

STATE OF ALASKA

Jay S. Hammond, Governor



Annual Performance Report for

HARVEST ESTIMATE OF
SELECTED FISHERIES THROUGHOUT
SOUTHEAST ALASKA

by

*Richard A. Marriott
Artwin E. Schmidt
Darwin Jones*

ALASKA DEPARTMENT OF FISH AND GAME
Ronald O. Skoog, Commissioner

SPORT FISH DIVISION
Rupert E. Andrews, Director

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RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations
of Alaska

Project No.: F-9-11

Study No.: G-I Study Title: INVENTORY & CATALOGING

Job No.: G-I-Q Job Title: Harvest Estimates of
Selected Fisheries
Throughout Southeast Alaska

Period Covered: July 1, 1978 to June 30, 1979

ABSTRACT

Harvest studies were conducted on the Juneau area marine boating fishery, the Juneau roadside fishery, the Haines area fishery, the Starrigavan and Crescent Bay fishery in Sitka, the Sitkoh Creek steelhead fishery, and the chinook fishery in Wrangell.

Juneau Area Marine Boating Fishery

Juneau area marine boating anglers in 1978 spent an estimated 217,853 angler hours of effort to catch 2,770 chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), 13,822 coho salmon, *Oncorhynchus kisutch* (Walbaum), 6,004 pink salmon, *Oncorhynchus gorbuscha* (Walbaum), and 2,265 sockeye salmon, *Oncorhynchus nerka* (Walbaum). This effort was 20 percent less than in 1977 but 76 percent higher than the 10-year mean. The seasonal catch per angler hour for chinook was .013, the second lowest on record, and continued the downward trend observed since 1960. The catch rate per hour for coho during the June 25 to September 2 time period was 0.107, the highest since 1972. The catch rate per hour for pink salmon during the June 25 to August 19 time period was 0.058, the highest on record. Participation in the Golden North Salmon Derby accounted for 8,283 angler trips, a level of effort similar to all years since 1971. Only 250 chinook were caught, the lowest on record. However, the 2,875 coho landed was the highest on record, reflecting a strong year class and late-season date of the derby.

The contribution to the sport fishery of chinook and coho salmon released from Juneau area rearing facilities was determined through the normal creel census conducted May 1 to September 27, by supplemental creel census conducted July 3 to September 27, and by the census conducted during the Golden North Salmon Derby. No chinook salmon were censused from the 1974 releases at the Mendenhall Lakes Salmon Rearing Facility, and no marked pink salmon were censused from the 1977 releases at Auke Creek. An estimated 20 coho caught by Juneau marine anglers were from Juneau area rearing facilities, and an estimated 20 coho were from coho marked in natural rearing areas. An estimated 39 sockeye were also caught from returns to Auke Lake (fry marking experiments of 1974).

Juneau Area Roadside Fishery

In the Juneau roadside fishery of May 1 to September 5, anglers spent a record 43,578 hours to catch an estimated 8,394 Dolly Varden, *Salvelinus malma* (Walbaum), 2,195 pink salmon, 666 coho salmon, 488 cutthroat trout, *Salmo clarki* Richardson, 423 chum salmon, *Oncorhynchus keta* (Walbaum), 222 Eastern brook trout, *Salvelinus fontinalis* (Mitchell), 198 sockeye salmon, 69 chinook salmon, 55 steelhead, *Salmo gairdneri* Richardson, and 747 fish of other species.

Haines Area Sport Fishery

The Haines area roadside census was conducted from September 22 through October 23. The Chilkat system catch was 400 coho, 550 chums and 99 Dolly Varden per 3,210 angler hours of effort. The Chilkoot system catch was 788 coho, 29 chum and 117 Dolly Varden per 3,813 angler hours of effort. These catch and effort data were very similar to the 1974 census, except the Chilkat River catch of chum salmon was much lower than in 1974. The sport fishery took an estimated 42 percent of the coho escapement to the Chilkoot system. Approximately 65 percent of the anglers in this Haines area fishery are Canadians from Whitehorse.

Starrigavan Area Sport Fishery

The contribution of coho salmon, *Oncorhynchus kisutch* (Walbaum), released from the Starrigavan Estuarine Rearing Facility to the Starrigavan Bay sport fishery was determined. Boat and shoreline anglers were interviewed from August 15 to October 8, 1978. Of the 99 coho salmon examined, 4 had adipose clips and were microwire tagged. Of the estimated 364 coho salmon caught at Starrigavan, 137 (37.6 percent) were contributed by the Starrigavan Estuarine Rearing Facility. All tagged coho salmon recovered were from the Little Port Walter stock. No chinook salmon were caught during the census period. The pink salmon sport catch during the census period was estimated at 4,936. None of the 819 pink salmon examined had been finclipped. This indicates no contribution of pink salmon by the nearby Sheldon Jackson Hatchery.

Crescent Bay Sport Fishery

The contribution of pink, coho, and chum salmon released from the Sheldon Jackson Hatchery to the Crescent Bay sport fishery was determined. Boat and shoreline fishermen were interviewed from July 13 to August 25, 1978. Seven pink salmon were caught by sport fishermen prior to the area's closure to salmon fishing on August 7, 1978. None of these fish had been finclipped. No coho or chum salmon were taken by anglers during the census period.

Sitkoh Creek Sport Fishery

A creel census was conducted on Sitkoh River from April 15 to May 28, 1978. A minimum estimate of 32 steelhead trout were taken by sport fishermen. Half of the catch came from anglers based at the False Island Logging Camp. These anglers include both camp personnel and U.S. Forest Service personnel associated with the camp.

An analysis of age structure of 12 steelhead trout taken by anglers showed: (1) rearing steelhead trout spend 3 years (50 percent) or 4 years (50 percent) in fresh water before going to sea; (2) Sitkoh steelhead trout begin spawning after 2 years (58 percent) or 3 years (42 percent) in the ocean; (3) all fish examined spawned each consecutive year after reaching maturity; and (4) no legal fish, 84 cm (33 inch) total length, had spent less than 3 years in salt water or was less than 6 years old.

Wrangell Area Sport Fishery

A creel census of the marine chinook salmon fishermen in the Wrangell area was conducted between April 15 and June 15, 1978. Anglers were interviewed as they returned to their moorages in the Wrangell harbor. During the 2-month period an estimated 297 anglers spent 4,199 hours to harvest 120 chinook salmon. During the Wrangell King Salmon Derby held on May 27-29 and June 3 and 4 an estimated 211 anglers entered 31 chinook salmon with the winner weighing in excess of 27.7 kg (61 pounds). Examination of the sampled chinook salmon showed 90% to be mature fish bound for local spawning grounds.

Figure 1 is a map of the State indicating the study areas. Table 1 lists common and scientific names of the fish species mentioned in this report.

JUNEAU-HAINES AREA

OBJECTIVES

1. Determine the saltwater boating angler effort and catch of sport fish in the Juneau area, which includes determining the contribution of stocks from various artificial and natural rearing areas. The artificial stocks to be evaluated include chinook and coho salmon from the Mendenhall Lakes Salmon Rearing Facility, coho salmon from the Fish Creek Estuarine Rearing Facility and pink salmon from the Auke Creek Hatchery. The natural stocks to be evaluated include coho salmon bearing coded wire tags from twelve mainland rearing systems in the area from Port Snettisham to Chilkat River.
2. Determine the angler effort and catch in the Juneau area roadside sport fishery and to develop comparable methods for establishing trends from past surveys.
3. Determine the angler effort and catch of coho salmon from Chilkoot and Chilkat River roadside fisheries in the Haines area.

Background

The marine area surrounding Juneau has been the center of user conflict and allocation problems between sport fishermen, hand trollers, power

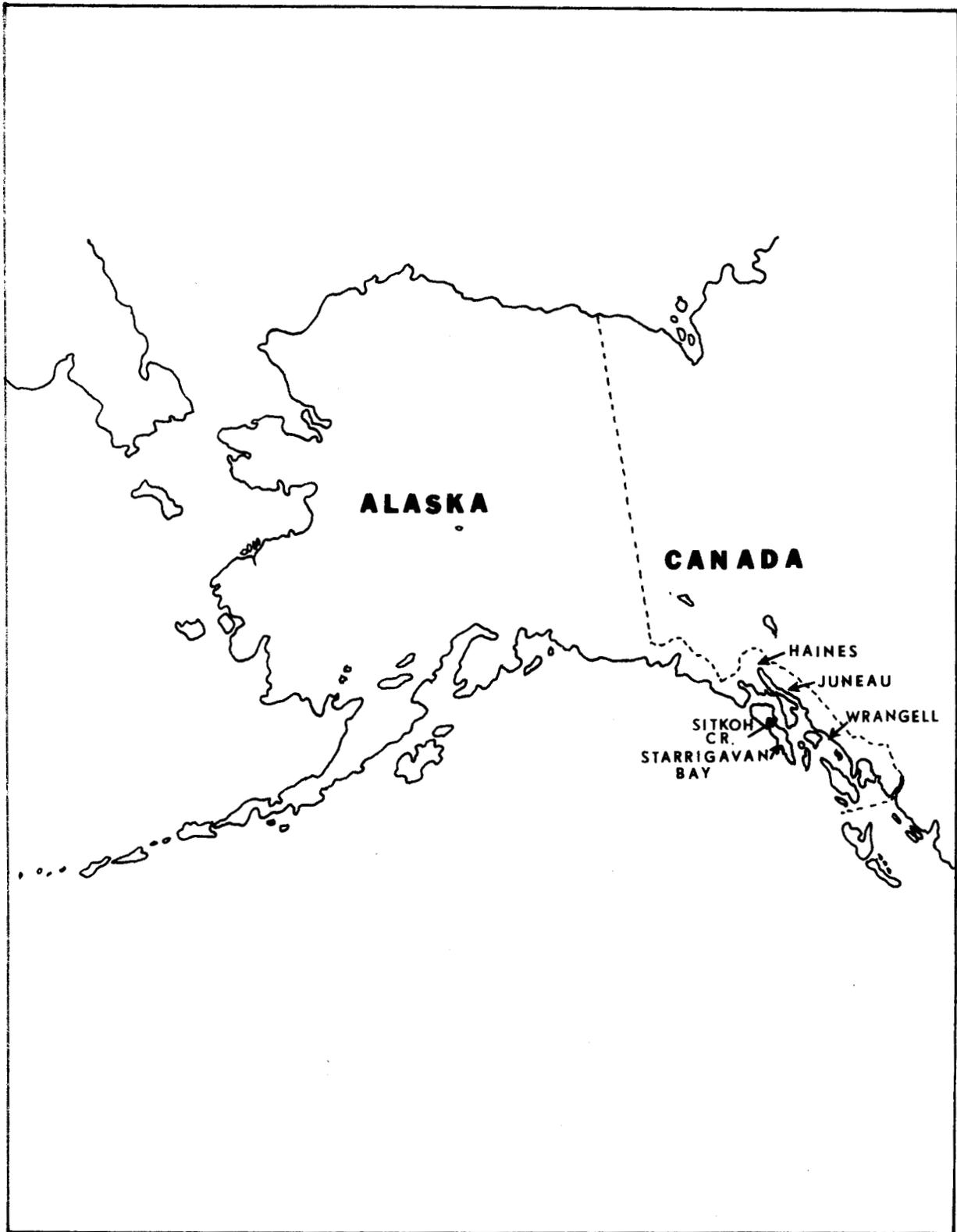


Figure 1. Study Areas in Southeastern Alaska.

Table 1. List of common names and scientific names.

| Common Name | Scientific Name and Author |
|-----------------|---|
| Pink salmon | <i>Oncorhynchus gorbuscha</i> (Walbaum) |
| Chinook salmon | <i>Oncorhynchus tshawytscha</i> (Walbaum) |
| Chum salmon | <i>Oncorhynchus keta</i> (Walbaum) |
| Coho salmon | <i>Oncorhynchus kisutch</i> (Walbaum) |
| Sockeye salmon | <i>Oncorhynchus nerka</i> (Walbaum) |
| Dolly Varden | <i>Salvelinus malma</i> (Walbaum) |
| Rainbow trout | <i>Salmo gairdneri</i> Richardson |
| Steelhead | <i>Salmo gairdneri</i> Richardson |
| Cutthroat trout | <i>Salmo clarki</i> Richardson |
| Brook trout | <i>Salvelinus fontinalis</i> (Mitchell) |
| Arctic grayling | <i>Thymallus arcticus</i> (Pallas) |
| Halibut | <i>Hyppoglossus stenolepis</i> Schmidt |
| Flounder | <i>Pleuranectidae</i> spp. |
| Sablefish | <i>Anaplopoma fimbria</i> |
| Rockfish | <i>Sebastes</i> spp. |

trollers, gill netters, and seiners (before that, salmon trap operators) while effort has increased and stock sizes have generally declined. Predictably, this area has a history of increasingly restrictive sport fishing regulations.

Prior to 1963 in the Juneau marine recreational fishery, the daily bag and possession limit was 23 kg (50 lb) of chinook salmon plus one chinook salmon, or three chinook, whichever was the least restrictive. All chinook had to be over 66 cm (26 sq in) in length. In 1963 this was changed to a bag and possession limit of three chinook salmon, but the minimum size limit was dropped. Except for chinook, no saltwater limits were established for any species of salmon, trout or char until 1968 when a bag limit of six coho, with a possession limit of two daily bag limits was provided. In 1975, this six coho bag limit was expanded to include all salmon (except chinook) and the first restrictions on trout and char (a total of 10 daily, of which only 2 could be over 51 cm or 20 inches, possession limit of two daily bag limits) were established. In 1976, after two seasons of emergency regulations on declining chinook salmon stocks, Board changes were made in the chinook salmon regulations in conjunction with extensive troll and gill net restrictions. These sport fishing regulation changes included a chinook salmon closure from April 15 to June 14 in waters between Limestone Inlet and the Piling Point--Point Louisa line. A season-long daily bag and possession limit of one chinook salmon was also established in the area between Point Sherman and Limestone Inlet and west to the latitude of Point Couverden. A minimum length of 66 cm (26 in) was also established for chinook salmon in all of Southeast Alaska. In 1978, decline of Dolly Varden in the Juneau area resulted in Board action which reduced the bag and possession limit to five Dolly Varden, only two over 30 cm (12 in) in length in all marine areas to 0.4 km (1/4 mi) offshore in the area between Point Bishop and Sawmill Creek.

In freshwater areas of the Juneau area, no restrictions were in effect until 1960, when the following regulations were established: Bag limit is 15 trout or grayling (3 over 51 cm or 20 in) daily, possession limit is two daily bag limits. Bag limit is 20 fish daily when excess over 15 is composed of Dolly Varden or Eastern brook trout; five coho daily over 51 cm (20 in); two chinook daily over 51 cm (20 in); 15 immature salmon daily or in possession; no limit on adult chinook or coho under 51 cm (20 in); Auke Nu, Duck, Jordan, Salmon, Switzer, Steep and Wadleigh creeks closed to salmon fishing. In 1963, all fresh water was closed to chinook salmon fishing. In 1967, Auke Creek was closed to salmon fishing from July 1 to July 31. In 1968 this closed area was defined as from the lake to 274 m (300 yd) below the weir, and three sockeye daily were allowed in the estuarine area of Auke Creek. In 1969 Auke Creek was closed June 15 to September 30 and the closed area extended to within 183 m (200 yd) of the mouth. Also in 1969 the char and brook trout bag limit provision was dropped and the coho bag limit increased to six daily, but with a two daily bag possession limit. In 1971 Steep Creek was closed to all fishing and a 30 fish daily or in possession bag limit established for Salmon Creek Reservoir. In 1972, the two daily bag possession limit was dropped for Fish Creek. In 1975 the trout, grayling

and char bag limit was reduced to 10 fish daily, only two over 51 cm (20 in), possession limit of two daily bag limits. Fish Creek was closed July 1 to September 30 from the bridge to markers located 457 m (500 yd) downstream (following a similar Emergency Order in 1974). Salmon Creek upstream to the first falls was closed during the same time period. Sheep Creek was closed to salmon fishing and the special liberal limit on Salmon Creek Reservoir was dropped. In 1978, all lakes and streams from Point Bishop to Sawmill Creek, including all of Douglas Island, came under Dolly Varden bag and possession limits of five fish, only two over 30 cm (12 in).

To increase the numbers of salmon available to anglers in the Juneau area, the Mendenhall Lakes, Fish Creek and Auke Creek facilities have continued to rear and release chinook, coho and pink salmon into Juneau area waters. An important part of the 1978 marine census was to evaluate the contribution of releases from these facilities. A few six-year-old fin-marked chinook were expected to complete the returns from 163,889 smolts released from the Mendenhall Lakes Salmon Rearing Facility in 1974 (Bethers, 1978). The 1977 coho releases, totaling 39,110 coded wire tagged (CWT) smolt from this facility, were expected to contribute to the local sport fishery, as were 75,820 CWT coho released in 1977 from the Fish Creek saltwater rearing pens. The 42,000 fin-clipped pink salmon released in 1977 from the Auke Creek Hatchery were also expected to contribute to the marine and roadside fisheries in the Auke Bay area. In addition, 3,038 wild Auke Creek coho smolt and 47,997 coho fingerling and smolts were marked in wild systems in 16 separate lots scattered in the Chilkat, Chilkoot, Berners, Taku and Speel lake systems. These fish were marked primarily to assess the commercial fishery harvest rates in Icy Straits, but contribution to the sport fishery was important in helping select one of the areas for future brood stock use in local rearing facilities.

Haines Area:

Freshwater fishing opportunity in the Haines area is varied and controlled primarily by road access. On the Chilkat River system, the only clear water fisheries occur at Chilkat Lake (fly-in and airboat access mostly by local residents) Mosquito Lake, Little Salmon River and Herman and Walker lakes. These are mostly cutthroat trout and coho salmon fisheries except for recently introduced Arctic grayling in Herman Lake. The glacial mainstem Chilkat River clears significantly in the late fall and winter providing a March and April fishery near Klukwan for overwintering Dolly Varden and a late fall fishery for coho and chum salmon. This roadside salmon fishery extends from the airport upstream to spawning areas above Mosquito Lake. The Chilkoot River system is semi-glacial with fisherman access confined mainly to the lake shore in front of the Chilkoot campground and to the 2.0 km (1 1/4 mi) of Chilkoot River below the lake. This system provides popular Dolly Varden fishing all spring and summer and a concentrated coho fishery in the fall. In 1976, the Division of Commercial Fisheries built a sockeye enumeration weir across the river. This weir has been operated late enough to enumerate the coho run. Escapement levels have been below 1,000 coho, and the sport

fishery appears capable of taking 50% of this escapement, creating cause for concern. No special freshwater closures or bag reductions have been imposed on this fishery (except for Chilkoot Lake inlet closures to protect sockeye spawning areas) and the bag limit remains six salmon daily with a possession limit equal to two daily bag limits. A summer creel census was conducted in the Haines area in 1972 and a fall census in 1974. The 1974 census showed larger catches and higher effort than expected with Canadian fishermen comprising the largest user group. The 1978 census was the first since the Chilkoot River weir installation and was undertaken to confirm the 1974 estimates, look at changes in distribution of effort, and to suggest methods of regulating the salmon harvest.

Recommendations

Management:

1. In the Juneau area the one chinook salmon daily bag and possession limit should continue in effect. Furthermore, the closed area north of the latitude of Limestone Inlet (south side) to a line from Point Louisa to Piling Point should be closed for the period April 16 to June 15 to ensure adequate escapement of chinook salmon into the Taku River. With the increased angler effort in the Juneau area this regulation will continue to be necessary until all year classes of the Taku chinook salmon stocks can increase in population size.
2. The fishery for sockeye salmon occurring seasonally in Auke Bay should be closed in 1979 by Emergency Order. The 1974 brood year was from a spawning escapement of only 4,300 adults which experienced poor spawning conditions due to low water conditions and has produced only 5,172 smolts (combined age I and II). As the adult return is composed of approximately 26% two-ocean fish, escapements are expected to be about 20% lower than normal in 1979 and 50% lower than normal in 1980, and will need protection during both of these years (Dewey, 1977).
3. The Juneau area Dolly Varden bag limit should remain in effect until a more effective regulation can be found. Alternatives to regulations should be explored. These alternatives could take the form of diverting effort to put-and-take fisheries or initiation of a major roadside Dolly Varden enhancement project.
4. The Haines freshwater salmon fishery needs regulations to reduce the harvest in the Chilkoot River system and prevent the taking of salmon near spawning areas. One possible approach is to reduce the daily bag limit to two or three salmon over 41 cm (16 in) in length and to close to salmon fishing all areas above 27 km (17 mi), or above Wells Bridge on the Chilkat River, and above the Chilkoot River weir.

Research:

1. The Juneau marine census should continue in 1979. The sample period should be from May 1 through September 30 to provide catch rates comparable to previous years and to detect changes in effort patterns caused by the new troll regulations.
2. The Juneau marine census should continue to recover marked fish and estimate the contribution of coho from the Mendenhall Lakes Salmon Rearing Facility, from the Fish Creek saltwater rearing pens, from wild coho fingerlings marked in several local systems by the Coho Research Project, and from wild chinook fingerlings marked in the Taku River by the Chinook Salmon Research Project.
3. The angler effort and catch of Dolly Varden in the Juneau roadside fishery should be determined during the period of May 1 through September 3, 1979. The Gastineau Channel marine portion of this census should be computed separately to produce data needed by the Board of Fisheries in regulating private nonprofit hatcheries in the area.

Techniques Used

Juneau Area Recreational Harvest Study:

Marine Recreational Harvest Study. Anglers fishing from boats in the Juneau area (Fig. 2) were interviewed as they returned to Auke Bay, Aurora Harbor, and Tee Harbor. Each angler party contacted was interviewed to determine the number of anglers aboard, the time spent fishing, the number and species of each fish kept, and the number of marked and unmarked chinook, coho, and pink salmon kept. Angler parties were interviewed at Auke Bay from May 3 through September 27, at Tee Harbor from May 5 through September 27, and at Aurora Harbor from June 17 through September 24. During each biweekly period, the study was conducted on four randomly selected weekdays and four weekend days. If a holiday occurred during the period, it was included with the weekend days; and four of these days were then randomly selected for sampling. Anglers were interviewed during the early hours (0600 through 1400 hours) and late hours (1400 through 2200 hours) of a day sampled and all day during the derby. Of the possible 300 strata during the time period of the census, 89 (29.7%) were sampled. The study design was similar to the study conducted in 1977 (Robards, 1978).

An estimate of the number of anglers, time spent fishing and the number of fish kept by species was derived by:

1. The number of recreational boats in the Juneau area was counted from an aircraft flying clockwise or counterclockwise (direction randomly selected) during a 2.0- to 2.5-hour period randomly selected within the dock censusing period. When section 111 A reopened to commercial trolling after August 15, vessels were not counted as recreational boats if they were observed using gurdies

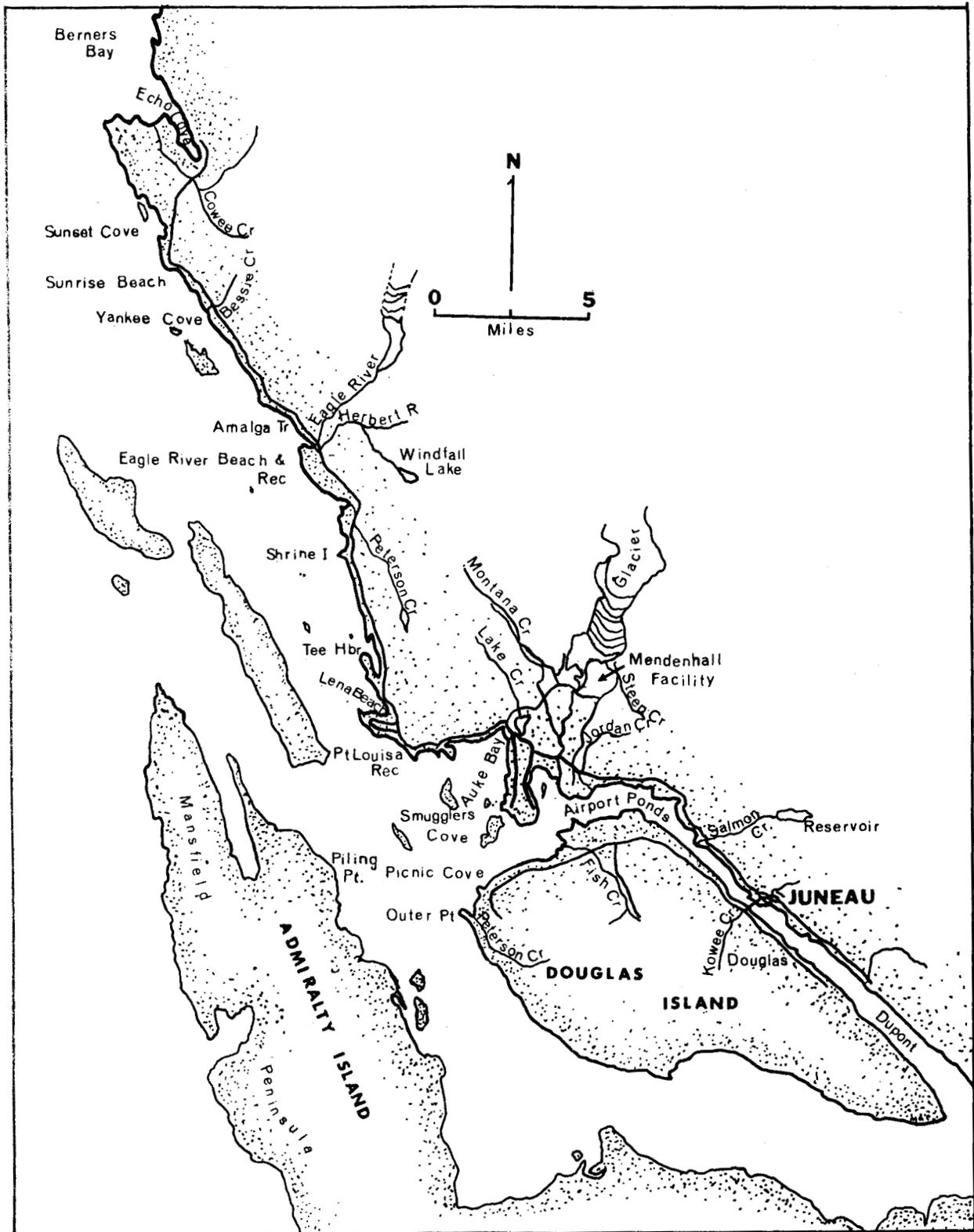


Figure 2. Map of the Juneau area roadside and marine recreational fisheries.

or four rods when four people were obviously not aboard. During the period of the census, 3 counts were made during the early weekday stratum, 10 were made during the late weekday stratum, 6 were made during the early weekend stratum, and 6 were made during the late weekend stratum.

2. A mean ratio of the number of recreational boats counted to the number of those boats interviewed was then calculated separately for each stratum.
3. The number of anglers, hours spent fishing, fish kept by species, and the number of marked and unmarked chinook, coho and pink salmon kept were summed for each stratum. These summed parameters were multiplied by the seasonal count:interview ratio for the stratum in which they were observed. These estimates were then weighted by the seasonal frequency of that stratum and summed for seasonal totals of catch and effort.

A scale and gonad sample were taken from each chinook salmon examined. Both testes lobes were collected from the male chinook salmon, and a sample of each female chinook salmon's egg skein was collected. These samples along with physical measurement data were forwarded to the chinook salmon studies project leader for his information.

In 1978 a supplemental creel census was also run from July 3 through September 23 to increase coverage in the recovery of coho salmon with coded wire tags. This census was conducted during weekend and holiday afternoons not covered in the regular census and at non-scheduled harbors (except Douglas and Harris) during times when the regular census coverage occurred during these prime hours. This coverage was not included in the expansions for catch and effort but was used in the expansions for marked-fish recoveries. The estimated contribution of each CWT marked lot was based upon the number of marked salmon that were observed during the period in which it was sampled. Voluntary marked fish returns were not expanded, but fish with codes not detected in the regular sampling were added to the tag returns for the appropriate stratum.

Golden North Salmon Derby. The Golden North Salmon Derby was monitored at each judge's float located at Tee Harbor, Auke Bay and Douglas Harbor. All salmon observed were examined for any marks or tags, and the number of participating anglers was obtained from derby records.

Anglers were also sampled to determine the number of each species kept and not entered for prizes. A derby estimate was then prepared by multiplying the mean number of each species kept per angler by the number of validated anglers.

Comparison of Juneau Area Marine Recreational Harvests. Study data from previous harvest studies conducted from 1960 through 1978 was standardized to compare trends in angler effort and catch success. Comparative seasonal and salmon derby mean catch per angler trip was presented for

chinook and coho salmon. A summary was compiled from records of the Juneau salmon derby for the years 1959 through 1978 to illustrate trends in angler effort and catch success.

Juneau Area Roadside Recreational Harvest Study. The Juneau area roadside fishery study was conducted from May 1 through September 4, 1977. During the study 88 (58%) of the 153 days in the season were sampled. Angler parties were contacted along the Juneau road system while fishing or after completing fishing. Each angler party contacted was interviewed to determine the number of anglers, time spent fishing, the number of fish kept by species, and whether they had completed or were still fishing. In addition to actually checking an area for anglers, vehicles parked alongside the road adjacent to known fish streams or trails to lakes were checked. If the angler party was not in the immediate area, a questionnaire was left on the vehicle's windshield.

During each biweekly period the study was conducted on four randomly selected weekdays and four weekend days. If a holiday occurred during the period, it was included with the weekend days; and four of these days were then randomly selected for sampling. Anglers were interviewed during the early hours (0600 through 1400 hours) or late hours (1400 through 2200 hours) on a sample day.

Two technicians were employed for the study. The first covered the area between Echo Cove and Auke Bay, and the second covered the area between Auke Creek and Outer Point. Within their respective areas, the technicians started at random points and travelled in random directions, alternately counting and interviewing anglers in two circuits per sampling period.

An estimate of the number of anglers, time spent fishing, and the number of fish kept by species was derived by:

A. Interview Census

1. Catch per angler hour by species was determined on a monthly basis by adding together the catch of each species and dividing this by the total hours the anglers interviewed spent fishing.
2. Angler hours per month were estimated. The seasonal catch rates for Dolly Varden from the above were separated by weekday, weekend, completed and incomplete trips and tested to see if this index catch rate showed significant differences among groups. If not, they were pooled. Mean hours fished during completed and incomplete trips were computed and the incomplete trip hours were multiplied by the completed trip length:incomplete trip length ratio. Monthly effort totals for weekend and weekday strata unsampled days were multiplied by the possible-day:sampled-day ratio to obtain expanded monthly estimates of angler hours.
3. Catch rates per species were multiplied by calculated angler hours per month to produce the calculated catch by species for the interview portion of the census.

B. Postcard Census

This portion of the census was obtained in the following manner:

1. Weekday and weekend cards were treated as separate strata.
2. Angler hours per party and catch by species were totaled by month and multiplied by that month's weekday or weekend expansion factor.
3. Monthly, weekday, and weekend expansion factors were obtained by multiplying together:
 - a. Correction for non-returned cards, expressed as cards issued/cards received.
 - b. Correction for incomplete cards discarded, expressed as all cards/used cards.
 - c. Correction for partial day coverage (chance of a car not being carded during the census day), expressed as hours/circuit X circuits/day (mean hours fished + hiking time).
 - d. Correction for uncensused days per stratum, expressed as stratum days possible/stratum days sampled.

C. Combining Interview, Postcard and Separate Census

1. The Auke Bay sockeye snag fishery and Salmon Creek Reservoir fisheries were prepared separately and included in this final step.
2. Catch and effort data from the interview and postcard portions of the census were added for each month to produce the Juneau roadside census for the period of May 1 through September 3.

Haines Area Roadside Census:

One technician conducted angler counts and interviews on the Chilkat River and Chilkoot River roadside fishery on weekends and for one to three weekdays per week during the September 22 to October 23 duration of this fishery (Fig. 3). One to four circuits per day were made at an interval of approximately 2 1/2 hours. Interviews were separated into complete and incomplete trips. Besides fishing time and catch success, anglers were asked about residency, and condition of the salmon caught (bright or dark) was noted. In the Chilkoot River system, fishing location (above or below the weir) was noted so that a seasonal percent of catch above or below this enumeration point could be used in calculating percent of escapement being harvested by sport anglers.

As this fishery for coho and chum salmon peaks about half way through the census period, an interpolation method for missing census days was used. First, the seasonal mean fishing time for each stratum (Chilkat, Chilkoot, completed, incompleted) was determined. For completed trips

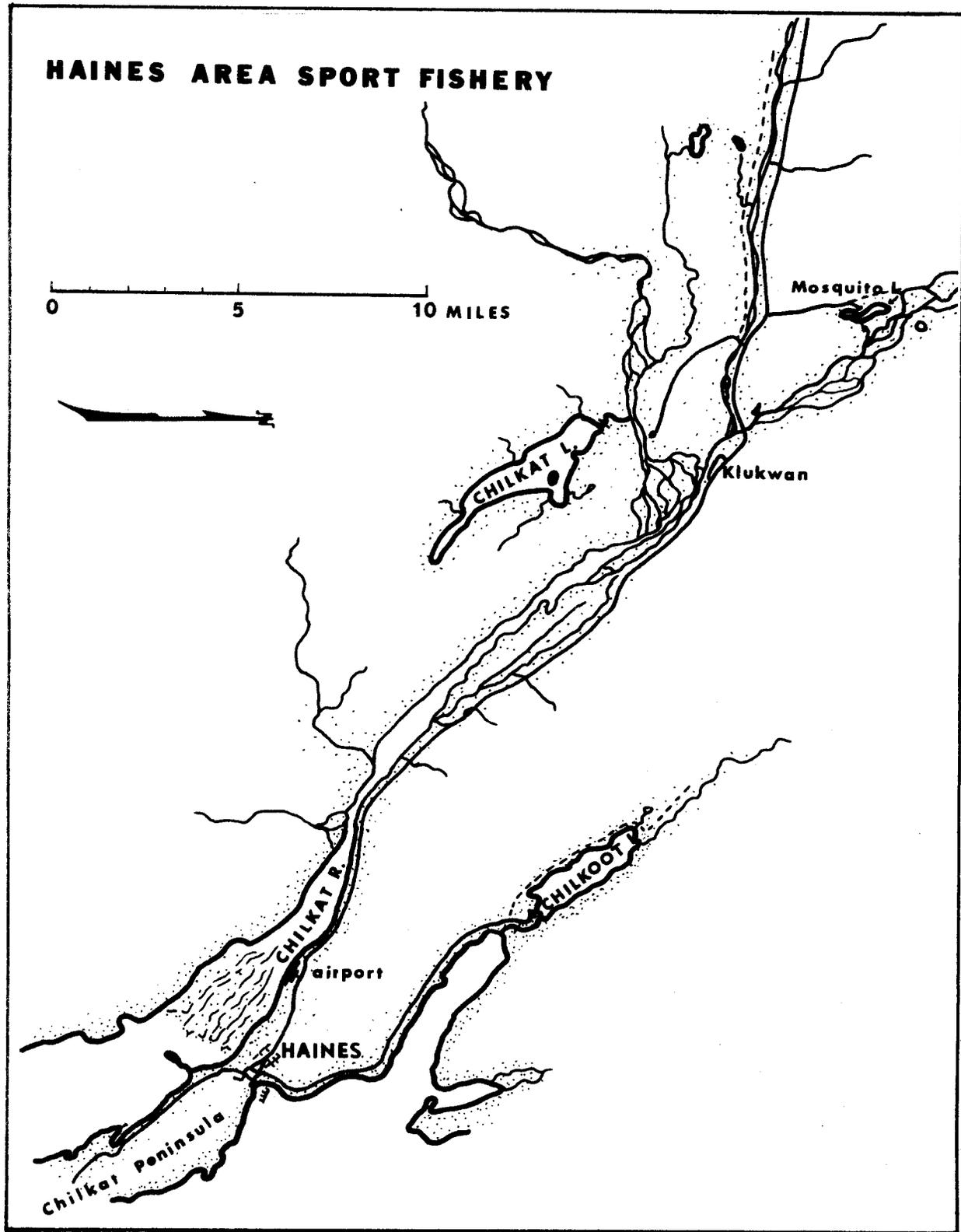


Figure 3. Map of the Haines area roadside sport fishery.

during the days censused, expansion of catch and effort was made by dividing the 10 possible fishing hours per day by the mean fishing time X number of circuits per day. When two circuits were made per a.m. or p.m. period, but none during the other half of the day, the 2 1/2-hour circuit was shorter than the mean fishing time, so the expansion of two was used to correct for the whole day. Incompleted trips were treated similarly after being expanded to equal completed trip time. For missing days, interpolation was made between the bracketing covered days of the weekend or weekday stratum.

Findings

Results:

Juneau Area Marine Recreational Harvest Study. This survey was conducted from May 1 through September 30, 1978. An estimated 48,838 angler trips, totalling 217,853 angler hours were spent in this fishery, and an estimated 2,770 chinook, 13,822 coho, 6,004 pink, 240 chum, and 2,265 sockeye salmon were caught by anglers. In addition to the salmon, 881 Dolly Varden char, 826 Pacific halibut and 214 rockfish were caught by anglers during the study period (Table 2).

The Golden North Salmon Derby (Table 3) was conducted on August 11-13, 1978. Derby officials recorded 8,283 daily validations (angler trips). Derby participants entered 210 chinook, 1,799 coho, 122 pink and 13 chum salmon for various prize categories. Nineteen CWT marked coho were recovered from the derby samples, and an additional 10 adipose clipped coho bearing no CWT were observed. During the derby, anglers were also interviewed to determine if any fish they caught in the derby were not entered. From the "take home" sample, an estimated 40 chinook, 1,076 coho, 98 pink and 9 chum salmon were kept and not entered in the derby.

In 1978, Juneau area rearing facilities contributed a calculated 20 coho (0.12% of the catch) to the recreational fishery. Contribution to this fishery from the marked portion of one wild stock of sockeye and 12 wild stocks of coho was 39 sockeye (1.7% of the catch) and 20 coho (0.12% of the catch). Auke Lake was the highest contributor of all natural rearing areas while Fish Creek was the highest contributor of rearing facilities to the coho recreational fishery (Table 4).

Comparative seasonal and salmon derby mean catch per angler trip for chinook salmon were illustrated in Figures 4 and 5. Figures were standardized to consider only chinook salmon caught greater than or equal to 66 cm (26 in) in total length. The angler catch of chinook salmon per angler hour in Figure 4 illustrated a sharp decline in catch rate from 1960 through 1962, a rise in 1963 and 1964, and a significant decline commenced in 1965 with occasional minor increases of a cyclic nature. The trend is negative, reflecting the decline in catch rate over the seasons 1960 through 1978. However, the trend would appear to have a greater negative slope if only the period from 1964 through 1978 was considered. The catch trend of chinook salmon in the salmon derby was

Table 2. Estimate of angler effort and catch by species in the Juneau area marine recreational fishery.
May 1 through September 27, 1978.

| PERIOD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8* | 9 | 10 | 11 | Season Total |
|-----------------|--------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|-----------------|
| | 5/1- 5/13 | 5/14- 5/27 | 5/28- 6/10 | 6/11- 6/24 | 6/25- 7/8 | 7/9- 7/22 | 7/23- 8/5 | 8/6- 8/19 | 8/20- 9/2 | 9/3- 9/16 | 9/17- 9/27 | |
| Angler Trips | 2,424 | 4,989 | 5,609 | 5,601 | 7,375 | 7,208 | 6,148 | 2,629 | 3,820 | 2,174 | 861 | 48,838 |
| Angler Hours | 11,797 | 20,719 | 25,268 | 22,539 | 32,802 | 34,553 | 29,830 | 11,025 | 17,027 | 9,258 | 3,035 | 217,853 |
| Chinook Salmon | 293 | 953 | 630 | 439 | 171 | 89 | 98 | 7 | 78 | 12 | 0 | 2,770 |
| Coho Salmon | 0 | 0 | 0 | 320 | 2,245 | 3,243 | 3,696 | 1,777 | 1,758 | 547 | 236 | 13,822 |
| Pink Salmon | 0 | 0 | 0 | 34 | 1,585 | 2,100 | 1,766 | 206 | 287 | 26 | 0 | 6,004 |
| Chum Salmon | 0 | 0 | 22 | 65 | 60 | 31 | 13 | 7 | 36 | 6 | 0 | 240 |
| Sockeye Salmon | 0 | 0 | 0 | 1,250 | 1,015 | 0 | 0 | 0 | 0 | 0 | 0 | 2,265 |
| Dolly Varden | 10 | 44 | 175 | 155 | 226 | 129 | 45 | 97 | 0 | 0 | 0 | 881 |
| Pacific Halibut | 0 | 79 | 153 | 50 | 36 | 158 | 49 | 75 | 104 | 96 | 26 | 826 |
| Rock Fish | 0 | 0 | 40 | 7 | 0 | 22 | 93 | 0 | 0 | 52 | 0 | 214 |

* Data from Golden North Salmon Derby is not included.

Table 3. Comparison of Golden North Salmon Derby angler effort and catch estimates, 1959-1978.

| Year | Dates Held | Angler Validations | Chinook Salmon | | Coho Salmon | | Pink Salmon | | Chum Salmon | | Sockeye Salmon | |
|------|----------------|--------------------|----------------|------------|-------------|------------|-------------|------------|-------------|------------|----------------|------------|
| | | | Entered | Taken Home | Entered | Taken Home | Entered | Taken Home | Entered | Taken Home | Entered | Taken Home |
| 1959 | July 24-26 | 3,511 | 599 | | 862 | | 0 | | | | | |
| 1960 | July 29-31 | 3,479 | 361 | | 650 | | 19 | | | | | |
| 1961 | . . . | 2,818 | 221 | | 551 | | 22 | | | | | |
| 1962 | July 27-29 | 2,033 | 226 | | 490 | | 7 | | 10 | | | |
| 1963 | July 26-28 | 2,229 | 617 | | 695 | | 115 | | 12 | | | |
| 1964 | July 31-Aug. 2 | 4,940 | 624 | | 1,246 | | 297 | | 5 | | | |
| 1965 | July 23-25 | 1,598 | 454 | | 821 | | 16 | | 4 | | | |
| 1966 | July 22-24 | N/A | 795 | | 290 | | 92 | | 33 | | | |
| 1967 | July 28-30 | 3,228 | 431 | | 633 | | 144 | | 27 | | | |
| 1968 | Aug. 2-4 | 3,350 | 424 | | 1,908 | | 382 | | 6 | | | |
| 1969 | . . . | 3,825 | 477 | | 1,225 | | 603 | | 26 | | | |
| 1970 | . . . | 3,800 | 375 | | 919 | | 124 | | 9 | | | |
| 1971 | July 16-18 | 7,434 | 682 | | 1,331 | | 409 | | 226 | | | |
| 1972 | July 21-23 | 8,199 | 528 | | 1,817 | | 328 | | 123 | | | |
| 1973 | July 20-22 | 7,915 | 637 | | 449 | | 278 | | 34 | | | |
| 1974 | July 26-28 | 7,714 | 291 | | 1,526 | | 226 | | 24 | | | |
| 1975 | July 18-20 | 7,847 | 276 | 184 | 315 | 354 | 174 | 531 | 15 | 14 | 0 | 0 |
| 1976 | July 23-25 | 8,466 | 136 | 167 | 536 | 1,135 | 58 | 96 | 4 | 12 | 1 | 0 |
| 1977 | Aug. 5-7 | 8,762 | 161 | 355 | 1,206 | 2,419 | 259 | 55 | 28 | 1 | 1 | 0 |
| 1978 | Aug. 11-13 | 8,283 | 210 | 40 | 1,799 | 1,076 | 122 | 98 | 13 | 9 | 0 | 0 |

Table 4. Summary of marked salmon potentially available to the Juneau area marine recreational fishery in 1978 and marked salmon returns detected through creel census sampling and voluntary returns.

| <u>Species</u> | <u>Year Released</u> | <u>Release Site</u> | <u>Div.</u> | <u>Mark</u> | <u>Number Marked</u> | <u>Total Release</u> | <u>Marks Sampled</u> | <u>Calculated Contribution to Recreational Fishery **</u> |
|----------------|----------------------|---------------------|-------------|-------------|----------------------|----------------------|----------------------|---|
| Sockeye | 1974 | Auke Lake | | Ad RV | 20,000 | ... | 3 | 39 |
| | | | | Ad LV | 40,000 | ... | 0 | 0 |
| Chinook | 1974 | Mendenhall Lakes | (SF) | Ad | 39,580 | 93,129 | 0 | 0 |
| | | | | 1/2 D | 124,309 | 124,309 | 0 | 0 |
| Pink | 1977 | Auke Creek | (SF) | Ad RV | 21,000 | ... | 0 | 0 |
| | | | | Ad LV | 21,000 | ... | 0 | 0 |
| Coho | 1977 | Mendenhall Lakes | (SF) | CWT | | | | |
| | | | | 4-16-42 | 6,197 | 6,197 | 3 | 3 |
| | | Mendenhall Lakes | (FRED) | 4-16-40 | 22,816 | 22,816 | 0 | 0 |
| | | | | 4- 2- 7 | 10,097 | 10,097 | 0 | 0 |
| | | | | | | | | |
| | | Fish Creek | (FRED) | 4-16- 4 | 10,349 | 10,713 | 2 | 2 |
| | | | | 4-16- 5 | 5,798 | 6,155 | 0 | 0 |
| | | | | 4-16- 6 | 10,350 | 10,648 | 2 | 2 |
| | | | | 4-16-17 | 10,435 | 10,703 | 1 | 1 |
| | | | | 4-16-39 | 8,381 | 8,432 | 2 | 1 |
| | | | | 4-16-51 | 7,486 | 7,600 | 1 | 1 |
| | | | | 4-16-52 | 17,266 | 17,642 | 2 | 6 |
| | | | | 4-16-53 | 5,755 | 5,880 | 2 | 4 |
| | | Auke Lake | (CF) | 4- 5- 6 | 3,038 | ... | 7 | 11 |
| | | Taku River | (CF) | 4-16-43 | 4,205 | ... | 4 | 4 |
| 4-16-44 | 1,270 | | | ... | 0 | 0 | | |
| 1976* | Berners River | (CF) | 4- 2-15 | 10,817 | ... | 1 | 1 | |
| | Yehring Creek | (CF) | 4- 3- 1 | 484 | ... | 0 | 0 | |

Table 4. (Cont.) Summary of marked salmon potentially available to the Juneau area marine recreational fishery in 1978 and marked salmon returns detected through creel census sampling and voluntary returns.

| <u>Species</u> | <u>Year Released</u> | <u>Release Site</u> | <u>Div.</u> | <u>Mark</u> | <u>Number Marked</u> | <u>Total Release</u> | <u>Marks Sampled</u> | <u>Calculated Contribution to Recreational Fishery **</u> |
|------------------|----------------------|---------------------|-------------|----------------|----------------------|----------------------|----------------------|---|
| Coho | 1976* | Mosquito Lake | (CF) | CWT 4- 3- 2 | 3,347 | ... | 0 | 0 |
| | | Sockeye Creek | (CF) | 4- 3- 3 | 3,214 | ... | 0 | 0 |
| | | Moose Lake | (CF) | 4- 3- 4 | 3,419 | ... | 1 | 1 |
| | | | | 4- 3- 5 | 1,251 | ... | 0 | 0 |
| | | Chilkat River | (CF) | 4- 3- 6 | 1,019 | ... | 0 | 0 |
| | | | | 4- 3- 7 | 1,503 | ... | 0 | 0 |
| | | Berners River | (CF) | 4- 3- 8 | 526 | ... | 0 | 0 |
| | | Johnson Creek | (CF) | 4- 3- 9 | 1,352 | ... | 0 | 0 |
| | | Speel Lake | (CF) | 4- 4-10 | 7,535 | ... | 3 | 3 |
| | | Chilkat Lake | (CF) | 4- 5- 2 | 2,985 | ... | 0 | 0 |
| L. Chilkat River | (CF) | 4- 5- 3 | 3,339 | ... | 0 | 0 | | |
| | | 4- 5- 4 | 1,731 | ... | 0 | 0 | | |

* Tagged as fingerlings, expected to naturally out-migrate in 1977 as 2-check smolts.

** Unexpanded recoveries from Golden North Salmon Derby added to recoveries expanded for creel census coverage. Sockeye fishery expanded separately.

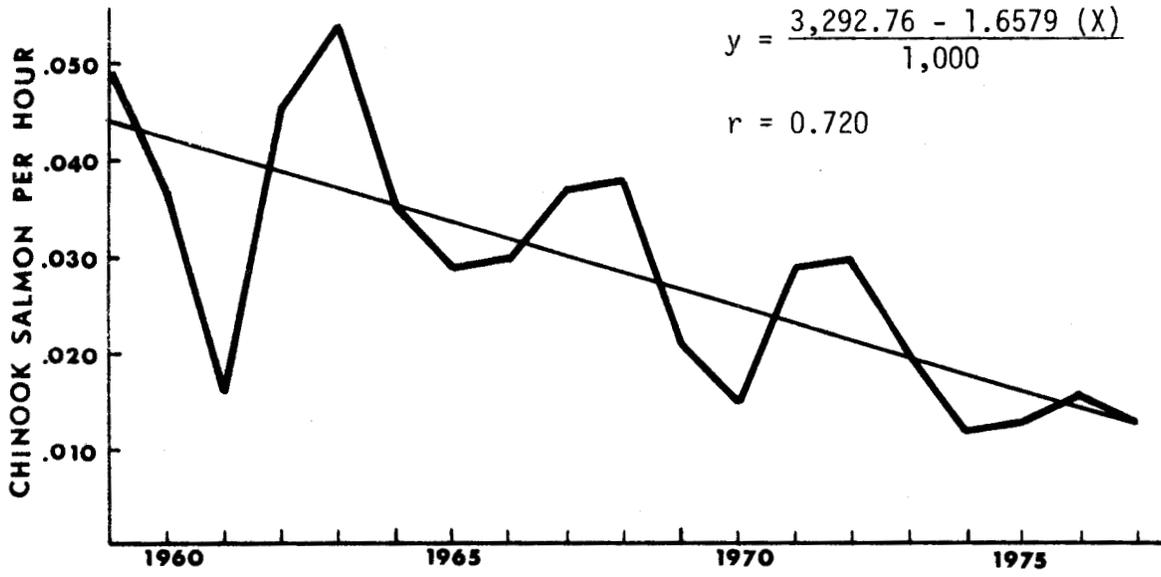


Figure 4. Trend in mean chinook salmon per hour in the Juneau area sport fishery, 1960-1978.

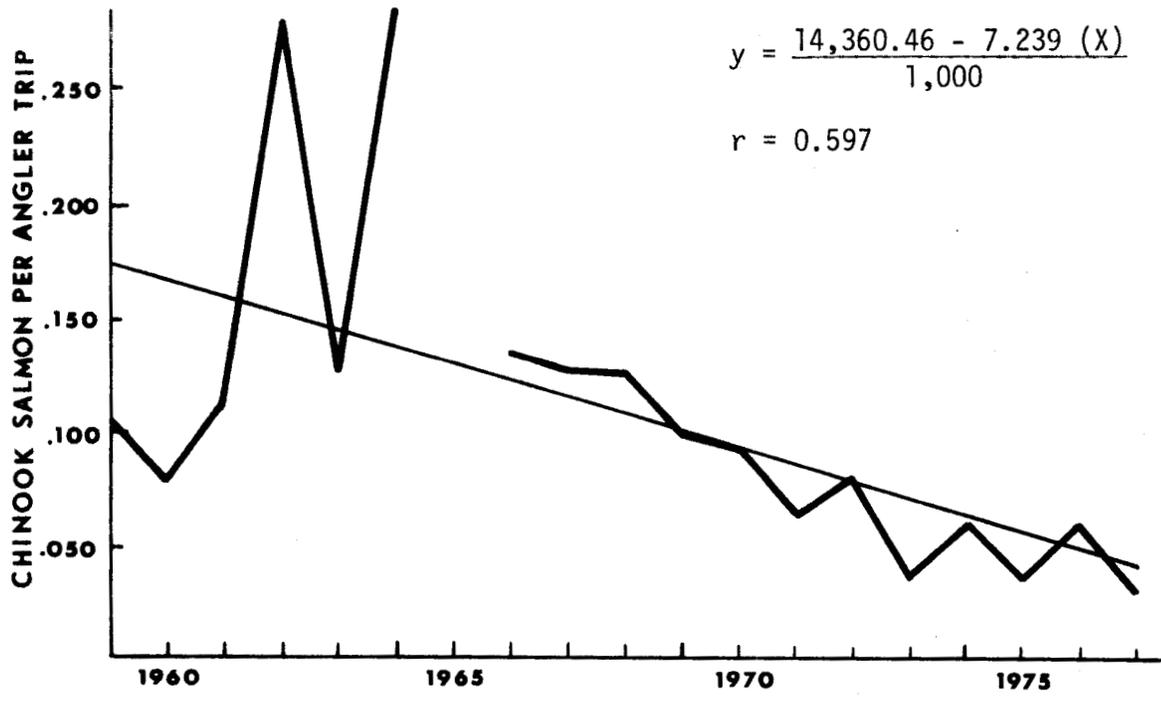


Figure 5. Trend in mean chinook salmon per angler trip during the Golden North Salmon Derby, 1960-1978.

illustrated in Figure 5. There was considerable fluctuation between 1959 and 1965 and a significant decline from 1967 through 1977. However, the long-term trend is negative. The catch rate for coho salmon increased, (Fig. 6); however, the trend in the catch rate for coho salmon in the Juneau derby was negative (Fig. 7). This trend was probably due to increased numbers of anglers in the derby and crowding in good fishing areas. The increases in 1977 and 1978 are partly due to later season derbies, which occurred during the peak of the coho run.

The relative timing of chinook and coho salmon stocks fished upon by anglers in the Juneau area is reflected in Tables 5 and 6.

Variables in angler behavior have a decided effect upon these trends in the sport fishery although it is difficult to quantify their contribution. When seasonal catch rates are used for comparative purposes, changing effort patterns in one species-directed fishery may have an artificial effect in altering catch rates in other fisheries. For example, increased effort in the early season chinook salmon fishery during a good year of return would add to seasonal effort with no chance of adding to the coho catch and would produce an artificial decline in catch rates for coho. To help reduce this problem, seasons reflecting availability of various salmon species in the fishery were identified in 1978 seasonal comparisons (Table 7). A related problem has been catch rates for halibut and other bottom species. An angler fishing for bottom fish will only be catching salmon incidentally, just as a salmon fisherman will only be catching bottom fish incidentally. In the future, these species-directed or method-directed fisheries should be identified during interviews, and expanded separately.

Another bias in past data presentation is the use of angler trips instead of angler hours. For various unknown reasons, significant variations in mean trip duration have been observed since 1960, varying from 3.71 to 5.44 hours (Table 8), therefore in 1978 data, and wherever possible in prior comparative data, catch rates are shown in catch per hour.

The comparative summary of the Juneau salmon derby in Table 3 shows a marked increase in angler participation up to 1971 and a leveling of effort since that time. As the number of anglers increased, more coho and pink salmon were entered. Since 1973 the number of salmon entered has declined significantly. A second sample was initiated during the 1975 derby to detect that portion of the catch that was not entered for prizes but was taken home. This "take home" catch has increased in size during subsequent derbies. Reasons for the increase in the catch retained by the angler and not entered for prizes are probably numerous and peculiar to each angler. With the increased angler demand for salmon, particularly chinook salmon, they have increased in value to an angler such that if it is not of sufficient size to guarantee him a prize, he will not enter it in the derby.

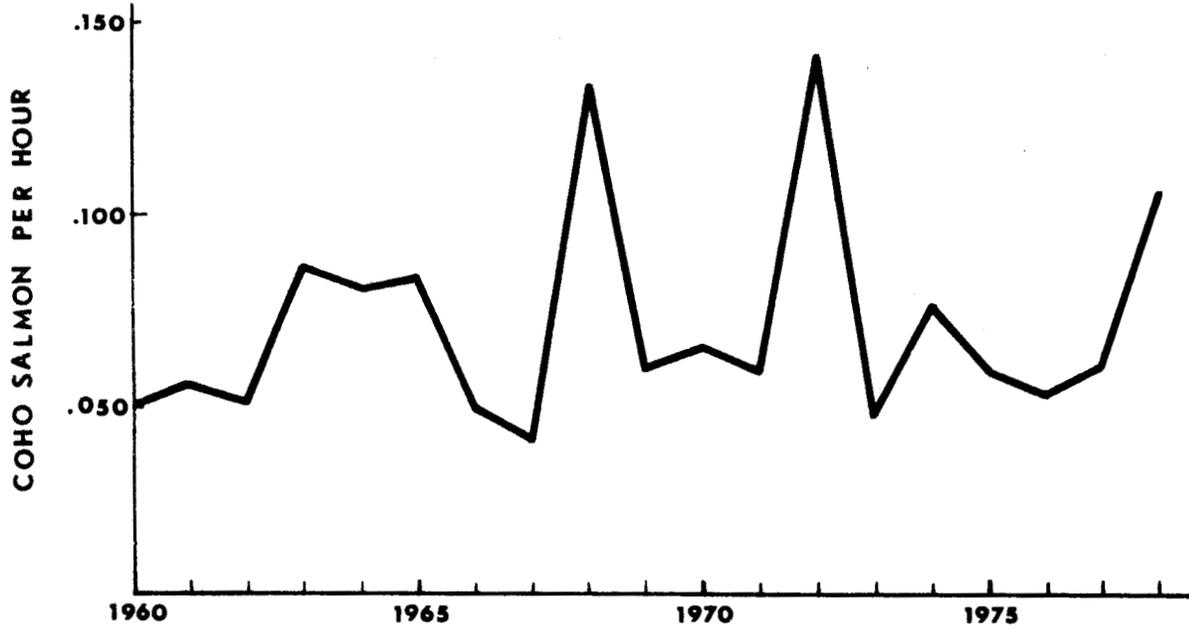


Figure 6. Trend in mean coho salmon per angler hour in the Juneau area sport fishery, 1960-1978.

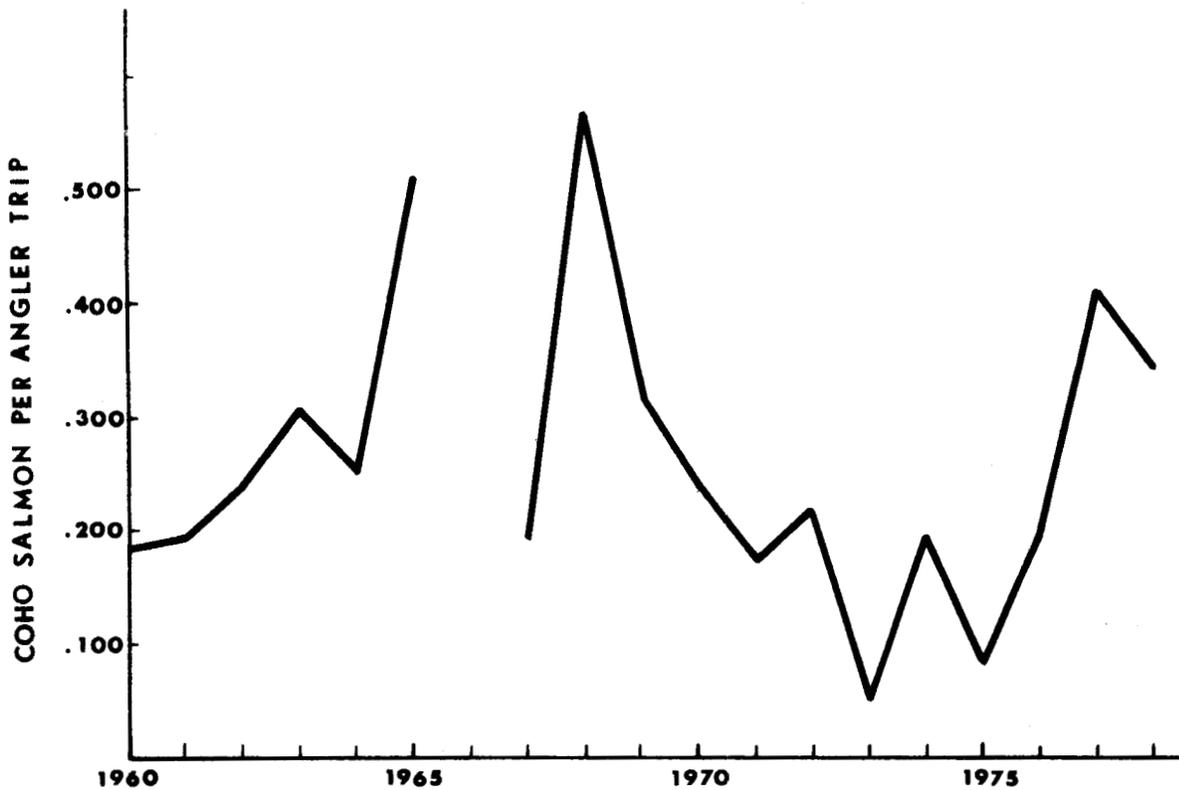


Figure 7. Trend in mean coho salmon per angler trip during the Golden North Salmon Derby, 1960-1978.

Table 5. Comparative chinook salmon caught per angler hour of effort during the Juneau area marine recreational fishery.

| Period | 1 5/1- 5/14 | 2 5/15- 5/28 | 3 5/29- 6/11 | 4 6/12- 6/25 | 5 6/26- 7/9 | 6 7/10- 7/23 | 7 7/24- 8/6 | 8 8/7- 8/20 | 9 8/21- 9/3 | 10 9/4- 9/17 | 11 9/18- 10/1 | 12 10/2- 10/15 | Seasonal Mean |
|--------|-------------------|--------------------|--------------------|--------------------|-------------------|--------------------|-------------------|-------------------|-------------------|--------------------|---------------------|----------------------|------------------|
| 1960 | .092 | .047 | .072 | .063 | .065 | .033 | .020 | .031 | .008 | .000 | | | .049 |
| 1961 | .051 | .064 | .060 | .034 | .036 | .029 | .035 | .020 | .005 | | | | .036 |
| 1962 | .022 | .033 | .030 | .014 | .003 | .014 | .034 | .008 | .015 | | | | .016 |
| 1963 | .090 | .089 | .086 | .048 | .060 | .045 | .030 | .019 | .020 | .013 | | | .046 |
| 1964 | .075 | .070 | .065 | .053 | .045 | .078 | .039 | .022 | .013 | | | | .054 |
| 1965 | .055 | .069 | .059 | .028 | .027 | .037 | .032 | .014 | .013 | | | | .035 |
| 1966 | .000 | .036 | .026 | .033 | .027 | .020 | .022 | .028 | .034 | | | | .029 |
| 1967 | .008 | .031 | .045 | .035 | .032 | .025 | .019 | .012 | .018 | | | | .030 |
| 1968 | | | .028 | .033 | .036 | .048 | .035 | .028 | .023 | | | | .037 |
| 1969 | | | .036 | .047 | .048 | .034 | .033 | .030 | | | | | .038 |
| 1970 | | | .046 | .025 | .016 | .028 | .015 | .017 | .013 | | | | .021 |
| 1971 | .014 | .041 | .052 | .038 | .032 | .034 | .033 | .040 | .027 | .015 | | | .015 |
| 1972 | | | .016 | .031 | .023 | .033 | .029 | .049 | .024 | .028 | | | .029 |
| 1973 | .050 | .029 | .032 | .035 | .048 | .057 | .029 | .012 | .023 | | | | .030 |
| 1974 | .007 | .017 | .015 | .036 | .031 | .017 | .018 | .014 | .017 | .017 | | | .020 |
| 1975 | .030 | .018 | .034 | .022 | .018 | .030 | .007 | .007 | .002 | .004 | .004 | | .012 |
| 1976 | .023 | .026 | .024 | .030 | .020 | .016 | .007 | .006 | .006 | .003 | .002 | .000 | .013 |
| 1977 | .015 | .032 | .023 | .025 | .011 | .016 | .010 | .001 | .003 | .003 | .000 | | .016 |
| 1978 | .037 | .029 | .024 | .023 | .008 | .004 | .005 | .001 | .004 | .002 | .000 | | .013 |
| | | | | | | | | | | | | | .028 |

Table 6. Comparative coho salmon caught per angler hour of effort during the Juneau area marine recreational fishery.

| <u>Period</u> | <u>1</u> <u>5/1-</u> <u>5/14</u> | <u>2</u> <u>5/15-</u> <u>5/28</u> | <u>3</u> <u>5/29-</u> <u>6/11</u> | <u>4</u> <u>6/12-</u> <u>6/25</u> | <u>5</u> <u>6/26-</u> <u>7/9</u> | <u>6</u> <u>7/10-</u> <u>7/23</u> | <u>7</u> <u>7/24-</u> <u>8/6</u> | <u>8</u> <u>8/7-</u> <u>8/20</u> | <u>9</u> <u>8/21-</u> <u>9/3</u> | <u>10</u> <u>9/4-</u> <u>9/17</u> | <u>11</u> <u>9/18-</u> <u>10/1</u> | <u>12</u> <u>10/2-</u> <u>10/15</u> | <u>Mean</u> <u>6/26-</u> <u>9/3</u> |
|---------------|--|---|---|---|--|---|--|--|--|---|--|---|---|
| 1960 | .000 | .000 | .003 | .002 | .003 | .009 | .055 | .065 | .092 | .034 | | | .045 |
| 1961 | .000 | .000 | .000 | .001 | .006 | .042 | .079 | .054 | .100 | | | | .056 |
| 1962 | .000 | .000 | .000 | .010 | .002 | .014 | .034 | .086 | .126 | | | | .052 |
| 1963 | .000 | .000 | .002 | .006 | .020 | .044 | .102 | .145 | .121 | .143 | | | .086 |
| 1964 | .000 | .001 | .002 | .004 | .035 | .041 | .099 | .095 | .131 | | | | .080 |
| 1965 | .000 | .000 | .015 | .007 | .026 | .074 | .093 | .114 | .108 | | | | .083 |
| 1966 | .000 | .000 | .001 | .002 | .019 | .028 | .049 | .085 | .063 | | | | .049 |
| 1967 | .000 | .000 | .000 | .006 | .015 | .019 | .034 | .074 | .063 | | | | .041 |
| 1968 | | | .000 | .061 | .072 | .119 | .143 | .149 | .232 | | | | .133 |
| 1969 | | | .000 | .012 | .026 | .030 | .081 | .099 | | | | | .059 |
| 1970 | | | .002 | .002 | .021 | .042 | .057 | .100 | .106 | | | | .065 |
| 1971 | .000 | .000 | .002 | .005 | .013 | .038 | .080 | .087 | .073 | .196 | | | .058 |
| 1972 | | | .000 | .051 | .093 | .102 | .237 | .127 | .133 | .120 | | | .142 |
| 1973 | | .000 | .005 | .006 | .023 | .023 | .034 | .061 | .096 | | | | .047 |
| 1974 | .000 | .002 | .001 | .008 | .044 | .066 | .087 | .089 | .092 | .133 | | | .076 |
| 1975 | .000 | .000 | .004 | .002 | .025 | .036 | .061 | .097 | .066 | .081 | .060 | | .059 |
| 1976 | .000 | .000 | .002 | .006 | .029 | .040 | .054 | .063 | .079 | .065 | .060 | .005 | .053 |
| 1977 | .000 | .001 | .000 | .013 | .044 | .081 | .068 | .058 | .056 | .045 | .016 | | .061 |
| 1978 | .000 | .000 | .000 | .015 | .065 | .092 | .129 | .143 | .106 | .065 | .055 | | .107 |

Table 7. Estimate of recreational catch per unit of effort in the Juneau area marine fishery, May 1 through September 27, 1978.

| PERIOD | 1 5/1- 5/13 | 2 5/14- 5/27 | 3 5/28- 6/10 | 4 6/11- 6/24 | 5 6/25- 7/8 | 6 7/9- 7/22 | 7 7/23- 8/5 | 8* 8/6- 8/19 | 9 8/20- 9/2 | 10 9/3- 9/16 | 11 9/17- 9/27 | Season Total | Periods Used for Seasonal Totals |
|------------------------------------|-------------------|--------------------|--------------------|--------------------|-------------------|-------------------|-------------------|--------------------|-------------------|--------------------|---------------------|-----------------|-------------------------------------|
| Sample Size (Anglers Contacted) | 210 | 672 | 815 | 465 | 781 | 829 | 638 | 371 | 374 | 305 | 123 | 5,583 | |
| Chinook Salmon/ Angler Trip | .167 | .128 | .108 | .101 | .035 | .019 | .022 | .005 | .019 | .007 | .000 | .058 | 1-11 |
| Angler Hour | (.035) | (.028) | (.023) | (.023) | (.007) | (.003) | (.004) | (.001) | (.004) | (.001) | (.000) | (.012) | |
| Coho Salmon/ Angler Trip | .000 | .000 | .000 | .067 | .288 | .410 | .574 | .639 | .471 | .292 | .244 | .447 | 5-11 |
| Angler Hour | (.000) | (.000) | (.000) | (.015) | (.057) | (.074) | (.102) | (.118) | (.100) | (.064) | (.068) | (.098) | |
| Pink Salmon/ Angler Trip | .000 | .000 | .000 | .011 | .228 | .310 | .288 | .162 | .058 | .013 | .000 | .203 | 5-10 |
| Angler Hour | (.000) | (.000) | (.000) | (.002) | (.045) | (.056) | (.051) | (.030) | (.013) | (.003) | (.000) | (.044) | |
| Chum Salmon/ Angler Trip | .000 | .000 | .006 | .011 | .003 | .008 | .005 | .005 | .008 | .003 | .000 | .006 | 3-9 |
| Angler Hour | (.000) | (.000) | (.001) | (.002) | (.001) | (.002) | (.001) | (.001) | (.002) | (.001) | (.000) | (.001) | |

Table 7. (Continued) Estimate of recreational catch per unit of effort in the Juneau area marine fishery, May 1 through September 27, 1978.

| PERIOD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8* | 9 | 10 | 11 | Season Total | Periods Used for Seasonal Totals |
|---------------------------------|--------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|-----------------|-------------------------------------|
| | 5/1- 5/13 | 5/14- 5/27 | 5/28- 6/10 | 6/11- 6/24 | 6/25- 7/8 | 7/9- 7/22 | 7/23- 8/5 | 8/6- 8/19 | 8/20- 9/2 | 9/3- 9/16 | 9/17- 9/27 | | |
| Sockeye Salmon/ Angler Trip | .000 | .000 | .001 | .138 | .061 | .000 | .000 | .000 | .000 | .000 | .000 | .088 | 3-6 |
| Angler Hour | (.000) | (.000) | (.000+) | (.031) | (.012) | (.000) | (.000) | (.000) | (.000) | (.000) | (.000) | (.020) | |
| Trout & Char/ Angler Trip | .005 | .000 | .023 | .034 | .058 | .025 | .016 | .013 | .000 | .000 | .000 | .021 | 1-11 |
| Angler Hour | (.001) | (.000) | (.005) | (.008) | (.011) | (.005) | (.003) | (.001) | (.000) | (.000) | (.000) | (.004) | |
| Pacific Halibut/ Angler Trip | .000 | .010 | .034 | .011 | .010 | .014 | .011 | .038 | .035 | .046 | .040 | .020 | 1-11 |
| Angler Hour | (.000) | (.002) | (.007) | (.002) | (.002) | (.003) | (.002) | (.006) | (.007) | (.010) | (.011) | (.004) | |
| Other Species/** Angler Trip | .000 | .000 | .011 | .002 | .000 | .001 | .014 | .000 | .000 | .030 | .000 | .005 | 1-11 |
| Angler Hour | (.000) | (.000) | (.002) | (.000+) | (.000) | (.000+) | (.003) | (.000) | (.000) | (.006) | (.000) | (.001) | |

* Data from the Golden North Salmon Derby is not included.

** Other species of families Pleuronectidae, Gadidas, and Scorpaeridae.

Table 8. Comparative seasonal angler effort and catch for Juneau area marine recreational fishery,
May 1 through September 3, 1960-1978.

| Year | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 |
|------------------------|--------|--------|--------|---------|---------|---------|---------|---------|---------|---------|
| Angler Trips | 4,934 | 6,550 | 6,220 | 9,787 | 10,864 | 9,863 | 11,598 | 11,059 | 21,095 | 15,812 |
| Angler Hours | 24,496 | 27,376 | 32,001 | 49,059 | 51,266 | 46,614 | 58,694 | 53,370 | 89,203 | 60,192 |
| Mean hrs/trip | 4.96 | 4.18 | 5.14 | 5.01 | 4.72 | 4.73 | 5.06 | 4.83 | 4.23 | 3.81 |
| Chinook | 1,065 | 828 | 520 | 2,234 | 2,780 | 1,634 | 2,726 | 1,599 | 3,075 | 2,141 |
| (Chinook \geq 66 cm) | (905) | (708) | (499) | (1,704) | (1,954) | (1,259) | (1,797) | (1,097) | (2,360) | (1,331) |
| Coho | 425 | 664 | 743 | 2,940 | 1,813 | 2,526 | 1,462 | 1,063 | 8,363 | 2,403 |
| Pink | 47 | 55 | 35 | 211 | 164 | 45 | 190 | 139 | 1,595 | 1,175 |
| Chum | 8 | 19 | 29 | 39 | 0 | 14 | 27 | 35 | 36 | 24 |
| Sockeye | 0 | 0 | 0 | 0 | 0 | 5 | 41 | 5 | 63 | 0 |
| TOTAL SALMON | 1,545 | 1,566 | 1,327 | 5,424 | 4,757 | 4,224 | 4,446 | 2,841 | 13,132 | 5,743 |
| Trout & Char | 139 | 3 | 64 | 270 | 295 | 115 | 280 | 379 | 897 | 362 |
| Pacific Halibut | 433 | 13 | 1,254 | 1,332 | 1,029 | 1,523 | 3,105 | 1,930 | 3,354 | 3,312 |
| Other Species | 86 | 0 | 152 | 159 | 164 | 60 | 113 | 24 | 282 | 184 |

Table 8. (Continued) Comparative seasonal angler effort and catch for Juneau area marine recreational fishery, May 1 through September 3, 1960-1978.

| Year | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 |
|------------------------|---------|---------|--------|---------|---------|--------|---------|---------|---------|
| Angler Trips | 34,328 | 22,790 | 15,150 | 21,773 | 20,766 | 18,004 | 30,591 | 44,240 | 48,838 |
| Angler Hours | 127,349 | 98,792 | 58,473 | 93,304 | 112,865 | 91,527 | 156,793 | 219,174 | 217,853 |
| Mean hrs/trip | 3.71 | 4.33 | 3.86 | 4.29 | 5.44 | 5.08 | 5.13 | 4.95 | 4.46 |
| Chinook | 2,886 | 3,735 | 1,742 | 2,604 | 2,326 | 1,277 | 2,184 | 3,302 | 2,770 |
| (Chinook \geq 66 cm) | (2,299) | (2,328) | (912) | (1,465) | (1,808) | (987) | (2,184) | (3,302) | |
| Coho | 5,635 | 3,052 | 6,274 | 2,576 | 5,622 | 4,541 | 6,873 | 8,635 | 13,822 |
| Pink | 1,613 | 435 | 575 | 909 | 1,110 | 824 | 446 | 1,997 | 6,004 |
| Chum | 72 | 380 | 224 | 75 | 89 | 108 | 167 | 123 | 240 |
| Sockeye | 10 | 8 | 0 | 0 | 32 | 21 | 146 | 1,243 | 2,265 |
| TOTAL SALMON | 10,216 | 7,610 | 8,815 | 6,164 | 9,179 | 6,771 | 9,816 | 15,300 | 25,101 |
| Trout & Char | 1,479 | 922 | 2,147 | 1,319 | 742 | 803 | 205 | 1,334 | 881 |
| Pacific Halibut | 4,043 | 1,450 | 1,833 | 3,098 | 1,366 | 756 | 915 | 1,026 | 826 |
| Other Species | 331 | 143 | 30 | 540 | 738 | 259 | 355 | 400 | 214 |

The decline in the catch rate of chinook and coho salmon by anglers during the derby, as reflected in Figures 4 and 6 and in Table 3, can be attributed to the increased number of participating anglers and the resulting crowding of popular fishing locations. With its prize incentive, the derby attracts many inexperienced anglers whose effort contributes to the low catch rate.

Juneau Area Roadside Recreational Harvest Study. Along the Juneau area roadside, an estimated 19,155 anglers spent 43,578 hours to catch 8,394 Dolly Varden; 2,195 pink, 666 coho, 198 sockeye and 69 chinook salmon; 488 cutthroat-rainbow and 222 brook trout; 134 rockfish; 142 flounder; and 381 sablefish (Table 9). The mean catch per angler hour was 0.193 for Dolly Varden; .076 for pink, .023 for coho, .007 for sockeye, and .002 for chinook salmon; .011 for cutthroat-rainbow and 0.507 for brook trout; .003 for rockfish; .003 for flounder; and .009 for sablefish (Table 10).

Using Dolly Varden catch rates as an index, the weekend, weekday, completed trip and incompleting trip strata were compared. Unlike 1977, no significant difference was found in catch rates of completed and incompleting trips, so these were pooled. (Incompleting trips averaged 64% as long as completed trips.) Weekend trips were significantly longer than weekday trips, with a mean of 2.16 hours per trip compared to 1.91 hours per trip. Significant differences also appeared in the catch rate, and the strata were treated separately.

A potential bias was found in the postcard replies, where catch success of responding anglers was significantly higher than interviewed anglers. It appeared that successful anglers were more prone to return postcards than unsuccessful anglers. The monthly catch rates of Dolly Varden were used as an index for correcting this probable bias, and the expansion factor for non-returned cards was adjusted accordingly.

Another factor to consider in the comparison of 1977 and 1978 data is that the sample size for the 1977 data was only 25% that of 1978 (493 versus 1,964 interview replies). The 1977 analysis discarded all incomplete trip data because the catch rates of completed and incompleting trips were significantly different. However, the catch rates between completed trips and postcard replies were found to be similar enough to combine. It is possible that completed trips matched postcard replies only due to variance caused by the small sample size, and that both biases were merely in the same direction.

With reservations due to these differences in treatment, comparison of the 1978 roadside census with the 1977 census can be made. The most notable difference is the 89% increase in angler trips. However, the seasonal angler hours was up only 24%, reflecting a change in the mean length of trips. The mean trip length in 1977 was 3.47 hours, whereas in 1978 it was 2.28 hours. This may be the result of more exploratory trips by fishermen who were unsuccessful in one or more prior locations. Unlike the marine census, an angler trip may be entirely different than an angler day, as each new fishing location is labeled a separate trip. This is one more reason why catch rates per angler hour should be used

Table 9. Juneau roadside creel census May 1 through September 5, 1978.
Estimates of angler effort and catch by species.

| <u>Period</u> | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug.</u> | <u>Sept.</u> | <u>1978 Total</u> | <u>1977 Total</u> |
|------------------------|------------|-------------|-------------|-------------|--------------|-------------------|-------------------|
| Angler Trips | 2,498 | 4,125 | 8,218 | 3,736 | 578 | 19,155 | 10,144 |
| Angler Hours | 6,320 | 8,832 | 18,791 | 8,248 | 1,387 | 43,578 | 35,227 |
| Dolly Varden | 890 | 1,469 | 4,594 | 1,300 | 141 | 8,394 | 8,012 |
| Eastern Brook Trout | 36 | 14 | 158 | 6 | 8 | 222 | 892 |
| Cutthroat Rainbow | 55 | 180 | 90 | 153 | 10 | 488 | 1,393 |
| Steelhead | 55 | 0 | 0 | 0 | 0 | 55 | 0 |
| Chinook | 24 | 11 | 29 | 0 | 5 | 69 | 22 |
| Coho | 0 | 17 | 374 | 248 | 27 | 666 | 690 |
| Chum | 0 | 11 | 370 | 43 | 0 | 424 | 0 |
| Pink | 0 | 28 | 1,289 | 713 | 165 | 2,195 | 1,474 |
| Sockeye | 0 | 164 | 34 | 0 | 0 | 198 | 550 |
| Rockfish | 41 | 30 | 26 | 6 | 31 | 134 | 489 |
| Sablefish | 44 | 11 | 326 | 0 | 0 | 381 | 0 |
| Flounder | 32 | 71 | 33 | 6 | 0 | 142 | 24 |
| Halibut | 0 | 0 | 84 | 6 | 0 | 90 | 0 |

Table 10. Estimate of Juneau area roadside recreational catch per unit of effort by species of fish, May 1 through September 5, 1978.

| | May | June | July | Aug. | Sept. 1-5 | Seasonal Mean | | Time Period Used for Seasonal Totals |
|------------------------------------|-------|-------|-------|-------|-----------|---------------|--------|--|
| | | | | | | 1978 | 1977 | |
| Sample Size (Anglers Contacted) | 273 | 377 | 752 | 367 | 121 | 1,890 | 493 | |
| Dolly Varden/Trip | 0.356 | 0.356 | 0.559 | 0.348 | 0.244 | 0.438 | 0.810 | May 1 - Sept. 5 |
| /Hour | 0.141 | 0.166 | 0.244 | 0.158 | 0.102 | 0.193 | 0.227 | |
| Brook Trout /Trip | 0.014 | 0.003 | 0.192 | 0.002 | 0.014 | 1.405 | 3.440 | May 1 - Sept. 5 |
| /Hour | 0.006 | 0.002 | 0.008 | 0.001 | 0.006 | 0.507 | ... | (Separate Expansion) |
| Rainbow /Trip | 0.022 | 0.044 | 0.011 | 0.041 | 0.017 | 0.025 | 0.098 | May 1 - Sept. 5 |
| Cutthroat /Hour | 0.009 | 0.020 | 0.005 | 0.019 | 0.007 | 0.011 | 0.040 | |
| Steelhead /Trip | 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 0.022 | 0.000 | May 1-31 |
| /Hour | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.000 | |
| Chinook Salmon/Trip | 0.010 | 0.003 | 0.004 | 0.000 | 0.010 | 0.004 | 0.000+ | May 1 - Sept. 5 |
| /Hour | 0.004 | 0.001 | 0.002 | 0.000 | 0.004 | 0.002 | 0.001 | |
| Coho Salmon /Trip | 0.000 | 0.004 | 0.046 | 0.066 | 0.047 | 0.052 | 0.075 | July 1 - Sept. 5 |
| /Hour | 0.000 | 0.002 | 0.020 | 0.030 | 0.019 | 0.023 | 0.029 | |

Table 10. (Continued) Estimate of Juneau area roadside recreational catch per unit of effort by species of fish, May 1 through September 5, 1978.

| | <u>May</u> | <u>June</u> | <u>July</u> | <u>Aug.</u> | <u>Sept. 1-5</u> | <u>Seasonal Mean</u> | | <u>Time Period Used for Seasonal Totals</u> |
|---------------------|------------|-------------|-------------|-------------|------------------|----------------------|-------------|---|
| | | | | | | <u>1978</u> | <u>1977</u> | |
| Chum Salmon /Trip | 0.000 | 0.003 | 0.045 | 0.012 | 0.000 | 0.026 | 0.000 | 6/1 - 8/31 |
| /Hour | 0.000 | 0.001 | 0.020 | 0.005 | 0.000 | 0.012 | 0.000 | |
| Pink Salmon /Trip | 0.000 | 0.007 | 0.157 | 0.191 | 0.285 | 0.173 | 0.224 | 7/1 - 9/5 |
| /Hour | 0.000 | 0.003 | 0.069 | 0.086 | 0.119 | 0.076 | 0.062 | |
| Sockeye Salmon/Trip | 0.000 | 0.040 | 0.004 | 0.000 | 0.000 | 0.016 | 0.108 | 6/1 - 7/31 |
| /Hour | 0.000 | 0.019 | 0.002 | 0.000 | 0.000 | 0.007 | 0.070 | |
| Rockfish /Trip | 0.016 | 0.007 | 0.003 | 0.002 | 0.054 | 0.007 | 0.050 | 5/1 - 9/5 |
| /Hour | 0.006 | 0.003 | 0.001 | 0.001 | 0.022 | 0.003 | 0.014 | |
| Sablefish /Trip | 0.018 | 0.003 | 0.040 | 0.000 | 0.000 | 0.020 | 0.000 | 5/1 - 9/5 |
| /Hour | 0.007 | 0.001 | 0.017 | 0.000 | 0.000 | 0.009 | 0.000 | |
| Flounder /Trip | 0.013 | 0.017 | 0.004 | 0.002 | 0.000 | 0.007 | 0.000+ | 5/1 - 9/5 |
| /Hour | 0.005 | 0.008 | 0.002 | 0.001 | 0.000 | 0.003 | 0.001 | |
| Halibut /Trip | 0.000 | 0.000 | 0.010 | 0.002 | 0.000 | 0.005 | 0.000 | 5/1 - 9/5 |
| /Hour | 0.000 | 0.000 | 0.004 | 0.001 | 0.000 | 0.002 | 0.000 | |

in both roadside and marine census and have been used whenever possible in the 1978 data.

The catch per hour of Dolly Varden in 1978 was slightly below that of 1977, continuing the downward trend since the first Juneau roadside census (Fig. 8). The length frequency distribution of Dolly Varden in 1978 displayed a mean length nearly 35 mm (1.4 in) shorter than in 1977, and lacked the distinct peak of older fish seen in 1977 (Fig. 9). Catch rates between 1977 and 1978 were similar for coho, chinook and pink salmon. The decrease in sockeye salmon catch rate in 1978 reflected a change in effort pattern. Nearly all sockeye fishermen are now using small boats to follow schools of sockeye, and the shoreline fishery was limited to a few generally unsuccessful fishermen. In 1978, an interest developed in small sablefish which were caught at twilight from docks in Auke Bay and Tee Harbor. Changes in catch rates in other species are not reliable, as they are based on too small a sample size (particularly in 1977) to show any distinct trends.

Haines Area Roadside Census. The fall roadside fishery in the Haines area in 1978 consisted of over 7,000 angler hours of effort divided nearly equally between the Chilkat and Chilkoot river systems (Table 11) On the Chilkat River, an estimated 400 coho (0.125 per angler hr) and 550 chum salmon (0.171 per angler hr) were taken. The catch was above normal for coho and well below normal for chum salmon. The 1978 chum return to the commercial fishery and the spawning grounds was also much below normal. A sonar counter was operated just below Klukwan by the chum research project and a fishwheel further downstream was used to sample species composition. An estimate of 19,750 coho in the escapement derived by this method was considered too high based on spawning ground surveys conducted by the coho research staff in their tag recovery. If the sonar estimate is used, the sport fishery harvested less than 3% of the run. If the Coho Research maximum escapement estimate of 10,000 coho is used, the sport fishery harvested an estimated 5% of the escapement. The principal concentration of anglers was near the airport, with the second highest concentration at "Schnable's Landing" between Mosquito Lake and Bear Lake.

On the Chilkoot River an estimated 788 coho (0.207 per angler hr) and 29 chum (.008 per angler hr) were taken. The catches were consistent with those observed in recent years. An estimated 91% of the effort occurred below the sockeye research project counting weir. As the weir count was 1,180 coho, the sport fishery took approximately 42% of the run which entered the river $(788/1,180 + [0.91 \times 788] = .42)$.

Nearly 50% of the Chilkat River catch was dark fish, particularly the chum and upriver coho catch. Most Chilkoot River coho were in bright coloration. Participants in this fishery are primarily Canadians from Whitehorse who come down the Haines Highway with campers, particularly over the Canadian Thanksgiving Holiday on the first Friday of October. In 1978, 65% of the effort during this fishery was from Canadians.

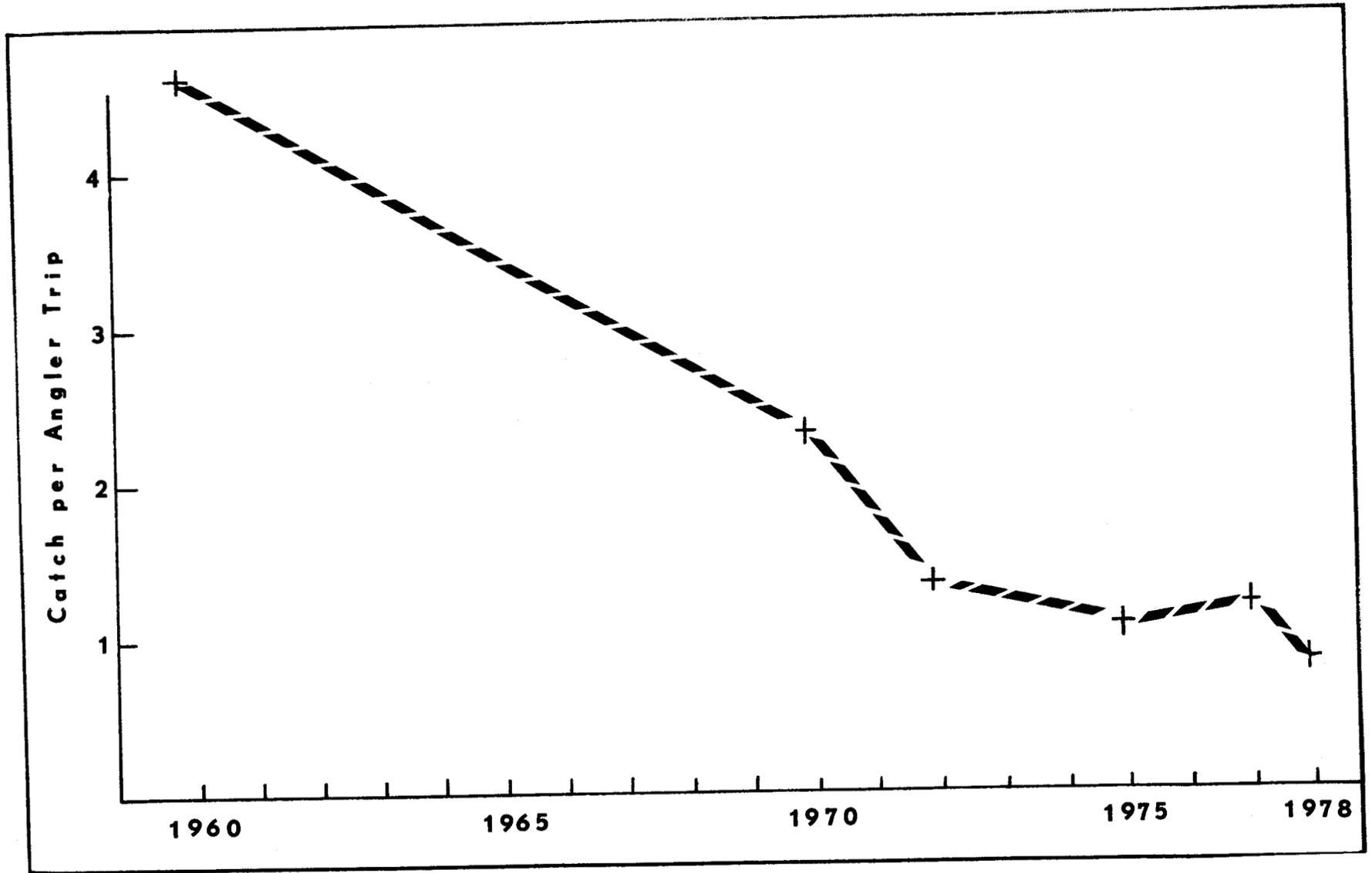


Figure 8. Declining Dolly Varden catch rates in the Juneau area roadside recreational fishery.

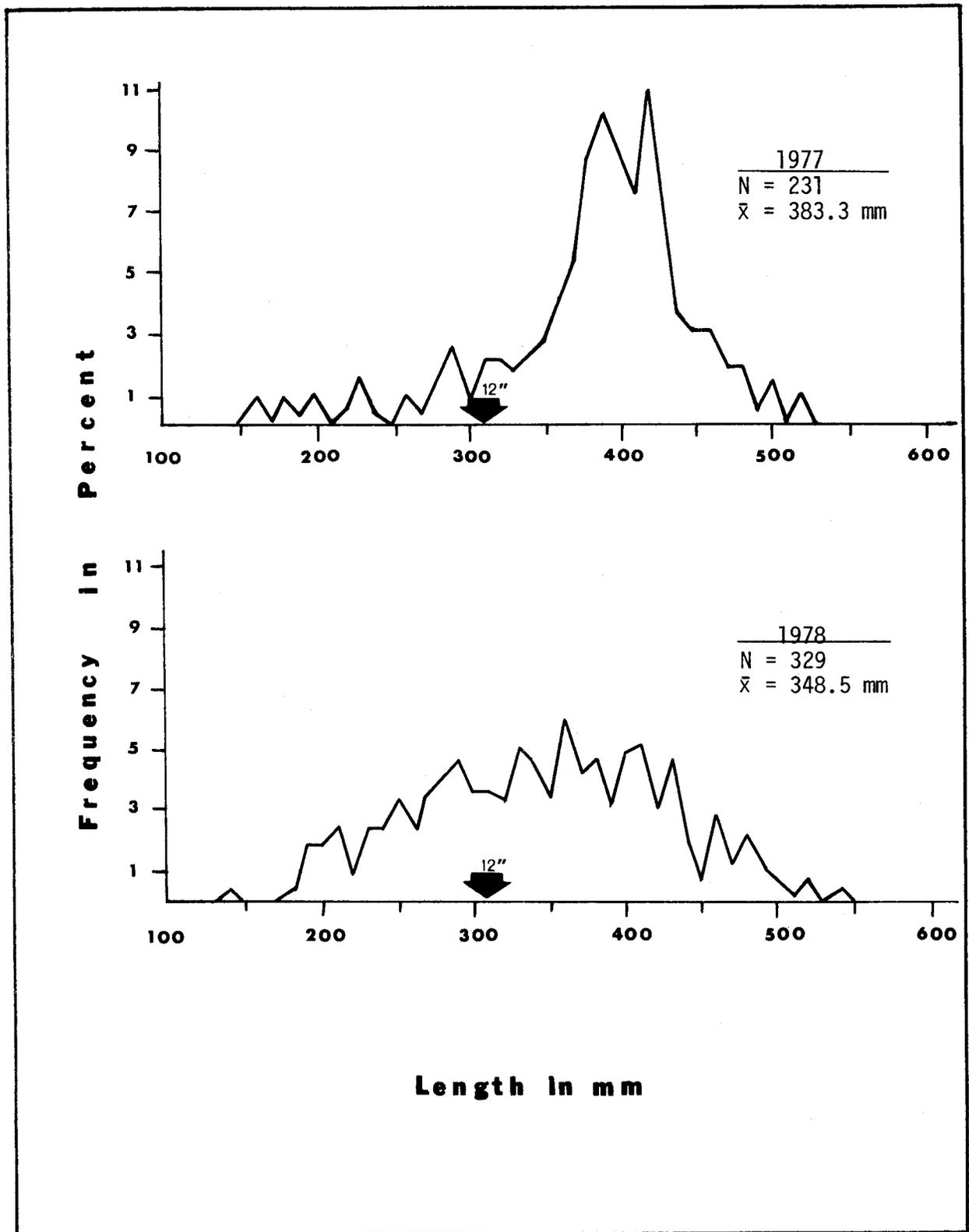


Figure 9. Dolly Varden length frequencies Juneau roadside creel census.

Table II. Haines area roadside sport fishery, comparisons between systems and years of census.

| System | Chilkat | | Chilkoot | |
|-----------------------------|----------------------|----------------------|----------------------|------------------------|
| | 1974 9/28 - 11/02 | 1978 9/22 - 10/23 | 1974 10/5 - 10/28 | 1978 9/22 - 10/23 |
| Angler Trips | 933 | 880 | 588 | 1,103 |
| Angler Hours | 5,862 | 3,210 | 3,831 | 3,813 |
| Coho Catch | 138 | 400 | 768 | 788 |
| Coho/Hour | (.024) | (.125) | (.200) | (.207) |
| Chum Catch | 1,322 | 550 | 30 | 29 |
| Chum/Hour | (.412) | (.171) | (.008) | (.008) |
| Dolly Varden Catch | ... | 99 | ... | 117 |
| Dolly Varden/Hour | ... | (.031) | ... | (.031) |
| % Coho Escapement Harvested | ... | 5%* | ... | 42%** |
| % Non-resident Anglers | 77% | 73%*** | 80% | 73% |
| Marks or CWT Tags Recovered | 0 | 1 (4-3-2) | 0 | 3 (4-3-7) 3 No Tags |

* Based on estimated 9,875 escapement.

** Based on weir count of 788 coho and 91% of effort occurring below the weir.

*** 65% Canadians.

In 1976, the coho research staff marked 12,421 wild Chilkat River system coho fingerlings and 1,503 wild fingerlings from Chilkoot Lake. Besides the commercial fishery, recoveries in 1978 were also expected from the sport fishery. One CWT tag (Mosquito Lake code) was recovered from 46 Chilkat system coho examined, and three CWT tags (Chilkoot Lake code) were recovered from 203 Chilkoot system coho examined. An additional three adipose clipped coho with no CWT tags were found in the Chilkoot system samples.

Discussion:

Juneau Area Marine Recreational Harvest Study. Commercial hand trolling has expanded rapidly in the Juneau area in recent years. Most of this fishery takes place from small pleasure boats using hand gurdies or four sport rods. Reasons for the increase are many, but center around lack of limited entry permit requirements, tax benefits for gasoline, boat and tackle depreciation, and the option to sell fish that are in excess of sport fishing bag limits or personal needs of the angler. It is this last reason which has caused the most concern, as a hand troll license holder does not need to decide if he is commercial or sport fishing until he returns to the dock. Considerable numbers of fish are thought to have been "bootlegged" by sport boats fishing in areas closed to commercial fishing and then selling their catch. During the 1978 meeting of the Board of Fisheries, this problem was addressed with a new set of troll regulations designed to control expansion of the hand troll fleet and more clearly separate hand trolling from sport fishing. These regulations took the form of: (1) no sport fishing from a salmon troll vessel except charter boats and during authorized derbies; (2) redefinition of a charter vessel to prevent its use in commercial fishing; (3) a year-round troll closure for fishing sections 111 A, 111 B, and 115 B; (4) permanent marking of HT on hand troll vessels; and (5) an eight-day-on, six-day-off weekly fishing period for trolling areas in the Icy Straits and Lynn Canal area. The effect of these regulations on sport fishing activity will be of special interest in the creel census of 1979. It is possible that most potential hand trollers will not register their vessels until just before the peak of the coho season, creating more sport fishing effort on early run chinook stocks, but less on coho. With sections 111 A and 111 B closed to all commercial trolling, the August sport fishery for coho should improve significantly.

The Sport Fish Division statistical staff in Anchorage began a Statewide Sport Fish Harvest Study in 1977 (Mills, 1979). A carefully designed questionnaire was mailed to randomly selected license holders throughout the State and to non-residents who fished in the State. Questions on effort and catch pertained to the entire family, so that anglers under 16 years of age were included. The survey also had a series of two follow-up questionnaires to improve the response. Portions of this survey that could be compared with regular sport fishing surveys already being conducted were compared (Table 12). Statewide, the correlation was remarkably good, being poorest for the Southeast Alaska census area. The poor correlation with the Juneau pink salmon estimate may be due to

Table 12. 1977 Alaska sport harvest survey comparison with creel censuses - salmon.

| <u>Fishery</u> | <u>Creel Census</u> | <u>Harvest Survey</u> |
|-------------------|---------------------|-----------------------|
| Ketchikan | | |
| King Salmon | 1,712 | 3,395 |
| Coho Salmon | 1,459 | 2,961 |
| Pink Salmon | 11,904 | 8,021 |
| Juneau | | |
| King Salmon | 4,845 | 5,066 |
| Coho Salmon | 13,084 | 15,950 |
| Red Salmon | 1,748 | 1,205 |
| Pink Salmon | 2,402 | 4,059 |
| Gulkana River | | |
| King Salmon | 332 | 421 |
| Red Salmon | 998 | 1,180 |
| Deshka River | | |
| Coho Salmon | 527 | 559 |
| Deep Creek Marine | | |
| King Salmon | 4,983 | 4,470 |
| Resurrection Bay | | |
| Coho Salmon | 16,345 | 14,528 |
| Kenai River | | |
| King Salmon | 7,321 (8,783*) | 7,585 |
| Coho Salmon | 10,056 | 9,537 |
| Russian River | | |
| Red Salmon | 47,840 | 48,263 |
| Buskin River | | |
| Coho Salmon | 750 | 890 |
| Pink Salmon | 4,503 | 3,868 |
| Salcha River | | |
| King Salmon | 50 | 62 |
| Chum Salmon | 25 | 27 |

* Including jacks.

difficulties in censusing this fishery. A large part of the pink salmon fishery is from small boats which launch at minor boat launch ramps and off beach areas. These fishermen are included in the marine effort (from aerial counts) but their catches are not sampled proportionately. The weakest statistical area in workup of the Juneau marine census is in the aerial counts, which produce the count:interview ratio. These ratios are highly variable within each strata, and the aerial counts are not conducted frequently enough, due to the high cost involved. There are also problems separating sport and commercial vessels and problems with vessels seen in areas but not fishing or in transit during the time of surveys. The weakest area in the Juneau roadside census is the expansion for non-returned cards and for partial-day coverage. There is no good way to detect bias in postcard replies. Also, calculation of partial-day coverage required knowledge of how long the average vehicle was parked during days of the survey, and estimation of hiking time added to mean fishing time. Hours fished is also subject to angler interpretation when fishing is done intermittently or incidental to other activities. Beginning in 1979, the statewide harvest questionnaire will be used for seasonal estimates, thereby replacing aerial boat counts and roadside angler counts and most postcards. The roadside census will concentrate primarily on CPUE and marked fish recoveries. The statewide harvest questionnaire also includes areas such as Yakutat, Glacier Bay and Haines, thereby reducing the need for special census in these areas.

STARRIGAVAN SPORT FISHERY

OBJECTIVES

4. Determine the contribution of coho and chinook salmon released from the Starrigavan Estuarine Rearing Facility to the Starrigavan area sport fishery, August 15 through October 15, 1978.
5. Determine the differential return rate of the three lots of coho salmon returning to Starrigavan, August 14 through October 15, 1978.

Background

The Starrigavan Estuarine Rearing Facility released 128,770 coho salmon smolt in May and June 1977. Three lots of fish were released: (1) Little Port Walter coho salmon - 90,875 released, 9,231 microwire tagged; (2) Starrigavan coho salmon - 3,523 released, 3,417 microwire tagged; and (3) Blind Slough coho salmon - 34,390 released, 8,750 microwire tagged.

On September 2, 1975, 2,063 chinook salmon were released at Starrigavan. About 70 percent (1,438) of these Ship Creek chinook salmon were microwire tagged.

A creel census was designed for the Starrigavan Bay area to evaluate the contribution of these released fish to the local sport fishery (Fig. 10).

Recommendations

The Starrigavan Bay creel census should be conducted on a continuing annual basis to monitor: (a) contribution of salmon from the Starrigavan facility to the sport fishery, (b) rate of return from each lot of fish released, and (c) comparative dependence of the fishery on natural versus hatchery-reared fish.

Techniques Used

A boat and shoreline sport harvest study was conducted in the Starrigavan Bay area from August 14 to October 8, 1978. During the study 32 days (57%) of the 56 days were sampled. Anglers were interviewed after they had stopped fishing to determine the time they had spent fishing, their catch success, and the species composition of their catch. All salmon were examined for marks and tags to determine if they were from the Starrigavan or Sheldon Jackson facility.

The study was conducted using the sample design described by Moyle and Franklin (1957). Two creel census technicians were used, one for shoreline and one for boat anglers. Two weekdays (randomly selected) and both weekend days were sampled during each week. On each sample day 9 (56%) of the available 16 daylight hours were sampled. Selected days were sampled alternately during the early period 0700 to 1600 hours or the late period 1300 to 2200 hours.

Starrigavan Bay has several access points available to anglers. To gain a representative sample, an interval-count method was used whereby anglers fishing along the shore and by boat were enumerated every hour. The total number of angler trips was calculated by adding the number of anglers counted and dividing by the mean length of an angler trip in hours. Catch of each species per angler trip was based on interview data and presented for each weekly period. Data for the missing portion of each day were estimated on the basis of records for the overlapping hours, 1 p.m. to 4 p.m. of each day during the 8-week period.

Findings

Results:

Estimated catch during the creel census period was 4,936 pink and 364 coho salmon (Table 13). No chinook salmon or Dolly Varden were observed during the census. Of the 151 coho salmon caught by boat fishermen, 101 were from the Starrigavan facility, while only 36 of the 213 coho salmon caught from shore were from the Starrigavan facility. These estimates are based upon four tagged coho salmon in the examined sample of 99 coho salmon and the mark/unmarked ratio of these fish when released as smolts.

All tagged coho salmon recovered were of the 1975 Little Port Walter stock.

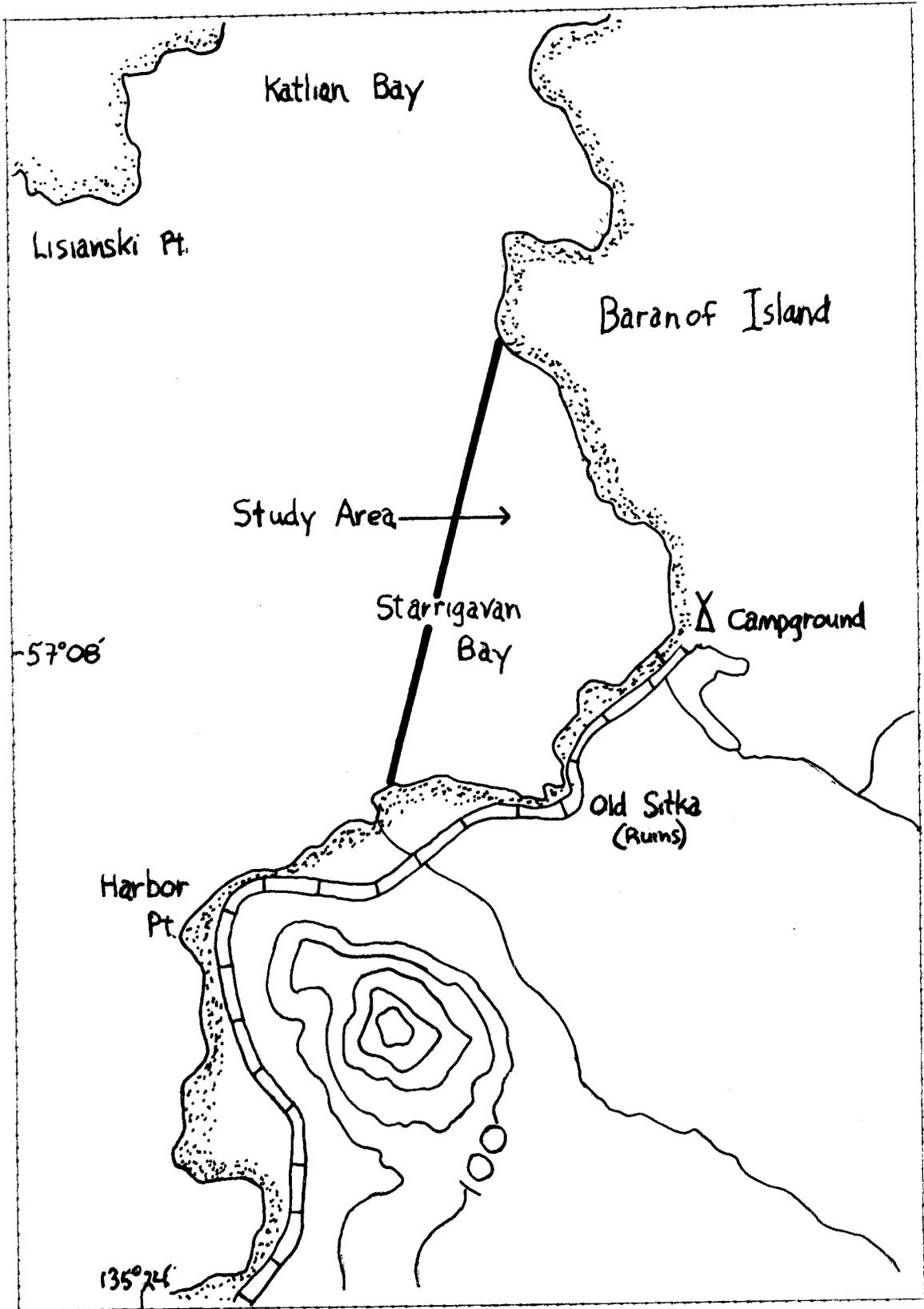


Fig. 10. Starrigavan Bay creel census area.

Table 13. Estimate of angler effort and catch during Starrigavan Bay sport fishery, August 14, 1978, to October 8, 1978.

| Period | 8/14- 8/20 | | 8/21- 8/27 | | 8/28- 9/3 | | 9/4- 9/10 | | 9/11- 9/17 | | 9/18- 9/24 | | 9/25- 10/1 | | 10/2- 10/8 | | Seasonal Total |
|--------------|-------------------|-----|---------------|-----|--------------|-----|--------------|---|---------------|--|---------------|--|---------------|--|---------------|--|-------------------|
| | Shoreline Fishery | | | | | | | | | | | | | | | | |
| Angler Trips | 680 | 519 | 250 | 227 | 91 | 62 | 41 | 5 | 1,875 | | | | | | | | |
| Angler Hours | 1,167 | 893 | 424 | 386 | 156 | 104 | 70 | 9 | 3,209 | | | | | | | | |
| Pink Salmon | 1,544 | 770 | 386 | 61 | 50 | 8 | 31 | 0 | 2,850 | | | | | | | | |
| Coho Salmon | 7 | 17 | 38 | 35 | 26 | 39 | 51 | 0 | 213 | | | | | | | | |
| | Boating Fishery | | | | | | | | | | | | | | | | |
| Angler Trips | 436 | 413 | 149 | 121 | 45 | 33 | 14 | 0 | 1,211 | | | | | | | | |
| Angler Hours | 909 | 870 | 310 | 249 | 88 | 69 | 30 | 0 | 2,525 | | | | | | | | |
| Pink Salmon | 1,509 | 439 | 108 | 22 | 8 | 0 | 0 | 0 | 2,086 | | | | | | | | |
| Coho Salmon | 8 | 0 | 66 | 43 | 22 | 6 | 6 | 0 | 151 | | | | | | | | |

The mean catch of coho salmon per angler trip was 0.153 for the shoreline fishery and 0.178 for the boat fishery (Table 14). The mean catch of pink salmon per angler trip was 1.356 for the shoreline fishery and 1.194 for the boat fishery.

Discussion:

The Starrigavan Bay fishery has shown a marked increase in angler effort and catch for both pink and coho salmon. The shoreline fishery from August 16 to October 10, 1976, showed only 1,195 angler trips compared with 1,875 for the same period in 1978. In 1976, 119 coho and 550 pink salmon were caught by shoreline fishermen during the period when 213 coho and 2,850 pink salmon were caught this year. A comparison of boat fishermen success is not possible, as the 1976 census did not include a boat census at Starrigavan.

This census was not intended to enumerate total pink salmon catch so was not begun until mid-August. Total pink salmon catch was indubitably much higher than the 4,936 estimated by the census. The census period encompassed nearly all of the coho salmon return. Only 32 coho salmon were caught during the first 2 weeks of the census. By October 8 all fish had entered streams and were inaccessible to the bay fishermen.

It is interesting to note that a high percentage of coho salmon caught by boat were Starrigavan facility-reared fish (66.9%), while only a small percentage (16.9%) of shore-caught fish were facility-reared fish. This is because Starrigavan facility-reared fish return to the immediate vicinity of the pens. They lie in a large school under the rearing pens and are not accessible to shoreline fishermen. Their homing response takes them directly to the pens and water supply where they were reared.

In order for a census to be representative of total catch in Starrigavan Bay, both a boat and shoreline census must be conducted. Starrigavan facility-reared fish contributed an overall 37.6% of the coho salmon sport catch, while naturally reared fish contributed 62.4% of the catch.

All of the tagged fish collected by creel census were from Little Port Walter stock. None of the Starrigavan or Blind Slough fish released at Starrigavan were encountered.

CRESCENT BAY SPORT FISHERY

OBJECTIVE

6. Determine the number of pink, coho, and chum salmon released from the Sheldon Jackson Hatchery taken by the Crescent Bay sport fishery.

Table 14. Sport catch per angler trip by species during Starrigavan Bay sport fishery, August 15, 1978, to October 8, 1978.

| <u>Period</u> | <u>8/14- 8/20</u> | <u>8/21- 8/27</u> | <u>8/28- 9/3</u> | <u>9/4- 9/10</u> | <u>9/11- 9/17</u> | <u>9/18- 9/24</u> | <u>9/25- 10/1</u> | <u>10/2- 10/8</u> | <u>Seasonal Mean</u> |
|---|-----------------------|-----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------------------|
| Shoreline Fishery | | | | | | | | | |
| Sample (Anglers Contacted) | 96 | 89 | 79 | 52 | 31 | 16 | 12 | 4 | |
| Pink Salmon/ Angler Trip* | 2.271 | 1.483 | 1.544 | 0.269 | 0.548 | 0.125 | 0.750 | 0.000 | 1.356 |
| Coho Salmon/ Angler Trip* | 0.001 | 0.034 | 0.152 | 0.154 | 0.290 | 0.625 | 1.250 | 0.000 | 0.153 |
| Boating Fishery | | | | | | | | | |
| Sample (Anglers Contacted) | 52 | 95 | 18 | 39 | 22 | 23 | 9 | 0 | |
| Pink Salmon/ Angler Trip* | 3.461 | 1.063 | 0.722 | 0.179 | 0.182 | 0.000 | 0.000 | 0.000 | 1.194 |
| Coho Salmon/ Angler Trip* | 0.019 | 0.000 | 0.444 | 0.359 | 0.500 | 0.174 | 0.444 | 0.000 | 0.178 |
| *Calculations from actual interview data so may vary slightly from calculations derived from expanded estimates on Table 1. | | | | | | | | | |

Background

Sheldon Jackson released 1,593,184 pink salmon, which should have returned in 1978. Of these fish, 71,985 were finclipped. An additional 65,316 chum salmon (10,501 marked) and 3,150 coho salmon (3,150 marked) were released to return this year.

A creel census was designed to evaluate the contribution of these released fish to the local Crescent Bay sport fishery (Fig. 11).

Recommendations

The Crescent Bay creel census should not be continued unless specific problems arise.

Current management strategy does not allow fall sport fishing for salmon in Crescent Bay until pink salmon escapement to the area exceeds the spawning requirements of Indian River and egg take requirements of Sheldon Jackson Hatchery. Information gained from a census after the salmon sport fishery opens is not cost effective.

Techniques Used

A boat and shoreline sport harvest study was conducted in the Crescent Bay area from July 13 to August 24, 1978. During the study 24 days (57%) of the 42 days were sampled. Anglers were interviewed after they had stopped fishing to determine the time spent fishing, their catch success, and species composition of their catch. All salmon were examined for marks and tags to determine if they were from the Sheldon Jackson facility.

The study was conducted using the sample design described by Moyle and Franklin (1957). Crescent Bay has several access points available to anglers. To gain a representative sample, an interval-count method was used whereby anglers fishing along the shore and by boat were enumerated every hour. Two weekdays (randomly selected) and both weekend days were sampled during each week. On each sample day 9 (56%) of the available 16 daylight hours were sampled. Selected days were sampled alternately during the early period 0700 to 1600 hours or the late period 1300 to 2200 hours.

Findings

Results:

The area was open to all sport fishing from July 10 to August 6. During this period 124 anglers spent 115 hours to catch 22 pink salmon, 22 Dolly Varden, 72 sablefish, 22 rockfish, 9 sculpin, 3 turbot, and 3 eel. The area was closed to salmon fishing on August 7. Between August 7 and 24 six anglers spent 1.5 hours and caught nothing.

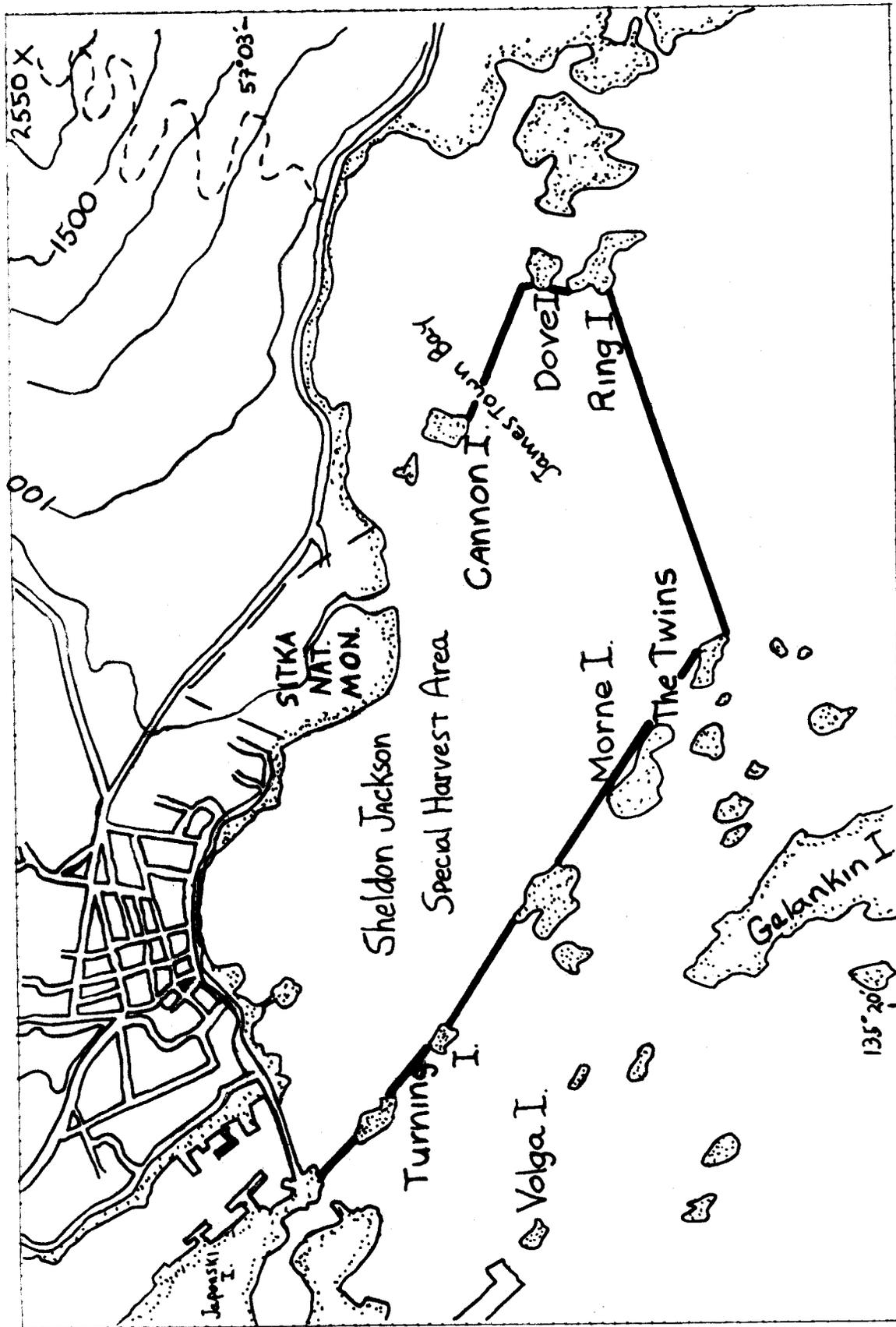


Fig. 11. Sheldon Jackson creel census area.

Discussion:

The Crescent Bay area received light angler use between July 10 and August 6. Most fishing was done from shore by young anglers. The first pink salmon were seen on August 1. The fishery was closed on August 7 due to a poor return to the Sheldon Jackson Hatchery. Fishing effort from August 7 to August 24 was practically nonexistent. The census was terminated on August 24 when it became evident that the salmon fishery would not be reopened. The low effort after August 7 may be due in part to the excellent fishing for naturally produced pink salmon at Starrigavan Creek at that time.

The salmon fishery remained closed at Crescent Bay until all pink salmon had entered the weir at Sheldon Jackson or Indian River.

A total of 5,777 pink salmon entered the Sheldon Jackson weir. Of this escapement, 1,035 females and 972 males were transported up Indian River to spawn. Sheldon Jackson Hatchery used 1,572 females and 645 males for the hatchery egg take.

SITKOH CREEK SPORT FISHERY

OBJECTIVE

7. Determine weekend catch of steelhead trout in Sitkoh Creek during the period May 15 to May 28, by fishermen entering the system from Sitkoh Bay.

Background

The Sitkoh Creek steelhead trout fishery has come under greatly increased fishing pressure in the past few years. As many of these fish are repeat spawners, the population is vulnerable to overexploitation.

The Board of Fisheries passed a regulation in an attempt to protect this population from overexploitation. The daily bag and possession limit for steelhead trout is now one fish over 84 cm (33 inches) in total length. In order to monitor the harvest of steelhead trout and estimate escapement to Sitkoh Creek, a creel census was proposed for the period April 15 through May 28 (Fig. 12).

Records indicate that steelhead trout begin entering Sitkoh Creek about the 15th of April, and fair numbers of fish are present until the end of May. The peak of fishing and abundance appears to occur during the first week of May. During this period angler success is high, and fish are very visible near the stream mouth. Many fish enter the system during high tides at this time. A partial census conducted in 1976 estimated about 50 fish taken from mid-April to May 31.

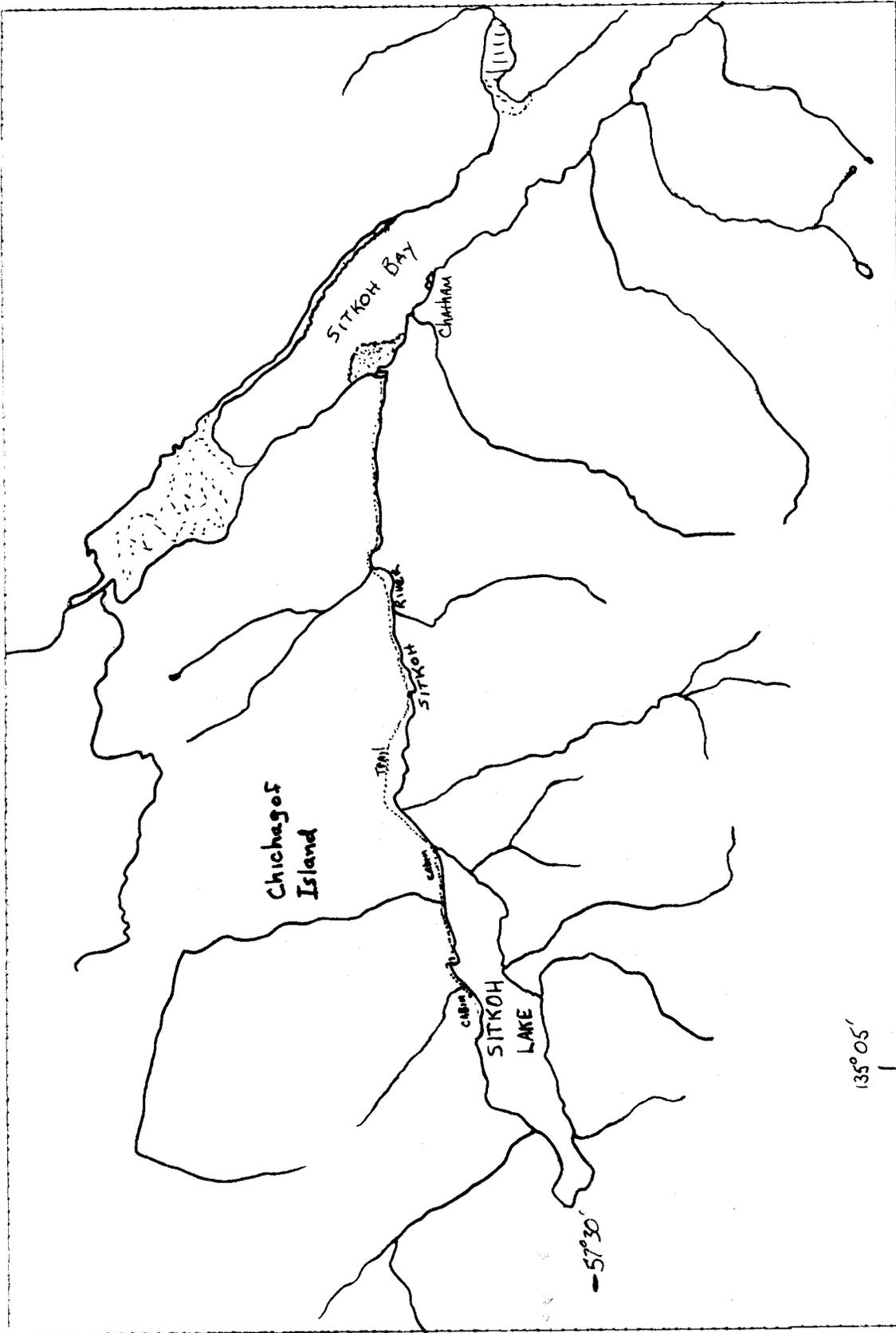


Fig. 12. Sitkoh River creel census area.

Recommendations

Research:

1. The total escapement of steelhead trout to Sitkoh Creek should be established by use of a weir as soon as possible. Chipperfield (1938) enumerated 1,108 steelhead trout into Sitkoh River in 1937. Total population now is thought to be less than 200, but no accurate enumeration is available in recent years. An accurate population estimate is needed to determine if any protective measures are required at this time.
2. Age structure of the steelhead trout population should be determined concurrent with weir operation. Age analyses of Sitkoh steelhead trout indicates a high proportion of old-age, repeat-spawning individuals. A population of this type is more susceptible to overharvest. An accurate age analysis of the population is desirable.

Management:

The 84 cm (33-inch), one-fish limit on steelhead trout should not be relaxed until evaluation of the population is completed. Preliminary evaluation of this population indicates an 80% reduction over historic escapement.

Techniques Used

A creel census was conducted on lower Sitkoh River on weekends from April 15 to May 28 during the hours of 10 a.m. to 4 p.m. Census during the 10 a.m. to 4 p.m. period was assumed to contact nearly all weekend anglers. Anglers were interviewed to determine amount of time fished, species and number of fish caught, and number of fish kept. Length-weight and scale samples from steelhead trout were collected when possible.

The U.S. Forest Service cabin rental at Sitkoh Lake (upper river) showed that eight fishing parties of 31 people rented the cabin during the April 15 to May 28 period. These fishermen were not interviewed for fishing success.

The creel census technician, who lived at the False Island Logging Camp, attempted to determine how many steelhead trout were taken by U.S. Forest Service and False Island camp personnel during the weekdays.

Findings

Results:

The lower Sitkoh River weekend census contacted 62 fishermen who fished 315 hours to catch 29 steelhead trout (13 taken, 16 released) (Table 15).

Table 15. Sitkoh Creek creel census angler interview data, April 15, 1978, to May 28, 1978.

| Date | Number Anglers Interviewed | Total Time Fished (hours) | Steelhead Trout Caught | |
|-------------|----------------------------|---------------------------|------------------------|----------|
| | | | Kept | Released |
| April 15-16 | 9 | 24 | 1 | |
| April 22-23 | 9 | 36 | | |
| April 29-30 | 6 | 19 | 4 | 1 |
| May 4-7 | 18 | 142 | 4 | 7 |
| May 13-14 | 8 | 62 | 1 | 8 |
| May 20-21 | 12 | 32 | 3 | |
| May 27-28 | <u>0</u> | <u>0</u> | — | — |
| TOTAL | 62 | 315 | 13 | 16 |

An additional 13 steelhead trout were taken from the lower river by U.S. Forest Service and False Island camp personnel during weekdays. This is a minimum number, as not all fishermen were interviewed. At least two of these weekday-caught fish were sublegal (admission by angler).

Steelhead trout catch from the upper river area is not known, but U.S. Forest Service records show that eight fishing parties (31 people) rented the Sitkoh Lake cabin during the census period. All fishermen were from Sitka or Juneau. Application of the catch per fisherman ratio from the lower river area would yield an estimate of at least six steelhead trout taken.

An analysis of age structure of large fish examined (Table 16) shows that the rearing steelhead trout spend 3 years (50%) or 4 years (50%) in fresh water before going to sea. They begin spawning after 2 years (58%) or 3 years (42%) in the ocean. All fish examined spawned each consecutive year after reaching maturity. No legal fish examined, 84 cm (33-inch) total length, was less than 6 years old or had spent less than 3 years in salt water.

Discussion:

A minimum estimate shows that 32 steelhead trout were taken from Sitkoh Creek between April 15 and May 28. This estimate does not include some anglers who fished the lower river on weekdays or people who may have flown in to the upper river area and not rented the U.S. Forest Service cabin.

An attempt was made to determine the origin of anglers. Of anglers interviewed on weekends, 42% were from Sitka or Juneau, 39% from False Island camp (including U.S. Forest Service personnel), and 19% unknown.

An evaluation of catch data showed that exactly half of the estimated total catch came from anglers at False Island camp (including U.S. Forest Service personnel).

Comparison of catch per angler during weekend census (0.21 fish per angler) and weekday catch by camp and U.S. Forest Service personnel (0.93 fish per angler) shows a marked discrepancy. This is due in part to keeping of illegal fish (admission by angler). Extent of this practice is unknown.

WRANGELL AREA SPORT FISHERY

OBJECTIVE

8. Determine the saltwater boating angler effort and catch in the Wrangell area sport fishery.

Table 16. Length, age, and sex of 12 steelhead trout sampled from Sitkoh Creek, April 15, 1978 to May 28, 1978.

| <u>Number</u> | <u>Total Length (mm)</u> | <u>Sex</u> | <u>Age*</u> |
|---------------|--------------------------|------------|---------------|
| 1 | 850 | Male | 4-1-S-1 |
| 2 | 920 | Female | R-1-S-S-S-S-1 |
| 3 | 900 | Male | 3-3 |
| 4 | 850 | Female | 4-1-S-1 |
| 5 | 865 | Female | 4-1-S-S-S-1 |
| 6 | 864 | Male | 4-3 |
| 7 | 790 | Unknown | R-2 |
| 8 | 840 | Female | 3-3 |
| 9 | 870 | Female | 3-1-S-1 |
| 10 | 865 | Female | 3-2-S-S-1 |
| 11 | 842 | Female | 3-3 |
| 12 | 858 | Male | 4-1-S-1 |

*First number is freshwater age, R indicates regenerated scale. Successive numbers indicate years in salt water, S indicates 1 year in salt water and spawning.

Background

The Stikine River chinook salmon stocks that pass through the Wrangell area (Figure 13) in the spring have shown a decline in abundance. In an effort to reduce the angling mortality on these spawners, management regulations closing some of the more productive fishing areas were adopted for the 1978 season. In addition, the bag and possession limit in adjacent waters was reduced to one chinook salmon per day and in possession from April 15 to June 16, 1978.

In order to determine the effect of the new regulations on the Wrangell area sport fishery, a random five day per week creel census was conducted during April 15 to June 15, 1978.

Recommendations

Management:

In the immediate Wrangell Dry Pass area, the present chinook fishing closure should be continued. The present bag and possession limit of one chinook salmon during the spring in Commercial Fishing Districts 7 and 8 should remain in effect. The combination of the above will give added protection to the depressed chinook salmon runs bound for the Stikine River.

Research:

The angler effort and catch of chinook salmon in the Stikine area should be monitored in 1979 to determine trends in the effort and area fished under existing regulations.

Techniques Used

Wrangell Area Recreational Harvest Study:

Sport anglers fishing from boats in the Wrangell creel census area (Figure 13) were interviewed as they returned to the floats in Wrangell harbor. Each angler party was contacted to determine the number of anglers on board, the number of hours spent fishing, the area fished, the numbers and species of fish kept and the method used in fishing. Total length, weight, sex and any marks were recorded for each chinook salmon examined. Scale samples were taken for age analysis, and flesh color was noted. All tags noted were removed and retained for analysis.

The Wrangell area creel census was conducted from April 15 through June 15, 1978. The study was divided into weekly periods and stratified into weekdays and weekend-holidays to sample angler effort.

During each week the study was conducted on three randomly selected weekdays and both weekend days. If a holiday occurred during a week, it was included with the weekend.

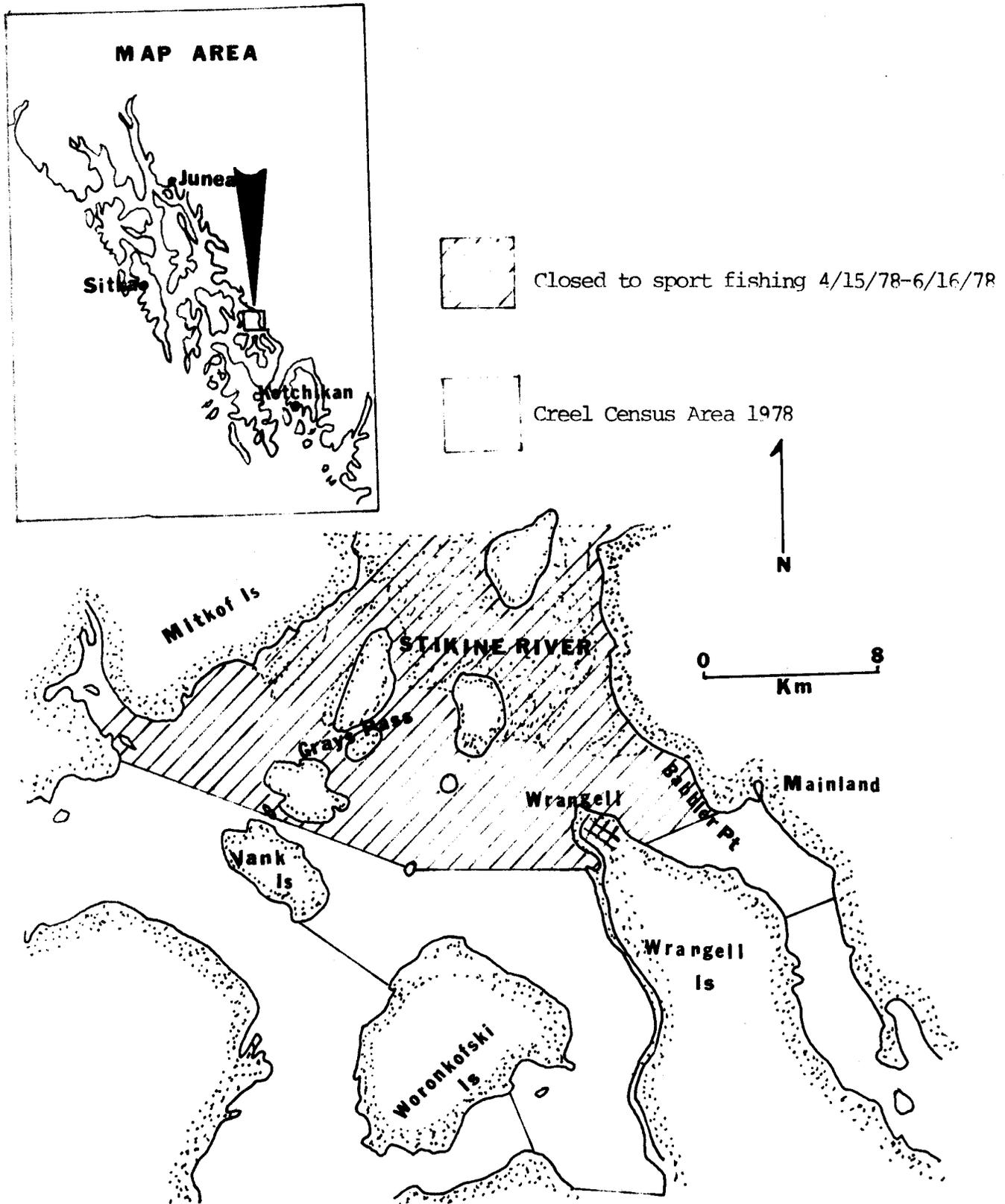


Fig. 13. Wrangell Area Marine Recreational Fishery 1978.

Each census day was sampled during the early hours (0600-1400) stratum or late (1400-2300) time stratum. One boat count was made during each stratum sampled. The starting time was randomly selected during the sampling time. The direction in which the count proceeded was also randomly selected.

An estimate of the number of anglers, time spent fishing, and the number of fish kept was derived by:

1. The number of recreational boats fishing in the Wrangell area was noted from a speed boat during a 1.0-1.5 hour period randomly selected during each sampling stratum.
2. The number of recreational parties that were interviewed and had reported that they were fishing in the Wrangell census area during the time of the count was noted.
3. A ratio of the number of recreational boats counted to the number of those boats interviewed was calculated for each stratum sampled.
4. The number of anglers, hours spent fishing and fish kept was summed for each stratum. These sums were then multiplied by the appropriate mean count/interview ratio. These summed parameters were then weighted for each stratum and summed for the overall estimates of angler effort and catch for the census period.

The Wrangell King Salmon Derby was monitored at the judge's float. The number of participating anglers, hours spent fishing and chinook salmon caught were estimated utilizing the same methodology described above for the season estimate.

Findings

Wrangell Area Recreational Fishing:

During the 1978 census period of April 15, 1978 through June 15, 1978 in the Wrangell area, an estimated 796 anglers spent 4,199.5 hours to harvest 120 chinook salmon (Table 17).

Chinook salmon angling was quite slow in the Wrangell area in April and early May. Angling improved after the middle of May and reached a peak the last of May. Angling effort rapidly declined after the first week of June due to increased water turbidity in the Wrangell area.

The Sport fish harvest of chinook salmon in the Wrangell area in 1978 was down considerably from the 360 fish caught during 1977 (Robards 1978). This reduction in harvest reflects the change in sport fishing areas during 1978. Two of the more productive chinook salmon angling areas (Grays Pass and Babbler Point) were closed to salmon angling during the census period. In addition, the bag limit in open areas was reduced to one chinook daily or in possession.

Table 17. Estimates of angler effort and catch of chinook salmon in the Wrangell area, April 15 - June 15, 1978.

| Period | No. Anglers | Anglers Hours | King Salmon |
|------------------------|-------------|---------------|-------------|
| 1. April 15 - April 22 | 37 | 101.5 | 0 |
| 2. April 23 - April 29 | 25 | 68.0 | 3 |
| 3. April 30 - May 6 | 32 | 78.0 | 6 |
| 4. May 7 - May 13 | 85 | 280.5 | 18 |
| 5. May 14 - May 20 | 140 | 538.5 | 15 |
| 6. May 21 - May 27 | 133 | 722.5 | 10 |
| 7. May 28 - June 3 | 227 | 1,720.5 | 43 |
| 8. June 4 - June 10 | 75 | 483.0 | 14 |
| 9. June 11 - June 15 | <u>42</u> | <u>207.0</u> | <u>11</u> |
| Totals | 796 | 4,199.5 | 120 |

Wrangell King Salmon Derby:

The Wrangell Special Derby days of May 27-29 and June 3-4, 1978 were censused. During the derby an estimated 211 anglers caught 31 chinook salmon. A chinook salmon in excess of 27.7 kg (61 lbs.) captured first place in the 1978 Derby.

Examination of chinook salmon by the census taker showed that 90% were mature spawners headed for local spawning streams. Examination of flesh color showed that the sample was 73% red and 27% white. No marked chinook salmon were found among those sampled.

Discussion

The harvest of an estimated 120 chinook salmon in the Wrangell area in 1978 is the lowest harvest since census work began in Wrangell. In 1970, 352 chinook salmon were estimated taken; in 1971, 449 chinook were caught (McHugh et al., 1971; 1972); in 1977, 360 chinook were estimated taken (Robards, 1978). The 1970 and 1971 creel census covered only the Grays Pass fishery while the 1977 census covered a larger area (Figure 13). Beginning in 1978, two of the more productive fishing areas, Grays Pass and Babbler Point, were closed to fishing in an effort to reduce the harvest of adult spawner chinook salmon bound for the Stikine River. The catch of 120 chinook salmon in 1978 shows that the new regulation has indeed reduced the sport angling mortality on Stikine River chinook salmon below the historical average.

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Prepared by:

Approved by:

Richard A. Marriott
Fishery Biologist

Rupert E. Andrews, Director
Sport Fish Division

Artwin E. Schmidt
Fishery Biologist

Mark C. Warner, Ph.D.
Sport Fish Research Chief

Darwin Jones
Fishery Biologist