

STATE OF ALASKA

Jay S. Hammond, Governor



Annual Performance Report for

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

by

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TABLE OF CONTENTS

Section A

Abstracts	Page No.
Federal Aid in Fish Restoration	1
Anadromous Fish Studies	

Section B

Study G-I

Inventory and Cataloging

Job No. G-I-B

Inventory and Cataloging of Frank Van Hulle
the Sport Fish and Sport John B. Murray
Fish Waters in Southwestern
Alaska

Abstract	1
Background	2
Recommendations	3
Objectives	3
Techniques Used	4
Findings	5
Results	5
Lake and Stream Surveys	5
Sport Fish Harvest Estimates	7
Assessment and Inventory of Anadromous Fish Populations	7
Discussion	33
Lake and Stream Surveys	33
Sport Fish Harvest Estimates (1977)	34
Sport Fish Harvest Estimates (1976)	36
Assessment and Inventory of Anadromous Fish Populations	36
Acknowledgement	37
Literature Cited	37

Job No. G-I-C

Inventory and Cataloging Stephen Hammarstrom
of Kenai Peninsula, Cook
Inlet and Fish Stocks

Abstract	42
Background	42
Stocked Lake Evaluation	42
Kenai River Creel Census	43
Recommendations	43
Objectives	43
Techniques Used	44
Findings	44

Section B

Job No. G-I-C (continued)	Page No.
Stocked Lake Evaluation	44
Kenai River Creel Census	50
Discussion	52
Stocked Lake Evaluation	52
Kenai River Creel Census	52
Literature Cited	56

Job No. G-I-D

Inventory, Cataloging and David Watsjold
Population Sampling of the
Sport Fish and Sport Fish
Waters in Upper Cook Inlet

Abstract	57
Background	58
Recommendations	58
Objectives	59
Techniques	59
Findings	61
Results	61
Fish and Meadow Creeks Fisheries Investigation	61
Kepler Lakes Area Creel Census	69
Lake Stocking Evaluations	76
Chinook Studies	76
Coho Studies	78
Discussion	84
Literature Cited	88

Section C

Study G- I
Inventory and Cataloging

Job No. G-I-E
Inventory and Cataloging Louis A. Gwartney
of Sport Fish and Sport Richard Russell
Fish Waters of the Bristol
Bay Area

Abstract	1
Background	2
Recommendations	2
Objectives	4
Techniques Used	4
Findings	4
Results	4
Naknek River Chinook Salmon	4

RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations
of Alaska

Project No.: F-9-10

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

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

Period Covered: July 1, 1977 - June 30, 1978

ABSTRACT

Relative growth and survival rates as determined by fall gill netting are presented for rainbow trout, Salmo gairdneri Richardson, and coho salmon, Oncorhynchus kisutch (Walbaum), stocked in area lakes. Results of a plant of Arctic grayling, Thymallus arcticus (Pallus), in a lake previously unable to overwinter salmon or trout 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 km (40 miles) of the Kenai River indicated an estimated harvest of 10,056 coho salmon. Harvest estimates for sockeye salmon, O. nerka (Walbaum); pink salmon, O. gorbuscha (Walbaum); rainbow trout; and Dolly Varden, Salvelinus malma (Walbaum), are also presented. Total effort from June 1 through September 30 was estimated at 102,203 man-days of which 83,018 were directed primarily at chinook salmon, O. tshawytscha (Walbaum), during June and July. Beginning in August, effort is directed at coho salmon and on even numbered years also at pink salmon. Harvest of other species is considered incidental.

Attempts to establish a self sustaining population of Arctic grayling in Seldovia Lake from transplanted adults and sub-adults are discussed.

BACKGROUND

Stocked Lake Evaluation

Since statehood an ongoing program of lake rehabilitation and enhancement has been directed at waters easily accessible to sport anglers. Survey data have been analyzed with regard to: need for additional angling opportunity; potential of a given water to sustain species of desirable fish; status, condition and composition of existing populations; and requirements for rehabilitation or enhancement.

All lakes stocked thus far have been landlocked with the exception of three stocked with rainbow trout and seven planted with Arctic grayling.

Historically stocked species have been limited to rainbow trout, coho salmon, sockeye salmon, and Arctic grayling.

Fish populations are sampled each fall and the data gathered have been used to determine relative survival, growth rates and future stocking densities.

Kenai River Creel Census

In 1974, a creel census was initiated on the Kenai River with chinook salmon being the target species. It was found that after the chinook salmon season closes (July 31) effort is directed toward other species, primarily coho salmon and pink salmon. The technique changes from drifting to anchored boats and either casting lures or fishing bait. Fishing continues through September unless weather conditions or high water levels, such as occurred in 1977, preclude.

RECOMMENDATIONS

1. Adult lake trout from Skilak Lake should be captured using electrofishing gear and transplanted to Upper Summit Lake in an attempt to establish a self-sustaining population.
2. A creel census should be initiated on the Anchor River to determine angler effort and harvest of coho salmon, steelhead trout and Dolly Varden.
3. A creel census should be initiated in Kachemak Bay to determine recreational angler effort and harvest of all fin and shell fish species.

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 and 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 the 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

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

The creel census employed on the Kenai River was based on one described by Newhold and Lu (1957) and described in detail by Hammarstrom (1977). Effort estimates are based on two randomly selected instantaneous counts per day. Every weekend/holiday day was sampled and three of five weekdays were sampled. Due to decreasing daylight the fishing day was as follows: June and July, 20 hours; August, 16 hours; September, 12 hours. Interviews to obtain hours fished, harvest and samples for biological data were conducted during two three-hour periods arranged around the instantaneous counts.

Since two distinct runs of coho salmon occur in the Kenai River, harvest and effort data is calculated accordingly. Run timing was determined by relative catch per angler hour for each major section of river. Data obtained over the last three field seasons indicate approximately a one week difference in timing between the upstream and downstream section for coho salmon. For simplicity, data are summarized by calendar month rather than by run timing.

Adult and sub-adult Arctic grayling from Crescent Lake were captured with rod and reel and flies, held in wire mesh holding pens for up to 48 hours, then transported via fixed wing aircraft to Seldovia Lake. During the one hour flight, fish remained in plastic containers in approximately 113.5 liters (30 gal) of continuously oxygen enriched water.

FINDINGS

Stocked Lake Evaluation

Population sampling using variable mesh gill nets was conducted on 14 area lakes. One lake was also sampled using electrofishing gear. All lakes stocked with rainbow trout, Salmo gairderi Richardson, except Rainbow Lake (Fetus), have been treated chemically with emulsified rotenone to eliminate competing species, usually threespine stickleback, Gasterosteus aculeatus Linnaeus. Rainbow Lake was naturally free of stickleback. In addition, three lakes stocked with coho salmon, Oncorhynchus kisutch (Walbaum), have been treated chemically. One lake, Bernice, has winterkilled in previous years, thus eliminating natural stickleback populations and artificially introduced populations of rainbow trout; coho salmon; and sockeye salmon, O. nerka (Walbaum). Two lakes, Sunken Island and Upper Jean, received supplemental plants of sockeye salmon in 1977. North Joseph Lake was selected as a test lake for the native rainbow trout brood stock program (Hammarstrom, 1977).

Analysis of the 1977 gill net results failed to produce any fish from the 1976 plant of rainbow trout in Longmare Lake. These fish were planted late in the season, August 8, 1976. Historically fall plants have not been as successful as spring plants. It is assumed that this plant failed, as that lake should have grown fish large enough over one growing season to be captured in the gill nets used. Pertinent historical data and sampling data for the six lakes containing rainbow trout are presented in Tables 1 and 2.

Gill net results after one growing season showed a gill net catch per hour of 12.04 in 1976 for coho salmon in Centennial Lake. After another season, this lake showed a catch per hour of 1.76. This lake has received heavy angling effort both summer and winter which could explain the reduced catch rate. Pertinent historical data and sampling data for the seven lakes stocked with coho salmon are presented in Tables 3 and 4.

Because Bernice Lake has an abundant food source, scud (Gammarus), and a State operated campground, numerous plants of salmon and trout have been tried but failed to carry fish through the winter. The lake has a maximum depth of eight feet and dissolved oxygen levels have been recorded as low as 0.4 ppm. Arctic grayling sac-fry were experimentally planted in June 1976. After abnormally mild conditions during the winter of 1976-1977, the lake was sampled September 27, 1977 and 145 fish were captured in 46 hours of gill netting (catch per hours 3.152). These fish ranged in length from 219 mm (8.6 inches) to 278 mm (10.9 inches) with a mean of 250.1 mm (9.8 inches) and a standard deviation of 9.9 mm (0.39 inches). A mean weight of 208.7 gm (0.46 lb.) was also recorded. Whether these fish will be able to tolerate low dissolved oxygen levels during a normal winter will be determined by sampling in the spring of 1978.

In an attempt to establish a self-sustaining Arctic grayling population in Seldovia Lake on the south side of Kachemak Bay, 173 adult and sub-adult fish were captured and transplanted from Crescent Lake located in the Central Kenai Peninsula.

July 20-22, 1977 were spent at Crescent Lake capturing fish. It was initially planned to utilize a 30.5 m (100 ft.) beach seine as the primary means of capture but, due to the extremely high water level, this proved to be unsatisfactory and hook and line with flies was used. All fish were captured within the first 100 m (328 ft.) of the outlet stream.

Fish were held in two wire mesh pens for as long as 48 hours. No mortalities were recorded during holding. The fish were then retransported in four plastic containers, at approximately 45 fish per container, using bottled oxygen and two aeration stones per container to enrich the water.

The flight duration was approximately one hour. No fish mortalities were recorded during the flight or upon release.

Fork length measurements were taken from 32 fish. Fish ranged in size from 116 mm (4.6 inches) to 341 mm (13.4 inches) with a mean of 212.5 mm (8.4 inches). Although no scales were collected for determination of age, the length data based on work by Engel (1973) on Crescent Lake Arctic grayling suggest fish were of age I, II and III.

Table 1. Summary of Rainbow Trout Stocking in Rehabilitated Kenai Peninsula Lakes Sampled with Gill Nets, 1977.

<u>Lake</u>	<u>Date Rotenoned</u>	<u>Date Stocked</u>	<u>Origin</u>	<u>Fish/kg</u>	<u>Fish/Hectare</u>	<u>Total Stocked</u>
Cabin	6/18/70	9/11/70	Winthrop, WA	363	1,038	24,000
		6/ 5/71	Ennis, MT.	251	618	14,300
		6/20/73	Ennis, MT.	284	563	13,000
		7/16/75	Ennis, MT.	255	494	11,400
Jerome	6/28/68	5/24/77	Ak. Ennis, AK.	297	303	7,000
		8/27/68	Winthrop, WA.	462	1,297	8,550
		9/ 5/69	Winthrop, WA	290	544	3,600
		9/11/70	Winthrop, WA.	233	494	3,200
		6/11/71	Ennis, MT.	348	544	3,600
		8/ 3/72	Winthrop, WA.	988	544	3,600
		6/20/73	Ennis, MT.	284	544	3,600
		7/19/74	Winthrop, WA.	750	605	4,000
Johnson	9/11/72	7/14/76	Ship Creek, AK.	524	605	4,000
		6/20/73	Ennis, MT.	284	633	21,800
		7/16/75	Ennis, MT.	255	494	17,000
Longmare	9/ 7/72	5/24/77	Ak. Ennis, AK.	297	295	10,200
		6/20/73	Ennis, MT.	284	1,161	81,100
		8/24/73	Ennis, MT.	136	667	47,000
		7/17/74	Winthrop, WA.	750	494	34,400
Rainbow (Fetus)		8/ 9/76	Ship Creek, AK.	431	507	35,300
		6/28/71	Oregon	6,565	1,483	9,000
		7/ 3/74	Winthrop, WA.	1,602	1,253	7,600
Tirmore (Short Pine)	9/ 8/72	7/13/77	Ennis, MT.	1,742	495	3,000
		7/26/73	Ennis, MT.	246	371	7,800
		7/26/73	Winthrop, WA.	275	371	7,800
		7/16/75	Ennis, MT.	365	494	10,400
		5/24/77	Ak. Ennis, AK		309	6,500

Table 2. Summary of Gill Net Results from Kenai Peninsula Area Lakes Stocked with Rainbow Trout, 1977.

Lake	Date Sampled	Method *	Species **	Number in Sample	C/H ***	Length Range mm	Mean Length mm	Length S.D. ****	Weight Range Grams	Mean Weight Grams	Year Planted
Cabin	9/27/77	G.N.	R.B.	2	0.042	363-373	368	7.07	630.5-657.7	644.1	1975
			R.B.	39	0.813	97-240	189.5	26.85	13.6-190.5	99.3	1977
Jerome	9/15/77	G.N.	R.B.	10	0.240	95-333	199.1	110.0	9.1-553.4	226.8	1974 & 1976
			D.V.	5	0.180	415-480	445.2	28.5	698.5-1152.1	880.0	Unknown
Johnson	9/11/77	G.N.	R.B.	7	0.220	412-510	436.1	33.7	834.6-.574.0	1084.1	1973 & 1975
			R.B.	28	0.580	158-294	227.0	27.7	49.9-322.0	104.9	1977
Longmare	9/29/77	G.N.	R.B.	11	0.362	380-430	399.9	16.5	675.9-1134.0	877.2	1974
Rainbow	9/20/77	G.N.	R.B.	4	0.091	393-435	421	24.2	870.9-1179.3	1065.9	1974
			R.B.	4	0.091	107-144	126.8	16.5	9.1-36.3	13.6	1977
Tirmore	9/27/77	G.N.	R.B.	5	.10	458-467	461	5.2	1288.2-1433.4	1339.5	1973 & 1975
			R.B.	10	.240	154-228	202.9	21.3	54.4-154.2	109.8	1977

* G.N. - Gill Net
 ** R.B. - Rainbow Trout
 D.V. - Dolly Varden
 *** C/H - Catch per hour
 **** S.D. - Standard Deviation

Table 3. Summary of Kenai Peninsula Lakes Stocked with Coho Salmon and Sampled by Gill Nets, 1976.

<u>Lake</u>	<u>Date Stocked</u>	<u>Origin</u>	<u>Fish/kg</u>	<u>Fish/Hectare</u>	<u>Total Stocked</u>
Arc	7/19/74	Seward	757	642	4,100
	6/02/76	Blind Slough	656	630	4,000
Centennial	7/16/75	Seward	882	1,421	14,400
	7/13/77	Seward	919	308	3,125
Engineer	7/16/75	Seward	882	371	34,400
	7/13/77	Seward	919	370	34,350
Portage	7/26/73	Kodiak	563	741	8,300
	7/16/75	Seward	882	618	6,900
	7/13/77	Seward	919	502	5,600
Scout	6/02/76	Blind Slough	656	866	33,300
Sunken Island	6/28/71	Seward	860	494	28,000
	7/26/73	Kodiak	563	494	28,000
	7/16/75	Seward	882	247	14,000
Upper Jean	7/26/73	Kodiak	563	618	11,500
	7/16/75	Seward	882	618	11,500

Table 4. Summary of Results of Kenai Peninsula Area Lakes Sampled with Gill Nets and Electro-Fishing Gear, 1977

Lake	Date Sampled	Methods *	Species **	Number in Sample	C/H ***	Length Range mm	Mean Length mm	Length S.D. ****	Weight Range Grams	Mean Weight Grams	Year Planted
Arc	10/12/77	G.N.	S.S.	51	1.159	148-189	161.3	7.6	40.8-63.5	48.1	1976
Centinnial	10/11/77	G.N.	S.S.	43	1.760	213-280	244.9	12.8	113.4-235.9	158.8	1975
Engineer	9/21/77	G.N.	S.S.	111	2.790	220-365	269.1	27.8	136-535.2	254.0	1975
		G.N.	S.S.	74	1.931	92-120	103.8	5.7	9.0-22.7	11.2	1977
Portage	9/22/77	G.N.	S.S.	42	1.293	135-217	194.2	13.4	27.2-117.9	75.7	1975
		G.N.	S.S.	57	1.360	90-115	104.4	5.4		17.2	1977
Scout	10/12/77	G.N.	S.S.	38	0.840	182-220	194.7	9.1	63.5-113.4	74.0	1976
	10/14/77	E.F.	S.S.	66	66.000	170-212	191.9	10.7	54.4-122.5	78.0	1976
Sunken Is.	9/22/77	G.N.	S.S.	48	1.181	205-317	257.3	31.7	99.8-417.3	210.9	1975
Upper Jean	9/15/77	G.N.	S.S.	5	0.074	300-400	355.4	40.2	299.4-834.6	553.3	1973
	9/15/77	G.N.	S.S.	161	2.370	118-251	205.0	18.8	68.0-208.7	108.9	1975

- * G.N. - Gill Net
- E.F. - Electro-Fishing
- ** S.S. - Coho Salmon
- *** C/H - Catch Per Hour
- **** S.D. - Standard Deviation

Kenai River Creel Census

The Kenai River creel census begins in early June, and until late July the primary species taken by sport anglers is chinook salmon, O. tshawytscha (Walbaum). Other species are harvested incidental to chinook salmon, namely rainbow trout and Dolly Varden, Salvelinus malma (Walbaum), although a few sockeye salmon are also harvested. Around mid-July the first coho salmon enter the system and on "even" years large numbers of pink salmon, O. gorbuscha (Walbaum), are also available from mid-July until mid-August. Data regarding chinook salmon are presented in a Report of Progress by Hammarstrom (1978).

The first coho salmon was reported by July 23. This datum was used as the start of the coho salmon season for creel census calculations. The creel census terminated September 30, 1977; thus the season extended 70 days.

Total effort was estimated at 19,185 man-days after July 28, with 12,522 man-days during the early run and 6,632 man-day during the late run. Total harvest of coho salmon is estimated at 10,056 fish with 6,778 and 3,278 from the early and late run. A man-day averaged 4.4 hours during the early run and 4.7 hours during the late run. Catch per hour is estimated at 0.123 during the early run after the chinook salmon season closed and 0.105 during the late run.

Both harvest and effort were reduced from 1976. The most probable cause is the flooding conditions that existed during early August and again in early September. The first high water period was caused by the melt of snow from an abnormally high snow pack in the Chugach Range. The second period of high water was caused by the simultaneous dumping of two ice-dammed lakes, one located in Snow River Glacier feeding Kenai Lake and the other located in Skilak Glacier feeding Skilak Lake.

The early run of coho salmon, which is present from late July until late August, showed a higher catch per hour in the recreational fishery in 1977 than in 1976, 0.123 and 0.085. Effort during the same times was reduced by nearly 33% while the harvest increased by 6.5%.

The late run, which is present from early September through mid-winter, appeared to be smaller in 1977 than in 1976. The catch per angler-hour was reduced from 0.122 in 1976 to 0.105 in 1977. Corresponding figures for effort are 17,430 and 6,632 man-days, respectively, and for harvest 7,445 and 3,278 coho salmon, respectively. In addition, commercial fishing data show a decline from 27.1 fish per landing in 1976 to 16.7 in 1977 with the total harvest estimated at 13,767 and 6,008, respectively.

In addition to coho salmon the following harvest estimates were made for the other species: sockeye salmon, 1,436; rainbow trout, 2,474; Dolly Varden, 8,058. The harvest of pink salmon was estimated to be less than 100.

Effort and harvest estimates were made on the basis of 147 instantaneous angler counts, 5,510 angler interviews and 1,599 coho salmon creel checked. Angler effort and harvest data are presented in Table 5. Historical effort

Table 5. Summary of Angler Effort and Harvest by Species (Chinook Salmon Excluded), Kenai River, 1977.

<u>Month</u>	<u>Effort (Man-Days)</u>	<u>Sockeye Salmon</u>	<u>Coho Salmon</u>	<u>Rainbow Trout</u>	<u>Dolly Varden</u>	<u>Total</u>
Upstream Section						
June & July	18,918	717	60	1,759	3,260	5,796
August*	5,001	205	2,864	398	2,493	5,960
September	2,337	0	1,476	97	208	1,781
Total	26,256	922	4,400	2,254	5,961	13,537
Midstream Section						
June & July	6,960	101	31	161	406	699
August*	1,136	19	577	37	246	879
September	464		230	10	20	260
Total	8,560	120	838	208	672	1,838
Downstream Section						
June & July	57,140	385	285	12	1,198	1,880
August*	7,488	9	3,485	0	214	3,708
September	2,759	0	1,048	0	13	1,061
Total	67,387	394	4,818	12	1,425	6,649
Total						
June & July	83,018	1,203	376	1,932	4,864	8,375
August*	13,625	233	6,926	435	2,953	10,574
September	5,560	0	2,754	107	241	3,102
Total	102,203	1,436	10,056	2,474	8,058	22,024

* Includes last four days of July because of emergency order closing chinook salmon fishing July 27, 1977.

and harvest data are presented in Table 6. Historical commercial data regarding late run coho salmon are presented in Table 7. Timing as determined by catch per hour is presented in Figure 1.

DISCUSSION

Stocked Lake Evaluation

The apparent failure of the fall plant of rainbow trout in Longmare Lake further advances the suspectability of fall plants. Similar results have appeared before under similar conditions. The obvious precaution to alleviate this problem would be to omit fall plants in favor of spring plants. But in all past cases, fish used were non-Alaskan strains acquired from federal hatcheries in the continental United States. Development of a native Alaskan strain, currently originating from the Swanson River, may prove to be less affected by time of stocking. It may prove to be even beneficial to rear these fish to a larger size before stocking, thus necessitating fall stocking. Results of experimental plantings in the Matanuska Valley using Swanson River fish (Engel, 1978) have shown initial success far surpassing historical results in Alaska using non-native strains. Better survival rates in non-rehabilitated waters have been recorded for Swanson River fish than have been reported for non-native fish in rehabilitated lakes. Further evaluation will have to be accomplished, but currently a commitment to develop the Swanson River strain as the native brood stock has been made.

Should the Arctic grayling in Bernice Lake survive another winter, presumably under more normal conditions than occurred in 1976, many marginal waters, previously thought to be unsatisfactory for stocking, could be reevaluated. Since Arctic grayling are a popular species, the opportunities for recreational angling could be further increased. Currently most of the Arctic grayling on the Kenai Peninsula are located in remote lakes and the potential for utilizing this species in more accessible waters has a variety of benefits.

Kenai River Creel Census

The one point apparent from the work done in 1977 is the direct effect climatic conditions have on a fishery. Because of high water levels, anglers failed to utilize the fishery to the same extent they had in the previous year. During the month of June and July, effort increased by nearly 87% from 1976 estimates, yet effort in August and September decreased by 88% from 1976. Total numbers of fish available were felt to be slightly lower during the early run and substantially lower during the late run when compared to 1976. Most of the high water impact was felt by shore anglers. Flooding conditions prevented access to many of the historically popular and productive locations. Catch per hour data for both runs were similar and considered to be adequate for the estimated participation, but had effort levels approached 1976 levels the catch per hour would have been marginal.

Because sockeye salmon do not readily strike at conventional gear, many anglers resort to snagging, an illegal method of taking fish in fresh water. Also most sockeye salmon are taken by shore anglers in fishing areas located

Table 6. Kenai River Historical Sport Harvest (excluding chinook salmon) and Effort Data for 1976-1977.

<u>Year</u>	<u>Effort (man-days)</u>	<u>Coho Salmon</u>	<u>Sockeye Salmon</u>	<u>Pink Salmon</u>	<u>Rainbow Trout</u>	<u>Dolly Varden</u>	<u>Total Harvest</u>
1976	80,506	13,808	719	21,443	1,797	4,957	42,724
1977	102,203	10,056	1,436	100	2,474	8,058	22,124
Mean	91,355	11,932	1,078	not applicable	2,136	6,508	32,424

Table 7. Summary of Commercial Harvest, Effort and Catch Rates for Late Run Coho Salmon from the East Side Set Net Fishery (Statistical Area 244-20, 30, 40) 1971-1977.

	Years							Mean
	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	
Harvest	7,852	7,320	6,987	15,436	23,116	13,767	6,088	11,498
Landings*	332	418	364	594	626	507	355	457
Hours Fished*	240	192	144	228	216	168	144	190
Harvest Per Landing	23.6	17.5	19.2	26.0	36.9	27.1	16.7	23.9

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

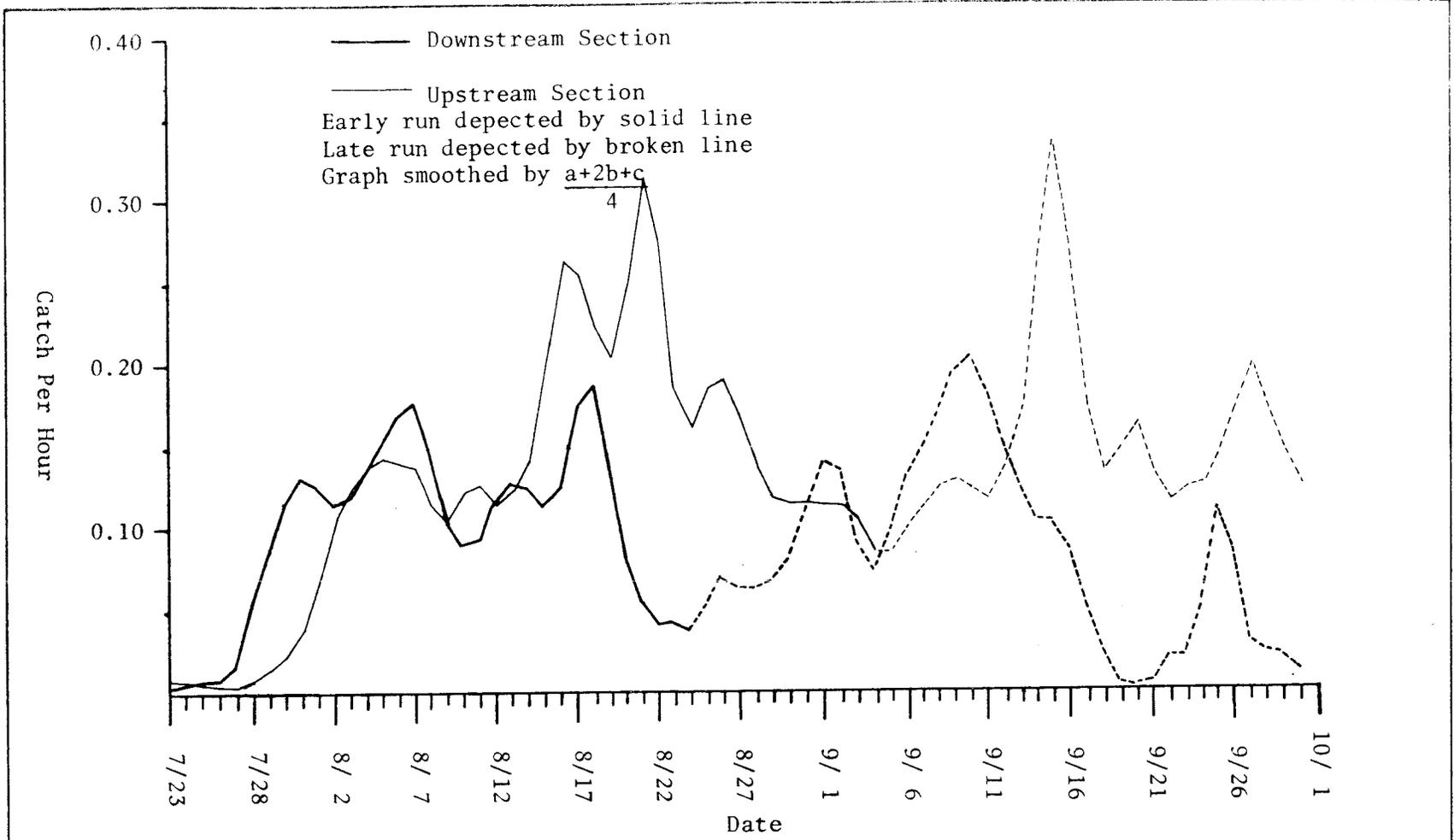


Figure 1. Catch Per Hour by Date Kenai River Sport Caught Coho Salmon, 1977.

primarily outside the major chinook and coho salmon areas. Thus the harvest estimate is considered minimal and not reflective of the total sockeye salmon harvest. Estimates on all other species are considered accurate.

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