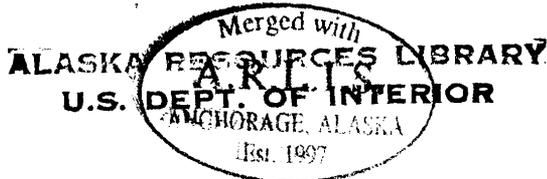


Volume 8



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STATE OF ALASKA  
Walter J. Hickel, Governor

ANNUAL REPORT OF PROGRESS, 1966 - 1967  
FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-8  
SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME  
Urban C. Nelson, Commissioner  
Wallace H. Noerenberg, Deputy Commissioner

Alex H. McRea, Director  
[Alaska Department of Fish and Game] Sport Fish Division

Louis S. Bandirola, Coordinator

## INTRODUCTION

This report of progress consists of findings and work accomplished under the State of Alaska Federal Aid In Fish Restoration Project F-5-R-8, "Sport Fish Investigations of Alaska."

The project during this report period is composed of 20 separate studies. Some are specific to certain areas, species or fisheries, while others deal with a common need for information. Each job has been developed to meet the needs of various aspects of the State's recreational fishery resource. Seven jobs are designed to pursue the cataloging and inventory of the numerous State waters. These are divided into logical utilization areas and are jobs of a continuing nature. It will be many years before an index of the potential recreational fishing waters is completed. Six jobs are directed toward specific sport fish studies. These include special efforts toward the anadromous Dolly Varden of Southeastern Alaska, silver salmon in Resurrection Bay, king salmon stocks on the lower Kenai Peninsula, king and other salmon stocks in Upper Cook Inlet, and Arctic grayling and sheefish in Interior Alaska. Special reports have been prepared on specific phases of the Dolly Varden life history and appear in the Department's special "Research Report" series.

The Statewide access evaluation remains one of the most important jobs conducted under this Federal Aid Program. It provides the Department with a tool to recommend withdrawal of suitable access sites on potential recreational fisheries throughout the State.

The remaining jobs include creel census efforts on specific fisheries in high use areas of the State, an egg-take program directed toward locating suitable indigenous stocks, perfecting advanced techniques in taking, handling and rearing species that are not normally associated with standard fish cultural practices, and continuation of the evaluation of the Fire Lake System.

The material contained in this report is often fragmentary in nature. The findings, evaluations and interpretations contained herein are subject to re-evaluation as the work progresses and additional data are collected.

## RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.  
Project No: F-5-R-8 Title: Inventory and Cataloging of the Sport Fish and Sport Fish Waters in Southwest Alaska.  
Job No: 6-A

Period Covered: July 1, 1966 to June 30, 1967.

## ABSTRACT

Winter oxygen samples were taken from 7 local lakes where marginal winter survival conditions were anticipated. Three new lakes and 15 major sport fishing streams were investigated and survey cards completed. The third consecutive year of June variable-mesh gillnetting in local lakes was completed for aiding in evaluating the local rainbow trout, Salmo gairdneri, stocking program.

Aerial and ground counts were made for steelhead trout, king salmon, Oncorhynchus tshawytscha, and silver salmon, O. kisutch. A total of 691 additional Dolly Varden, Salvelinus malma, were tagged in Buskin, Saltery and American Rivers, and preliminary migration patterns were determined. Various silver salmon egg taking sites were evaluated, resulting in the selection of Lake Rose Tead inlets as the only desirable location in the area. Continued assistance was given to public access and multiple water use projects.

## RECOMMENDATIONS

Physical and chemical investigations should continue on the area's lakes and streams, with particular emphasis on completing the sport fish stream cataloging.

Yearly lake sampling and stream counts of steelhead trout, silver salmon and king salmon should continue. The king salmon counts, which should be made in the Karluk and Ayakulik Rivers between August 10 and 15, should also be supplemented with ground (drift) counts.

A counting tower or weir should be installed on the Karluk River to better enumerate in-migrating steelhead and silver salmon.

Dolly Varden tagging should be terminated and effort directed toward thorough tag recovery aspects of the investigation.

## OBJECTIVES

1. To assess and inventory the physical, chemical and biological characteristics of all potentially significant sport fishing streams and all lakes under management consideration in the region.
2. To make surveys on lakes, streams and coastal marine areas for establishing the magnitude, distribution, timing, yearly fluctuations and angler harvest of sport fish populations in areas of particular concern to resource management.
3. To investigate sources of Dolly Varden, steelhead trout, and silver salmon egg takes which appear to have significant future value in sport fish management, to attempt small-scale pilot egg takes as a test of feasibility, and to conduct other tests of egg taking techniques as found necessary.
4. To evaluate multiple-use development projects (public and private) and their effects on the region's streams, lakes, and coastal marine areas for the proper protection of the sport fish resource.

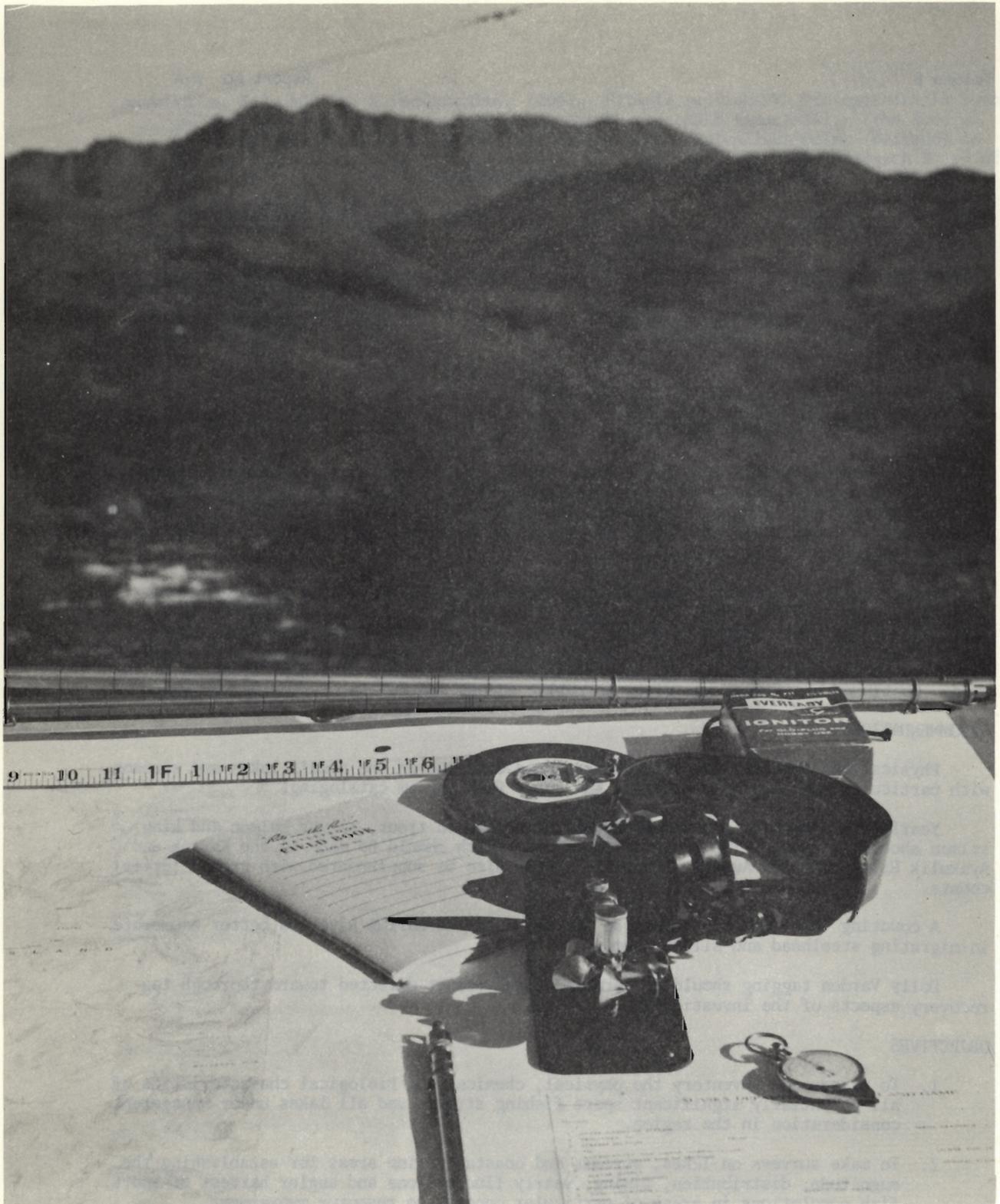


FIGURE 1. Stream Survey Equipment Used in the 1966 Kodiak-Afognak Island Surveys.

5. To assist as required in the investigation of public access status to the region's fishing waters.

#### TECHNIQUES USED

Standard techniques, as described by Marriott, 1964, were used in surface mapping, in analysis of water samples and in gill net sampling.

Physical stream surveys incorporated the use of a Gurley current meter, sounding rod, measuring tape, map references, and visual estimates of bottom composition. This equipment is shown in Figure 1.

All stream captures of Dolly Varden and silver salmon were made with a 60-foot beach seine of 1-inch square webbing. All Dolly Varden tagging was with 5/8-inch diameter Peterson disc tags and nickel pins.

#### FINDINGS

##### Assessment and Inventory of Sport Fish Environment

Late February water samples were taken from Kodiak area lakes that have previously shown marginal winter conditions for fish survival. A summary of the findings is shown in Table 1.

Table 1 - Mid-Depth Lake Water Samples for Kodiak Island Lakes in 1967.

<u>Lake</u>	<u>Date of obs.</u>	<u>Oxygen (ppm.)</u>	<u>pH</u>
Snag	2-20-67	0.0	6.4
Dragonfly	2-20-67	2.1	5.8
Beaver	2-22-67	1.3	5.8
Island	2-22-67	4.6	5.8
Ambercrombie	2-22-67	5.7	-
Horseshoe	2-24-67	6.3	5.8
B.P. #40	2-27-67	0.5 @ 20 ft.	-
		12.2 @ 7 ft.	-

Winter conditions were moderately severe in the area, and by late February most of the lakes had approximately 26 inches of ice cover. Snag, Dragonfly and Beaver lakes, which are all shallow lakes with low water exchange, were lower in dissolved oxygen than when observed in February of 1965 and 1966. Although no noticeable winter-kill developed in Snag Lake after the 1965 reading of 2.1 ppm., a complete winter-kill is expected this year. The lake was not stocked during 1966, but contains a good population of rainbow trout from the 1965 stocking. Beaver and Dragonfly Lakes were stocked with rainbow trout fry in 1966. The low oxygen in B.P. #40 Lake is the result of a continuing hypolimnion of saline water which was deposited by the 1964 tsunami (Marriott, 1965).

Three additional lakes in the Kodiak area were surveyed and added to the lake survey card files.

Long Island #72 Lake was mapped (17.5 acres) and the maximum depth (12 ft.) determined. Silver salmon stocked in this lake in 1963 experienced excellent growth and survival and created a moderately heavy sport fishery in 1966. The lake was restocked this year by aerially dropping 3800 silver salmon fry from a PA-18 with float tanks.

Exploratory observations were made and lake survey cards completed for the two most promising lakes on the Kupreanof Peninsula. A 5-hour variable mesh gill net set in Dry Spruce Lake produced only three Dolly Varden. This deep, attractive lake of about 100

acres contains no salmon run and could be developed into an excellent fly-in lake. Barabara Lake (Approx. 300 acres, maximum depth 25 feet) is a productive lake already fairly popular with fly-in fishermen. A 2-hour gill net produced 2 rainbows (11.8 and 12.4 inches), 3 Dolly Varden, and 1 sockeye, *O. nerka*, fingerling. The lake contains a significant sockeye salmon run, which was in the lake by mid-July. The outlet stream is reported good for spring rainbow fishing.

Mid-winter mapping of several larger fly-in lakes (Barry, Summit, and Saltery) could not be completed as a suitable aircraft on wheel-skis was not available during the winter.

Stream cataloging was started during this year's field season and survey cards were completed for 15 of the most important sport fishing streams on Kodiak and Afognak Islands. A summary of data from the cards is shown in Table 2.

TABLE 2 - A Summary of Kodiak-Afognak Island Streams Cataloged in 1966.

Stream Name	Date of Physical Survey	Length in Miles	Estimated Flow Range in Cubic Feet	Sport Fish Species Present						
				DV	RB	SH	KS	RS	SS	PS
Buskin River	9-6-66	3.5	85-250	A	-	-		X	X	A
American River	9-9-66	9.5	100-300	A					X	A
Old's Creek	9-9-66	4.5	70-200	A					X	A
Roslyn Creek	9-9-66	6.5	22-120	A					X	A
Pasagshak River	9-9-66	1.5	60-150	A				X	A	X
Saltery River	9-21-66	3.0	150-300	A	X	-		X	X	A
Karluk River	8-6-64 5-13-66	25.0	760-1200	A	X	X	A	A	A	A
Frazer R. (upper)	5-15-66	3.0	200-500	A	X	X		X	-	A
Red River	5-25-66	3.5	110-200	A	-	X	X	A	X	
Little R. (upper)	8-25-66	10.0	20-40	A	X	-		X		A
Afognak River	9-8-66	2.3	70-120	A	X	-		A	X	A
Middle Malina River	9-8-66	0.3	14-25	A	A					X
Lower Malina River	9-8-66	2.0	15-30	A	A	-				A
Portage Creek	9-8-66	1.5	50-90	A	A					
Laura Creek	9-8-66	0.5	40-90	A	A			X	X	X

DV = Dolly Varden  
 RB = Rainbow Trout  
 SH = Steelhead Trout  
 KS = King Salmon

RS = Red Salmon  
 SS = Silver Salmon  
 PS = Pink Salmon

A = Abundant  
 X = Present  
 - = Present in small numbers

## Assessment and Inventory of Sport Fish Populations

### Rainbow Trout:

Gill net sampling was conducted again this year during the last half of June, making the third consecutive year of sampling for most local lakes. A summary of data from these samples is shown in Table 3. This year's samples suggest the following relationships:

1. The 1963 rainbow stocking of Genevieve and Margaret Lakes appears to have been a total failure, probably due to intensive silver salmon fingerling predation.
2. The 1962 plant of sockeye salmon in Ambercrombie Lake has survived, but remains severely stunted.
3. Rainbow fry from the 1965 plantings in Horseshoe and Snag Lakes had unusually rapid growth and have already attained sufficient size to be taken in the sampling net.
4. The 1962 and 1963 silver salmon plants in the Hidden Lakes appear to be dying off and leaving only a few older rainbows. Restocking of Jupiter and Saturn lakes with rainbow is recommended for this year.

While cataloging the streams on Afognak Island, large populations of native rainbow trout 7 to 14 inches in length were observed in Afognak River, Middle Malina River, Portage Creek and Laura Creek. Although they are presently little utilized, these streams comprise the best rainbow trout fishing in the Kodiak-Afognak Island area.

An aerial count of king salmon was made on the Karluk River on August 25. The timing of this survey should be advanced to August 10-15, as too many spawning sockeye and pink salmon were mixed with the kings and greatly hampered the counts. This system presents major difficulty in aerial counts, as shown by the variability of this season's counts in Table 4.

The Bureau of Commercial Fisheries weir count at the end of the season (November 12) showed that 500 king salmon had passed upstream. Most of these spawn in the upper 1/4 mile of the river between Karluk Lake and the weir site.

As an aid in determining species composition in the upper Karluk River and to determine distribution in the rapids area below Portage, it is recommended that next year's aerial counts be preceded by ground observations made from a drift of the entire river. Future aerial surveys should also include the Sturgeon and Ayakulik Rivers, where Hennick (1965) observed 2000 and 6000-8000 kings respectively on August 15.

### Silver Salmon:

Silver salmon investigations were made throughout the month of November to furnish population estimates and evaluate the egg taking potential of the various systems. The following evaluation resulted:

Lake Miam - Access is obtained by air to the lake outlet or to the shore spit at the river mouth. Spawning takes place in the upper 2/3 mile of the stream and peaks about October 22. This year's ground count of 350 silvers agreed with the aerial estimate of 200-300. The river is easily seined, but as access is hampered by early ice formation on the lake and the population is small, this system is not recommended for future egg takes.

Lake Rose Tead - Since the March 1964 land subsidence, ocean water with marine organisms periodically enters Lake Rose Tead (Marriott, 1965). This has resulted in unusually large 1-check silver salmon smolts, which were first observed migrating to sea in 1965. The first adults from these smolts returned to the system in September 1966, and ripened in the lake until October 31 when they entered the small spring creeks at the north end of the lake. Most of the spawning was completed within 24 hours. This year's population estimate of 1600 silver salmon was a dramatic increase over the 200-300 observed in the past two years. Approximately 200 silvers also beach spawned in the roadside gravel pit on the lake shore. The two best spring-fed inlets on the north shore are within 100 yards of the road and could be easily weired. If the system continues to maintain the same general level of spawners, an annual egg take of one million eggs (300 females) could be anticipated without endangering the run.

TABLE 3 - 1966 Kodiak Area Lake Sampling with Monofilament Sampling Gill Nets.

<u>Lake</u>	<u>Hrs. Set</u>	<u>Species</u>	<u>Brood Yr.</u>	<u># Caught</u>	<u>Inches Av. Length</u>	<u>Grams Av. Weight</u>
Genevieve	O.N.	D.V.	-	4	7.1	-
		S.S.	1965	2	4.3	-
Margaret	1	D.V.	-	3	4.2	-
		S.S.	1965	2	4.1	-
Louise	3	R.B.	-	5	-	-
		S.S.	1965	7	4.2	-
Ambercrombie	O.N.	R.S.	1962	2	7.3	-
Island	1	D.V.	-	7	5.3	-
		S.S.	1965	2	4.8	-
Buskin	1	-	-	0	-	-
Horseshoe	1	R.B.	1963	1	10.9	225.1
		R.B.	1964	2	6.9	61.2
		R.B.	1965	7	5.8	38.6
Aurel	1	R.B.	1963	1	12.5	320.8
Cicely	1	-	-	0	-	-
Caroline	1	R.B.	1962	1	14.0	512.0
Jack	1	R.B.	1964 (?)	1	7.2	83.1
Lee	1	R.B.	1963	1	10.0	154.0
		R.B.	1964	1	7.4	87.0
Dragonfly	1	-	-	0	-	-
Snag	1	D.V.	-	1	9.3	-
		R.B.	1964	1	6.8	66.3
		R.B.	1965	4	6.0	42.6
Jupiter	O.N.	R.B.	1961	2	24.9	*
Saturn	O.N.	S.S.	1963	1	16.5	-

\* Released - no weights taken.

TABLE 4 - 1966 Karluk River King Salmon Aerial Estimates.

<u>Date</u>	<u>Observer</u>	<u>Count</u>	<u>Section</u>
June 19	Lall (ADF&G)	400	-
July 12	Jennings (ADF&G)	894	-
August 15	Hennick (ADF&G)	8,000	Entire
August 18	Burns (FWS)	830	Lake to Portage
August 25	Marriott (ADF&G)	610	Lake to Portage
August 26	Lall (ADF&G)	200	Lake to Portage

American River - The center portion of American River has several pool areas where silvers congregate for protection while ripening. Eggs from these fish may be obtained by floating a seine downstream and seining these pools. However, as the river's total silver salmon population was estimated at only 350 fish, and the area is moderately used by sport fishermen, it is not recommended as a future egg take site.

Salonie Creek - Although close in on the road system, Salonie Creek is in a semi-restricted area and is lightly fished. Most of the 250 counted silvers were located in two pools in the middle section of the stream. The late, prolonged nature of these spawners makes this system suitable for small egg takes of approximately 60,000 eggs for local use.

Buskin River - This year's estimated silver run of 250 fish was considerably lower than the 600 estimated in 1965. Lake drop-out peaked about November 10, but small numbers of spawners were observed in the upper river until early January. Heavy sportsman utilization makes this river undesirable for an egg take site.

Roslyn Creek, Old's Creek, Afognak River - These other areas, which had silver salmon counts of 80, 250, and 200 respectively, all have small but utilized populations and present difficult access problems. They are not recommended for future egg take sites.

#### Steelhead Trout:

Steelhead observations were centered upon determining the spawning escapement size of runs in Karluk, Frazer and Red Rivers.

Karluk River - Efforts to obtain a reliable estimate from the Karluk River were unsuccessful. Visibility was not adequate for reliable aerial counts on April 19 and May 25. Only one steelhead was observed by ground observations in the upper river on May 15. From May 15 to May 25, a fishing party at Portage took only 10 steelhead, all spawned-out drop-outs. An attempt to seine and tag entering steelhead at Karluk Lagoon in September and October was also unsuccessful. Until its removal on October 17, the Bureau of Commercial Fisheries' weir counts showed that 75 steelhead had entered Karluk Lake. It is recommended that a counting tower be installed on the lower Karluk River in the fall of 1967 to enumerate in-migrating steelhead and silver salmon.

Frazer River - Aerial observations at Frazer River were more reliable in steelhead enumeration. Observations on April 19, May 17, and May 20 counted 4, 5, and 9 steelhead respectively in the area between Dog Salmon forks and Frazer River Falls. Four steelhead were observed, captured and tagged in ground observations in this area on May 17. Although some fish spawn in the canyon below the forks, it is unlikely that the total of spawners in 1966 was over 50 steelhead.

Red River - At Red River, ground counts on May 25 located only 1 pair of spawners in the area from Red Lake to Ayakulik River forks. However, in early October reliable sportsmen observations indicated that a population of at least 100 steelhead had come up the river on high water and were lying below lake outlet for 1/2 mile. It is likely that these fish winter in Red Lake or Ayakulik River and spawn in the reportedly excellent (Hennick - personal communication) spawning grounds below the forks. Future spring observations on these lower-river spawning grounds are needed.

#### Dolly Varden:

The Dolly Varden observations and tagging program that was initiated in the Kodiak area in 1966 has three main objectives:

1. Establishing general levels of population size and angler harvest for major streams in the Kodiak area.
2. Determining life history and migration behavior patterns, with particular attention to those patterns that appear to deviate from the more intensive work done in Southeast Alaska (Armstrong, 1965; Heiser, 1966).
3. Determining the degree of intra-system movement between three major habitat streams in the Kodiak area (Buskin River, Saltery River, and American River).

In 1965, 416 Dolly Varden were tagged and released in these systems. In 1966, an additional 691 Dolly Varden were tagged with the following distribution: Buskin River - 279 yellow tags; Salter River - 170 white tags; American River - 242 red tags. Length frequency distributions for these fish are shown in Figures 2, 3 and 4.

As the tagging effort in Buskin and Saltery Rivers was not evenly distributed between in-migration and out-migration, these length frequencies are not necessarily representative of the populations in these systems. However, the American River tagging may be considered representative of all fish in this system over 8 inches in length. These fish were not aged, but if the Lake Eva (Heiser, 1966) age-length data is applied, they would be almost entirely age VII to age IX fish. The adult Dolly Varden, which are found in this river only between August 1 and December 1, all appear to be spawning in the river and side spring tributaries. Juvenile rearing appears to be confined to these tributaries, as no small Dolly Varden have been observed in the main river.

A creel census was conducted on the Buskin River from April 29 to May 30, a period which covered virtually all of the spring fishery on out-migrating Dolly Varden. A total of 1130 man-days of fishing was accounted for, and a total catch of 3487 Dolly Varden were estimated taken. The mean catch was 3.2 fish per man-day, with the peak of catch occurring May 15. During this April 29-May 30 period, 5 tags were recovered in this fishery. They were all from Dolly Varden that had been tagged while spawning in Buskin Lake feeder streams from October 22 - 29, 1965. No American River or Saltery River tags were recovered.

As the out-of-stream recoveries for all three systems consist of only 7 recoveries and 2 unrecovered observations, the trends which have appeared so far should be viewed as very preliminary. These migration patterns are shown in Figure 5. The Buskin River fish have demonstrated a northward migration as far as Anton Larsen Bay. The Saltery River fish have been picked up only in the Ugak Bay salmon fishery and off the mouth of Pasagshak River. Only one American River fish has been recovered.

Capelin:

The capelin, Mallotus villosus, runs on Silver Beach peaked June 3 and June 4, although fish were seen in the area for over one week previous to this time. Good advance publicity this year stimulated sport fishing effort, and approximately 120 people per night were on this beach at the peak of the run. The run itself was much larger than observed in 1965, as deep windrows of spent fish lined the entire beach for 3/4 mile. Unlike 1965, no capelin spawned on Pony Beach. Capelin were reported to have spawned in large numbers on Pasagshak Beach. Although nothing is known of the age of these fish, their 1964 to 1966 behavior on Silver Beach indicates strong even-year cycles and weaker odd-year cycles.

Halibut:

Halibut, Hippoglossus stenolepis, fishing effort in the entire Chiniak Bay area is too diverse to obtain reliable catch data. However, the following data has been obtained from the logs of Kodiak Naval Base tugs which take parties of 10-15 Navy personnel fishing twice per week throughout June, July and August:

TABLE 5 - Kodiak Naval Station Tug Catches of Halibut in 1965 and 1966.

<u>Year</u>	<u>Number Trips</u>	<u>Man-Days Effort</u>	<u>Catch</u>	<u>Size Range</u>
1965	24	324	300	2-96# (15# av.)
1966	19	243	270	3-127#(15# av.)

All of these fish were taken in the Chiniak Bay area. Anton Larsen Bay is also becoming an important sport fishing area for halibut because the protected nature of this bay makes it suitable for smaller fishing boats.

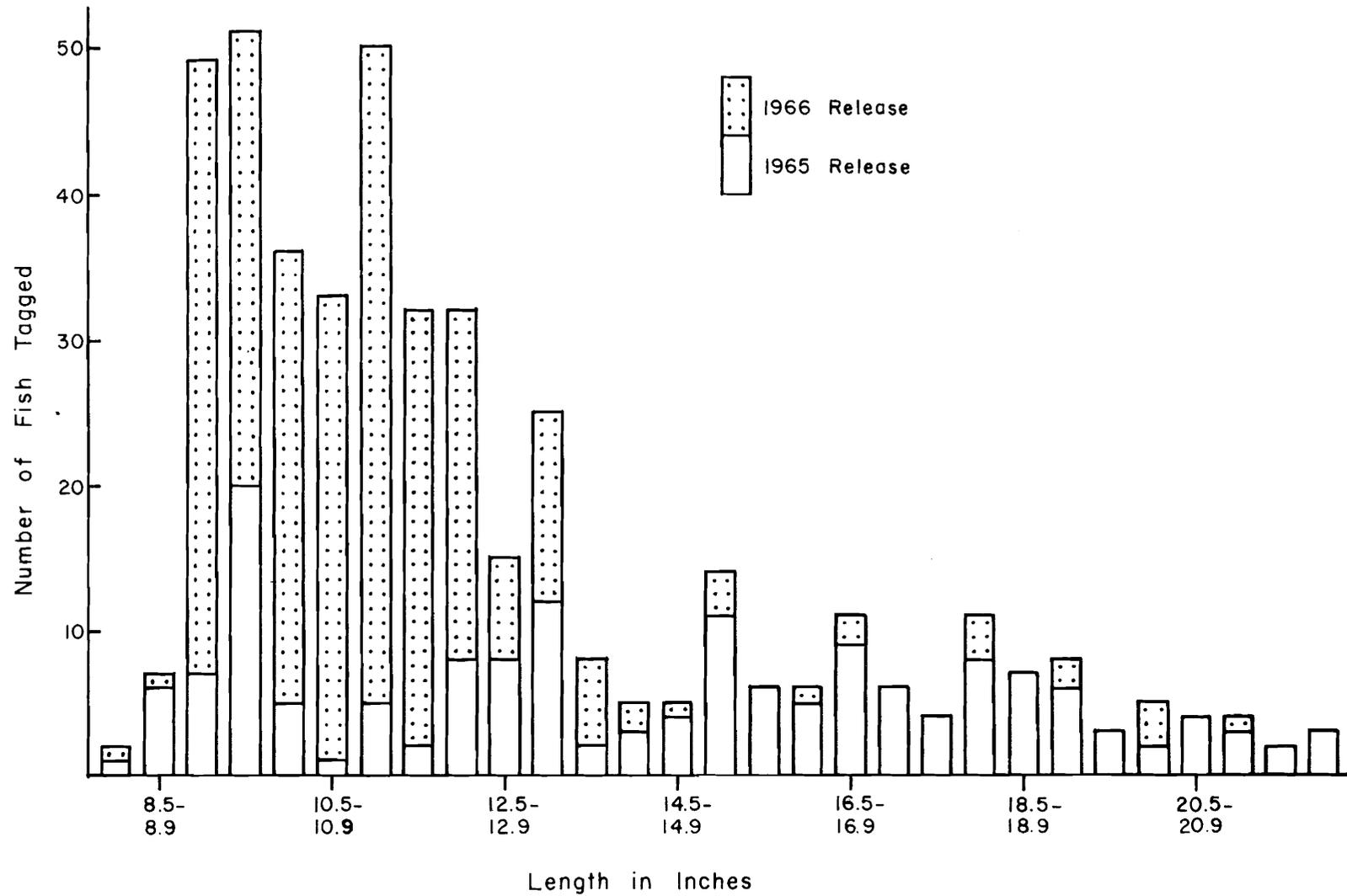


Figure 2. Length-Frequency Distribution of Tagged Dolly Varden in the Buskin River.

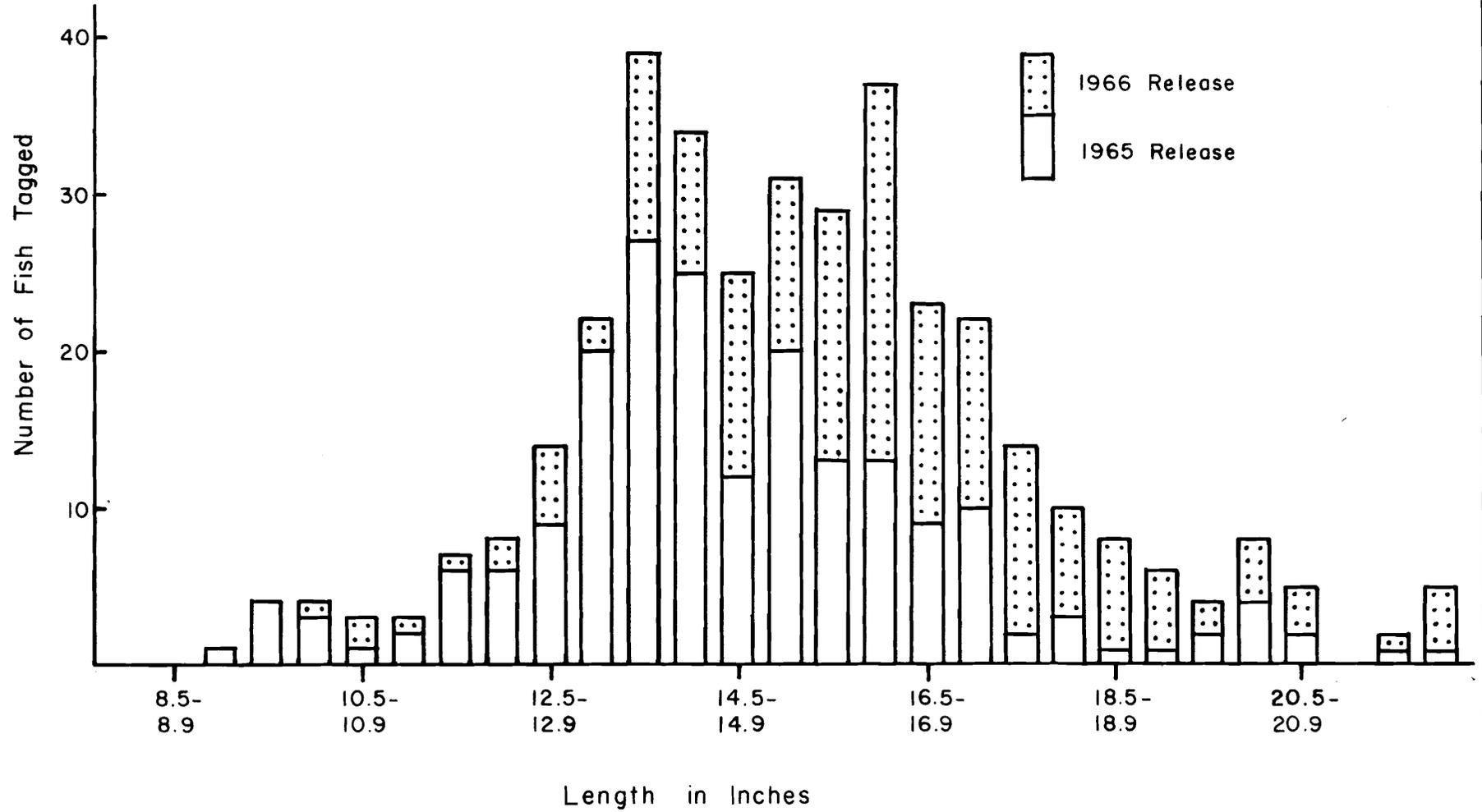


Figure 3. Length - Frequency Distribution of Tagged Dolly Varden in the Saltery River.

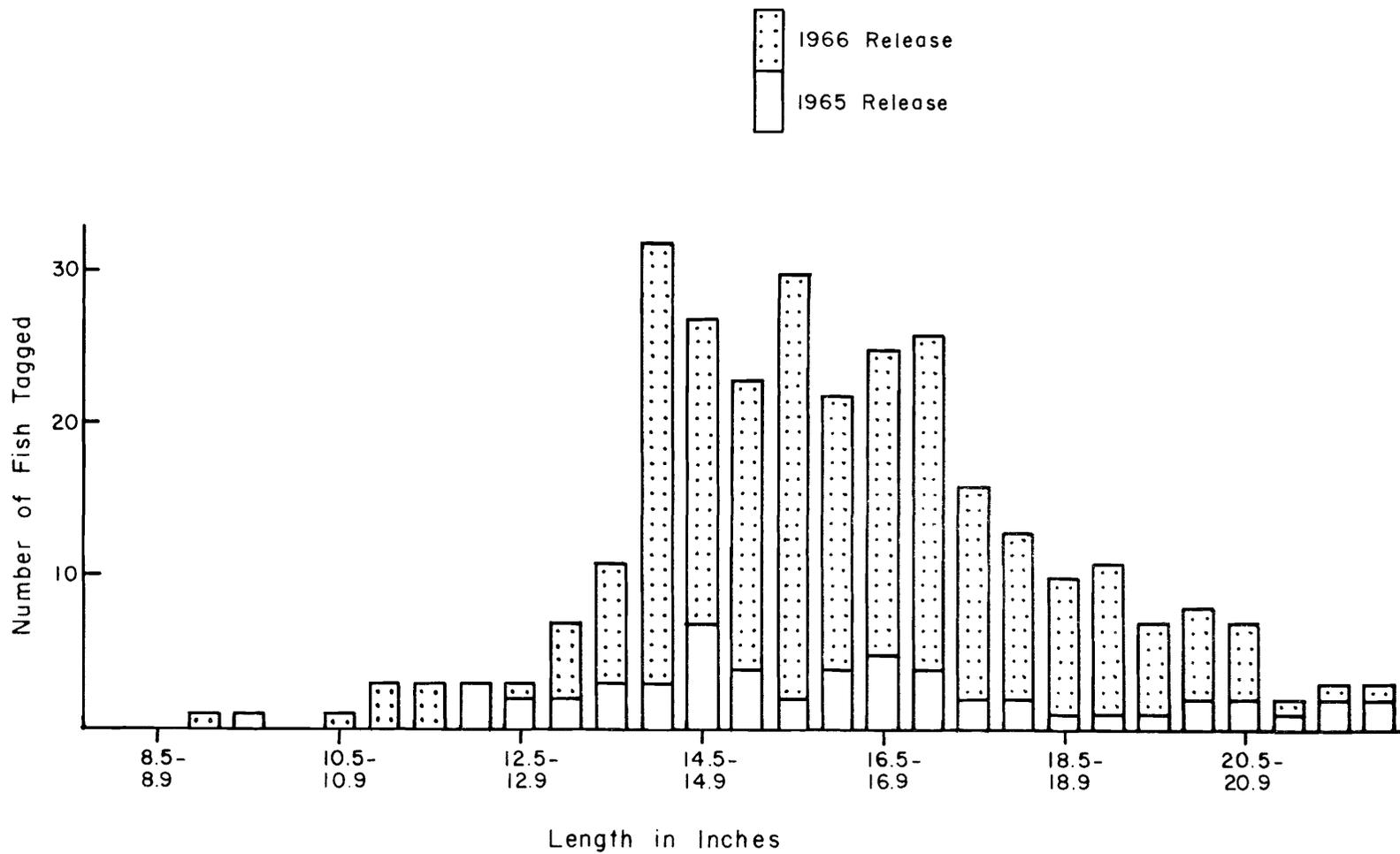


Figure 4. Length-Frequency Distribution of Tagged Dolly Varden in the American River.

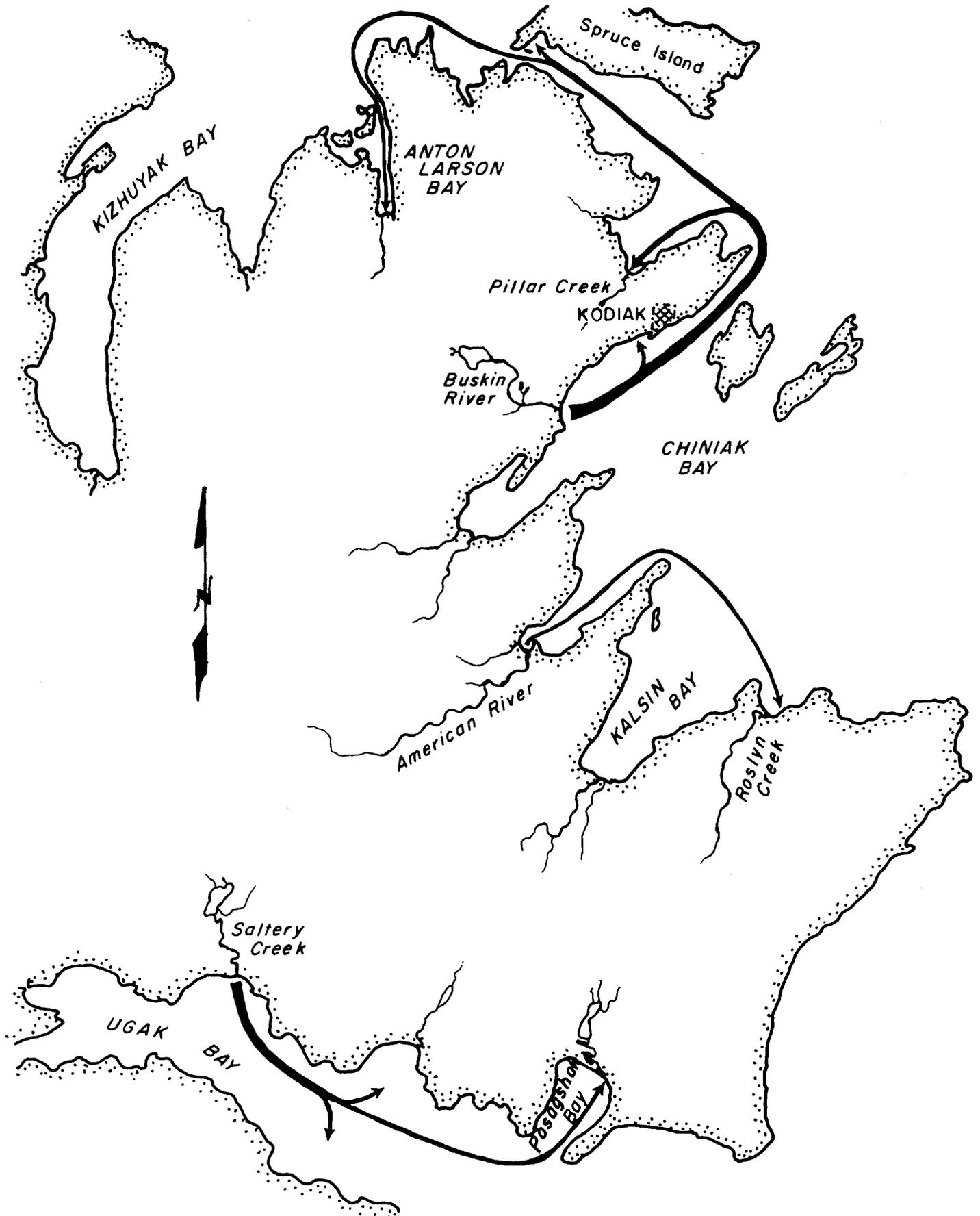


Figure 5. Map Showing Migration Routes of Tagged Dolly Varden.

### Experimental Egg Takes

Experimental silver salmon egg takes were made in connection with the population assessment studies. A summary of these egg takes, including mean length and weight of the spawning fish is shown in Table 6.

TABLE 6 - 1966 Kodiak Area Silver Salmon Observations.

<u>Area</u>	<u>Population Estimate</u>	<u>Est. Peak Spawning</u>	<u>Female Length</u>	<u>Mean Weight</u>	<u>Male Length</u>	<u>Mean Weight</u>	<u>Eggs Taken</u>
L. Miam (outlet stream)	350	Oct. 22	28.6"	9.0#	29.6"	10.3#	64,000
L. Rose Tead (inlets and gravel pit)	1600	Nov. 1	28.3"	10.0#	29.0"	9.6#	100,000
American River	350	Nov. 10	27.5"	9.5#	27.6"	8.5#	107,000
Salonie Creek	250	Nov. 5-25	27.1" (Mean fecundity 4750)	9.1#	29.3"	11.8#	120,000 (+50,000 for local use)
Roslyn Creek	80	Nov. 10	-	-	-	-	0
Old's Creek	250	Nov. 10	-	-	-	-	0
Buskin River	250	Nov. 10	-	-	-	-	0
Afognak River (aerial obs.)	200	Nov. 10	-	-	-	-	0

These eggs from the Kodiak area are particularly desirable for sport fish transplants within the State because the brood stock is above average in size and particularly late in spawning. This late spawning produces late hatching fry that will enter the critical early hatchery feeding stage during a period of warmer water temperatures.

A small egg take of 20,000 Dolly Varden eggs was made November 8 and 9 on the American River.

No rainbow or steelhead trout egg takes were attempted.

An electro-shocking experiment was made with Buskin River pink salmon to determine possible effects of this capturing device on viability of fish eggs and sperm. The experiment was set up to test effects of the shocking on unspawned eggs, unejected sperm, and fertilized eggs being waterhardened while shocking is going on in the area. Eggs from 24 females were used. Ten baskets of eggs were held in the Kodiak hatchery for evaluation at the end of the eyeing period.

In early October the pink salmon eggs were eyed enough to be "shocked" and counted for completion of the electro-shocking experiment. A summary of the results is shown in Table 7.

These results, and other observations associated with the experiment indicate the following:

1. Electro-shocking capture has no directly harmful effect on salmon eggs or milt while inside the fish.
2. The higher infertility in the shocked control is attributed to mechanical rupturing of internal organs noted in two of these females, apparently caused by violent spasms during shocking.
3. Fertilized eggs left in metal buckets in the stream while shocking is being done in the area can be partially damaged if given severe exposure to electricity, but are not sensitive enough to be damaged from normal activity.

TABLE 7 - Results of an Electro-Shocking Experiment on Buskin River Pink Salmon in 1966.

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A. Egg Group #1 (20 unshocked females)	
1. Unshocked male control	
Bucket a. = 17.5% mortality	Geometric mean = 15.76% mortality
b. = 13.9%	
c. = 16.1%	
2. Post-fertilization shock (unshocked male)	
Bucket d. = 18.6%	
3. Male only shock	
Bucket e. = 12.1%	
B. Egg Group #2 (20 shocked females)	
1. Shocked male control	
Bucket f. = 24.5% mortality	Geometric mean = 27.60% mortality
g. = 30.7%	
h. = 28.0%	
2. Post-fertilization shock (shocked male)	
Bucket i. = 42.8%	
3. Female only shock	
Bucket j. = 25.1%	

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#### Public Access Assistance

Assistance to public access was limited to trail improvement and blazing at Hidden Lakes, location and sign marking for the trail to Summit Lake, and various sign replacements along the Kodiak road system.

#### Evaluation of Multiple Water Usage

In the Bell's Flats Recreation Area, recommendations were made that the State retain enough land to provide access to Orbin Lake, the Beaver Ponds, and to the trails for Jack and Lee Lakes.

A water-use request for Myrtle Creek was also investigated for effects on the sport fishing. One winter stream flow was obtained at the Geological Survey stream gauge site.

The Terror Lake hydroelectric project, Monashka Creek city reservoir project, and Buskin antenna field herbicide program have all progressed little during the year, and no further sport fish recommendations were requested or given for these projects.

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SCUBA Techniques Supplement Survey Investigations and Provide Information not Readily Available through other Methods.