most important phases of the salmon question, which concerns whites and natives alike, is in relation to the dog. The whole scheme of things in the sparsely populated Yukon wilderness is predicated on the dog, and the use of the dog necessitates dried salmon. The winter is the only time for travel except along the waterways of Alaska, and winter travel is impossible without the dog team. Dogs are equally indispensable as draft animals and pack animals. Transportation of the winter mails over thousands of miles of the interior of Alaska must be accomplished by dog team. Men of the Army and the Signal Corps, like all other people in Alaska, are dependent on the dog whenever business makes it necessary for them to undertake winter travel. Fort Gibbon alone needs 40 tons of dried salmon each year to feed the dogs that they find indispensable in their work. Prospectors need them to carry their supplies into the hills. Wood choppers require them to haul in the wood. Indians must have them on their long hunting and trapping expeditions, and without them can neither secure meat for their families nor furs to exchange for the other necessities of life.

The dog is as essential in Alaska as is the horse in other regions, and the only acceptable dog feed is dried salmon. Various substitutes have been tried out when salmon could not be procured. They were used extensively by the "dog-mushers" of 1919, when dried salmon often could not be had at any price. Fresh meat was used, and enormous numbers of caribou and moose were slaughtered for this purpose. But it is impossible to carry sufficient meat for many days, and the supply is precarious. Furthermore, the dogs do not thrive and work well on this diet. A diet of cereals and fat in some form was extensively used. Stocks of rice, flour, corn meal, and bacon were heavily drawn on. Dogs traveled well on a ration of corn meal and bacon, but the expense was almost prohibitive, and there was the labor of cooking up each night in camp a meal for the dogs after the exhausting travel of the day with the temperature perhaps 50° below zero and a weary famished team waiting to be fed. Dried salmon forms a light condensed food which contains all the elements needed to keep a hard-working team in excellent condition, and it is always ready to be fed without preparation. There is no acceptable substitute, and there is not in Alaska any divergence of opinion on this subject. No single need in the interior of Alaska is more generally or more urgently felt than dried salmon for its various uses.

It is clear, then, that the Yukon and the Kuskokwim offer salmon problems which are not pressing on any other Alaskan rivers with the exception of the Copper River. These streams drain the far northern interior districts of Alaska with long severe winters and the briefest of summers. The inhabitants are few in number and are distributed widely over a wilderness which is largely without

population. Their lives are subject to the most severe conditions of existence. Largely they are dependent on the resources of the country. To deprive these people of one of their most valued and most important resources would seem under such circumstances peculiarly indefensible. The principle should be adopted with regard to the interior rivers of Alaska that no commercial interests should be permitted to exploit them until it should be demonstrated that a portion of their salmon run could be spared without detriment to the run itself and without encroaching on the supply needed by the populations that inhabit the valleys of these rivers. And if there is any question whether the salmon run in a given stream is adequate to supply the demands of commercial operations as well as the needs of the inhabitants, the doubt should at once be resolved in favor of the people. The subject should not be one for experiment. Canneries should not be permitted to establish themselves on these streams while we calmly await the result. They may create havoc before the evidence thereof is clearly shown, and in the meantime they will have secured those highly prized "vested rights" which make their position difficult of attack.

A floating cannery operated by the Carlisle Packing Co. is already established at the mouth of the Yukon, and it becomes appropriate to inquire whether the continued operation of this cannery is compatible with the best interests of the Yukon Valley. It is evident that if the fish required by this company can without question be safely spared, the cannery should be welcomed, for it provides much needed freight for a transportation company that supplies the Yukon and it offers much needed employment for a limited number of natives and others during a brief period of the summer. But if the operation of the cannery should threaten encroachment on the supply of salmon needed in the interior it should be compelled to close, as no advantage to its few employees could possibly compensate for widespread inconvenience, distress, and suffering.

As a result of the Yukon hearing, given in Seattle, Wash., November 20, 1918, the Secretary of Commerce promulgated an order that limited the pack of canned salmon to 30,000 cases in any year from the Yukon River, embracing all waters of its delta to and including the area 500 yards outside each mouth or slough of the delta at mean high tide. Beyond this area of 500 yards outside the mouth or mouths of the river the Secretary of Commerce exercises no jurisdiction, the Congress having failed to confer it upon him. He is therefore helpless to extend protection to channels between shoals and islands off the mouth of any river, although such channels may be regular migration routes of the salmon bound for that river and as much open to attack as any part of the river channels.

Realizing this deficiency of the laws, the Carlisle Packing Co. in 1919 put up approximately the maximum pack inside the river, and then proceeded nearly to double this with salmon equally bound for the Yukon which they captured outside the mouth of the river. In doing this they were wholly within their legal rights, but they evinced thereby an indifference to the obvious purport of the order, which was to provide for a strictly limited pack of Yukon fish. In making this increased pack they happened on a year when the run was poor and the fishing conditions were excellent. They were

enabled, therefore, to give a demonstration of the results of such operations when these two conditions appear in conjunction. The disastrous year of 1919 resulted.

As to the future, there is no assurance of better protection than in 1919. From our inquiries it appears that the Yukon runs of salmon are by no means uniform in size. Good years and poor years alternate, and occasional very poor years have always appeared. Meanwhile the Carlisle company continues to operate without check beyond the mouth of the river. Should they consider the prospect of success warranted the expenditure, there is nothing to prevent their increasing the number of fishermen and preparing for a pack of 100,000 instead of 60,000 cases. Or one or more other companies may join in the business of catching Yukon salmon off the mouth of the river if they consider the venture a promising one. The Yukon run is wholly without adequate protection as long as the approaches to the river are open to unrestricted fishing and are outside the jurisdiction of the Secretary of Commerce.

Finally, it is the judgment of the writers that the Yukon River salmon run is not to be relied on annually to produce a surplus for export in addition to the supply needed for local requirements and the further quantity essential for propagation. During good years a surplus might be spared sufficient to produce a limited pack, but during poor years the operation of a cannery will have the effect of making a bad situation very decidedly worse.

It is recommended, therefore, that all commercial fishing for export be prohibited in the Yukon River and its tributaries, including the waters of the delta and an area 500 yards outside the mouth of each channel or slough of the delta.

Furthermore, it is recommended that immediate steps be taken to have brought within the jurisdiction of the Secretary of Commerce all those channels between the shoals and islands which form the approaches to the Yukon in order that commercial fishing in said channels for export may be effectively limited or entirely prohibited.

