Volume 26 Study G-I

STATE OF ALASKA

Bill Sheffield, Governor

Annual Performance Report for

KODIAK AREA ANGLER USE AND STOCK ASSESSMENT STUDIES

by

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ALASKA DEPARTMENT OF FISH AND GAME
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TABLE OF CONTENTS

Study: G-I INVENTORY AND CATALOGING Page

Job: G-I-B Kodiak Area Angler Use and Stock Assessment Studies
by: John B. Murray

LIST OF TABLES AND FIGURES

TABLE OF CONTENTS (CONT'D) Page

Volume 26 Study G-I

RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations of Alaska

Project: F-9-17

Study: G-I Study Title: INVENTORY AND CATALOGING

Job: G-I-B Job Title: Kodiak Area Angler Use and Stock Assessment Studies

Cooperator: John B. Murray

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ABSTRACT

Peak salmon escapement counts in 19 northeast Kodiak Island streams during 1984 indicated a minimum escapement of 262,570 pink salmon, *Oncorhynchus gorbuscha* (Walbaum), 126,534 sockeye salmon, *Oncorhynchus nerka* (Walbaum), 40,700 chum salmon, *Oncorhynchus keta* (Walbaum), and 6,888 coho salmon, *Oncorhynchus kisutch* (Walbaum).

A total of 76,666 juvenile chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), of Chignik origin (number = 70,809) and Lake Rose Tead origin (number = 5,857) were stocked in Lake Rose Tead on June 1, 1984. Spawning ground surveys and a creel census indicated a minimum of 70 adult chinook salmon returned from previous chinook fingerling plants. Thirty-six of 39 adult chinook sampled for age-growth data were Age 1.4 fish that returned from 65,652 fingerlings stocked in 1979. Approximately 120,000 Lake Rose Tead chinook salmon eggs were taken for stocking in 1985. An additional 100,000 eggs were naturally deposited in the Lake Rose Tead system.

A creel census conducted on Buskin River between April 16 and May 27, 1984, indicated sport anglers fished 3,410 angler-days (6,129 hours) and harvested 5,460 spring run Dolly Varden, *Salvelinus malma* (Walbaum). A summary of the creel census and Dolly Varden sampled from angler creels is presented.

An egg take conducted on Buskin River coho salmon on November 2, 1984 resulted in the acquisition of 40,000 green eggs from 12 females that were fertilized with six males.

A summary of water characteristics and sampling data for three Shemya Island lakes is presented. Seven additional lakes were found to be less than 1.5 meters in depth and therefore not sampled.

Swanson strain rainbow trout, *Salmo gairdneri* Richardson, stocked as fingerlings in August 1983 (weight = 871 fish/kilogram) in Abercrombie Lake demonstrated a 22 percent survival rate at Age I. A summary of rainbow trout age and size data is presented.

Fyke net trapping and tagging Buskin River Dolly Varden (n = 227) and Lake Genevieve Dolly Varden (n = 247) provided an insufficient sample size (n = 474 fish) to estimate the population size. Nineteen tagged Dolly Varden returned in the sport fishery and six tagged Dolly Varden observed during stream surveys indicated a minimum migration range of 28.4 kilometers from the Buskin River. Growth data collected from nine recaptured fish indicated a length increase of 0-51 millimeters and a gain of 0-182 grams. The duration between tagging and recapture was 1-90 days.

KEY WORDS

Sport, effort, harvest, escapement, stocking, salmon, steelhead, Kodiak, chinook.

BACKGROUND

The Kodiak management area (Figure 1) is comprised of the Kodiak/Afognak Island group and the Alaska Peninsula, south of a line from Cape Douglas to Port Heiden, including the Aleutian Islands. The Kodiak Island complex is approximately 200 km long by 120 km wide. The Alaska Peninsula section is 1,600 km long extending 800 km into the Bering Sea. The area is mountainous with numerous bays, lakes and streams that contain both anadromous and resident fish. Much of the area has not been surveyed and the total number of fish-producing waters is unknown. Kodiak Island has over 1,609 km of coastline, over 1,000 lakes 4 ha or larger in size and 301 known anadromous fish streams.

However, much of the management area is not accessible to the general public, and many fish-producing waters are productive for the short while anadromous fish are present. A fish stocking program for Kodiak area lakes was initiated in 1953 and has continued to this time. In order to develop more successful programs, numerous lakes have been chemically rehabilitated and stocked with various fish species at differential rates. Different sizes of fish have been tested and various habitat conditions have been studied to determine optimal growth and survival.

The physical and biological condition of lakes on northeast Kodiak Island has been examined in some detail, and the results of these observations are shown in the Annual Federal Aid in Fish Restoration reports since 1953. Priority for research, stocking and general survey work has been directed toward these areas.

Past stream research has centered on waters with steelhead trout, rainbow trout, coho and chinook salmon. Substantial increases in fishing effort suggest these studies should be intensified.

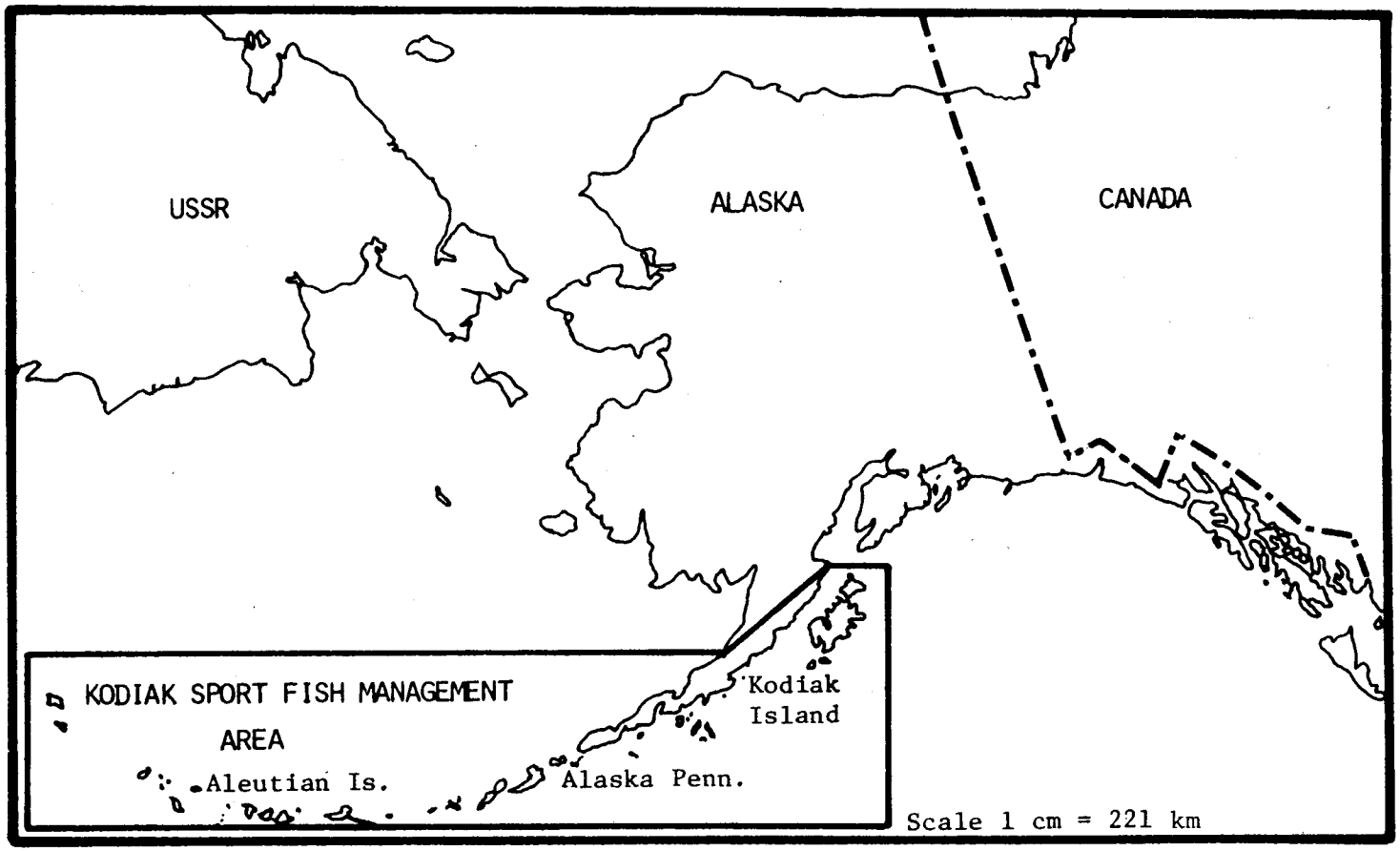

Figure 1. The Kodiak sport fish management area: Kodiak Island Archipelago, Alaska Peninsula and Aleutian Islands.

The Federal Aid in Fish Restoration reports for the Kodiak area from 1953 to the present depict specific data concerning the size, age and growth rate of Dolly Varden, rainbow trout, steelhead trout, coho, chinook and sockeye salmon from the Kodiak area. Additional data concerning harvest rates and spawning escapement are also presented.

These data form the foundation for most sport fish management decisions and sport fish recommendations pertaining to land use activities which may affect respective Kodiak area fisheries.

Table 1 presents a list of the fishes observed or studied in this report.

RECOMMENDATIONS

1. Roadside lakes should be stocked with Arctic grayling, rainbow trout or coho salmon to provide all season sport fishing.

2. In-season coho salmon escapement counts should be made on American River, Olds River, Roslyn Creek and Salonie Creek to manage the coho sport fishery.

3. A creel census should be conducted on Buskin River in 1985 to determine the angler effort and harvest of Dolly Varden and coho salmon for management of these fisheries.

4. The Buskin River weir should be operated to provide Dolly Varden, steelhead trout, sockeye salmon, pink salmon and coho salmon escapement data for management of the respective fisheries.

5. The Lake Rose Tead chinook salmon project should be continued to provide a chinook sport fishery accessible to the city of Kodiak.

6. Kitoi rainbow trout should be evaluated to determine if they are nonmigratory and superior to Swanson rainbow trout for stocking Kodiak roadside lakes.

7. Eleven lakes stocked in 1984 with juvenile coho salmon to provide an anadromous adult coho fishery should be evaluated for coho smolt production.

8. A study should be implemented to determine the salmonid carrying capacity of coho salmon streams on the Kodiak road system.

9. A study should be developed to determine the Dolly Varden population sizes in Kodiak roadside streams and the optimum allowable sport harvest.

10. A creel census should be conducted on the Pasagshak River in 1985 to determine angler effort and harvest of Dolly Varden and chinook salmon.

11. The fish producing waters on Afognak Island and Shuyak Island that remain as public waters (following total implementation of the Alaska Native Claims Settlement Act) should be surveyed.

Table 1. List of common names, scientific names and abbreviations used in this report.

Common Name	Scientific Name and Author	Abbreviation
Arctic grayling	*Thymallus arcticus* (Pallus)	GR
Chinook salmon	*Oncorhynchus tshawytscha* (Walbaum)	KS
Chum salmon	*Oncorhynchus keta* (Walbaum)	CS
Coho salmon	*Oncorhynchus kisutch* (Walbaum)	SS
Dolly Varden	*Salvelinus malma* (Walbaum)	DV
Pink salmon	*Oncorhynchus gorbuscha* (Walbaum)	PS
Rainbow trout	*Salmo gairdneri* Richardson	RT
Sockeye salmon	*Oncorhynchus nerka* (Walbaum)	RS
Steelhead trout	*Salmo gairdneri* Richardson	SH
Threespine stickleback	*Gasterosteus aculeatus* Linnaeus	TS

12. Hydrographic mapping of selected roadside lakes should be conducted to determine volume, mean depths and morphoedaphic index values.

OBJECTIVES

1. To determine physical, chemical and biological characteristics of Upper Lake, Lower Lake and Laundry Lake on Shemya Island during January.

2. To determine the magnitude, distribution, timing and yearly fluctuations of coho salmon, chinook salmon, steelhead trout and Dolly Varden in up to 20 Kodiak and Afognak Island waters in May, August, October and November.

3. To determine the angler effort and harvest of Buskin River Dolly Varden in April and May and Pasagshak chinook salmon from June through August.

4. To investigate, evaluate and develop plans for enhancement of chinook salmon in Lake Rose Tead and coho salmon on the Kodiak road system from June through September.

5. To ensure and enhance public access to Kodiak recreational fishing waters throughout the year.

6. To determine the population size, marine migration routes and summer-fall distribution of Buskin River Dolly Varden during April through October.

TECHNIQUES USED

Fish population estimates in Abercrombie Lake were made by Regier and Robson's (1967) mark and multiple recapture estimator. Fish were captured for sampling and marking by fyke nets of the following size: length, 3.7 m; diameter, 1 m and; 2 wings measuring 1.2 m x 7.6 m. Two square aluminum frames and five aluminum hoops support the entrance and body of the fyke net. The wings, body and internal throats are constructed of 9.5 mm square mesh knotless nylon.

Delphin Bay Lake fish populations were sampled with variable mesh monofilament gill nets (38.1 m x 1.8 m), composed of five different net panels (7.6 m long) with mesh ranging in size from 12.7 mm to 50.8 mm bar measure, and minnow traps with 6.4 mm mesh screens. The traps were baited with salmon eggs, placed in shoal areas where good catches could be expected and fished overnight.

All rainbow trout captured by fyke traps were anesthetized with diluted (6:1) 0.2% stock solution of tricaine methanesulfonate (MS 222), sampled for age-growth data, marked with a caudal clip and then released in the center of the lake for dispersion.

Buskin River Dolly Varden were fyke net-trapped at Buskin Lake outlet, tagged and sampled for age-growth data with the aid of an anesthetic (MS 222). Floy Mark II tagging guns were used to insert sequentially numbered, yellow anchor tags under the dorsal fin in such a manner that the tag anchor passed through the fin pterygiophores and remained as the applicator was withdrawn. All tagged fish were released downstream from the fyke traps after 30 minutes of recovering in a holding tank.

Salmon and rainbow trout were aged by projecting a scale from the preferred scale area on a Bruning 220 microfiche projector. Anadromous salmon ages are coded for brevity as discussed by Koo (1962) and resident fish ages are designated by Roman numerals.

Water characteristics for Shemya Island lakes (total hardness, total alkalinity, dissolved oxygen, pH, temperature, salinity and conductivity) were determined with a DREL Hach Kit or model 33 Yellow Stone Instrument. Depth profiles were measured with a Ross P100 Portable Depth Indicator and surface areas were determined from a U.S. Air Force topographic map.

Fish escapement counts were made by foot or by aerial surveys on roadside streams and by weirs on Afognak River, Ayakulik River, Dog Salmon River, Karluk River, Upper Station Creek and Lake Genevieve.

Rainbow trout and salmon stocked in lakes were transported as fingerlings from the hatcheries in aerated fish transport tanks. Arctic grayling fry were shipped air freight in plastic bags and styrofoam boxes containing a maximum of 25,000 fish (wt = 0.36 kg) per bag with 11 liters of oxygen saturated water, 4 liters of residual oxygen and 4 liters of crushed ice.

The number of fish stocked per lake was either hand counted or estimated by weight; i.e., weight of stocked fish = number of stocked fish ÷ number of fish per kilogram.

Rainbow trout and coho salmon were stocked at approximately 250-500 fish per hectare for resident fish production. Coho salmon were stocked at 1,235 fish per hectare for anadromous fish production.

Coded wire tags were placed in 22,004 of 70,809 chinook salmon fingerlings stocked in Lake Rose Tead and every coho salmon fingerling (n = 22,443) stocked in Lake Genevieve. The chinook fingerlings were held in a 3 m x 3 m x 3 m floating net pen for 6 days in the lake and fed Oregon Moist Pellet 10 times daily prior to liberation.

Lake Rose Tead chinook salmon broodstock and Buskin River coho salmon brood stock were collected with a beach seine. All eggs were taken surgically, dry fertilized (one male/two or three females), water hardened for 1-2 hours and transported by single engine aircraft to Kitoi Bay Fish Hatchery for incubation and rearing.

FINDINGS

Development and Enhancement of Resident and Anadromous Fish Populations

Abercrombie Lake:

Abercrombie Lake has been stocked annually with rainbow trout and periodically with Arctic grayling since it was chemically rehabilitated in 1972. The only exception was in 1981 when Kodiak was not allocated rainbow trout for research or management purposes. On August 22, 1983 the lake was stocked with 3,700 Swanson strain rainbow trout ($\bar{x}$ wt = 871/kg). On August 14 and 16, 1984, Kitoi strain (n = 1,850, $\bar{x}$ wt = 680/kg) and Swanson strain rainbow trout (n = 1,800, $\bar{x}$ wt = 478/kg) were stocked, respectively. Arctic grayling fry were stocked on June 4, 1983 (n = 20,000) and June 8, 1984 (n = 25,000). Five fyke nets set for 600 trap-hours on October 25 through 30, 1984 captured: 1,113 Age 0 (84 Kitoi strain and 1,029 Swanson strain), 347 Age I, 14 Age II, 1 Age IV rainbow trout and 0 Arctic grayling. The population estimate for Age 0 Kitoi and Swanson rainbow trout (Table 2) was 233 ± 51 and 1,155 ± 15 fish with an estimated survival rate of 12.6% and 64.2%, respectively. The population estimate for Age I rainbow trout was 815 ± 77 fish with an estimated survival rate of 22.0%. Insufficient numbers of Age II and Age IV rainbow trout were captured to compute a population estimate.

The low catch of Age II and older rainbow trout is probably due to exploitation of larger fish by the sport fishery and net avoidance. The population estimates for Age 0 rainbow trout are probably not accurate, as some Kitoi and Swanson fish were small enough to escape through the fyke net webbing. Age-growth data presented in Table 3 indicated 202 Age 0 Swanson rainbow trout averaged 91 mm and 58 Age 0 Kitoi rainbow trout averaged 82 mm, while 205 Age I and 14 Age II rainbow trout averaged 175 mm and 221 mm, respectively. The absence of Arctic grayling is probably due to net avoidance and a small grayling population size. The latter is probably due to large numbers of threespine stickleback that have reinfested the lake. Rainbow trout production will probably also decline in the next few years and lake rehabilitation will be necessary to achieve maximum sport fish production.

Delphin Bay Lake #13566:

Delphin Bay Lake was initially surveyed in 1974 and determined to be an excellent experimental lake for stocking rainbow trout (Van Hulle and Murray, 1975). It was chemically rehabilitated (0.5 ppm Pronox Fish) in September 1978 and stocked with 3,695 Swanson River rainbow trout at 1,516/kg on September 19, 1979. A gabion fish barrier installed on the lake outlet in October 1978 washed out and was replaced in June 1980. Fish immigration may have occurred while the barrier was inoperable; however, char were captured in the lake after rehabilitation and prior to the washout (Ralph Browning, USFS, pers. comm., 1979) thus indicating an incomplete fish kill. Dolly Varden were also observed throughout the system during a September 16-19, 1980 survey, while threespine stickleback were seen only in the outlet below a 1 meter falls (Van Hulle and Murray, 1980). Fyke net trapping during 1980 captured 81 Dolly Varden,

Table 2. Population estimates of Age 0 (Swanson Strain and Kitoi Strain) and Age I (Swanson Strain) Abercrombie Lake rainbow trout from a sequence of samples, October 25 through October 30, 1984.

	Experimental Results					Summary Statistics		Estimates	
Sample	Catch	Marked Recaptures	Number Dead or Injured on Capture	Number of Marked Released	Un-Marked Catch	Cumulative Un-Marked Catch	Number Previously Dead or Injured	N	±S.E.(N)
Age 0 Swanson Strain Rainbow Trout:									
1	243	0	0	243	243	243	0	0	0
2	444	118	0	444	326	569	0	914	52
3	429	190	0	429	239	808	0	1,180	40
4	742	521	1	741	221	1,029	0	1,155	15
Age 0 Kitoi Strain Rainbow Trout:									
1	23	0	0	23	23	23	0	0	0
2	17	1	0	17	16	39	0	391	371
3	21	2	0	21	19	58	0	403	217
4	37	11	1	36	26	84	0	233	51
Age I Swanson Strain Rainbow Trout:									
1	75	0	0	75	75	75	0	0	0
2	169	15	2	167	154	229	0	845	186
3	66	16	0	66	50	279	2	895	135
4	107	39	1	106	68	347	2	815	77

Table 3. Sampling summary of Abercrombie Lake, 1984.

Water Name & Location	Date Sample	Species	Number* Sampled	Age	Length (mm) $\bar{x}$	Length (mm) ±S.D.	Weight (g) $\bar{x}$	Weight (g) ±S.D.	Population Estimate Number	Population Estimate ±S.E.	Percent Survival	Date Stocked	Number Stocked	Per kg	Per ha
Abercrombie	10/25	RT (S)	202	0	91	7.6	6.6	2.5	1,155	15	61.4	8-16-84	1,800	478	238
T27S, R19W	Thru	RT (K)	58	0	82	8.3	5.1	1.9	233	51	12.6	8-14-84	1,850	680	244
Sec. 15	10/30	RT (S)	205	I	175	18.9	56.6	19.0	815	77	22.0	8-22-83	3,700	871	489
		RT (S)	14	II	221	10.2	112.3	20.3	NE**	...	NE	8-01-82	3,700	972	489
		RT (S)	1	IV	350	...	428.0	...	NE	...	NE	8-25-80	3,695	1,005	488

* Fish captured via fyke trap.
** NE = No estimate

RT = Rainbow Trout
S = Swanson Strain
K = Kitoi Strain

0 threespine stickleback and 650 rainbow trout. The stocked rainbow trout population estimate after 12 months of residency was 1,150 ± 43 fish ($\bar{x}$ ln = 174 mm, $\bar{x}$ wt = 66.3 g) with a minimum estimated survival rate of 31.1%. Actual survival may have been higher as stocked trout can migrate from this lake through the outlet barrier.

Delphin Bay Lake #13566 was sampled May 30, 1984 to assess the stocked rainbow trout population and the reestablishment of other fishes. A total of 48 Dolly Varden, 0 threespine stickleback and 6 rainbow trout were captured during 48 hours of gill-netting and 170 hours of minnow-trapping. Four rainbow trout were Age V ($\bar{x}$ ln = 459 mm) from the 1979 plant and two fish were Age II ($\bar{x}$ ln = 192 mm) progeny from the 1979 plant. Growth and survival rates of stocked rainbow trout to Age I were sufficient to provide an excellent sport fishery. However, the natural rainbow trout reproduction appeared insufficient to sustain a sport fishery.

Delphin Bay Lake #13566 was the first water ever chemically rehabilitated on Afognak Island and subsequently stocked with rainbow trout. Since the lake is remote and exploitation is light, this information may be used as base line data for stocking similar lakes on Afognak Island.

Shemya Island Lake Surveys:

Water characteristics and sampling data for three Shemya Island lakes (Lower Lake, Middle Lake and Laundry Lake) sampled June 27 and 28, 1984 are presented in Table 4. Headquarters, Grace, Jeanne, Sweeney, Hospital, June and Myrtle Lakes were found to be less than 1.5 meters in depth and therefore not sampled for water characteristics or fish populations.

Lower, Middle and Laundry Lakes had surface areas of 5.7, 3.2 and 2.8 hectares with maximum depths of 3.4, 2.4, and 1.5 meters, respectively. The dissolved oxygen for all waters was greater than 10.0 ppm while total alkalinity and total hardness were less than 10.0 ppm ($CaCO_2$). The pH was slightly basic (7.5-8.5 units) and conductivity was high (240-300 MHo). Variable mesh gill nets set overnight captured 11 Dolly Varden ($\bar{x}$ ln = 248 mm and $\bar{x}$ wt = 233.9 g) in Lower Lake and one Dolly Varden (ln = 360 mm, wt = 582.0 g) in Middle Lake. Threespine stickleback were also observed in both Lower Lake and Middle Lake. Fish were not captured or observed in Laundry Lake.

On July 10, 1984 coho fingerlings (Kitoi origin, $\bar{x}$ wt = 662/kg) were experimentally stocked in Lower Lake (n = 3,260) and Middle Lake (n = 1,740) to create a resident sport fishery.

Lake Rose Tead Chinook Salmon:

Chinook salmon have been stocked annually in Lake Rose Tead (Table 5), the headwaters of Pasagshak River, since 1976 (Van Hulle and Murray, 1977-1981). The first returning adults were observed in 1979 (n = 4) and 1980 (n = 11), and the largest return (n = 80) occurred in 1981 (Murray, 1982). Both streamside and sport creel censuses have been and will be conducted in future years to assess angler effort and the number of sport-caught chinook salmon.

Table 4. Water characteristics and sampling data for three Shemya Island lakes sampled June 27 and 28, 1984.

Lake Name	Surface Area(ha)	Maximum Depth(m)	Water Temp(°C)	Dissolved Oxygen(ppm)	pH	Total* Alkalinity	Total Hardness	Salinity (%)	Conductivity MHo	Net Hrs	Species	Number Captured	Mean** Length	Mean*** Weight
Lower	5.7	3.4	9.5	11.0	8.5	9.0	8.0	0.5	300	16.5	DV SB	11 Observed	248	233.9
Middle	3.2	2.4	9.5	11.0	7.5	5.0	5.0	0.2	240	18.0	DV SB	1 Observed	360	582
Laundry	2.8	1.5	10.0	10.5	8.0	6.0	5.0	0.2	240	20.0	...	0	...	...

Note: Headquarters Lake, Grace Lake, Jeanne Lake, Sweeney Lake, Hospital Lake, June Lake and Myrtle Lake were less than 1.5 meters in depth, therefore, these waters were not sampled for water characteristics or fish populations.

DV = Dolly Varden
TB = Threespine Stickleback

* ppm $CaCO_3$
** millimeters
*** grams

Table 5. Lake Rose Tead chinook salmon stocking history and 1978-1984 observed adult returns.

Year Stocked	Number of Fish Stocked	Origin	Fingerling Size(#/kg)		Observed Adult Return by Year 1978	1979	1980	1981	1982	1983	1984	Total
1976	22,500	Chignik	1,430		0	0	0	3	...	...	...	3
1977	133,109	Chignik	1,130		...	3	5	36	49	...	...	93
1978	14,261	Chignik	77		...	1	0	1	0	0	1	3
1979	65,652	Chignik	980		...	...	0	1	8	10	36	55
1980	93,259	Chignik	685		...	...	...	0	0	0	1	1
1981	134,784	Chignik	808		...	...	...	...	0	0	0	0
1982	96,756*	Chignik	1,399		...	...	...	...	...	0	1	1
	29,950*	Rose Tead	1,555									
1983****	119,499**	Chignik	1,101		...	...	...	...	...	...	0	0
	37,399**	Rose Tead	969									
1984****	70,809***	Chignik	918	Subtotal	0	4	5	41	57	10	39	156
	5,857***	Rose Tead	1,724	Unageable	0	0	6	39	0	26	31	102
				Grand Total	0	4	11	80	57	36	70	258

* 11,657 Pasagshak KS and 11,656 Chignik KS fingerlings were coded wire tagged in 1982.
** 15,661 Pasagshak KS and 14,670 Chignik KS fingerlings were coded wire tagged in 1983.
*** 5,259 Pasagshak KS and 16,745 Chignik KS fingerlings were coded wire tagged in 1984.
**** Fingerlings were stocked into a 3 m x 3 m x 3 m holding pen and fed Oregon Moist Pellets for 6 days.

During June and July, 1984, adult chinook salmon were not observed in the Lake Rose Tead system via foot and aerial surveys. Stream flows were extremely low at this time and it is presumed that most fish did not move into fresh water until extremely high tides occurred in early August.

A cursory creel census conducted on Pasagshak River between July 1 and August 6, 1984 indicated 97 completed anglers fished 173 hours and retained: 28 pink salmon, 1 chum salmon, 34 Dolly Varden, 1 coho salmon and 1 chinook salmon. Sport anglers reported or brought in 13 additional chinook salmon to the Department for sampling. Fourteen chinook salmon were also observed harvested in the subsistence gill net fishery in Pasagshak Bay, and several additional chinook were presumed harvested because gill nets could fish daily and up to seven gill nets were observed fishing during a creel census. On August 4, 42 chinook salmon were observed in the lake for a total of 70 chinook known to have returned in 1984. Thirty-nine Pasagshak chinook salmon analyzed for age-growth, as presented in Table 6, were comprised of 11 males and 28 females. Scale analysis indicated all fish smolted at Age 1.0 and most fish (36 of 39) were Age 1.4. Age 1.4 males (n = 10) and females (n = 26) had respective mean lengths of 1,114 mm and 990 mm.

A total of 70,809 Chignik origin chinook salmon ($\bar{x}$ wt = 1.1 g/fish) and 5,857 Lake Rose Tead origin chinook salmon ($\bar{x}$ wt = 0.6 g/fish) were stocked in Lake Rose Tead on June 4, 1984. Coded wire tags were put in 5,259 Lake Rose Tead fingerlings and 16,745 Chignik fingerlings. All of the fingerlings (n = 76,666), were held in a 3 m x 3 m x 3 m pen and fed Oregon Moist Pellet for 6 days before liberation into the lake.

Approximately 30,000 chinook salmon eggs were taken from four Lake Rose Tead females and fertilized with two males on September 4, 1984. An additional 90,000 eggs were taken from 11 Lake Rose Tead females and fertilized with four males September 18, 1984. These eggs are incubating in the Kitoi Bay Hatchery and will be stocked in Lake Rose Tead as fingerlings in June 1985. Age, sex and length data for Lake Rose Tead brood stock chinook are presented in Table 7.

In addition to the eggs obtained from the Lake Rose Tead egg take, approximately 100,000 chinook eggs were naturally deposited in Lake Rose Tead; i.e., 22 females x 10,000 eggs/female = 220,000 eggs - 120,000 green eggs = 100,000.

Lake Genevieve Coho Salmon:

Lake Genevieve is a 19.3 hectare lake, located in the Buskin Lake drainage, that historically supported a small coho and sockeye salmon population, numerous threespine stickleback and Dolly Varden (Van Hulle and Murray, 1972). The lake was chemically rehabilitated in 1972 and stocked with rainbow trout from 1973 through 1976 which produced a viable sport fishery (Van Hulle and Murray, 1974-1977). However, the lake was out of fish production for 7 years as suitable rainbow trout were not available for stocking. Subsequently, Lake Genevieve was stocked with coho salmon fingerlings (Buskin River origin) in 1983 (n = 35,472, $\bar{x}$ wt = 1,218/kg) and 1984 (n = 23,443, $\bar{x}$ wt = 1,334/kg) to

Table 6. Age, sex and length of Pasagshak River chinook salmon, September 1984.

Age Class	Males				Females					
			Length (mm)				Length (mm)			
	n	%	$\bar{x}$	±S.D.*	n	%	$\bar{x}$	±S.D.*	n	%
1.1	1	9.1	403	...	...	...	...	...	1	2.6
1.3	...	...	...	...	1	3.6	904	...	1	2.6
1.4	10	90.9	1,114	80.2	26	92.8	990	73.0	36	92.3
1.5	...	...	...	...	1	3.6	1,035	...	1	2.6
Total	11	100.0			28	100.0			39	100.1

* Standard Deviation

Table 7. Age, sex and length of Pasagshak River chinook salmon utilized for brood stock, September 1984.

Age Class	Males				Females					
			Length (mm)				Length (mm)			
	n	%	$\bar{x}$	±S.D.*	n	%	$\bar{x}$	±S.D.*	n	%
1.4	5	100.0	1,136	26.7	14	93.3	997	69.0	19	95.0
1.5	...	...	...	...	1	6.7	1,035	...	1	5.0
Total	5	100.0			15	100.0			20	100.0

* Standard Deviation

produce an annual return of approximately 470 adult fish; e.g., utilizing F.R.E.D. Division standard assumptions, 23,443 fingerlings x 2% fingerling to adult survival = 468 adult coho salmon.

A total of 511 Dolly Varden, 1,014 marked coho salmon smolts, 1,603 unmarked coho salmon smolts, 3 rainbow trout and 1,063 sockeye salmon smolts were enumerated through the weir between April 30 and June 15, 1984. Additional fish may have outmigrated during this time period as the weir was inoperable for 48 hours due to high water. Age-growth analysis of 131 unmarked coho smolts indicated 25 fish (19%) were Age 1.0 ($\bar{x}$ ln = 115 mm, $\bar{x}$ wt = 14.8 g) and 106 fish (81%) were Age 2.0 ($\bar{x}$ ln = 129 mm, $\bar{x}$ wt = 20.5 g). The marked coho smolts (n = 143) were Age 1.0 with a mean length and weight of 108 mm and 12.7 g. Age-growth analysis of 104 sockeye smolt indicated 49 fish (47.1%) were Age 1.0 ($\bar{x}$ ln = 96, $\bar{x}$ wt = 8.7 g) and 55 fish (52.9%) were Age 2.0 ($\bar{x}$ ln = 107 mm, $\bar{x}$ wt = 11.1 g). The Dolly Varden sampled (n = 247) averaged 231 mm in length with a range of 191 mm to 362 mm.

An egg take conducted on Buskin River coho salmon November 2, 1984, for the purpose of stocking Lake Genevieve, collected approximately 40,000 eggs from 12 females that were fertilized by six males. The eggs are currently being incubated at the Kitoi Bay Hatchery and 23,550 of the resultant fingerlings, all bearing a coded wire tag, will be stocked in Lake Genevieve during June 1985. Any excess fingerlings will be restocked in Buskin River. Age, sex and length data of the coho salmon brood stock are presented in Table 8. Ages 1.1, 2.1 and 3.1, respectively comprised 5.6%, 88.9% and 5.6% of the fish. Males and females of the dominant Age 2.1 class had mean lengths of 846 mm and 776 mm, respectively.

Lake Stocking:

A total of 35 waters in the Kodiak management area, as presented in Table 9, were stocked with juvenile rainbow trout (n = 62,320), Arctic grayling (n = 125,000) or coho salmon (n = 180,113) in 1985. Twenty-four waters were stocked for resident sport fisheries while 11 waters were stocked to provide anadromous coho salmon. Chinook salmon (n = 76,666) were stocked in Lake Rose Tead to provide large, trophy-sized fish accessible to the Kodiak road system. All fish were stocked as fry or fingerlings because larger fish are difficult and costly to transport from the hatcheries to Kodiak. Fish stocked in landlocked lakes usually grow to pan size (200 mm) after 1 year residency and provide a sport fishery. Coho salmon fingerlings smolt at Age 1.0 or Age 2.0 and return the third or fourth year after stocking. Chinook salmon smolt at Age 1.0 and return within 2 to 5 years after stocking.

Sport Fish Harvest Estimates

Buskin River:

A streamside creel census conducted on Buskin River between April 16 and May 27, 1984, as presented in Table 10, indicated sport anglers fished 3,410 angler-days (6,129 hours) and harvested 5,460 spring Dolly Varden.

Table 8. Age, sex and length of Buskin River coho salmon used for brood stock, November 2, 1984.

Age Class	Males				Females					
			Length (mm)				Length (mm)			
	n	%	$\bar{x}$	±S.D.*	n	%	$\bar{x}$	±S.D.*	n	%
1.1	1	16.7	820	...	0	0	...	...	1	5.6
2.1	5	83.3	846	44.8	11	91.7	776	30.2	16	88.9
3.1	0	0.0	...	...	1	8.3	807	...	1	5.6
Total	6	100.0			12	100.0			18	100.1

* Standard Deviation

Table 9. Total number of chinook salmon, Arctic grayling, coho salmon and rainbow trout stocked in the Kodiak Sport Fish Management Area, 1984.

Water Body Stocked	Surface Hectares	Date Stocked	Water Temp°C	Number Stocked	Source/ Strain	Fish/kg
Chinook Salmon						
Lake Rose Tead	95.7	6/4/84*	14.0	70,809	Chignik	919**
		6/4/84*	14.0	5,857	Rose Tead	1,726***
			Total	76,666		
Arctic Grayling						
Abercrombie	7.5	6/8/84	14.0	25,000	Clear	Fry
Aurel	6.1	6/8/84	15.5	20,000	Clear	Fry
Cascade	6.7	6/8/84	12.0	20,000	Clear	Fry
Cicely	2.8	6/8/84	16.0	10,000	Clear	Fry
Heitman	13.2	6/8/84	12.0	25,000	Clear	Fry
Long	14.6	6/8/84	17.0	25,000	Clear	Fry
			Total	125,000		
Coho Salmon						
Barry	51.4	6/12/84	15.0	25,400	L.Kitoi	1,043
Mayflower*	5.3	6/12/84	16.0	6,500	L.Kitoi	1,043
Pony	5.7	6/12/84	18.5	2,000	L.Kitoi	1,043
Southern	7.0	6/12/84	15.0	3,500	L.Kitoi	1,043
Monashka*	0.8**	6/12/84	12.0	10,000	L.Kitoi	1,043
Island*	18.2	6/12/84	15.8	27,975	L.Kitoi	1,043
Dark*	6.1	6/12/84	15.4	7,500	L.Kitoi	1,043
Pillar*	0.6**	6/12/84	12.0	10,000	L.Kitoi	1,043
Mission*	8.1	6/12/84	20.0	11,975	L.Kitoi	1,043
Kalsin Pond*	30.4	6/12/84	23.0	19,475	L.Kitoi	1,043
Orbin*	6.1	6/12/84	16.5	7,500	L.Kitoi	1,043
Genevieve*	19.1	6/14/84	14.0	23,443	Buskin	1,334
Margaret*	3.2	6/14/84	14.0	4,000	Buskin	1,334
Buskin*	101.0	6/14/84	10.0	15,845	Buskin	1,334
Lower***	6.6	7/05/84	10.0	3,260	L.Kitoi	662
Middle***	3.5	7/05/84	9.5	1,740	L.Kitoi	662
			Total	180,113		

* Held in floating pen and fed for 7 days.
** Chignik fish = 889/kg on release.
*** Rose Tead fish = 1,091/kg on release (Note: fish size bias as smaller fish escaped through large mesh net pen.)

* Stocked for volitional marine release.
** Stream length in kilometers.
*** Located on Shemya Island.

Table 9.(Cont'd.) Total number of chinook salmon, Arctic grayling, coho salmon and rainbow trout stocked in the Kodiak Sport Fish Management Area, 1984.

Water Body Stocked	Surface Hectares	Date Stocked	Water Temp°C	Number Stocked	Source/ Strain	Fish/kg
Rainbow Trout						
Jack	2.0	7/08/84	19.0	1,100	Swanson	1,000
Aurel	6.1	7/08/84	17.0	2,965	Swanson	1,000
Caroline	2.8	7/08/84	18.0	1,380	Swanson	1,000
Cicely	2.4	7/08/84	19.0	1,150	Swanson	1,000
Horseshoe	2.0	7/08/84	19.0	1,000	Swanson	1,000
Bull	4.0	7/08/84	17.5	2,000	Swanson	1,000
Twin	8.1	7/08/84	19.0	2,800	Swanson	1,000
Cascade	16.1	7/08/84	12.0	3,300	Swanson	1,000
Big	7.3	7/08/84	19.5	3,600	Swanson	1,000
Dolgoi	21.0	7/09/84	19.5	10,300	Swanson	1,000
Heitman	13.0	7/08/84	19.5	6,500	Swanson	1,000
Jupiter	7.3	7/09/84	17.0	3,645	Swanson	1,000
Saturn	4.9	7/09/84	17.0	1,200	Swanson	1,000
Delphin*	13.0	7/09/84	18.0	8,400	Swanson	1,000
Lilly Pond**	3.2	8/16/84	22.0	793	Swanson	478
Lee**	5.7	8/16/84	20.0	1,417	Swanson	478
Abercrombie**	7.7	8/16/84	19.0	1,880	Swanson	478
Long**	14.6	8/16/84	19.0	1,825	Swanson	478
Lilly Pond***	3.2	8/14/84	19.5	800	Kitoi	677
Lee***	5.7	8/14/84	18.0	1,400	Kitoi	677
Abercrombie***	7.7	8/14/84	19.0	1,850	Kitoi	677
Long***	14.6	8/14/84	19.5	1,800	Kitoi	677
Tanignak	12.1	8/14/84	19.5	1,215	Kitoi	677
			Total	62,320		

* Located on Afognak Island.
** LV clipped.
*** RV clipped.

Table 10. Sport harvest of Buskin River Dolly Varden as determined by a streamside creel census, April 16 through May 27, 1984.

Harvest Period	Angler Trips	Angler Hours	Dolly Varden
April 16-29	950	1,858	1,199
May 2-May 13	1,946	3,362	4,261
May 16-May 27	514	909	0
Season Total	3,410	6,129	5,460

Fish (n = 290) randomly sampled from angler creels, as presented in Figure 2, had a mean length of 316 mm and a range of 207 mm to 516 mm. Since 1971, the spring Dolly Varden harvest has dropped by approximately 8,000 fish. In addition, the harvest rate has dropped from a high of 2.0 fish per hour in 1971 (Van Hulle and Murray, 1974) to a low of 0.9 fish per hour in 1984. Because of increased fishing pressure, a reduction in Dolly Varden catch per hour and a lack of population data, there is concern the population may be overharvested. To protect Buskin River Dolly Varden and concurrently permit optimum sport harvest, it is mandatory that more biological information be collected to formulate prudent regulatory guidelines and a sound management program.

To protect Buskin River Dolly Varden, the bag limit was reduced from 15 to 10 fish in 1981 (Murray, 1982). This 33.3% bag limit reduction probably reduced the overall harvest by about 10%. Census data obtained in 1979 indicated only 10.7% of the total harvest came from that portion of the bag limit which exceeded 10 fish in number.

Afognak River:

A spot creel census was conducted from April 25 through September 15, 1984 on Afognak River by Sport Fish and Commercial Fish Division weir personnel. The creel census data presented in Table 11 indicate a minimum of 217 anglers fished 1,209 hours and harvested: 316 coho salmon, 9 steelhead, 12 rainbow trout, 59 Dolly Varden, 145 sockeye salmon and 27 pink salmon. Coho salmon (n = 83) sampled from angler creels as presented in Table 12 were comprised of Ages 1.1, 2.1 and 3.1 representing 12.1%, 77.1% and 10.8% of the sample, respectively. Age 2.1 males (n = 34) and females (n = 30) had mean lengths of 709 mm and 726 mm, respectively.

The above data do not show total sport harvest or effort but will be useful in determining the trend of Afognak River sport fisheries; i.e., the sport fish effort was considered nonexistent 10 years ago. Considering the good access from Kodiak and anticipated angler increase (10% per year) Afognak River will be one of the heaviest utilized waters on Afognak Island.

Assessment and Inventory of Anadromous Fish Populations

Data reflected in Table 13 show escapement counts of the respective salmon species through weirs operated on Kodiak and Afognak Island. Table 11 shows creel census data collected by weir personnel.

Karluk River:

Fish escapement estimates through the Karluk Lagoon weir between May 20 and September 29, 1984 were comprised of 7,747 chinook salmon, 2,512 steelhead kelts, 12,365 coho salmon, 116 upmigrant steelhead trout, 1,672,386 pink salmon, 138 chum salmon and 420,268 sockeye salmon. Table 14 presents weekly counts of chinook salmon, steelhead and coho salmon. The chinook escapement (n = 7,747) was 543 fish below the

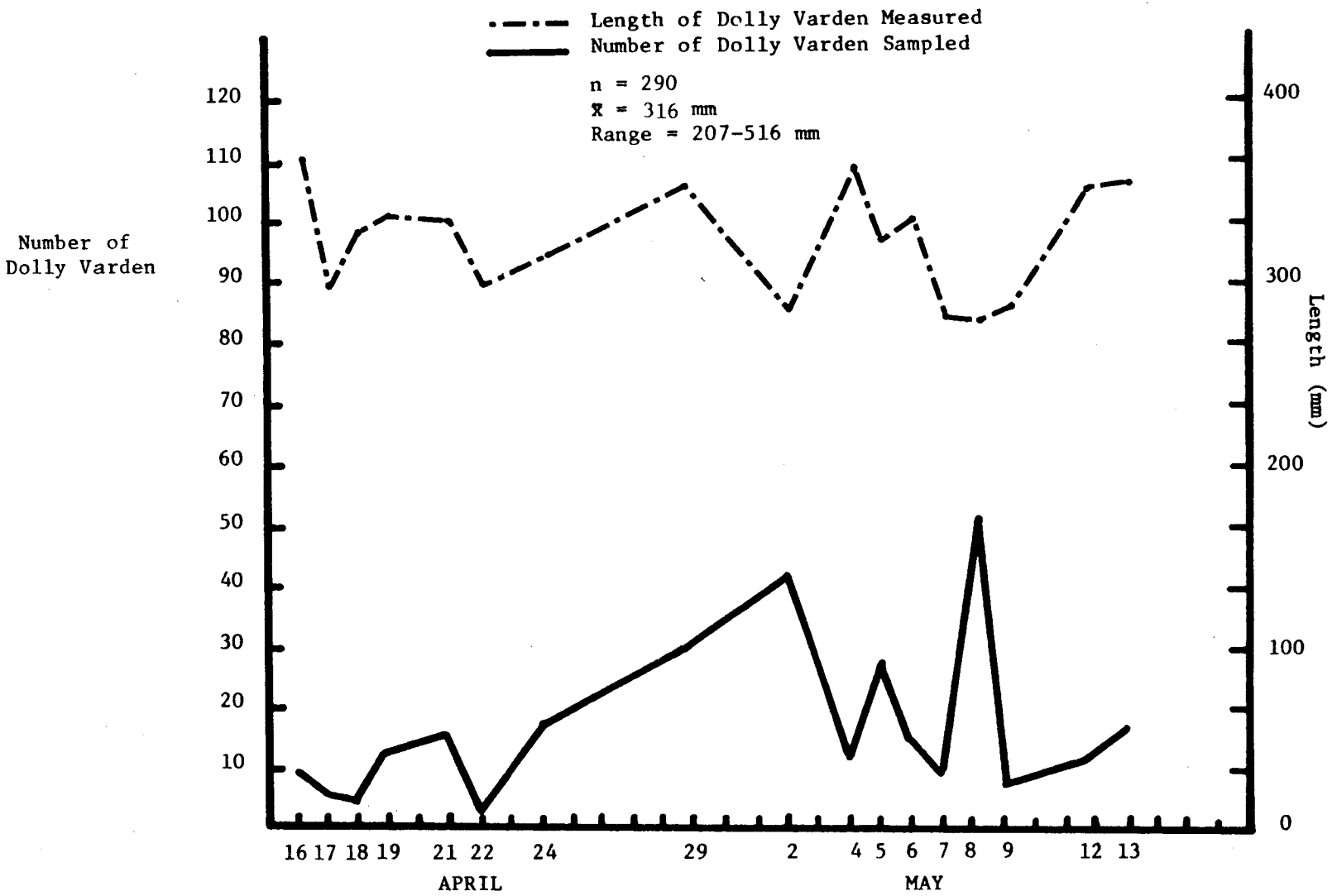

Figure 2. Number and mean length of Buskin River Dolly Varden sampled from angler creels, April and May 1984.

Table 11. Creel census estimates from weir camps at Afognak River, Ayakulik River, Pauls Lake and Karluk Lagoon, 1984.

Area	Date	Number Anglers	Total Days	Total Hours	Steelhead* Rel.	Steelhead* Ret.	Rainbow Trout Rel.	Rainbow Trout Ret.	Dolly Varden Rel.	Dolly Varden Ret.	Coho Rel.	Coho Ret.	Chinook Rel.	Chinook Ret.	Sockeye Rel.	Sockeye Ret.	Pink Rel.	Pink Ret.
Afognak River	April 25-Sept. 15	217	286	1,209	10	9	105	12	124	59	23	316	0	0	29	145	21**	27
Ayakulik River	May 4-June 30	44	238	1,569	92	2	20	0	20	0	0	0	827	86	425	57	0	0
Pauls Lake	July 25-Aug. 21	100	142	...	0	0	0	0	0	0	2	126	0	0	2	7	9	2
Karluk River Lagoon	June 2-July 1	55	196	1,136	24	3	0	0	368	0	0	0	123	79	431	84	0	0

* Kelt steelhead were caught between April 30 and June 30.
** Additional pink salmon released but not reported.

Rel. = Released
Ret. = Retained

Table 12. Age, sex and length of angler-caught Afognak River coho salmon, 1984.

Age Class	Males				Females					
			Length (mm)				Length (mm)			
	n	%	$\bar{x}$	±S.D.*	n	%	$\bar{x}$	±S.D.*	n	%
1.1	6	13.0	708	103.9	4	10.8	685	54.9	10	12.1
2.1	34	73.9	709	71.1	30	81.1	726	29.8	64	77.1
3.1	6	13.0	739	34.0	3	8.1	713	39.9	9	10.8
Total	46	99.9			37	100.0			83	100.0

* Standard Deviation

Table 13. Fish escapement counts through weirs on Kodiak and Afognak Islands, 1984.

River	Sockeye Salmon	Chinook Salmon	Pink Salmon	Chum Salmon	Coho* Salmon	Steelhead* Kelts	Steelhead* Up
Afognak	94,463	0	30,463	0	7,732	27	41
Upper Station	319,226	1	10,499	1	3,240	1	3
Ayakulik	283,215	6,502	631,060	34	11,951	1,306	135
Dog Salmon	53,524	137	55,964	18,121	1,340	80	2
Karluk Lagoon	420,268	7,747	1,672,386	138	12,365	2,512	116
Pauls Lake	32,659	0	6,180	6	4,274	19	0

* Total coho and steelhead escapements were not counted as all weirs were installed in May and removed in August or September.

Table 14. Summary of chinook, coho and steelhead migrational timing as determined by partial enumeration through Karluk Lagoon weir, 1984.

Period	Chinook		SH Kelts		UP SH		Coho	
	No.	%	No.	%	No.	%	No.	%
May 20-26	205	2.6	4	0.2	...	...	...	...
May 27-June 2	1,329	17.2	144	5.7	...	...	...	...
June 3- 9	2,073	26.8	746	29.7	...	...	...	...
June 10-16	1,803	23.3	570	22.7	...	...	...	...
June 17-23	1,098	14.2	334	13.3	...	...	...	...
June 24-30	712	9.2	366	14.6	...	...	...	...
July 1- 7	270	3.5	236	9.4	...	...	...	...
July 8-14	104	1.3	68	2.7	...	...	...	...
July 15-21	80	1.0	22	0.9	...	...	...	...
July 22-28	45	0.6	9	0.4	...	...	...	...
July 29-August 4	23	0.3	6	0.2	...	...	3	0.0
August 5-11	3	0.0	4	0.1	...	...	3	0.0
August 12-18	1	0.0	3	0.1	4	3.4	11	0.1
August 19-25*	1	0.0	...	...	...	...	19	0.1
August 26-Sept.1*	...	...	...	...	1	0.9	210	1.7
September 2- 8*	...	...	...	...	3	2.6	2,060	16.7
September 9-15*	...	...	...	...	2	1.7	1,273	10.3
September 16-22	...	...	...	...	45	38.8	2,483	20.1
September 23-29**	...	...	...	...	61	52.6	6,304	51.0
Total	7,747	100.0	2,512***	100.0	116	100.0	12,366	100.0

* During part of this time period the weir was removed and numbers of fish estimated.
** Weir removed on September 29.
*** 119 additional dead kelts were removed from the weir.

1976-1983 average. The high chinook salmon escapement and the increase in escapements during the last few years is attributed to favorable freshwater rearing conditions and the spring commercial fish closure in the Karluk district. Once Karluk sockeye salmon have been reestablished and normal commercial fishing resumes, the chinook salmon escapement will probably be substantially reduced in number.

Ayakulik River:

Fish escapement estimates through Ayakulik River weir between May 20 and August 25, 1984, were comprised of 283,215 sockeye salmon, 6,502 chinook salmon, 631,060 pink salmon, 34 chum salmon, 11,951 coho salmon, 1,306 kelt steelhead and 135 upmigrant steelhead. Table 15 presents weekly counts of chinook salmon, steelhead and coho salmon.

The Ayakulik chinook escapement (n = 6,502) was the third largest number of chinook salmon known to have spawned in Ayakulik River since the weir was installed at Ayakulik Lagoon in 1972. This high escapement is attributed to favorable freshwater rearing conditions and reduced commercial fishing in the Red River and Karluk River districts.

Northeast Kodiak Island Streams:

Peak salmon escapement estimates for northeast Kodiak Island, as presented in Table 16, indicated 262,570 pink salmon, 40,700 chum salmon, 126,534 sockeye salmon and 6,888 coho salmon spawned in 19 roadside streams. These peak counts were similar to previous years' escapements, with the exception of sockeye salmon which reflected the highest escapement since counts were initiated in 1966. A total of nine adult steelhead trout were observed in Buskin River via foot and boat surveys on May 9, 1984. This was the smallest spawning escapement observed since the river was closed to steelhead trout fishing in 1970.

Buskin River Dolly Varden:

Four fyke net traps were set across Buskin Lake outlet between April 15 and May 16, 1984 for 21 days to assess the Dolly Varden population. A total of 586 Dolly Varden were captured and all fish larger than 175 mm (n = 227) were sampled for length-weight data and marked with a yellow floy tag. During midseason it became apparent that an insufficient number of Dolly Varden would be captured to compute the population size. Therefore, 247 Lake Genevieve Dolly Varden, which also migrate through Buskin River, were tagged to provide a larger data base for assessing migration routes and summer-fall distribution.

Buskin River Dolly Varden averaged 215 mm in length with a range of 177-335 mm and Lake Genevieve Dolly Varden averaged 231 mm in length with a range of 191-362 mm.

During the spring and summer sport fishery a total of 19 tagged Dolly Varden as presented in Figure 3 and Table 17 were reported harvested. Nine fish were recaptured in Buskin River, 8 in saltwater beach areas near Kodiak City, 1 in Russian River and 1 in Olds River. Growth data of nine recaptured fish as presented in Table 18 indicated a length

Table 15. Summary of chinook, coho and steelhead migrational timing as determined by partial enumeration through Ayakulik River weir, 1984.

Period	Chinook		SH Kelts		UP SH		Coho	
	No.	%	No.	%	No.	%	No.	%
May 20-26	1,226	18.9	19	1.4	...	...	...	...
May 27-June 2	1,103	17.0	71	5.4	...	...	...	...
June 3- 9	1,151	17.7	443	33.7	...	...	...	...
June 10-16	1,119	17.2	134	10.2	...	...	...	...
June 17-23	891	13.7	533	40.6	...	...	...	...
June 24-30	550	8.5	5	0.4	...	...	...	...
July 1- 7	268	4.1	11	0.8	...	...	...	...
July 8-14	124	2.0	45	3.4	...	...	...	...
July 15-21	33	0.5	4	0.3	...	...	...	...
July 22-28	11	0.2	3	0.2	2	1.5	36	0.3
July 29-August 4	6	0.0	26	2.0	7	5.2	232	1.9
August 5-11	8	0.1	14	1.1	22	16.3	859	7.2
August 12-18	9	0.1	2	0.2	46	34.1	3,366	28.2
August 19-25*	3	0.0	4	0.3	58	42.9	7,458	62.4
Total	6,502	100.0	1,314**	100.0	135	100.0	11,951	100.0

* Weir removed on August 25.
** 56 additional dead kelts were removed from the weir.

Table 16. Peak salmon escapement estimates, northeast Kodiak Island, 1984.

System	Chum Salmon		Coho Salmon		Pink Salmon		Sockeye Salmon	
	Date	Escpmt.***	Date	Escpmt.*	Date	Escpmt.***	Date	Escpmt.
American	September 11	8,400	October 11	277	August 28	31,200	NA	...
Buskin	NC	...	November 9	939	September 11	100,000	September 10	4,665**
Chiniak	NC	...	November 6	76	August 31	11,000	NA	...
Hurst	August 27	1,300	November 8	339	August 27	1,000	NA	...
Kalsin	August 13	0	November 7	73****	August 13	0	NA	...
Monashka	NC	...	October 29	93	August 3	4,600	NA	...
Myrtle	NC	...	NC	...	September 11	1,200	NA	...
Olds	August 28	15,000	November 9	325	August 22	36,500	NA	...
Panamaroff	NC	...	November 5	9	NC	...	NA	...
Pasagshak	NC	...	November 5	1,540	August 27	3,500	August 30	1,869**
Pillar	NC	...	October 29	53	July 31	550	NA	...
Roslyn	NC	...	October 12	168	August 31	17,000	NA	...
Russian	September 11	4,800	November 5	62	September 11	9,700	NA	...
Sacramento	NC	...	October 19	650***	August 31	4,800	NA	...
Salonie	September 11	1,100	October 11	113	September 11	4,300	NA	...
Saltery	August 3	10,000	September 10	2,100***	August 28	33,500	July 20	120,000***
Sargent	September 11	100	November 5	61	September 11	3,400	NA	...
Twin	NC	...	September 11	10***	September 11	300	NA	...
#410	NC	...	NC	...	August 13	20	NA	...
Total		40,700		6,888		262,570		126,534

* Foot Survey
** Boat Survey
*** Aerial Survey
**** Includes 12 coho observed in Kalsin Pond.
NC = No Count
NA = Not Applicable

Note: 24 chinook salmon were observed via aerial survey August 13 in Pasagshak River.

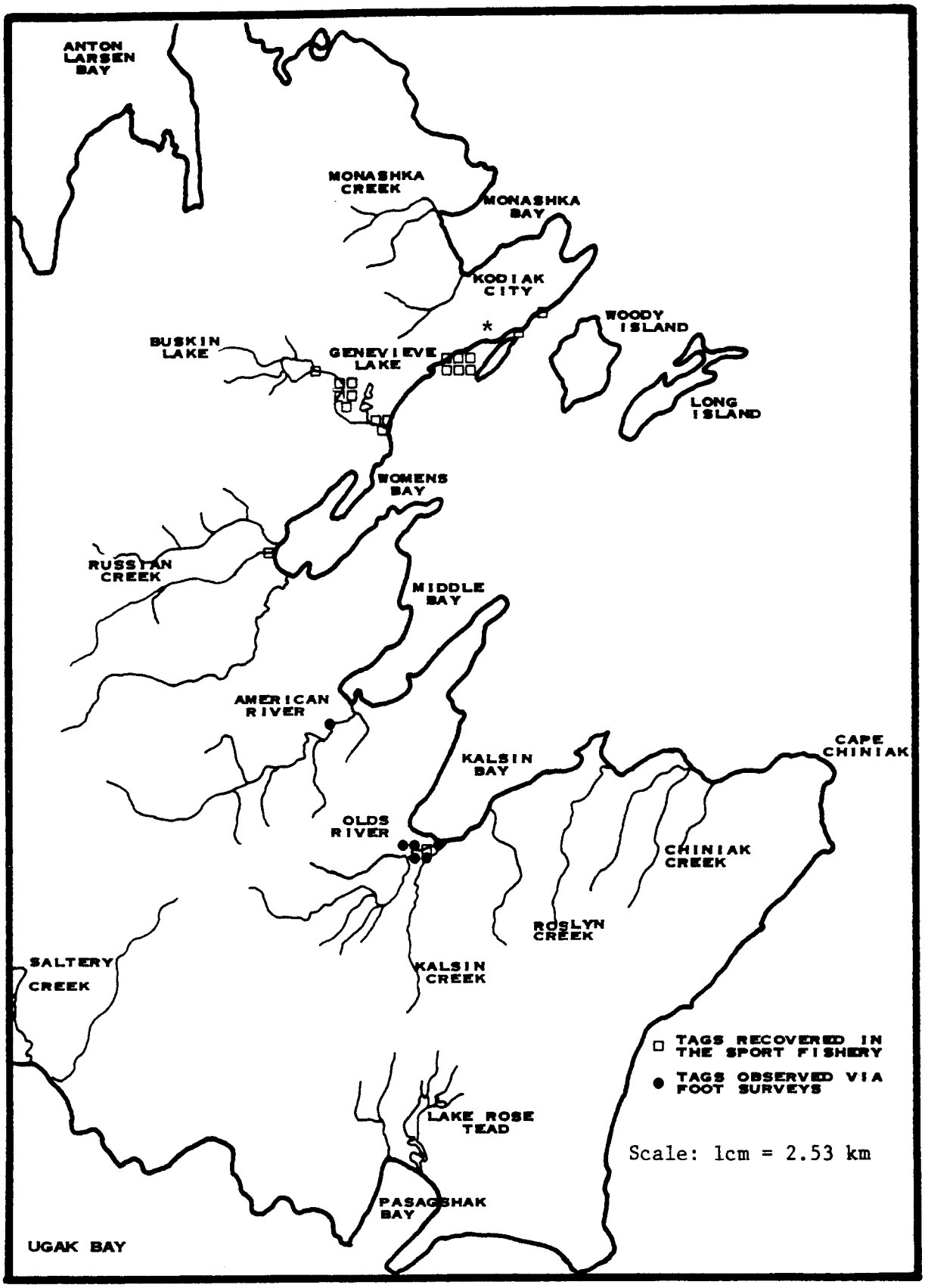

Figure 3. Location of Buskin River Dolly Varden tag recoveries and observations on northeast Kodiak Island, 1984.

Table 17. Timing data, migration distance and area of recaptured Dolly Varden originally tagged in the Buskin River drainage, 1984.

Tag Number	Date		Days Before Recapture	Migration Distance (k)	Area	
	Tagged	Recaptured			Tagged	Recaptured
6	4/17/84	4/18/84	1	...	Buskin R.	Buskin R.
11	4/19/84	4/23/84	4	...	Buskin R.	Buskin R.
36	4/22/84	4/24/84	2	...	Buskin R.	Buskin R.
52	4/25/84	5/08/84	13	...	Buskin R.	Buskin R.
420	5/16/84	5/25/84	9	7.2	Lk.Gen.*	Mission Beach
467	5/17/84	6/27/84	41	...	Lk.Gen.	Buskin R.
199	5/07/84	7/01/84	54	5.6	Lk.Gen.	Ursin Dock
456	5/16/84	7/01/84	46	5.6	Lk.Gen.	Ursin Dock
4**	...	7/05/84	...	6.4	**	Whitney Dock
77	5/04/84	7/08/84	65	...	Buskin R.	Whitney Dock
213	5/07/84	7/08/84	62	...	Lk.Gen.	Buskin R.
87	5/05/84	7/17/84	73	...	Buskin R.	Buskin R.
424	5/16/84	7/18/84	63	...	Lk.Gen.	Buskin R.
203	5/07/84	7/20/84	74	28.4	Lk.Gen.	Olds R.
206	5/07/84	7/29/84	43	6.4	Lk.Gen.	Russian R.
407	5/15/84	8/13/84	90	...	Lk.Gen.	Buskin R.

* Lake Genevieve

** Tags reported but not returned.

Table 18. Length and weight data of nine Dolly Varden tagged in the Buskin River drainage and subsequently recaptured in the sport fishery, 1984.

Date Tagged	Days Before Recaptured	Length (mm)				Weight (g)			
		When Tagged	When Recaptured	Gain Total	Gain %	When Tagged	When Recaptured	Gain Total	Gain %
4/17	1	284	284	0	0	176	176	0	0
4/25	13	242	252	10	4	95	...	...	...
5/17	41	223	268	45	20	90	...	...	...
5/16	46	202	238	36	18	62	149	87	140
5/07	54	200	242	42	21	50	150	100	200
5/07	62	291	331	40	14	180	362	182	101
5/16	63	210	...	...	...	77	215	138	179
5/07	74	219	270	51	23	72	199	127	176
5/07	83	241	285	44	18	99	209	110*	111

* Fish dehydrated when weighed

increase of 0-51 mm and a weight gain of 0-182 g. The duration between tagging and recapture as presented in Table 17 was 1 to 90 days. The migration distance from Buskin River Lagoon extended 7.2 kilometers east to Mission Beach and 28.4 kilometers southwest to the Olds River.

Periodic foot surveys for tagged Dolly Varden were conducted in 2 kilometer sections of Olds River, American River and Salonie Creek, commencing upstream of the highway bridges, between July 14 and October 11, 1984. Fish observations as presented in Table 19 show a low number of Dolly Varden counted July 14 and October 11. Peak counts were observed August 9 (n = 573), September 20 (n = 1,131) and July 30 (n = 218) in American River, Olds River and Salonie Creek, respectively. One tagged Dolly Varden was observed in American River and five tagged fish were observed in Olds River. During the Dolly Varden counts, coho salmon were first observed August 26 in American River (n = 6) and Salonie Creek (n = 1), and August 31 in Olds River (n = 2).

The above counts do not reflect the total Dolly Varden and coho salmon escapements but may be used as an index for Dolly Varden and coho salmon entry into Kodiak roadside streams and when they are first available to the freshwater sport fishery. The tag observations presented in Figure 3, correlated with tags returned in the sport fishery indicate Buskin River Dolly Varden migrate a minimum of 28.4 kilometers (Buskin River to Olds River) during the summer migration. Although the tagging information is not extensive, it appears the Buskin River Dolly Varden population is subject to a sport fishery that encompasses saltwater beaches and streams in the entire Chiniak Bay area.

Public Access to Sport Fishing Waters

The cooperative agreement between the United States Coast Guard (USGS) and the Alaska Department of Fish and Game (ADF&G), Sport Fish Division, was rewritten and submitted to Administration for processing. According to the 5-year plan, properly licensed civilians are allowed free access to the U.S.C.G. Base to sport fish, and ADF&G/Public Safety personnel have fish and game law enforcement authority on the base.

Letters were sent to the Habitat Division requesting land surrounding Long Lake on Woody Island be withdrawn for public recreation and excluded from a State of Alaska land subdivision.

A request was made through Sport Fish Division Headquarters to purchase a total of 72.8 hectares of land in various locations on Kodiak Island that would provide angler access to Karluk River, Ayakulik River, Upper Station Creek, Silver Salmon Creek, Horse Marine Creek and Akalura Lake.

Letters were written to the United States Coast Guard requesting a Green Belt and recreational access corridor be established on Buskin River.

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Table 19. Dolly Varden and coho salmon observations in American River, Olds River and Salonie Creek, July 14 through October 11, 1984.

Name/ Date	Area Surveyed*	Number of Fish Observed		
		Dolly Varden	Tagged DV	Coho
American River				
7/14	Up to 400 m	7	0	0
7/30	2 kilometers	194	0	0
8/09	2 kilometers	573	0	0
8/26	2 kilometers	452	0	6
9/20	2 kilometers	371	1	266
10/11	2 kilometers	161	0	277**
Olds River				
7/14	Up to 400 m	18	0	0
7/26	2 kilometers	181	0	0
8/03	2 kilometers	232	0	0
8/31	2 kilometers	997	3	2
9/11	2 kilometers	467	0	118
9/20	2 kilometers	1,131	2	422
10/11	2 kilometers	99	0	130
Salonie Creek				
7/14	Up to 400 m	0	0	0
7/26	2 kilometers	poor visibility no count	...	...
7/30	2 kilometers	218	0	0
8/26	2 kilometers	152	0	1
9/11	2 kilometers	202	0	5
10/11	2 kilometers	2	0	90

* Observations commenced at the highway bridges.
** Coho were counted in the entire system including tributary streams.

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LITERATURE CITED

Koo, T.S.Y. 1962. Studies of Alaska red salmon. Univ. Wash. Press, Seattle, WA.: pp. 39-48.

Murray, J.B. 1982. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23(G-I-B): 44 pp.

_____. 1983. Inventory and research of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24(G-IB): 26 pp.

Regier, H.A. and D.S. Robson. 1967. Estimating population number and mortality rates. The Biological Basis of Freshwater Fish Production. Blackwell, Oxford: p. 31.

Van Hulle, F. and J.B. Murray. 1972. Inventory and cataloging of sport fish and sport fish waters of southwest Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress 1971-1972, Project F-9-4, 13(G-I-B): 17-41.

_____. 1974. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1973-1974, Project F-9-6, 15(G-I-B): 21 pp.

_____. 1975. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1974-1975, Project F-9-7, 16(G-I-B): 68 pp.

_____. 1976. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1975-1976, Project F-9-8, 17(G-I-B): 34 pp.

_____. 1977. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1976-1977, Project F-9-9, 18(G-I-B): 27 pp.

_____. 1978. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1977-1978, Project F-9-10, 19(G-I-B): 41 pp.

_____. 1979. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20(G-I-B): 47 pp.

_____. 1980. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21(G-I-B): 58 pp.

_____. 1981. Inventory and cataloging of the sport fish and sport fish waters in southwestern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22(G-I-B): 32 pp.

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