

STATE OF ALASKA

*Jay S. Hammond, Governor*



Annual Performance Report for

INVENTORY AND CATALOGING OF  
KENAI PENINSULA AND COOK INLET  
DRAINAGES AND FISH STOCKS

by

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## RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations of Alaska.

Project No.: F-9-11

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

Job No.: G-I-C Job Title: Inventory and Cataloging of Kenai Peninsula, and Cook Inlet Drainages and Fish Stocks.

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

## ABSTRACT

Relative growth and survival rates, determined by fall gill netting, are presented for rainbow trout, *Salmo gairdneri* Richardson and coho salmon, *Oncorhynchus kisutch* (Walbaum), stocked in area lakes. The failure of a lake to overwinter stocked Arctic grayling, *Thymallus arcticus* (Pallas), which had survived through one previous winter is discussed. Pertinent historical data regarding stocking, size, time, densities and catch rates are examined for various managed lakes.

Creel census activities on 64.4 kilometers (40 miles) of the Kenai River resulted in an estimated harvest of 53,709 fish in 118,307 man-days of effort. Harvest estimates for coho salmon, sockeye salmon, *Oncorhynchus nerka* (Walbaum), rainbow trout, and Dolly Varden, *Salvelinus malma* (Walbaum), are also presented. Effort during June and July are directed primarily toward chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), although other species are harvested incidentally. After August 1, effort is directed towards coho salmon and pink salmon, *Oncorhynchus gorbuscha* (Walbaum), although during 1978 significant interest was observed in the large run of sockeye salmon returning to the Kenai River.

An estimated 20,906 angler days was spent on Anchor River during the period July 15 - November 12, 1978. There was an estimated harvest of 21,141 Dolly Varden; 1,462 steelhead trout, *Salmo gairdneri* Richardson; 1,433 coho salmon; 179 rainbow trout; 151 pink salmon; and 201 cottids and flatfishes. Eighty steelhead and 128 coho were tagged and released. Tagged to untagged ratios of steelhead indicated a total population of 4,132 fish in the spawning migration and a catch to escapement ratio of 1:1.83. Examination of 113 steelhead scales showed that 93, or 82.3 percent were returning to spawn for the first time and 20, or 17.7 percent, had spawned previously. The majority of males returning to spawn the first time were Age 3.1, and the most frequent age classification for

females was 3.2. Scale examination of 88 coho salmon showed that 48.9 percent were Age 1.1, 47.7 percent were Age 2.1, and 3.4 percent were Age 3.1. Data obtained from tagged coho were inadequate to make a population estimate. There was an estimated harvest of 33,503 finfish which was comprised of 69.3 percent halibut, *Hyppoglossus stenolepis* Schmidt, 15.8 percent salmonids, 6.9 percent flatfishes, and the balance a variety of species.

## BACKGROUND

A vicinity map showing location of the study area is presented in Figures 1 and 2. A list of species of fish noted in the study is presented in Table 1.

### Stocked Lake Evaluation

Since statehood, an ongoing program to provide angling opportunities in easily accessible lake waters has utilized artificially reared or transplanted fish. Survey data have been analyzed with regard to: need for additional angling opportunity, potential of a given water to sustain desired species, status, condition and composition of existing populations, and requirements for rehabilitation or enhancement.

All but 12 of the lakes selected for rehabilitation or enhancement were landlocked. Three of these have been planted with rainbow trout and nine with Arctic grayling.

Historically, rainbow trout and coho salmon have been the predominant species used for stocking; sockeye salmon and Arctic grayling, however, have been used when these species were available.

Stocked populations are sampled each fall and the data obtained are used to determine relative survival, growth rates, and future stocking densities.

### Kenai River Creel Census

A creel census was initiated in 1974 with chinook salmon the target species. Information gathered the first year revealed that anglers merely direct their efforts toward coho salmon after the chinook salmon season closes (July 31). The fishing technique changes from drifting for chinook to still fishing with bait or casting artificial lures for coho salmon. Fishing continues through September unless weather conditions or high water levels prevail.

The coho salmon run into the Kenai River is comprised of two segments, early and late. The early run enters the river in late July and is present until early September. The late run enters in late August and is present until freeze-up.

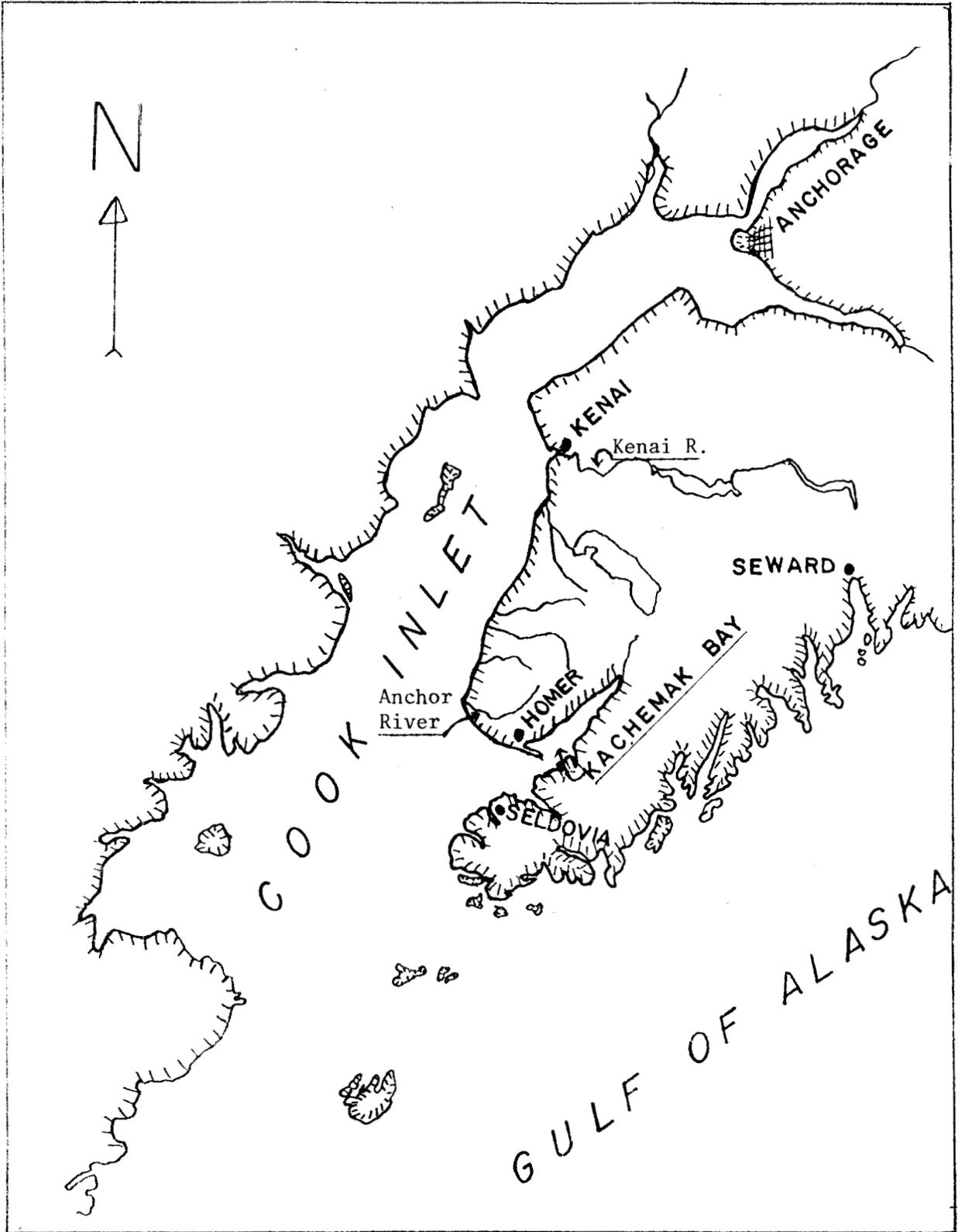


Fig. 1. Vicinity map showing location of the study area.

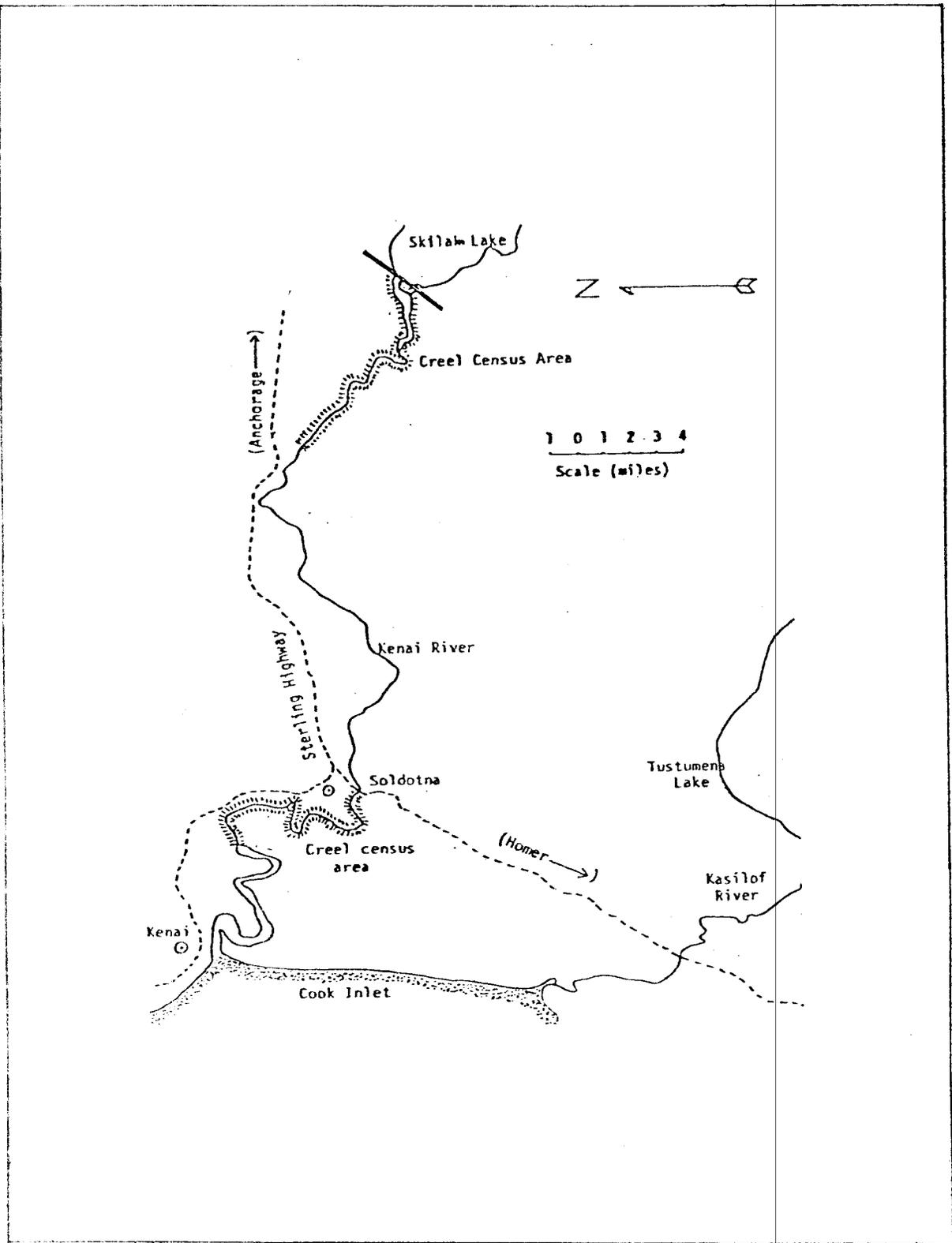


Fig. 2. Map depicting creel census areas on the Kenai River.

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

Common Name	Scientific Name & Author	Abbreviation
Pink salmon	<i>Oncorhynchus gorbuscha</i> (Walbaum)	PS
Chinook salmon	<i>Oncorhynchus tshawytscha</i> (Walbaum)	KS
Chum salmon	<i>Oncorhynchus keta</i> (Walbaum)	CS
Coho salmon	<i>Oncorhynchus kisutch</i> (Walbaum)	SS
Sockeye salmon	<i>Oncorhynchus nerka</i> (Walbaum)	RS
Dolly Varden	<i>Salvelinus malma</i> (Walbaum)	DV
Lake trout	<i>Salvelinus namaycush</i> (Walbaum)	LT
Rainbow trout	<i>Salmo gairdneri</i> Richardson	RT
Steelhead trout	<i>Salmo gairdneri</i> Richardson	SH
Arctic grayling	<i>Thymallus arcticus</i> (Pallas)	GR
Threespine stickleback	<i>Gasterosteus aculeatus</i> Linnaeus	TST
Halibut	<i>Hyppoglossus stenolepis</i> Schmidt	H
Pacific cod	<i>Gadus macrocephalus</i> Tilesius	
Pacific tomcod	<i>Microgadus proximus</i> (Girard)	
Rockfish	<i>Sebastes</i> sp.	
Greenling	<i>Hexagrammus</i> sp.	
Starry flounder	<i>Palatichthys stellatus</i> (Pallas)	
Yellowfin sole	<i>Limanda aspera</i> (Pallas)	

### Anchor River Creel Census

Anchor River has long been recognized as one of the most popular sport fishing streams on the Kenai Peninsula. The river supports good populations of Dolly Varden and chinook and coho salmon and has the largest steelhead trout population of the five Kenai Peninsula streams that produce this species.

The sport fishery for chinook salmon has been monitored closely for the past several years due to management needs. The fishery for other species has been checked only intermittently over the years, as manpower limitations did not permit more intensive monitoring. We relied primarily upon spot checks and personal observations. As a result, data on sport fishing effort and harvest is incomplete for this stream. These observations indicated a great increase in angler effort and harvest on the river, and dictated that we obtain current data on harvest levels.

### Kachemak Bay Creel Census

Kachemak Bay is one of the most popular recreational areas in Southcentral Alaska. It has relatively calm and protected waters which permits use of small boats as well as large ones. The Homer Spit extends approximately 4 miles into the bay, and provides a large area for shore anglers. There is a variety of finfish and shellfish present to satisfy various pursuits.

Partial creel censuses of the recreational fishery in Kachemak Bay have been conducted in previous years and reported by Engel (1967, 1973) and Hammarstrom (1974). There have been increasing numbers of visitors to the area in recent years; this creel census was intended to provide more current data and to assess more fully the sport fishing effort and harvest in Kachemak Bay.

### RECOMMENDATIONS

1. Adult lake trout from Skilak Lake should be captured using electro-fishing gear and transplanted to Upper Summit Lake in an attempt to establish a self sustaining population.
2. Base line information should be gathered on the rainbow trout fishery that exists in the early spring on the Kenai River at the outlet of Skilak Lake.
3. Arctic grayling should be transplanted from Crescent Lake to Grewink Lake in an attempt to establish a self sustaining population.
4. Sub-adult rainbow trout should be transplanted from China Poot Lake into other suitable lakes on the Kenai Peninsula, including Upper China Poot and Hazel lakes.

5. The Anchor River creel census of the summer and fall fishery should be continued, and increased emphasis should be placed on a tag and re-capture program to provide population estimates.

#### OBJECTIVES

1. To determine the environmental characteristics of the existing recreational fishery waters of the job area and to obtain estimates of existing and/or potential angler use of sport fish harvest.
2. To evaluate application of fishery restoration measures and availability of sport fish egg sources.
3. To assist as required in the investigation of public access status to the area's fishing waters and to make specific recommendations for segregation of public fishing access sites.
4. To investigate, evaluate and develop plans for enhancement of anadromous and resident fish stocks.
5. To provide recommendations for the management of sport fish resources in these waters and direct the course of future studies.

#### TECHNIQUES USED

##### Stocked Lake Evaluation and Lake Survey

The techniques for stocked lake evaluation were the same as those described by the Lake and Stream Manual, ADF&G, (1971), Engel (1973), and Hammarstrom (1977).

##### Kenai River Creel Census

The creel census employed on the Kenai River was based on those described by Neuhold and Lu (1957) and described in detail by Hammarstrom (1977a). Effort estimates are based on two randomly selected instantaneous angler counts per day. Every weekend-holiday and three of five weekdays were sampled. Because of changing daylight hours the fishing day ranged from 20 hours to 12 hours as follows: June and July, 20 hours; August, 16 hours; September, 12 hours. During the interview periods, the following information was collected: hours fished; catch by number and species; and specific biological data from chinook salmon, coho salmon and large rainbow trout.

The Kenai River coho run is comprised of two distinct segments, early-run fish and late-run fish. Certain Alaska Board of Fisheries policies pertain to these run segments; therefore, effort and harvest were calculated

separately for early-run and late-run fish in upstream and downstream sections of the river. Previous unpublished data have shown that the uncensused sections of the river account for 9.1% as much effort as the two census areas; therefore, estimates from the upstream and downstream sections were expanded by that factor to arrive at a total estimate of effort and harvest. Timing of the runs was determined by changes in angler catch rate.

#### Anchor River Creel Census

The Anchor River creel census was conducted during the period July 15 through November 12, 1978. For purposes of scheduling and coverage, the area was divided into three sections: Section 1 extended from the mouth upstream to include the Slide Hole, a distance of approximately 1 mile; Section 2 extended from the Slide Hole to the junction with the North Fork, a distance of approximately 1 mile; and Section 3 from the forks upstream to a bridge on the North Fork Loop Road, a distance of about 12 miles.

Fishing days were predetermined to include 16 hours during the period July 15 through August 15, 14 hours from August 16 through September 15, and shortened to 12 hours per day during the period September 16 through November 12. Sampling days were separated into three 2 1/2-hour periods, and counts and interviews were performed in each section each day. Timing and sequence of activities among the sections was selected at random.

In Sections 1 and 2, anglers were counted. The census taker walked the length of the section and vehicle counts were made simultaneously. Vehicles were counted in Section 3 at all access and parking area. Because it was not feasible to make direct angler counts, these data were converted to angler counts by using the regression of angler counts to vehicle counts in Sections 1 and 2.

Effort and harvest were calculated by a modification of the method described by Neuhold and Lu (1957). Mean hourly angler counts were multiplied by total possible fishing hours to estimate total angler hours. Mean hours per angler and catch per unit of effort were determined from angler interviews. Data were separated into weekday and weekend-holiday strata. Because of major seasonal changes in species composition, harvest was calculated by weekly periods.

Coho and steelhead were captured with a beach seine and tagged with serially numbered Floy anchor tags. Tags were recovered during the creel census and by voluntary returns. Tagged to untagged ratios were used to make a population estimate of steelhead, based upon Schaefer's formula as outlined by Ricker (1975).

Biological data (fork length to nearest 5 mm and scales) were collected from samples of coho salmon and steelhead.

## Kachemak Bay Creel Census

The Kachemak Bay creel census was conducted during the period May 15 through September 15, 1978, and was divided into two segments: Homer Spit shore anglers and boat anglers. The fishing day was predetermined to extend from 0600 to 2000, a total of 14 hours, and each day was divided into two time periods, 0600-1300 and 1300-2000. During each time period, four activities were conducted: (1) shore angler count, (2) shore angler interviews, (3) boat count, and (4) boat angler interviews. The sequence of activities and the time during which they were conducted were selected at random within each time period. Sampling was scheduled on each weekend day and holiday, and two weekdays each week were selected at random.

Effort and harvest were calculated by a modification of the method described by Neuhold and Lu (1957). Data were separated into two strata, weekdays and weekends-holidays. Effort for shore anglers was a straight forward calculation of mean hourly angler counts times total possible fishing hours. Sport boat angling effort was calculated as follows:

$$\frac{(BC)(H)}{H/B} - CB \times A/B = \text{Total Angler Days}$$

where BC = mean hourly boat count adjusted by the regression of  
aerial on bluff counts,  
H = total possible fishing hours,  
H/B = mean hours each boat was out of the harbor,  
CB = known charter boat trips, and  
A/B = mean number of anglers per boat.

Shore angler counts were made by driving and walking the length of the Spit. Boats on Kachemak Bay were counted from two areas with the aid of binoculars and a spotting scope. The area westward of the Spit was observed from the Bluff Point wayside west of Homer. The area easterly of the Spit was viewed from one of two vantage points: (1) at the intersection of East Hill Road and Skyline Drive; or (2) a high point on East End Road, approximately one mile east of Miller's Landing. Selection of the vantage point was made daily depending upon visibility and weather conditions.

Ten aerial boat counts were made simultaneously with the bluff counts to determine the proportion of boats that could be seen from the shore vantage points. Boat counts from the bluff were adjusted by the resulting regression.

Shore anglers were interviewed throughout the length of the Spit wherever they could be contacted. Boat anglers were interviewed in the Homer small boat harbor. Data, which consisted of both interviews and examination of photos and records, were obtained from charter boat operators for the number of anglers and harvest.

## FINDINGS

### Stocked Lake Evaluation

Fifteen stocked lakes in the area were sampled with gill nets and one was also sampled with electrofishing gear. The lakes stocked with rainbow trout had been treated chemically with emulsified rotenone to eliminate competing species, usually threespine stickleback, except Rainbow Lake and Joseph Lake, which had not been treated. Three lakes stocked with coho salmon had been treated with rotenone. Bernice Lake has winterkilled in previous years, so natural populations of stickleback and stocked populations of rainbow trout, coho salmon and sockeye salmon have been eliminated.

#### Bernice Lake:

Bernice Lake, located in the North Kenai area, has been stocked repeatedly with rainbow trout, sockeye salmon and coho salmon in attempts to establish a fishable population. This lake has received more emphasis because of the State maintained campground located on its southern shore. In past years the developing petro-chemical industry drilled numerous wells to provide water for its own use. The result was a marked decrease in the water table. Since then the water table has returned to its original level; but during the years of low water, severe winterkills resulted in the elimination of natural populations of threespine stickleback. The lake also has an excellent population of scud, which has resulted in excellent growth of fish during the summer months. Dissolved oxygen samples taken during the winter revealed extremely low oxygen levels. The aroma of hydrogen sulfide gas, "rotten egg" smell, was noted each time a hole was drilled in the ice.

In June, 1976, a total of 75,000 Arctic grayling, sac-fry were planted in Bernice Lake. No attempt was made to sample the population in 1976. In September, 1977, 145 fish were captured in 46 net-hours. These fish averaged 250 mm (10 in) in length and 209 gm (7 oz) in weight. It should be mentioned that the winter of 1976-1977 was abnormally warm; freeze-up was quite late and break-up, quite early. No dissolved oxygen samples were taken that winter. In September, 1978, 48 net hours of fishing resulted in no fish captured. It appears that the Arctic grayling succumbed to the same fate as previous plants--winter kill. The author feels enough evidence exists that this lake should be deleted from future stocking plans.

#### Grewink and Hazel Lakes:

In 1973 Arctic grayling fry were planted into Grewink and Hazel lakes. Both lakes were test netted in August, 1978, but no grayling were caught. No fish were caught or observed in Grewink Lake. In Hazel Lake, a total of 41 Dolly Varden were caught in 44 net hours; threespine sticklebacks were observed in shoal areas of the lake and small salmonids were observed in the shallow water at the lake outlet.

In view of the failure of the 1973 plants, it is felt that another attempt should be made to establish an Arctic grayling population in Grewink Lake, using Crescent Lake fish as donors. Existence of Dolly Varden and sticklebacks in Hazel Lake may be responsible for the failure of that plant, and it is thought that rainbow trout may be more likely to become established.

#### Joseph Lake:

An experimental plant of rainbow trout from two different sources was tried in Joseph Lake. In October of 1977, 2,000 Alaska Ennis fish at an average weight of 4.4 gm each with a right ventral fin clip and 4,000 Swanson River fish at 3.6 gm each with a left ventral fin clip were stocked. The lake had not been rehabilitated so it had a natural population of stickleback.

Sampling in October, 1978, resulted in capturing 34 fish in 44.5 net hours. Four fish had Alaska Ennis marks and 30 had Swanson River marks. Apparent survival was 3.75 times higher for Swanson River fish than Alaska Ennis fish. The sampled Alaska Ennis fish increased their weight from 4.4 gms to 418 gms while the Swanson River fish increased from 3.5 gms to 110 gms. Further evaluation of this plant will continue next fall.

Pertinent historical and sampling data for the seven lakes stocked with rainbow trout are presented in Tables 2 and 3 while respective data for the six lakes stocked with coho salmon are presented in Tables 4 and 5.

#### Lake Survey

China Poot Lake was stocked with 26,000 eyed rainbow trout eggs by Roger Allin of the U.S. Fish and Wildlife Service in 1957. Dunn gillnetted the lake in 1960 and caught 13 rainbows ranging from 7.4 to 10.8 inches in a 24-hour period (ADF&G, unpublished data). No further testing of the population had been done until 1978, although there has been limited local knowledge that China Poot Lake has a good population of rainbows.

In August, 1978, two nets fished for 20 hours each yielded 19 fish; in addition, eight fish were caught on hook and line. Length, weight, and age data for 26 of these fish are presented in Table 6.

Rainbows from China Poot Lake have a local reputation for being very skinny. Among the fish caught were a few which were very thin, but they were spawned out females which had not recovered body condition. This stock of fish originated from eggs taken from Karluk River steelhead, and fish would be expected to be more streamlined than some deep-bodied races of rainbows.

One of four Age IV females and two of three Age V females had spawned during the preceding spring. The Age XI female had spawned three times, the first time at Age IX, then in each of the succeeding years.

Table 2. Summary of recent rainbow trout stocking in Kenai Peninsula lakes sampled with gillnets, 1978.

Lake	Date Rotenoned	Date Stocked	Origin	Fish/kg. (lb)	Fish/hectare (a)	Total Stocked
Cabin	6/18/70	7/16/75	Ennis, Mt.	255 (155)	494 (1,220)	11,400
		5/24/77	Ak. Ennis, Ak.	297 (135)	303 ( 748)	7,000
Jerome	6/28/68	7/14/76	Ship Cr. Ak.	524 (238)	605 (1,495)	4,000
Johnson	9/11/72	7/16/75	Ennis, Mt.	255 (116)	494 (1,220)	17,000
		5/24/77	Ak. Ennis, Ak.	297 (135)	295 ( 728)	10,200
Joseph	--	10/ 4/77	Swanson River, Ak.	350 (159)	447 (1,105)	4,000
		10/ 4/77	Ak. Ennis, Ak.	440 (200)	224 ( 554)	2,000
Longmare*	9/ 7/72	8/ 9/76	Ship Cr. Ak.	431 (195)	507 (1,253)	35,300
Rainbow	--	7/13/77	Ennis, Mt.	1,742 (790)	495 (1,220)	3,000
Timore	9/ 8/72	7/16/75	Ennis, Mt.	365 (165)	494 (1,220)	10,400
		5/24/77	Ak. Ennis, Ak.	337 (153)	309 ( 764)	6,500

\* Stocked with coho salmon in 1978 due to shortage of rainbow trout.

Table 3. Summary of gill net sampling of Kenai Peninsula lakes stocked with rainbow trout, 1978.

Lake	Date Sampled	Species	Number in Sample	Catch/ Hour	Length in mm		S.D.*	Weight in gm		Year Planted
					Range	Mean		Range	Mean	
Cabin	Oct. 2	RT	5	0.10	360-420	384.8	24.3	700-982	809	1975
	Oct. 2	RT	3	0.08	305-329	315.6	12.2	373-441	414	1977
Jerome	Sept. 22	RT	8	0.18	152-207	169.5	19.9	45-109	61	1976
		DV	15	0.33	168-445	299.7	68.3	45-891	344	Unknown
Johnson	Sept. 27	RT	8	0.16	353-422	386.5	22.3	609-1086	827	1975&77
Joseph	Oct. 10	RT**	30	0.67	152-272	201.5	37.1	41-264	110	1977
	Oct. 10	RT***	4	0.09	242-364	297.5	51.9	186-782	418	1977
Longmare	Sept. 26	SS	3	0.06	104-119	109.3	8.4	14-18	15	1978
		RT	1(Released)		-	-	-	-	-	1976
Rainbow	Sept. 19	RT	5	0.11	267-307	294.2	15.8	282-382	345	1977
Tirmore	Oct. 10	RT	4	0.09	425-610	530.5	79.4	1318-3236	1973	1975-77

\* Standard deviation

\*\* Swanson River stock

\*\*\* Alaska Ennis stock

Table 4. Summary of recent coho salmon stocking history of Kenai Peninsula area lakes sampled with gill nets in 1978.

Lake	Date Stocked	Species	Origin	Fish/kg (lb)		Fish/Hectare (a)		Total Stocked
Arc	7/19/74	SS	Seward	757	(343)	642	(1,596)	4,100
	6/02/76	SS	Blind Slough	656	(298)	630	(1,556)	4,000
	6/15/78	SS	Seward	652	(295)	630	(1,556)	4,000
Centennial	7/16/75	SS	Seward	882	(400)	1,421	(3,511)	14,400
	7/13/77	SS	Seward	919	(417)	308	( 761)	3,125
Engineer	7/16/75	SS	Seward	882	(400)	371	( 916)	34,400
	7/13/77	SS	Seward	919	(417)	370	( 916)	34,350
Portage	7/26/73	SS	Kodiak	563	(255)	741	(1,831)	8,300
	7/16/75	SS	Seward	882	(400)	618	(1,527)	6,900
	7/13/77	SS	Seward	919	(417)	502	(1,240)	5,600
Scout	6/02/76	SS	Blind Slough	656	(298)	866	(2,140)	33,300
	6/15/78	SS	Seward	652	(295)	494	(1,220)	19,000
Sunken Island	6/28/71	SS	Seward	860	(390)	494	(1,220)	28,000
	7/26/73	SS	Kodiak	563	(255)	494	(1,220)	28,000
	7/16/75	SS	Seward	882	(400)	247	( 610)	14,000
	6/ 6/77	RS	Tustumena Lake	8,435	(3,825)	3,970	(9,810)	225,050
Upper Jean	7/26/73	SS	Kodiak	563	(255)	618	(1,527)	11,500
	7/16/75	SS	Seward	882	(400)	618	(1,527)	11,500
	6/10/77	RS	Tustumena Lake	9,219	(4,180)	4,030	(9,958)	75,000

Table 5. Summary of sampling with gillnets of Kenai Peninsula lakes stocked with coho salmon, 1978.

Lake	Date Sampled	Species	Number in Sample	C/H*	Length in mm			Weight in gm		Year Planted
					Range	Mean	S.D.**	Range	Mean	
Arc	Sept. 28	SS	16	0.67	193-223	212.8	12.9	68-127	100	1976
	Sept. 28	SS	23	0.96	105-115	110.3	3.7	9- 18	15	1978
Centennial	Sept. 27	SS	26	1.08	190-240	223.7	13.7	82-155	129	1977
	Oct. 25***	SS	36	36.0	172-235	206.4	18.0	55-155	106	1977
Engineer	Sept. 22	SS	67	3.05	204-278	234.6	13.0	100-309	155	1977
Portage	Sept. 23	SS	33	0.72	158-188	168.9	6.3	45- 59	50	1977
Scout	Sept. 25	SS	12	0.25	251-269	261.2	6.3	173-236	203	1976
	Sept. 26	SS	16	0.33	109-143	115.3	8.3	14- 36	17	1978
Sunken Island	Sept. 23	SS	9	0.21	370-464	419.1	36.9	677-1173	945	1975
	Sept. 23	RS	21	0.44	122-179	163.2	17.2	23- 64	51	1977
Upper Jean	Sept. 29	SS	7	0.15	241-352	277.9	41.1	136-482	264	1975
	Sept. 29	RS	10	0.21	126-187	167.3	16.8	18- 73	49	1977

\* C/H = catch per hour

\*\* Standard deviation

\*\*\* EF = electro fishing

Table 6. Age composition, by sex, of rainbow trout captured in China Poot Lake, 1978.

	Age Class					
	II	III	IV	V	...	XI
<u>Males</u>						
Number	2	8	2	1		
Length (mm)						
Mean	132.5	231.2	290	392		
Range	127-138	223-244	270-310	...		
S.D.	7.8	7.2	28.3	...		
<u>Females</u>						
Number	1	4	4	3		1
Length (mm)						
Mean	178	242.2	309.5	392		625
Range	...	210-272	294-335	383-403		...
S.D.	...	25.4	18.1	10.1		...

## Kenai River Creel Census

The Kenai River creel census commenced June 1 and was continuous through September 30. Until July 31, the primary species captured is chinook salmon. Other species harvested incidental to chinook salmon are Dolly Varden, rainbow trout, sockeye salmon, pink salmon, and coho salmon. Data regarding chinook salmon are presented in a Report of Progress by Steve Hammarstrom (1979).

The most important species harvested in the recreational fishery, other than chinook salmon, is probably coho salmon; although interest in sockeye salmon became evident in 1978 when large numbers appeared in the river.

Most sockeye salmon are harvested by shore anglers; whereas, most chinook salmon are harvested by boat anglers. The creel census was designed to measure the take of boat anglers; thus, the data regarding total harvest of sockeye salmon may be biased and somewhat misleading. It is felt that the actual harvest is substantially larger than creel census estimates. Estimates for other species are considered accurate.

Pink salmon were abundant in 1978 and the recreational harvest reflects this "even" year occurrence.

The first coho salmon was reported caught on July 15 but substantial catches were not reported until July 26. For all practical purposes, coho salmon harvested prior to August 1 are incidental to the chinook salmon fishery.

Early run coho were present in the lower section (Beaver Creek to Soldotna Bridge) until August 20. Catch rates rose sharply August 1, not due to increased numbers of fish present, but to a change in angling techniques when the chinook season closes and anglers target on coho salmon. Early run fish were reported in the upper section (Naptowne Rapids to Skilak Lake) beginning August 1 and continuing through August 30.

The separation point between early and late run coho was determined by both catch rates (Figure 3) and size of fish present (Table 7), with late run fish being significantly larger.

Total harvest of early run coho was estimated at 5,225 fish in 19,965 man-days of effort (average man-day equals 4.5 hours) with a mean catch per hour of .058. Total late run harvest was estimated at 6,360 fish in 18,140 man-days of effort (average man-days equaling 3.5 hours) with a mean catch per hour of 0.1.

Angling pressure increased substantially from estimates derived in 1977. The Kenai River followed its normal flow pattern with decreasing water levels after mid-August. In 1977 flood conditions were felt to preclude angling effort (Hammarstrom, 1978).

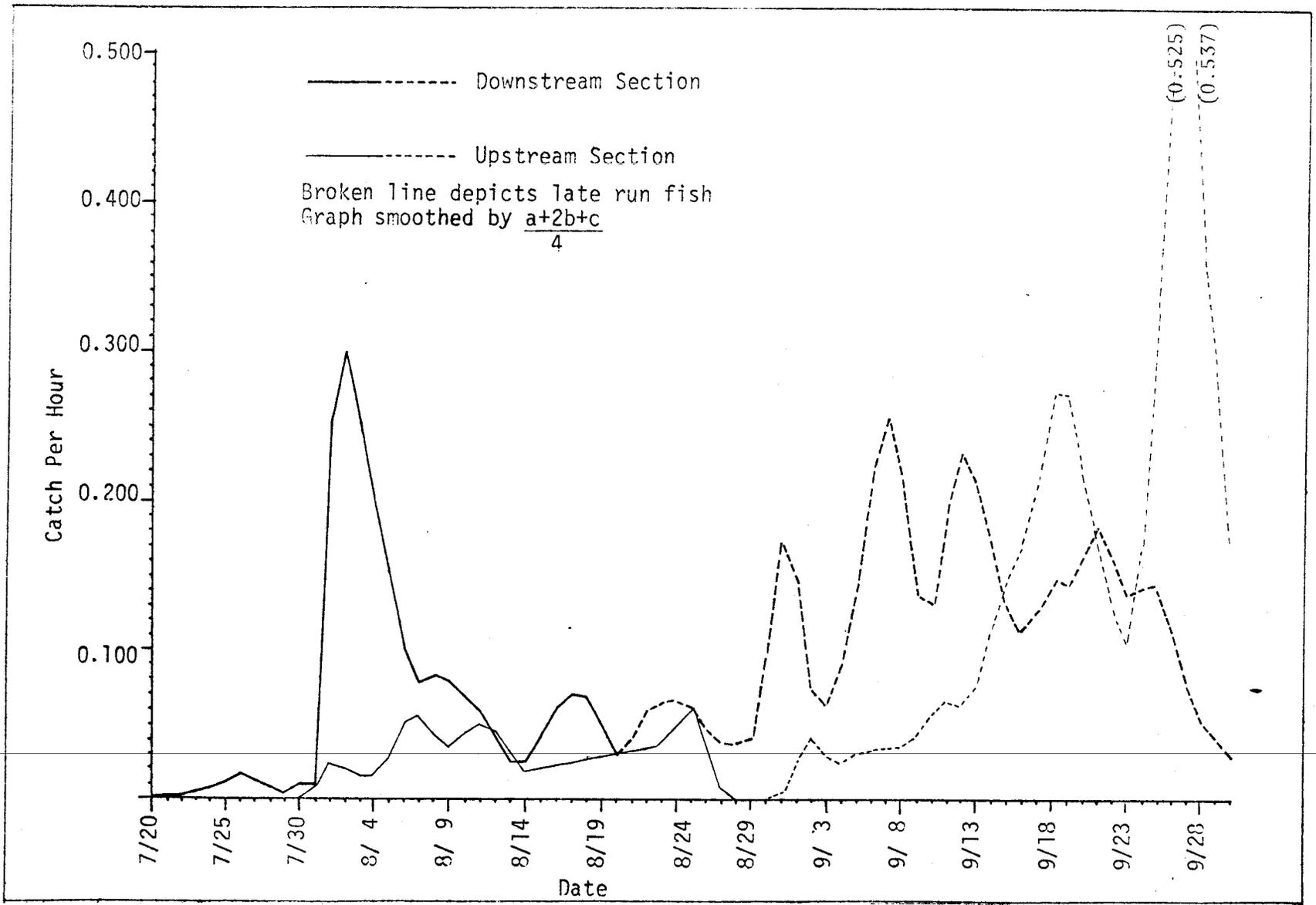


Fig.3. Catch per hour, by date, for Kenai River coho salmon in upstream and downstream sections, 1978.

Table 7. Summary of length-weight data from coho salmon samples captured in the Kenai River recreational fishery, 1978.

	Early Run		Late Run	
	Length (mm)	Weight (kg)	Length (mm)	Weight (kg)
Number in Sample	82	71	157	151
Range	450-660	1.6-5.2	495-715	2.0-7.0
Mean	598	3.6	625	4.6
Standard Deviation	40.8	0.78	46.0	0.95

Harvest of late run coho salmon was affected by a policy adopted by the Board of Fisheries in 1978. As prescribed by the policy, the commercial season on the east side beaches (Areas 244-20-30-40) closed after the catch rate (fish per delivery) fell below mean levels (Table 8) for two consecutive periods (September 1). After this date subsistence fishing with gill nets was allowed. There was a marked increase in the number of subsistence permits issued in 1978 (297) over the number in 1977 (73), and the reported subsistence harvest increased from 310 fish in 1977 to 2,557 in 1978. Many more of the subsistence permits were issued to commercial fishermen in 1978 than 1977 and the reported catch per permit reflects the increased expertise in the subsistence fishery when the two years are compared: 15.9 coho in 1978 and 5.3 coho in 1977 (Sanders, 1979 personal comm.).

Recreational catch rates (catch per hour) for late run coho salmon were similar in 1977 and 1978, 0.105 and 0.100, respectively. The effort nearly tripled between the two years, 6,630 man-days to 18,140 while the harvest increased by 94%. Total late run commercial and subsistence harvest combined increased from 6,500 in 1977 to 11,500 (preliminary estimate) in 1978. The total harvest from the late run (commercial, subsistence, and recreational) increased by 85% from 1977 to 1978.

In addition to 11,585 coho being harvested, the following harvest estimates were made: sockeye salmon, 3,180; pink salmon, 17,011; rainbow trout, 3,118; Dolly Varden, 11,695. (Table 9).

Harvest and effort estimates were based on 320 instantaneous angler counts (145 after August 1), 16,571 angler interviews (5,470 after August 1), and the following creel checked fish: 297 sockeye salmon, 1,250 coho salmon, 1,337 pink salmon, 274 rainbow trout and 996 Dolly Varden. Historical harvest and effort data are presented in Table 10.

#### Anchor River Creel Census

A summary of estimated angler effort on Anchor River during the period July 15 through November 12, 1978 is presented in Table 11. Summary of data obtained during angler interviews is contained in Table 12, and the species composition of the harvest from Anchor River by weekly intervals is presented in Table 13.

Anchor River is closed to fishing from the end of the chinook salmon fishery until July 1. There is comparatively little fishing effort until about mid-July when the sea-run Dolly Varden appear. The major effort from mid-July to about mid-August is directed toward Dollies. By mid-August substantial numbers of coho salmon are in the stream and they become the primary target species. Steelhead appear in good numbers by early September, and for about the next month effort is directed at either coho salmon or steelhead. The population of larger, spawning Dolly Varden shows up in early October and they, in combination with steelhead, are the target species until the stream freezes.

Table 8. Summary of commercial harvest, effort and catch rates for late run coho salmon from east side set net fishery (statistical area 244-20,30,40), 1971-1978.

Year	Harvest	Landings*	Hours Fished*	Harvest/Landing
1971	7,852	332	240	23.6
1972	7,320	418	192	17.5
1973	6,987	364	144	19.2
1974	15,436	594	228	26.0
1975	23,116	626	216	36.9
1976	13,767	507	168	27.1
1977	6,088	355	144	16.7
1978**	<u>7,106</u>	<u>326</u>	<u>72</u>	<u>21.8</u>
Mean	10,959	440	176	23.6

\* Data for landings and hours fished from August 16 through September 29 only.

\*\* Commercial fishing closed after September 1 (only six periods allowed).

Table 9. Harvest and effort, by month, by species for the Kenai River, 1978.

Month	Effort Man-days	Chinook Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Rainbow Trout	Dolly Varden	Total Harvest	Total Catch/Hour
Downstream Section									
June &									
July	55,793	5,502	1,078	211	600	325	1,258	8,974	0.040
August	19,393	-	-	13,130	4,306	18	420	17,874	0.230
September	6,008	-	-	631	3,084	-	25	3,740	0.160
Total	81,194	5,502	1,078	13,972	7,990	343	1,703	30,588	0.100
Midstream Section									
June &									
July	6,642	587	241	18	57	162	395	1,460	0.060
August	2,350	-	21	1,275	488	70	482	2,336	0.250
September	827	-	-	110	422	25	133	690	0.210
Total	9,819	587	262	1,403	967	257	1,010	4,486	0.120
Upstream Section									
June &									
July	17,767	1,031	1,601	-	-	1,478	3,135	7,245	0.110
August	6,444	-	230	1,038	1,070	778	4,396	7,512	0.290
September	3,083	-	9	598	1,558	262	1,451	3,878	0.310
Total	27,294	1,031	1,840	1,636	2,628	2,518	8,982	18,635	0.180
Total									
June &									
July	80,202	7,120	2,920	229	657	1,965	4,788	17,679	0.060
August	28,187	-	251	15,443	5,864	866	5,298	27,722	0.250
September	9,918	-	9	1,339	5,064	287	1,609	8,308	0.210
Total	118,307	7,120	3,180	17,011	11,585	3,118	11,695	53,709	0.120

Table 10. Kenai River historical sport harvest (excluding chinook salmon) and effort data for 1976-1978.

Year	Effort Man-days	Sockeye Salmon	Coho Salmon	Pink Salmon	Rainbow Trout	Dolly Varden	Total Harvest
1976	80,506	719	13,808	21,443	1,797	4,957	42,724
1977	102,203	1,436	10,056	100	2,474	8,058	22,124
1978	<u>118,307</u>	<u>2,180</u>	<u>11,585</u>	<u>17,011</u>	<u>3,118</u>	<u>11,695</u>	<u>45,589</u>
Mean	100,339	1,445	11,816	Not Applicable	2,463	8,237	39,519

Table 11. Estimated total angler effort on Anchor River, July 15 to November 12, 1978, by weekly intervals, in angler hours.

Week Ending	Downstream from Forks	Upstream from Forks	Total
July 16	944	800	1,744
July 23	2,352	1,136	3,488
July 30	4,272	1,648	5,920
August 6	2,720	1,536	4,256
August 13	3,077	1,115	4,192
August 20	2,131	986	3,117
August 27	3,113	728	3,841
September 3	5,213	597	5,810
September 10	2,543	513	3,056
September 17	3,107	649	3,756
September 24	3,924	440	4,364
October 1	3,664	520	4,184
October 8	3,188	704	3,892
October 15	1,720	388	2,108
October 22	1,280	252	1,532
October 29	474	240	714
November 5	348	212	560
November 12	<u>472</u>	<u>276</u>	<u>748</u>
Total	44,542	12,740	57,282

$$\text{Total Angler Days} = \frac{57,282 \text{ Angler Hours}}{2.74 \text{ Hours/Angler}} = 20,906$$

Table 12. Summary of data obtained during angler interviews, Anchor River creel census, July 15 to November 12, 1978.

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Total number of anglers interviewed	-	4,057
Total number of completed anglers interviewed	-	1,154
Mean number of fishing hours per completed angler	-	2.74
Mean number of anglers per vehicle	-	2.24

Composition of Fish Caught and Kept

<u>Species</u> *	<u>Number Caught</u>	<u>Number Kept</u>	<u>Percent Kept</u>
Dolly Varden	4,941	2,515	50.9
Pink salmon	71	20	28.2
Chinook salmon	7	0	0
Coho salmon	407	198	48.6
Rainbow	116	25	21.6
Steelhead	648	290	44.8
Other **	<u>152</u>	<u>30</u>	<u>19.7</u>
Total	6,342	3,078	48.5

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\* One chum salmon was observed but it was outside the sampling and census program, hence is not included.

\*\* Cottids and starry flounder caught in Area 1 which was under tidal influence.

Table 13. Species composition of harvest from Anchor River, July 15 to November 12, 1978, by weekly intervals, in percent.

Week Ending	DV	PS	SS	RT	SH	Other
July 16	81.5	1.9				16.7
July 13	98.7			1.0		0.3
July 30	98.4	0.7	0.2	0.2		0.5
August 6	97.0	1.2	1.2		0.6	
August 13	91.7	0.4	7.1	0.4	0.4	
August 20	60.9	5.1	22.5		5.1	6.5
August 27	61.8	1.0	26.7	2.1	6.3	2.1
September 3	51.7	1.7	32.5		14.2	
September 10	45.7		15.0	10.2	29.1	
September 17	32.6		15.8	1.1	48.4	2.1
September 24	52.1	0.7	7.9	1.4	36.4	1.4
October 1	63.4		3.7		32.8	
October 8	63.0		6.0		31.0	
October 15	88.4				11.6	
October 22	95.2				4.8	
October 29	96.6				3.4	
November 5	95.5		0.6		3.9	
November 12	93.0				7.0	

Data obtained during angler interviews show that approximately one-half the fish caught are kept. There are varied reasons for fish to be released: (1) small Dolly Varden were often released; (2) with the low stream flow conditions which existed, many coho salmon and steelhead were snagged and released; (3) the more proficient steelhead fishermen release most of their catch as a matter of course; and (4) it was not legal to keep chinook salmon caught anywhere in the stream, or to keep coho salmon caught above the forks.

The catch per unit of effort and estimated total harvest by weekly intervals are listed in Table 14.

Earlier creel census studies which included estimates of total harvest from Anchor River were reported by Allin (1954, 1957) and Dunn (1960). In 1978 the Sport Fish Division conducted a statewide creel census of 1977 harvest data via a questionnaire mailed to a sample of sport fish license holders (ADF&G, unpublished data). Estimates of effort and harvest for Anchor River are available from this survey. Estimates of harvest and total runs of Dolly Varden, coho salmon, and steelhead in Anchor River from these earlier studies are summarized in Table 15, with estimates from the 1978 creel census. Total effort listed includes that directed toward chinook salmon, because that portion cannot be separated for the earlier data. It is intended to illustrate the magnitude of change in effort rather than provide quantitative comparisons.

It is obvious that both fishing effort and harvest on Anchor River have increased greatly during the period for which we have records. Total population of all species has been at high levels the past few years. The status of chinook salmon runs has been documented in various other reports. The only historical estimates of run size of Dolly Varden, coho and steelhead we have were made in the middle 1950's. Information obtained during creel census studies for 1977 and 1978 indicates that the coho salmon population is somewhat greater than in earlier years, but the Dolly Varden and steelhead populations have increased tremendously since the 1950's studies. General comments from biologists who have worked on Anchor River and anglers who have fished the stream for many years were that it was "the best steelhead run in 25 years"; 1978 was also an exceptionally good year for Dolly Varden.

Various management practices and regulatory changes have likely played a role in the increased runs, and environmental conditions have been favorable the past few years. It is not known whether run sizes will remain high in face of differing conditions, so it will be necessary to continue to monitor the fishery and the populations to assess the status of the runs.

On August 28 and September 11, coho salmon and steelhead were captured with a beach seine and tagged with serially numbered Floy anchor tags before release. Some of the pertinent tagging and recovery data are listed in Tables 16 and 17.

Table 14. Calculated catch per unit of effort and total sport fish harvest on Anchor River, July 15 to November 12, 1978, by weekly intervals.

Week Ending	Fish Per Hour	DV	Estimated Harvest				other	Total
			PS	SS	RT	SH		
July 16	0.25	355	8				73	436
July 23	1.56	5,371			54		16	5,441
July 30	0.56	3,261	23	7	7		17	3,315
August 6	0.57	2,353	29	29		15		2,426
August 13	0.90	3,460	15	268	15	15		3,773
August 20	0.26	493	41	182		41	53	810
August 27	0.32	760	12	328	26	77	26	1,229
September 3	0.19	570	19	358		157		1,104
September 10	0.21	294		96	65	187		642
September 17	0.12	147		71	5	219	9	451
September 24	0.12	274	4	41	7	191	7	524
October 1	0.21	558		33		288		879
October 8	0.07	172		16		84		272
October 15	0.27	503				66		569
October 22	0.92	1,341				68		1,409
October 29	0.66	455				16		471
November 5	1.11	594		4		24		622
November 12	0.26	<u>180</u>				<u>14</u>		<u>194</u>
TOTAL		21,141	151	1,433	179	1,462	201	24,567
Percent of Total		86.1	0.6	5.8	0.7	6.0	0.8	100.0

Table 15. Summary of historical creel census data from Anchor River for harvest in summer-fall fishery, with results of 1977 and 1978 creel census data.

Year	Total Effort Man-Days	<u>Dolly Varden</u>		<u>Coho</u>		<u>Steelhead</u>	
		Harvest	Total Run	Harvest	Total Run	Harvest	Total Run
1954	3,000	4,000	11,500	395	1,700	50	600
--							
1957	5,800	573	7,000	90	801	247	511
--							
1960	5,300*	3,300	...	1,000	...	400	...
--							
1977	31,515**	9,222	...	1,339	...	1,072	...
1978	44,654***	21,141	...	1,433	...	1,462	4,132

\* Incomplete - covers period May 7 - July 14 only.

\*\* Data from 1978 questionnaire (ADF&G, unpublished data) and includes 10,978 man-days during king salmon fishery (Hammarstrom, unpublished data).

\*\*\* Includes 23,748 man-days during king salmon fishery (Hammarstrom, unpublished data), plus data from the 1978 creel census being reported herein.

Table 16. Summary of tagging and recovery data for Anchor River coho, 1978.

	<u>Date Tagged</u>		Total
	Aug. 28	Sept. 11	
Number of fish tagged	58	70	128
Number of tags returned	14	8	22
Tags reported but not returned			3
Number of tagged fish caught & released			7
Known harvest of tagged fish			18
Days from tagging to capture*			
Mean	5.2	14.8	
Range	1-7	5-19	
<u>Time of Recapture</u>			
<u>Week Ending</u>	<u>Est. Coho Harvest</u>	<u>Tagged Fish</u>	
July 30	7		
Aug. 6	29		
Aug. 13	268		
Aug. 20	182		
Aug. 27	328		
Sept. 3	358	10	10
Sept. 10	96	4	4
Sept. 17	71		1
Sept. 24	41		1**
Oct. 1	33		4**
Oct. 8	16		1***
Oct. 15	0		1***
Oct. 22	0		
Oct. 29	0		
Nov. 5	4		
Total	1,433	14	8

\* Excluding fish caught in Beluga Slough.

\*\* Caught above forks and released; area closed to coho fishing.

\*\*\* Recovered in Beluga Slough.

Table 17. Summary of tagging and recovery data for Anchor River steelhead, 1978.

	Date Tagged		Total
	Aug. 28	Sept. 11	
Number of fish tagged	16	64	80
Number of tags returned	5*	16	21
Tags reported but not returned			5
Number of tagged fish caught & released			8
Known harvest of tagged fish			18
Days from tagging to capture			
Mean	18.0	18.0	
Range	7-33	1-60	

Time of Recapture

<u>Week Ending</u>	<u>Est. Steelhead Harvest</u>	<u>Tagged Fish</u>		
Aug. 6	15			
Aug. 13	15			
Aug. 20	41			
Aug. 27	77			
Sept. 3	157			
Sept. 10	187	1		1
Sept. 17	219	2	3	5
Sept. 24	191	0	2	2
Oct. 1	288	1	7	8
Oct. 8	84		3	3
Oct. 15	66		0	0
Oct. 22	68		0	0
Oct. 29	16		0	0
Nov. 5	24		0	0
Nov. 12	14		1	1
Total	1,462	4	16	20

\* Includes one for which no date of capture is known.

Reservations about the validity of population estimates based upon tagged to untagged ratios revolve around the questions: (1) whether the numbers of fish tagged were ample, (2) whether the tagged fish were randomly distributed throughout the population, (3) whether either the tagging or recovery is done in a random manner, and (4) what proportion of tags recovered are actually reported.

The time of tag recovery was compared to the period of estimated harvest of coho and steelhead to help determine if tagged fish were distributed throughout the population. Tags were recovered both during creel census interviews, which were scheduled at random, and by voluntary effort, which was not random.

Data obtained from recovery of tagged coho are not adequate to use for a population estimate. More than half the estimated coho harvest had occurred before any fish were tagged, and tagged fish were recovered in a manner and in locations to suggest they were not randomly distributed throughout the population.

All the tags recovered from coho tagged on August 28 were recovered within a 7-day period, and they all were recovered within about 1/2 mile of the point of release. Stream flow was comparatively low during this period, but flows increased following rains early in the week ending September 10, and no more of this lot of tagged fish were recovered. This suggests that during the low flows the fish moved very little, but once flows increased, fish moved out of the area rapidly.

One coho tagged on September 11 was recovered downstream from the forks 5 days after tagging. Five tags were returned from fish caught above the forks and released because that area was closed to taking coho; they were caught from 13 to 19 days after tagging. Stream flows were comparatively high during this period and it appears that the fish moved upstream more rapidly than the first tagged lot.

Two coho of the lot tagged September 11 were recovered at Beluga Slough in Homer. These fish moved downstream out of Anchor River, then southeast a distance of about 16 miles to enter a stream which does not normally support a coho run. There are two possible explanations: the first, that the seining and tagging operation disrupted their migratory pattern and caused them to seek another stream; and the second, that they were destined for Beluga Slough and had entered Anchor River first in the course of seeking their home stream. One fish had been tagged approximately 1/2 mile above the mouth, an area under tidal influence, and the other was tagged about one mile above the mouth, out of the area of tidal influence. Scales from one of the fish were examined and the freshwater pattern was more comparable to some other fish from Anchor River than to those from the artificially produced run into Beluga Slough; this comparison, however, is not conclusive.

Data from recovery of tagged steelhead appear to be adequate to make a qualified population estimate. Only 10% of the estimated steelhead harvest had occurred prior to the time the first fish were tagged, and tagged fish were recovered throughout the balance of the season.

Tags recovered from steelhead during the random creel census interviews were used to establish tagged/untagged ratios and a population estimate based upon the method of Schaefer as outlined by Ricker (1975). The estimated population was 3,640 fish; an additional estimated 492 fish were harvested prior to recovery of the first tagged fish during the creel census, making a total estimate of 4,132 steelhead in Anchor River during the fall of 1978.

It was determined that seining is a feasible method of capturing coho salmon and steelhead and that tagging appears to be a practical method for estimating populations. It will be necessary to capture and tag fish throughout their migration period and to design an adequate tag recovery program to provide reliable information. Increased effort on this program is called for.

Scales were collected from 88 coho salmon for age determination. The length frequency of the sample is listed in Table 18, by age classification and sex. In the sample, 48.9% were Age 1.1, 47.7% were Age 2.1, and 3.4% were Age 3.1. The ratio of males to females was 1:0.87.

Scales were collected during creel census interviews from 113 steelhead caught by anglers. Total age could be determined from 99 scales, and post-smolt history could be determined from the remaining 14 scales regenerated during freshwater growth. In the sample, females predominated with a male to female ratio of 1:1.9. Previous data reported by Allin (1957) and Dunn (1960), Redick (1968), and McHenry (1969) have shown that females outnumber males, comprising from 53 to 73% of the samples.

Age classifications and lengths, by sex, of steelhead returning to spawn for the first time, and for which total age could be determined, are summarized in Table 19. There is an obvious difference in age structure between males and females. For both sexes, most of the fish, 76% of males and 82% of females, spent three years in fresh water before going to sea. However, 52% of the males returned to spawn after spending one winter in the ocean and 40% after two ocean winters, but 93% of the females had spent two winters in the ocean.

Twenty of the fish, 17.7% of the sample, had spawned before this migration, and three of these had spawned twice previously. Age classification of repeat spawners as determined by interpretation of scales from the 17 fish whose total age could be determined are presented in Table 20. Six fish had returned to spawn in successive years, whereas most, 11 of 17, had one ocean annulus following the spawning check before they returned for repeated spawning. Allin (1957) reported evidence of spawning in successive years based upon tag recoveries, although Redick (1968) found no such indication. The percentage of repeat spawners in this sample, 17.7%, is within the range of values reported by earlier investigators: Allin (1954), 26%; Dunn (1960), 3.5%; Redick (1968), 24.3%; and McHenry (1969), 16.2%.

Table 18. Length frequency of coho salmon from Anchor River, by sex and age classification, 1978.

Age Classification	Females			Males		
	1.1	2.1	3.1	1.1	2.1	3.1
<u>Length Interval (mm)</u>						
425-499					1	
450-474						
475-499		1				
500-524						
525-549	1					
550-574		1				
575-599	1			1	1	
600-624	2	6	1	1		
625-649	7	2		3	2	
650-674	4	6		5	7	
675-699	2	2		4	3	
700-724	1	2	1	6	6	1
725-749	1			2	1	
750-774				1	1	
775-799	—	—	—	1	—	—
Number	19	20	2	24	22	1
Mean Length	644	637	658	681	669	710
S.D.	45.8	51.1	60.1	48.0	63.9	...

Table 19. Summary of age composition and lengths of Anchor River steelhead trout which were returning to spawn their first time; data from scales collected in fall, 1978.

Age Class	No.	Percent	Length (mm)		
			Mean	Range	S.D.
<u>Males</u>					
2.2	2	8.0	807.5	800-815	10.6
3.1	11	44.0	612.7	565-710	43.5
3.2	7	28.0	770	700-815	39.6
3.3	1	4.0	...	815	...
4.1	2	8.0	595.0	560-630	49.5
4.2	1	4.0	...	655	...
4.3	<u>1</u>	4.0	...	840	...
Total	25				
<u>Females</u>					
2.2	10	17.5	690.5	650-740	29.7
3.1	3	5.3	610	560-640	43.6
3.2	43	75.4	714	660-760	24.5
3.3	<u>1</u>	1.8	...	735	...
Total	57				

Table 20. Summary of age classification and lengths of Anchor River steelhead trout which were returning as repeat spawners; data from scales collected in fall, 1978.

Age Class	Number	Length (mm)		S.D.
		Mean	Range	
<u>Males</u>				
2.1s	1	...	720	...
2.2s1	1	...	850	...
3.1s	1	...	790	...
3.1ss	1	...	755	...
3.1s1	<u>4</u>	793.8	760-805	22.5
Total	8			
<u>Females</u>				
2.1s	1	...	700	...
2.1s1s1	2	...	825-870	31.8
2.2s	1	...	730	...
3.1s	1	...	700	...
3.1s1	1	...	725	...
3.2s	1	...	800	...
3.2s1	<u>2</u>	820	815-825	7.1
Total	9			

## Kachemak Bay Creel Census

A summary of the calculated total effort by sport anglers and subsistence shellfish fishermen in Kachemak Bay during the period May 15 through September 15, 1978 is presented in Table 21.

Clam diggers comprised 18.5% of the anglers counted on the Homer Spit and accounted for 1,516 man-days of effort. Fifteen percent of the boat anglers interviewed fished only for shellfish, and an additional 12.4% of boat anglers fished for both finfish and shellfish. A total of 7,542 man-days were devoted to shellfish harvest by boat fishermen although 3,413 of these days were involved in finfish harvest, also.

A limited amount of sport fishing effort occurs before May 15 and after September 15, the dates covered by this census. However, that effort is felt to be insignificant in relation to that accounted for during the census period and no attempt has been made to include a correction.

During the aerial counts, the approximate locations of sport fishing boats were plotted on a map. Figure 4 represents a composite of the data from 10 flights conducted during the period May 20 through September 14, 1978. Each dot represents a single sighting and a total of 608 boats are represented.

Boats are well distributed throughout the bay, yet the more favored locations are apparent from repeated sightings. There were some seasonal changes in distribution of effort. The primary change was increased concentration of boats fishing for salmon in a few specific locations.

A summary of harvest rate of finfish anglers determined through interviews is presented in Table 22. Some anglers fish only for a specific species while others may fish for a combination of species. The separation of harvest data by target species represents those anglers who fished for and kept nothing other than the designated species. Anglers who noted a preference for a species but caught and kept fish of another species were assigned to the "mixed species" category.

Species composition of the sport fishing harvest of finfish in Kachemak Bay in 1978 is listed in Table 23, and the calculated total harvest of finfish is presented in Table 24.

Shore anglers expressed a strong preference for salmonids, with 51.7% fishing for and keeping nothing other than salmon and Dolly Varden. Approximately 50% of the anglers listed in Table 22 under "mixed species" expressed a preference for salmonids, but kept other species which they caught. Almost one-half (46%) of the harvest was of salmonids, with flatfishes, largely starry flounder and yellowfin sole, and various species of cottids making up the balance. Several miscellaneous marine fishes were observed to have been caught but were not kept by the anglers interviewed.

Table 21. Estimated total effort by sport anglers and subsistence shellfish fishermen in Kachemak Bay, May 15 to September 15, 1978.

	Mean Count	Total Angler Hours	Total Angler Days
<u>Shore Anglers</u>			
Weekdays	7.9	9,622	5,201
Weekends	10.7	5,543	2,996
Total		<u>15,165</u>	<u>8,197</u>
<u>Boat Anglers</u>			
Weekdays	30.0	66,417	14,694
Weekends	61.6	57,996	12,831
Total		<u>124,413</u>	<u>27,525</u>
<u>Charter Boat Anglers</u>			
811 boat trips		23,057	5,101
<u>Total Effort</u>			
Shore anglers		15,165	8,197
Boat anglers		124,413	27,525
Charter boat anglers		23,057	5,101
Total		<u>162,635</u>	<u>40,823</u>

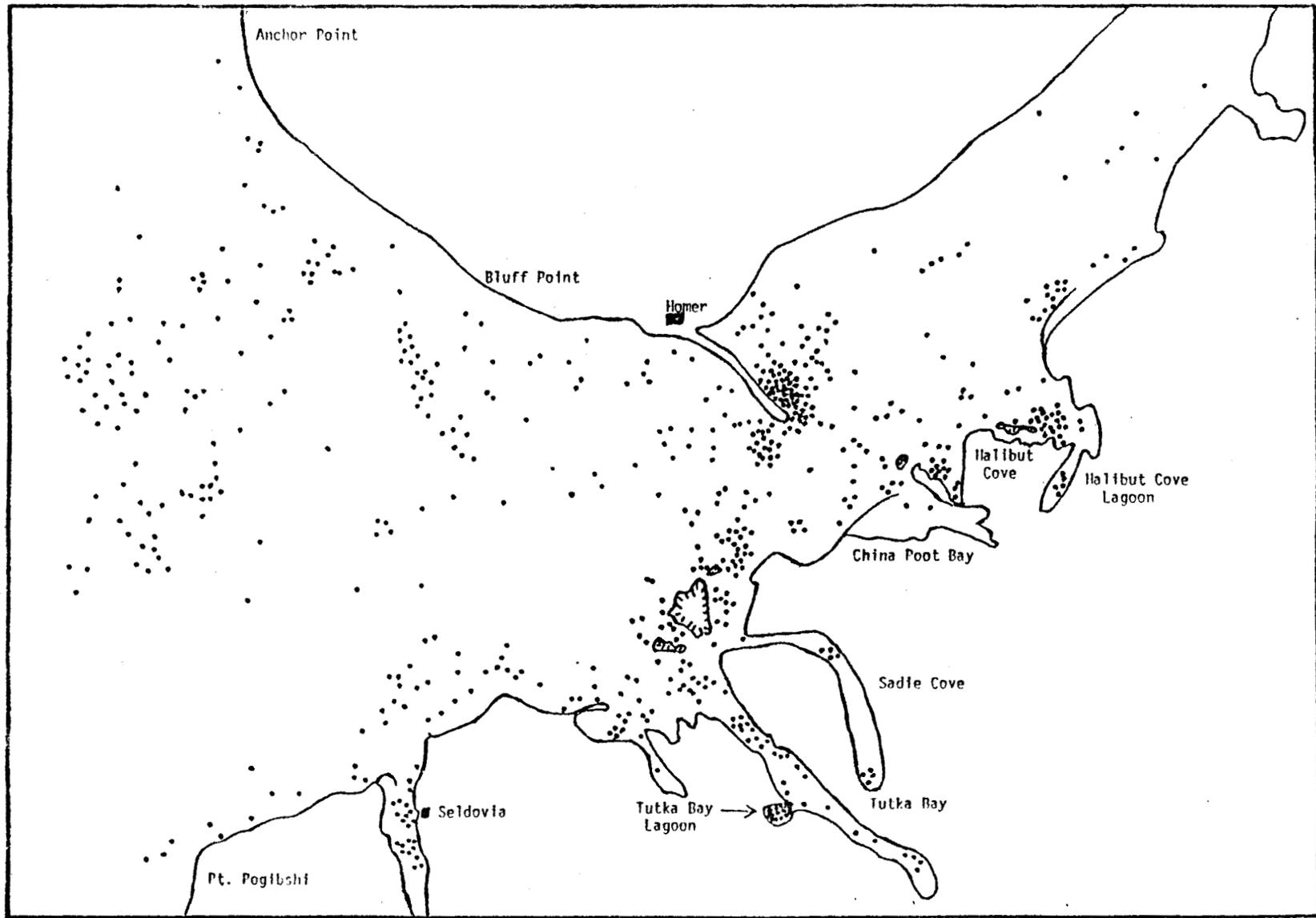


Fig. 4. Distribution of sport fishing boats in Kachemak Bay during ten aerial flights, 1978.

Table 22. Finfish harvest rate in Kachemak Bay during 1978 as determined by interviews with completed anglers (charter boat data based upon operator's records and calculated time per angler).

Target Species	Number Anglers	Number Hours	Harvest	Fish/Hour
<u>Shore Anglers</u>				
Salmon only				
Pink salmon	40	62	5	0.081
Coho salmon	29	47	1	0.021
Pink & coho	<u>142</u>	<u>333</u>	<u>34</u>	<u>0.102</u>
Combined	211	442	40	0.090
Dolly Varden only	35	49	12	0.245
Mixed species	<u>230</u>	<u>390</u>	<u>117</u>	<u>0.300</u>
Total all species	476	881	169	0.192
<u>Sport Boat Anglers</u>				
Salmon only				
Chinook salmon	10	24	3	0.125
Pink salmon	76	183	62	0.339
Coho salmon	<u>98</u>	<u>368</u>	<u>48</u>	<u>0.130</u>
Combined	184	575	113	0.197
Halibut only	920	3,895	715	0.184
Mixed species	<u>345</u>	<u>2,075</u>	<u>488</u>	<u>0.235</u>
Total all species	1,449	6,545	1,316	0.201
<u>Charter Boat Anglers</u>				
Halibut only	4,626	20,910	8,669	0.415

Table 23. Species composition of finfish harvest in Kachemak Bay, based upon interviews with anglers, 1978.

Species	Shore Angler Harvest		Sport Boat Angler Harvest	
	No.	Percent	No.	Percent
Pink salmon	21	12.4	82	6.2
Coho salmon	23	13.6	54	4.1
Chinook salmon	2	1.2	5	0.4
Chum salmon			1	0.1
Dolly Varden	32	18.9	50	3.8
Halibut			898	68.2
Flat fishes	44	26.0	102	7.8
Rockfish			23	1.7
Cottids	47	27.8	65	4.9
Cod			7	0.5
Tomcod			11	0.8
Greenling			1	0.1
Other			17	1.3
Total	169	99.9	1,316	99.9

Table 24. Estimated harvest of finfish in Kachemak Bay by sport fishermen, May 15 - September 15, 1978.

Species	Shore Anglers	Sport Boat Anglers	Charter Boat Anglers	Other	Total
Pink salmon	294	1,319	87		1,700
Coho salmon	323	872		800*	1,995
Chinook salmon	28	85	108	100**	321
Chum salmon		21			21
Dolly Varden	449	809			1,258
Halibut		14,513	8,689		23,202
Flat fishes	618	1,660	36		2,314
Rockfish		361	24		385
Cottids	661	1,043			1,704
Cod		106	30		136
Tomcod		170			170
Greenling		21			21
Other		276			276
Total	2,373	21,256	8,974	900	33,503

\* Beluga Slough - not covered in creel census schedule.

\*\* Halibut Cove Lagoon - not covered in creel census schedule.

Halibut is the preferred species of a great majority of sport boat anglers: 63.5% of the finfish anglers interviewed fished only for halibut, and more than half the anglers listed in Table 22 under "mixed species" fished for halibut as well as other species. Halibut comprised more than two-thirds of the total sport fish harvest.

A comparatively small percentage, 12.7%, of anglers interviewed fished only for salmon, and all species of salmonids constituted 15.8% of the total harvest. Most of the other fishes listed in the harvest were caught incidental to fishing for salmonids and halibut and comprised 14.9% of the total estimated harvest.

Results of this study differed greatly from those reported by Engel (1967, 1973) and Hammarstrom (1974). While any attempt to explain these differences would be speculative, a few general observations are in order. There has been a great increase in the sport boat fishery over the past several years, and this is the first time a full census of boating effort has been undertaken. There has also been an increase in numbers of charter boats, and in 1978 there were 14 boats known to be engaged in sport fishing charters. Twelve of these specialize in halibut fishing, but do limited chartering for other species, and two boats specialize in salmon fishing with limited effort for halibut. Both Engel and Hammarstrom reported harvest in the shore based fishery from the Homer City Dock; however, fishing is no longer permitted from the dock.

Engel (1967) described shore anglers on the Homer Spit as "casual fishermen". This is an apt description, and when weather conditions are not favorable, effort drops off noticeably. In 1978 weather conditions were poor a great deal of the time and is thought to be the major factor in the comparatively low effort for shore anglers.

Results of the 1977 statewide sport fishing survey showed a total of 38,498 man-days of effort in Kachemak Bay (ADF&G, unpublished data). This compares closely with 40,823 man-days estimated in 1978 during this census. There were some substantial differences in species composition of the harvest in 1977 and 1978, however.

#### Marked Fish Returns

Beginning in 1974 and continuing to date, the Department of Fish and Game has planted coho and chinook salmon smolts into Halibut Cove Lagoon. Most of these fish were reared at the Fire Lake-Ft. Richardson Hatchery complex, then were transported to Halibut Cove and held a short time in saltwater pens before release. Most of the smolts were fin-marked and tagged with coded wire tags before release.

A number of anglers interviewed during the creel census had fished for coho in Halibut Cove Lagoon, and their catch data are included in the estimate of total harvest by boat anglers. A total of 54 coho salmon were checked in the harvest of boat anglers, and only one was marked and tagged.

Personnel at the Halibut Cove Lagoon facility estimated a total return of 1,000 coho adults to the site in 1978. Six hundred forty-seven were examined for marks and 305, or 41.1%, were marked. A total of 7,244 coho smolts of the 1975 brood year had been released, of which 7,180, or 99.1%, had been marked; of this lot, 113 marked fish were recovered, 1.6% of the numbers released. The high proportion of unmarked fish captured at Halibut Cove Lagoon indicates that a substantial portion did not originate there.

No anglers interviewed during the creel census had fished for chinook in Halibut Cove Lagoon. The estimated harvest of 100 chinook salmon of this source listed in Table 24 is a guess based upon observations of personnel at the Halibut Cove Lagoon facility and no quantitative data are available to make a calculated estimate.

All of the chinook smolts which have been due to return as adults up to this year have been fin-marked and tagged with a coded wire tag. Some of the numbers of tags assignable to various lots are uncertain at present, but approximately one-half the adults which have been captured at the site have been unmarked, suggesting that they did not originate from stocks released at Halibut Cove Lagoon.

Adult chinook which have resulted from the Halibut Cove Lagoon plants have made a very small contribution to the sport fishery in Kachemak Bay. Because of its location, very few people fish in the lagoon. The adult chinook salmon which return to the lagoon do not take lures readily. None of the marked fish of these plants are known to have been caught in any location in Kachemak Bay other than inside the Lagoon.

In June, 1976, 26,000 chinook salmon smolts which averaged 20.2 grams each (22.5 fish per pound) and were marked with a right ventral fin-clip were planted into Tutka Bay Lagoon Creek. The fish originated from eggs of the 1975 brood year in Ship Creek and had been reared at the Ft. Richardson Hatchery near Anchorage. During 1978 three marked adults of this lot were captured by anglers in Tutka Bay Lagoon. One fish was a male, 68.6 cm (27 inches) fork length, and weighed 3.9 kg (8.5 lb.). No data were obtained from the other two fish.

#### Kachemak Bay Feeder Chinook Salmon

There are chinook salmon in Kachemak Bay year-round. They are caught in set net and seine fisheries throughout the summer and in winter are frequently taken in shrimp trawls. A few sport fishermen catch them from early spring through late fall.

During 1977 a local charter boat operator delivered a marked and tagged chinook salmon to the Homer office of Alaska Department of Fish and Game. Examination of the tag revealed the fish originated at the Puntledge River Hatchery in British Columbia. In 1978 scales were collected from sport caught chinook salmon in Kachemak Bay in an attempt to determine probable origin of the fish. The previously noted charter

boat operator provided many of the scales, and he also brought in a total of five chinook salmon marked with an adipose fin clip and coded wire tags. Examination of the tags revealed that the fish originated at several locations (Table 25).

Final assessment is not yet complete, but preliminary examination of scales from sport caught chinook reveals a variety of patterns in freshwater growth which also suggests that the feeder chinook salmon in Kachemak Bay are from a variety of sources.

#### Beluga Slough Coho

In the fall of 1976, approximately 10,000 coho salmon fingerlings were planted into Beluga Lake in Homer. The winter of 1976-77 was exceptionally mild, Beluga Lake remained ice free and coho smolts were observed moving out of the lake in the spring of 1977. Coho "jacks" (about 100 fish) returned to Beluga Slough in the fall of 1977. Three-year-old adults returned to Beluga Slough in 1978. Inadequate data were obtained to estimate numbers, but it is required that about 800 fish returned and were harvested by local fishermen. Scales were examined from 12 fish from Beluga Slough, and two had patterns which indicated they originated somewhere else.

At high tide, Beluga Slough floods to the roadway which crosses the area adjacent to Beluga Lake. Because the channel is small, most fish that entered at high tide retreated as the tide went out. Many fish became stranded as the tide receded, and those that remained in the channel were vulnerable to capture by many methods. These fish did not take lures readily, but their exposure led to fishermen capturing them by any means at their disposal (reportedly snagging, dipnetting, gaffing, clubbing and capture by hand, even though these methods are illegal).

There was no potential for this planted run to reproduce; consequently, they could and should, have a 100% harvest. Our current policies and regulations are not flexible enough to cover this specific kind of situation, but if the hatchery planting program becomes successful there will be many similar situations throughout the State and it would appear to be appropriate for the Board of Fisheries to address the problem.

#### Tutka Bay Lagoon Dolly Varden

Dolly Varden were captured and tagged with colored Floy anchor tags in an attempt to help determine the extent of Dolly Varden predation upon pink salmon fry at Tutka Bay Lagoon and to learn more of distribution and movements of Dollies within Kachemak Bay.

No fish could be captured by seining, four were caught on hook and line during several man-hours of effort, and 16 were caught in a gill net fished at high tide during three tide changes. Twenty fish were tagged, one died following tagging, and a total of 19 tagged fish were released. One tagged fish was recaptured in a purse seine in Tutka Bay Lagoon during a commercial opening for pink salmon, and one was caught in Seldovia Bay by a sport fisherman.

Table 25. Data for tagged chinook caught in Kachemak Bay sport fishery, 1978.

Data Captured	Size Length Weight	Tag Code	Race	Brood Year	Origin
Sept. 26	680 mm 5.9 kg	9-5-7	Spring	1975	South Santiam River, Oregon; hatchery experimental.
Sept. 30	825 mm 6.8 kg	9-5-8	Spring	1975	South Santiam River, Oregon; planted in Willamette River at Oregon City.
Sept. 26	575 mm 3.7 kg	2-4-11	Fall	1975	Nitnat River, British Columbia; wild stock contribution.
Sept. 26	570 mm 3.6 kg	2-1-10	Summer	1975	Atnarko River, British Columbia; wild stock contribution.
Oct. 19	. . . 2.3 kg	63-16-6	Summer	1976	Skagit River, Washington; wild stock contribution.

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