FEDERAL AID IN FISH RESTORATION
STUDY G-I

INVENTORY AND CATALOGING

By: F.D. Van Hulle, J.B. Murray, S.L. Hammarstrom, D.A. Watsjold, L.A. Gwartney, F.T. Williams, S.W. Kubik and J.C. Riis

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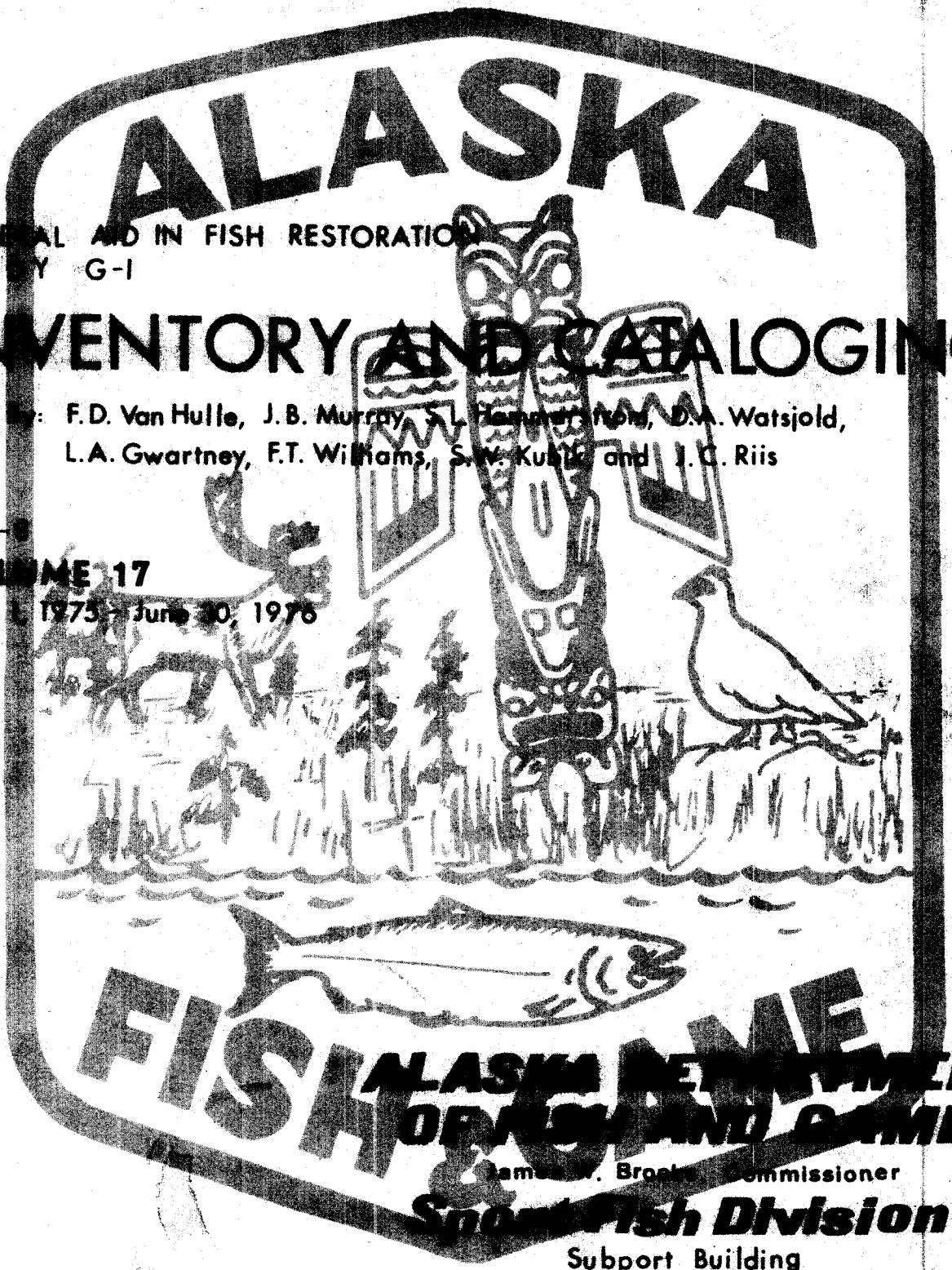

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Volume 17 STUDY G-1

STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

INVENTORY AND CATALOGING

by

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RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations of Alaska.

Project No.: F-9-8

Study No.: G-I Study Title: INVENTORY AND 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, 1975 to June 30, 1976.

ABSTRACT

A survey performed on one Kenai Peninsula lake is discussed. Relative growth and survival rates are presented for rainbow trout, Salmo gairdneri (Richardson) and coho salmon, Oncorhynchus kisutch (Walbaum), stocked in area lakes. Results of electrofishing compared to gill net catches are discussed. Pertinent historical data regarding stocking size, time, densities, and catch rates are examined for various managed lakes.

Creel census activities conducted on 50.9 miles of the Kenai River indicated an estimated harvest of 2,610 adult chinook salmon, O. tshawytscha (Walbaum), by boat anglers and an effort of 23,821 man-days. Estimates for shore anglers indicated a 360 fish harvest during 6,170 man-days of angler effort. Data regarding harvest and effort of other species are presented.

An experimental rainbow trout egg take on the Swanson River yielded 29,700 eggs from 52 females.

BACKGROUND

Lake Management

Since statehood an ongoing program of lake rehabilitation and enhancement has been directed primarily at roadside waters. Survey data have been

analyzed with regard to need for additional angling opportunity, potential to sustain fish populations, status, condition, and composition of existing populations, and requirements for rehabilitation or enhancement. All lakes thus far stocked have been landlocked, with the exception of three planted 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 have been sampled each fall and data gathered have been used to determine survival rates, growth rates, and future stocking densities.

Kenai River Creel Census

During the past three summers (1973-75) increasing effort for chinook salmon has warranted monitoring the sport fishery on the Kenai River. Only recently have substantial numbers of anglers learned successful techniques for capturing these fish. Prior to this discovery, the effort was primarily conducted from the shore and success was minimal. Now most anglers fish from boats and drift an artificial lure or egg cluster along the bottom. The harvest had, as a result, increased to a point that was no longer considered inconsequential.

The Kenai River is glacially turbid. Originating from Kenai Lake it flows westerly, through Skilak Lake, to its terminus in Cook Inlet. The stream is approximately 68 miles long, with the lower 51 miles (Skilak Lake to Cook Inlet) open to chinook salmon fishing. (Figure 1 and Table 1).

From 1966-1972 the chinook salmon harvest in the Kenai River was monitored by evaluating punch card returns (Nelson, 1972). In 1970 a relaxation of the regulation was initiated by the Alaska Borard of Fish and Game and the season was extended to 63 days (May 30-July 31). In 1975 the Board further extended the season to 212 days (January 1-July 31). However fishing was actually only extended by three weeks since the earliest arrival of fish is mid-May.

A creel census was conducted on the upper 10 miles of the fishery (Naptowne Rapids to Skilak Lake) in 1974 (Hammarstrom, 1975). It was recommended at that time to expand the program to include that section of river from Beaver Creek to the Soldotna Bridge.

Swanson River Egg Take

Since statehood, rainbow trout for lake stocking have been reared in Alaskan hatcheries from eggs obtained from brood stocks of federal hatcheries, primarily Ennis, Montana and Winthrop, Washington.

In 1974 a Department of Fish and Game directive discouraged the importation of eggs for stocking purposes. This required a native brood

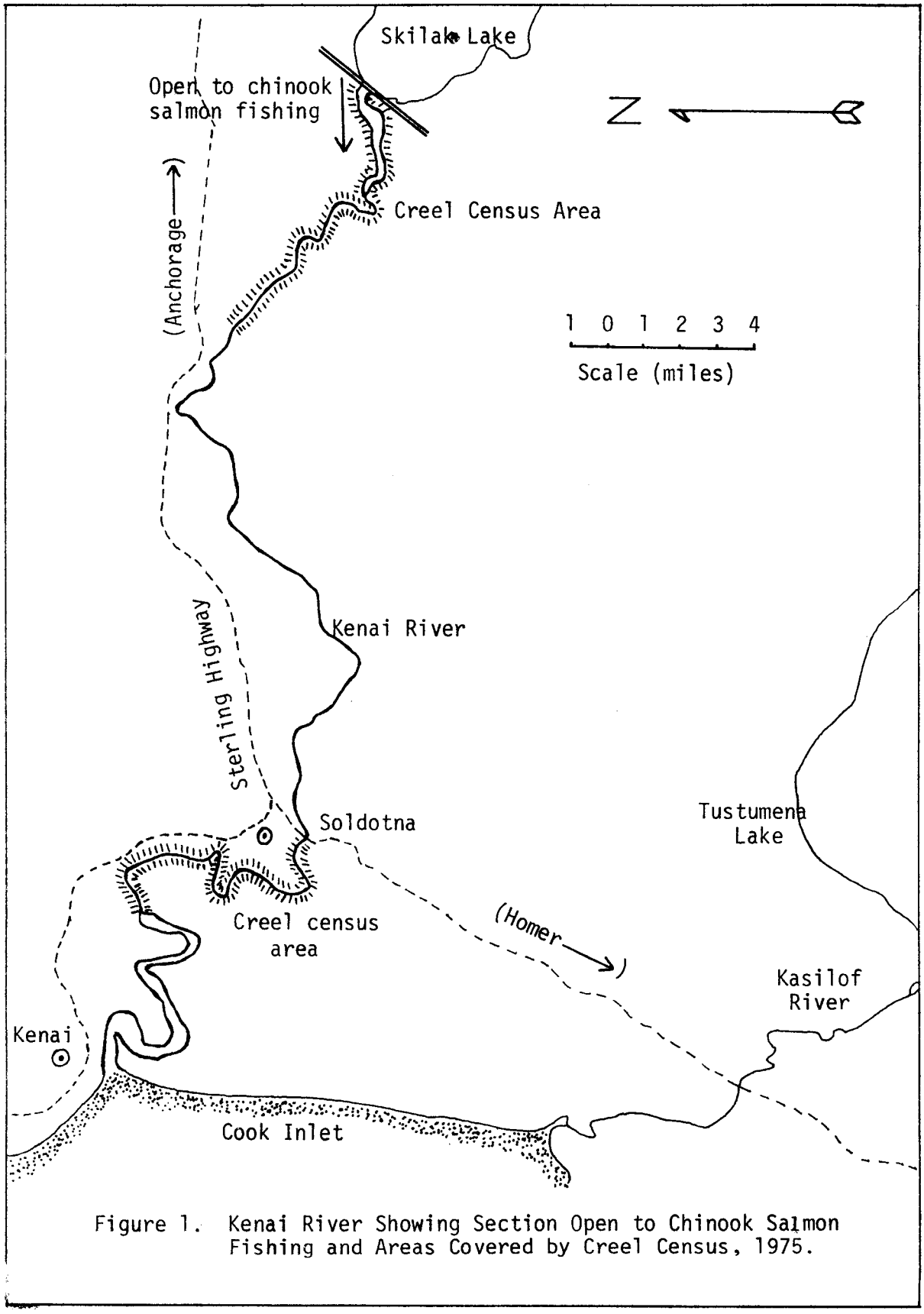

Figure 1. Kenai River Showing Section Open to Chinook Salmon Fishing and Areas Covered by Creel Census, 1975.

stock be established. The Swanson River was selected as one of the possible source sites.

The initial egg take in 1974 yielded 20,700 eggs from 38 females. A second egg take was conducted in 1975, and a third will be conducted again in 1976. All eggs have been incubated and reared at the Fire Lake Hatchery.

Some of the resultant fish from the 1974 brood were experimentally planted in lakes in the Matanuska Valley. Data regarding the success of the plant are still under analysis.

Table 1. Physical Characteristics of the Kenai River.

Section	Length (miles)	Gradient (feet/mile)	Fishery Characteristics
Cook Inlet to Beaver Creek	9.7	1.55	Open but no fishery
Beaver Creek to Soldotna Bridge	11.3	3.54	Over 80% of Chinook salmon harvest occurs here
Soldotna Bridge to Naptowne Rapids	19.4	5.41	Open but fishery very light
Naptowne Rapids to	10.5	3.33	Less than 20% of chinook salmon harvest occurs here
Skilak Lake Inlet Outlet	17.3	13.93	Closed to chinook salmon fishing
Total	68.2	6.39	

RECOMMENDATIONS

1. Transplant Arctic grayling from Crescent Lake to Seldovia Lake in an attempt to establish a self-sustaining population.

2. Using electrofishing gear, capture and transplant adult lake trout from Skilak Lake to Upper Summit Lake in an attempt to establish a self-sustaining population

3. Continue rainbow trout egg take on Swanson River.

4. Explore posibilities of determining chinook salmon escapement into Kenai River.

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 resources.

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

Lake Surveys

Lakes were surveyed according to prescribed methods (Lake and Stream Manual, 1971). A Hach A1-36-WR Kit was utilized to gather chemical data, a Ross P-100 depth finder was used to record bottom contours, and Hach Model 2510 conductivity meter was used to measure conductivity. Fish populations were sampled with monofilament gill nets (125 x 6') containing five mesh sizes ranging from 3/4 - 2-inch bar measure. Nets were fished approximately 24 hours.

Stocked Lake Evaluation

Stocked lakes were sampled by methods described by Engel (1973) and by use of an electric shocking boat (Hammarstrom, 1974). Fork length was measured to the nearest millimeter, while weights were measured to the nearest 0.01 pound. Age of the samples were determined by length frequency and scales that had been pressed into cellulose acetate and read by a Bruning 200 microfiche reader.

Kenai River Creel Census

Harvest of chinook salmon and angler effort in man-days on the Kenai River were determined by a creel census, using a modified Neuhold and Lu (1957) design.

The river was separated into three sections: the downstream section extending 11.3 miles (18.2 Km) from Beaver Creek to the Soldotna Bridge; the

midstream section extending 19.4 miles (31.2 Km) from the Soldotna Bridge to Naptowne Rapids; and the upstream section extending 10.5 miles (16.9 Km) from Naptowne Rapids to Skilak Lake. By regulation, 50.9 miles (81.9 Km) of the river is open to chinook salmon fishing from January 1-July 31. Previous observations and aerial flights have shown very little boat angler effort in the 29.1 miles (46.8 Km) not censused. Shore angler effort was sampled in all areas open to chinook salmon fishing.

The census extended from June 7-August 31. Every weekend day, and three weekdays selected randomly, were sampled. Each day was divided into 20 one-hour segments commencing at 0400 and terminating at 2400. Two one-hour periods were chosen randomly and used as angler count hours during which an instantaneous count was conducted from a 24-foot river boat powered by a 40 h.p. outboard motor. Records were kept as to number of boats, number of anglers in the boats, and number of shore anglers. Angler interviews were conducted over 5.5 hours of each sample day on the entire section of river by stopping alongside individual boats. Total catch and fishing time was recorded and length, weight, and scale samples collected from any chinook salmon harvested.

Angler effort is calculated by (1) determining number of anglers fishing (on any given day) during the two randomly selected hourly periods, (2) applying a figure reflecting percent of daily angling effort for each of the two hourly sampling periods (as determined by analysis of seasonal data and determining what percent of daily angling effort occurs within the respective 20 hourly periods), (3) totaling the percent of effort occuring in each of the two daily sample periods, and (4) expanding the daily angler counts taken during the two hourly periods with the total daily percent figure, for a total angler figure.

Estimated angler hours were calculated daily as follows:

$$\frac{\text{total estimated anglers}}{\text{20 hourly periods}} - \text{mean anglers/hours}$$

mean angler/hour x 20 available hours = total angler hours.

Catch per unit of effort (either by hour or day) for chinook salmon was determined from completed angler interviews, conducted on that given day. Total chinook salmon reported was divided by the total hours reported to arrive at catch per hour. Catch per hour multiplied by total angler hours provided the total estimated harvest for the given day. Man-days effort, for any given day, was calculated by dividing the total number of estimated hours by mean hours fished per angler. Harvest and effort for other species were calculated in a similar manner.

Seasonal totals for weekdays were arrived at by the following:

$$\frac{\text{Total estimated harvest for weekdays sampled}}{\text{Number of weekdays sampled}} = \frac{\text{total season harvest}}{\text{number of possible weekdays}}$$

This calculated total was then added to the total for all weekend days (which were censused) to arrive at a season total for the fishery. Total effort (weekend and weekdays) was calculated in a similar manner.

Because daylight hours decrease as the summer progresses, starting August 1 the fishing day was reduced to 16 hours (0600-2200). The month of August was treated as a separate fishery and calculation was similar to that of June and July.

The shore creel census was conducted in a similar manner as the boat census. Shore anglers were counted from the creel census boat concurrently with the instantaneous boat counts in the two boat census areas. Interviews were conducted over a 7-hour period with a randomly selected starting hour. Locations selected as interview sites were 10 of the most popular-random access points along the river. Three points selected were in the area not covered by boat and counts taken by the shore census taker were assumed to be the total for that section of river and calculated separately.

Age composition was determined by scale samples taken from chinook salmon creel checked during the interview periods, pressed into cellulose acetate, and read on a microfiche reader.

Swanson River Egg Take

Spawning rainbow trout were observed at the capture sites on the Swanson River on May 27, 1975. Collection began immediately and continued through June 5. Rod and reel with barbless flies and lures proved to be the most effective method of capture as seining and electrofishing were tried with very limited success. Fish were sorted into three pens set in the stream near the bank with males, unripe females, and ripe females separated.

Eggs were taken on May 30 and June 5. Females were anesthetized with MS-222 (tricane methanesulfonate). Anesthetized fish were held in a small pen in the stream until recovery of motor reflexes was observed, then released. The eggs were fertilized, water hardened, packed in plastic containers and flown to Fire Lake Hatchery by Fish and Wildlife Service aircraft.

The females not used in the egg take were found to be either spent or unripe. All fish captured were tagged by the Fish and Wildlife Service except six that had been tagged in 1974 and recaptured in 1975. Tags used were numbered Floy "spaghetti" tags. All fish used in fertilization were released that same day. On June 5 all remaining fish were tagged and released.

FINDINGS

Results

Lake Surveys:

Browns Lake was the only lake on which an initial survey was conducted during the 1975 field season. The lake is 338 acres in size with a 20

acre island in the center. The shoreline was predominately gravel. Bottom material was mostly gravel covered with a layer of decaying organic material. Maximum depth is 10 feet, with most of the lake less than 5 feet deep. No inlets or outlets were observed. No fish were captured in 48 hours of gill net fishing, although numerous threespine stickleback, a Goasterosteus aculeatus (Linnaeus) were observed.

Stocked Lake Evaluation:

Sampling was conducted on 16 lakes with variable mesh gill nets. All lakes planted with rainbow trout, Salmo gairdneri (Richardson), except Rainbow (Fetus) Lake have been treated chemically with rotenone to eliminate competing species, usually threespine stickleback. Pertinent data concerning eight lakes stocked with rainbow trout are presented in Tables 2 and 3.

Two of the seven lakes (Arc and Centennial) planted with coho salmon, Oncorhynchus kisutch (Walbaum) have been treated chemically with rotenone. Pertinent historical data regarding these seven lakes are presented in Tables 4 and 5.

Electrofishing was used in six lakes in conjunction with gill nets for comparative catch effectiveness. Three lakes stocked with rainbow trout and three coho salmon were selected.

In all lakes except Tirmore the mean lengths for fish of the same age class captured with gill nets were larger than those captured by electrofishing. It is felt the reversal in Tirmore can be attributed to growth attained in the month between gill net sampling and electrofishing. It is also interesting to note that in Tirmore Lake none of the 1973 plant were captured by electrofishing.

Over the past three years, electrofishing has been compared to gill netting on 11 different occasions. In 9 of the 11 cases, a signficant difference (to .05) was observed in mean lengths, electrofishing capturing the small fish. Similar results were obtained when the totals of all 11 comparisons were tested. Length frequency comparisons between fish captured by gill netting and electrofishing are presented in Figures 2, 3, and 4.

Because stocking densities, survival rates, and physical and chemical properties differ from lake to lake, catch per unit effort for electrofishing cannot be compared directly. It has been observed that the best results with the particular electrode arrangement and generating equipment now employed occurred at 2.5 amperes. On the control box in use, amperage is a function of voltage; the voltage is adjustable and the amperage then depends on the conductivity of the water.

As the conductivity in micromhos/cm increases the required voltage to attain 2.5 amperes decreases. Because the output limit on the unit is 300 volts AC it is impossible to achieve 2.5 amperes in many of the lakes on the Kenai Peninsula. At ampere levels less than 2.5, fish remain in the electric field for such a short duration that capture with a dipnet becomes more difficult. At levels above 2.5 amperes, ruptured blood

Table 2. Rehabilitation Summary of Kenai Peninsula Lakes Stocked with Rainbow Trout and Sampled with Gill Nets and/or Electroshocking, 1975.

Lake	Date Rotenoned	Date Stocked	Origin	Fish/lb.	Fish/Acre	Total Stocked
Cabin	6/18/70	9/11/70	Winthrop, Washington	165	420	24,000
		6/ 4/71	Ennis, Montana	114	250	14,300
		6/20/73	Ennis, Montana	129	228	13,000
		7/16/75	Ennis, Montana	166	200	11,400
Jerome	6/28/68	8/27/68	Winthrop, Washington	210	525	8,550
		9/ 5/69	Winthrop, Washington	132	220	3,600
		9/11/70	Winthrop, Washington	106	200	3,200
		6/11/71	Ennis, Montana	158	220	3,600
		8/ 3/72	Winthrop, Washington	449	220	3,600
		6/20/73	Ennis, Montana	129	220	3,600
		7/19/74	Winthrop, Washington	341	245	4,000
Johnson	9/11/72	6/20/73	Ennis, Montana	129	256	21,800
		7/16/75	Ennis, Montana	116	200	17,000
Longmare	9/ 7/72	6/20/73	Ennis, Montana	129	470	81,100
		8/24/73	Ennis, Montana	62	270	47,000
		7/17/74	Winthrop, Washington	341	200	34,400
Rainbow (Fetus)		6/28/71	Oregon	2,984	600	9,000
		7/ 3/74	Winthrop, Washington	728	507	7,600
Sport	7/23/65	7/ 7/66	Winthrop, Washington	1,160	400	29,000
		8/27/68	Winthrop, Washington	210	400	29,000
		6/ 4/71	Ennis, Montana	114	315	22,800
		6/11/71	Ennis, Montana	158	95	6,800
Tirmore (Short Pine)	9/ 8/72	7/26/73	Ennis, Montana	112	150	7,800
		7/26/73	Winthrop, Washington	125	150	7,800
		7/16/75	Ennis, Montana	166	200	10,400
Vagt	9/18/73	7/ 3/74	Winthrop, Washington	728	610	26,200

Table 3. Sampling Summary of Kenai Peninsula Lakes Stocked with Rainbow Trout, 1975.

Lake	Date Sampled	Method	Species*	Sample Number	Catch Per Hour	Length Range	Mean Length	SD**	Year Planted
Cabin	9/17/75	Gill Net	RB	6	0.13	367-443	401.3	25.7	Prior to 1973
			RB	67	1.40	91-137	112.4	9.8	1975
Jerome	9/ 4/75	Gill Net	RB	5	0.10	280-630	399.4	154.0	Prior to 1974
			DV	3	0.06	210-375	296.7	82.8	***
Johnson	9/18/75	Gill Net	RB	14	0.29	333-390	359.3	15.5	1973
			RB	13	0.27	120-158	142.6	14.0	1975
	10/10/75	Electrofishing	RB	5	5.00	330-401	356.4	27.5	1973
			RB	58	58.00	108-178	138.9	13.7	1975
Longmare	9/10/75	Gill Net	RB	39	0.81	210-345	276.2	40.3	1973
	10/ 1/75	Electrofishing	RB	21	21.00	193-330	238.1	45.1	1973
Rainbow (Fetus)	9/ 4/75	Gill Net	RB	28	0.60	223-300	244.4	14.9	1974
Sport	9/16/75	Gill Net	RB	3	0.06	505-544	529.0	21.0	1971
Tirmore (Short Pine)	9/11/75	Gill Net	RB	41	0.28	348-486	437.2	33.4	1973
			RB	198	1.38	96-172	134.5	15.3	1975
	10/13/75	Electrofishing	RB	50	71.00	100-196	148.0	24.8	1975
Vagt	8/27/75	Gill Net	RB	51	1.27	162-271	206.9	24.9	1974

* RB - Rainbow Trout
DV - Dolly Varden
** SD - Standard Deviation
*** Fish introduced by private parties illegally

Table 4. Summary of Kenai Peninsula Lakes Stocked with Coho Salmon and Sampled by Gill Nets and/or Electrofishing, 1975.

Lake	Date Stocked	Origin	Fish/lb.	Fish/Acre	Total Stocked
Arc	7/19/74	Seward	344	260	4,100
Bernice	7/26/63	Kodiak	256	100	13,400
	7/19/74	Seward	344	100	13,400
Centennial	7/16/75	Seward	401	575	14,400
Portage	7/26/73	Kodiak	256	300	8,300
	7/16/75	Seward	401	250	6,900
Rock	7/26/73	Kodiak	256	210	2,000
	7/19/74	Seward	344	160	1,500
Sunken Island	6/28/71	Seward	391	200	28,000
	7/26/73	Kodiak	256	200	28,000
	7/16/75	Seward	401	100	14,000
Upper Jean	7/26/73	Kodiak	256	250	11,500
	7/16/75	Seward	401	250	

Table 5. Sampling Summary of Kenai Peninsula Lakes Stocked with Coho Salmon, 1975.

Lake	Date Sampled	Method	Species*	Sample Number	Catch Per Hour	Length Range	Mean Length	SD**	Year Planted
Arc	9/10/75	Gill Net	SS	42	0.88	147-183	166.0	8.3	1974
			RB	1	0.02		300.0		1969-1973
Bernice	9/17/75	Gill Net		No Fish Captured					1974***
Centennial	9/18/75	Gill Net	SS	158	3.16	95-120	105.5	4.6	1975
	9/26/75	Electrofishing	SS	61	61.00	76-117	99.4	6.8	1975
Portage	9/ 9/75	Gill Net	SS	61	1.33	163-227	198.1	14.2	1973
Rock	9/ 4/75	Gill Net	SS	3	0.11	270-290	280.0	10.0	1974
Sunken Island	9/ 9/75	Gill Net	SS	20	0.38	223-340	296.9	36.1	1973
			SS	26	0.50	94-105	98.7	3.2	1975
	9/30/75	Electrofishing	SS	3	4.28	217-230	225.7	7.5	1973
			SS	46	65.71	73-111	92.8	8.6	1975
Upper Jean	9/ 5/75	Gill Net	SS	30	0.71	185-300	219.0	36.0	1973
			SS	18	0.43	95-107	100.2	4.1	1975
		Electrofishing	SS	3	3.00	198-215	206.0	8.5	1973
			SS	7	7.00	85-110	96.1	9.2	1975

* SS - Cono Salmon
RB - Rainbow Trout
** SD - Standard Deviation
*** Suspected of winter kill

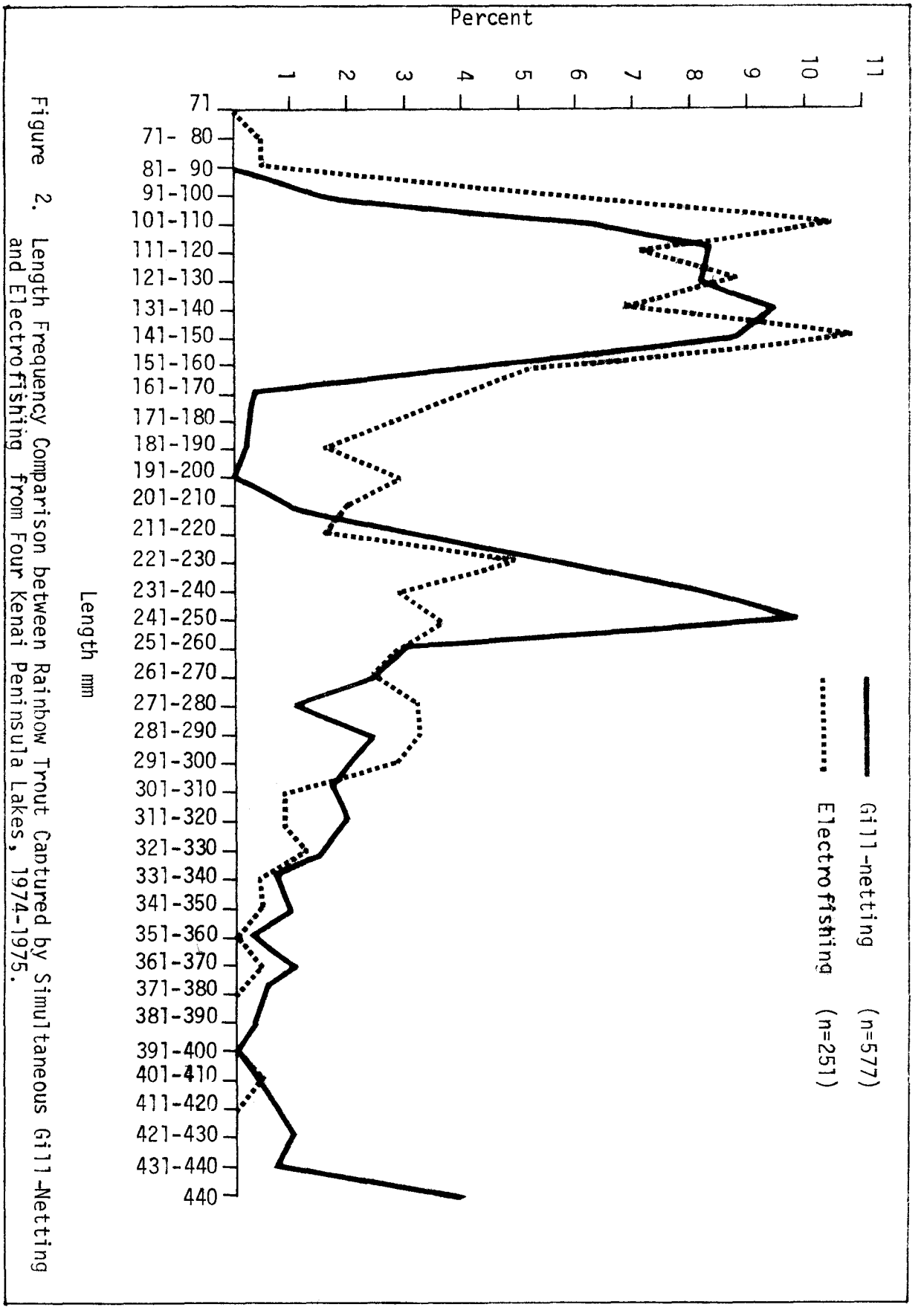

Figure 2. Length Frequency Comparison between Rainbow Trout Captured by Simultaneous Gill-Netting and Electrofishing from Four Kenai Peninsula Lakes, 1974-1975.

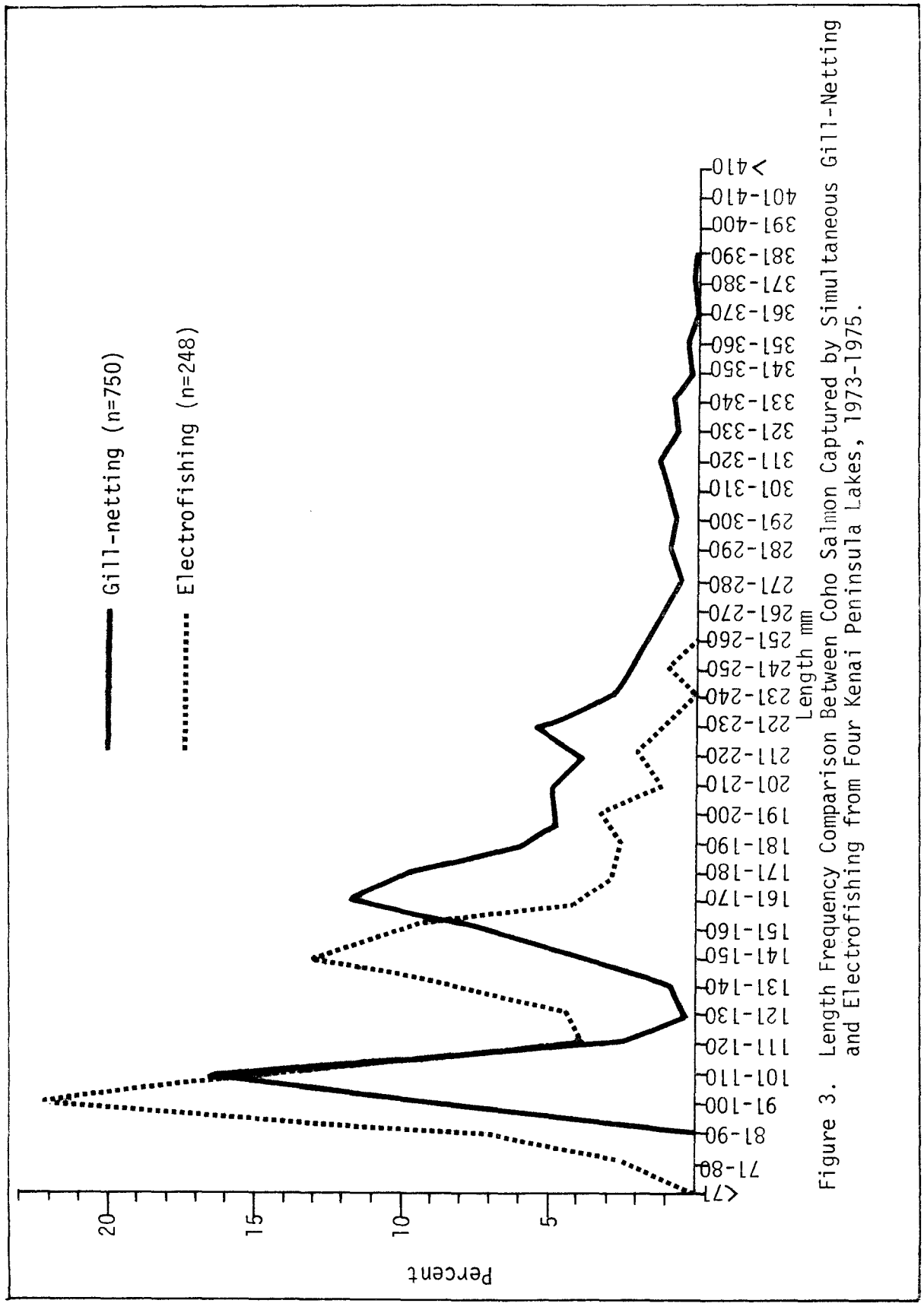

Figure 3. Length Frequency Comparison Between Coho Salmon Captured by Simultaneous Gill-Netting and Electrofishing from Four Kenai Peninsula Lakes, 1973-1975.

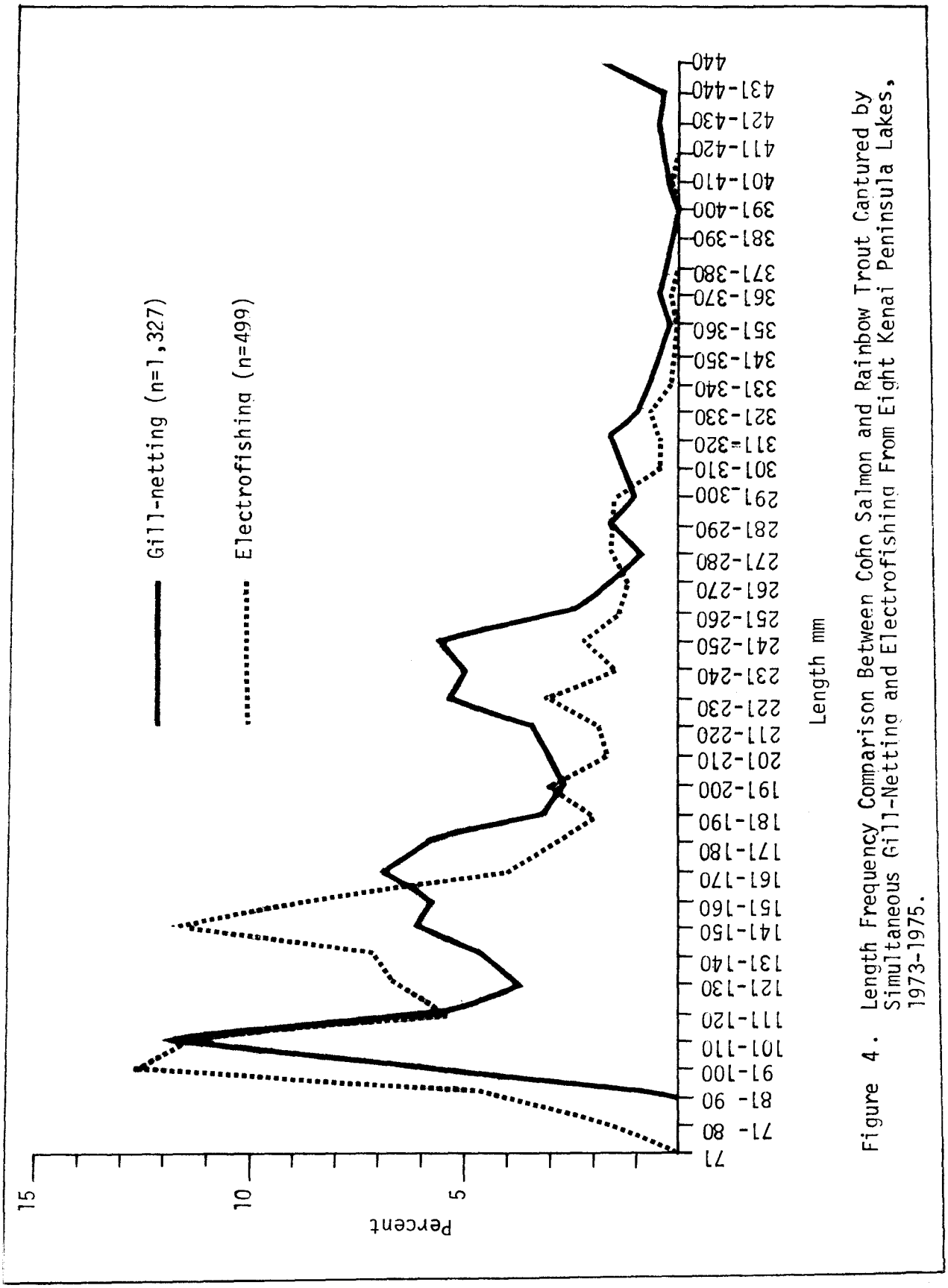

Figure 4. Length Frequency Comparison Between Coho Salmon and Rainbow Trout Captured by Simultaneous Gill-Netting and Electrofishing From Eight Kenai Peninsula Lakes, 1973-1975.

vessels on the gills have been observed. Figure 5 displays the voltage required to achieve 2.5 amperes in water of various conductivity.

Electrofishing using two units similar in construction as that used on the Kenai Peninsula was conducted for the third year in Bear Lake near Seward. Catch per hour for coho salmon for 1973, 1974, and 1975 have been 462, 654, and 510, respectively. Stocking densities have been about 1,000 per acre. Conductivity of the lake was 92 micromhos/cm and voltage required to attain 2.5 amperes was 175 volts AC. Age 0.0 fish (mean length 77 mm) comprised 86.4% of the catch; however, all age classes up to 3.0 were represented.

Kenai River Creel Census:

Due to the increasing popularity of chinook salmon, O. tshawytscha, (Walbaum), fishing on the Kenai River, a creel census was conducted for the second year. Work done in 1974 (Hammarstrom, 1975) indicated a need for expansion of the program to include more river area in the census program, including shore anglers as well as boat anglers.

During 1975, creel census activities indicated a total of 23,820 man-days were spent in pursuit of chinook salmon by boat anglers and 6,170 man-days by shore anglers. Harvest was estimated at 2,610 adult chinook salmon and 1,150 precocial males ("jacks") by boat anglers, and 360 adults and 460 "jacks" by shore anglers, for a total sport harvest of 2,970 adults and 1,610 "jacks".

The run into the Kenai River is comprised of two segments. The early run enters the river in early June, the late run in early July. Fishing in the river peaked around June 20-25 for the early run and July 20-25 for the late run. Because of timing through the river, the late run appears to have contributed little to the upstream fishery (Naptowne Rapids to Skilak Lake) prior to the July 31 closure. (Figures 6 and 7).

Timing of this year's late run appears average as compared to the last nine years of commercial set net catches from the three statistical areas (244-20, 30, 40) which most directly influence the Kenai River. By July 24 the commercial set net fishery had taken 61.6% of their chinook salmon harvest. The nine year average for this date is 63.6%. Very little can be said about the early run as it is no longer fished commercially and historical data from the sport fishery is lacking.

Comparing 1974 with 1975 (Naptowne Rapids to Skilak Lake only) this year was not as successful. Overall catch per hour for 1974 was 0.024 while in 1975 it was 0.010. This drop in fishing success was the result of a combination of factors; smaller run, poorer fishing conditions (more turbidity), and lack of contribution by late run fish.

In both sections of the river fishing was better on weekdays than weekends. The mean seasonal catch per hour for upstream and downstream weekdays was 0.015 and 0.056, respectively, while for weekends it was 0.006 and 0.041, respectively.

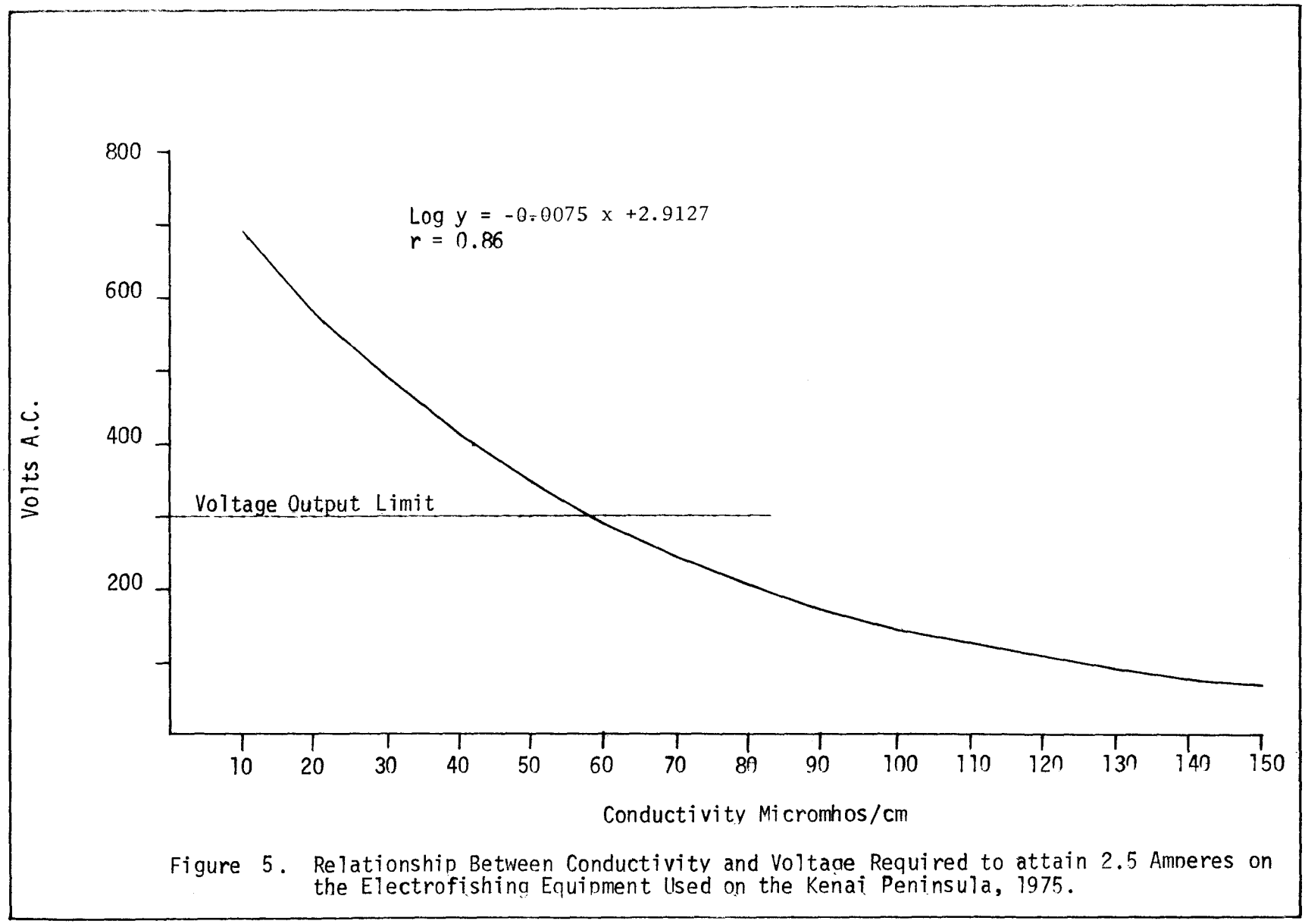

Figure 5. Relationship Between Conductivity and Voltage Required to attain 2.5 Amperes on the Electrofishing Equipment Used on the Kenai Peninsula, 1975.

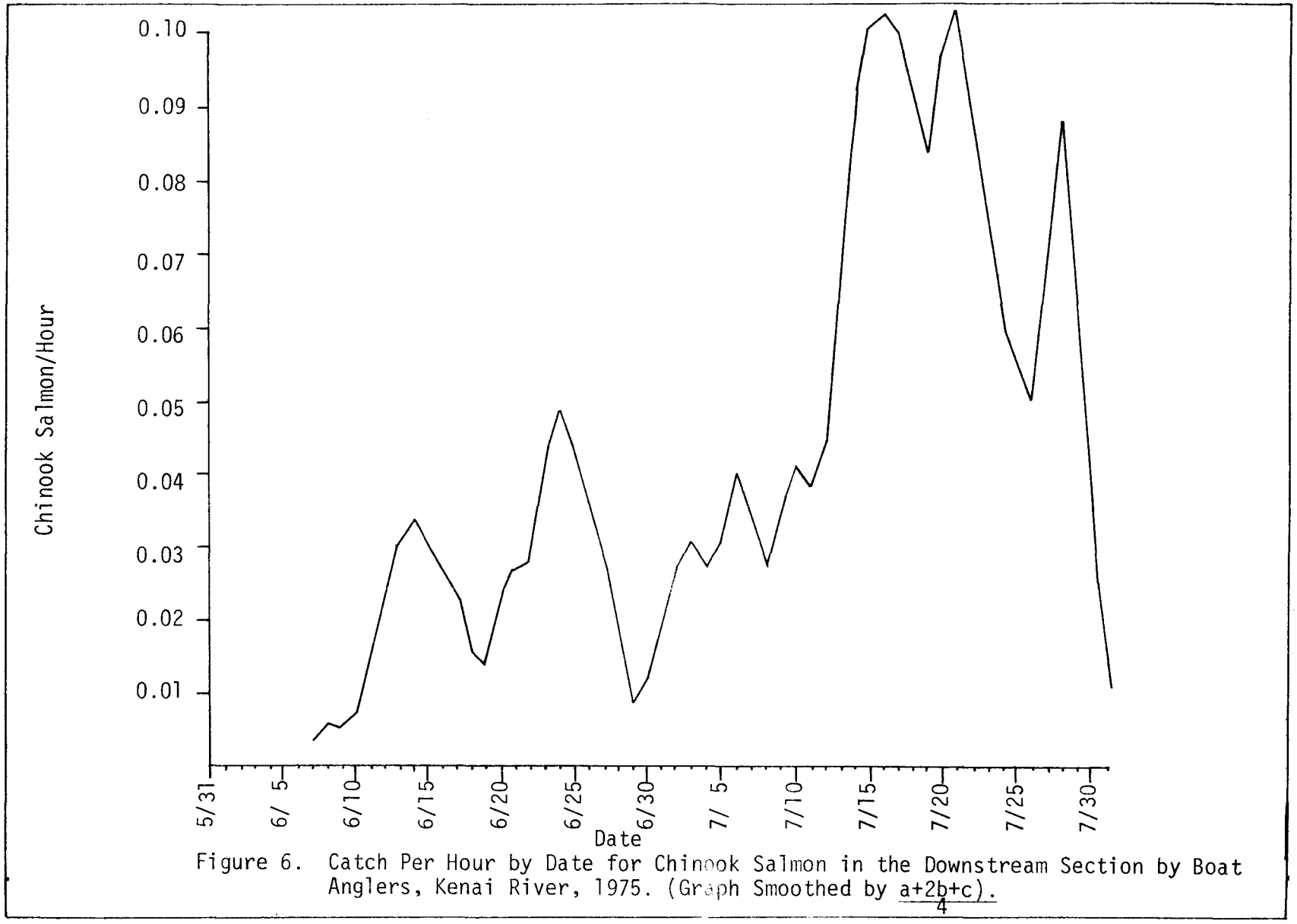

Figure 6. Catch Per Hour by Date for Chinook Salmon in the Downstream Section by Boat Anglers, Kenai River, 1975. (Graph Smoothed by $\frac{a+2b+c}{4}$).

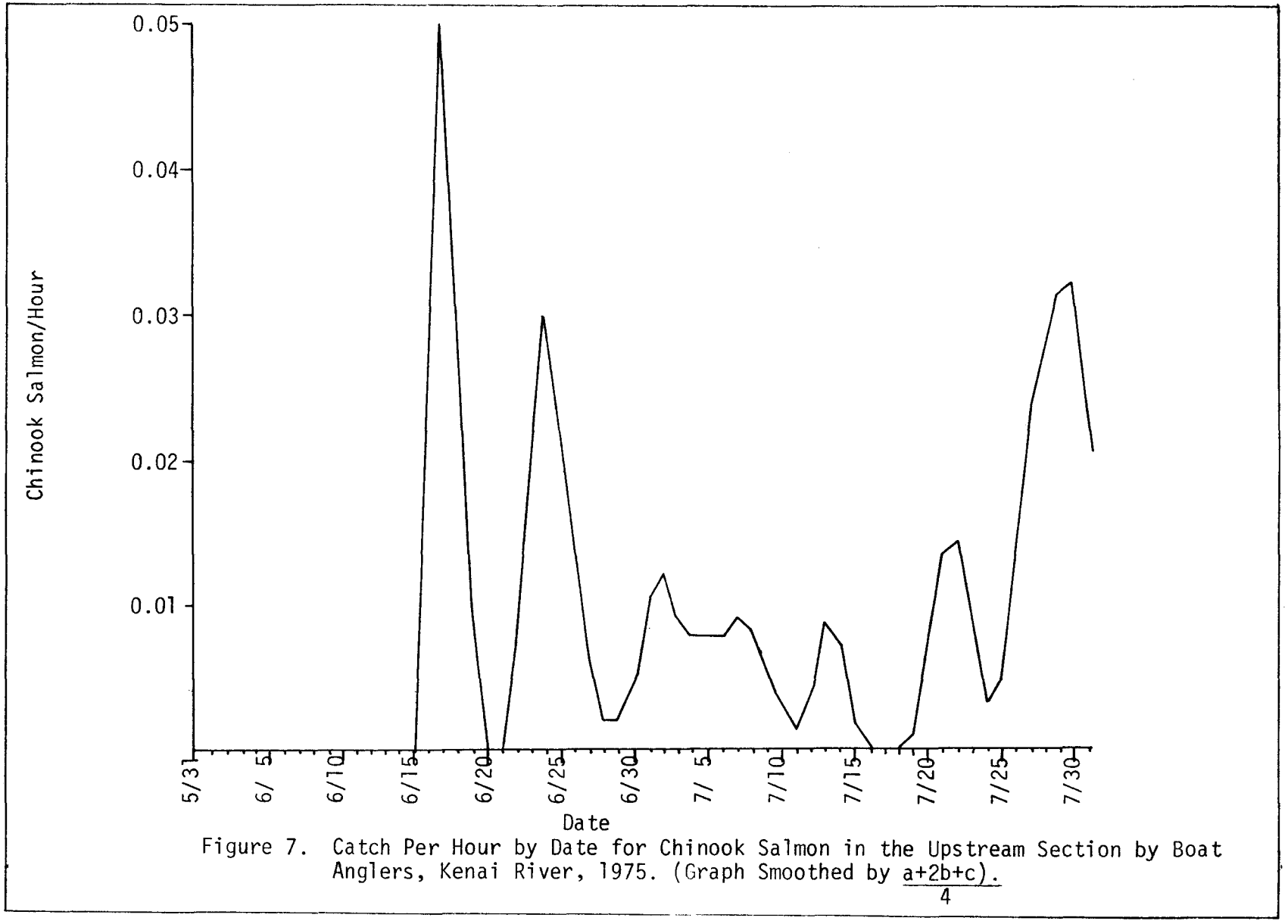

Figure 7. Catch Per Hour by Date for Chinook Salmon in the Upstream Section by Boat Anglers, Kenai River, 1975. (Graph Smoothed by $\frac{a+2b+c}{4}$).

Effort was substantial, especially on the lower river section, but relatively constant. (Figures 8 and 9). The daily weekday average for the lower section was 267 angler days while the weekend averages was 442 angler days. Corresponding averages for the upstream section was 65 and 217, respectively. It was noted, however, that as the success rate increased toward the end of July both sections displayed an increase in effort.

Age composition was determined from scales taken from sport caught chinook salmon. The largest contributor was from the 1971 brood year, age class 1.2. An interesting note is the relatively high incidence of "jacks", age class 1.1. (Table 6 and 7). Shore angler harvest displayed a higher proportion of "jacks" than did boat anglers, 56.5% and 29.2%, respectively. This can be explained partially by the fact that it is easier to land smaller fish from the shore than larger fish. Figure 10 is a length-weight relationship for chinook salmon from the Kenai River. There was an absence of 50+ pound fish during 1975. During 1974, age class 1.4 fish made up 81.6% of the harvest as compared to 14.1% this year.

Effort for June and July was calculated at 23,820 man-days for boat anglers and 6,170 by shore anglers, while August estimates were 11,030 and 6,895, respectively, totaling 47,915 man-days for the fishery.

Harvest and effort estimates were calculated on a basis of 9,906 interviews over the three month period, 6,395 boat anglers and 3,511 shore anglers. During this time 260 instantaneous boat counts and 325 shore counts were conducted. In June and July 16.1% of the effort and 15.6% of the chinook salmon harvest was creel checked while in August 22.9% of the effort was creel checked.

Table 6. Age Structure of Chinook Salmon Harvested from the Kenai River by Boat Anglers, 1975.

	Age Class						
	1.1	1.2	1.3	1.4	1.5	Other	Total
Number	110	118	86	53	8	1	376
Percent	29.2	31.4	22.9	14.1	2.1	0.3	100.0

	Brood Year					
	1968	1969	1970	1971	1972	Total
Number	8	53	87	118	110	376
Percent	2.1	14.1	23.2	31.4	29.2	100.0

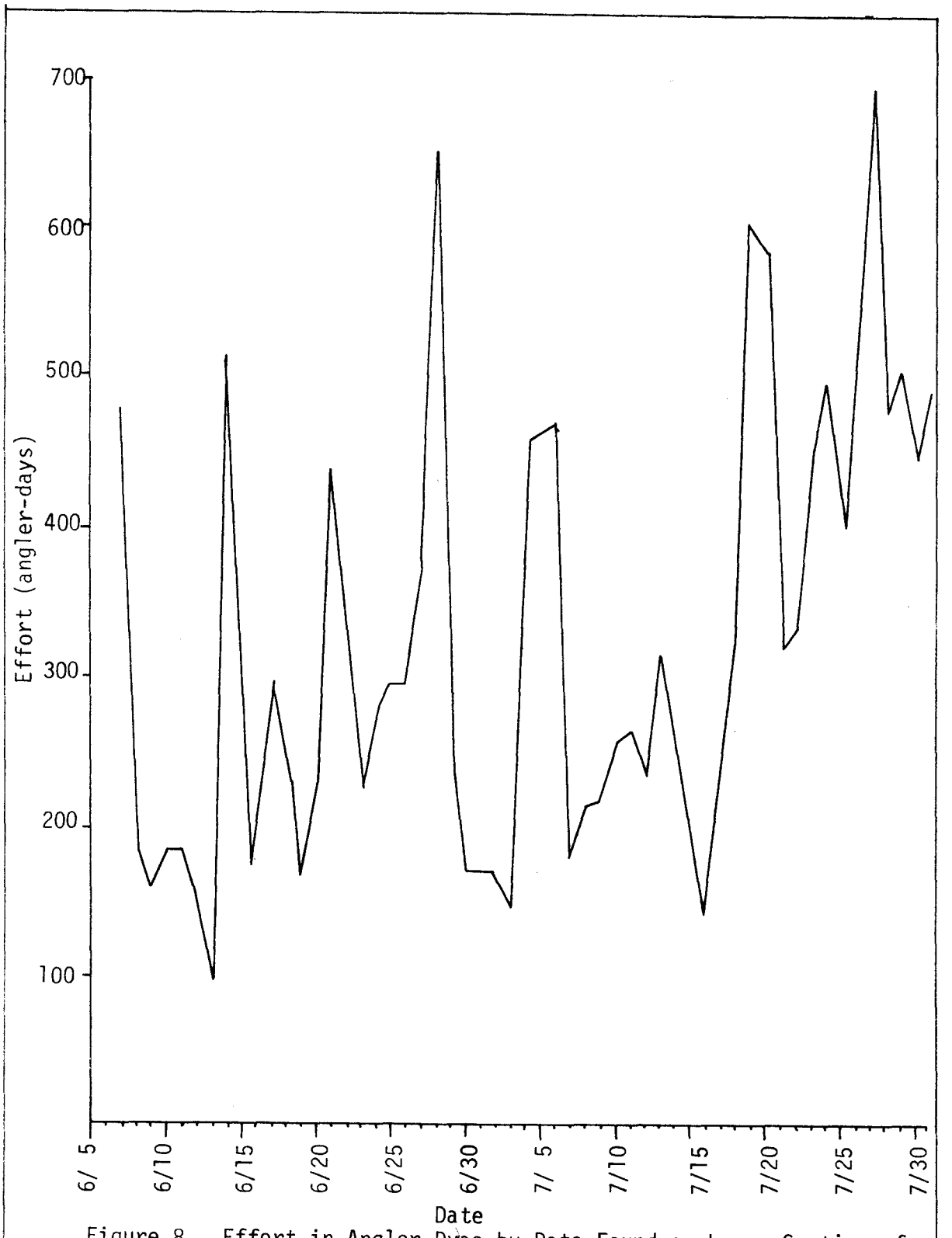

Figure 8. Effort in Angler-Days by Date Found on Lower Section of Kenai River by Boat Anglers, 1975.

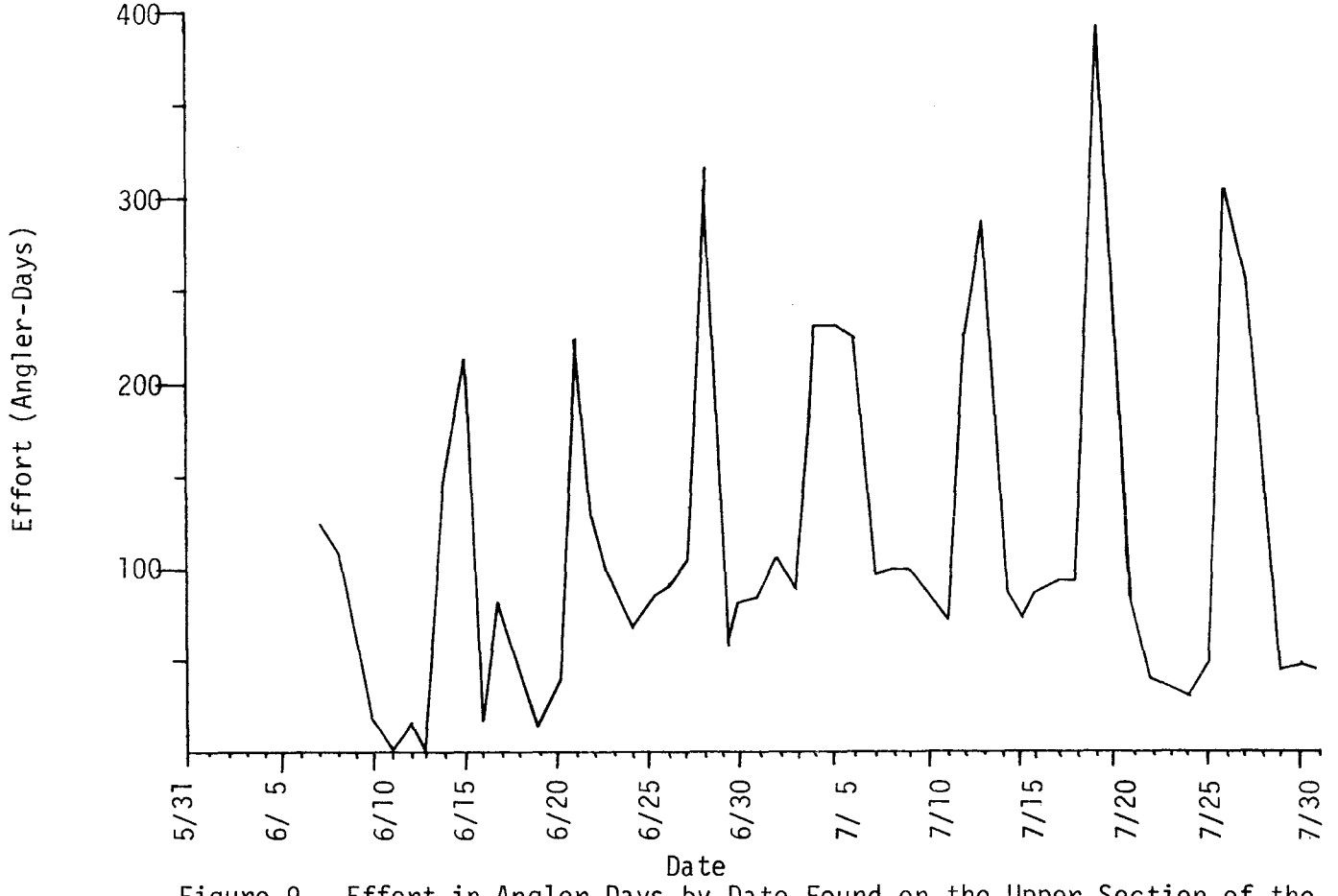

Figure 9. Effort in Angler-Days by Date Found on the Upper Section of the Kenai River by Boat Anglers, 1975.

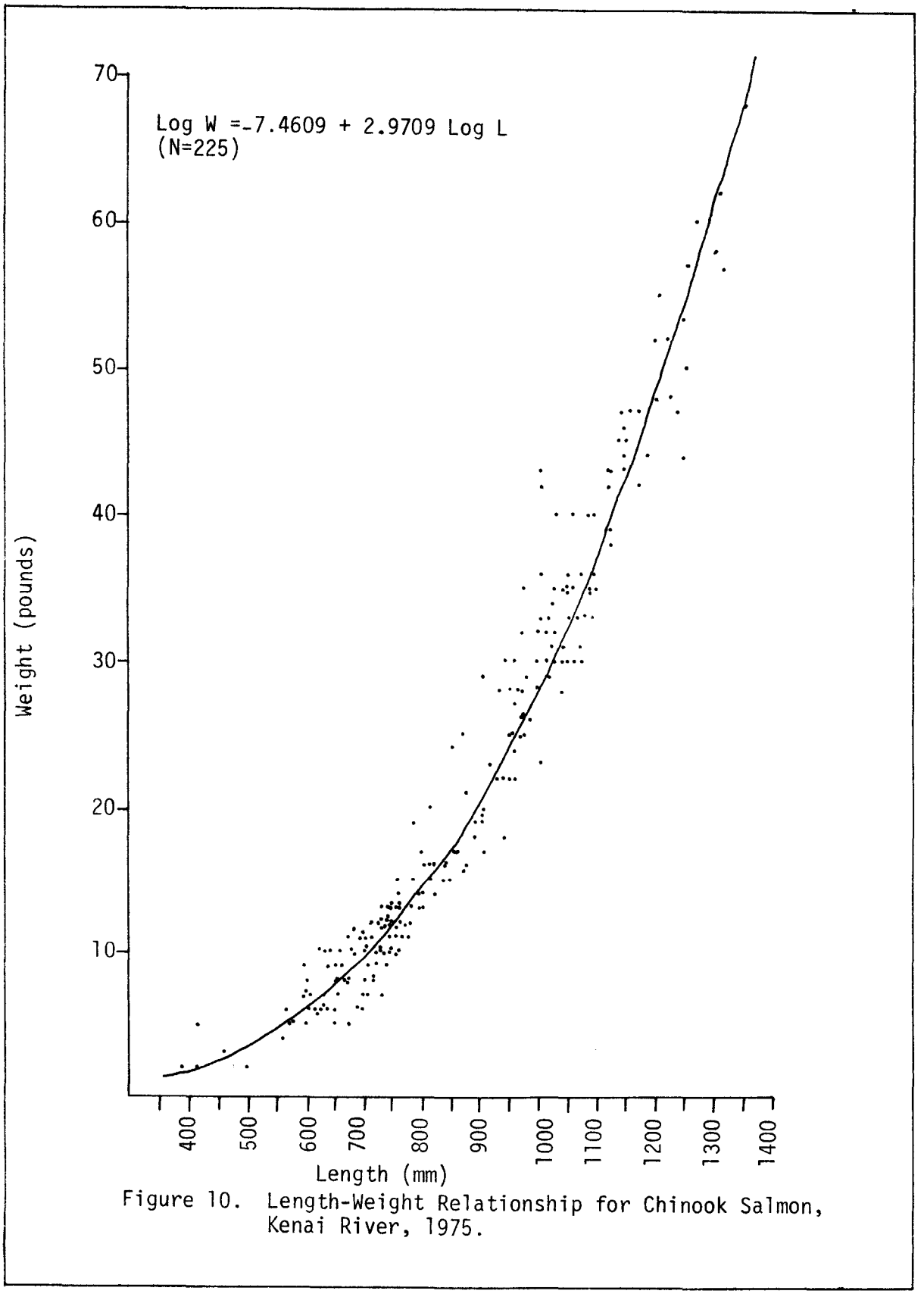

Figure 10. Length-Weight Relationship for Chinook Salmon, Kenai River, 1975.

Table 7. Length Data of Chinook Salmon of Various Age Classes Harvested from the Kenai River by Boat Anglers, 1975.

	Age Class				
	1.1	1.2	1.3	1.4	1.5
Range (mm)	305-503	438-860	640-1,120	914-1,311	1,007-1,292
Mean (mm)	425.6	673.4	904.8	1,102.3	1,176.3
Standard Deviation	34.0	82.6	99.3	88.6	103.0

Through June and July, fishing for species other than chinook salmon was limited. Except for Dolly Varden, Salvalinus malma (Walbaum), few fish other than chinook salmon were harvested in the downsteam section during this period.

August displayed an increase in harvest of sockeye salmon, O. merla, coho salmon, and pink salmon, O. gorbuscha. Harvest of Dolly Varden and rainbow trout remained similar to that of June and July. Fishing was better for all species in the upstream section during August.

Total harvest for the season was calculated at 23,460 fish: 4,580 chinook salmon (2,970 adults, 1,610 precocial males), 920 sockeye salmon, 6,385 coho salmon, 205 pink salmon, 3,030 rainbow trout, and 8,340 Dolly Varden. Catch rates and numbers harvested by species are presented in Table 8.

All fish captured were tagged before being released; six fish captured were tagged in 1974. Of the 460 tags released (199 in 1974 and 261 in 1975) 19 have been returned to the Fish and Wildlife Office in Kenai, Alaska, representing 4.1%. Tagged fish have been reported as far as 22 miles (35.4 Km) upstream.

The program will be terminated upon completion of the 1976 egg take. Succeeding egg takes may be scheduled on a periodic basis to maintain the gene pool of the brood stock population.

DISCUSSION

All managed lakes sampled by gill-netting and electrofishing showed normal growth and survival with the exception of Rock and Arc Lake. Low dissolved oxygen levels in Rock Lake last winter are the probable causes of poor survival. The lake has a history of winter-kills. Arc Lake is a small body of water with poor productivity indications. Conductivity was found to be less than 10 micromhos/cm. Although survival seemed reasonable, growth was less when compared to other lakes stocked with equal quality fish at the same density.

Population sampling with electrofishing gear has advantages over gill nets in that smaller fish can be captured with less harmful effects, and captured fish can be released live. Also, reinfestation by threespine

Table 8. Summary of Creel Census Data Calculated for Kenai River, 1975.

Species	Boat Anglers: Beaver Creek to Soldotna Bridge		Boat Anglers: Naptowne Rapids to Skilak Lake		Shore Anglers		Total	
	Number	Catch/Hour	Number	Catch/Hour	Number	Catch/Hour	Number	Catch/Hour
Chinook salmon	3,530*	0.048	230**	0.010	820***	0.029	4,580	0.037
Sockeye salmon	90	0.001	620	0.018	210	0.004	920	0.005
Coho salmon	2,715	0.032	2,255	0.066	1,415	0.029	6,385	0.038
Pink salmon	20	0.000	105	0.003	80	0.002	205	0.001
Rainbow trout	270	0.003	2,300	0.067	460	0.009	3,030	0.018
Dolly Varden	1,470	0.017	5,170	0.151	1,700	0.035	8,340	0.050
Total	8,095	0.101	10,680	0.315	4,685	0.108	23,460	0.149
Effort (angler days)	23,630		11,220		13,065		47,915	

* 2,450 adults, 1,080 precocial males
** 150 adults, 80 precocial males
*** 360 adults, 460 precocial males

sticklebacks is readily observed at least a year before it would otherwise be noted. Reoccurrence of stickleback was confirmed in three managed lakes. Reasons for reinfestation are unknown but illegal transplanting of fish by private individuals is suspected in all three cases. Disadvantages of electrofishing include: (1) inability to capture larger fish under certain conditions, (2) physical characteristics such as water depth and access limit utilization, and (3) weather conditions affect operational safety. Not enough work has been done on the Kenai Peninsula to allow replacement of gill net methods by electrofishing.

Electrofishing efficiency is limited by water conductivity, water clarity, surface reflection due to wind, electrode design, and power output. Electrode design is the only variable that can be practically altered. The arrangement now in use is selective towards smaller fish in lakes. Whether it provides a more accurate representation of the actual population size structure is unknown; however, it has worked well on adult salmon in the Kenai River.

The Kenai River creel census revealed many interesting facts of this newly developed fishery. Although shore anglers do harvest chinook salmon, over half of their take is comprised of precocial males. Due to timing and the season closure of July 31, the upstream section of the river harvests predominately early run fish. Late run fish appear to arrive in substantial numbers after the season closes. The upstream section provides better fishing for rainbow trout and Dolly Varden, while salmon fishing is better in the lower section.

Swanson River Egg Take:

For the second consecutive year, eggs have been taken from a wild rainbow trout spawning population in the Swanson River in an effort to establish a native brood stock population. This is a cooperative project with the Fish and Wildlife Service who have provided personnel for the tagging study and aircraft support.

Capture efforts yielded a total of 267 fish comprised of 127 females and 140 males. Eggs taken from 52 females totaled 29,700, or 571 per female. The remaining females were found to be either unripe or spawned out.

Fish captured represented five age classes, 2.0-6.0. Length ranges, means, and percent representations for both females and males are presented in Table 9.

After July 31, effort is not reduced but rather redirected towards other species, especially coho salmon. Data indicate differential timing of coho salmon into the Kenai River, with the first peak occurring in early August, and the second in late August. Because 1975 was a low cycle year, the harvest of pink salmon was substantially reduced from the 1974 catch.

Generally, smaller fish characterized the chinook salmon harvest during 1975 as compared to 1974. Very few fish over 50 pounds were reported, and a relatively high percentage of precocial males were checked.

Table 9. Age and Length Data of Mature Rainbow Trout Collected During the Egg Take on Swanson River, 1975.

Age Class	2.0	3.0	4.0	5.0	6.0	Total
Female						
n	0	7	53	45	16	121
Range (mm)		190-350	210-415	270-470	280-455	190-470
Mean (mm)		243.3	292.6	346.2	367.2	319.0
SD*		54.7	56.2	47.3	47.7	62.7
Percent		5.8	43.8	37.2	13.2	100.0
Male						
n	1	7	26	21	5	60
Range (mm)	250	200-375	415-445	230-520	315-405	200-520
Mean (mm)	250	260.7	312.7	306.9	350.0	306.4
SD*	0	62.8	58.0	67.5	37.6	62.8
Percent	1.7	11.7	43.3	35.0	8.3	100.0
Total						
n	1	14	79	66	21	181
Range (mm)	250	490-375	210-445	230-520	280-455	190-520
Mean (mm)	250	247.5	299.1	333.7	363.1	314.9
SD*	0	58.2	57.2	57.1	45.3	62.9
Percent	0.6	7.7	43.6	36.5	11.6	100.0

* Standard Deviation

LITERATURE CITED

Engel, L.J. 1973. Inventory and cataloging of Kenai Peninsula, Cook Inlet and Prince William Sound drainages and fish stocks. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Progress, 1972-1973, Project F-9-5, 14: 1-29.

Hammarstrom, S.L. 1975. Inventory and cataloging of Kenai Peninsula, Cook Inlet and fish stocks. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Performance, 1974-75, Project F-9-7, 16: 27-68.

Nelson, D.C. 1972. Population studies of anadromous fish population, southwestern Kenai Peninsula and Kachemak Bay. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Progress, 1971-72, Project F-9-4, 13: 13-29.

Neuhold, J.M. and Lu, K.H. 1957. Creel census methods. Publ. No. 8, Utah Dept. of Fish and Game.

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