

STATE OF ALASKA

*Jay S. Hammond, Governor*



Annual Performance Report for

HARVEST ESTIMATES OF  
SELECTED FISHERIES  
THROUGHOUT SOUTHEAST ALASKA

by

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## RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations  
of Alaska  
Project No.: F-9-9  
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, 1976 to June 30, 1977

## ABSTRACT

The contribution of chinook, Oncorhynchus tshawytscha (Walbaum), coho, O. kisutch (Walbaum), and pink salmon, O. gorbuscha (Walbaum), released from Juneau area salmon rearing facilities to the sport boat fishery in the Juneau area was determined by interviewing anglers during the period May 1 through October 15, 1976. An estimated 48 (2.2%) of the 2,206 chinook and 45 (0.6%) of the 7,646 coho salmon caught by anglers were reared at salmon rearing facilities in the Juneau area. No pink salmon from a rearing facility were observed during the sampling period.

The catch rate of chinook salmon by anglers in the Juneau area has declined from 1960 to 1976 from 0.206 to 0.065 chinook salmon per angler trip as compared to the increase in the catch rate of coho salmon in 1960 of 0.117 to 0.225 coho salmon per angler trip in 1976. There has been an increase in angler participation from 1959 to 1976 in the Juneau salmon derby of 3,511 to 8,466 angler validations. However, the catch rate of chinook and coho salmon during the derby has declined from 0.170 to 0.016 chinook salmon per angler trip and 0.246 to 0.063 coho salmon per angler trip.

The contribution of chinook and coho salmon released from the Starrigavan Bay Estuarine Rearing Facility to the Sitka area boat and Starrigavan Bay shoreline sport fisheries was determined by interviewing boat and shoreline anglers from July 1 to October 15, 1976. Of the 534 coho salmon caught by anglers in the Sitka area boat fishery, 17 (3.2%) were reared at the Starrigavan Bay facility. In the Starrigavan Bay shoreline fishery an estimated 46 (38.7%) of the 119 coho salmon caught by anglers were reared at the Starrigavan Bay facility. No marked chinook salmon were observed in the study.

The contribution of coho salmon produced from the Crystal Lake Hatchery to the Blind Slough area sport fisheries was determined from angler interviews during the period July 12 through September 30, 1976. Of the 22 coho salmon caught in the shoreline fishery an estimated 4 (18.1%)

and 162 (47.5%) of 341 coho salmon caught in the boat fishery were reared at the Crystal Lake Hatchery near Petersburg.

## BACKGROUND

### Juneau Area

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, Oncorhynchus tshawytscha (Walbaum) coho, O. kisutch (Walbaum), and pink salmon, O. gorbuscha (Walbaum), into Juneau area waters. A summary of released stocks expected to return to the Juneau area and contribute to the sport fishery is contained in Table 1.

To monitor the numbers of chinook and coho salmon returning to the Juneau area and to estimate the benefit derived by the anglers from the increased production by the Juneau area rearing facilities, a harvest study was conducted. The study was similar in design to that conducted in previous years to facilitate identification of trends in the Juneau area sport boat fishery.

The contiguous waters south of the line from Piling Point to Point Louis to the southern study boundary at the entrance of Taku Harbor was closed to chinook salmon fishing from April 15 to June 15, 1976. Thereafter the bag limit was one chinook salmon per day for anglers in the Juneau area (Figure 1).

### Sitka Area

Sitka area chinook and coho salmon stocks continue to be supplemented since 1963 by smolt releases from the Starrigavan Bay facility. A summary of released stocks expected to return to the Sitka area (Figure 2) and contribute to the sport fishery is contained in Table 2. With the increased production and releases from the Starrigavan Bay facility an additional season's data was required to make an evaluation of the benefit that anglers were deriving from the supplement of chinook and coho salmon to the wild stocks. The boat harvest study and the shoreline study at Starrigavan Bay were determined to be important to get a representative sample and estimate the contribution of the Starrigavan Bay facility to the Sitka area sport fisheries.

### Petersburg Area

Chinook and coho salmon stocks in the Petersburg area were supplemented by smolt releases from the Crystal Lake Hatchery. The hatchery, because of its location at the head of Blind Slough on Wrangell Narrows, contributes to the shoreline and boat sport fishery located at the mouth of the slough (Figure 3). After the facility began production and release of smolt a measure was needed to estimate the benefit that Petersburg area anglers were receiving from the salmon stocks returning to Crystal Lake Hatchery. Considerable speculation arose in 1975 over whether

Table 1. Summary of salmon releases from Juneau area rearing facilities to the Juneau area saltwater sport fishery.

<u>Salmon Species</u>	<u>Year Released</u>	<u>Facility or Release Site</u>	<u>Identifiable Mark</u>	<u>Percent Marked</u>	<u>Total Released</u>
Chinook	1974	Mendenhall Lakes	Ad <sup>1</sup>	42.4	93,129
Chinook	1974	Mendenhall Lakes	1/2 D <sup>2</sup>	100.0	124,309
Coho	1973	Mendenhall Lakes	Ad <sup>1</sup>	30.5	81,425
Coho	1974	Mendenhall Lakes	RV <sup>3</sup>	33.2	3,904
Coho	1974	Mendenhall Lakes	Ad + CWT <sup>4</sup>	30.2	50,200
Coho	1974	Mendenhall Lakes	Ad + 1/2 D <sup>5</sup>	100.0	46,479
Coho	1974	Fish Creek	Ad + CWT <sup>6</sup>	100.0	11,555
Coho	1974	Fish Creek	Ad + CWT <sup>7</sup>	100.0	12,565
Coho	1975	Salmon Creek	Ad + 1/2 D <sup>5</sup>	100.0	12,793
Coho	1975	Sheep Creek	Ad + 1/2 D <sup>5</sup>	100.0	15,264
Pink	1975	Auke Creek	Ad + LV <sup>8</sup>	100.0	27,500
Pink	1975	Auke Creek	Ad + RV <sup>9</sup>	100.0	18,000
Pink	1975	Auke Creek	LV + 1/2 D <sup>10</sup>	100.0	27,500
Pink	1975	Auke Creek	RV + 1/2 D <sup>11</sup>	100.0	6,500
Pink	1975	Auke Creek		0	1,267,298

<sup>1</sup>Adipose finclip.

<sup>2</sup>Half dorsal finclip.

<sup>3</sup>Right ventral finclip.

<sup>4</sup>Adipose finclip and implanted micro wire tag (binary code 4-2-6).

<sup>5</sup>Adipose and half dorsal finclips.

<sup>6</sup>Adipose finclip and implanted micro wire tag (binary code 4-2-13).

<sup>7</sup>Adipose finclip and implanted micro wire tag (binary code 4-2-12).

<sup>8</sup>Adipose and left ventral finclips.

<sup>9</sup>Adipose and right ventral finclips.

<sup>10</sup>Left ventral and half dorsal finclips.

<sup>11</sup>Right ventral and half dorsal finclips.

# JUNEAU AREA SPORT FISHERY

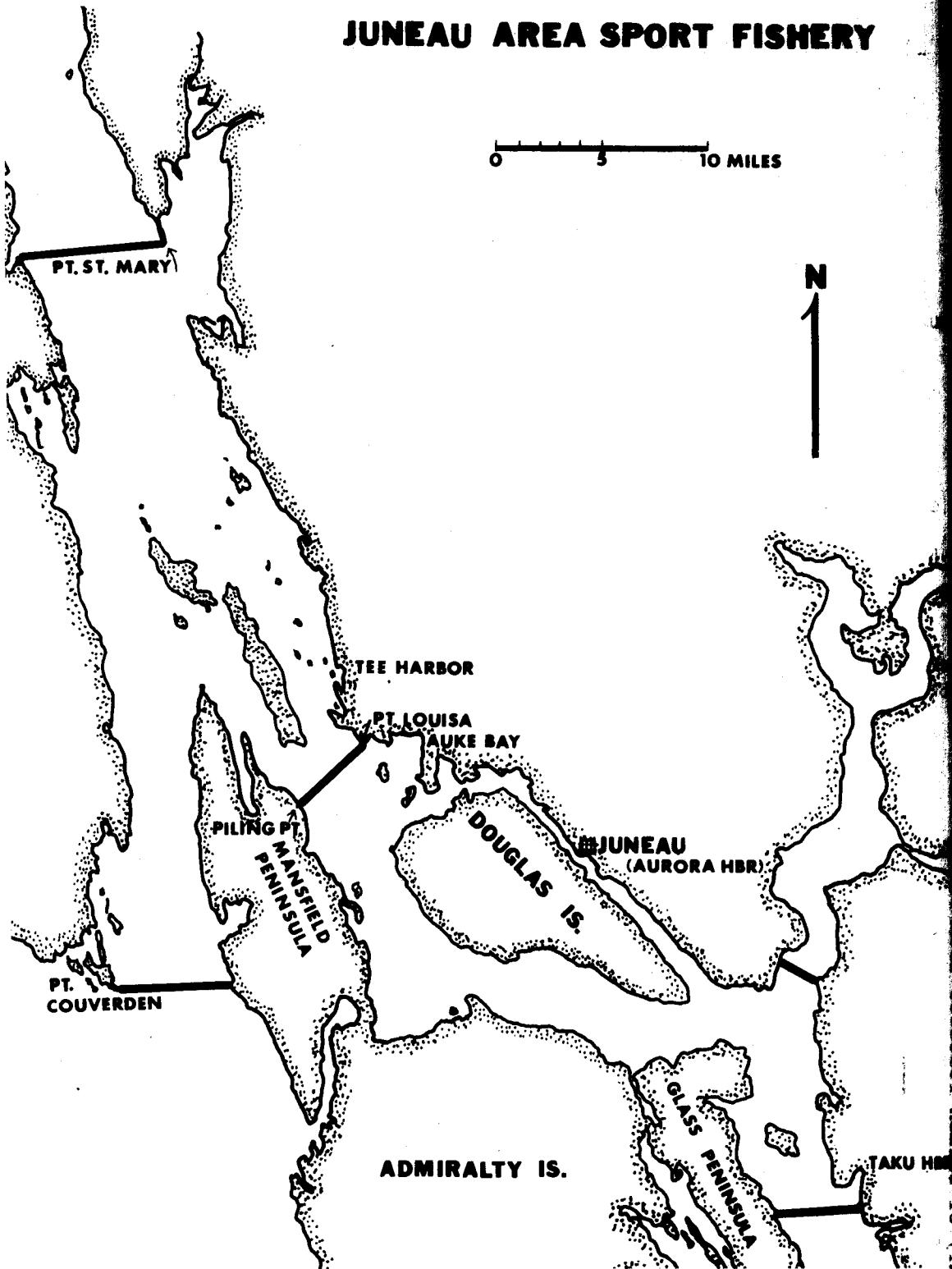


Figure 1. Map of Juneau area sport fishery. The contiguous waters south of the line from Piling Point to Point Louisa to the southern study boundary at the entrance of Taku Harbor was closed to chinook salmon fishing from April 15 to June 15, 1976. There the bag limit was one chinook salmon per day for anglers in the Juneau area.

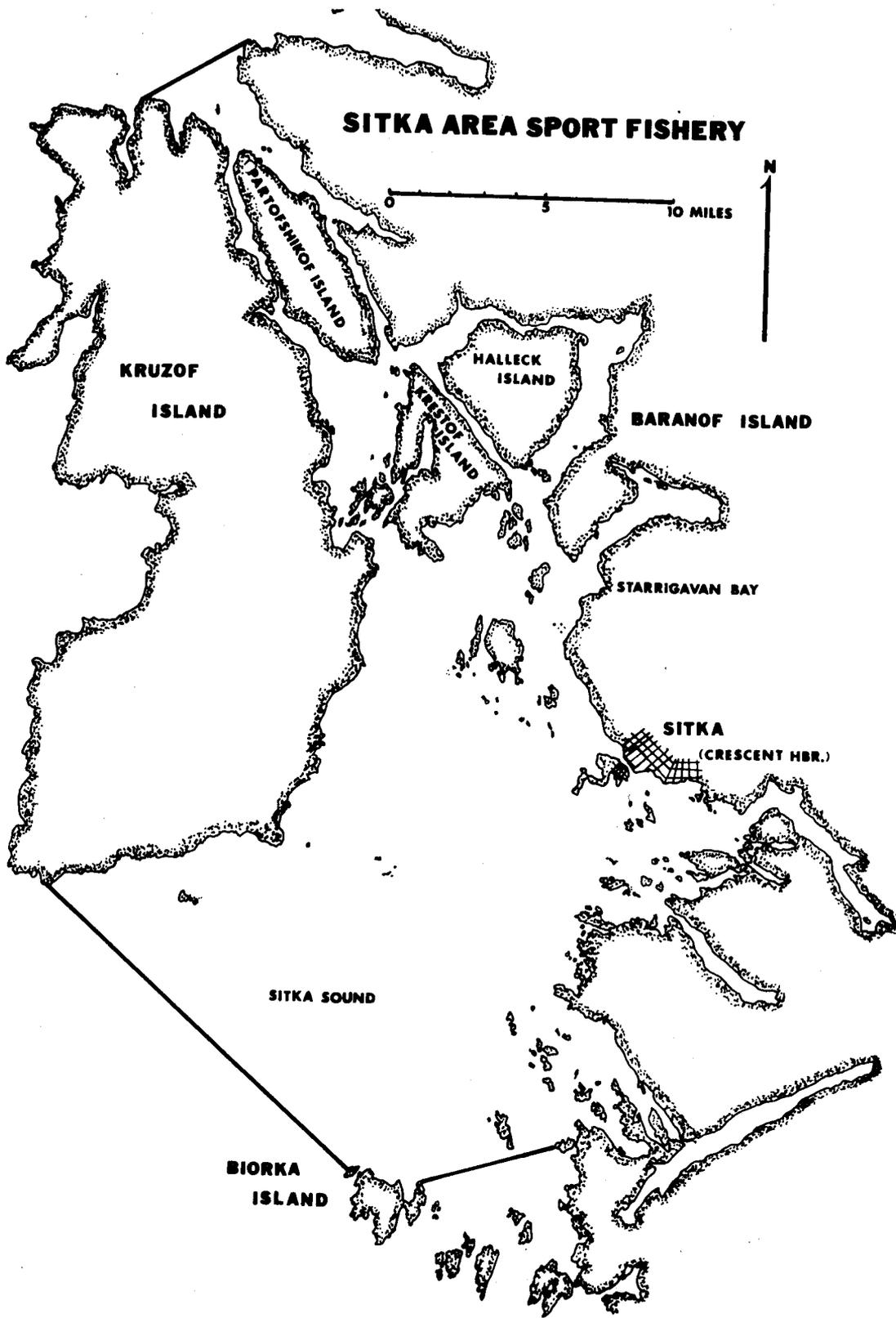


Figure 2. Map of Sitka area and Starrigavan Bay shoreline sport fisheries.

Table 2. Summary of salmon releases from Starrigavan Bay Estuarine Release Facility to the Sitka and Starrigavan Bay sport fisheries.

<u>Salmon Species</u>	<u>Year Released</u>	<u>Facility</u>	<u>Identifiable Mark</u>	<u>Percent Marked</u>	<u>Total Released</u>
Chinook	1975	Starrigavan	Ad + CWT*	69.7	2,060
Coho	1975	Starrigavan	Ad + CWT**	35.1	121,290

\*Adipose finclip and implanted micro wire tag (binary code 4-1-10).

\*\*Adipose finclip and implanted micro wire tag (binary codes 4-2-8, 4-2-10, 4-2-11, or 4-2-14).

# BLIND SLOUGH AREA SPORT FISHERY

2 Miles

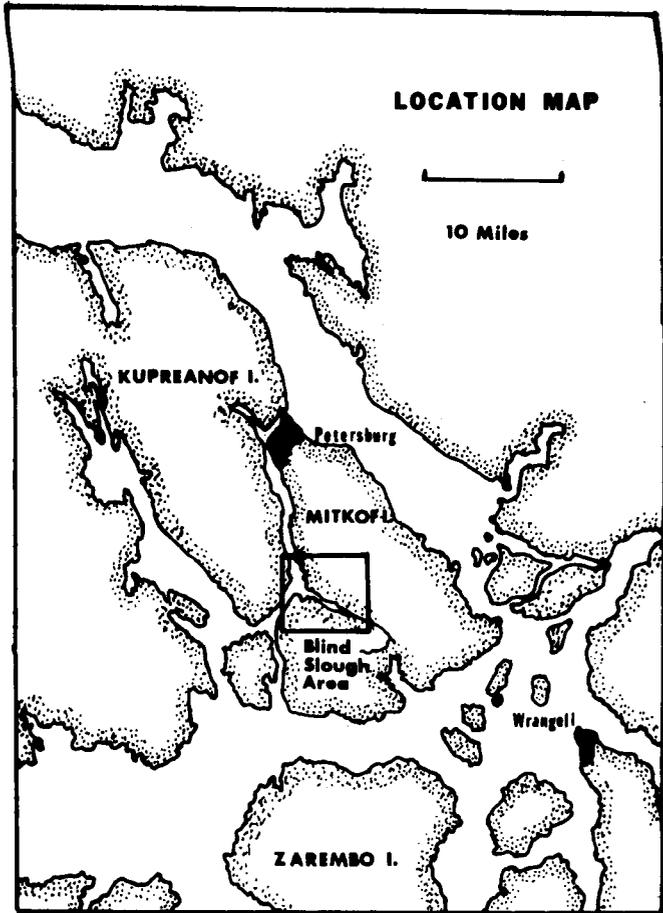
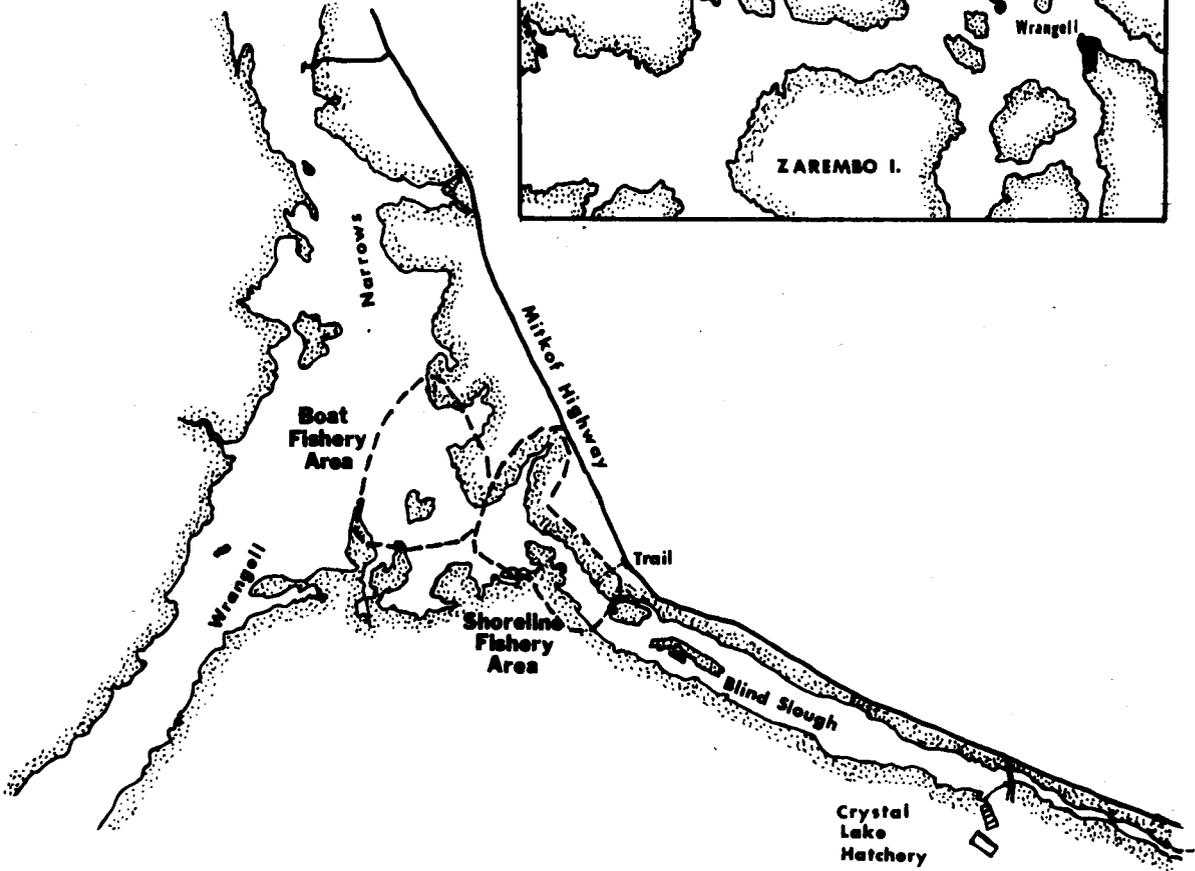


Figure 3. Map of Blind Slough area sport fishery.

anglers should be allowed to fish this area or whether the slough should be closed to assure the escapement of salmon to the hatchery. Before a management prescription could be formulated a harvest study was requested to evaluate the affect angler pressure had upon the returning salmon stocks. A summary of facility reared coho salmon released to the Blind Slough area sport fishery is as follows:

<u>Salmon Species</u>	<u>Year Released</u>	<u>Facility</u>	<u>Identifiable Mark</u>	<u>Percent Marked</u>	<u>Total Released</u>
Coho	1975	Crystal Lake	Ad + 1/2 D*	100.0	448,93

\*Adipose and half dorsal finclips.

## RECOMMENDATIONS

### Research

1. The contribution of facility-reared salmon to the Juneau area sport fishery should be determined. The sample period should be from May through October so that salmon stocks frequenting Juneau can be sampled.
2. The angling quality of facility-reared salmon should be further evaluated with the appropriate wild species stock to determine if a significant difference exists.
3. The Sitka area boat, Starrigavan Bay shoreline, and Blind Slough sport fisheries should be studied in 2- or 3-year cycles or sooner if a resource conflict is anticipated.

## OBJECTIVES

1. Determine the saltwater sport catch and angler effort in the Juneau area and to further determine the contribution of coho and king salmon produced from the Mendenhall Lakes Rearing Facility and the Fish Creek Rearing Facility to the Juneau area saltwater sport fishery.
2. Determine the saltwater sport catch, angler effort, and the contribution of coho and king salmon produced from the Starrigavan Rearing Facility to the Sitka area sport fishery.
3. Determine the saltwater sport catch, angler effort, and the contribution of salmon produced from the Crystal Lake Hatchery to the Blind Slough area sport fishery.

## TECHNIQUES USED

### Juneau Area Sport Harvest Study

#### Saltwater Sport Harvest Study:

Anglers fishing from boats in the Juneau area (Figure 1) 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 1 through October 15, at Tee Harbor from June 6 through September 30, and at Aurora Harbor from June 13 through September 30.

During each week the study was conducted on two randomly selected weekdays and both weekend days. If a holiday occurred during a week, it was included with the weekend days; and two of these days were then randomly selected for sampling. Anglers were interviewed on 44 (38%) of the 116 weekdays and 45 (92%) of the 49 weekend-holidays from May 1 through October 15, 1976. Anglers were interviewed during the hours 1300 through 2200 on a sampled day. The study design was similar to the study conducted in 1975 (Robards, 1976).

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 were counted from an aircraft during a 1.5-hour period randomly selected between 1300-2200 hours. During the study period eight counts were made during weekdays, and eight counts were made during weekend-holidays.
2. The number of recreational parties that were interviewed and had been out in the Juneau area during the time of a count was noted.
3. A mean ratio of the number of recreational boats counted to the number of the boats interviewed was then calculated separately for weekday and weekend-holidays.
4. The number of anglers; hours spent fishing; fish kept by species; and the number of marked and unmarked chinook, coho, and pink salmon kept (Table 3) were summed for weekdays and weekend-holidays. These sums were then multiplied by the appropriate mean ratio. These estimates were then weighted appropriately for weekdays and weekend-holidays and summed to comprise the estimates of angler effort and catch for the study period.

All chinook salmon specimen data were forwarded to the chinook salmon project leader for his information. Data collected from chinook and coho salmon determined to be from the Mendenhall Lakes facility was forwarded to that project leader for his information.

Table 3. Summary of marked salmon observed and estimated contribution of rearing facilities in the Juneau area saltwater sport fishery, May 1, 1976 - October 15, 1976.

<u>Salmon Species</u>	<u>Rearing Facility or Release Site</u>	<u>Mark/Tag Combination</u>	<u>Marks Sampled</u>	<u>Estimate of Marks Caught</u>	<u>Facility Contribution<sup>1</sup></u>
Chinook	Mendenhall Lakes	Ad <sup>2</sup>	3	11	26
Chinook	Mendenhall Lakes	1/2 D <sup>3</sup>	2	22	22
Coho	Mendenhall Lakes	Ad + CWT <sup>4</sup>	1	4	13
Coho	Fish Creek	Ad + CWT <sup>5</sup>	1	4	4
Coho	unknown	Ad <sup>2</sup>	6	28	28
Coho	Mendenhall Lakes	Ad + 1/2 D <sup>2,3</sup>	0	0	0
Coho	Salmon Creek	Ad + 1/2 D <sup>2,3</sup>	0	0	0
Coho	Sheep Creek	Ad + 1/2 D <sup>2,3</sup>	0	0	0
Coho	Mendenhall Lakes	RV <sup>6</sup>	0	0	0
Pink	Auke Creek	Ad + LV <sup>7</sup>	0	0	0
Pink	Auke Creek	Ad + RV <sup>8</sup>	0	0	0
Pink	Auke Creek	LV + 1/2 D <sup>9</sup>	0	0	0
Pink	Auke Creek	RV + 1/2 D <sup>10</sup>	0	0	0

<sup>1</sup>Marked and unmarked salmon.

<sup>2</sup>Adipose finclip.

<sup>3</sup>Half dorsal finclip.

<sup>4</sup>Adipose finclip and implanted micro wire tag (binary code 4-2-6).

<sup>5</sup>Adipose finclip and implanted micro wire tag (binary code 4-2-12 or 4-2-13).

<sup>6</sup>Right ventral finclip.

<sup>7</sup>Adipose and left ventral finclips.

<sup>8</sup>Adipose and right ventral finclips.

<sup>9</sup>Left ventral and half dorsal finclips.

<sup>10</sup>Right ventral and half dorsal finclips.

## Golden North Salmon Derby:

The Golden North Salmon Derby was monitored at each judge's float. 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. All salmon observed were examined for any marks or tags, and the number of participating anglers was obtained from derby records (Figures 5 and 7; Table 8).

## Comparison of Juneau Area Saltwater Sport Harvests:

Study data from previous harvest studies conducted from 1960 through 1976 was standardized to compare trends in angler effort and catch success. Comparative seasonal and salmon derby mean catch per angler trip were presented for chinook and coho salmon. A summary was compiled from records of the Juneau salmon derby for the years 1959 through 1976 to illustrate trends in angler effort and catch success (Figures 6 and 8; Tables 6, 7, and 15).

## Sitka Area Sport Harvest Study

### Saltwater Harvest Study:

Anglers fishing from boats in the Sitka area (Figure 2) were interviewed as they returned to Crescent Harbor. Each angler party 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 and coho salmon kept.

Angler parties were interviewed at Crescent Harbor exclusively for the duration of the study. Anglers returning to other harbors were not contacted because of smaller numbers and less frequent recreation use of boats in those harbors.

During each week the study was conducted on two randomly selected weekdays and both weekend days. If a holiday occurred during a week, it was included with the weekend; and two of these days were then randomly selected for sampling. Anglers were interviewed on 31 (41%) of 76 weekdays and 32 (97%) of 33 weekend-holidays from July 1 through October 17, 1976. The study design was similar to the study conducted in 1975 (Robards, 1976).

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 Sitka area were counted from an aircraft during a 1.5-hour period randomly selected between 1300-2200 hours. During the study period four counts were made during weekdays, and five counts were made during weekend-holidays.
2. The number of recreational parties that were interviewed and had been out in the Sitka area during the time of a count was noted.

3. A mean ratio of the number of recreational boats counted to the number of those boat parties interviewed was then calculated separately for weekday and weekend-holidays.
4. The number of anglers, hours spent fishing, fish kept by species, and the number of marked and unmarked chinook and coho salmon were summed for weekdays and weekend-holidays. These sums were then multiplied by the appropriate mean ratio. These estimates were then weighted appropriately for weekdays and weekend-holidays and summed to comprise the estimates of angler effort and catch for the study period.

Data collected from chinook and coho salmon determined to be from the Starrigavan Bay facility was forwarded to that project leader for his information.

#### Starrigavan Bay Sport Harvest Study:

A shoreline sport harvest study was conducted in the Starrigavan Bay area (Figure 2) from July 1 through October 17, 1976. During the study 62 days (57%) were sampled of the 109 days in the sampling season. Anglers were interviewed after they had stopped fishing to determine the time they spent fishing, their catch success, and the species composition of their catch. All chinook and coho salmon were examined for marks or tags to determine if they were from the Starrigavan Bay facility.

The study was conducted using the sampling design described by Moyle and Franklin (1957) and similar to the 1975 study (Robards, 1976). On each sample day 9 (56%) of the available 16 daylight hours were sampled. Days in the season were stratified into weekdays and weekend-holidays. Two days were selected from each strata during each sample week. Selected days were sampled alternately during the early period 0700 to 1600 hours or the late period 1300 to 2200 hours. These periods were changed on August 24 to 0700 to 1600 hours for the morning period and 1200 to 2100 hours for the evening period. The sampling periods were changed again during September to 0800 to 1700 hours and 1100 to 2000 hours and during October to 0900 to 1800 hours and 1000 to 1900 hours, respectively, for the morning and evening periods.

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 were enumerated every hour. From these interval counts the estimated total number of angler trips was calculated for the census period by adding the number of anglers counted and dividing by the mean length of an angler trip in hours. Estimates of the number of fish caught and angler effort during the missing portion of each day were determined from the proportion of the number of anglers interviewed.

#### Blind Slough Area Sport Harvest Study

Shoreline and boating harvest studies were conducted in the Blind Slough area (Figure 3) from July 15 through September 30, 1976. During the study 45 (58%) of the 78 days in the season 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 coho salmon caught by sport fishermen were examined for marks or tags to determine if they were from the Crystal Lake Hatchery.

The sample design was changed from the design used in the Starrigavan Bay sport harvest study to one that was stratified around the high and low tide periods. McHugh et al. (1972) observed that angler effort was stratified such that the shoreline fishery occurred largely at high tide and the boating fishery occurred largely at low tide. The sampling schedule was then formed by first stratifying the 0700 to 2200 interval of each day from July 12 through September 13 into a low tide stratum, a high tide stratum, and a stratum defined as the remaining time stratum. This was accomplished by rounding the Ketchikan area tide table times to the nearly quarter hour, adding 30 minutes for the Blind Slough correction to the tables, and assigning this latter time as the midpoint of a 4-hour sampling period. If a day had two low tides or two high tides occurring in the 0700 to 2200 hour interval, the longer was assigned to the appropriate tidal stratum and the shorter was assigned to the remaining time stratum.

After stratification a random sample of two weekdays per week was chosen. On these weekdays and all weekend-holidays a shoreline harvest sample was assigned to the high tide stratum, and a boating harvest sample was assigned to the low tide stratum. For each of the four selected days of every week a random beginning time, rounded to the nearest quarter hour, was chosen for a 1-hour sample from the remaining time stratum. In the remaining time stratum a boating sample was randomly assigned to one of two chosen weekdays and to one of the chosen weekend days. A shoreline sample was assigned to the other weekday and weekend day selected for that week. To gain a representative sample of the number of anglers fishing in the boating and shoreline fisheries, an interval-count method was used whereby anglers fishing in a fishery were counted every hour. From these interval counts the estimated total number of angler trips was calculated for the study period by adding the number of anglers counted and dividing by the mean length of an angler trip in hours. Estimates of angler effort and catch success were then calculated for each strata (low tide, high tide, and remaining time for both weekdays and weekend-holidays), weighted appropriately, and summed for each fishery.

## FINDINGS

### Results

#### Juneau Area Saltwater Sport Harvest Study:

During the saltwater boat study an estimated 48 (2.2%) of the 2,206 chinook and 45 (0.5%) of the 7,646 coho salmon caught by anglers were reared at salmon rearing facilities in the Juneau area. The contribution of each facility was based upon the number of marked salmon that were observed during the study and is contained in Table 3.

An estimated 2,206 chinook, 7,646 coho, 496 pink, 186 chum, O. keta (Walbaum), and 162 sockeye salmon, O. nerka (Walbaum), were caught. In addition to the salmon, 205 trout and char, Salmo spp., and Dolly Varden Salvelinus malma (Walbaum); 1,018 Pacific halibut, Hippoglossus stenolepis Schmidt; and 395 other species (Pleuronectidae; Gadidae; and rockfish, Sebastes spp.) were caught by anglers during the sampling period (Table 4). The catch per angler trip was 0.065 for chinook, 0.225 for coho, 0.015 for pink, 0.005 for chum, and 0.005 for sockeye salmon; 0.006 trout and char; 0.030 Pacific halibut; and 0.012 for other species (Table 5).

#### Golden North Salmon Derby:

The Golden North Salmon Derby was conducted on July 23, 24, and 25, 1976. Derby officials recorded that 4,465 tickets were sold and that 8,466 dai validations were made. Derby participants entered 136 chinook, 536 coho, 58 pink, 4 chum, and 1 sockeye salmon for various prize categories. One marked chinook salmon was examined and determined to be from the Mendenhall Lakes facility.

During the derby anglers were also interviewed to determine if any fish they caught in the derby were not entered. From this "take home" sample an estimated 167 chinook, 1,135 coho, 96 pink, and 14 chum salmon; 36 Pacific halibut; 37 Dolly Varden; and 107 rockfish were kept and not entered in the derby. No tagged salmon were observed in this sample.

#### Comparison of Juneau Area Saltwater Sport Harvests:

Study data from harvest studies conducted in 1960 through 1976 were standardized in format comparable to Mattson (1975) to compare trends in seasonal parameters of interest.

Comparative seasonal and salmon derby mean catch per angler trip for chinook salmon are illustrated in Figures 4 and 5, respectively. Figures are standardized to consider only chinook salmon caught greater than or equal to 66 cm in total length. The angler catch of chinook salmon per angler trip in Figure 4 illustrates a sharp decline in catch rate from 1960 through 1962, a rise in 1963 and 1964, and commencing in 1965 a significant decline with occasional minor increases that has progressed to 1976. The regression line has a negative slope reflecting the decline in catch rate over the seasons 1960 through 1976. However, the regression line would appear to have a greater negative slope and better correlation if only the period from 1964 through 1976 was considered. The catch trend of chinook salmon in the salmon derby roughly approximates the line in Figure 5. There was considerable fluctuation between 1959 and 1965 and a significant decline from 1967 through 1976. However, the regression line reflects a negative slope. The catch rate for coho salmon is increasing, as shown in Figure 6. The slope of the regression line is positive. However, the slope of the line for the coho salmon catch rate in the Juneau derby is negative (Figure 7). This trend is probably due to increased numbers of anglers in the derby and crowding in good fishing areas.

Table 4. Estimate of angler effort and catch success during Juneau Area Sport Fishery, May 1, 1976 - October 15, 1976.

Period	1	2	3	4	5	6	7	8	9	10	11	12	13*
	<u>5/1- 5/2</u>	<u>5/3- 5/9</u>	<u>5/10- 5/16</u>	<u>5/17- 5/23</u>	<u>5/24- 5/30</u>	<u>5/31- 6/6</u>	<u>6/7- 6/13</u>	<u>6/14- 6/20</u>	<u>6/21- 6/27</u>	<u>6/28- 7/4</u>	<u>7/5- 7/11</u>	<u>7/12- 7/18</u>	<u>7/19- 7/25</u>
Angler Trips	248	252	260	514	580	1,889	1,713	2,626	1,091	952	2,721	1,631	539
Angler Hours	991	1,037	1,057	2,606	3,379	17,373	8,489	12,175	10,900	4,875	15,712	10,270	3,005
Chinook	27	31	23	90	77	212	259	396	154	59	244	112	16
Coho	0	0	0	0	8	8	39	89	184	124	588	311	158
Pink	0	0	0	0	0	0	0	0	8	0	58	75	0
Chum	0	0	0	0	0	0	0	0	48	0	8	8	0
Sockeye	0	0	0	0	0	0	0	8	55	95	0	0	0
Total Salmon	27	31	23	90	85	220	298	493	449	278	898	506	174
Trout and Char	0	0	0	0	0	4	4	58	58	31	23	19	0
Pacific Halibut	0	0	0	0	0	23	15	101	63	47	96	46	15
Other Species	4	0	0	0	0	47	8	23	0	0	4	0	0

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

Table 4. (Cont.) Estimate of angler effort and catch success during Juneau area sport fishery, May 1, 1976 - October 15, 1976.

<u>Period</u>	<u>14</u> <u>7/26-</u> <u>8/1</u>	<u>15</u> <u>8/2-</u> <u>8/8</u>	<u>16</u> <u>8/9-</u> <u>8/15</u>	<u>17</u> <u>8/16-</u> <u>8/22</u>	<u>18</u> <u>8/23-</u> <u>8/29</u>	<u>19</u> <u>8/30-</u> <u>9/5</u>	<u>20</u> <u>9/6-</u> <u>9/12</u>	<u>21</u> <u>9/13-</u> <u>9/19</u>	<u>22</u> <u>9/20-</u> <u>9/26</u>	<u>23</u> <u>9/27-</u> <u>10/3</u>	<u>24</u> <u>10/4-</u> <u>10/10</u>	<u>25</u> <u>10/11-</u> <u>10/15</u>	<u>Seasonal</u> <u>Total</u>
Angler Trips	2,684	3,518	2,630	2,389	3,633	1,936	1,333	309	215	211	46	0	33,920
Angler Hours	14,877	29,792	15,888	16,953	22,929	8,239	7,279	1,319	1,312	621	142	0	211,200
Chinook	98	90	93	97	74	39	11	0	4	0	0	0	2,206
Coho	709	503	1,317	1,181	1,164	606	468	151	27	11	0	0	7,646
Pink	43	39	74	152	19	28	0	0	0	0	0	0	496
Chum	4	8	4	31	20	51	4	0	0	0	0	0	186
Sockeye	4	0	0	0	0	0	0	0	0	0	0	0	162
Total Salmon	858	640	1,488	1,461	1,277	724	483	151	31	11	0	0	10,696
Trout and Char	8	0	0	0	0	0	0	0	0	0	0	0	205
Pacific Halibut	180	122	32	132	0	58	61	4	8	15	0	0	1,018
Other Species	38	0	176	4	0	80	11	0	0	0	0	0	395

Table 5. Juneau area sport catch per angler trip by fish species, May 1, 1976 - October 15, 1976.

Period	1 5/1- 5/2	2 5/3- 5/9	3 5/10- 5/16	4 5/17- 5/23	5 5/24- 5/30	6 5/31- 6/6	7 6/7- 6/13	8 6/14- 6/20	9 6/21- 6/27	10 6/28- 7/4	11 7/5- 7/11	12 7/12- 7/18	13* 7/19- 7/25
Sample Size (Angler Contacted)	65	55	66	114	125	415	354	564	455	176	592	396	34
Chinook Salmon/ Angler Trip	0.109	0.123	0.088	0.175	0.133	0.112	0.151	0.151	0.141	0.062	0.090	0.011	0.030
Coho Salmon/ Angler Trip	0.000	0.000	0.000	0.000	0.014	0.004	0.023	0.034	0.169	0.130	0.216	0.191	0.293
Pink Salmon/ Angler Trip	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.021	0.046	0.000
Chum Salmon/ Angler Trip	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.044	0.000	0.003	0.005	0.000
Sockeye Salmon/ Angler Trip	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.050	0.100	0.000	0.000	0.000
Total Salmon/ Angler Trip	0.109	0.123	0.088	0.175	0.147	0.116	0.174	0.188	0.412	0.292	0.330	0.310	0.323
Trout and Char/ Angler Trip	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.022	0.053	0.033	0.008	0.011	0.000
Pacific Halibut/ Angler Trip	0.000	0.000	0.000	0.000	0.000	0.012	0.009	0.038	0.058	0.049	0.035	0.028	0.028
Other Species/ Angler Trip	0.016	0.000	0.000	0.000	0.000	0.025	0.005	0.009	0.000	0.000	0.001	0.000	0.000

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

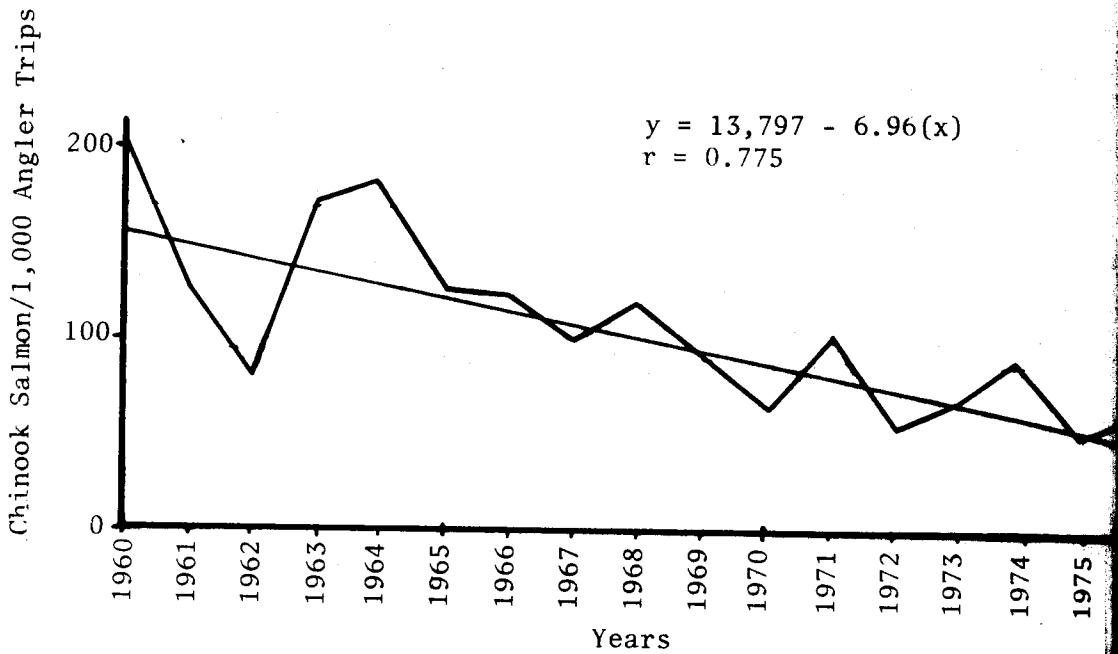


Figure 4. Trend in mean chinook salmon/1,000 angler trips in the Juneau area sport fishery, 1960-1976.

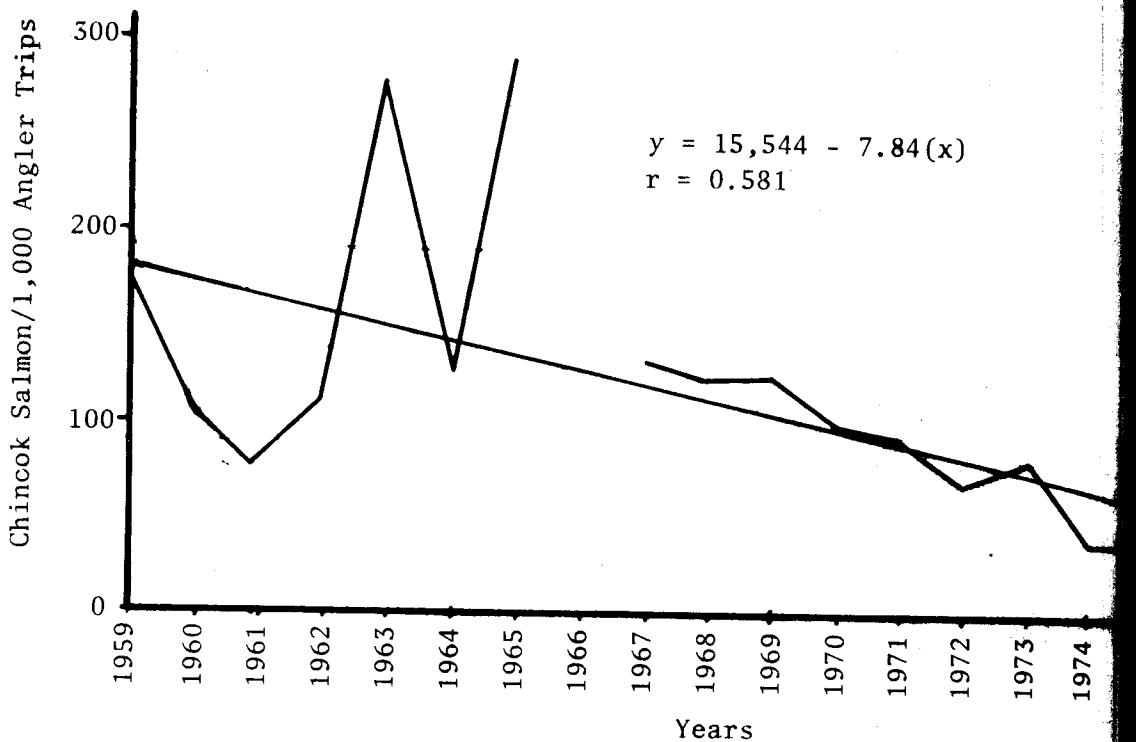


Figure 5. Trend in mean chinook salmon/1,000 angler trips during the North Salmon Derby, 1959-1976.

Table 5. (Cont.) Juneau area sport catch per angler trip by fish species, May 1, 1976 - October 15, 1976.

Period	14 7/26- 8/1	15 8/2- 8/8	16 8/9- 8/15	17 8/16- 8/22	18 8/23- 8/29	19 8/30- 9/5	20 9/6- 9/12	21 9/13- 9/19	22 9/20- 9/26	23 9/27- 10/3	24 10/4- 10/10	25 10/11- 10/15	Seasonal Mean
Sample Size (Anglers Contacted)	577	748	612	490	791	424	306	65	48	52	12	0	7,536
Chinook Salmon/ Angler Trip	0.037	0.026	0.035	0.041	0.020	0.020	0.008	0.000	0.019	0.000	0.000	0.000	0.065
Coho Salmon/ Angler Trip	0.269	0.143	0.501	0.494	0.320	0.313	0.351	0.489	0.126	0.052	0.000	0.000	0.225
Pink Salmon/ Angler Trip	0.016	0.011	0.028	0.064	0.005	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.015
Chum Salmon/ Angler Trip	0.002	0.002	0.002	0.031	0.006	0.026	0.003	0.000	0.000	0.000	0.000	0.000	0.005
Sockeye Salmon/ Angler Trip	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
Total Salmon/ Angler Trip	0.325	0.182	0.566	0.612	0.352	0.374	0.362	0.489	0.144	0.052	0.000	0.000	0.314
Trout and Char/ Angler Trip	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
Pacific Halibut/ Angler Trip	0.067	0.035	0.012	0.055	0.000	0.030	0.046	0.013	0.037	0.071	0.000	0.000	0.030
Other Species/ Angler Trip	0.014	0.000	0.067	0.002	0.000	0.041	0.008	0.000	0.000	0.000	0.000	0.000	0.012

19

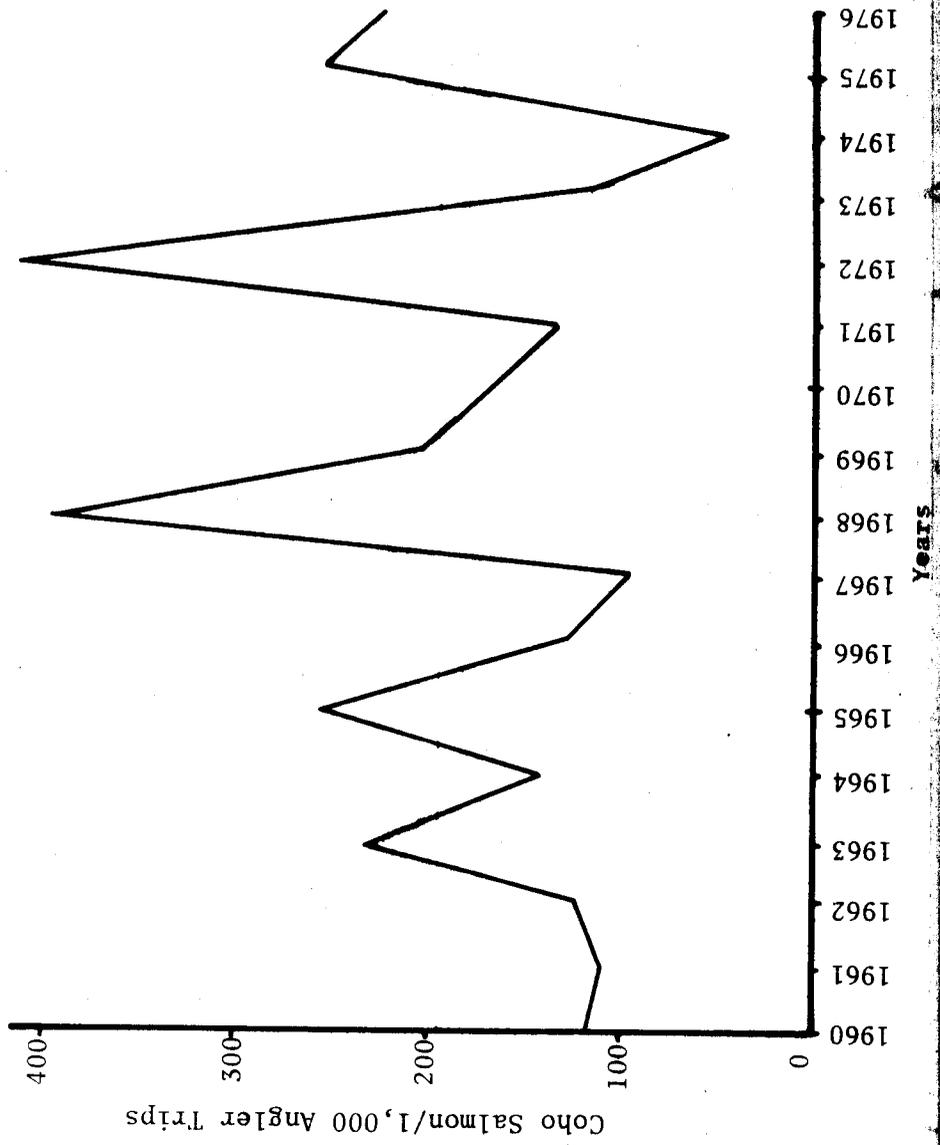


Figure 6. Trend in mean coho salmon/1,000 angler trips in the Juneau area sport fishery, 1960-1976.

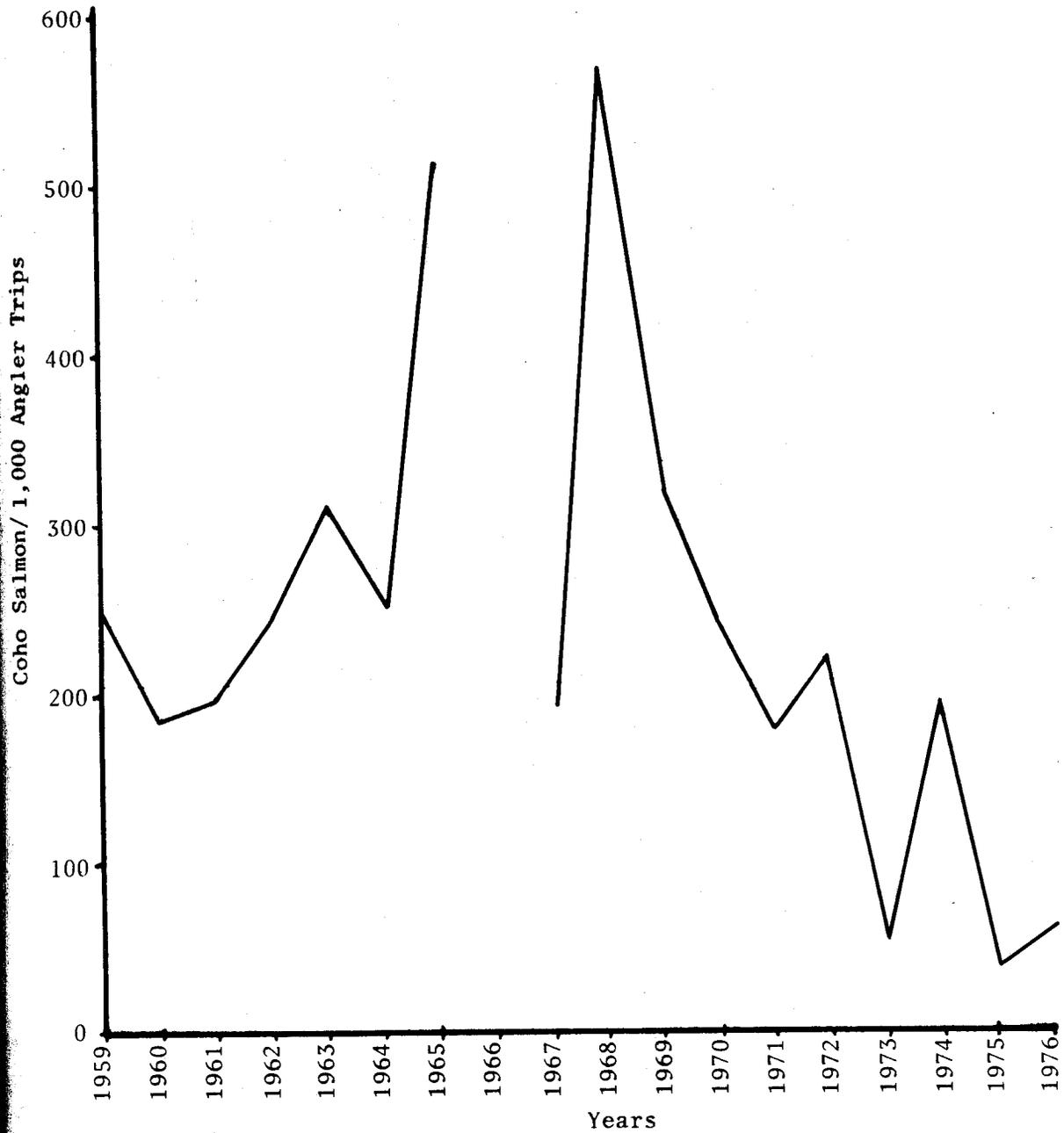


Figure 7. Trend in mean coho salmon/10,000 angler trips during the Golden North Salmon Derby, 1959-1976.

The mean length of chinook salmon caught that were equal to or greater than 66 cm total length measure varied considerably between 1960 and 1976. A somewhat cyclic 5-year pattern was evident in mean length commencing in 1961 (Figure 8).

The timing of chinook and coho salmon stocks fished upon by anglers in the Juneau area is reflected in Tables 6 and 7, respectively.

Variables in angler behavior have a decided effect upon these trends in the sport fishery although it is difficult to quantify their contribution. A direct influence can be seen in the effect of regulations. During the 1960, 1961, and 1962 seasons a minimum size of 66 cm (26") fork length measure for chinook salmon was in effect. A significantly lower measure of catch rate is reflected in Table 6, as anglers were regulated to take only those chinook salmon greater than 66 cm (26"), than if the regulation was not in effect. Restrictive regulations were again imposed from May 17 to June 15, 1975, when the closed area shown in Figure 1 was in effect to protect the migration of chinook salmon. On July 30, 1975, regulations were implemented to restrict the take of chinook salmon to only those equal to or greater than 66 cm total length measure and to restrict the take of all salmon species to two per day. The latter restriction is reflected in Table 6 during weeks 13 through 21. In 1976 the closed area was again in effect from April 15 through June 14, 1976; and the take of chinook salmon was regulated to one chinook salmon per day that must be equal to or greater than 66 cm (26") total length measure. These regulations are reflected in Table 6 as a low catch rate.

The comparative summary of the Juneau salmon derby in Table 8 shows a marked increase in angler participation. As the number of anglers increased, more coho and pink salmon were entered. Some chum and sockeye salmon were also entered as the number of participating anglers steadily increased. Since 1973 the number of salmon entered has declined significantly. A second sample was initiated during the 1975 derby to sample that portion of the catch that was not entered for prizes but was taken home. This "take home" catch has increased in size during the 1976 derby. The reason 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.

The decline in the catch rate of chinook and coho salmon by anglers during the derby, as reflected in Figures 5 and 7 and in Table 8, 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 who have a considerable effect on the low catch rate.

#### Sitka Area Saltwater Harvest Study:

In the boat study an estimated 17 (3.2%) of 534 coho salmon caught by anglers were reared at the Starrigavan Bay facility. This estimate was

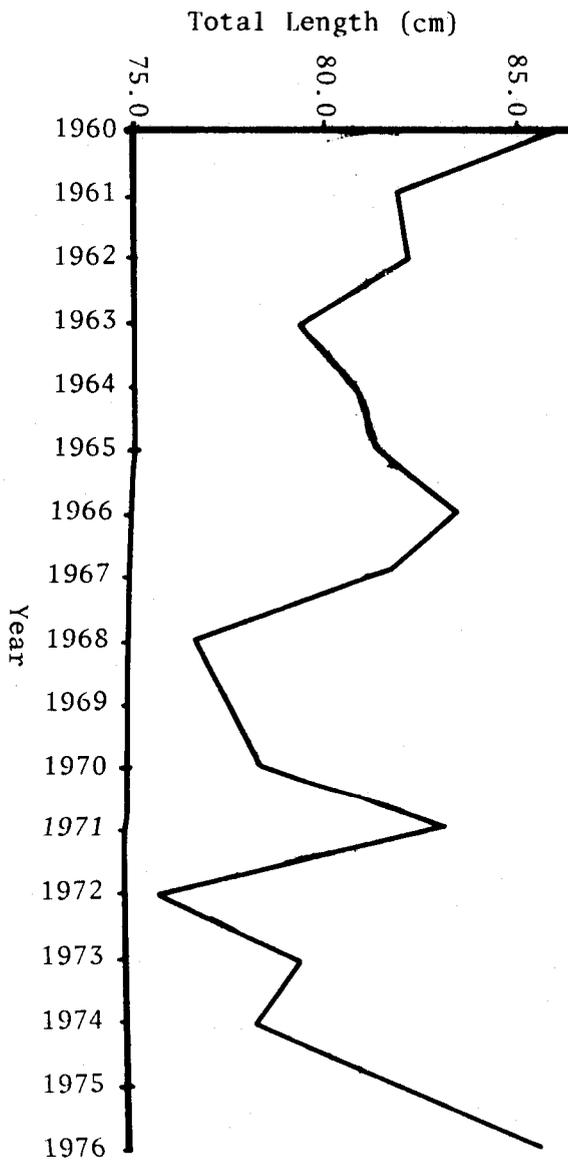


Figure 8. Seasonal trend in mean length of chinook salmon ( $\geq 66$  cm) caught in the Juneau area sport fishery, 1960-1976.

Period	1 5/1- 5/7	2 5/8- 5/14	3 5/15- 5/21	4 5/22- 5/28	5 5/29- 6/4	6 6/5- 6/11	7 6/12- 6/18	8 6/19- 6/25	9 6/26- 7/2	10 7/3- 7/9	11 7/10- 7/16	12 7/17- 7/23	13 7/24- 7/30	14 7/31- 8/6	15 8/7- 8/13	16 8/14- 8/20	17 8/21- 8/27	18 8/28- 9/3	19 9/4- 9/10	20 9/11- 9/17	21 9/18- 9/24	22 9/25- 10/1	23 10/2- 10/8	24 10/9- 10/15
1960	0.605	0.308	0.161	0.307	0.400	0.317	0.338	0.289	0.239	0.408	0.243	0.085	0.067	0.130	0.178	0.128	0.081	0.000	0.000					
1961	0.193	0.232	0.291	0.248	0.250		0.180	0.108	0.164	0.140	0.145	0.095	0.069	0.222	0.111	0.057	0.038	0.000						
1962		0.111	0.183	0.152	0.123	0.187	0.117	0.029	0.011	0.016	0.062	0.083	0.218	0.136	0.025	0.053	0.154	0.000						
1963	0.462	0.436	0.320	0.574	0.412	0.451	0.247	0.232	0.383	0.221	0.244	0.208	0.050	0.248	0.092	0.099	0.060	0.144	0.085	0.043				
1964	0.250	0.455	0.405	0.260	0.227	0.387	0.277	0.219	0.189	0.240	0.321	0.419	0.230	0.138	0.110	0.093	0.038	0.085						
1965		0.261	0.281	0.370	0.313	0.240	0.183	0.079	0.126	0.126	0.200	0.147	0.133	0.170	0.076	0.060	0.069	0.054						
1966	0.000	0.000	0.148	0.212	0.120	0.143	0.154	0.178	0.081	0.190	0.141	0.062	0.092	0.129	0.133	0.154	0.128	0.218						
1967	0.029	0.053	0.157	0.138	0.250	0.181	0.121	0.217	0.164	0.147	0.117	0.125	0.082	0.099	0.068	0.154	0.128	0.218						
1968					0.078	0.163	0.175	0.107	0.147	0.159	0.165	0.243	0.145	0.150	0.149	0.087	0.099							
1969					0.111	0.165	0.265	0.096	0.152	0.214	0.078	0.182	0.116	0.139	0.113	0.119								
1970					0.169	0.108	0.078	0.048	0.072	0.079	0.132	0.018	0.093	0.068	0.061	0.035	0.062							
1971	0.000	0.119	0.095	0.264	0.272	0.177	0.215	0.111	0.159	0.116	0.122	0.171	0.196	0.093	0.115	0.230	0.083	0.151	0.065					
1972					0.088	0.033	0.082	0.155	0.078	0.100	0.129		0.144	0.083	0.201	0.179	0.057	0.128	0.109					
1973	0.333	0.094	0.115	0.130	0.151	0.122	0.190	0.113	0.212	0.198	0.186	0.301	0.140	0.106	0.060	0.047	0.040	0.160						
1974		0.040	0.070	0.110	0.010	0.150	0.190	0.200	0.190	0.150	0.120	0.070	0.070	0.130	0.080	0.070	0.150	0.040	0.090					
1975	0.090	0.211	0.034	0.147	0.205	0.139	0.165	0.055	0.086	0.097		0.152	0.039	0.030	0.030	0.038	0.017	0.008	0.027	0.013	0.021			
1976	0.109	0.123	0.088	0.175	0.133	0.112	0.151	0.151	0.141	0.062	0.090	0.069	0.030	0.037	0.026	0.035	0.041	0.020	0.020	0.008	0.000	0.019	0.000	0.000

<u>Period</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>	<u>22</u>	<u>23</u>	<u>24</u>	
	<u>5/1-</u>	<u>5/8-</u>	<u>5/15-</u>	<u>5/22-</u>	<u>5/29-</u>	<u>6/5-</u>	<u>6/12-</u>	<u>6/19-</u>	<u>6/26-</u>	<u>7/3-</u>	<u>7/10-</u>	<u>7/17-</u>	<u>7/24-</u>	<u>7/31-</u>	<u>8/7-</u>	<u>8/14-</u>	<u>8/21-</u>	<u>8/28-</u>	<u>9/4-</u>	<u>9/11-</u>	<u>9/18-</u>	<u>9/25-</u>	<u>10/2-</u>	<u>10/9-</u>	
	<u>5/7</u>	<u>5/14</u>	<u>5/21</u>	<u>5/28</u>	<u>6/4</u>	<u>6/11</u>	<u>6/18</u>	<u>6/25</u>	<u>7/2</u>	<u>7/9</u>	<u>7/16</u>	<u>7/23</u>	<u>7/30</u>	<u>8/6</u>	<u>8/13</u>	<u>8/20</u>	<u>8/27</u>	<u>9/3</u>	<u>9/10</u>	<u>9/17</u>	<u>9/24</u>	<u>10/1</u>	<u>10/8</u>	<u>10/15</u>	
1960	0.000	0.000	0.000	0.000	0.000	0.029	0.013	0.005	0.005	0.028	0.024	0.066	0.067	0.481	0.259	0.391	0.245	0.667	0.171						
1961	0.000	0.000	0.000	0.000	0.000		0.000	0.007	0.020	0.027	0.180	0.174	0.219	0.444	0.111	0.341	0.437	0.400							
1962		0.000	0.000	0.000	0.000	0.000	0.000	0.108	0.016	0.005	0.038	0.108	0.092	0.256	0.465	0.424	0.628	0.667							
1963	0.000	0.000	0.000	0.000	0.000	0.019	0.043	0.018	0.063	0.135	0.197	0.242	0.550	0.476	0.621	0.832	0.648	0.568	0.729	0.702					
1964	0.000	0.000	0.000	0.006	0.004	0.011	0.007	0.027	0.153	0.182	0.214	0.173	0.314	0.621	0.452	0.444	0.614	0.623							
1965		0.000	0.000	0.000	0.120	0.020	0.038	0.029	0.065	0.178	0.272	0.426	0.313	0.564	0.555	0.527	0.511	0.514							
1966	0.000	0.000	0.000	0.000	0.007	0.004	0.000	0.023	0.000	0.194	0.172	0.113	0.246	0.250	0.348	0.508	0.340	0.294							
1967	0.000	0.000	0.000	0.000	0.002	0.000	0.010	0.051	0.035	0.110	0.075	0.107	0.066	0.258	0.454	0.256	0.394	0.217							
1968					0.000	0.000	0.214	0.504	0.281	0.325	0.463	0.545	0.435	0.775	0.684	0.575	0.982								
1969					0.000	0.002	0.051	0.037	0.078	0.122	0.044	0.182	0.214	0.402	0.479	0.278									
1970						0.017	0.006	0.008	0.009	0.150	0.103	0.206	0.219	0.207	0.367	0.377	0.401	0.383							
1971	0.000	0.000	0.000	0.000	0.004	0.013	0.015	0.031	0.049	0.060	0.183	0.145	0.299	0.392	0.404	0.351	0.256	0.374	0.848						
1972					0.000	0.000	0.089	0.302	0.358	0.361	0.392		1.235	0.592	0.479	0.504	0.332	0.698	0.465						
1973				0.002	0.005	0.036	0.025	0.029	0.054	0.145	0.115	0.086	0.098	0.191	0.268	0.254	0.427	0.392							
1974		0.000	0.012	0.005	0.000	0.012	0.018	0.071	0.198	0.281	0.366	0.346	0.478	0.469	0.466	0.502	0.604	0.401	0.723						
1975	0.000	0.000	0.000	0.000	0.018	0.021	0.010	0.010	0.116	0.140		0.185	0.402	0.215	0.315	0.669	0.378	0.292	0.407	0.417	0.303				
1976	0.000	0.000	0.000	0.000	0.014	0.004	0.023	0.034	0.169	0.130	0.216	0.191	0.293	0.264	0.143	0.501	0.494	0.320	0.313	0.351	0.489	0.126	0.052	0.000	

Table 7. Comparative coho salmon kept per angler trip during Juneau area sport fishery, 1960-1976.

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	7/24-7/26	3,511	599		862			0				
1960	7/29-7/31	3,479	361		650			19				
1961	n/a	2,818	221		551			22				
1962	7/27-7/29	2,033	226		490			7	10			
1963	7/26-7/28	2,229	617		695			115	12			
1964	7/31-8/2	4,940	624		1,246			297	5			
1965	7/23-7/25	1,598	454		821			16	4			
1966	7/22-7/24	n/a	795		290			92	33			
1967	7/28-7/30	3,228	431		633			144	27			
1968	8/2 -8/4	3,350	424		1,908			382	6			
1969	n/a	3,825	477		1,225			603	26			
1970	n/a	3,800	375		919			124	9			
1971	7/16-7/18	7,434	682		1,331			409	226			
1972	7/21-7/23	8,199	528		1,817			328	123			
1973	7/20-7/22	7,915	637		449			278	34			
1974	7/26-7/28	7,714	291		1,526			226	24			
1975	7/18-7/20	7,847	276	184	315	354	174	531	15	14	0	0
1976	7/23-7/25	8,466	136	167	536	1,135	58	96	4	12	1	0

Year	Pacific Halibut		Dolly Varden		Rockfish		Pacific Cod		Total		Total Catch
	Entered	Taken Home	Entered	Taken Home	Entered	Taken Home	Entered	Taken Home	Entered	Taken Home	
1959									1,461		
1960									1,030		
1961									794		
1962									733		
1963									1,439		
1964									2,172		
1965									1,295		
1966	35								1,215		
1967									1,235		
1968									2,720		
1969									2,331		
1970									1,427		
1971									2,648		
1972									2,796		
1973									1,398		
1974									2,067		
1975	0	142	0	21	0	57	0	14	780	1,317	2,037
1976	0	36	0	37	0	107	0	0	735	1,590	2,325

Table 8. (Cont.) Comparison of Golden North Salmon Derby angler effort and catch estimates, 1959-1976.

based upon two coho salmon observed in the study sample and the proportion of coho salmon marked. No marked chinook salmon were observed during the study period.

In the saltwater boat fishery an estimated 106 chinook, 534 coho, 378 pink, 25 chum, and 47 sockeye salmon; 98 trout and char; 170 Pacific halibut; and 512 other species were caught by anglers during the study period (Table 9). The mean catch per angler trip was 0.030 for chinook, 0.149 for coho, 0.106 for pink, 0.007 for chum, and 0.013 for sockeye salmon; 0.027 for trout and char; 0.048 for Pacific halibut; and 0.143 for other species (Table 10).

Anglers who fished the Starrigavan Bay shoreline caught an estimated 119 coho salmon of which 46 (38.7%) were determined to be from the Starrigavan Bay facility. The estimate was based upon four coho salmon observed in the study sample and the proportion of coho salmon marked. No marked chinook salmon were observed or voluntarily reported during the study period in this shoreline fishery.

During the study period an estimated 1,103 pink and 119 coho salmon and 35 Dolly Varden were caught by anglers (Table 11). The mean catch per angler trip was 0.492 for pink and 0.053 for coho salmon and 0.016 for Dolly Varden (Table 12).

#### Blind Slough Area Harvest Study:

An estimated 4 (18.1%) of 22 coho salmon caught in the shoreline fishery were marked coho salmon of Crystal Lake Hatchery origin. In the boat fishery an estimated 162 (47.5%) of 341 coho salmon caught were marked coho salmon, also from the hatchery. These estimates were based upon 2 marked coho salmon observed in the shoreline fishery and 103 marked coho salmon observed in the boat fishery.

In addition to the coho salmon noted above there were 69 Dolly Varden and 1 pink salmon noted in the catch (Table 13). The catch per angler trip was 0.553 for coho salmon in the boat fishery and 0.081 in the shoreline fishery, 0.256 for Dolly Varden, and 0.004 for pink salmon (Table 14).

#### Discussion

##### Juneau Area Saltwater Sport Harvest Study:

The numbers of chinook and coho salmon caught by anglers increased significantly over the 1975 season (Table 15). However, the contribution of facility-reared coho salmon was 67 (0.8%) of 7,646 coho salmon in the 1976 season compared to 286 (5.3%) of 5,394 coho salmon caught in the 1975 season. The decline in the estimate of facility coho salmon to the fishery appears to be complicated by possible low marine survival and by those coho salmon observed with an adipose finclip. Without the secondary mark their specific origin is unclear. These coho salmon may have been members of another marked group, or part of a group that strayed from another area, and subsequently lost their second mark or tag.

<u>Period</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>Seasonal</u>
	<u>7/1-</u>	<u>7/5-</u>	<u>7/12-</u>	<u>7/19-</u>	<u>7/26-</u>	<u>8/2-</u>	<u>8/9-</u>	<u>8/16-</u>	<u>8/23-</u>	<u>8/30-</u>	<u>9/6-</u>	<u>9/13-</u>	<u>9/20-</u>	<u>9/27-</u>	<u>10/4-</u>	<u>10/11-</u>	<u>Total</u>
	<u>7/4</u>	<u>7/11</u>	<u>7/18</u>	<u>7/25</u>	<u>8/1</u>	<u>8/8</u>	<u>8/15</u>	<u>8/22</u>	<u>8/29</u>	<u>9/5</u>	<u>9/12</u>	<u>9/19</u>	<u>9/26</u>	<u>10/3</u>	<u>10/10</u>	<u>10/17</u>	
Angler Trips	157	306	319	436	312	464	362	248	146	231	167	135	78	73	108	35	3,577
Angler Hours	625	1,392	552	1,415	1,850	1,516	1,236	1,032	464	640	514	412	183	270	285	168	12,554
Chinook	0	15	0	7	28	17	6	4	11	5	9	4	0	0	0	0	106
Coho	0	2	7	20	12	85	48	61	11	43	49	37	25	16	86	32	534
Pink	0	7	0	40	60	99	56	80	27	9	0	0	0	0	0	0	378
Chum	0	0	0	0	0	0	0	0	14	2	0	0	0	2	7	0	25
Sockeye	0	0	0	27	0	0	0	7	0	0	13	0	0	0	0	0	47
Total Salmon	0	24	7	94	100	201	110	152	63	59	71	41	25	18	93	32	1,090
Trout and Char	0	0	13	0	56	0	0	0	27	2	0	0	0	0	0	0	98
Pacific Halibut	4	31	20	24	28	14	12	2	4	9	13	0	0	2	7	0	170
Other Species	93	66	45	185	22	32	0	22	20	0	7	14	4	2	0	0	512

Table 9. Estimate of angler effort and catch during Sitka area sport fishery, July 1, 1976 - October 10, 1976.

<u>Period</u>	<u>1</u> <u>7/1-</u> <u>7/4</u>	<u>2</u> <u>7/5-</u> <u>7/11</u>	<u>3</u> <u>7/12-</u> <u>7/18</u>	<u>4</u> <u>7/19-</u> <u>7/25</u>	<u>5</u> <u>7/26-</u> <u>8/1</u>	<u>6</u> <u>8/2-</u> <u>8/8</u>	<u>7</u> <u>8/9-</u> <u>8/15</u>	<u>8</u> <u>8/16-</u> <u>8/22</u>	<u>9</u> <u>8/23-</u> <u>8/29</u>	<u>10</u> <u>8/30-</u> <u>9/5</u>	<u>11</u> <u>9/6-</u> <u>9/12</u>	<u>12</u> <u>9/13-</u> <u>9/19</u>	<u>13</u> <u>9/20-</u> <u>9/26</u>	<u>14</u> <u>9/27-</u> <u>10/3</u>	<u>15</u> <u>10/4-</u> <u>10/10</u>	<u>16</u> <u>10/11-</u> <u>10/17</u>	<u>Seasonal</u> <u>Mean</u>
Sample Size (Anglers Contacted)	31	100	58	74	81	54	49	78	46	84	63	8	23	97	57	54	
Chinook Salmon/ Angler Trip	0.000	0.049	0.000	0.016	0.090	0.037	0.017	0.016	0.075	0.022	0.054	0.03	0.000	0.000	0.000	0.000	0.030
Coho Salmon/ Angler Trip	0.000	0.007	0.022	0.046	0.038	0.183	0.133	0.246	0.075	0.186	0.293	0.274	0.321	0.219	0.796	0.914	0.149
Pink Salmon/ Angler Trip	0.000	0.023	0.000	0.092	0.192	0.213	0.155	0.323	0.185	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.106
Chum Salmon/ Angler Trip	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.096	0.009	0.000	0.000	0.000	0.027	0.065	0.000	0.007
Sockeye Salmon/ Angler Trip	0.000	0.000	0.000	0.062	0.000	0.000	0.000	0.028	0.000	0.000	0.078	0.000	0.000	0.000	0.000	0.000	0.013
Total Salmon/ Angler Trip	0.000	0.078	0.022	0.216	0.321	0.455	0.304	0.615	0.432	0.255	0.425	0.304	0.321	0.247	0.000	0.000	0.305
Trout and Char/ Angler Trip	0.000	0.000	0.041	0.000	0.179	0.000	0.000	0.000	0.185	0.009	0.000	0.000	0.000	0.000	0.861	0.914	0.027
Pacific Halibut/ Angler Trip	0.025	0.101	0.063	0.055	0.090	0.050	0.035	0.008	0.027	0.039	0.078	0.000	0.000	0.027	0.065	0.000	0.048
Other Species/ Angler Trip	0.149	0.216	0.141	0.424	0.071	0.069	0.000	0.089	0.137	0.000	0.042	0.104	0.051	0.027	0.000	0.000	0.145

Table 10. Estimate of sport catch per angler trip by species during Sitka area sport fishery, July 1, 1976 -

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Seasonal Total
	7/1- 7/4	7/5- 7/11	7/12- 7/18	7/19- 7/25	7/26- 8/1	8/2- 8/8	8/9- 8/15	8/16- 8/22	8/23- 8/29	8/30- 9/5	9/6- 9/12	9/13- 9/19	9/20- 9/26	9/27- 10/3	10/4- 10/10	10/11- 10/17	
Angler Trips	66	109	85	83	243	232	224	205	228	121	305	189	111	32	4	5	2,242
Angler Hours	154	255	199	194	569	543	524	480	534	283	714	442	260	75	9	12	5,247
Pink Salmon	0	0	5	28	65	179	276	175	183	55	80	57	0	0	0	0	1,103
Coho Salmon	0	0	0	0	0	0	0	0	0	15	48	53	3	0	0	0	119
Dolly Varden	6	18	5	0	6	0	0	0	0	0	0	0	0	0	0	0	35

Table 11. Estimate of angler effort and catch during Starrigavan Bay area shoreline sport fishery, July 1, 1976 - October 17, 1976.

<u>Period</u>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Seasonal Mean.
	<u>7/1- 7/4</u>	<u>7/5- 7/11</u>	<u>7/12- 7/18</u>	<u>7/19- 7/25</u>	<u>7/26- 8/1</u>	<u>8/2- 8/8</u>	<u>8/9- 8/15</u>	<u>8/16- 8/22</u>	<u>8/23- 8/29</u>	<u>8/30- 9/5</u>	<u>9/6- 9/12</u>	<u>9/13- 9/19</u>	<u>9/20- 9/26</u>	<u>9/27- 10/3</u>	<u>10/4- 10/10</u>	<u>10/11- 10/17</u>	
Sample Size (Anglers Contacted)	11	37	34	9	41	44	43	55	133	42	19	43	37	2	0	0	
Pink Salmon/ Angler Trip	0.000	0.000	0.059	0.333	0.268	0.773	1.233	0.855	0.805	0.452	0.263	0.302	0.027	0.000	0.000	0.000	0.492
Coho Salmon/ Angler Trip	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.119	0.158	0.279	0.000	0.000	0.000	0.000	0.053
Dolly Varden/ Angler Trip	0.091	0.162	0.059	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.016

Table 12. Estimate of sport catch per angler trip by species during Starrigavan Bay shoreline sport fishery, July 1, 1976 - October 17, 1976.

<u>Period</u>	<u>1</u> 7/15- 7/18	<u>2</u> 7/19- 7/25	<u>3</u> 7/26- 8/1	<u>4</u> 8/2- 8/8	<u>5</u> 8/9- 8/15	<u>6</u> 8/16- 8/22	<u>7</u> 8/23- 8/29	<u>8</u> 8/30- 9/5	<u>9</u> 9/6- 9/12	<u>10</u> 9/13- 9/19	<u>11</u> 9/20- 9/26	<u>12</u> 9/27- 9/30	<u>Seasonal Total</u>
Shoreline Fishery													
Angler Trips	12	12	6	6	27	17	39	23	59	28	41	0	270
Angler Hours	14	14	7	7	32	20	46	27	69	33	48	0	317
Pink Salmon	0	0	1	0	0	0	0	0	0	0	0	0	1
Coho Salmon	0	0	0	0	0	0	5	3	2	10	2	0	22
Dolly Varden	5	3	0	3	11	4	5	28	10	0	0	0	69
Boating Fishery													
Angler Trips	0	0	1	0	20	115	146	154	88	80	12	1	617
Angler Hours	0	0	2	0	23	135	171	180	103	94	14	2	724
Coho Salmon	0	0	0	0	3	39	48	79	80	90	2	0	341

Table 13. Estimate of angler effort and catch during Blind Slough area sport fishery, July 15 - September 30, 1976.

<u>Period</u>	<u>1</u> <u>7/15-</u> <u>7/18</u>	<u>2</u> <u>7/19-</u> <u>7/25</u>	<u>3</u> <u>7/26-</u> <u>8/1</u>	<u>4</u> <u>8/2-</u> <u>8/8</u>	<u>5</u> <u>8/9-</u> <u>8/15</u>	<u>6</u> <u>8/16-</u> <u>8/22</u>	<u>7</u> <u>8/23-</u> <u>8/29</u>	<u>8</u> <u>8/30-</u> <u>9/5</u>	<u>9</u> <u>9/6-</u> <u>9/12</u>	<u>10</u> <u>9/13-</u> <u>9/19</u>	<u>11</u> <u>9/20-</u> <u>9/26</u>	<u>12</u> <u>9/27-</u> <u>9/30</u>	<u>Seasonal</u> <u>Mean</u>
Shoreline Fishery													
Sample Size (Anglers Contacted)	9	8	5	6	10	8	23	7	28	12	26	0	
Pink Salmon/ Angler Trip	0.000	0.000	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Coho Salmon/ Angler Trip	0.000	0.000	0.000	0.000	0.000	0.000	0.120	0.143	0.030	0.040	0.009	0.000	0.081
Dolly Varden/ Angler Trip	0.444	0.250	0.000	0.500	0.400	0.235	0.120	0.714	0.171	0.000	0.000	0.000	0.256
Boating Fishery													
Sample Size (Anglers Contacted)	0	0	1	0	12	60	60	77	49	43	7	1	
Coho Salmon/ Angler Trip	0.000	0.000	0.000	0.000	0.170	0.340	0.330	0.510	0.900	1.130	0.130	0.000	0.553

Table 14. Estimate of sport catch per angler trip by species during Blind Slough area sport fishery.

<u>Year</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>
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
Chinook	1,065	828	520	2,234	2,780	1,634	2,726	1,599	3,075	2,141
Chinook ≥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 and 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 15. Comparative seasonal angler effort and catch for Juneau area sport fishery, May 1 - September 3, 1960 - 1976

<u>Year</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>Mean</u>	<u>Total</u>
Angler Trips	34,328	22,790	15,150	21,773	20,766	18,004	30,591	15,952	287,136
Angler Hours	127,349	98,792	58,473	93,304	112,865	91,527	156,793	72,434	1,303,808
Chinook	2,886	3,735	1,742	2,604	2,326	1,277	2,184	2,080	35,356
Chinook ≥ 66 cm	2,299	2,328	912	1,465	1,808	987	2,184	1,377	23,413
Coho	5,635	3,052	6,274	2,576	5,622	4,541	6,873	3,351	56,975
Pink	1,613	435	575	909	1,110	824	446	563	9,568
Chum	72	380	224	75	89	108	167	79	1,345
Sockeye	10	8	0	0	32	21	146	21	356
Total Salmon	10,216	7,610	8,815	6,164	9,179	6,771	9,816	6,093	103,576
Trout and Char	1,479	922	2,147	1,319	742	803	205	601	10,221
Pacific Halibut	4,043	1,450	1,833	3,098	1,366	756	915	1,809	30,746
Other Species	331	143	30	540	738	259	355	213	3,620

Table 15. (Cont.) Comparative seasonal angler effort and catch for Juneau area sport fishery, May 1 - September 3, 1960 - 1976.

The season catch estimates (Table 15) show considerable variation from week to week and year to year in the catch of a particular species and in comparing the catch of one species to another. Such considerations as regulations, angler preference, knowledge of a species, weather, access to a fishery, abundance of a species, and distribution of that species have considerable influence upon the catch success of an angling party. In addition to the abundance of a fish species, angler preference and knowledge of a particular species are important considerations in a mixed species fishery such as the Juneau area saltwater boating fishery. This phenomenon is well discussed in the literature of other mixed species fisheries (Grosslein, 1957; Neuhold and Lu, 1957; Lambou and Stern, 1959; von Geldern, 1972; and von Geldern and Tomlinson, 1973). It arises from the fact that anglers exercise considerable control over the species composition of their catch by any one or a combination of the following methods:

1. The angler can select a particular fishing site known to be frequented by a desired species.
2. An angling method, i.e. type of tackle, bait, handling of boat, and particular depth zone fish, that is efficient in catching the desired species.
3. The actual disposition of fish caught is directly influenced by the angler's preference. Those fish retained must then be of a desired species and desirable size, and all undesirable species will be returned to the water. Species caught of an undesirable size to the angler or not in compliance with regulations would also be returned to the water.

Therefore, using catch and effort of all anglers fishing in such a fishery as an index of fishing quality of a single species could produce a poor measure of angling quality for an individual species.

In evaluating the impact of the variables affecting the participation of an angler in a sport fishery only those anglers using relatively efficient angling methods for a species should actually be included in calculating a catch rate estimate for that species is argued by von Geldern and Tomlinson (1973).

Often the more knowledgeable and productive anglers achieve commercial status in order to further benefit from their angling activity. Becoming a commercial fisherman and utilizing sport gear or hand gurdies gives him added flexibility in becoming sport or commercial at his discretion. The commercial status benefits the fisherman with financial gain from his efforts. As these more productive sport fishermen become commercial, their effort and catch is not included in the presentation of sport catch, leaving a remaining population of anglers of varying knowledge, experience, species preference, and access to the fishery.

In previous years these "relatively efficient angling methods" have not been completely described for the Juneau area fishery and applied solely to a particular species but instead the reported angler effort has been

summed and applied to all species of fish caught and kept by anglers. This method of estimating angling quality would result in low estimates for different species for which angling techniques vary and significantly lower estimates for less desired species.

Consistent with their species preference, anglers will seek out their preferred species and will often hook and release undesirable species depending upon their catch success of the species for which they are angling. In a mail survey of anglers Schmidt and Robards (1974) reported the most preferred species in the Juneau area was chinook salmon, with coho second, although some ranked coho salmon first. The other three salmon species were ranked as pink salmon, third; chum salmon, fourth; and sockeye salmon, fifth. However, there was considerable disagreement in ranking of these three species by responding anglers. Trout, Dolly Varden, Pacific halibut, and other species were not considered in the rating. The findings of this poll would probably vary from one time period to another and certainly from angler to angler. Therefore a poor estimate of angling quality could result if only those fish that were retained in the angler's creel were utilized in calculation of angling quality. This behavior is thought to be infrequent among anglers with salmon due to their popularity in the fishery. However, with some members of the families Gadidae, Scorpaenidae, Cottidae, and Pleuronectidae that are regarded as undesirable it is a common occurrence.

Species preference has changed for many anglers due to the depleted stocks of chinook salmon in the Juneau area. Other species have been in increasing demand, particularly the coho salmon. Its popularity is probably due to its well-known tenacity while on the hook. Since the 1963, season anglers have shown an increasing preference for coho salmon (Table 15). Pink salmon have become a more important species in the angler's catch since 1962; however, are not quite as desired as the chinook and coho salmon. This is probably due to their smaller size. The chum salmon has also become more desired by anglers but is not often caught on sport tackle. The number of sockeye salmon in the sport catch is small and fluctuates considerably. This is due largely to the planktonic prey preference of sockeye salmon, and they seldom strike at sport tackle. Some anglers do successfully snag sockeye salmon in the Auke Creek area of Auke Bay. Dolly Varden are often caught as incidental catch to salmon, and infrequently a steelhead or sea-run cutthroat trout may be caught. Pacific halibut is preferred to salmon by some anglers. However, since 1970 there has been a marked decline in the sport catch of Pacific halibut (Table 15).

#### Sitka Area Saltwater Harvest Study:

The contribution of the Starrigavan Bay facility to the Sitka area coho fishery has increased significantly from 1975 to 1976. In the sport boat fishery there was an increase of 0 to 17 coho salmon, and the shoreline sport fishery in Starrigavan Bay increased from 16 to 46 coho salmon. The number of chinook salmon has declined from 4 to 0 in the Starrigavan Bay fishery.

The number of angler trips has declined somewhat from 2,273 in the 1975 season to 2,242 in the 1976 season. However, the effort of these anglers has increased significantly from 3,637 hours in 1975 to 5,248 hours in 1976. The catch of coho salmon increased from 87 to 119, pink salmon from 972 to 1,103, and Dolly Varden from 4 to 35. No chinook salmon were caught by anglers in the shoreline fishery.

With the increase in effort there was not a significant increase in catch, particularly of coho salmon, even with the greater contribution of facility-reared coho salmon. Many anglers who had fished the Starrigavan Bay shoreline in previous years reported that the coho salmon "just weren't biting like they used to bite." With the substantial contribution of facility-reared coho salmon (41.2%), this fishery may be changing in character to a situation similar to the phenomenon noted by the Washington Department of Fisheries (1972) that facility-reared salmon were not as liable to take an angler's hook as a salmon from a wild stock. Washington noted that the Puget Sound hatcheries had not greatly helped sport fishing in the inner Puget Sound area. At Starrigavan the anglers caught most coho salmon by snagging them; few were hooked in the mouth. This may account for the angling behavior of Starrigavan-reared coho salmon.

#### Blind Slough Area Harvest Study:

Angler effort and catch has declined from the catch reported in the 1971 study by McHugh et al. (1972). The number of angler trips has increased from 626 to 887; however, the hours spent angling has declined from 1,612 to 941. In comparing standardized sampling periods the catch of coho salmon has declined considerably from 443 to 319. No cutthroat trout, Salmo clarki Richardson, were caught in the harvest; however, 242 were estimated caught in the 1971 study. There was also a considerable decline in the catch of Dolly Varden from 296 in the 1971 study to 69 in 1976.

The decline in the number of coho salmon caught may be due in part to the extensive use of the Blind Slough coho salmon stock by the Crystal Lake Hatchery as an egg take source for rearing and subsequent transplant to other systems throughout southeast Alaska. The same hypothesis could also be advanced for Blind Slough as for Starrigavan Bay coho salmon stocks. The Blind Slough coho salmon fishery may be changing in character to the situation noted by the Washington Department of Fisheries (1972) of facility-reared salmon not being as liable to take an angler's hook as a wild stock salmon.

A probable source of error in estimating the return of facility-reared salmon stock to a sport fishery is the use of the tag vs untagged ratio to estimate the total contribution based upon the recovery of tagged individuals. The determination of the catch of an unmarked salmon from a stock is dependent upon the catch of a marked salmon. If the marking mortality is significant for a marked salmon, then a source of error is inherently present in the estimated catch of individuals from that stock.

If this difference in angling quality could be negated or quantified, the number of marked salmon in a released stock would have to be substantial. This needs to be further evaluated.

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