

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-9-13

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

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

Cooperator: Mark W. Schwan

Period Covered: July 1, 1980 to June 30, 1981

## ABSTRACT

Juneau Area - Marine

In order to estimate the sport fishing effort and harvest by Juneau area anglers and to determine the contribution of facility reared chinook salmon to this sport fishery, a creel survey program was conducted from May 1 through September 29, 1980. Two creel technicians interviewed returning boat anglers at local harbors and boat ramps according to a prearranged sampling schedule. Interviews were oriented toward obtaining information on effort and catch by the anglers contacted. Additional information was also gathered.

Periodic aerial surveys were conducted over the entire marine sport fishing harvest area in order to assess total boat fishing activity during the survey season. Dockside interview data and aerial boat count data were analyzed and coordinated and estimates of total effort and catch were generated.

Juneau area marine boating anglers expended an estimated 271,395 angler hours of effort to catch: 5,075 legal size ( $\geq 711$  mm) chinook salmon, Oncorhynchus tshawytscha (Walbaum); 9,417 coho salmon, O. kisutch (Walbaum); 4,749 pink salmon, O. gorbuscha (Walbaum); 461 chum salmon, O. keta (Walbaum); 977 Dolly Varden, Salvelinus malma (Walbaum); 10,123 Pacific halibut, Hippoglossus stenolepis Schmidt; and 3,767 other demersal fishes (Pleuronectidae, Scorpaenidae, Hexagrammidae, and Gadidae).

Facility released chinook salmon contributed approximately 6.7 percent of the chinook salmon captured in the Juneau marine sport fishery. The Andrews Creek 1976 brood, reared at Crystal Lake Hatchery and released in Blind Slough near Petersburg, Alaska, was the single largest contributing hatchery stock to the Juneau sport fishery.

Table 1. List of common names, scientific names, and abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Pink salmon	<u>Oncorhynchus gorbuscha</u> (Walbaum)	PS
Chinook salmon	<u>Oncorhynchus tshawytscha</u> (Walbaum)	KS
Chum salmon	<u>Oncorhynchus keta</u> (Walbaum)	CS
Coho salmon	<u>Oncorhynchus kisutch</u> (Walbaum)	SS
Sockeye salmon	<u>Oncorhynchus nerka</u> (Walbaum)	RS
Dolly Varden	<u>Salvelinus malma</u> (Walbaum)	DV
Rainbow trout	<u>Salmo gairdneri</u> Richardson	RT
Steelhead	<u>Salmo gairdneri</u> Richardson	SH
Cutthroat trout	<u>Salmo clarki</u> Richardson	CT
Brook char	<u>Salvelinus fontinalis</u> (Mitchell)	BT
Arctic grayling	<u>Thymallus arcticus</u> (Pallas)	GR
Pacific halibut	<u>Hippoglossus stenolepis</u> Schmidt	H
Flounder	<u>Pleuronectidae</u> spp.	FF
Sablefish	<u>Anaplopoma fimbria</u> (Pallas)	
Rockfish	<u>Sebastes</u> spp.	RF

The 34th Golden North Salmon Derby was held on August 22, 23, and 24, 1980. There were 7,386 angler validations for the 3 days of Derby fishing. Estimates of salmon entered and taken home were as follows: chinook, 271 entered and 206 taken home; coho, 694 entered and 1,583 taken home; pink, 67 entered and 145 taken home; and chum, 97 entered and 33 taken home. In addition to the salmons, an estimated 502 halibut and 95 other demersal fishes were taken home during the Derby.

#### Juneau - Roadside

One creel technician drove the Juneau area roadway interviewing and counting anglers from June 1 through August 31, 1980. The technician worked on a prearranged schedule similar to the marine sampling program.

The roadside effort during June, July, and August of 1980 was only 64 percent of the sport effort during these months in 1979. The catch rate for Dolly Varden, .117 fish per angler-hour, was nearly identical to the catch rate during 1979, but the harvest of Dolly Varden in 1980 was 54 percent below the harvest in 1979.

Other facets of the roadside fishery also continue to be depressed. Regulatory management is probably not sufficient for revitalizing this fishery. Put-and-take fisheries, a major Dolly Varden enhancement project, and construction of one or more covered fishing piers, are all possible options for improving angler recreation along the Juneau road system.

#### BACKGROUND

Allocation of resources to multiple user groups often presents problems for resource managers. In the Juneau area, there has been a long history of user conflicts and increasing angling pressure on fish stocks. Marriott et al. (1979) documented these problems in the Juneau sport fishery and also succinctly described the trend in the sport fishery regulations toward more restrictive bag and possession limits.

Creel sampling programs have been implemented for estimating the angling effort and catch by sport anglers and for determining the contribution of salmon from enhancement projects in the Juneau area to the saltwater sport fishery (see Robards, 1976; 1977; 1978; Marriott et al., 1979; Schwan, 1980). The Juneau boat sport fishery should continue to be monitored because of possible allocation conflicts among different user groups. Allocation problems cannot be resolved, or even clearly elucidated, if the harvest of a resource by a particular user group goes unmeasured.

#### RECOMMENDATIONS

##### Research

1. The Juneau marine survey should continue in 1981. The sampling period should be from May 1 through September 30.

2. Tag recovery and analysis should continue. Wild and hatchery chinook and coho salmon will be contributing to the Juneau sport fishery in 1981.
3. The sport harvest of marine demersal fishes should continue to be monitored. Many of these species are slow growing and long lived and some species of rockfish exhibit strong home site preference. These attributes could facilitate rapid stock depletion resulting from excessive fishing pressure.
4. The Juneau roadside creel survey need not be conducted in 1981. However, on-site creel surveys will be required in future years on a continuing basis, especially once Dolly Varden enhancement programs become operational. Shoreline creel sampling will need to be intensified; supplementation of harvest data via the statewide questionnaire will be necessary.

#### Management

1. In the Juneau area, the one chinook salmon daily bag and possession limit should continue in effect. Furthermore, the area north of the latitude of Limestone Inlet (south side) to a line from Point Louisa to Piling Point should remain 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 age classes of the Taku chinook stocks can increase in population size.
2. As information is gathered concerning the sport harvest of marine demersal fishes, it may be necessary to create bag and possession limits for many of these species. There are data from other westcoast areas indicating that many demersal species have been severely impacted by recreational harvesting.
3. The Juneau roadside fishery is depressed and in need of enhancement. Regulatory management is not adequate for rebuilding this fishery. Put-and-take fisheries, a major Dolly Varden enhancement project, and construction of one or more covered fishing piers, are all possible options for improving angler recreation along the Juneau road system.

#### OBJECTIVES

- i. Determine the saltwater boating angling effort and catch of fishes in the Juneau area, which includes estimating the contribution of fishes to this fishery from various wild and artificial stocks marked with coded wire tags. These stocks include chinook salmon from the Taku River, and from various enhancement facilities, and coho salmon from the Auke Lake system. In addition, determine the catch, sex, and maturity of chinook salmon less than 71 cm in length during the periods of legal take granted by the Board of Fisheries.

2. Determine the saltwater boating angler's species preferences.
3. Determine the angler effort and catch in the Juneau area roadside sport fishery. Determine the effect on harvest of the new regulations reducing the season and the bag and possession limits on Dolly Varden taken in the Juneau area.

#### TECHNIQUES USED

##### Methods - Juneau Recreational Harvest Study

##### Marine Boat Recreational Harvest Study:

Saltwater anglers fishing from boats were interviewed upon their return to local harbors and boat ramps from May 1 through September 30, 1980. Boating parties were asked if they had engaged in recreational fishing during their outing. If so, the number of anglers in the boating party was recorded. Each angler was asked: how long they had fished; what the target species was; areas fished; the number and species of fish kept; and the number, if any, of undersized chinook salmon caught and released. Biological data were taken from certain fish in the creel. Scale samples, fork lengths, weights, and roe samples, if possible, were taken from all chinook salmon. Fork lengths were recorded from all Pacific halibut. Chinook and coho salmon were checked for missing adipose fins; heads from such fish were collected and micro-wire tags were removed at a later date.

Creel technicians stationed themselves at a specific harbor or ramp from noon until dusk on the sampling day. All traditional public access points were covered, however, harbor and ramps known to support light angler access were sampled less frequently. Access points were put into three strata: Auke Bay; Tee Harbor; and "Other," which included Amalga Harbor, Fishermen's Bend, Aurora Harbor, Harris Harbor, North Douglas ramp, and Douglas Harbor.

Sampling days were picked in the following way. Each week Auke Bay was covered on two randomly selected weekdays and one randomly selected weekend day. Each week Tee Harbor was covered twice, one weekday and one weekend day selected randomly. "Other" access points were sampled twice each week, again one random weekday and one random weekend day. The specific harbor within this composite stratum was selected randomly; however, during the spring southend closure on chinook angling, southend harbors were not covered.

##### Procedure of Estimation of Total Effort and Catch

Throughout the survey season, one-hour flights were conducted over the Juneau area marine recreational fishing area. Flight days and flight times were picked on a uniformly random basis, however, days were stratified into weekdays and weekends/holidays. The number of boats seen with poles out were counted during the flights, which represented the total angling effort in the area for that hour.

An estimate of total marine angling effort for the season was determined in the following way:

$$A\hat{H}_i = \bar{c}_i \times \bar{a}_i \times h \times d_i$$

where:  $i$  = stratum (weekdays or weekends/holidays)

$\bar{c}_i$  = mean count of boats/hr for stratum  $i$

$\bar{a}_i$  = mean count of anglers/boat for stratum  $i$

$h$  = hours in the fishing day (11 hours)

$d_i$  = days in the season for stratum  $i$

$A\hat{H}_i$  = estimate of angler-hours in stratum  $i$

then:  $A\hat{H}_{\text{season}} = \sum A\hat{H}_i$

Estimates of harvest for the various species of game fishes were generated by multiplying the seasonal catch rate (catch per angler-hour or CPUE) for a species by the estimated total seasonal effort (angler-hours). Seasonal catch rates were based on the total seasonal sample catch and total sampled effort intercepted all season at all sampled access points.

#### Golden North Salmon Derby

The 34th Golden North Salmon Derby was held on August 22, 23, and 24, 1980. Fish and Game personnel were stationed at the official Derby weigh-in stations (judges' floats) at Auke Bay, Tee Harbor, and Douglas Harbor, where they weighed, identified, and counted all fishes entered in the weight competition. When possible, fork lengths were recorded and scales were collected from chinook salmon. Fishes entered for door prize only were identified and counted. All fish were examined for missing adipose fins and any such fish were spaghetti-tagged in order for quick identification at the local cold storage facility. When intercepted at that time, their heads were severed and saved. Micro-wire tags were removed at a later date.

Additional personnel were stationed at satellite harbors and boat slips. Derby anglers were interviewed as to how many and what kinds of fish they were taking home. With this information, take home ratios for each species were calculated by dividing the number of anglers interviewed into the sampled catch by species.

The number of angler validations (representing angler trips) during the Derby was obtained from Derby officials and multiplied by the sample take home ratios for estimating the total take home catch of each species.

#### Roadside

The Juneau area roadside sport fishing survey was conducted from June 1 through August 31, 1980, which coincided with the Juneau area Dolly Varden "open season" established by the Board of Fisheries during their 1979 winter meeting.

During this survey season, the roadside angler interview program was run identically to the 1979 creel survey (Schwan, 1980). However, no postcard

survey was conducted. Significant bias in the data from the postcard portion of the survey has shown that it is not a worthwhile method for assessing angler effort and catch.

Expanded effort and catch estimates generated from the angler interview survey were computed as described in Schwan (1980).

## FINDINGS

### Juneau Area Marine Recreational Harvest Study

During the survey season, May through September, 1980, an estimated 54,827 angler trips were made representing 271,395 angler-hours of effort. The resulting estimated catches were: 5,075 legal chinook salmon ( $\geq 711$  mm); 9,417 coho salmon; 4,749 pink salmon; and 461 chum salmon (Table 2).

Additionally, 977 Dolly Varden char, 10,123 Pacific halibut, 2,253 rockfishes, 841 cods, and 541 flatfishes were harvested by Juneau boat anglers during this harvest study season. These estimates do not include catches during the 34th Golden North Salmon Derby (see Table 3 for Derby catches).

The following equation was used to estimate total tagged fish of a particular species caught in the sport fishery:

Starting with the relation:

$$(1) \frac{\text{Marked fish in sample}}{\text{All fish in sample}} = \frac{\text{Est. of total marked fish caught}}{\text{Est. of all fish caught}}$$

Then the estimate of total marked fish caught equals

$$\frac{\text{Marked fish in sample} \times \text{Est. of all fish caught}}{\text{All fish in sample}}$$

This equation is analogous to the Peterson Index (see Ricker, 1975) which is based on the assumption that the sample accurately represents what is found in the entire population.

Estimating the contribution of a facility (hatchery) release of fish to a fishery, where the total release is known and not all fish are marked but the marked portion is known, can be done by multiplying the estimated number of marked fish caught in the fishery by the ratio of total fish released to the number of marked fish released. That is:

Contribution to fishery =

$$(2) \text{ Est. total marked fish caught in fishery} \times \frac{\text{total release}}{\text{marked release}}$$

Tag recovery data are presented in Table 4. This indicates tag codes which appeared in the fishery, and estimated contributions of facility released chinook to the Juneau marine sport fishery during 1980.

Table 2. Estimates of Total Catch in 1980 Marine Juneau Sport and Derby Fishery.

	KS	KS*	SS	PS	RS	CS	DV	H	RF	Cod	FF	Other
May-September Recreational Harvest	5,075	2,636	9,417	4,749	0	461	977	10,123	2,253	841	543	130
34th Golden North Derby	477	...	2,277	212	0	130	0	502	...	...	...	...
TOTAL	5,552	2,636	11,694	4,961	0	591	977	10,625	2,253	841	543	130

\* Undersized and released kings less than 28 inches (711 mm) in total length.

Table 3. Comparison of Golden North Salmon Derby angler effort and catch estimates, 1959-1980.

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 24-29	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
1979	Aug. 3-5	8,327	350	657	663	2,561	98	242	52	44	0	5
1979	(490 halibut and 240 other demersal fishes taken home)											
1980	Aug. 22-24	7,386	271	206	694	1,583	67	145	97	33	...	...
1980	(502 halibut and 95 other demersal fishes taken home)											

Table 4. Summary of CWT hatchery chinook salmon, wild chinook, and wild coho salmon captured in the Juneau marine sport fishery, 1980.

FACILITY	BINARY CODE/ FIN CLIP	DATE AND LOCATION OF RELEASE	MARKED FISH IN RELEASE GROUP	TOTAL RELEASE	CREEL SAMPLE RECOVERIES	DERBY SAMPLE RECOVERIES	VOLUNTARY RECOVERIES	ESTIMATED STOCK CONTRIBUTION TO FISHERY	
<u>HATCHERY</u>									
Crystal Lake	AD/4-16-16	6/77 Blind Slough	71,227	166,030	13	5	8	302	
Crystal Lake	AD/4-16-41	6/77 Fish Cr. ERP	24,650	25,102	0	0	1	0	
Crystal Lake	AD/4-17-5	6/77 Fish Cr. ERP	19,086	20,814	0	0	1	0	
Crystal Lake	AD/4-17-6	6/77 Fish Cr. ERP	20,893	21,407	1	0	0	9	
Crystal Lake	AD/4-17-7	6/77 Fish Cr. ERP	20,688	21,284	2	0	0	20	
Little Port Walter	AD/3-16-10	4/78 LPW	4,918	4,938	0	0	1	0	
Little Port Walter	AD/3-16-13	5/78 LPW	4,472	4,490	0	1	0	2	
Little Port Walter	AD/3-16-14	5/78 LPW	4,378	4,396	3	0	2	28	
Little Port Walter	AD/3-16-16	5/78 LPW	4,462	4,480	0	0	2	0	
Little Port Walter	AD/3-16-17	6/78 LPW	4,184	4,201	1	0	1	9	
Cowlitz	AD/63-17-9	3/78 Cowlitz R., WA	89,433	90,446	0	0	1	0	
Cowlitz	AD/63-17-10	3/78 Cowlitz R., WA	89,966	87,966	0	0	1	0	
Cowlitz	AD/63-17-11	3/78 Cowlitz R., WA	53,262	59,879	0	1	0	2	
William/S. Santiam	AD/9-16-26	3/78 William R., OR (above falls)	14,917	14,917	0	0	1	0	
Quinsam	AD/2-19-16	6/77 Quinsam R., B.C.	97,123	376,446	0	0	1	0	
<u>WILD STOCKS</u>									
Taku River	AD/4-17-10	10/77 Taku R.	4,358	Unknown	1	0	0	Unknown	
<u>COHO</u>									
Auke Creek	AD/4-19-46	6/79 Auke Cr.	3,872	Unknown	1	0	2	Unknown	
Auke Creek	AD/4-19-49	6/80 Auke Cr.	Unknown	Unknown	0	0	1	Unknown	
					TOTALS	22	7	23	372

Table 5 shows catch rates by species for each week of the survey period. Table 6 shows the effort and catch during 1980 compared to past years' estimates. Comparisons of biweekly catch rates for chinook and coho salmon for the years 1960 through 1980 are presented in Table 7 and 8.

### Juneau Area Roadside Recreational Harvest Study

Estimates representing total effort and harvest by roadside and shoreline anglers were not obtainable during the 1980 survey season. The segment of the angling population contacted in previous years by way of the postcard questionnaire was missed owing to the lack of the postcard survey. Expanded levels of effort and catch were generated from angler interview data and compared to the 1979 estimates of effort and catch based on the angler interview portion of that creel survey (Table 9). These two data sets are directly comparable and serve as an index of levels of effort and harvest for the fishery.

### Discussion

Of the estimated 271,395 angling hours of effort during the May through September marine sport fishery, 108,692 angler-hours were expended on weekends and holidays. This equates to 1,025 angler-hours per weekday and 3,461 angler-hours per weekend day, or 3.38 times more effort per weekend day.

Although the total sport angling effort was much more intense on weekends and holidays, there were no significant differences in mean hours per fishing trip or mean anglers per boat measured during the weekday and weekend strata. Therefore, these data were pooled with resulting seasonal means of 4.5 hours/trip and 2.54 anglers/boat.

The catch success of weekday versus weekend marine anglers was analyzed by comparing the seasonal mean catch rates for chinook salmon taken by weekday and weekend salmon anglers. The observed mean CPUE for chinook by weekday salmon anglers was .033 fish per hour versus .027 fish per hour for weekend salmon anglers. This observed difference is not statistically significant ( $t = .026$ ). Pooling weekday and weekend data, the seasonal CPUE for legal chinook by salmon anglers was 0.29 fish per hour or 34.5 hours per legal chinook. The 95% confidence interval around this mean ranges from .025 to .033 fish per hour, or  $\pm 14\%$ . Note that the stratum means both fall within this range.

The seasonal catch (5,075) and CPUE (.0187 based on all hours, not just salmon hours) for legal chinook by Juneau marine anglers were both relatively good. The catch was probably at a record level although this is not a worthwhile index of the condition of the fishery since the level of effort was so much greater than in past years.

The seasonal catch rate based on all hours sampled indicated a continuing rebound in the local chinook fishery, however, at 53 hours per legal chinook salmon, the fishery is still depressed. The upswing in CPUE is hard to interpret. Escapement of spawning chinook to the Taku River system was good this year, although the effect of this "stronger" return to the

Table 5. 1980 Weekly CPUE (Catch Per Angler Hour) - Juneau Marine Sport Fishery.

	1 5/1- 5/4	2 5/5- 5/11	3 5/12- 5/18	4 5/19- 5/25	5 5/26- 6/1	6 6/2- 6/8	7 6/9- 6/15	8 6/16- 6/22	9 6/23- 6/29	10 6/30- 7/6	11 7/7- 7/13	12 7/14- 7/20
% of Sampled Effort Bottom Fishing	0.0%	7.3%	0.0%	8.0%	12.0%	21.6%	13.8%	28.0%	28.0%	29.0%	14.0%	23.6%
Chinook	.028	.016	.046	.030	.040	.026	.021	.026	.014	.019	.013	.013
(Released Chinook)*	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.007)	(.008)	(.010)	(.009)	(.016)	(.025)
Coho	.000	.000	.000	.000	.000	.002	.001	.001	.007	.023	.046	.049
Pink	.000	.000	.000	.000	.000	.000	.000	.006	.020	.033	.058	.031
Chum	.000	.000	.000	.000	.000	.000	.000	.000	.001	.002	.002	.001
Sockeye	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Dolly Varden	.000	.000	.000	.000	.003	.007	.008	.010	.009	.005	.005	.003
Halibut	.006	.001	.001	.013	.014	.038	.027	.050	.040	.050	.024	.044
Rockfishes	.001	.001	.000	.007	.004	.007	.005	.020	.007	.028	.004	.003
Cods	.000	.002	.000	.018	.004	.001	.005	.004	.001	.006	.000	.001
Flatfishes	.000	.002	.000	.005	.008	.001	.000	.002	.000	.001	.002	.002
Others	.000	.008	.000	.000	.000	.001	.000	.001	.000	.000	.000	.000

\* Under 28 inches (711 mm) total length.

Table 5. (Cont'd.) 1980 Weekly CPUE (Catch Per Angler Hour) - Juneau Marine Sport Fishery.

	13 7/21- 7/27	14 7/28- 8/3	15 8/4- 8/10	16 8/11- 8/17	17 8/18- 8/24	18 8/25- 8/31	19 9/1- 9/7	20 9/8- 9/14	21 9/15- 9/21	22 9/22- 9/28	Season 5/1- 9/30
% of Sampled Effort Bottom Fishing	14.8%	11.0%	23.0%	25.0%	Derby Week	33.0%	34.0%	51.0%	29.0%	19.8%	21.0%
Chinook	.018	.008	.008	.013	...	.008	.019	.006	.007	.022	.019
(Released Chinook)*	(.032)	(.013)	(.012)	(.014)	...	(.008)	(.012)	(.006)	(.003)	(.000)	(.010)
Coho	.058	.080	.076	.112	...	.055	.070	.051	.069	.000	.035
Pink	.033	.028	.028	.025	...	.003	.000	.000	.000	.000	.018
Chum	.002	.004	.004	.003	...	.004	.007	.004	.000	.000	.002
Sockeye	.000	.000	.000	.000	...	.000	.000	.000	.000	.000	.000
Dolly Varden	.002	.002	.001	.001	...	.001	.000	.000	.000	.000	.004
Halibut	.033	.034	.051	.060	...	.054	.082	.075	.031	.022	.037
Rockfishes	.007	.006	.013	.002	...	.002	.030	.018	.000	.000	.008
Cods	.004	.010	.001	.003	...	.000	.000	.000	.000	.000	.003
Flatfishes	.001	.002	.000	.001	...	.000	.000	.007	.028	.000	.002
Others	.000	.000	.000	.000	...	.000	.000	.000	.000	.000	.000

\* Under 28 inches (711 mm) total length.

Table 6. Comparative seasonal angler effort and catch for Juneau area marine recreational fishery, May 1 through September 3, 1960-1980.

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Angler Trips	4,934	6,550	6,220	9,787	10,864	9,863	11,598	11,059	21,095	15,812	34,328	22,790
Angler Hours	24,496	27,376	32,001	49,059	51,266	46,614	58,694	53,370	89,203	60,192	127,349	98,792
Mean Hrs/Trip	4.96	4.18	5.14	5.01	4.72	4.73	5.06	4.83	4.23	3.81	3.71	4.33
Chinook*	1,065	828	520	2,234	2,780	1,634	2,726	1,599	3,075	2,141	2,886	3,735
Chinook $\geq$ 660 (711) mm**	905	708	499	1,704	1,954	1,259	1,797	1,097	2,360	1,331	2,299	2,328
Coho	425	664	743	2,940	1,813	2,526	1,462	1,063	8,363	2,403	5,635	3,052
Pink	47	55	35	211	164	45	190	139	1,595	1,175	1,613	435
Chum	8	19	29	39	0	14	27	35	36	24	72	380
Sockeye	0	0	0	0	0	5	41	5	63	0	10	8
TOTAL SALMON	1,545	1,566	1,327	5,424	4,757	4,224	4,446	2,841	13,132	5,743	10,216	7,610
Trout and Char	139	3	64	270	295	115	280	379	897	362	1,479	922
Pacific Halibut	433	13	1,254	1,332	1,029	1,523	3,105	1,930	3,354	3,312	4,043	1,450
Other Species	86	0	152	159	164	60	113	24	282	184	331	143

\* Prior to 1976, there was no minimum size; in 1976, minimum size was 660 mm; and from 1977 to 1980, 711 mm was the minimum size. This number reflects the total seasonal harvest of chinook of all sizes.

\*\* The number of chinook longer than 660 mm in the seasonal chinook harvest during 1960-1976, and the number of chinook longer than 711 mm in the seasonal chinook harvest during 1977-1980.

Table 6. (Cont'd.) Comparative seasonal angler effort and catch for Juneau area marine recreational fishery, May 1 through September 3, 1960-1980.

	1972	1973	1974	1975	1976	1977	1978	1979	1980
Angler Trips	15,150	21,773	20,766	18,004	30,591	44,240	45,803	41,810	49,124
Angler Hours	58,473	93,304	112,865	91,527	156,793	219,174	205,560	233,157	243,162
Mean Hrs/Trip	3.86	4.29	5.44	5.08	5.13	4.95	4.49	5.57	4.95
Chinook*	1,742	2,604	2,326	1,277	2,184	3,302	2,758	3,591	4,693
Chinook $\geq$ 660 (711) mm**	912	1,465	1,808	987	2,184	3,302	2,758	3,591	4,693
Coho	6,274	2,576	5,622	4,541	6,873	8,635	13,039	5,995	8,097
Pink	575	909	1,110	824	446	1,997	5,978	4,819	4,498
Chum	224	75	89	108	167	123	234	289	389
Sockeye	0	0	32	21	146	1,243	2,265	29	...
TOTAL SALMON	8,815	6,164	9,179	6,771	9,816	15,300	24,274	14,723	17,680
Trout and Char	2,147	1,319	742	803	205	1,334	881	882	924
Pacific Halibut	1,833	3,098	1,366	756	915	1,026	704	5,242	8,657
Other Species	30	540	738	259	355	400	162	1,742	3,307

\* Prior to 1976, there was no minimum size; in 1976, minimum size was 660 mm; and from 1977 to 1980, 711 mm was the minimum size. This number reflects the total seasonal harvest of chinook of all sizes.

\*\* The number of chinook longer than 660 mm in the seasonal chinook harvest during 1960-1976, and the number of chinook longer than 711 mm in the seasonal chinook harvest during 1977-1980.

Table 7. Comparative chinook salmon caught per angler hour of effort during the Juneau area marine recreational fishery.

	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	.035	.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
1979	.032	.037	.019	.016	.009	.021	.010	.004	.008	.004	.001	...	.015
1980	.028	.036	.033	.024	.019	.013	.014	.010	.008	.010	.009	...	.019

Table 8. Comparative coho salmon caught per angler hour of effort during the Juneau area marine recreational fishery.

	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 (6/26-9/3)
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
1979	.000	.000	.000	.002	.014	.037	.039	.043	.090	.078	.003	...	.041
1980	.000	.000	.001	.001	.015	.047	.068	.089	.083	.057	.060	...	.055

Table 9. 1979 and 1980 Juneau Roadside Sport Fishery (expanded interview data only).

	<u>May</u>		<u>June</u>		<u>July</u>		<u>August</u>		<u>September</u>		<u>Season</u>	
	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980
Angler Trips	2,798	...	4,131	2,636	11,177	4,820	3,111	3,584	366	...	21,583	11,040
Angler Hours	6,396	...	6,607	5,140	21,609	9,399	6,259	6,989	732	...	41,603	21,528
Dolly Varden	713	...	757	802	2,853	909	856	815	302	...	5,481	2,526
Rainbow/Cutthroat	0	...	43	46	21	9	0	0	17	...	81	55
Pink Salmon	0	...	125	183	6,702	1,193	2,281	740	266	...	9,374	2,116
Chum Salmon	0	...	0	0	271	615	254	277	36	...	561	892
Coho Salmon	0	...	0	0	31	64	91	18	0	...	122	82
Chinook Salmon	38	...	115	0	0	0	0	0	0	...	153	0
Red Salmon	0	...	5	0	0	0	0	100	0	...	5	100
Pacific Halibut	0	...	21	23	0	25	0	0	0	...	21	48
Other	0	...	0	1,397	0	102	59	18	0	...	59	1,517
Steelhead	21	...	0	0	0	0	0	0	0	...	21	...

local sport fishery was not obvious. Hopefully, in 1981 when more of the tagged chinook from the Taku system return to spawn, the contribution of these fish to this sport fishery will be better understood. Kissner's (1973; 1974) scale analyses, fork length data, and CPUE data all indicate a contribution by returning Taku spring chinook to the marine sport fishery near Juneau. However, this contribution has been hard to quantify.

The improved chinook sport fishery in 1980 was not necessarily solely due to improved wild stock status. There were other factors involved. First, a new regulation allowed for the taking of chinook smaller than 28 inches (< 711 mm) during the time period of April 1 through June 14. This probably affects the harvest in the following way:

There was no creel survey in April but angling effort was very low. From May 1 through June 14, 13.1 percent of the chinook sampled were under 28 inches long. Owing to changes in estimating procedures, weekly harvest estimates could not be generated from 1980 data. However, in 1979, sub-seasonal (weekly) harvest estimates were computed, and 50 percent of the seasonal chinook catch was harvested during this 6 week period.

Assume that 50% of the 5,075 chinook, or 2,538 chinook, were taken between May 1 and June 14, 1980. Since 13.1% of the sampled catch were under 28 inches total length, then an estimated 332 (.131 x 2,538) undersized chinooks were harvested during this time. The daily bag limit of one chinook per angler is non-restrictive; only 6% of the boat trips with anglers seeking chinooks resulted in boat limits of chinooks. Therefore, the harvesting of chinooks less than 28 inches long should have increased the harvest.

Secondly, there was an important contribution of hatchery released chinooks to the Juneau marine sport fishery (see Table 4). An estimated 347 chinook salmon of hatchery origin were captured in the regular Juneau sport fishery plus an estimated 25 hatchery chinooks were taken during the 34th Golden North Salmon Derby.

The biggest contributing group was the 4-16-16 CWT lot released from the FRED Division Crystal Lake hatchery during June 1977. These fish were of the 1976 Andrews Creek brood, an Alaskan wild spring chinook stock, and were released into Blind Slough near Petersburg, Alaska. The release numbered 166,030 fish, of which 71,227 were marked with a wire tag bearing the 4-16-16 code.

These fish appeared in this year's local sport fishery as three-ocean immature feeders. They were being captured at many traditional sites during June through September but were notably absent in the catch during May and early June when the bulk of the angling effort was shallow trolling along the northern mainland shore (an area known as the Breadline).

Additionally, an estimated 29 chinooks came from other State hatchery releases and 37 chinooks came from the NMFS hatchery facility at Little Port Walter, located at the southeastern end of Baranof Island, Alaska. Other hatchery released chinook were intercepted in the local chinook sport fishery (see Table 4), but seen only through voluntary angler returns.

Rasch (1978) and Kimura (1976) discussed the analysis of tag recovery data from sport fisheries and the incorporation of voluntary returns into estimates of contribution of a group of fish to a given fishery. A nebulous aspect to the analysis centers on the varying probability that an angler will realize he has captured a tagged fish (with a missing adipose fin) and voluntarily brings the tagged head to fisheries personnel. This implies that the anglers "sample size" is an unknown.

There is, however, a way of estimating this sample size. Equations have been derived which allow for the weighted inclusion of voluntary return data with regular randomly sampled tagged returns. This is very advantageous in situations where most of the tag returns come from voluntary means. It allows for a much larger sample size which has a definite statistical benefit.

The key to the analysis of voluntary data is based on what is known as the probability of awareness (PA). This probability of an angler seeing a tagged fish and bringing it in must be quantified and in such a way that is independent from the basic tag recovery sample data and the total catch estimate of tagged fish (see Kimura, 1976). This has not been done in the Juneau marine creel sampling program. Therefore, voluntary tag returns cannot be lumped with creel sample tag analyses for expansion purposes.

There was nothing noteworthy about the 1980 Juneau sport fishery for coho salmon. The weekly catch rates for coho approximated the 10-year means for the respective weekly periods. A few cohos appeared in the local waters a little earlier than usual; however, the progression of the fishery followed a normal pattern with catch rates peaking in mid-August.

Because of the extensive bottom fishing effort during the prime part of the coho season, catch rates were calculated from salmon hours of effort as well as all hours of effort. The expanding bottom fishing effort is creating a "dual-target" marine fishery. This season's salmon effort comprised 80% of the seasonal effort, and this 80-20 split in effort creates a bias in the catch ratio for a specific target if non-directed effort is lumped with directed effort.

#### Halibut Sport Fishery:

The effort directed toward catching halibut comprised less than 10% of the sampled marine boat angling effort during May. As the spring chinook fishery began to fade in mid-June, the bottom fishing effort increased dramatically to 30% of the sampled effort.

As the coho fishing began to pick up in mid to late July, the bottom effort percentage dropped off to only 10% of the total effort. From early August to mid-September, the proportion of effort sampled directed to halibut steadily increased to 50%. However, the total marine fishing activity was rapidly winding down by this time.

Angler success for halibut was excellent throughout almost the entire season, with catch rates being best throughout August and early September.

Table 10. Juneau Roadside Creel Survey. Comparative catch rates by month and year (catch per angler hour).

	YEAR	MAY	JUNE	JULY	AUGUST	SEPT.
Dolly Varden	1977	.201	.052	.227	.412	.447
	1978	.141	.166	.244	.158	.102
	1979	.112	.093	.164	.172	.269
	1980	...	.156	.097	.116	...
Rainbow/Cutthroat	1977	.055	.054	.004	.074	.154
	1978	.009	.020	.005	.019	.007
	1979	.007	.039	.003	.038	.035
	1980	...	.009	.001	.000	...
Pink Salmon	1977	.000	.000	.088	.010	.000
	1978	.000	.003	.069	.086	.119
	1979	.000	.013	.280	.267	.387
	1980	...	.036	.127	.106	...
Chinook Salmon	1977	.000	.001	.000	.000	.000
	1978	.004	.001	.000	.000	.004
	1979	.004	.012	.000	.000	.000
	1980	...	.000	.000	.000	...
Coho Salmon	1977	.000	.000	.025	.032	.086
	1978	.000	.002	.020	.030	.019
	1979	.000	.000	.007	.009	.063
	1980	...	.000	.007	.003	...
Sockeye	1977	.000	.070	.000	.000	.000
	1978	.000	.019	.002	.000	.000
	1979	.000	.000	.000	.004	.000
	1980	...	.000	.000	.000	...
Chum Salmon	1977	.000	.000	.000	.000	.000
	1978	.000	.000	.020	.005	.000
	1979	.000	.000	.010	.026	.080
	1980	...	.000	.065	.040	...
Steelhead	1977	.000	.000	.000	.000	.000
	1978	.009	.000	.000	.000	.000
	1979	.010	.000	.000	.000	.000
	1980	...	.000	.000	.000	...

During 1980, of the 538 recreational boat fishing trips sampled in Juneau that had anglers specifically seeking halibut, 10.6% of these trips resulted in boat limits of halibut. The daily bag limit was two fish per angler. Of the 1,454 sampled angler trips targeting on halibut, 57.7% resulted in zero halibut caught, 20% resulted in one fish per angler and 22.3% had the two fish limit of halibut. The majority of the halibut (approximately 64%) were immature.

#### Juneau Roadside:

Estimates of total effort and harvest by roadside anglers were not generated. However, the creel survey results served as an adequate index reflective of any change from 1979. The roadside fishery was depressed in 1980. Many potential roadside anglers chose not to fish because of new early and late season area closures on the taking of Dolly Varden char, the year-round closure of Montana Creek to Dolly Varden fishing, the lack of strong pink salmon returns to local streams, generally poor fishing, and inclement weather.

The June through August 1980 roadside effort was only 52% of the May through September 3, 1979, roadside effort and the harvest of Dolly Varden was reduced by 54%. The reduced daily bag limit of two Dolly Varden, any size, did not seem to restrict the harvest by many anglers. The 1980 seasonal catch rate of 8.9 hours per Dolly Varden was almost identical to the 1979 June through August rate of 8.6 hours per Dolly.

During the spring of 1980, members of our staff worked cooperatively with federal fishery biologists at the Auke Creek facility counting, measuring, and marking all Dolly Varden that migrated from the Auke Lake wintering area to the sea. Sport Fish biologists did a similar study in 1970 (Reed and Armstrong, 1971). That year, 6,215 Dolly Varden emigrated from the system; this spring only 3,050 Dolly Varden were counted leaving Auke Lake, further evidence that the Dolly Varden populations in the Juneau area have declined.

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